



Study on costs and benefits of the sustainable urban mobility transition – D3: Final Report

EIT Urban Mobility - Mobility for more liveable urban spaces

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1. Introduction

1.1 Study context

Cities in Europe are vital centres of economic activity, innovation, and employment. Due to these circumstances, many of them face increasing challenges to their mobility system. On one hand, citizens require to move in an efficient way across the city. On the other, there is an emerging need to fight negative mobility-related externalities such as congestion, air quality, ambient noise, CO₂ emissions, accidents, and urban sprawl. These factors have significant negative impacts on the environment, health and economic performance of cities and can often affect a much broader area than the city itself. Also considering the possible modifications of mobility behaviours induced by the COVID-19 pandemic, many of these problems are expected to increase in the future as cities continue to grow in size and face demographic changes such as ageing populations.

Planning for a sustainable urban mobility system is a difficult task, given the increasingly limited financial resources available to public administrations. It is clear that mobility problems cannot be solved by spontaneous mechanisms alone (the advent of non-traditional operators, such as car-sharing and ride-hailing), technological progress (alternative propulsion cars) or the adoption of exceptional measures. The complex challenge and the scarce resources make it necessary to prepare an integrated strategy that is able to apply sustainable mobility policies evaluated in a scientific and measurable way and is flexible enough to accommodate for future changes. To tackle these challenges, cities need to develop and implement coherent plans focused on the achievement of the EU objectives for sustainable urban mobility.

1.2 Objective of the study

The objective of this study is to assess the impacts of different urban mobility transition scenarios based on the EIT Urban Mobility strategic objectives¹, as well as on those laid out in the European Green Deal² and the EU Smart and Sustainable Mobility Strategy³.

The impacts of the potential urban mobility transition scenarios assumed within this study are quantified in terms of costs and social benefits by 2030 and 2050, thus helping to answer to the following research questions:

¹ https://www.eiturbanmobility.eu/wp-content/uploads/2021/04/210329_SA_EIT-UM-branded_Final-published.pdf

² https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

³ <https://ec.europa.eu/transport/sites/default/files/2021-mobility-strategy-and-action-plan.pdf>

- How much will the transition to sustainable urban mobility cost? What are its costs and benefits, including the monetization of all externalities?
- What range of costs can be identified according to city variables?
- What are the most cost-efficient measures to accelerate sustainable urban mobility?
- For different types of measures, what are the investments needed?

1.3 Methodology

The aim of this study, i.e., to produce a quantified analysis of the costs and benefits of the transition to sustainable urban mobility in European cities by 2030 and 2050, has been accomplished using a quantitative tool which allows to simulate the impacts of different mobility transition scenarios.

The assessment tool MOMOS⁴ (*Sustainable Urban MObility MOdel*) has been used for the quantification of the costs and benefits of the scenarios. MOMOS builds on the algorithms and theoretical structure of the online *Urban Transport Roadmaps 2030 policy support tool*⁵, developed on behalf of DG MOVE.

The model, developed in MS Excel environment, runs until the time horizon 2050 according to transport demand evolution of the new EU Reference Scenario 2020⁶ and allows for the simulation of different transport policies. The tool provides a wide range of indicators, including costs and environmental benefits, for different types of cities.

The use of this tool made it possible to derive the quantification of the transition to sustainable urban mobility taking into account the differences among the European cities in terms of size, geographic location, transport infrastructures, citizens attitudes, etc. The tool provided a quantification of results for three different potential scenarios designed within the study which has been applied to “city prototypes” that consider both their dimension (Large, Medium, Small size) and the geographic location area (Northern Europe, Central/Western Europe, Southern and Eastern Europe), for a total combination of 12 city prototypes. Several reference cities have been used to approximate relevant urban and transport variables that define each city prototype.

The model’s outputs for the 12 prototypes have then been generalized at EU27 level based on the number of cities, and of their population, falling into each of the 12 city categories.

⁴ <http://www.trt.it/en/tools/momos/>

⁵ <http://urban-transport-roadmaps.eu>

⁶ https://ec.europa.eu/energy/data-analysis/energy-modelling/eu-reference-scenario-2020_en

Three potential scenarios, based on different combinations of policy measures selected from important EU initiatives such as ELTIS and CIVITAS, have been considered: “Promote and Regulate”, “Plan and Build”, and “Mixed”. In each of the three scenarios, the policies have been implemented considering the strategic objectives of EIT Urban Mobility, of the EU Green Deal⁷, and of the EU Smart and Sustainable Mobility Strategy.

The first scenario, “Promote and Regulate” is mainly based on changing behaviour by information and promotion. The second one, “Plan and Build” primarily focuses on investments in technologies and infrastructures. The third one, “Mixed” considers most of the policies that have been activated in each of the two previous scenarios.

The indicators calculated by the model provided information on the costs and revenues associated to the implementation of each of the three scenarios, as well as a series of transport and environmental indicators, including the impact on modal split, car ownership, CO₂ emissions, fatalities, etc.

1.4 Structure of the report

The report is organised as follows. First, the analytical framework of the study is illustrated, explaining the rationale behind the design of the three urban mobility scenarios and the policy measures implementation. Then, the quantification of the costs and benefits of the sustainable urban mobility transition is presented. Indicators are calculated for a series of city prototypes, necessary to summarize the entire EU27 context. These results are complemented with an analysis of policy measures effectiveness and with a series of recommendations and key messages that can be extrapolated from this study.

The full list of output indicators, for each of the 12 city prototypes, is contained in *Annex I – Output Indicators*.

⁷ The Green Deal target is to attain a -55% and -90% greenhouse gas reduction in the transport sector by 2030 and 2050, respectively. Comparisons are made with greenhouse gas emissions level in 1990.

2. Methodological approach

2.1 Analytical framework

The MOMOS assessment tool provides estimations of mobility trends in urban areas quantifying transport, environmental and economic impacts of transport policy measures from the base year (set as 2019) until 2050.

MOMOS, which is a strategic and aggregated model, is adaptable to different city circumstances in different European countries, and allows to rapidly identify, develop, screen, and assess different measures and policies scenarios and their expected impacts. This tool does not intend to replace sophisticated transport models but allows for an evaluation of alternative solutions.

Policy measures can be simulated individually or can be used to build policy packages activating multiple measures. Each measure is defined through specific inputs parameters, which determine its intensity, and through its temporal dimension. In fact, it is possible to set a specific year (and a ramp-up period to achieve full implementation) for the activation of each measure: this feature of the model allows to design intervention strategies assuming that some policies will be implemented first while others at a later stage.

The model estimates a set of output indicators, concerning different domains:

- Transport (modal split, vehicle fleet evolution, car ownership, congestion, etc.)
- Environment and safety (air pollutant and GHG emissions, energy consumption, fatalities, etc.)
- Economy (cost and revenues for the city, externalities, etc.)

The model allows to simulate at the same time different scenarios, designed independently, to be used for comparison purposes. Within this study, three urban mobility scenarios are compared among each other.

In order to evaluate impacts among European cities, different city prototypes have been designed to represent different urban conditions on the basis of their dimension and the geographic localization. In particular, three types of city dimensions have been considered:

- Small (50,000 - 100,000 inhabitants)
- Medium (100,000 - 500,000 inhabitants)
- Large (more than 500,000 inhabitants)

Also, four geographic areas have been considered among the EU27 Member States in order to take into account of different per capita income, motorisation rates, fleet composition, energy prices, value of travel time, etc.:

- *Northern Europe* (Denmark, Finland, Ireland, Sweden)
- *Central/Western Europe* (Austria, Belgium, France, Germany, Luxembourg, Netherlands)
- *Southern Europe* (Croatia, Cyprus, Greece, Italy, Malta, Portugal, Slovenia, Spain).
- *Eastern Europe* (Bulgaria, Czech Republic, Poland, Slovakia, Hungary, Romania, Estonia, Latvia, Lithuania)

Intersecting the three dimensions with the four geographic areas, 12 city prototypes have been generated to cover and generalize the entire EU27 context. Each prototype is representative of a set of cities in EU27 with specific mobility characteristics. The adaptation of the model for the application to the various prototypes is performed through a set of transport parameters, that allow the model to reproduce the most appropriate urban transport patterns. For example, small cities might have in general a reduced availability of public transport infrastructures compared to large cities, and so on.

Table 1 below includes the cities (30) that have been used as reference to define the city characteristics and transport parameters for each of the 12 city prototypes. In selecting these examples, priority has been given to cities that are currently part of the EIT Hub network and were involved in the SUMI project⁸. At the same time, all EU27 countries have at least one city to “represent” them, with the only exception of Cyprus, Luxembourg, and Malta.

Table 1: List of reference cities for each of the 12 city prototypes

	Southern Europe	Central/Western Europe	Northern Europe	Eastern Europe
Small City	Alessandria (IT) Faro (PT) Zadar (HR)	Klagenfurt (AT) La Rochelle (FR) Leuven (BE)	Galway (IR) Lahti (FI)	Daugavpils (LV) Tartu (EE) Zilina (SK)
Medium City	Perugia (IT) Ljubljana (SI)	Bielefeld (DE) Eindhoven (NL)	Uppsala (SE) Oulu (FI)	Gdynia (PL) Klaipeda (LT) Szeged (HU) Timisoara (RO)
Large City	Athens (EL) Barcelona (ES)	Bordeaux (FR) Munich (DE)	Copenhagen (DK) Dublin (IR) Göteborg (SE)	Prague (CZ) Sofia (BG)

Source: Own elaboration

⁸ https://ec.europa.eu/transport/themes/urban/urban_mobility/sumi_en

Although limited in number, the 12 city prototypes used in the simulation are fairly representative of the urban reality of EU27 context. In order to generalize to the European context, it is necessary to keep into consideration the number of Small/Medium/Large cities in Northern/Central-Western/Southern/Eastern Europe to provide the most accurate estimation for EU urban areas characteristics.

The total number of EU cities has been defined according to Eurostat⁹ definition of *City*: “A city is a local administrative unit (LAU) where the majority of the population lives in an urban center of at least 50,000 inhabitants”.

In total, 779 European cities have been considered. The full list of these cities, alongside the prototype they belong to, is available in *Annex II - List of EU27 cities*

2.2 Input Data

In order to represent the characteristics at the base year, as well as the trends in place in each city prototype, the modelling tool requires a set of input data to reproduce different city circumstances, related to socio-demographic aspects as well as mobility features (public transport infrastructure, innovative services, parking, traffic management solutions, etc.).

Table 2 below lists and describes all the data inputs that have been collected for the 30 reference cities and used to define the representative inputs of the 12 city prototypes. Inputs related to base year refers to 2019.

Table 2: List of data inputs used for the reference cities

Group	Input data	Description	Sources
Urban Characteristics	Population	Population of the city	National Statistics Database
	Population Structure	Age distribution of the city population	National Statistics Database
	Population Growth	Expected trend of the population growth	European Commission, JRC projections ¹⁰
	Population Distribution	Population distribution between city centre and outskirts	National Statistics Database
	Urban Growth	Population shifts between city centre and outskirts	National Statistics Database, EUROSTAT

⁹ <https://ec.europa.eu/eurostat/web/cities/data/database>

¹⁰ <https://urban.jrc.ec.europa.eu/thefutureofcities/urbanisation#figure7b>

Group	Input data	Description	Sources
	Average Income	Average income of the city population	National Statistics Database, EUROSTAT
	Economy	Economy city type, representing the relevance of industrial sector for the city in terms of employees working in manufacturing, construction and public utilities	European Commission Report ¹¹
Urban Mobility Characteristics	Motorization Rate	Number of private cars per capita	ACEA Report on Vehicles in use ¹²
	Motorization Rate Change	Annual growth of the motorization rate	ACEA Report on Vehicles in use
	Modal Split	Modal split with respect to the urban area only (walk, bike, car, motorbike, bus, tram, metro)	TEMS - The EPOMM modal split tool ¹³ , JRC mobility survey 2018
	Modal Split Change	Modal split trend over time in absence of policy activation	Assumption of business-as-usual trend
	Congestion Level	Qualitative description of road congestion in the city (significant, only during rush hour, negligible)	TOM TOM index, Google Maps Traffic Layer
	Incoming Trips	Share of incoming trips in the urban area, with respect to the total amount of trips within the area	Assumptions based on available city planning documents
	Modal Split of the Incoming Trips	Modal Split of the incoming trips into the urban area (private car, bus, train)	Assumptions based on available city planning documents
	Freight Vehicles Rate	Share of freight vehicles with respect to the total vehicles (freight and cars) travelling in the urban area	Assumptions based on selected traffic counts and available city planning documents
	Freight Vehicles Rate Change	Annual change in the share of freight vehicles with respect to total vehicles travelling in the area	Assumptions based on selected traffic counts in a business-as-usual configuration
Public Transport Characteristics	Ticket price	Ticket price for monthly passes and single tickets	Public Transport Operators Reports and Official Websites

¹¹ <https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/>

¹² ACEA (2019), ACEA Report Vehicles in use Europe 2019 (https://www.acea.auto/files/ACEA_Report_Vehicles_in_use-Europe_2019-1.pdf)

¹³ <http://tems.epomm.eu/>

Group	Input data	Description	Sources
	Cost	Implementation and management costs for public transport operators	Public Transport Operators Reports
	Network	Length of the network	Public Transport Operators Reports
	Average Speed	Average speed of the vehicles	Public Transport Operators Reports
	Transport Service Offer	Annual vehicle-kilometre	Public Transport Operators Reports
	Bus Vehicle Fleet	Composition of the fleet, with respect to the fuel type	ACEA Report on Vehicles in use
Park & Ride	Parking Capacity	Number of parking lots	Public Transport Operators Reports
	Network Extension	Length of the public transport routes connected with P&R park	
	Public Transport Frequency	Frequency of Park & Ride connection service	
	Tariff	Tariff for single use or subscription related to parking only (the cost of using PT not considered)	
Infrastructure and Traffic Management	Paid Parking	Number of paid parking lots in the urban area	City Annual Reports
	Parking Price	Average hourly parking price	Public Transport Operators
	Public Transport Reserved Lane	Length of the public transport reserved lanes	Public Transport Operators
	Bike Lane	Length of the bike lanes in the urban area	City Annual Reports
	Electric Charging Stations	Number of electric charging stations	City Annual Reports
	Hydrogen Charging Station	Number of hydrogen filling stations	City Annual Reports
Car Sharing	Subscribers	Number of subscribers	Carsharing Providers Official Websites
	Type	Station Based or Free-Floating service	
	Tariff	Fixed and hourly average tariff	
	Vehicle Fleet	Number of car sharing vehicles	
Bike Sharing	Vehicle Fleet	Number of bicycles of the bike Sharing service	Bike Sharing Providers Official Websites
	Electric Fleet	Share of electric bicycles in the fleet	
	Tariff	Fixed and hourly average tariff	
Vehicle Access Regulation	Limited Traffic Zone	Qualitative quantification of the share of urban area under Limited Traffic Zone	urbanaccessregulations.eu, City Annual Reports
	Pedestrian Areas	Qualitative quantification of the share of urban area with pedestrian areas	
Traffic Calming Measures	Traffic Calming Area	Share of the urban area under 30 km/h speed limit	City Annual Reports
Road vehicle fleet composition	Vehicle fleet	Vehicle fleet composition by fuel type and emission standard (for conventional fuels) for private cars, car sharing cars, Light Duty Vehicles and Heavy Goods Vehicles. It is	ACEA Report on Vehicles in use, National Statistics Database

Group	Input data	Description	Sources
		assumed that national data can be used as representative data for vehicle fleet composition also at urban level.	

Source: Own elaboration

2.3 Design of the urban mobility scenarios

Once defined the analytical framework, it is necessary to introduce the collection of policy measures that are implemented within the study. These measures, divided into six policy groups, comprehensively cover the range of options that cities currently have available to lead the transition to sustainable urban mobility (see Table 3).

Table 3: Identification of policy measures

Policy Group	Policy Measure
Shared Mobility and Demand Management	Sustainable travel information and promotion (behaviour)
	Mobility as a Service (MaaS)
	Bike sharing
	Micro mobility
	Carsharing
	Delivery and servicing plan ¹⁴
Innovative Services	Teleworking
	Autonomous vehicles
	Demand-responsive transport (DRT)
Green Public Transport and Logistics Fleets¹⁵ & Charging Infrastructure	Intelligent Transport Systems (ITS)
	Electric energy refuelling infrastructure
	Hydrogen energy refuelling infrastructure
	Green public fleet
Pricing Schemes	Green logistics fleet
	Congestion and pollution charging
	Parking pricing
Transport Infrastructure	Public transport integrated ticketing and tariff schemes
	Bus network and facilities
	Tram network and facilities
	Walking and cycling networks and facilities
	Park and ride (multimodal mobility hubs)
	Metro network facilities and light rail
	Urban Delivery Centres and city logistics facilities

¹⁴ Delivery and Servicing Plans (DSPs) are detailed plans to consolidate and reduce freight delivery and servicing vehicles accessing a site or building.

¹⁵ Green fleets include Electric and Hydrogen vehicles

Traffic management and control	Legal and regulatory framework of urban freight transport
	Legal and regulatory framework of new mobility services
	Prioritizing Public Transport
	Access regulation and road and parking space reallocation
	Traffic calming measures
	Pedestrian Areas

Source: Own elaboration

By differently combining the policy measures, three potential transition scenarios have been built through subsets of policies, whose combination and interaction define the scenario itself:

- **Scenario 1 “Promote and Regulate”** is mostly based on inducing a more sustainable mobility behaviour of citizens through information, regulations, and promotion of innovative and shared mobility services. The approach of this scenario is aimed at the short to medium term. Some of its measures are relatively fast to implement with few investments’ costs associated, others need some more time and resources but basically there are no long-term programmes.
- **Scenario 2 “Plan and Build”** is focused on investments in technologies and infrastructures¹⁶. The aim is to change the urban environment and its existing transport facilities, with a more long-term strategy. The focus is especially on public transport, with less emphasis on other transport alternatives (e.g., shared mobility). Autonomous vehicles and Demand-Responsive Transport are also a crucial part of this scenario. This strategy is ambitious and long term, as many of its measures need time to be implemented and provide results. With respect to the first scenario, this one generally requires higher investments, due to the infrastructures that need to be build and maintained.
- **Scenario 3 “Mixed”** considers policies from each of the two previous scenarios and intensifies their reach in order to reach the target of -55% of CO2 emissions reduction by 2030. It assumes changes in urban mobility (as well as in the other transport sectors) and extreme shifts in how people move (with also related acceptability issues) in addition to the foreseen trend of fleet decarbonisation. This is done including regulations and behavioural incentives as well as the provision of infrastructures and services. Economic instruments play a key role in this approach and their role would be twofold. On the one hand, they are used for changing the behaviour of citizens by adopting the “user pays” or “polluter pays” principle (for example, road pricing policies are a cornerstone of this scenario). On the other hand, they are used to generate resources to support sustainable mobility by improving public transport, walking, and cycling facilities.

¹⁶ Scenario 2’s investments in public transport are focussed on metro/tram in Large cities, tram/buses in Medium cities, and buses in Small cities.



Table 4 lists all the measures that contribute to the definition of each scenario

Table 4: List of policy measures associated to each scenario

Policy Group	Policy Measure	S01: Promote and Regulate	S02: Plan and Build	S03: Mixed
Shared Mobility and Demand Management	Sustainable travel information and promotion (behaviour)	X		X
	Mobility as a Service (MaaS)	X		X
	Bike sharing	X		X
	Micro mobility	X		X
	Carsharing	X		X
	Delivery and servicing plan	X		X
Innovative Services	Teleworking	X		X
	Autonomous vehicles		X	X
	Demand-responsive transport (DRT)		X	X
Green Public Transport and Logistics Fleets & Charging Infrastructure	Intelligent Transport Systems (ITS)		X	X
	Electric energy refuelling infrastructure	X	X	X
	Hydrogen energy refuelling infrastructure	X	X	X
	Green public fleet	X	X	X
Pricing Schemes	Green logistics fleet	X	X	X
	Congestion and pollution charging	X		X
	Parking pricing	X		X
Transport Infrastructure	Public transport integrated ticketing and tariff schemes	X		X
	Bus network and facilities		X	X*
	Tram network and facilities		X	
	Walking and cycling networks and facilities		X	X
	Park and ride (multimodal mobility hubs)		X	X
	Metro network facilities and light rail		X	
Traffic management and control	Urban Delivery Centres and city logistics facilities		X	X
	Legal and regulatory framework of urban freight transport	X		X
	Legal and regulatory framework of new mobility services	X		X
	Prioritizing Public Transport		X	
	Access regulation and street space reallocation	X		X
	Traffic calming measures	X		X
	Pedestrian Areas	X		X

Source: Own elaboration

*Except for in large cities

Policy measures are applied and modulated within each scenario according to different implementation patterns and roadmaps, whose ultimate objective is to address the zero emission and sustainable mobility goals.

Table 5, Table 6, and Table 7 summarize the initial year in which each policy is put into effect, as well as the ramp-up years needed to fully implement the measure. Once the policy is fully implemented, it is considered that it will stay in place until the scenario's last year (2050).

Legend:
Policy Implementation (activation + ramp-up)
 Policy fully implemented

Table 5: Policy measures implementation overview for Scenario 1 “Promote and Regulate”

Policy Measures	2019				2023				2028				2035				2040				2050			
Sustainable travel information and promotion					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Mobility as a Service (MaaS)									■	■	■	■												
Bike sharing					■	■	■	■	■	■	■	■												
Micro mobility					■	■	■	■	■	■	■	■												
Carsharing					■	■	■	■	■	■	■	■												
Delivery and servicing plan									■	■	■	■	■	■	■	■								
Teleworking					■	■	■	■	■	■	■	■												
Electric energy refuelling infrastructure					■	■	■	■	■	■	■	■												
Hydrogen energy refuelling infrastructure									■	■	■	■	■	■	■	■								
Green public fleet					■	■	■	■	■	■	■	■	■	■	■	■								
Green logistics fleet					■	■	■	■	■	■	■	■	■	■	■	■								
Congestion and pollution charging					■	■	■	■	■	■	■	■												
Parking pricing					■	■	■	■	■	■	■	■												
Public transport integrated ticketing and tariff schemes					■	■	■	■	■	■	■	■												
Legal and regulatory framework of urban freight transport									■	■	■	■												
Legal and regulatory framework of new mobility services					■	■	■	■	■	■	■	■												
Access regulation and street space reallocation					■	■	■	■	■	■	■	■												
Traffic calming measures					■	■	■	■	■	■	■	■												
Pedestrian Areas					■	■	■	■	■	■	■	■												

Source: Own elaboration



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Table 6: Policy measures implementation overview for Scenario 2 “Plan and Build”

Policy Measures	2019				2023				2028				2035				2040				2050							
Autonomous vehicles (Car Sharing)																												
Autonomous vehicles (DRT)																												
ITS																												
Demand-responsive transport																												
Electric energy refuelling infrastructures																												
Hydrogen energy refuelling infrastructures																												
Green public fleet																												
Green logistic fleet																												
Bus network and facilities																												
Tram network and facilities																												
Walking and cycling networks and facilities																												
Park and ride (multimodal mobility hubs)																												
Metro network facilities and light rail																												
Urban Delivery Centres and city logistics facilities																												
Prioritizing Public Transport																												

Source: Own elaboration



Table 7: Policy measures implementation overview for Scenario 3 "Mixed"

Policy Measures	2019	2023	2028	2035	2040	2050
Sustainable travel information and promotion						
Mobility as a Service (MaaS)						
Bike sharing						
Micro Mobility						
Car Sharing						
Delivery and servicing plan						
Teleworking						
Autonomous vehicles (Car Sharing)						
Autonomous vehicles (DRT)						
ITS						
Demand-responsive transport						
Electric energy refuelling infrastructures						
Hydrogen energy refuelling infrastructures						
Green public fleet						
Green logistic fleet						
Bus network and facilities						
Congestion and pollution charging						
Parking pricing						
Public Transport integrated ticketing and tariff schemes						
Walking and cycling networks and facilities						
Park and ride (multimodal mobility hubs)						
Urban delivery centres and city logistics facilities						
Legal and regulatory framework of urban freight transport						
Legal and regulatory framework of new mobility services						
Access regulation and road and parking space reallocation						
Traffic calming measures						
Pedestrian areas						

Source: Own elaboration



Beside the implementation timeline and the scenario(s) in which policy measures are activated, each policy measure is calibrated following a specific rationale that keeps into consideration the strategic objectives of the EIT Urban Mobility, the EU Green Deal, and the EU Smart and Sustainable Strategy.

Table 8 presents the rationale for each policy implementation, and outlines wherever there are policy input differences among the prototypes (based on the city dimension and geography).

Table 8: Policy measures implementation rationale

Policy Group	Policy Measure	Policy Implementation Rationale
Shared Mobility and Demand Management	Sustainable travel information and promotion (behaviour)	This policy aims at promoting sustainable mobility solutions through travel information and promotion campaigns to change people's travel behaviour. The intensity of this policy effort is defined according to EU cities SUMP.
	Mobility as a Service (MaaS)	The policy assumes that a MaaS platform is implemented in the city, allowing to integrate various forms of mobility services into a single service. It is assumed that the integration includes public transport (bus, tram, metro and DRT when implemented), car sharing, bike sharing and micromobility. Impacts concern transport time and transport cost for the services involved, becoming more attractive for the users. The policy assumes that the impacts are larger in medium and large cities with respect to small cities. Parameters are set based on literature on MaaS and existing cities examples / pilots.
	Bike sharing	The policy assumes an enhancement of the bike sharing scheme already in place at the base year. The tariff is considered unchanged, while the vehicle fleet is enlarged in order to enhance the coverage of the service within the urban area. Targets in terms of bikes per inhabitants are set and differentiated depending on the size of the city. Parameters are based on cities examples and SUMP objectives
	Micro mobility	The policy assumes the diffusion of micromobility (all small lightweight devices travelling below 25 km/h), also in the form of shared services. In particular, an increase of electric devices is assumed, with different pace and penetration depending on city size (lower in small cities, higher in medium and large cities). Parameters are set based on cities examples and SUMP objectives.
	Car Sharing	The policy assumes an enhancement of the car sharing scheme already in place at the base year. The tariff is considered unchanged, while the vehicle fleet is enlarged in order to enhance the coverage of the service within the urban area. Targets in terms of vehicle fleet are set and differentiated depending on the size of the city. Parameters are based on cities examples.

Policy Group	Policy Measure	Policy Implementation Rationale
	Delivery and servicing plan	The policy represents the implementation of detailed plans to consolidate and reduce delivery and servicing vehicles accessing a site or building. The expected impact is a reduction of the number of goods vehicles entering the urban area as result of more efficiency. Parameters are based on cities examples.
	Teleworking	The policy assumes an increasing adoption of telework and smart working, resulting in a change of trips generated per person, especially for commuting purposes. The intensity of the policy has been set based on literature review, and differentiated depending on the city dimension (the impacts expected to be larger in large cities)
Innovative Services	Autonomous vehicles	The uptake of autonomous driving is simulated for public transport (in the form of demand-responsive transport) and car sharing services, assuming a large penetration of AVs by 2050 and a large coverage of the urban area where the AV services are provided. The uptake of private autonomous vehicles is not considered in the policy. Parameters have been designed on the basis of the EU Study on exploring the possible employment implications of connected and automated driving ¹⁷
	Demand-responsive transport (DRT)	Demand-responsive transport is simulated as a new PT service, partially replacing the existing bus routes in the area where DRT is offered. DRT is expected to be provided in a limited part of the urban area. Parameters have been designed on the basis of literature review on DRT applications
	Intelligent Transport Systems (ITS)	The diffusion of Intelligent Transport Systems is expected to improve safety and efficiency in road transport, in terms of urban travel time, energy consumption, air pollutant emissions. The design of the policy is based on the European Commission studies related to the Intelligent Transport Systems Directive. ¹⁸
Green Public Transport and Logistics Fleets & Charging Infrastructure	Electric energy refuelling infrastructure	The availability of electric refuelling infrastructures is simulated assuming an increased number of stations in order to support the penetration of electric vehicles in the fleet. The target is based on the objectives of Green Deal, differentiated by city size (more infrastructure in large cities)
	Hydrogen energy refuelling infrastructure	The availability of hydrogen refuelling infrastructures is simulated assuming an increased number of stations in order to support the penetration of fuel cell vehicles in the fleet. The target is based on the objectives of Green Deal, differentiated by city size (more infrastructure in large cities)

¹⁷ European Commission (2020), Study on exploring the possible employment implications of connected and automated driving

¹⁸ Ricardo et al. (2019), Support study for Impact Assessment of Cooperative Intelligent Transport Systems, <https://op.europa.eu/en/publication-detail/-/publication/426495e6-81c1-11e9-9f05-01aa75ed71a1>

Policy Group	Policy Measure	Policy Implementation Rationale
	Green public fleet	The policy assumes an increased penetration of electric vehicles in the bus fleet, on top of the exogenous trend related to technology development already assuming the diffusion of innovative vehicles. The setup of parameters has been designed on the basis of examples of renewal objectives of SUMP.
	Green logistics fleet	The policy assumes a large penetration of electric vehicles in the light duty vehicle fleet used for logistic distribution, on top of the exogenous trend related to technology development already assuming the diffusion of innovative vehicles. The setup of parameters has been designed on the basis of examples of renewal objectives of SUMP.
Pricing Schemes	Congestion and pollution charging	It is assumed that a congestion charging scheme is implemented in a limited area of the city, applied to both cars and freight vehicles. The charge is in place during the day for all vehicles (also alternative vehicles). The setup of parameters has been designed based on existing application of the policy.
	Parking pricing	The policy assumes to increase the amount of parking slots subject to pricing in the urban area. The parking tariff is assumed to be unchanged, although a discount of 20% is foreseen for hybrid electric vehicles, and of 40% for electric/hydrogen vehicles
	Public transport integrated ticketing and tariff schemes	The policy is designed to support public transport users, i.e. implementing a discounted tariff for regular commuters and increasing tariff for infrequent users. Furthermore, it is assumed that an integrated ticketing systems is in place, resulting in seamless travels and no requirement to buy tickets whilst switching either transport modes or services.
Transport Infrastructure	Bus network and facilities	The policy consists of making the bus transport service more accessible. This means improving bus stops, stations, etc. but also extending the service (new lines, better frequency). Both these two elements influence the mode share of bus improving its attractiveness. The setup of parameters has been designed on the basis of examples of renewal objectives of SUMP. The policy is not implemented in the large cities.
	Tram network and facilities	The policy consists of making the tram transport service more accessible. This means improving tram stops, stations, etc. but also extending the service (new lines, better frequency). Both these two elements influence the mode share of tram improving its attractiveness. The setup of parameters has been designed on the basis of examples of renewal objectives of SUMP. The policy is not implemented in the small cities.
	Walking and cycling networks and facilities	The policy is aimed at making pedestrian and cycling trips easier and safer. The implementation of the measure consists of assuming that, when these facilities are provided, the mode share of pedestrian and bicycle modes grows at the expense of competing modes. Furthermore, also accident rates are reduced because it is

Policy Group	Policy Measure	Policy Implementation Rationale
		assumed that citizens can walk and cycle in protected lanes, pathways, etc. thus reducing the risk of being hit by motor vehicles. The setup of parameters has been designed on the basis of cities examples and objectives of SUMP
	Park and ride (multimodal mobility hubs)	The concept of Park and Ride is modelled assuming that parking areas are provided at the border of the city area with efficient public transport connections to the city centres. This means that a larger share of trips incoming from external zones by car will interchange to public transport. The intensity of the effect depends on the features of the Park and Ride service, i.e. its cost, the capacity of the parking areas, the coverage of the urban area by means of the public transport services and its frequency. The Park and Ride tariff is assumed to be unchanged, whereas parking capacity is increased. Moreover, public transport frequency is improved in medium and large cities, accordingly with cities examples and objectives of SUMP.
	Metro network facilities and light rail	The policy consists of making the metro transport service more accessible. This means improving metro stops, stations, etc. but also extending the service (new lines, better frequency). Both these two elements influence the mode share of metro. The setup of parameters has been designed on the basis of cities examples and objectives of SUMP. The policy is activated only in large city prototypes.
	Urban Delivery Centres and city logistics facilities	The policy is modelled assuming that logistics platforms are created at the border and within the urban area in appropriate locations to serve as hubs for the final distribution. A share of the shipments arriving from outside the city pass through the delivery centres, where loads are consolidated and distributed in a more efficient way, increasing the load factor of vehicles, shortening consignment routes and using cleaner vehicles. This means fewer freight vehicles-km in the urban area. The number of logistic platforms has been set on the basis of examples of renewal objectives of SUMP. The larger the city size, the larger the number of logistic platforms.
Traffic management and control	Legal and regulatory framework of urban freight transport	For the modelling of this policy the assumption is that the activity of freight modes in the urban area is regulated to reduce traffic especially in some zones and times of the day. Therefore, when this measure is activated, a reduction of freight vehicles within the urban area is modelled and the reduction is larger in peak time. The setup of parameters has been designed on the basis of cities examples.
	Legal and regulatory framework of new mobility services	The policy aims at improving the new mobility services such as car-sharing, bike-sharing, micro-mobility and MaaS. When this policy is activated, an improvement in these transport modes is modelled.
	Prioritizing Public Transport	The policy requires regulations but also appropriate infrastructures such as reserved lanes and automated traffic lights to give way to

Policy Group	Policy Measure	Policy Implementation Rationale
		buses and trams when they approach crossroads. The modelling of the measure assumes that such infrastructures are realised. The result is an improvement of public transport speed, making PT more attractive. The setup of parameters has been designed on the basis of city characteristics. In medium and large city prototypes, longer reserved lanes are assumed.
	Access regulation and road and parking space reallocation	The policy aims at reducing the space available for using cars and for parking cars in order to increase the liveability of the urban space. The assumption is that the restrictions applied make it less convenient to use a car for some trips and so there is a reduction in the share of cars in traffic. Another outcome of this policy is the reduced risk of accidents. The share of urban area where restrictions are applied has been designed on the basis of cities examples and SUMP.
	Traffic calming measures	The policy assumption is the implementation of traffic calming measures in the urban area, making the use of cars less convenient for a portion of trips. A reduction in accident rates is also foreseen. Traffic calming consists of regulation (e.g., zones with maximum allowable speed of 30 km/h) but also in various physical interventions (e.g., to restrict carriageways). The share of urban area where restrictions are applied has been designed on the basis of examples of SUMP.
	Pedestrian Areas	The policy is aimed at making pedestrian trips easier and safer. The implementation of the measure assumes that when pedestrian areas are provided pedestrian trips grow at the expenses of competing modes. Furthermore, also accident rates are reduced because it is assumed that citizens can walk in protected spaces thus reducing the risk of being hit by motor vehicles. The setup of parameters has been designed on the basis of cities examples and SUMP.

Source: Own elaboration

In addition to each policy own rationale, a general remark is also required in relation to the costs associated to the various measures (implementation, management/maintenance) in the policy inputs. In fact, a differentiation has been considered based on the 12 prototype's geography (Northern, Central/Western, Southern, Eastern Europe) to proportionally account for economic gaps among countries belonging different geographic areas. This differentiation is based on three indicators: Gross Domestic Product (GDP), Labour Cost, and Average Income.

More specifically, wider differences are assumed for maintenance costs, which are essentially based on the labour cost. On the other hand, investment costs, which comprehend a large component of fixed costs that are difficult to differentiate by country (e.g., the production cost of a new bus for the Public Transport system), shows smaller differences among prototypes.

2.4 Exogenous assumptions

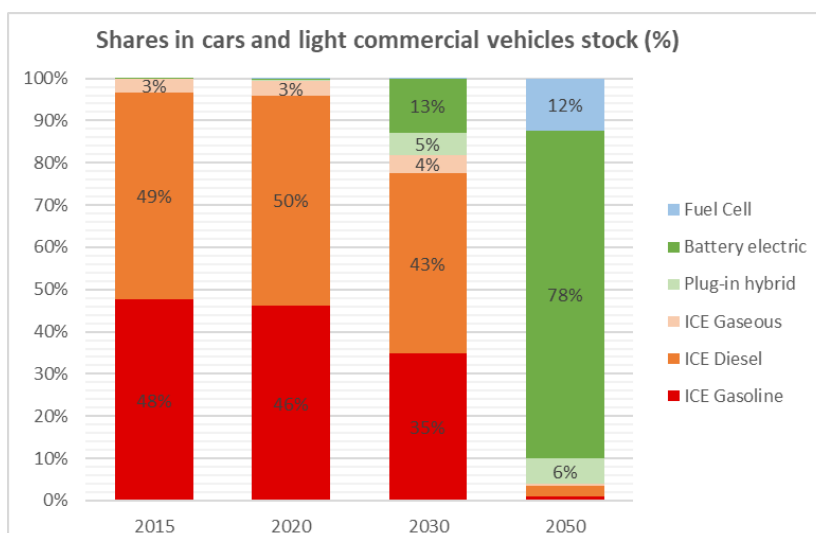
The model is designed to simulate scenarios under different exogenous assumptions related to the evolution of vehicle fleet composition over time. In fact, the data on road vehicle stock used to estimate environmental indicators is differentiated by fuel type, in order to simulate the impacts of the penetration of innovative technologies in the fleet.

The reference scenario adopted in this study follows the assumptions related to the vehicle technology composition of the EU Reference scenario 2020. According to this scenario, at the year 2050 the private cars and LDV vehicles fleet composition will be about 47% ICE (gasoline, diesel and gaseous) and 53% of innovative fuels (electric, including also plug-in hybrid, or fuel cell), while in 2030 the share of electric and plug-in hybrid is expected to cover only about 16%.

Conversely, the three alternative scenarios are simulated with a more ambitious penetration of innovative vehicle technologies, building on the assumptions of the EU “Fit for 55” strategy (European Commission, 2021). This “ambitious” assumption includes a significant reduction of the internal combustion engine vehicles in the long-term, by replacing them with low- and zero-emission vehicles and boosting the use of renewable and low-carbon fuels (fleet decarbonisation).

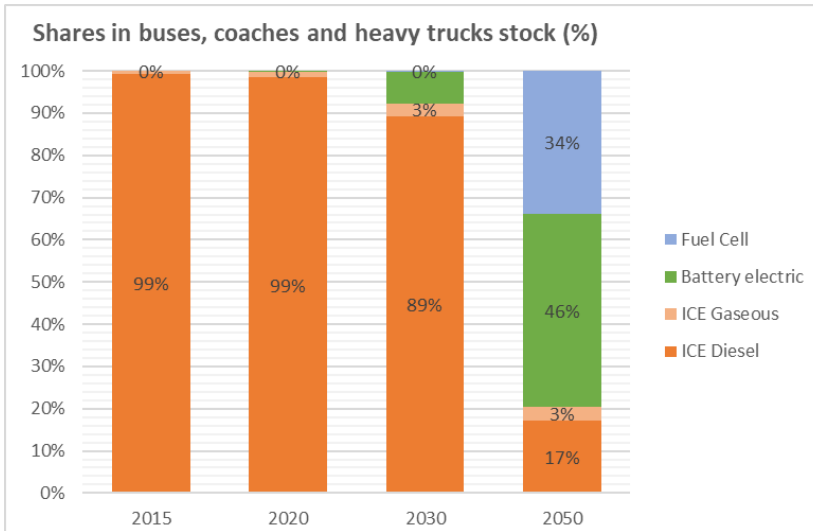
Also, the composition of the fleet is the same under the three scenarios. This means that the model does not consider the potential impact of the simulated policies on speed of EV penetration. This impact could be significant in Scenario 3 and to a more limited extent in Scenario 1 as well.

Figure 1: Vehicle stock composition (cars and LDV) for the three scenarios



Source: MOMOS model assumptions, building on FIT FOR 55 strategy

Figure 2: Vehicle stock composition (buses, coaches and heavy trucks) for the three scenarios



Source: MOMOS model assumptions, building on FIT FOR 55 strategy

This study considers only the costs affecting the local authorities (local administration, public transport operators, innovative services providers) such as the costs for the green fuel recharging urban infrastructure required to support the evolution of vehicle technologies. As a consequence, only a share of the costs associated to the ambitious penetration of innovative vehicles are included.

Other relevant costs associated, such as government incentives, costs for the automotive sector, etc., belong to external entities, thus they are not associated to the city budget and are not considered within this study.

3. Results of the Study

3.1 Quantification of costs and benefits of the sustainable urban mobility transition

This chapter presents the results of the simulation exercise through a series of indicators that quantify the costs and benefits of the sustainable urban mobility transition in European cities by the years 2030 and 2050. Results are offered for each potential scenario designed for the purpose of this study.

The results of the three potential scenarios are provided separately for the 12 city prototypes, which synthesise the differences of European cities in terms of geography (Southern, Central/Western, Northern, and Eastern Europe) and dimension (Small, Medium, and Large cities). Then, considering the number of actual cities that fall into each prototype category (e.g., Small Southern, Large Central/Western, Medium Eastern, etc.), results are generalized for the entire European context.

Importantly, in quantifying the cost of the sustainable urban mobility transition, the study also considers the cost of externalities. These costs are estimated taking into account CO₂ emissions, air pollutant emissions (considering NO_x, VOC, CO and PM_{2.5}), noise and accidents (fatalities and injured people). The applied monetary values are those adopted by the European Commission handbook of 2019 (*Sustainable Transport Infrastructure Charging and Internalisation of Transport Externalities*¹⁹), as reported in Table 9.

In particular, for climate change costs (CO₂) the central estimation of the Handbook has been used, taking into account the different values for the short – medium run (100 €/tCO₂ equivalent until 2030) and for the long run (269 €/tCO₂ equivalent from 2040).

¹⁹ https://ec.europa.eu/transport/themes/sustainable/studies/sustainable-transport-infrastructure-charging-and-internalisation_en

Table 9: Monetary values for externalities

	Marginal Costs	
GHG	CO ₂	100/269 €/ton
Air Pollutants	PM _{2.5}	123 €/kg
	CO	10 €/ton
	NOX	21,3 €/kg
	VOC	1,2 €/kg
Accidents	Motorbike	0,013 €-cent/pkm
	Car	0,045 €-cent/pkm
	Bus	0,189 €-cent/vkm
	Tram	0,189€-cent/vkm
	Metro	0,189 €-cent/vkm
	Car sharing	0,045 €-cent/pkm
	HDV	0,013 €-cent/tkm
	LDV	0,060 €-cent/tkm
Noise	Motorbike	0,089 €-cent/pkm
	Car	0,006 €-cent/pkm
	Bus	0,090 €-cent/vkm
	Tram	0,107 €-cent/vkm
	Metro	0,107 €-cent/vkm
	Car sharing	0,006 €-cent/pkm
	HDV	0,008 €-cent/tkm
	LDV	0,029 €-cent/tkm

Source: Own elaboration

To compare the three scenarios, all the costs considered, including the externalities, have been discounted at a yearly discount rate, ranging between 3% and 5%²⁰, as recommended by the EU Guide to Cost-Benefit Analysis of Investment Projects²¹.

To provide a first glance summary of the main outputs, 8 Key Indicators have been identified: two transport related (Modal Split, Car Ownership), two related to the environment and safety (CO₂ emissions, Fatalities), and four to the economy (City Total Revenues, City Total Costs, External Cost Savings, Net Balance) (Table 10).

Beside these Key indicators, a large set of additional indicators (Table 11) have been calculated using the modelling tool, including several SUMI indicators. It is important to mention that the only

²⁰ 3% discount rate has been applied to Northern and Central/Western Europe, 4% to Southern Europe, and 5% to Eastern Europe.

²¹ https://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf

SUMI indicators that aren't produced are the ones inextricably linked to the specific characteristics of a single city (e.g., accessibility for mobility impaired groups) or the ones that involve a human component that cannot be simulated by the model (e.g., satisfaction with public transport).

Table 10: Key indicators calculated in the study

Domain	Key indicator	Description
Transport	Car Ownership	Number of private cars per capita. [cars / 1000 inhabitants]
	Modal Split	Share of trips by aggregated mode (private motorized, public transport, active modes, car sharing). [%]
Environment and safety	Emissions of CO ₂	Emissions of CO ₂ per capita. [tons]
	Fatalities	Number of fatalities. [fatalities / 1000 inhabitants]
Economy	City Total Revenues	Public Administration and External Providers ²² total revenues, cumulated since base year, discounted with 4% discount rate. Computed as difference from BAU scenario ²³ . [mio euro] and [euro per capita]
	City Total Costs	Public Administration and External Providers total costs, cumulated since base year, discounted with 4% discount rate. Computed as difference from BAU scenario. [mio euro] and [euro per capita]
	External Costs Savings	Monetization of the savings in terms of externalities (CO ₂ , air pollutants, noise and accidents), cumulated since base year, discounted with 4% discount rate. Computed as difference from BAU scenario. [mio euro] and [euro per capita]
	Net Balance	Sum of revenues, costs and external costs savings. Computed as difference from BAU scenario. [mio euro] and [euro per capita]

Source: Own elaboration

²² Defined as providers of services that are not directly operated by the public administration (e.g., car sharing, bike sharing, public transport, etc.)

²³ Business As Usual (BAU) scenario. Scenario in which none of the policy measures is activated and the EU 2020 Reference scenario is used as reference for the vehicle fleet composition trend.

Table 11: All indicators calculated in the study

Domain	Indicator
Transport	Modal Split by disaggregated mode (private car, bike, pedestrian, motorbike, tram, metro, bus, car sharing)
	Car ownership
	Congestion and Delay index (SUMI)
	Public Transport Occupancy (by bus/tram and metro)
	Average Passenger Trip Length
	Opportunity for Active Mobility (SUMI)
	Penetration of alternatively fuelled car vehicles in the fleet
	Penetration of alternatively fuelled bus vehicles in the fleet
	Vehicles-km by mode (private cars and shared cars, trucks, public transport)
	Commuting Travel Time
Environment and Safety	Air Pollutant Emissions: PM _{2.5} , NO _x (SUMI)
	Air Pollutant Emissions: CO, VOC
	Emissions of Greenhouse Gases: CO ₂ (SUMI)
	Energy Consumption (SUMI)
	Fatalities: all modes (SUMI)
	Fatalities: active modes only (SUMI)
	Serious Accidents: all modes
	Serious Accidents: active modes only
Economy	City Total Revenues
	City Total Revenues per capita
	City Total Costs
	City Total Costs per capita
	External Costs Savings
	External Costs Savings per capita
	Net Balance
	Net Balance per capita

Source: Own elaboration

All the outputs of the study (Key indicators and all indicators) for each one of the 12 city prototypes are available in *Annex I – Output Indicators*.

The following paragraph focuses on the generalization of the prototypes results for the entire EU27 context. As already explained, this generalization is obtained by combining altogether the results of the 12 city prototypes and keeping into account the number of EU cities that fall into each prototype category.

The results are reported with the values of the indicators for the three policy scenarios (Promote and Regulate, Plan and Build, Mixed) for the year 2030 and 2050.

3.2 Results overview for the EU27 context

Modal Split

One of the most important indicators to analyse is the Modal Split. In the following charts, transport modes are aggregated into four categories: Private Motorized (private cars, both as driver or passenger, and motorbikes), Public Transport (metro, tram, buses, and DRT, when implemented), Active Modes (walking, cycling and micro-mobility), and Carsharing.

Looking at Figure 3,

Figure 4, and Figure 5, **private motorized**²⁴ modal share decreases in all three scenarios by 2030 and 2050 but with an important differentiation: while Scenario 1 and 2 show a reduction of -11% and -8% respectively, Scenario 3 reduces the modal share of private cars by 24%, more than halving the private car use. This significant reduction is the consequence of an extreme intensification of policies implemented in the “Mixed” scenario (compared to the other two) to allow it reaching the Green Deal target already by 2030.

In fact, such short-term objective would only be possible through drastic changes in how people move (i.e., the modal split). The need to achieve such a drastic impact on modal split could be reduced if policies were designed to push faster fleet turnover in favour of EVs. The potential for policy measures feedback on fleet turnover is something that should be further investigated.

The positive effects of the fleet decarbonisation, which are set to have a more predominant role in the following few years (as expected by the “Fit for 55” EU strategy) can also be seen in less drastic changes in modal split between 2030 and 2050. This is true for all three scenarios.

Also, **active modes** show a significant grow in both Scenario 1 and 3 by 2030 (+6% and +9% respectively). Then, the share remains constant until 2050. On the other hand, in Scenario 2, the number of people choosing active modes does not change over the course of time. It is necessary to clarify that a moderate increase of active modes, in some cases, is the result of a strong increase in biking accompanied by a decrease in walking. Such diverging trend is evident in several prototypes (see *Annex I – Output Indicators*).

For what concerns **public transport**²⁵ modal share, Scenario 2 is definitely the one with the largest increase, especially in the long term (+ 18% in 2050). This impact is justified by the implementation of new public transport infrastructures (bus, tram, metro, and DRT) foreseen in this scenario. This substantial growth in 2050 hinders the scenario’s uptake of active modes, which indeed are stable

²⁴ As explained in Table 8, in this study, autonomous vehicles are only considered as part of the carsharing and demand-responsive transport fleet. They are not considered as private vehicles.

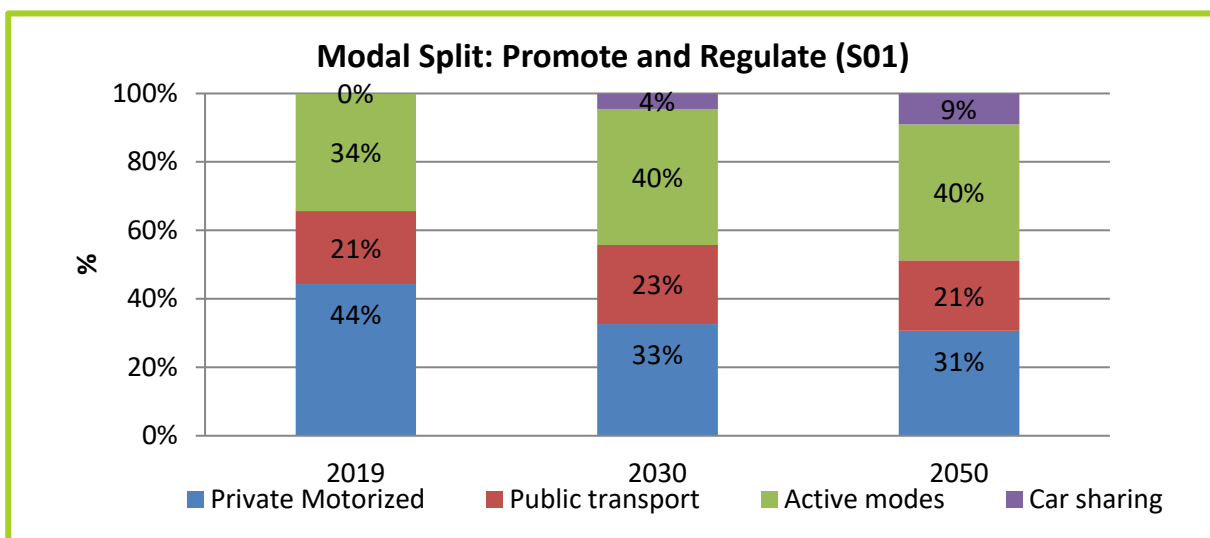
²⁵ This study’s scenarios have been designed foreseeing that public transport fully recovers the negative impact of Covid-19 pandemic within a few years.

over time. In particular, in large cities Scenario 2 will bring the public transport modal share to values between 37% (Central/Western) and 56% (Eastern).

In addition, it is worth highlighting the growth of **car sharing** (which is only implemented in Scenario 1 and 3). This growth is more evident in the Mixed scenario, where car sharing utilization is definitely boosted in the long term by the parallel implementation of autonomous vehicles.

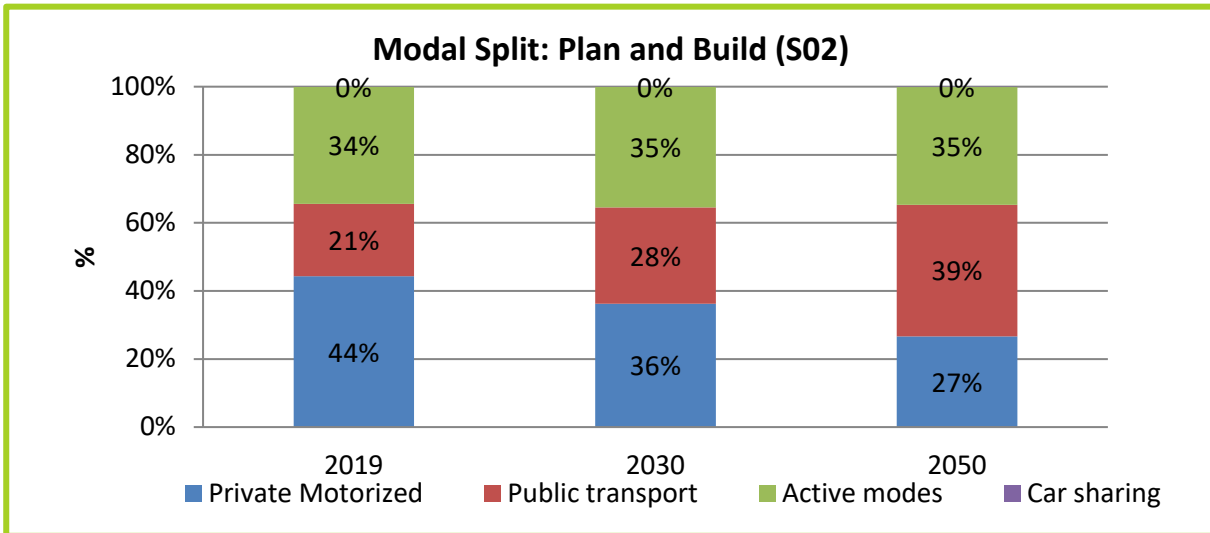
Finally, looking at the different city prototypes (see *Annex I – Output Indicators*), **Scenario 3 is the one that reduces the most the use of private motorized modes**. In 2050, in large cities, this percentage drops to around 10% in the four prototype regions. This reduction is accompanied by the highest percentage of carsharing modal split though. Of course, the (lower) initial car modal share compared to small and medium cities also plays a crucial role in explaining this number.

Figure 3: Aggregated Modal Split for Scenario 1 “Promote and Regulate” in 2019, 2030, 2050



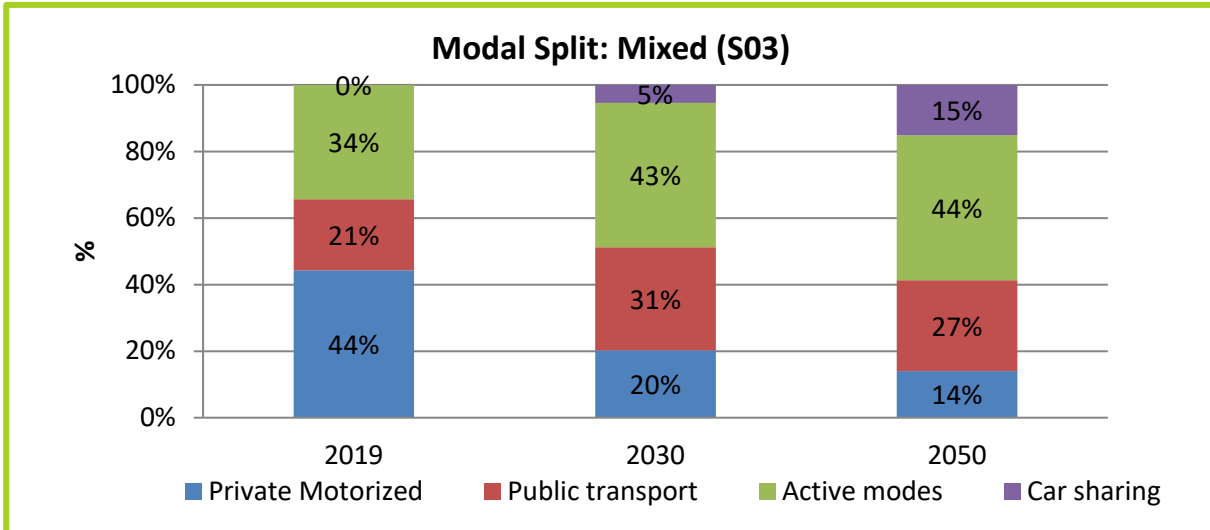
Source: Own elaboration

Figure 4: Aggregated Modal Split for Scenario 2 “Plan and Build” in 2019, 2030, 2050



Source: Own elaboration

Figure 5: Aggregated Modal Split for Scenario 3 “Mixed” in 2019, 2030, 2050



Source: Own elaboration

Car Ownership

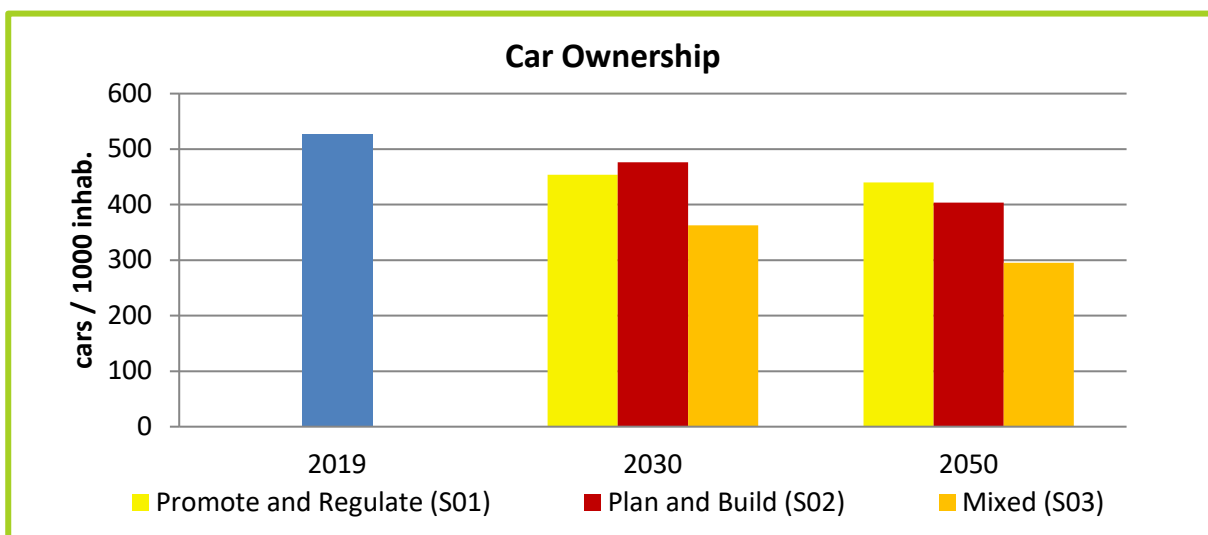
Another key indicator is represented by the Car Ownership level, which considers the number of private cars per capita.

Of course, there is a correlation between the decrease in number of cars per inhabitants and the private motorized modal split (presented in the previous section). In fact, Figure 6 shows that Scenario 3 is the one with the highest reduction in car ownership (-31% in 2030, -44% in 2050).

On the other hand, Scenarios 1 and 2 entail smaller reduction in the number of cars owned. In particular, the reduction associated to the second scenarios are more substantial by 2050, when the effects of alternative transport infrastructures, which characterize the “Plan and Build” scenario kick in. For the “Promote and Regulate” scenario, the number of cars per inhabitants will only decline by 16% by 2050. A possible explanation might be that policies mostly focused on promotion and taxation have impact on the cost of cars use (and this impact declines with the increase EVs penetration). However, these policies are not as capable of changing long-term decision on car ownership, as, for example, the uptake of autonomous vehicles combined with a large diffusion of shared mobility services.

Very similar trends are observed for all 12 city prototypes (see *Annex I – Output Indicators*). More specifically, the highest drops in car ownership levels are encountered in large cities. This might be explained by the widest offer of alternative modes that large cities will offer, which put the citizens in the condition of not needing a private car in order to accomplish their mobility needs.

Figure 6: Car Ownership level for the study scenarios in 2019, 2030, 2050



Source: Own elaboration

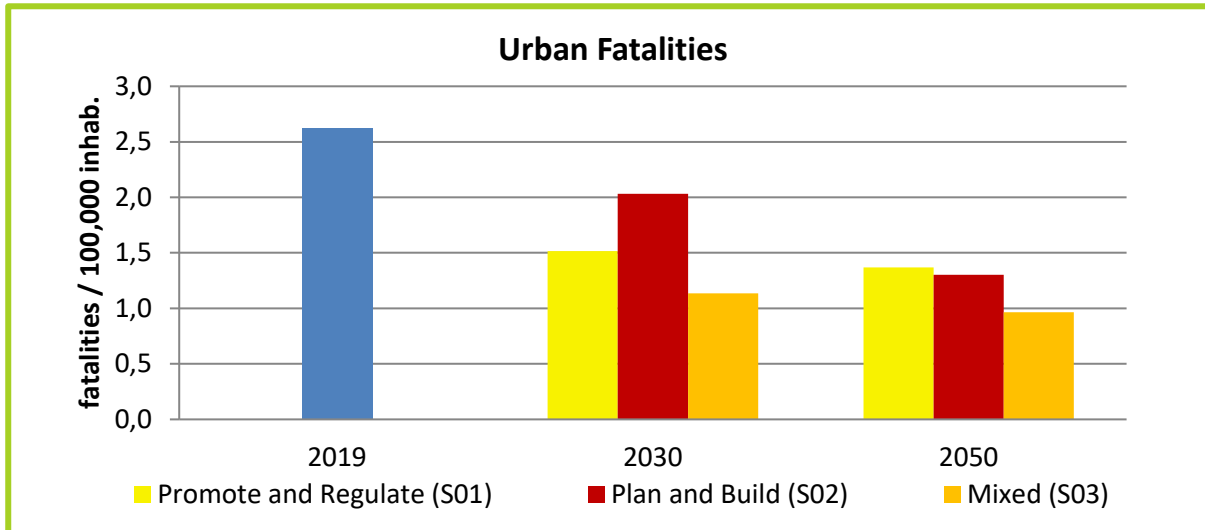
Fatalities

A third key indicator, and a fundamental parameter to assess sustainable mobility, is represented by the number of transport **fatalities** occurred in urban areas. In fact, according to the Green Deal, such fatalities should eventually tend towards zero.

Figure 7 shows, in 2030, Scenario 2 results the one with the lowest reduction. However, by 2050 all three scenarios obtain considerable reductions in fatalities, measured between -48% (scenario 1) and -63% (Scenario 3). For Scenario 2, this trend is mainly driven by the construction of active mobility infrastructure (walking and cycling lanes) which significantly improves the safety of pedestrian and cyclists. On the other hand, the reduction on the number of deaths of Scenario 1 and 3 is mainly due to the implementation of traffic management and control measures (30km/h speed limits, pedestrian areas, etc.).

Looking at the city prototypes (see *Annex 1 – Output Indicators*), it is possible to notice that in several prototypes the transition scenarios, thanks to combination of safety-addressing policy measures, bring the number of urban fatalities to less than 1 every 100,000 inhabitants. The best results are obtained in small cities.

Figure 7: Number of fatalities for the study scenarios in 2019, 2030, 2050



Source: Own elaboration

CO₂ emissions (tank-to-wheel)

Probably the most relevant indicator when considering the transition to sustainable urban mobility is the reduction in **CO₂ emissions level (tank-to-wheel)**. As said, the three potential scenarios have been designed to address the Green Deal target²⁶. As greenhouse gas emissions in the transport sector have been growing by around 24% between 1990 and 2019, the objective is to reduce the amount of CO₂ by -64% in 2030 and by -92% in 2050 if the comparison is made with the simulation's base year (2019).

Figure 8 shows that all three policy scenarios are able to gradually reach and overtake the Green Deal target by 2050. However, only Scenario 3 (with its intensified policy measures mainly resulting in substantial change in the modal split) allows to reach the objective also by 2030.

In particular, by 2030, Scenario 1, more focussed on short-term actions in comparison to Scenario 2, gets quite close to the target (0.278 ton CO₂/capita, whereas the estimated target is 0.237 ton CO₂/capita). On the other hand, the *Plan and Build* scenario, relying on long-term infrastructural actions, still generates a higher amount of greenhouse gases (0.319 ton CO₂/capita). By 2050, the three scenarios attain CO₂ emissions reductions of about -94% (compared to 2019 levels).

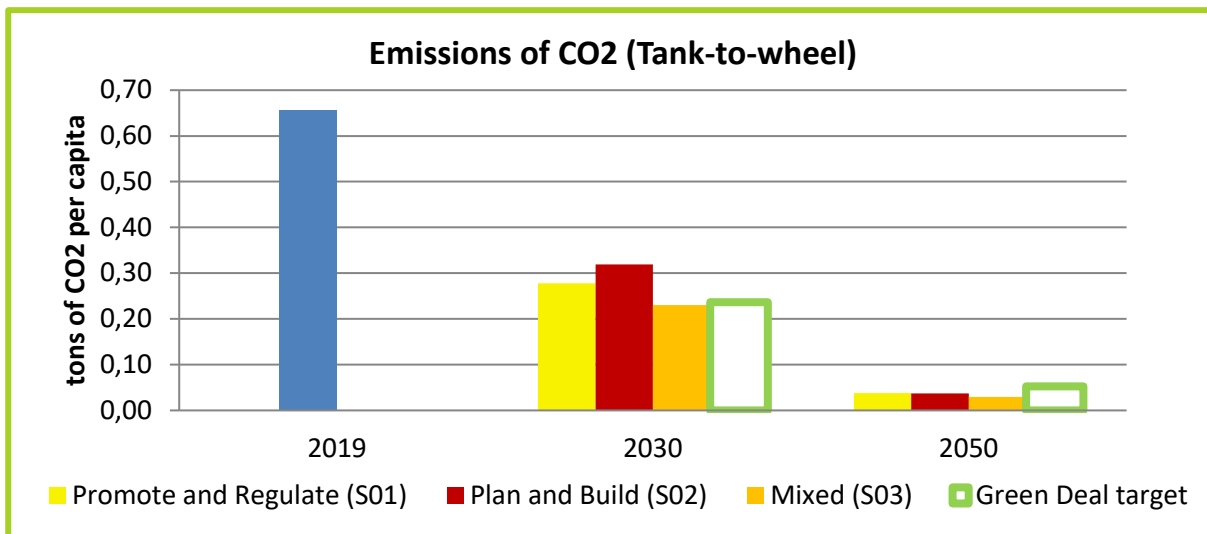
In case no policy measure foreseen in the three transition scenarios is implemented (BAU scenario with the EU Reference assumptions on vehicle technology evolution), the CO₂ emissions will only decline from 0.657 ton per capita in 2019 to 0.490 ton per capita in 2030 and to 0.231 ton per capita in 2050, respectively about -25% and -65% compared to 2019 levels.

The three potential scenarios allow to increase the reduction of CO₂ toward the achievement of the Green Deal target in 2050, thanks to the combination of urban policies measures and of the more ambitious scenario in terms of vehicle technology (based on the EU Fit For 55 strategy). The *Mixed* scenario is the only one reaching the target also in the short term. For this scenario, in 2030, the urban policies can contribute for covering about 70% of the gap to achieve the target. In 2050, for Scenario 3, the intensified policies can allow to cover about half of the gap (and the remaining part is attained thanks to the ambitious technological progress, which enables to overtake the target), while policies in Scenario 1 and 2 cover one third of the gap.

Considering the 12 prototypes (see *Annex I – Output Indicators*), the results show similar trends, with all three policy scenarios reaching the Green Deal target in 2050, and Scenario 3 doing it also in 2030. The lowest values of CO₂ per capita will be reached in small cities in northern and eastern Europe, where in 2050 each citizen will be responsible for the emission of as low as 0,016 t per year of greenhouse gases.

Figure 8: Emissions of CO₂ for the study scenarios in 2019, 2030, 2050

²⁶ -55% and -90% greenhouse gas reduction in the transport sector by 2030 and 2050, compared to 1990's levels.



Source: Own elaboration

Economic outputs

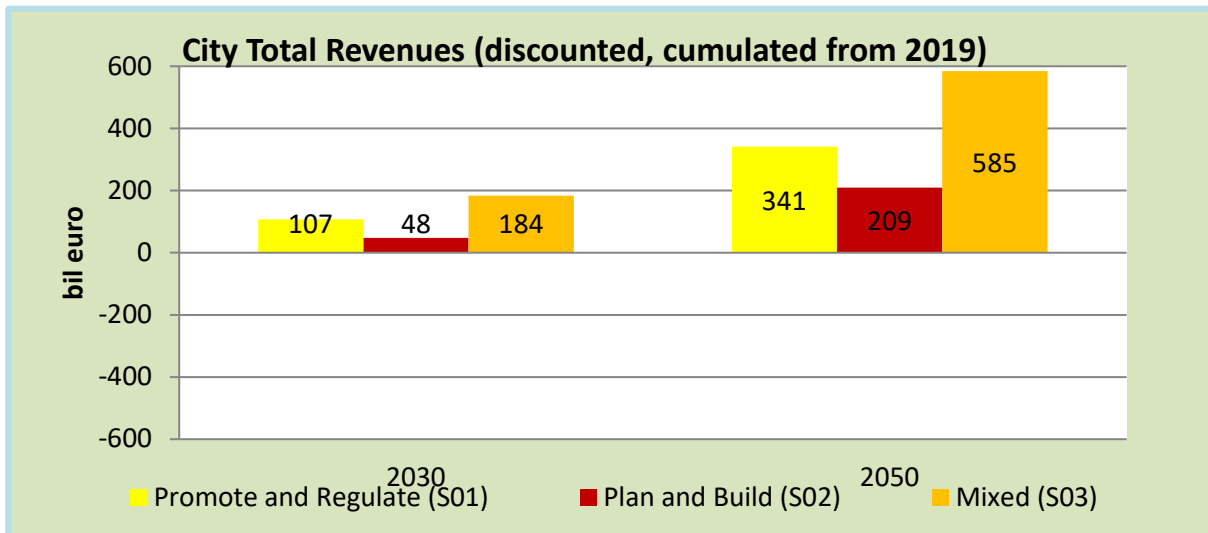
Most of the policy measures implemented in the scenarios have specific costs (for implementation and management) and revenues associated with. Considering the net difference between costs and revenues, and adding to the equation the monetization of externalities, it is possible to estimate the net costs of the sustainable urban mobility transition of each policy scenario for the entire EU27 context.

It is important to underline that the **costs and revenues considered are only the incremental ones associated with the implemented policies, with respect to the Business as Usual Scenario (BAU)**, in which no policy measures are activated. Thus, costs and revenues do not represent the total city costs and revenues, but only the economic impacts of the specific set of policies that has been implemented in the scenario.

Figure 9 and Figure 10 illustrate the **revenues and costs** associated with the three policy scenarios. These values are considered for both the public administration and the external providers. A differentiation among these two players not always it is straightforward, due to the fact that, in some cities, certain services (e.g., car sharing) might be in charge of the public administration, while in others of an external provider.

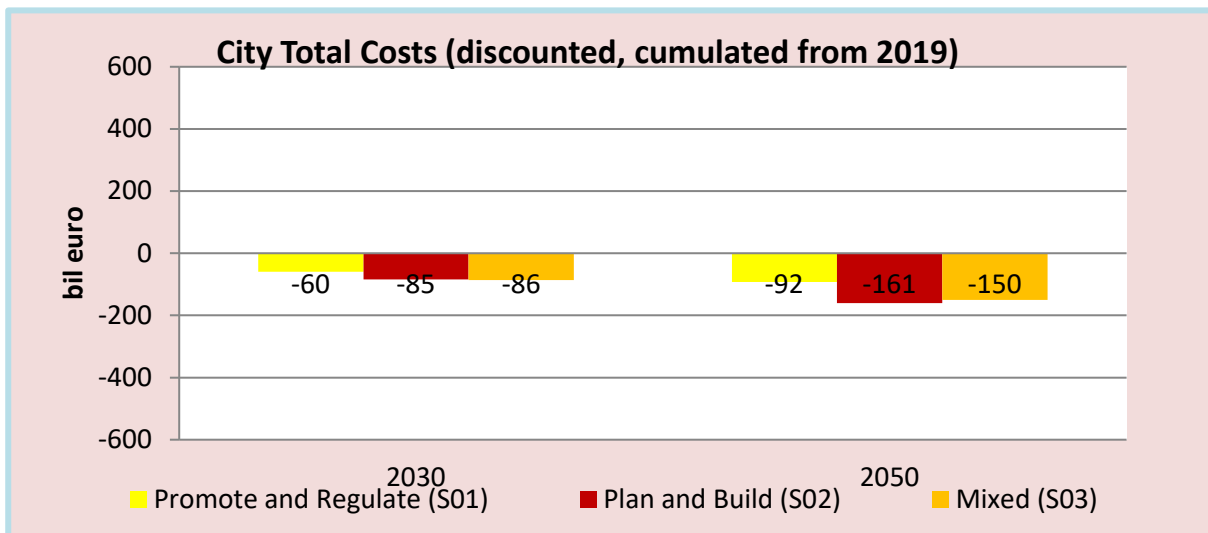
Generally speaking, Scenarios 2 and 3 have higher costs associated with. Intuitively, this is mainly due to the investments needed to upgrade the public transport infrastructures (Scenario 2) and to the larger amount of policies implemented (Scenario 3). In particular, in large cities the *Plan and Build* scenario is significantly the most expensive one (mostly due to the fact that transport infrastructure investments in large cities are focussed on metro lines, which are very pricey).

Figure 9: City Total Revenues for the study scenarios in 2030 and 2050



Source: Own elaboration

Figure 10: City Total Costs for the study scenarios in 2030 and 2050



Source: Own elaboration

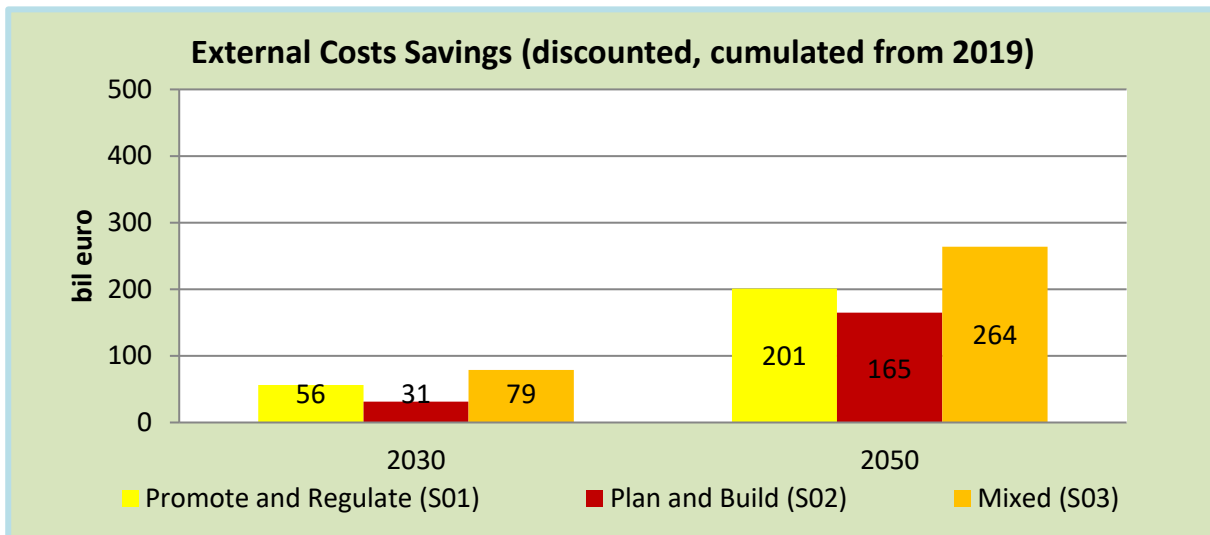
In addition to the costs and revenues of the policies, it is necessary to also take into account the **externalities** associated with their implementation. In fact, reductions in air pollutants and CO₂ emissions, less fatalities, and less noise contribute to the creation of benefits. **The monetization of**

this benefits, alongside the net difference between total revenues and costs, generates the city's net balance.

Figure 11 illustrates the difference in external cost savings for the three scenarios at EU27 level. According to its long-term nature, Scenario 2 is the one with smallest external cost savings in 2030. By 2050, the three scenarios are set to generated between 165 and 264 billion of external cost savings (discounted and cumulated from 2019).

In particular, the calculated external cost savings are the result of reductions in CO2 emissions (that account between 31 and 64% of the total externalities, depending on the scenario), road accidents (19-53%), air pollutants emissions (10-20%), and noise (2-6%).

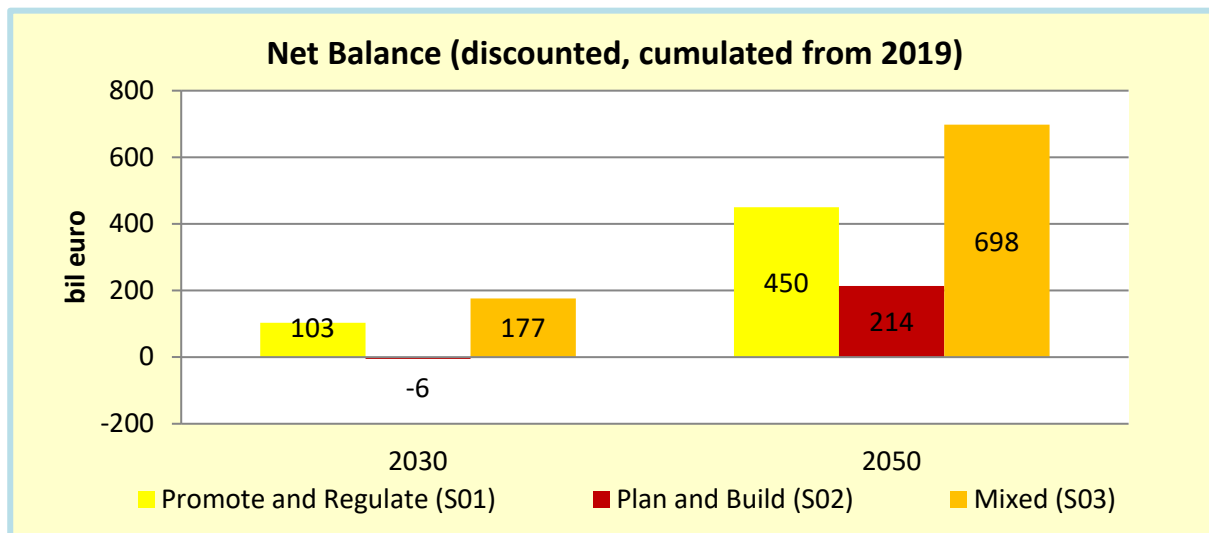
Figure 11: External Costs Savings for the study scenarios in 2030 and 2050



Source: Own elaboration

Figure 12 offers the Net Balance for the entire EU27 context. The results clearly indicate that Scenarios 1 and 3 are the preferred ones from an economic point of view. Moreover, for Scenario 1 and 3, the balance would be positive also if the external costs savings were excluded. This is not true for Scenario 2, that shows a positive balance only considering also the contribution of external costs.

Figure 12: Net Balance for the study scenarios in 2030 and 2050



Source: Own elaboration

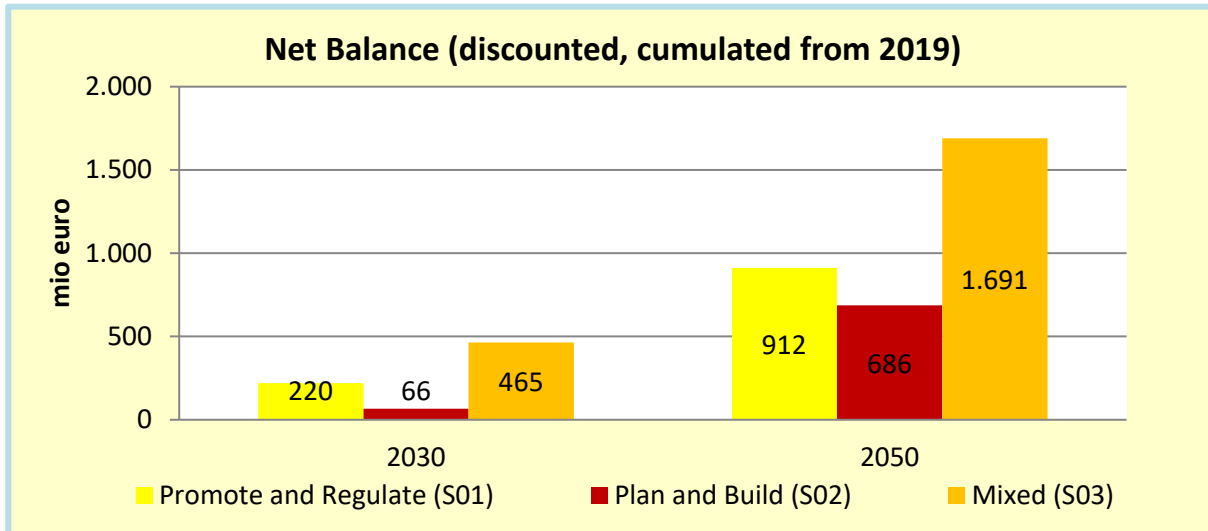
As said, the numbers presented in the previous three charts, consider the sum of costs and revenues of all 779 EU27 cities.

To better comprehend the magnitude of costs and benefits associated with a **single city**, it is possible to look at the net balance of a single prototype.

Figure 13 illustrates, as an example, the economic result of the *Central/Western Europe Medium Size City Prototype*.

While the detailed economic results of all 12 city prototypes are available in *Annex I – Output Indicators*, further interesting considerations about the economic and the effectiveness of the different prototypes are presented in the Policy measures effectiveness section.

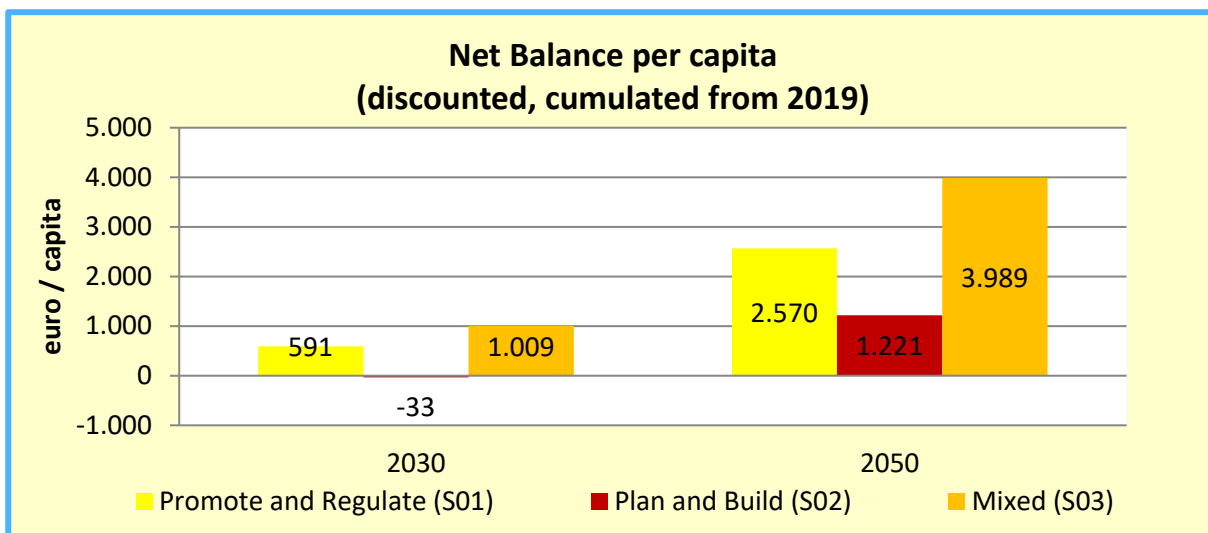
Figure 13: Net Balance for the study scenarios in 2030 and 2050 (Medium - Central/Western)



Source: Own elaboration

Finally, considering the entire EU27 cities population it is possible to obtain the **Net Balance per capita**. Keeping in mind that these values are cumulated over years, in the worst case (Scenario 2) the net balance per capita in Europe is over 1,200€ per capita until 2050. This means on average about 40€ per capita per year of net benefits. On the other hand, Scenario 3 entails on average a positive net balance per capita of almost 130 € per year.

Figure 14: Net Balance per capita for the study scenarios in 2030 and 2050



Source: Own elaboration

3.3 Policy measures effectiveness

While the results presented above consider the urban mobility transition scenarios in their totality (i.e., with the activation of the entire package of measures associated with each scenario), it is also possible to evaluate costs and revenues of single policy groups (e.g., shared mobility and demand management, innovative services, pricing schemes, etc.), as well as the CO₂ reduction that is attributable to it.

In particular, these calculations are performed by comparing an “empty” scenario with no policy measures activated²⁷, and scenarios in which each group of policy measures is activated separately²⁸. This way, it is possible to understand how much each group of policy measures is responsible in terms of reduction of CO₂ emission and to calculate the Net Costs associated to it.

In these comparisons, the policy group *Green Fleet* has not been considered. In fact, this group of policy measures is intrinsically linked to other exogenous conditions (e.g., fleet decarbonisation, charging infrastructure, etc.) and its parameters cannot be evaluated considering only the local level.

Looking at the **costs and revenues of the five policy groups**, the following two figures highlight how each of them results into a revenue (positive) or a cost (negative) in each of the 12 city prototypes. This is represented with cumulated costs as of 2030 (Figure 15) and as of 2050 (Figure 16).

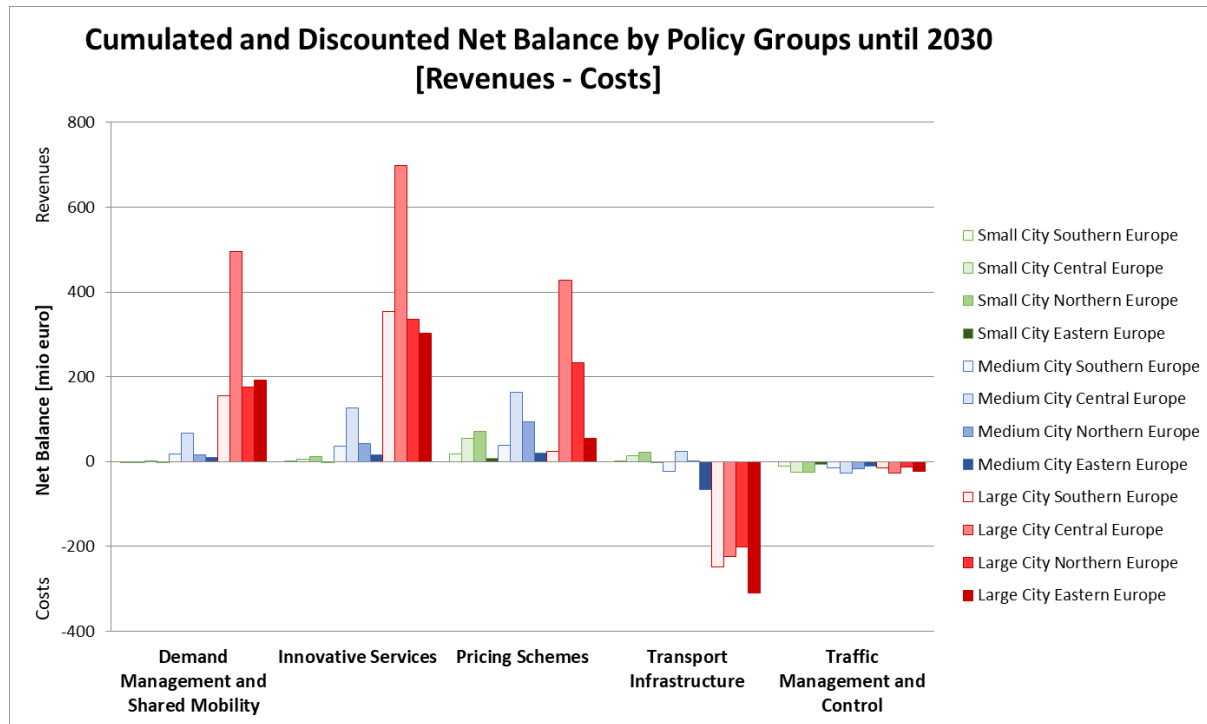
As of 2030, *Innovative Services* followed by *Shared Mobility and Demand Management* and *Pricing Schemes* are the group of measures that accounts for the highest revenues. This is true for each city prototype. On the other hand, *Transport Infrastructure* is particularly expensive in large cities.

Looking at the values in 2050, it is possible to notice how both *Shared Mobility and Demand Management* and *Innovative Services* significantly increase their revenues compared to *Pricing Schemes* (particularly in large cities). On the other hand, *Transport infrastructure* remains the most expensive group of measure, especially in large cities where the implementation of additional metro lines has a considerable impact on their net balance. Interestingly, *Traffic Management and Control* is the group of policies that entails the smallest differences among the 12 city prototypes.

²⁷ Scenario with only ambitious exogenous conditions for vehicle technology

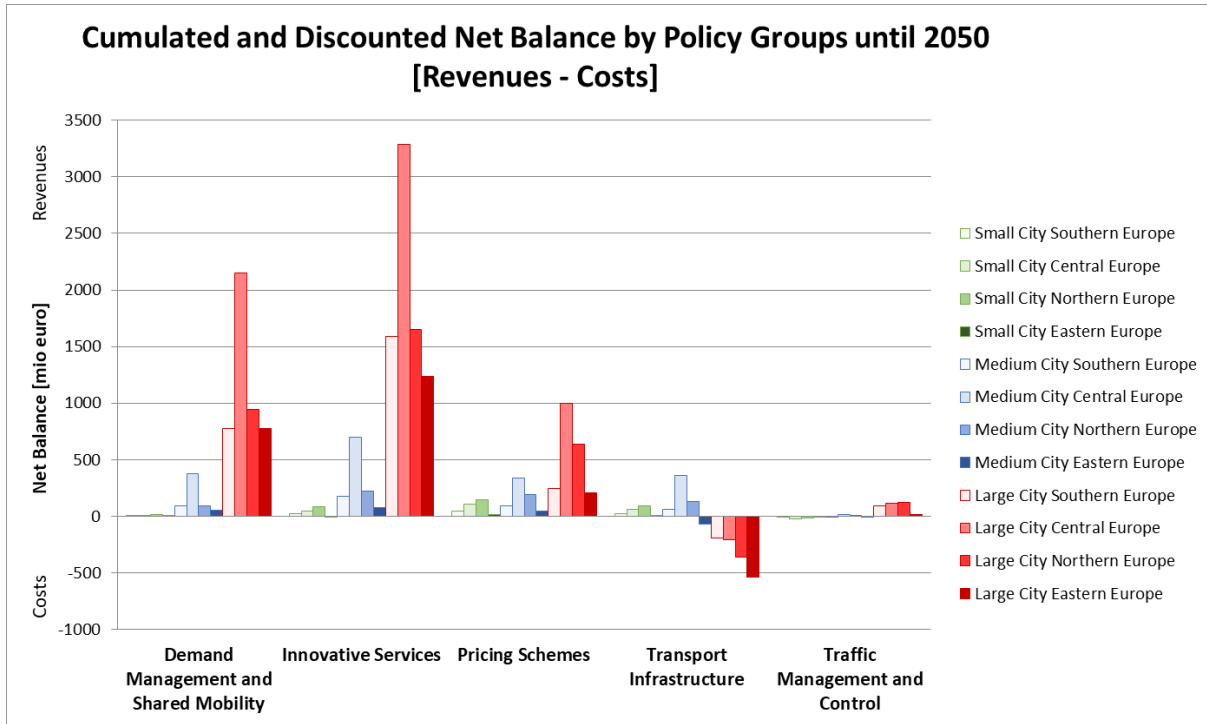
²⁸ The policy effectiveness analysis does not take into account differentiations among the three scenarios. Therefore, it has been chosen to use the policy intensity that has been applied to Scenario 1 and 2. This intensity is less aggressive than the one used for Scenario 3 (and needed to reach the Green Deal target by 2030). It is foreseen that applying the policy intensity of Scenario 3, *Pricing Schemes* might increase its effectiveness, as these policies have a key in the reduction of private car modal split (obtained in Scenario 3).

Figure 15: Cost and Revenues of Policy Groups by 2030



Source: Own elaboration

Figure 16: Cost and Revenues of Policy Groups by 2050



Source: Own elaboration

If, besides the cost and revenues associated to each policy group, the CO₂ reduction is also taken into account, it is possible to offer a disclosure on which policies might be the most effective, considering these two variables. The **policy effectiveness** results are shown in Figure 17 and Figure 18.

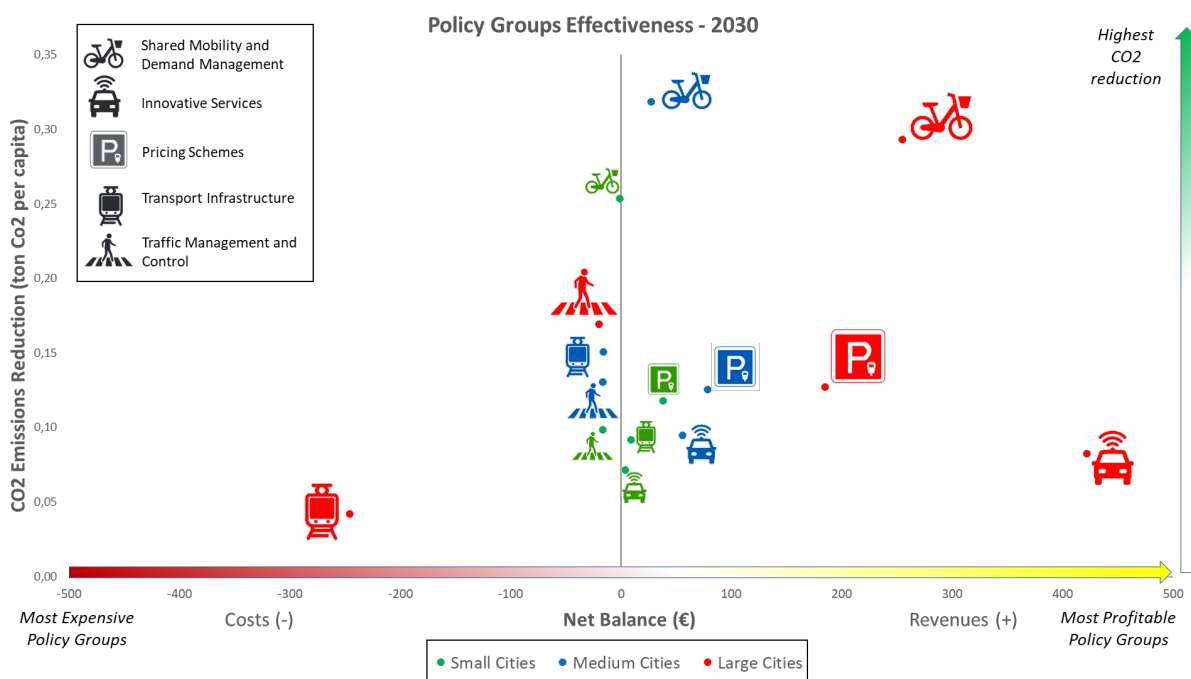
In the two graphs, the y-axis represents the reduction of CO₂ emissions, while the x-axis represents the net benefits. Thus, a higher value on the y-axis means a larger reduction of CO₂, and a higher value on the x-axis means a more profitable policy group. On the contrary, a negative value on the x-axis indicates a policy group that need to spend to reduce emissions. Shortly, the best results are the ones that fall closer to the top-right corner of the graphs. The worst results are the ones that fall closer to the bottom-left corner. Also, the three colours are used to differentiate among small, medium, and large cities prototypes.

In 2030, the policy group that brings the highest reduction of greenhouse gas emission is the *Shared Mobility and Demand Management*. These results are confirmed for the three city dimensions. On the other hand, in large cities *Transport Infrastructure* is the most expensive policy group as well as the worst one in terms of CO₂ emissions reduction. Looking at the revenues,

Innovative Services is the policy group with the highest revenues associated in large cities, while *Pricing Schemes* is the most profitable in small and medium cities.

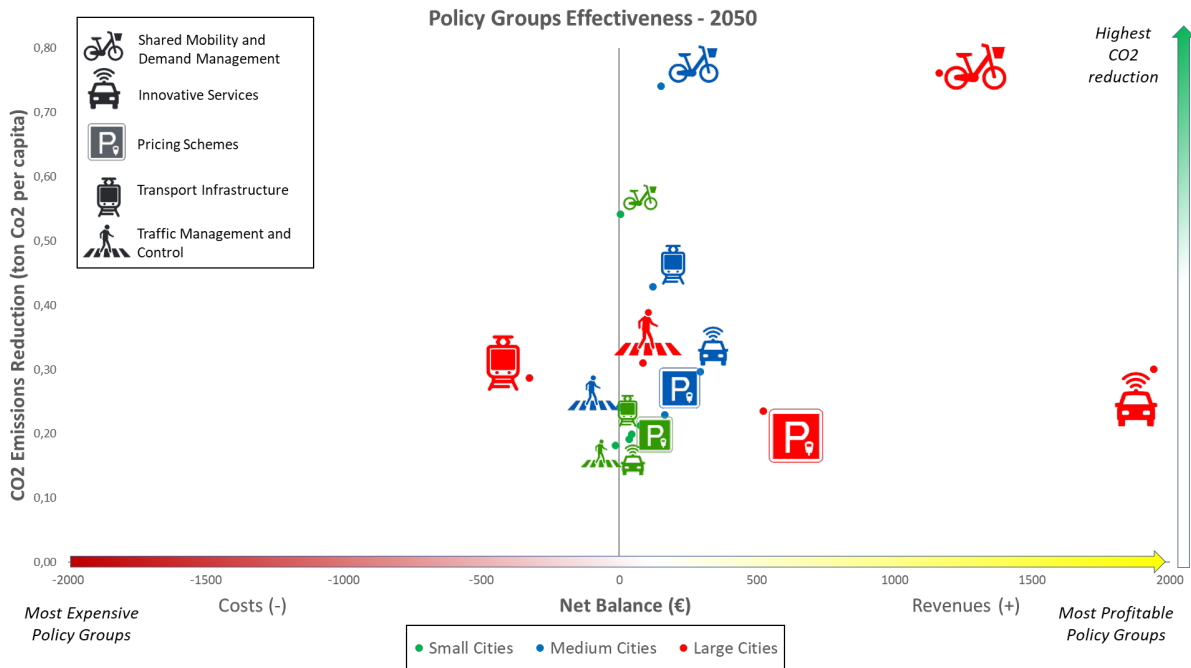
In 2050, *Shared Mobility and Demand Management* is still the policy group with the highest CO₂ reduction. In large cities, *Innovative Services* is the group with the highest revenues, while *Transport Infrastructure* is still the one with the highest costs.

Figure 17: Policy Groups Effectiveness by 2030



Source: Own elaboration

Figure 18: Policy Groups Effectiveness by 2050



Source: Own elaboration

The two graphs above consider two variables: CO₂ reduction and Costs/Revenues. However, each variable can assume a different value, depending on how each city prioritizes one or the other. In order to combine the two variables together, it is possible to **monetize the CO₂ reduction**. This way, the five policy groups can be ordered.

In Figure 19, it is possible to see how effective each policy group is, considered the three city dimensions in 2030 and 2050. *Innovative services* and *Shared Mobility and Demand Management* are the most effective group in large cities. In small cities, *Pricing Schemes* results to be the most effective group. On the other hand, *Transport Infrastructure* is the least effective policy group in large cities. In medium and small cities, *Traffic Management and Control* are not very effective instead.

Figure 19: Policy Groups effectiveness (with monetization of CO₂)

City Prototypes	Demand Management and Shared Mobility		Innovative Services		Pricing Schemes		Transport Infrastructure		Traffic Management and Control	
	2030	2050	2030	2050	2030	2050	2030	2050	2030	2050
Small Cities	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Red	Red
Medium Cities	Yellow	Green	Yellow	Green	Yellow	Green	Red	Green	Red	Yellow
Large Cities	Green	Green	Green	Green	Green	Green	Red	Red	Red	Green

	Net Balance (including CO ₂ monetization)
Green	> 100 mio €
Yellow	between 0 and 100 mio €
Red	< 0 mio €

Source: Own elaboration

4. Conclusions

This study has been capable of **assessing the impacts of the sustainable urban mobility transition of European cities** through the quantification of costs and benefits associated to three potential policy scenarios: Scenario 1 “Promote and Regulate”, Scenario 2 “Plan and Build”, Scenario 3 “Mixed”.

The simulation of the three potential scenarios for 12 city prototypes has allowed to fairly represent the entire EU27 context while taking into account differences among cities in terms of size and geography, as well as per capita income, motorisation rates, fleet composition, energy prices, and value of travel time among other indicators. In addition, the input data collection for the correspondent 30 reference cities has allowed to consider the urban and transport parameters that characterize each single city prototype at base year.

Looking at the results of the study, the first thing to point out is that **each of the three simulated scenarios has been capable of reaching the Green Deal target in terms of greenhouse gas emissions by 2050**. On the other hand, reaching the target of CO₂ emissions reduction set for the year 2030 seems to be more complicated. Considering the current projections for the electrification of the EU vehicle fleet inspired to the “Fit for 55” strategy, only the Scenario 3 can reach the objective with intensified policies that generate more drastic changes in people’s mobility behaviour and substantially reduce the private car modal split and might entail important acceptability issues. That said, the need to achieve such a drastic impact on modal split could be reduced if policies were designed to push faster fleet turnover in favour of EVs. The potential for policy measures feedback on fleet turnover, which is something that goes beyond this study, is something that should be further investigated.

While reaching the target by 2030 necessarily requires acting on modal split (in particular, through intensifying pricing policies tailored for the short term, while in the long term their impact could be mitigated by higher EV penetration), by 2050 a considerable help is provided by the large penetration of alternative fuels vehicle (as foreseen by the “Fit for 55” EU strategy). However, the implementation of sustainable policy measures is necessary to reach the Green Deal target.

Also, in terms of CO₂ reduction, the policy effectiveness analysis indicated that, for all city sizes, *Shared Mobility and Demand Management* is the policy group that generates the highest impacts by 2030 and 2050. After that, there are some differences, based on city dimensions, in terms of policy groups affecting greenhouse gas emissions. In small cities, pricing schemes is preferable over the other groups. In medium cities, *Transport Infrastructure* is the second “greenest” policy measure. Finally, in large cities, *Traffic Management and Control* is the second-best option.

As said, the implementation of sustainable transport policy measures is set to have **a great impact on the Modal split** of European citizens. Private motorized vehicles are intended to see a decline in their utilization. In Scenario 1 carsharing and active modes grow their share at the expenses of private cars. In Scenario 2, the car usage decline is accompanied by a strong increase in the utilization of public transport. Also, this change is reflected in a consistent reduction of car ownership. Fatalities are also set to halve as a result of the implementation of several policies that make cities more safe (more cycling infrastructures, pedestrian areas, reduced speed limits, etc.).

In terms of **economic results of the policy scenarios, which considers costs, revenues, and the external cost savings generated by the implementation of sustainable policy measures**, Scenarios 1 and 3 have positive net balances for all prototypes. Their magnitude increases with the city dimension, while the value per capita does not entail substantial differences due to city dimension. On the other hand, in 2030 Scenario 2 results into a negative net balance in more than half of the 12 city prototypes. However, the benefits of the infrastructural investments kick-in in the longer term resulting into positive net balances for almost all prototypes by 2050.

Looking at the **economic results of single policy groups**, *Innovative Service* and *Shared Mobility and Demand Management* are the two groups guaranteeing the highest revenues in large cities, while *Pricing Schemes* is the better option in small and medium cities (especially in the shorter period). On the other hand, *Transport Infrastructure* results to be most expensive group of policy measures, especially in large cities where the implementation of additional metro lines (not foreseen in small and medium cities) might have a considerable share on their net balance.

Finally, it is interesting to look at the **costs/revenues and the CO₂ monetization attributable to each policy group** (policy effectiveness). In the short term, *Pricing Schemes* is the most effective group for small and medium cities, while *Innovative Services* win in large cities and medium cities. On the other side, *Transport Infrastructure* is the least effective in large cities, while *Traffic Management and Control* is the worst in small and medium cities. In the long term, *Pricing Schemes* remains the favoured options for small cities, while *Innovative Services* followed by *Shared Mobility and Demand Management* are more effective for medium and large cities.

Accessibility of study results

A web page containing an interactive tool has been designed in order to make the calculation results accessible on the internet. The interactive web page will be accessible on-line on the EIT website (starting November 2021) and will allow to explore the costs and benefits of the different sustainable urban mobility transition scenarios.

This user guided interface makes it possible for the reader to analyse the full results of the analysis and in particular to browse the values of the different indicators, in the three scenarios and with reference to the 12 city prototypes, as well as the EU27 context.

Annex I – Output Indicators



EU27 GENERALIZATION

EMISSIONS OF CO₂ (TANK-TO-WHEEL), CAR OWNERSHIP, FATALITIES

Emissions of CO₂ (Tank-to-wheel) [t CO₂ eq / capita per year]

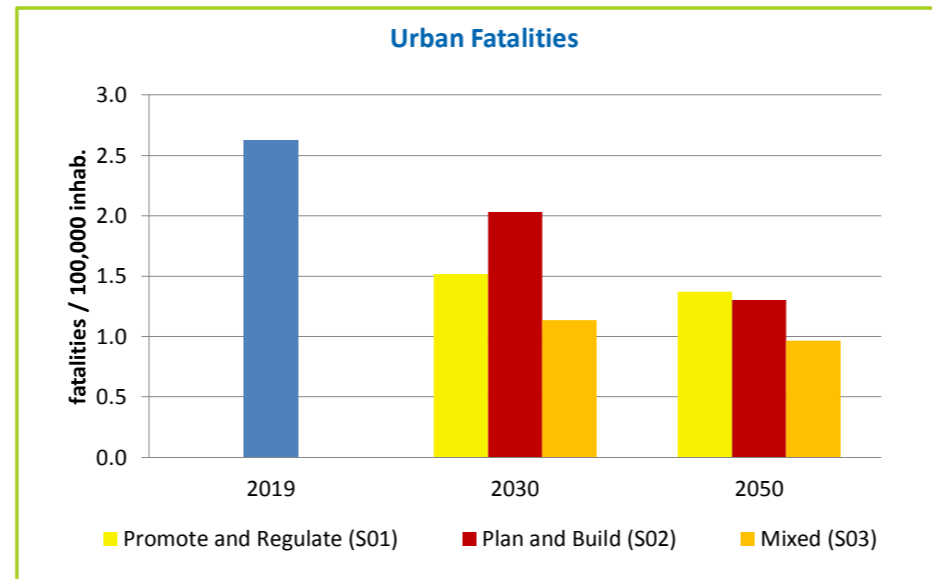
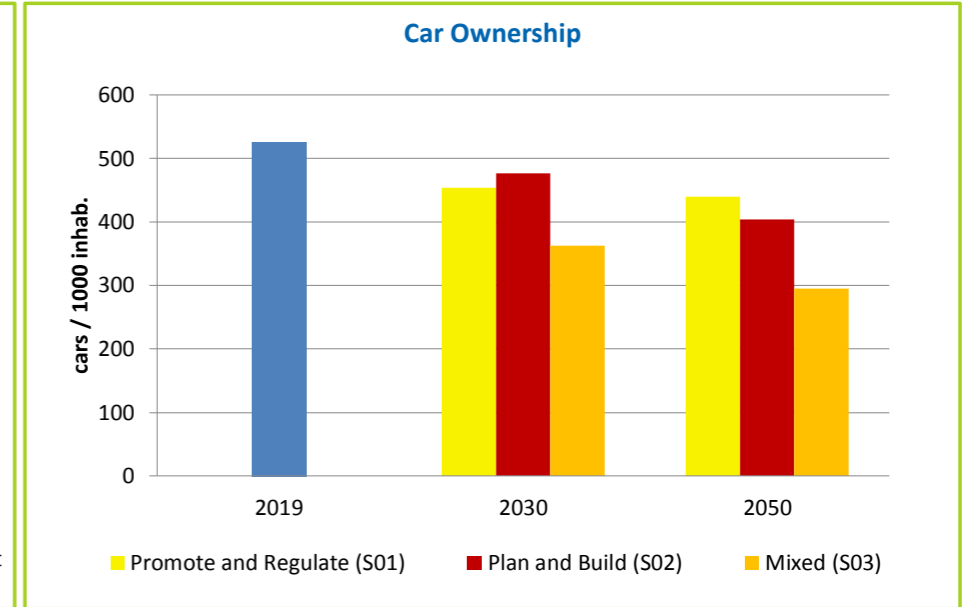
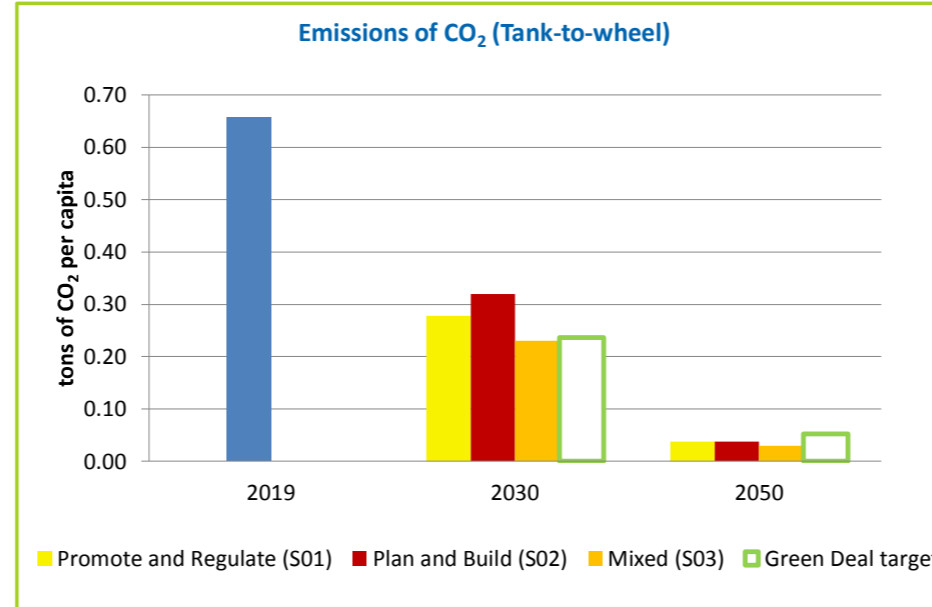
Scenario	2019	2030	2050
Promote and Regulate (S01)	0.657	0.278	0.038
Plan and Build (S02)	0.657	0.319	0.037
Mixed (S03)	0.657	0.230	0.030
Green Deal target		0.237	0.053

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	526	454	440
Plan and Build (S02)	526	477	404
Mixed (S03)	526	363	295

Urban Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	2.621	1.517	1.369
Plan and Build (S02)	2.621	2.031	1.302
Mixed (S03)	2.621	1.134	0.967



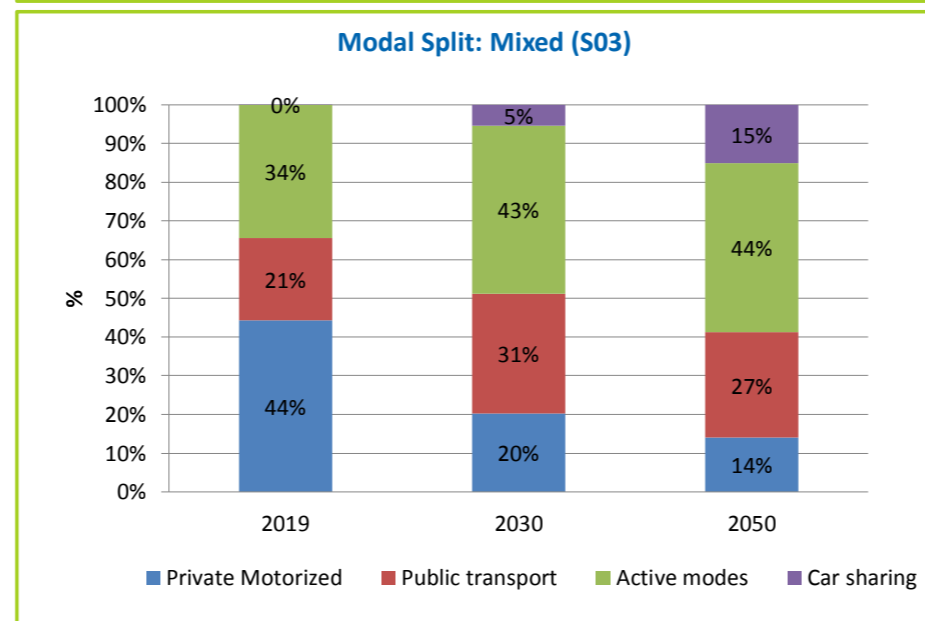
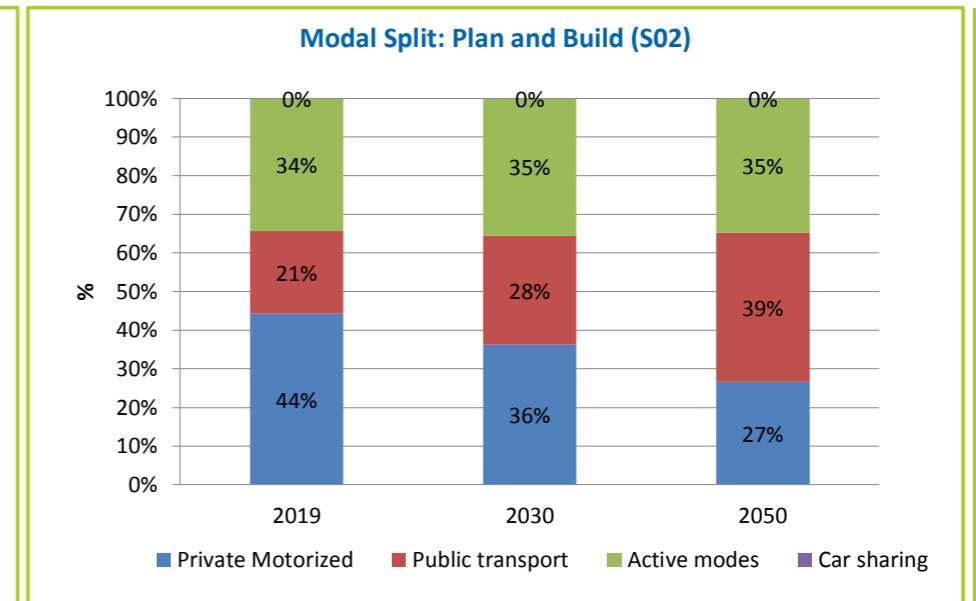
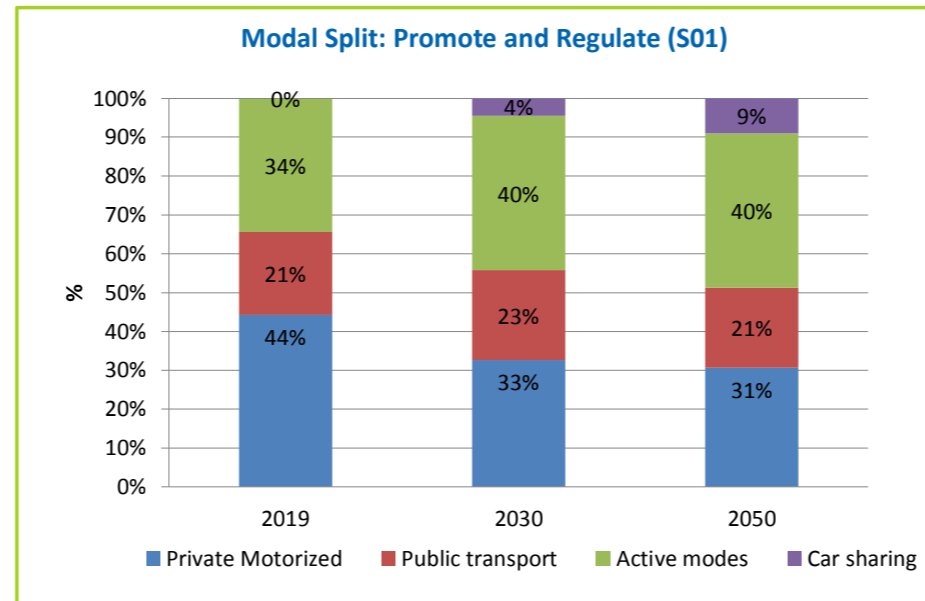
KEY INDICATORS

EU27 GENERALIZATION

MODAL SPLIT

Aggregate mode split [%]

Scenario	Mode	2019	2030	2050
Promote and Regulate (S01)	Private Motorized	44%	33%	31%
Promote and Regulate (S01)	Public transport	21%	23%	21%
Promote and Regulate (S01)	Active modes	34%	40%	40%
Promote and Regulate (S01)	Car sharing	0%	4%	9%
Plan and Build (S02)	Private Motorized	44%	36%	27%
Plan and Build (S02)	Public transport	21%	28%	39%
Plan and Build (S02)	Active modes	34%	35%	35%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Private Motorized	44%	20%	14%
Mixed (S03)	Public transport	21%	31%	27%
Mixed (S03)	Active modes	34%	43%	44%
Mixed (S03)	Car sharing	0%	5%	15%



KEY INDICATORS

EU27 GENERALIZATION

ECONOMIC OUTPUTS (discounted, cumulated from 2019)*

City total revenues [bil euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	107	341
Plan and Build (S02)	0	48	209
Mixed (S03)	0	184	585

City total costs [bil euro]

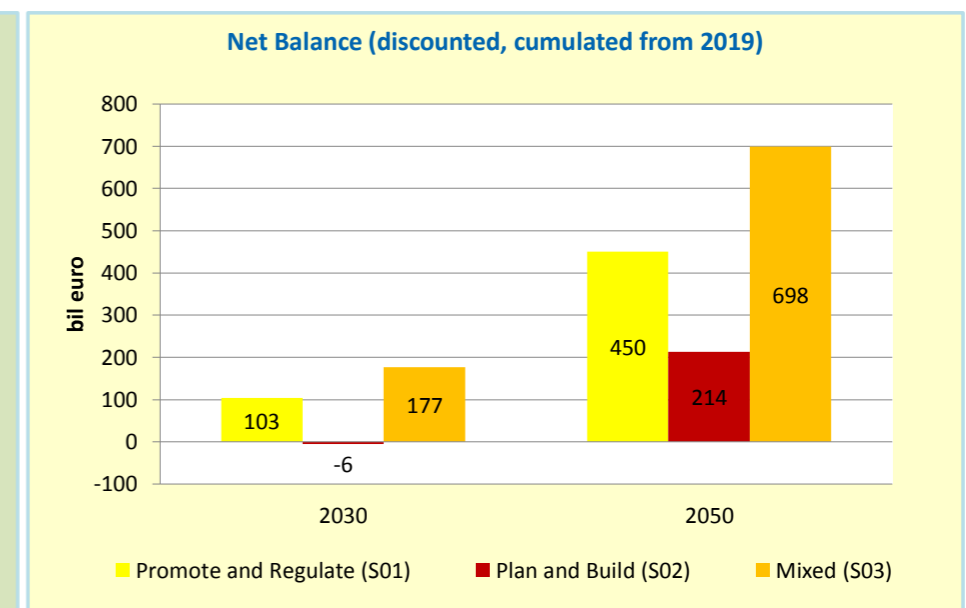
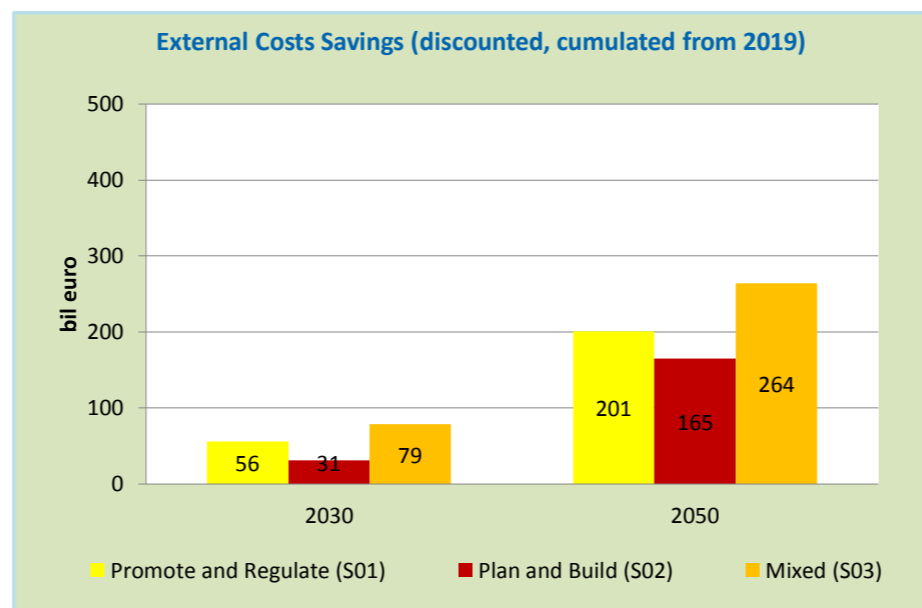
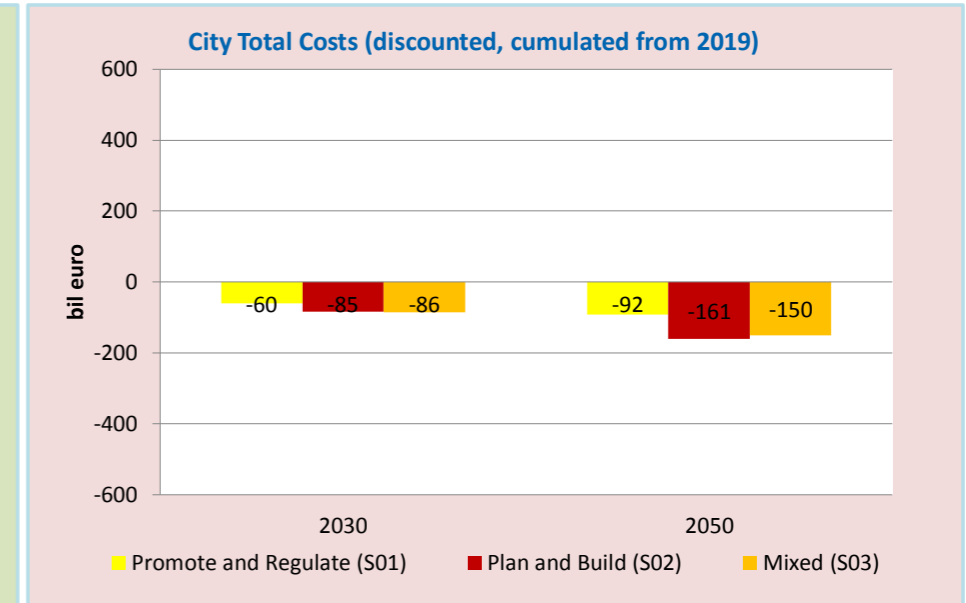
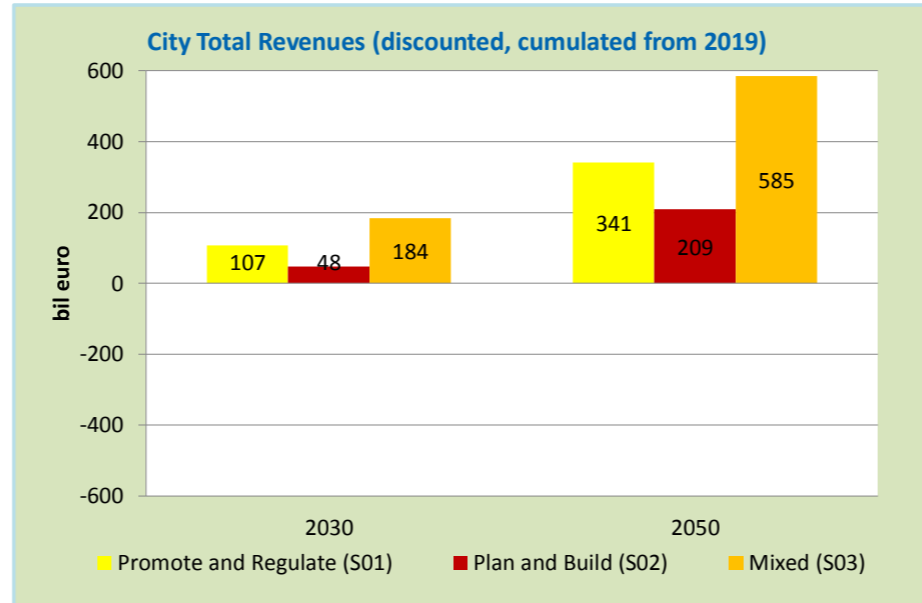
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	60	92
Plan and Build (S02)	0	85	161
Mixed (S03)	0	86	150

External costs savings [bil euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	56	201
Plan and Build (S02)	0	31	165
Mixed (S03)	0	79	264

Net balance [bil euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	103	450
Plan and Build (S02)	0	-6	214
Mixed (S03)	0	177	698



* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

EU27 GENERALIZATION

ECONOMIC OUTPUTS PER CAPITA (discounted, cumulated from 2019)*

City total revenues [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	613	1,950
Plan and Build (S02)	0	272	1,196
Mixed (S03)	0	1,051	3,339

City total costs [euro / capita]

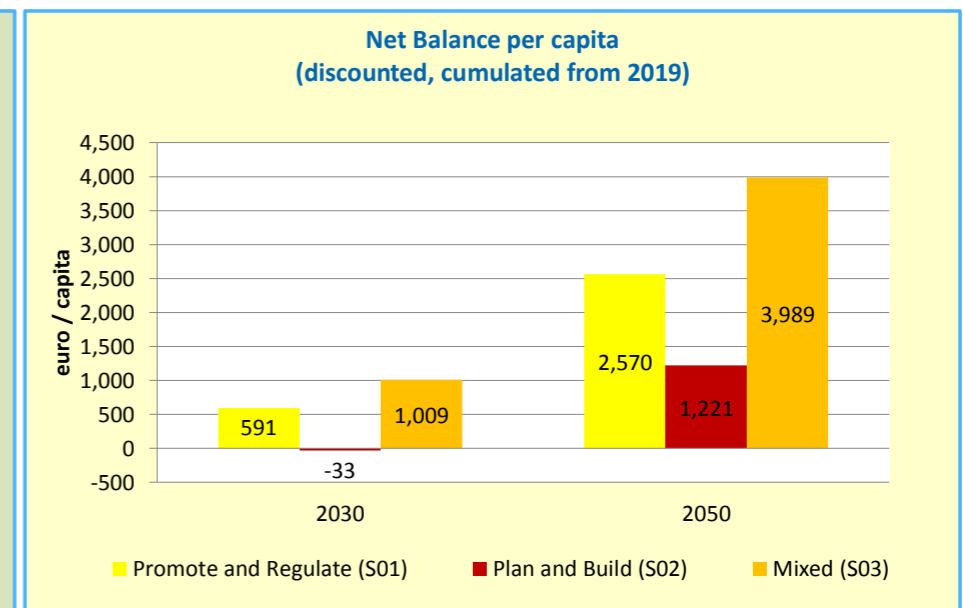
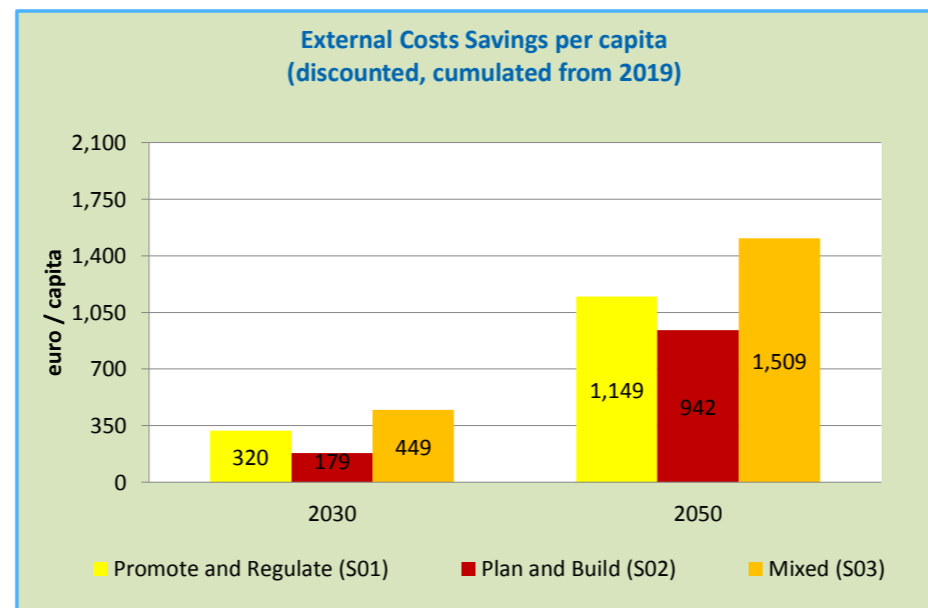
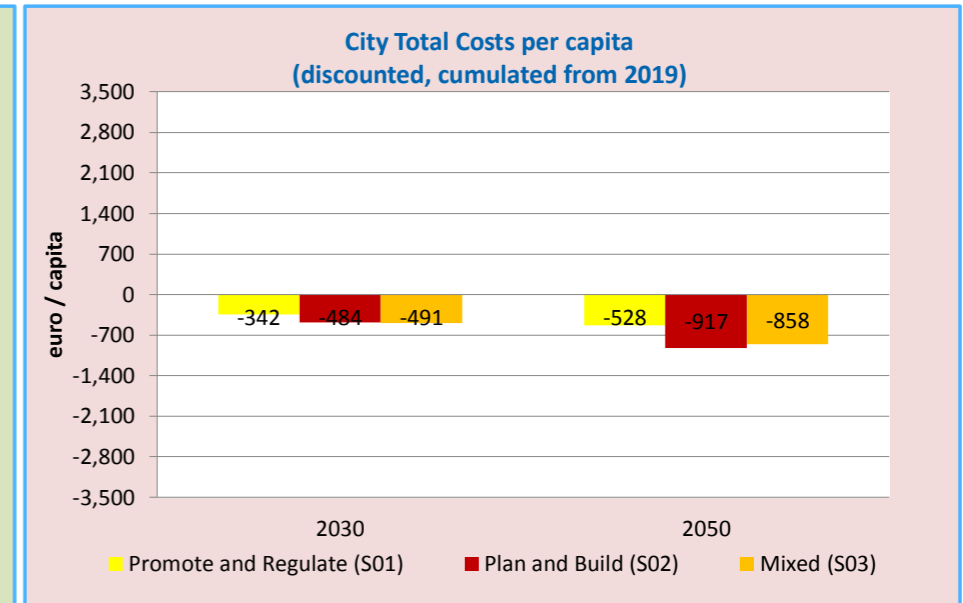
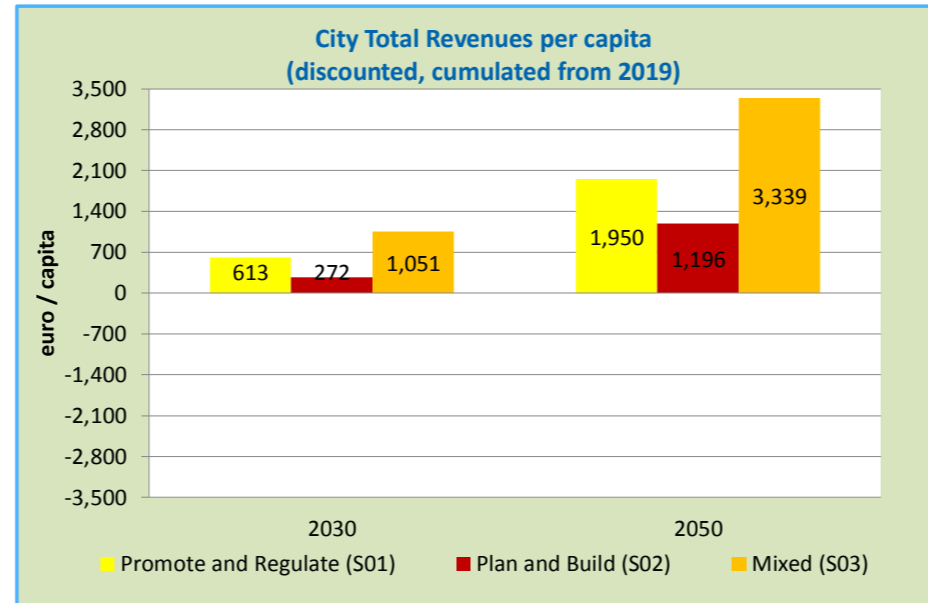
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	342	528
Plan and Build (S02)	0	484	917
Mixed (S03)	0	491	858

External costs savings [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	320	1,149
Plan and Build (S02)	0	179	942
Mixed (S03)	0	449	1,509

Net balance [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	591	2,570
Plan and Build (S02)	0	-33	1,221
Mixed (S03)	0	1,009	3,989



* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Small City - Southern Europe

EMISSIONS OF CO₂ (TANK-TO-WHEEL), CAR OWNERSHIP, FATALITIES

Emissions of CO₂ (Tank-to-wheel) [t CO₂ eq / capita per year]

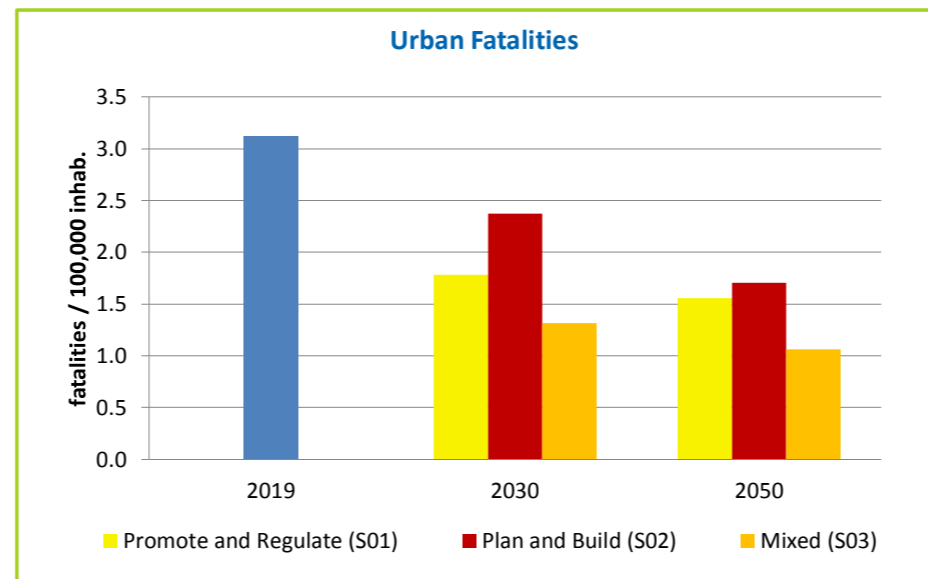
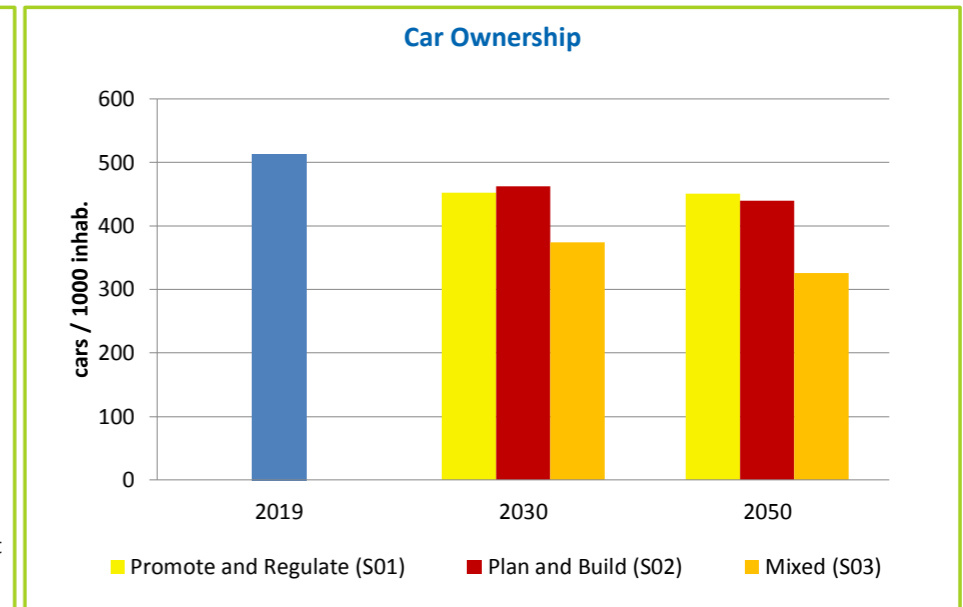
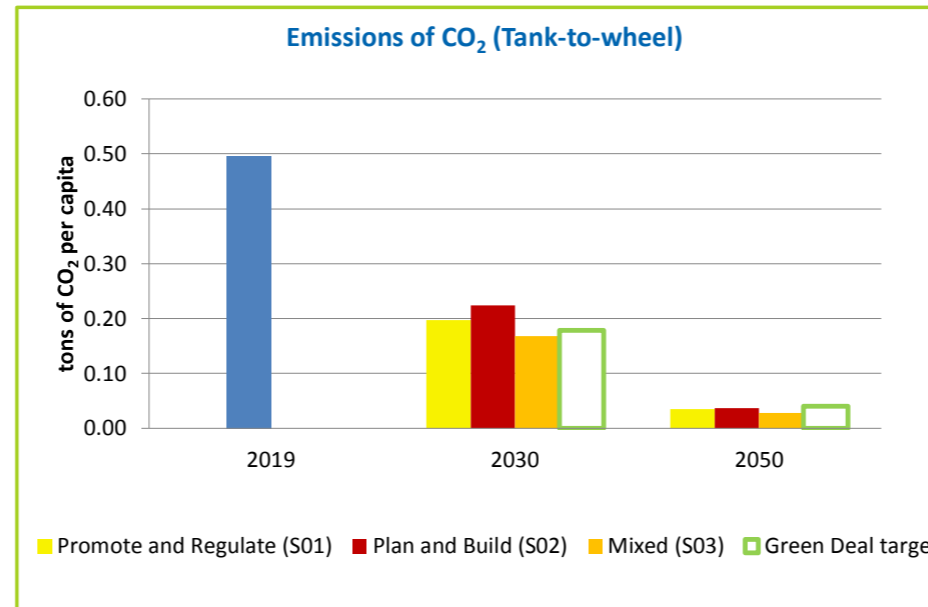
Scenario	2019	2030	2050
Promote and Regulate (S01)	0.496	0.197	0.036
Plan and Build (S02)	0.496	0.224	0.037
Mixed (S03)	0.496	0.168	0.028
Green Deal target		0.178	0.040

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	513	453	451
Plan and Build (S02)	513	462	440
Mixed (S03)	513	374	326

Urban Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	3.124	1.784	1.554
Plan and Build (S02)	3.124	2.374	1.706
Mixed (S03)	3.124	1.315	1.061



KEY INDICATORS

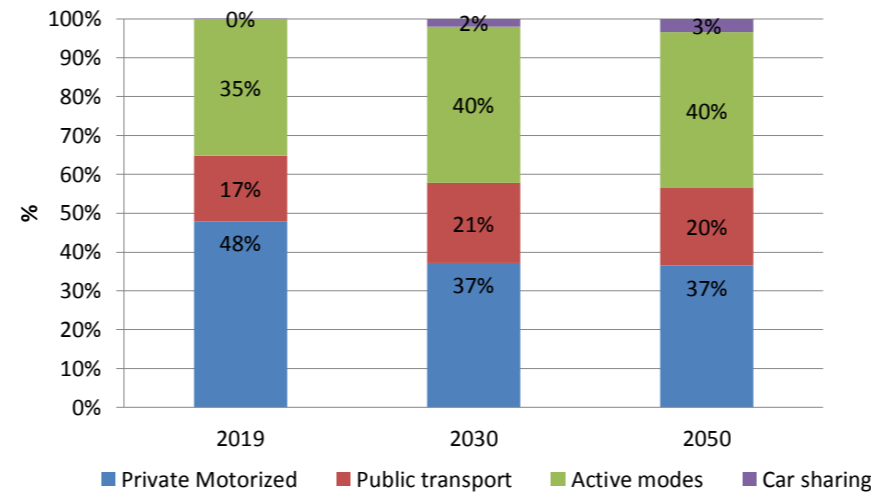
Small City - Southern Europe

MODAL SPLIT

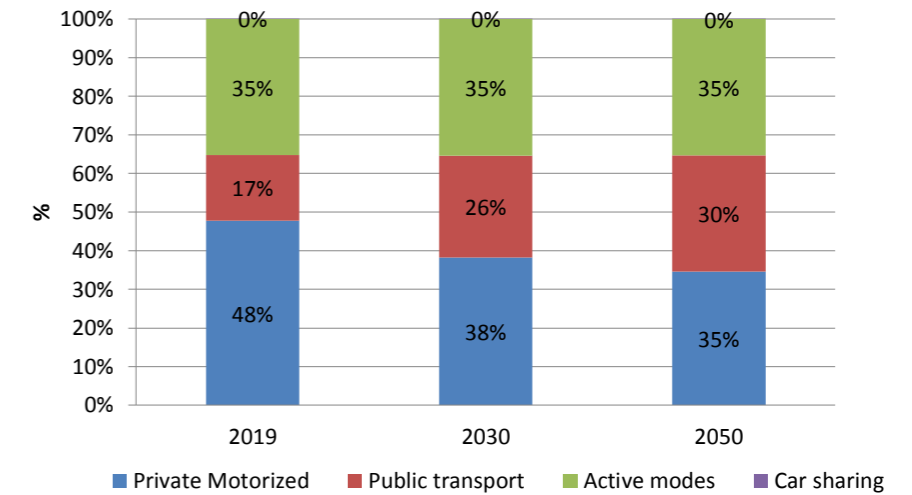
Aggregate mode split [%]

Scenario	Mode	2019	2030	2050
Promote and Regulate (S01)	Private Motorized	48%	37%	37%
Promote and Regulate (S01)	Public transport	17%	21%	20%
Promote and Regulate (S01)	Active modes	35%	40%	40%
Promote and Regulate (S01)	Car sharing	0%	2%	3%
Plan and Build (S02)	Private Motorized	48%	38%	35%
Plan and Build (S02)	Public transport	17%	26%	30%
Plan and Build (S02)	Active modes	35%	35%	35%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Private Motorized	48%	25%	18%
Mixed (S03)	Public transport	17%	31%	29%
Mixed (S03)	Active modes	35%	42%	42%
Mixed (S03)	Car sharing	0%	3%	11%

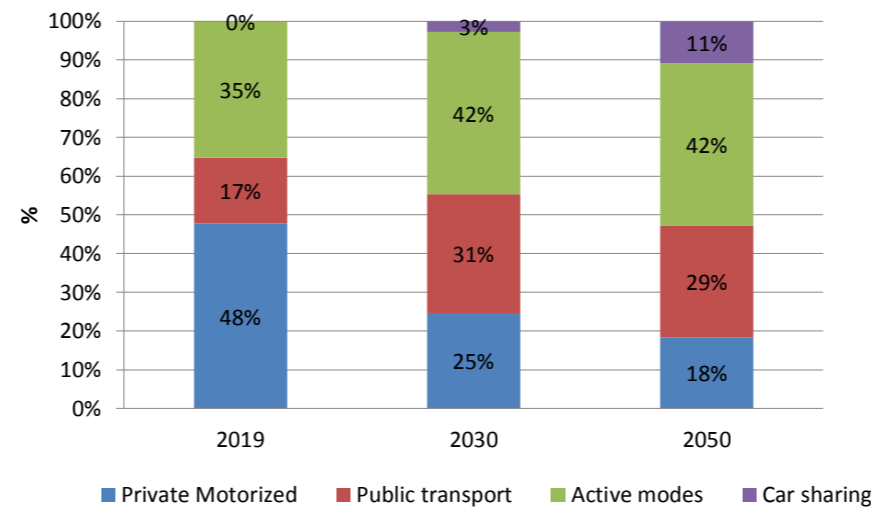
Modal Split: Promote and Regulate (S01)



Modal Split: Plan and Build (S02)



Modal Split: Mixed (S03)



KEY INDICATORS

Small City - Southern Europe

ECONOMIC OUTPUTS (discounted, cumulated from 2019)*

City total revenues [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	21	57
Plan and Build (S02)	0	17	55
Mixed (S03)	0	40	122

City total costs [mio euro]

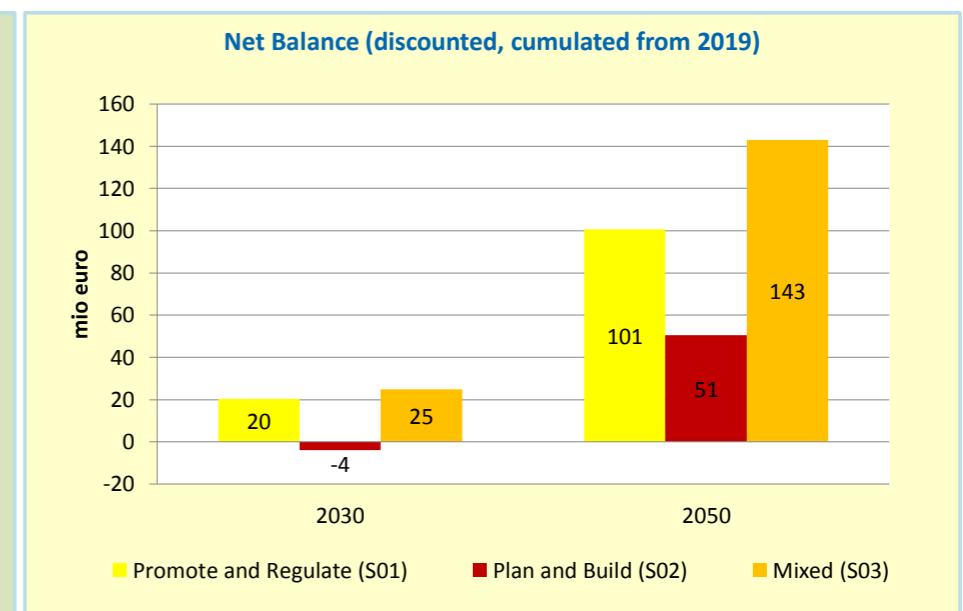
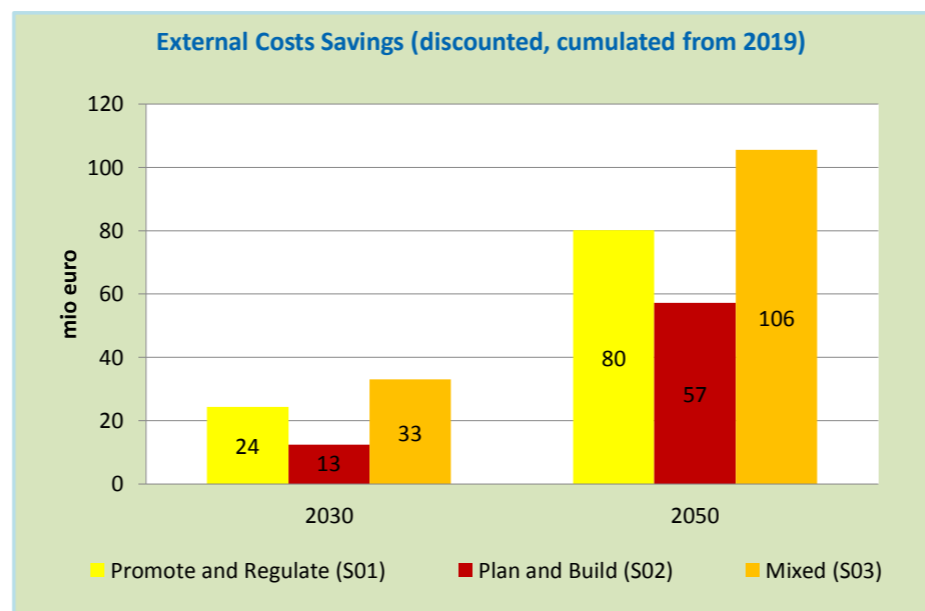
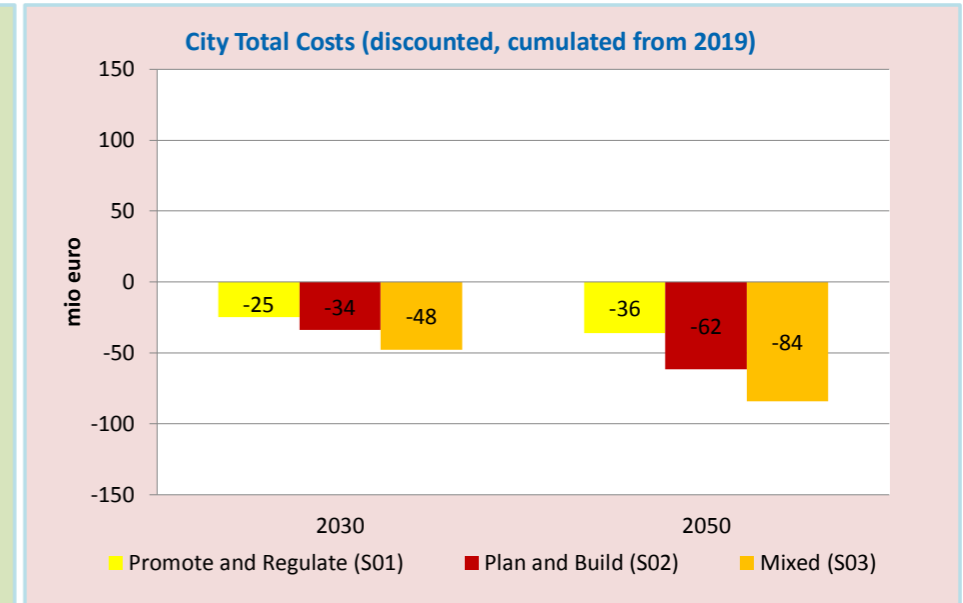
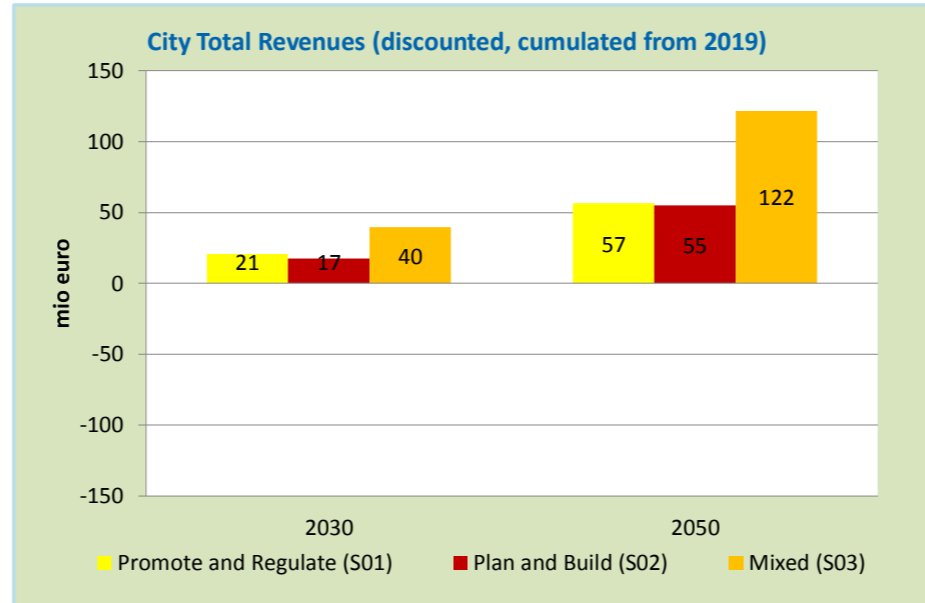
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	25	36
Plan and Build (S02)	0	34	62
Mixed (S03)	0	48	84

External costs savings [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	24	80
Plan and Build (S02)	0	13	57
Mixed (S03)	0	33	106

Net balance [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	20	101
Plan and Build (S02)	0	-4	51
Mixed (S03)	0	25	143



* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Small City - Southern Europe

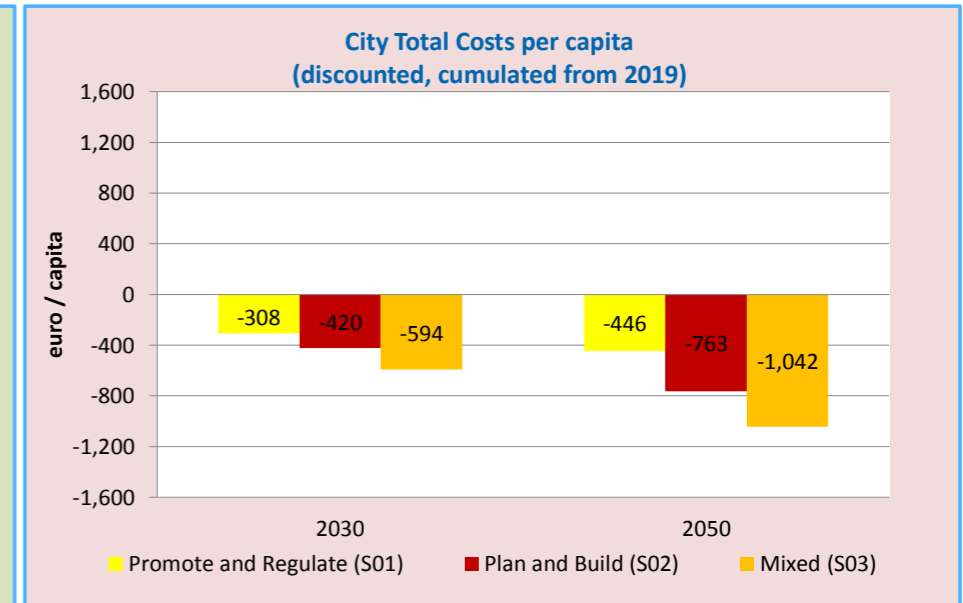
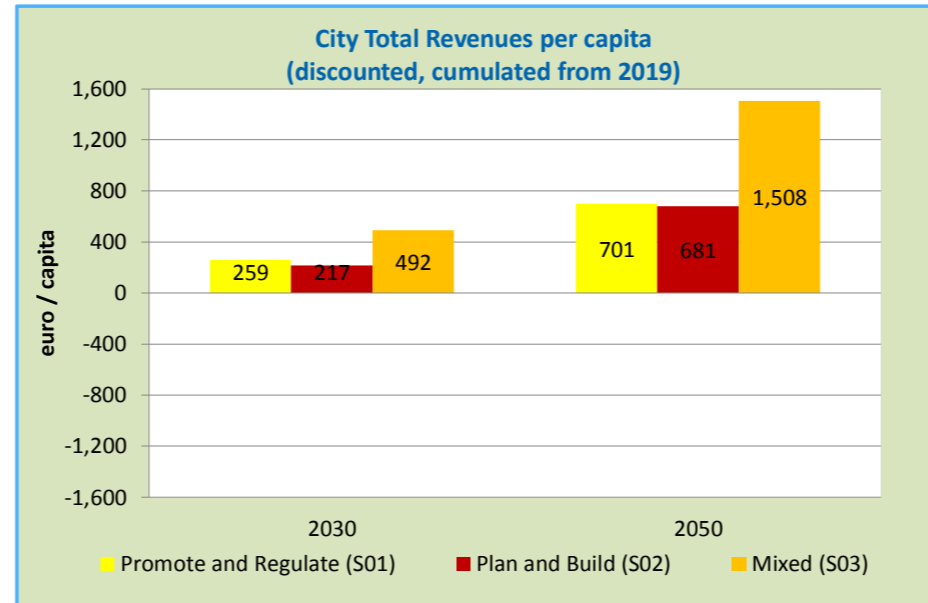
ECONOMIC OUTPUTS PER CAPITA (discounted, cumulated from 2019)*

City total revenues [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	259	701
Plan and Build (S02)	0	217	681
Mixed (S03)	0	492	1,508

City total costs [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	308	446
Plan and Build (S02)	0	420	763
Mixed (S03)	0	594	1,042

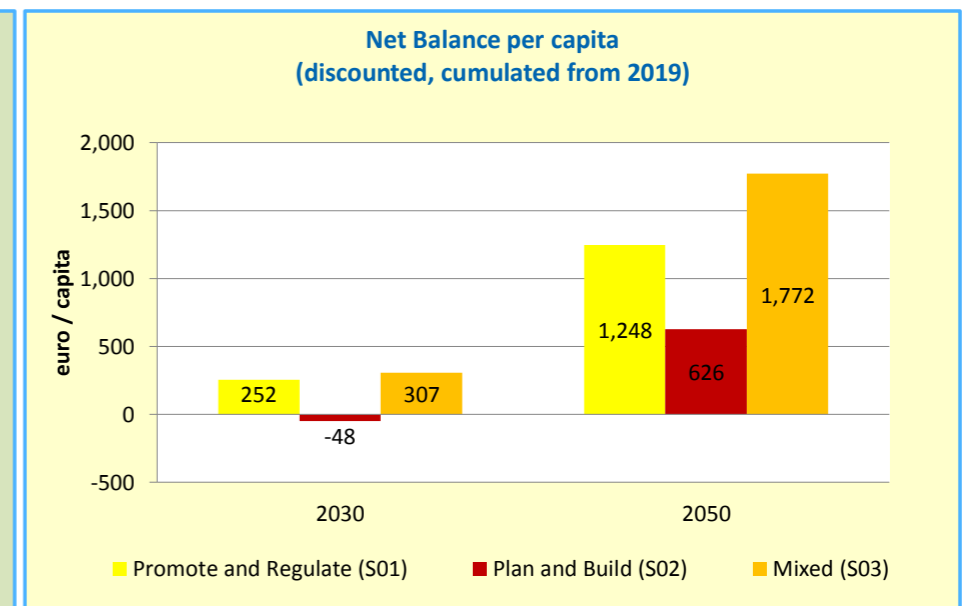
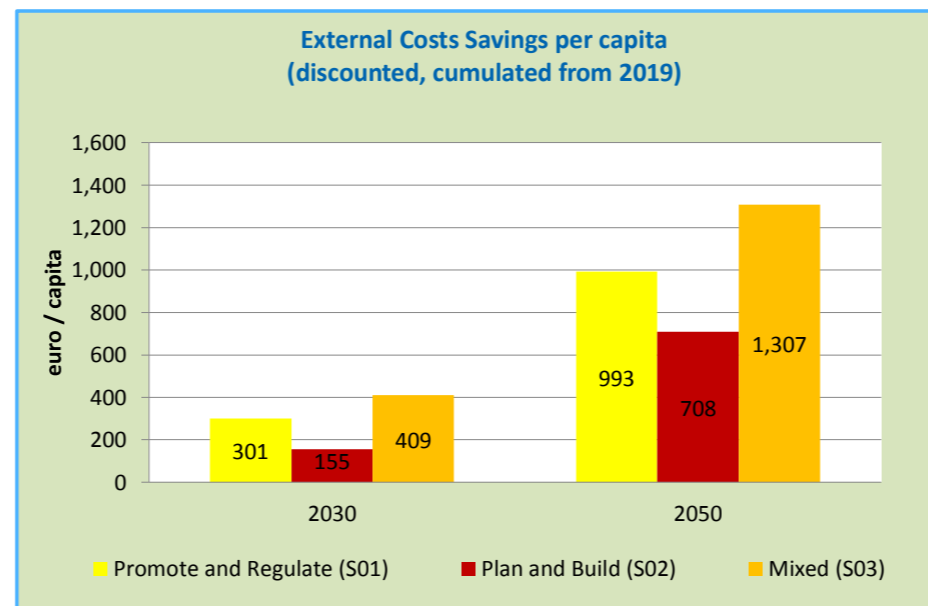


External costs savings [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	301	993
Plan and Build (S02)	0	155	708
Mixed (S03)	0	409	1,307

Net balance [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	252	1,248
Plan and Build (S02)	0	-48	626
Mixed (S03)	0	307	1,772



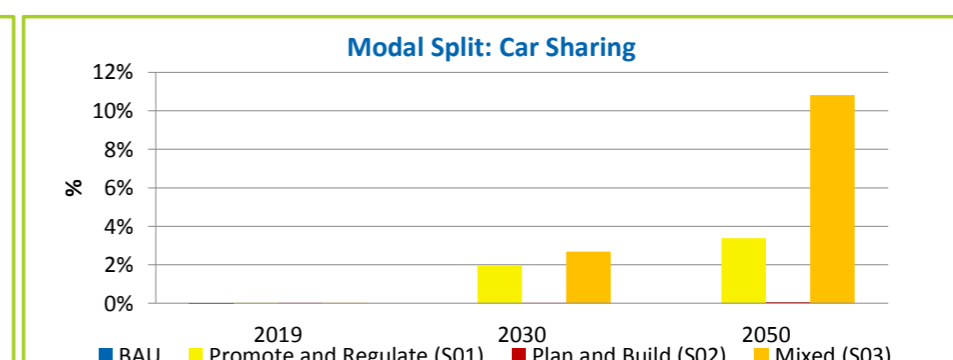
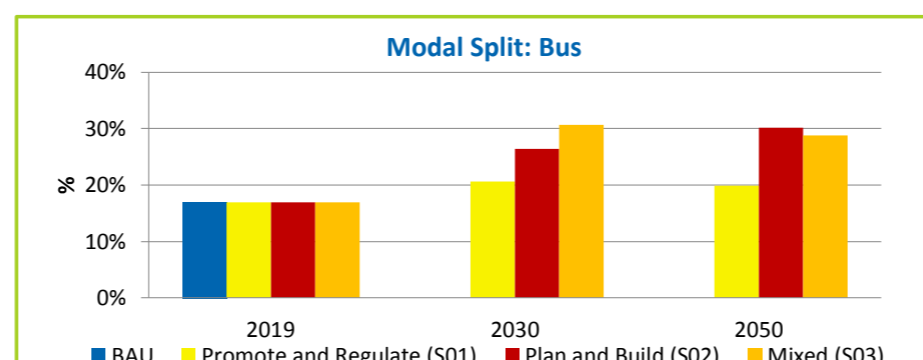
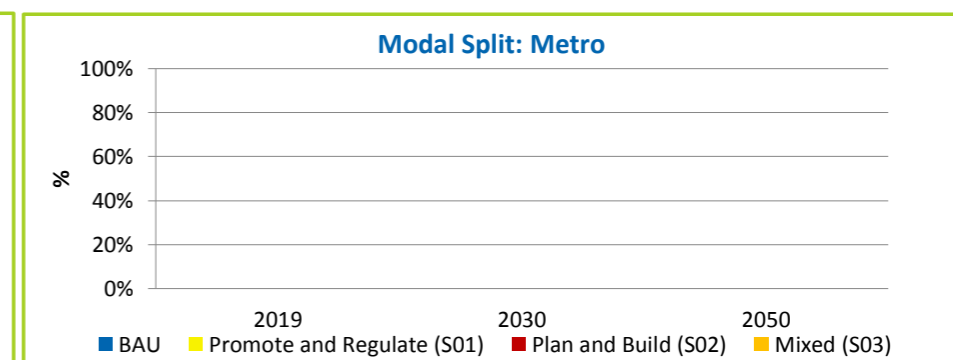
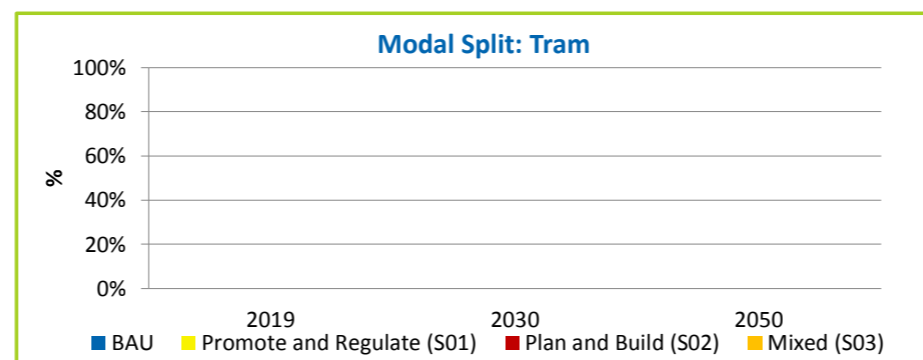
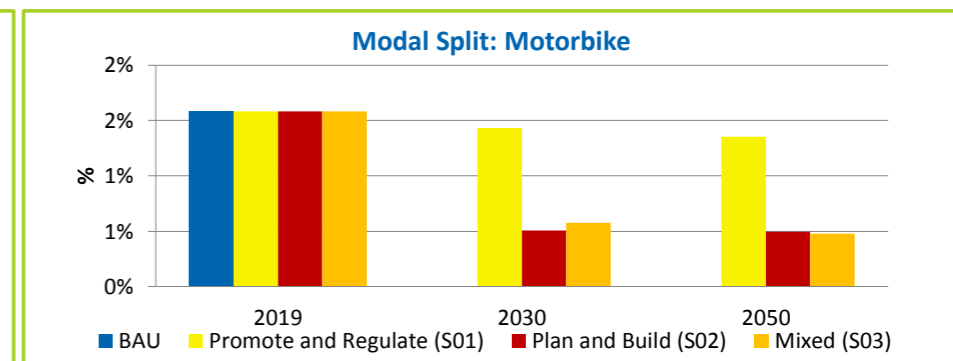
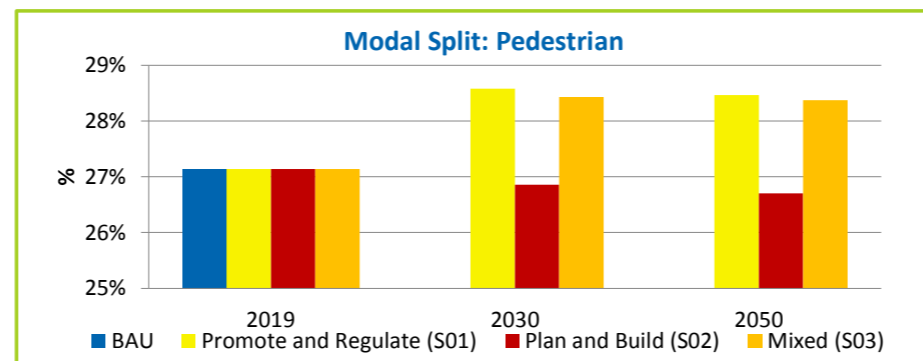
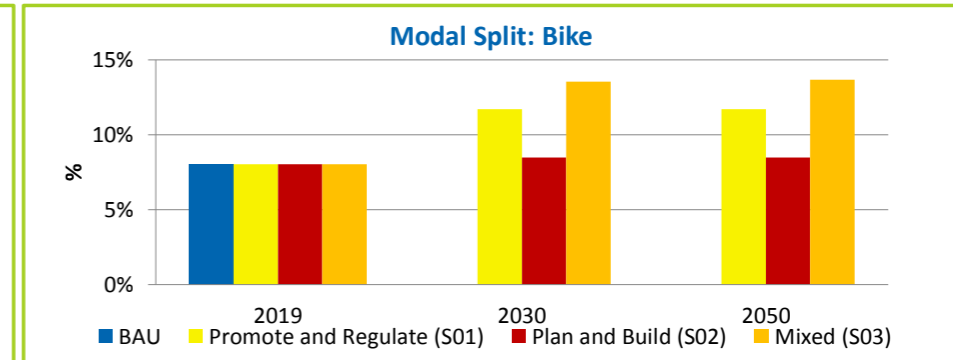
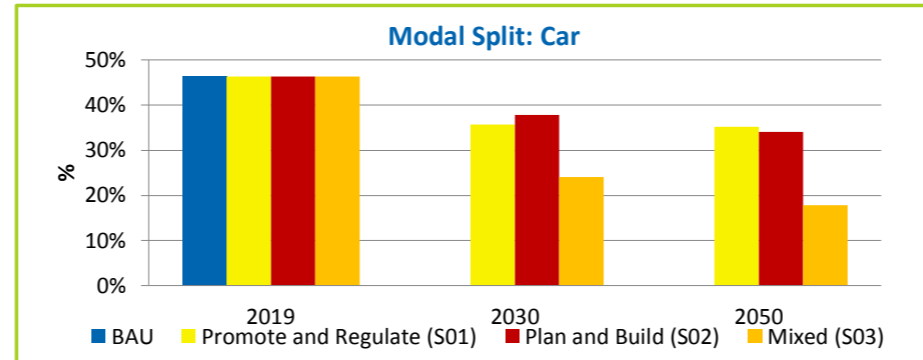
* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Small City - Southern Europe

TRANSPORT AND MOBILITY INDICATORS

Mode split [%]					
Scenario	Mode	2019	2030	2050	
BAU	Pedestrian	27%			
BAU	Bike	8%			
BAU	Motorbike	2%			
BAU	Car	46%			
BAU	Bus	17%			
BAU	Tram	0%			
BAU	Metro	0%			
BAU	Car sharing	0%			
Promote and Regulate (S01)	Pedestrian	27%	29%	28%	
Promote and Regulate (S01)	Bike	8%	12%	12%	
Promote and Regulate (S01)	Motorbike	2%	1%	1%	
Promote and Regulate (S01)	Car	46%	36%	35%	
Promote and Regulate (S01)	Bus	17%	21%	20%	
Promote and Regulate (S01)	Tram	0%	0%	0%	
Promote and Regulate (S01)	Metro	0%	0%	0%	
Promote and Regulate (S01)	Car sharing	0%	2%	3%	
Plan and Build (S02)	Pedestrian	27%	27%	27%	
Plan and Build (S02)	Bike	8%	8%	8%	
Plan and Build (S02)	Motorbike	2%	1%	0%	
Plan and Build (S02)	Car	46%	38%	34%	
Plan and Build (S02)	Bus	17%	26%	30%	
Plan and Build (S02)	Tram	0%	0%	0%	
Plan and Build (S02)	Metro	0%	0%	0%	
Plan and Build (S02)	Car sharing	0%	0%	0%	
Mixed (S03)	Pedestrian	27%	28%	28%	
Mixed (S03)	Bike	8%	14%	14%	
Mixed (S03)	Motorbike	2%	1%	0%	
Mixed (S03)	Car	46%	24%	18%	
Mixed (S03)	Bus	17%	31%	29%	
Mixed (S03)	Tram	0%	0%	0%	
Mixed (S03)	Metro	0%	0%	0%	
Mixed (S03)	Car sharing	0%	3%	11%	



ALL INDICATORS

Small City - Southern Europe

TRANSPORT AND MOBILITY INDICATORS

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
BAU	513		
Promote and Regulate (S01)	513	453	451
Plan and Build (S02)	513	462	440
Mixed (S03)	513	374	326

Congestion and delays index (SUMI)

Scenario	2019	2030	2050
BAU	9.52		
Promote and Regulate (S01)	9.52	9.83	9.84
Plan and Build (S02)	9.52	9.69	9.81
Mixed (S03)	9.52	10.00	10.00

Public transport occupancy levels [pass/vehicle]

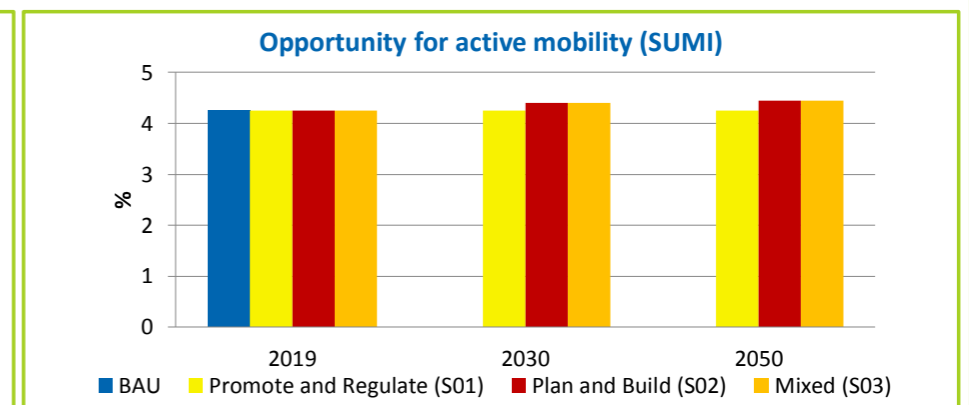
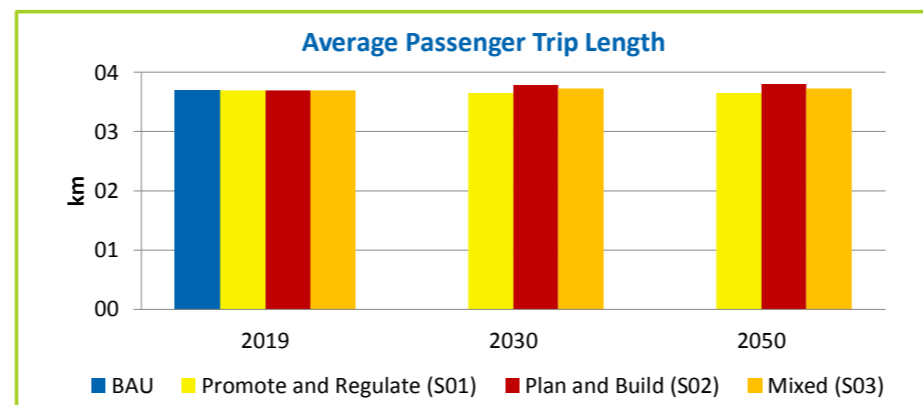
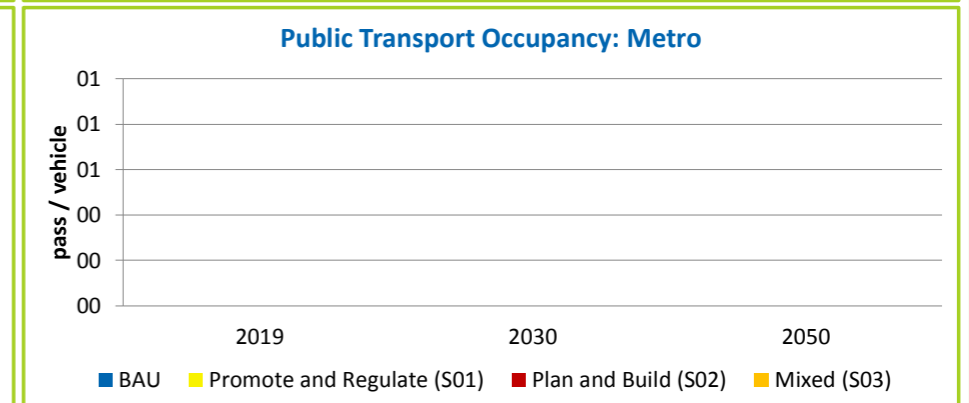
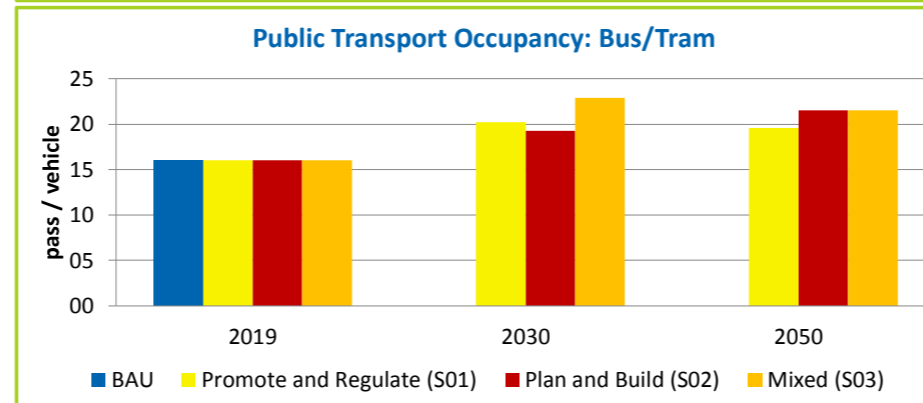
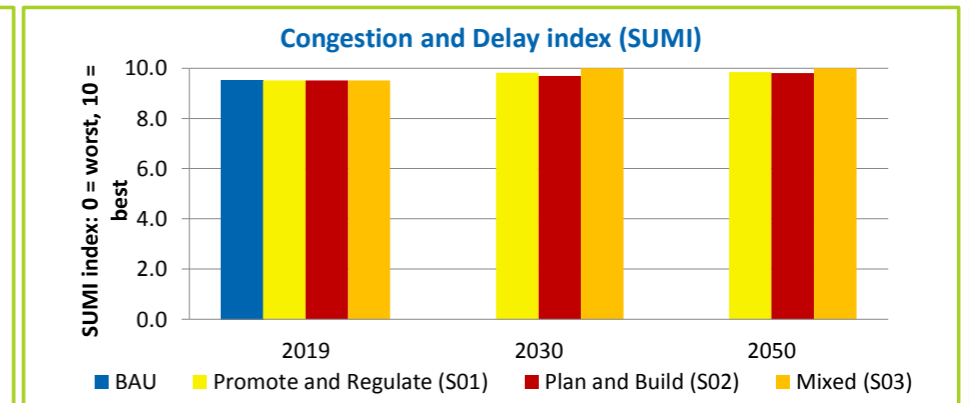
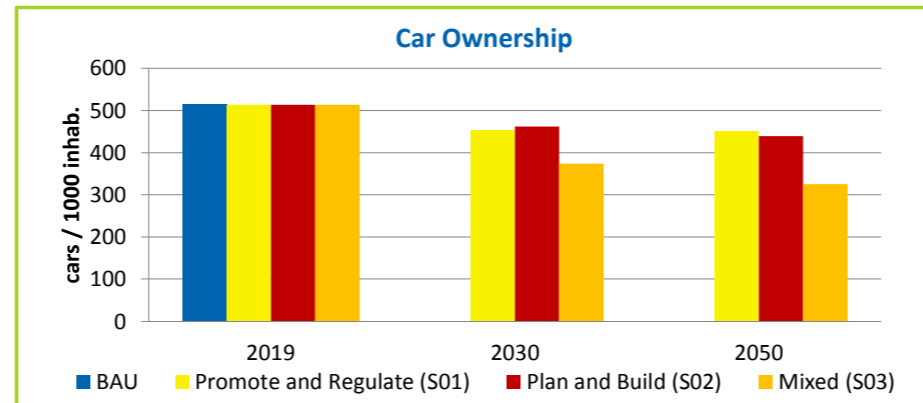
Scenario	PT mode	2019	2030	2050
BAU	Bus/tram	16.1		
BAU	Metro	0.0		
Promote and Regulate (S01)	Bus/tram	16.1	20.2	19.6
Promote and Regulate (S01)	Metro	0.0	0.0	0.0
Plan and Build (S02)	Bus/tram	16.1	19.3	21.5
Plan and Build (S02)	Metro	0.0	0.0	0.0
Mixed (S03)	Bus/tram	16.05	22.94	21.53
Mixed (S03)	Metro	0.00	0.00	0.00

Average passenger trip length [km]

Scenario	2019	2030	2050
BAU	3.7		
Promote and Regulate (S01)	3.7	3.7	3.7
Plan and Build (S02)	3.7	3.8	3.8
Mixed (S03)	3.7	3.7	3.7

Opportunity for active mobility (SUMI) [%]

Scenario	2019	2030	2050
BAU	4.25		
Promote and Regulate (S01)	4.25	4.25	4.25
Plan and Build (S02)	4.25	4.40	4.44
Mixed (S03)	4.25	4.40	4.44



ALL INDICATORS

Small City - Southern Europe

TRANSPORT AND MOBILITY INDICATORS

Penetration of alternatively fuelled car vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	Hybrid electric	0%		
BAU	Battery electric	0%		
BAU	fuel cells	0%		
Scenarios	Hybrid electric	0%	1%	10%
Scenarios	Battery electric	0%	39%	52%
Scenarios	fuel cells	0%	0%	25%

Penetration of alternatively fuelled bus vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	CNG	3%		
BAU	Hybrid electric	0.0%		
BAU	Battery electric	0.0%		
Scenarios	CNG	3%	5%	6%
Scenarios	Hybrid electric	0%	0%	0%
Scenarios	Battery electric	0%	46%	51%

Vehicles-km by mode: cars and car-sharing cars [million vkm/year]

Scenario	2019	2030	2050
BAU	83		
Promote and Regulate (S01)	83	67	68
Plan and Build (S02)	83	73	68
Mixed (S03)	83	49	53

Vehicles-km by mode: trucks [million vkm/year]

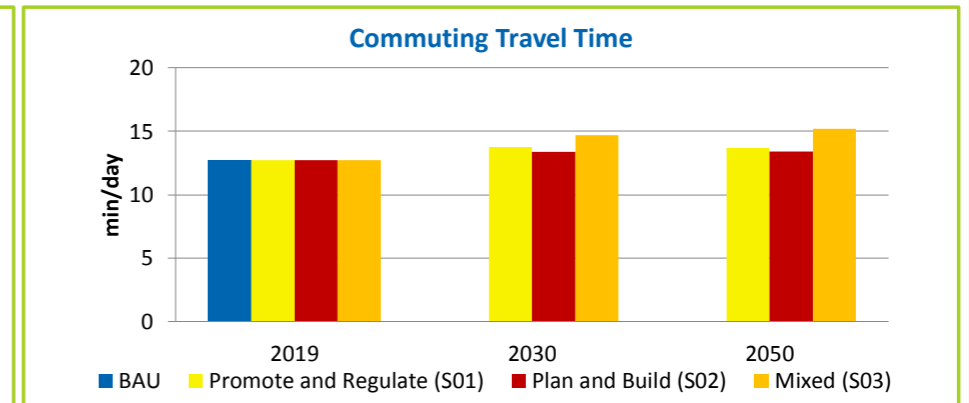
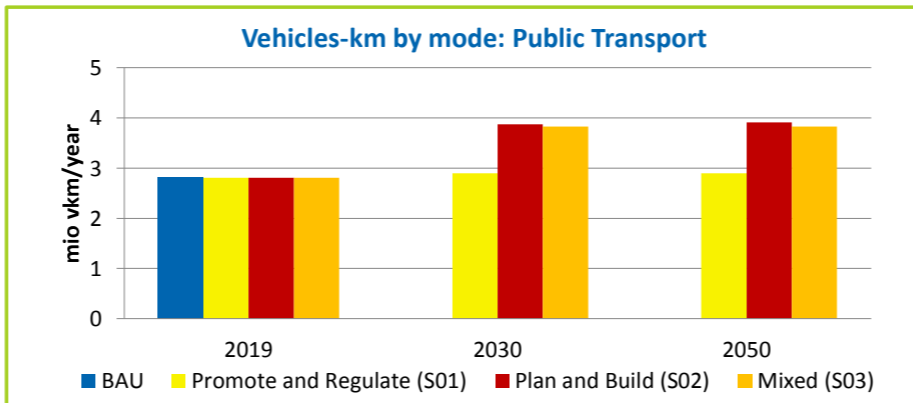
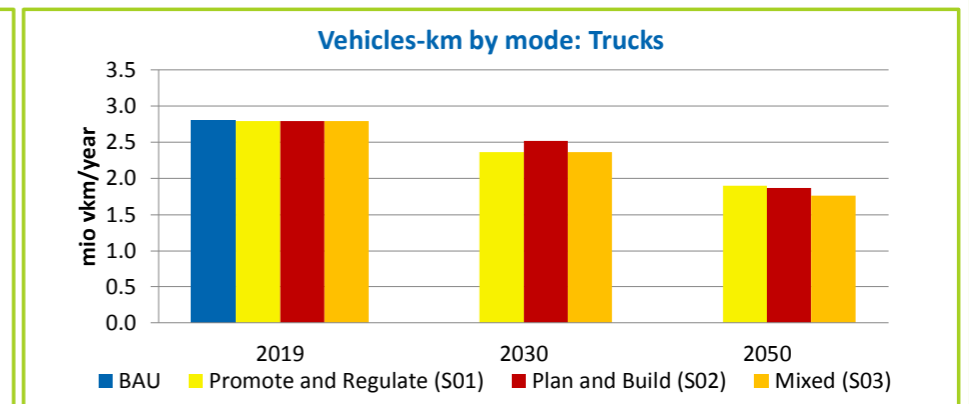
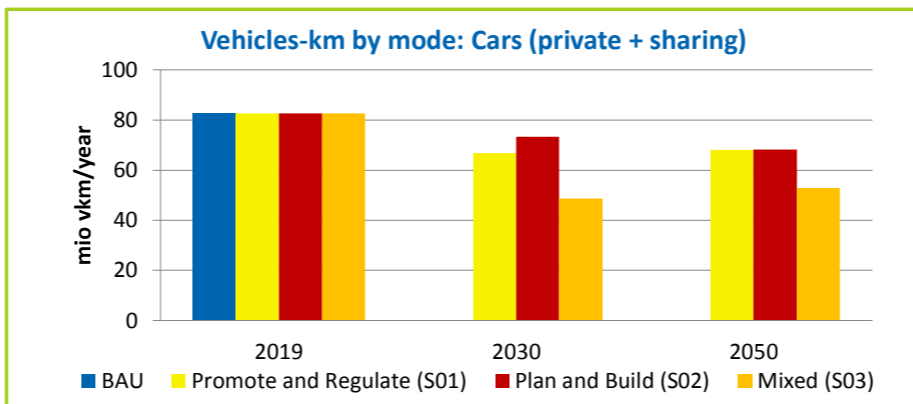
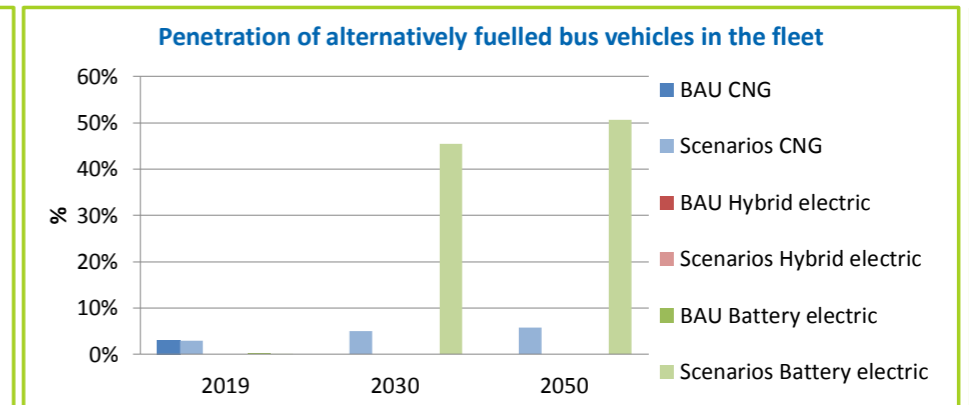
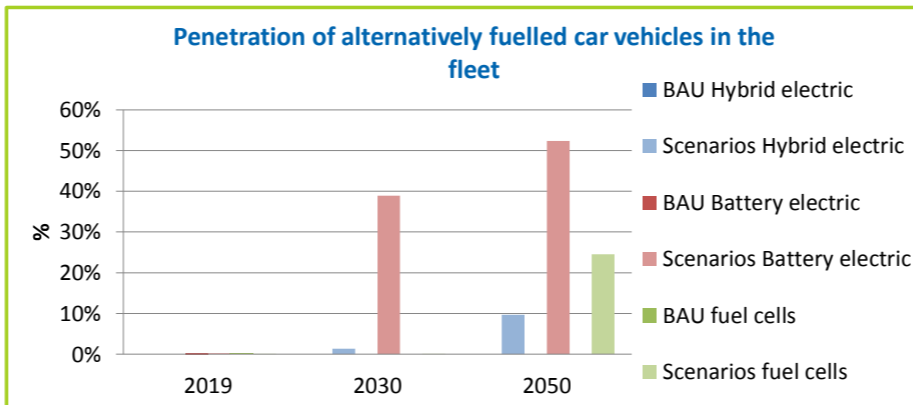
Scenario	2019	2030	2050
BAU	2.8		
Promote and Regulate (S01)	2.8	2.4	1.9
Plan and Build (S02)	2.8	2.5	1.9
Mixed (S03)	2.8	2.4	1.8

Vehicles-km by mode: Public Transport [million vkm/year]

Scenario	2019	2030	2050
BAU	2.8		
Promote and Regulate (S01)	2.8	2.9	2.9
Plan and Build (S02)	2.8	3.9	3.9
Mixed (S03)	2.8	3.8	3.8

Commuting travel time (SUMI) [min/day]

Scenario	2019	2030	2050
BAU	12.7		
Promote and Regulate (S01)	12.7	13.8	13.7
Plan and Build (S02)	12.7	13.4	13.4
Mixed (S03)	12.7	14.7	15.2



ALL INDICATORS

Small City - Southern Europe

ENVIRONMENT AND SAFETY INDICATORS

Air pollutant emissions (SUMI: PM2.5, Nox) [kg PM2.5 eq/capita]

Scenario	2019	2030	2050
BAU	0.7		
Promote and regulate (S01)	0.7	0.2	0.1
Plan and Build (S02)	0.7	0.3	0.1
Mixed (S03)	0.7	0.2	0.1

Air pollutant emissions (CO, VOC) [kg / capita]

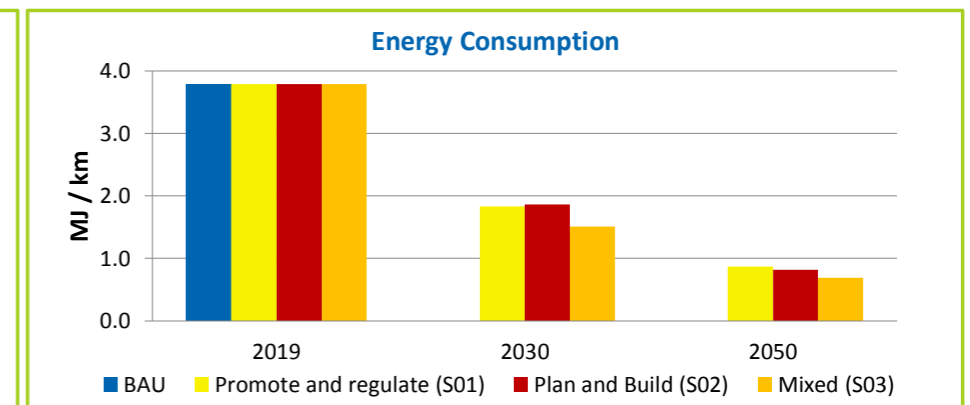
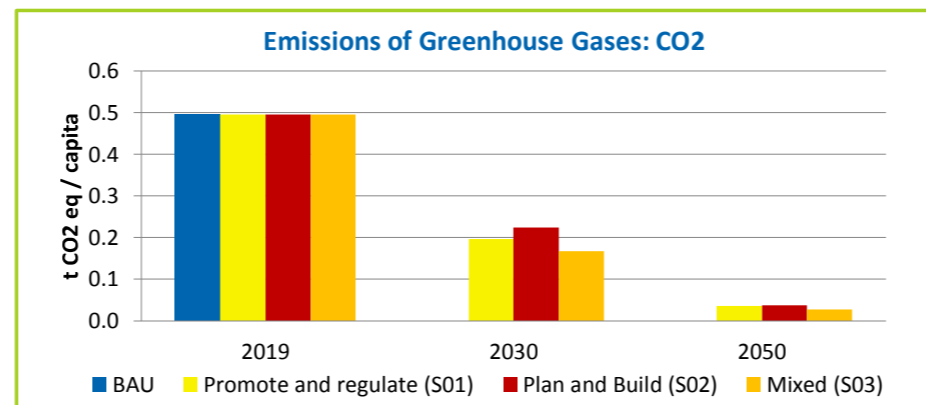
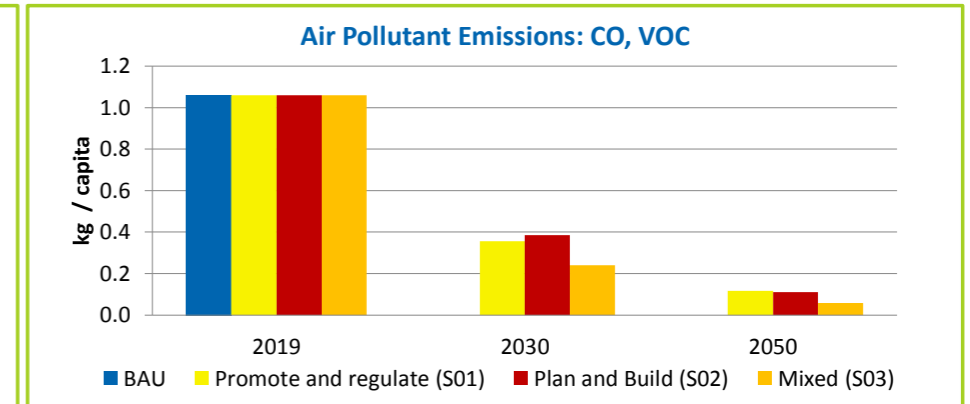
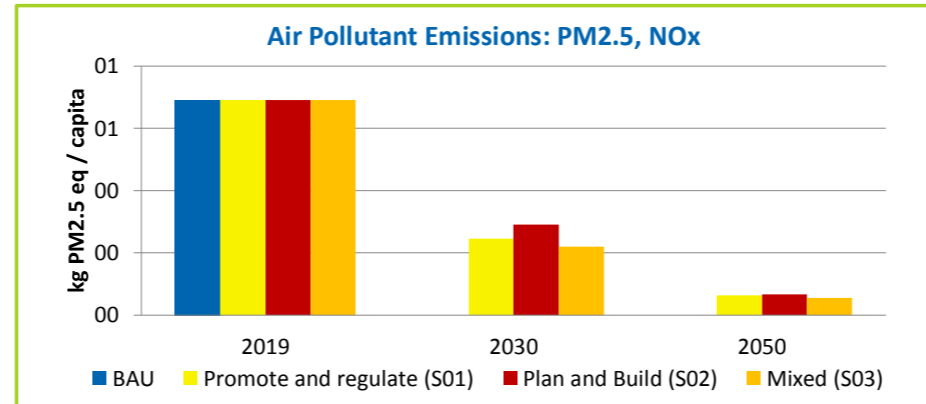
Scenario	2019	2030	2050
BAU	1		
Promote and regulate (S01)	1	0	0
Plan and Build (S02)	1.1	0.4	0.1
Mixed (S03)	1.1	0.2	0.1

Emissions of Greenhouse Gases [t CO2 eq / capita per year]

Scenario	2019	2030	2050
BAU	0.496		
Promote and regulate (S01)	0.496	0.197	0.036
Plan and Build (S02)	0.496	0.224	0.037
Mixed (S03)	0.496	0.168	0.028

Energy consumption [MJ / km]

Scenario	2019	2030	2050
BAU	3.8		
Promote and regulate (S01)	3.8	1.8	0.9
Plan and Build (S02)	3.8	1.9	0.8
Mixed (S03)	3.8	1.5	0.7



ALL INDICATORS

Small City - Southern Europe

ENVIRONMENT AND SAFETY INDICATORS

Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	3.1		
Promote and regulate (S01)	3.1	1.8	1.6
Plan and Build (S02)	3.1	2.4	1.7
Mixed (S03)	3.1	1.3	1.1

Fatalities: active modes [fatalities / 100,000 inhab.]

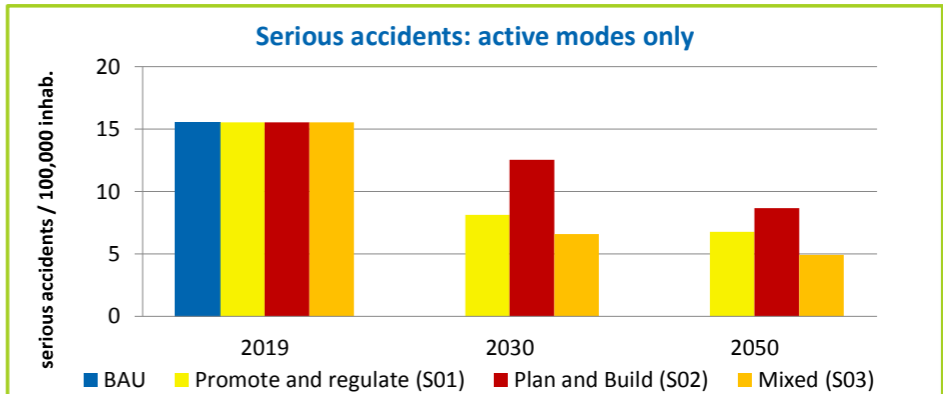
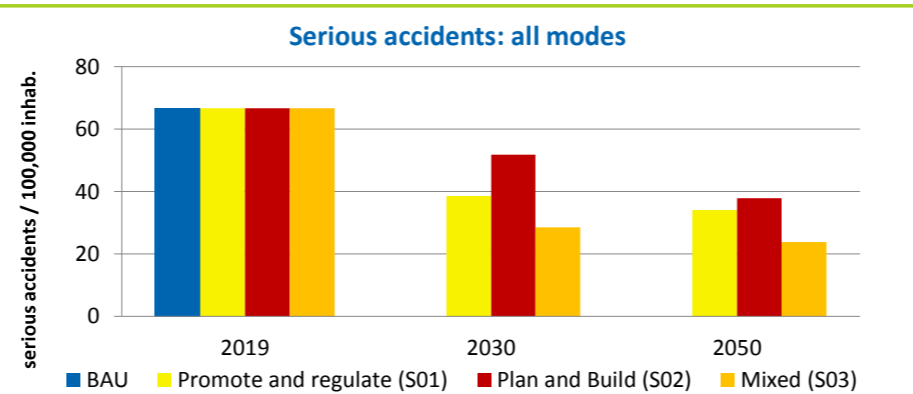
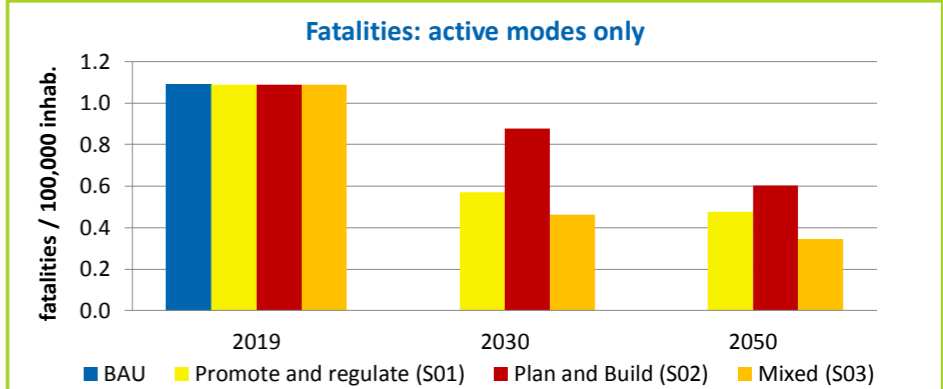
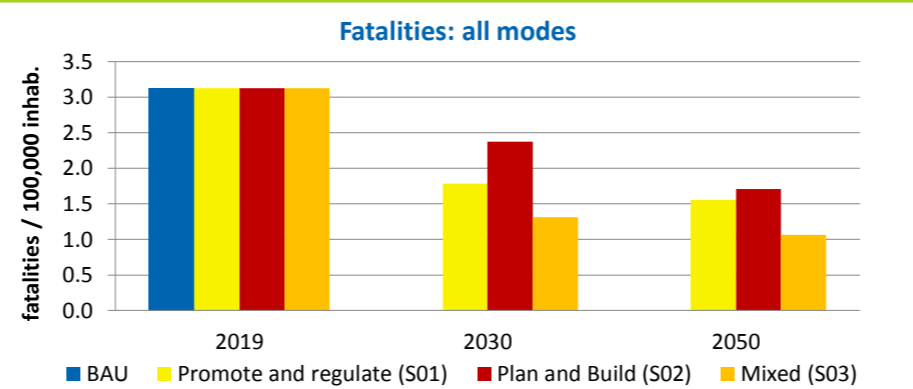
Scenario	2019	2030	2050
BAU	1.09		
Promote and regulate (S01)	1.09	0.57	0.48
Plan and Build (S02)	1.09	0.88	0.60
Mixed (S03)	1.09	0.46	0.34

Serious accidents [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	67		
Promote and regulate (S01)	67	39	34
Plan and Build (S02)	67	52	38
Mixed (S03)	67	29	24

Serious accidents: active modes [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	16		
Promote and regulate (S01)	16	8	7
Plan and Build (S02)	16	13	9
Mixed (S03)	16	7	5



ALL INDICATORS

Small City - Central/Western Europe

EMISSIONS OF CO₂ (TANK-TO-WHEEL), CAR OWNERSHIP, FATALITIES

Emissions of CO₂ (Tank-to-wheel) [t CO₂ eq / capita per year]

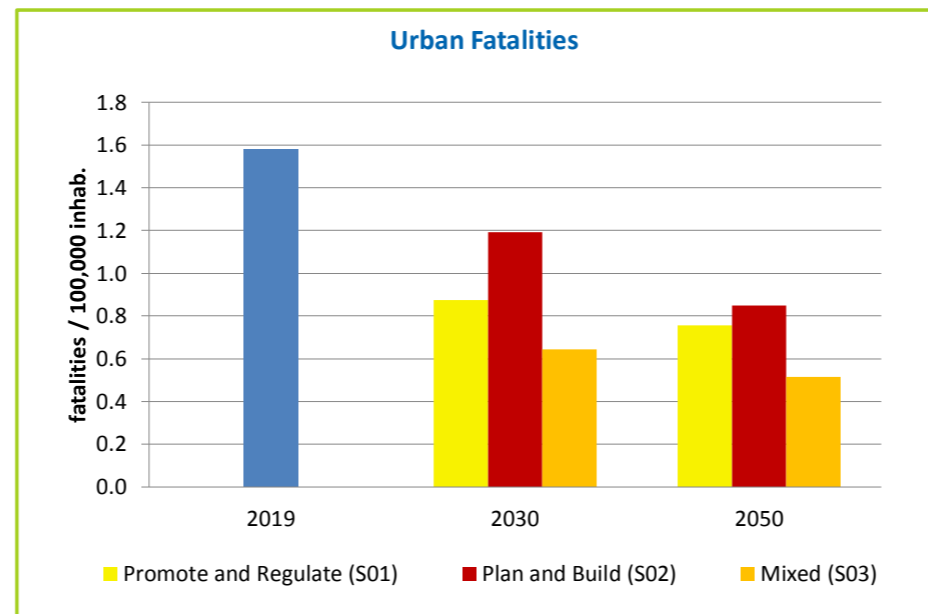
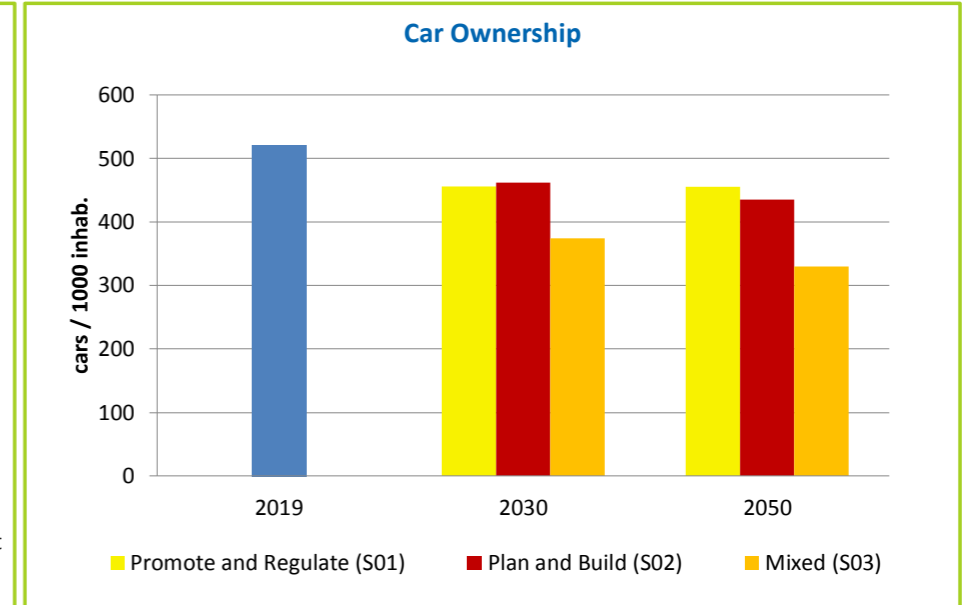
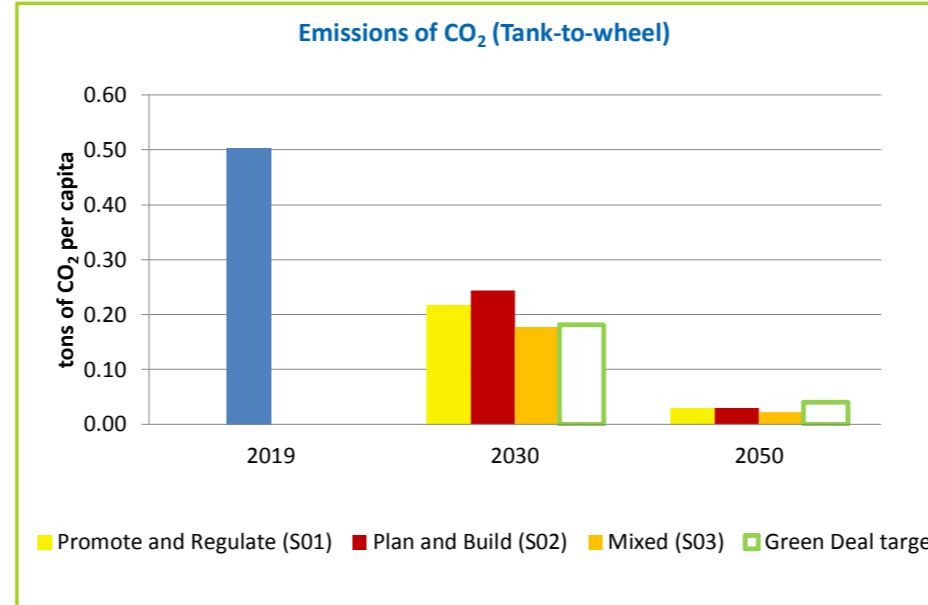
Scenario	2019	2030	2050
Promote and Regulate (S01)	0.504	0.218	0.029
Plan and Build (S02)	0.504	0.244	0.029
Mixed (S03)	0.504	0.177	0.022
Green Deal target		0.181	0.040

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	521	456	455
Plan and Build (S02)	521	462	435
Mixed (S03)	521	374	330

Urban Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	1.578	0.875	0.757
Plan and Build (S02)	1.578	1.192	0.848
Mixed (S03)	1.578	0.644	0.515



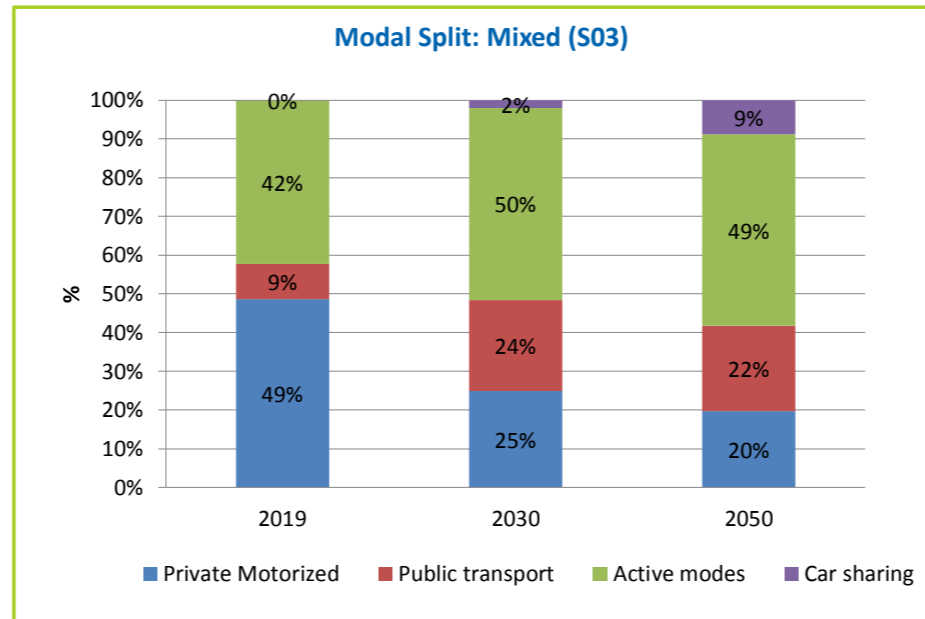
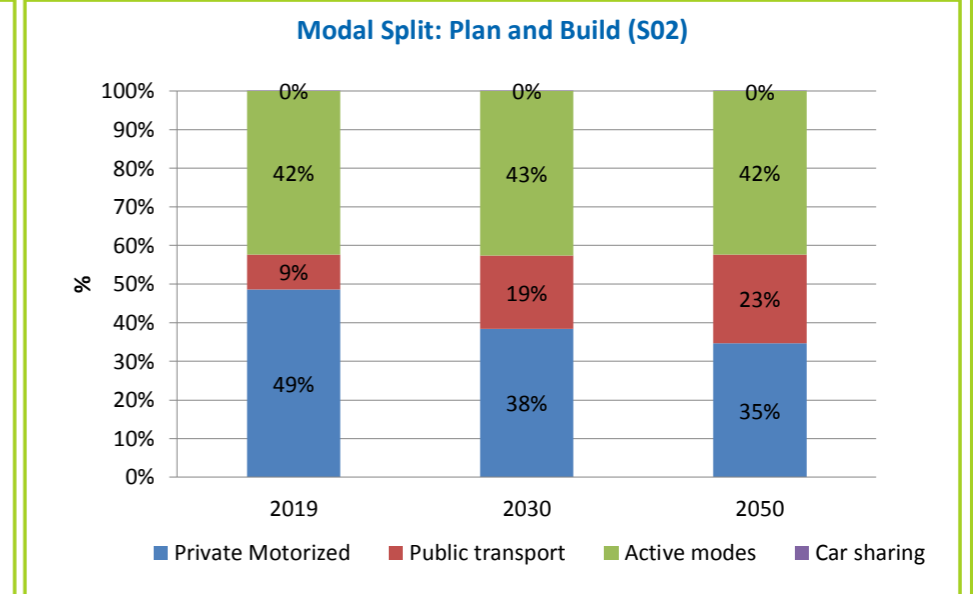
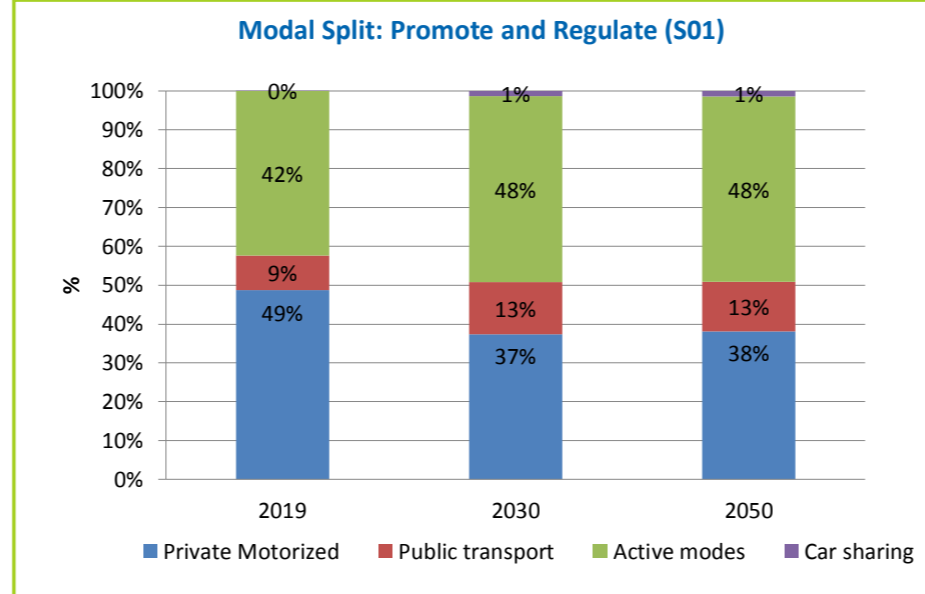
KEY INDICATORS

Small City - Central/Western Europe

MODAL SPLIT

Aggregate mode split [%]

Scenario	Mode	2019	2030	2050
Promote and Regulate (S01)	Private Motorized	49%	37%	38%
Promote and Regulate (S01)	Public transport	9%	13%	13%
Promote and Regulate (S01)	Active modes	42%	48%	48%
Promote and Regulate (S01)	Car sharing	0%	1%	1%
Plan and Build (S02)	Private Motorized	49%	38%	35%
Plan and Build (S02)	Public transport	9%	19%	23%
Plan and Build (S02)	Active modes	42%	43%	42%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Private Motorized	49%	25%	20%
Mixed (S03)	Public transport	9%	24%	22%
Mixed (S03)	Active modes	42%	50%	49%
Mixed (S03)	Car sharing	0%	2%	9%



KEY INDICATORS

Small City - Central/Western Europe

ECONOMIC OUTPUTS (discounted, cumulated from 2019)*

City total revenues [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	57	124
Plan and Build (S02)	0	31	115
Mixed (S03)	0	84	259

City total costs [mio euro]

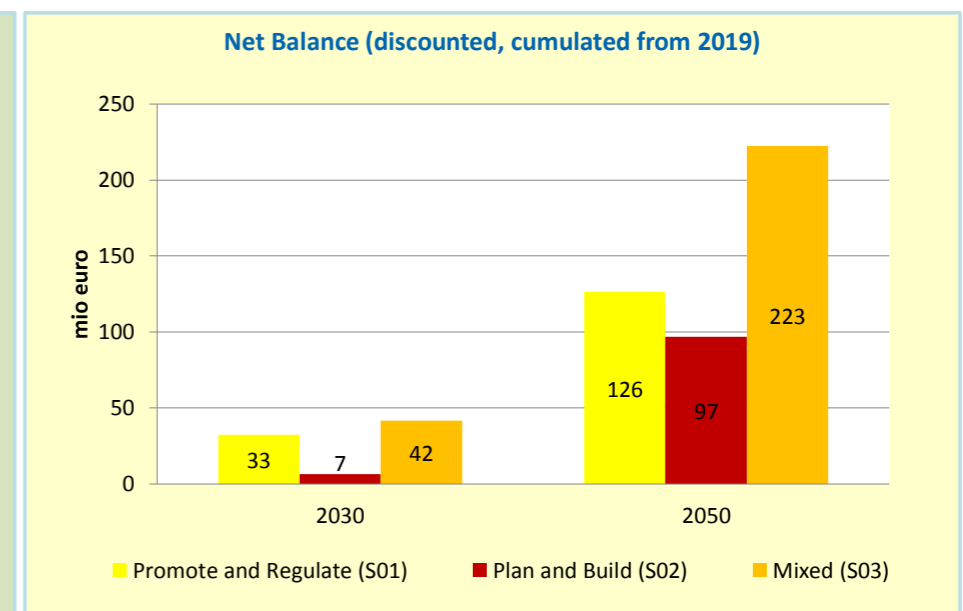
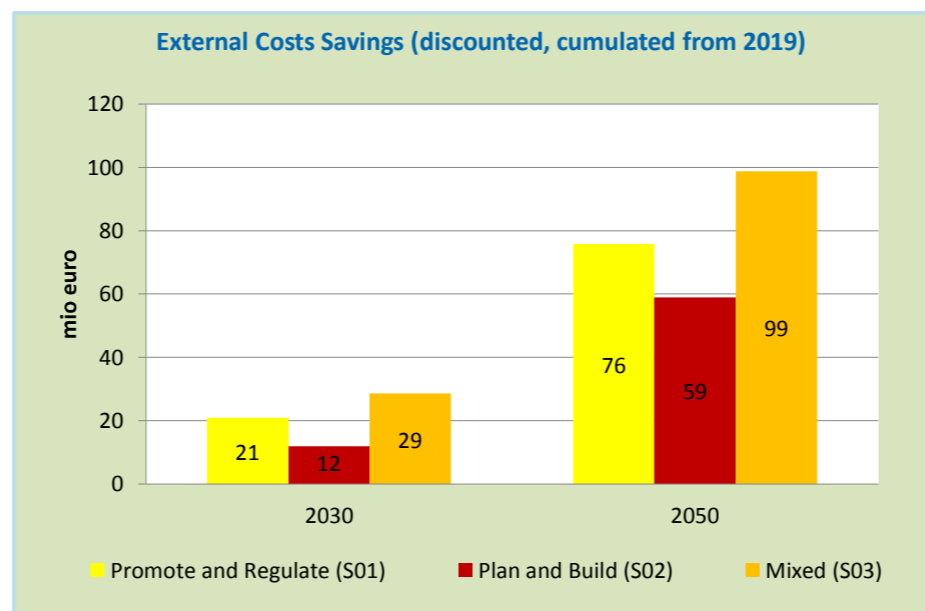
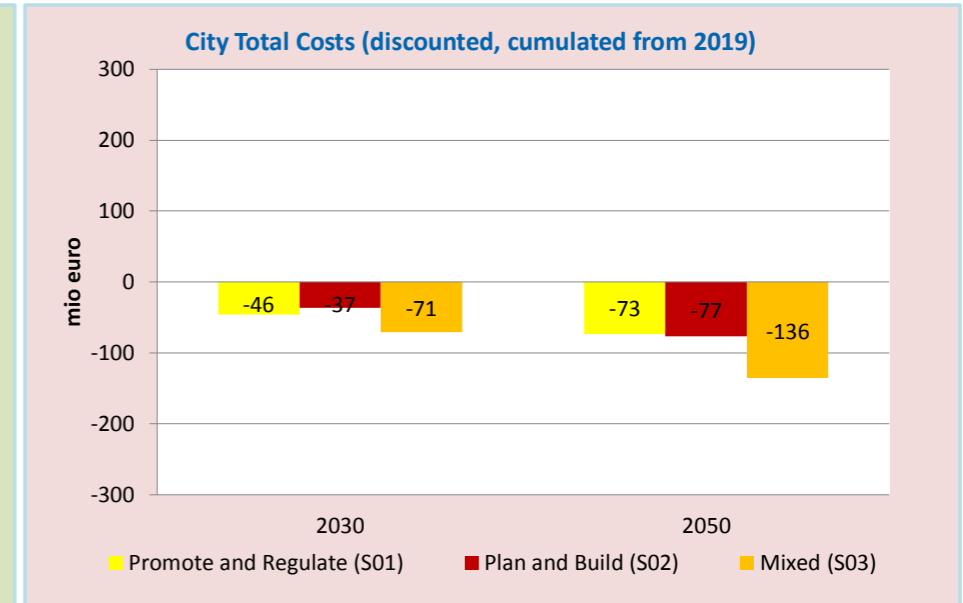
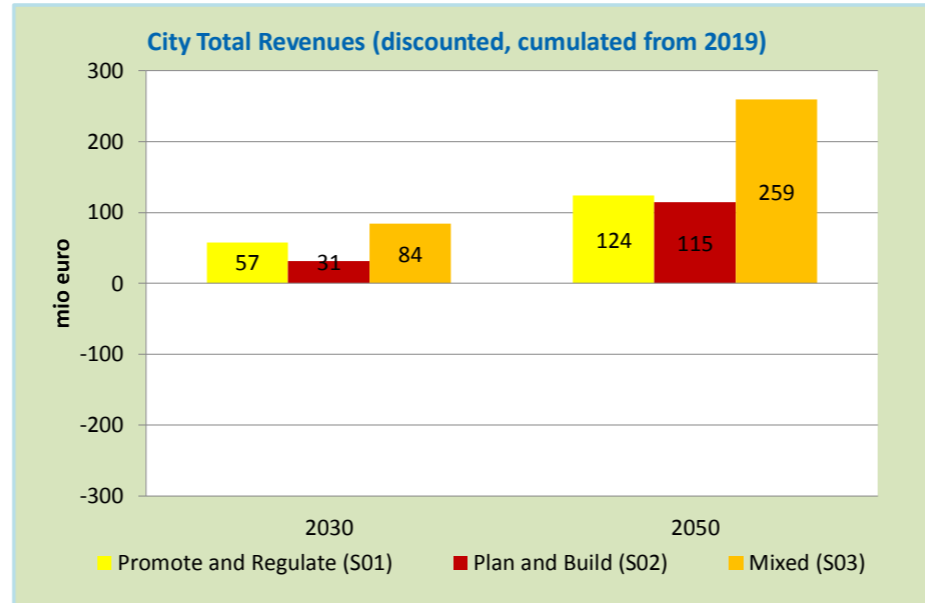
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	46	73
Plan and Build (S02)	0	37	77
Mixed (S03)	0	71	136

External costs savings [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	21	76
Plan and Build (S02)	0	12	59
Mixed (S03)	0	29	99

Net balance [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	33	126
Plan and Build (S02)	0	7	97
Mixed (S03)	0	42	223



* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Small City - Central/Western Europe

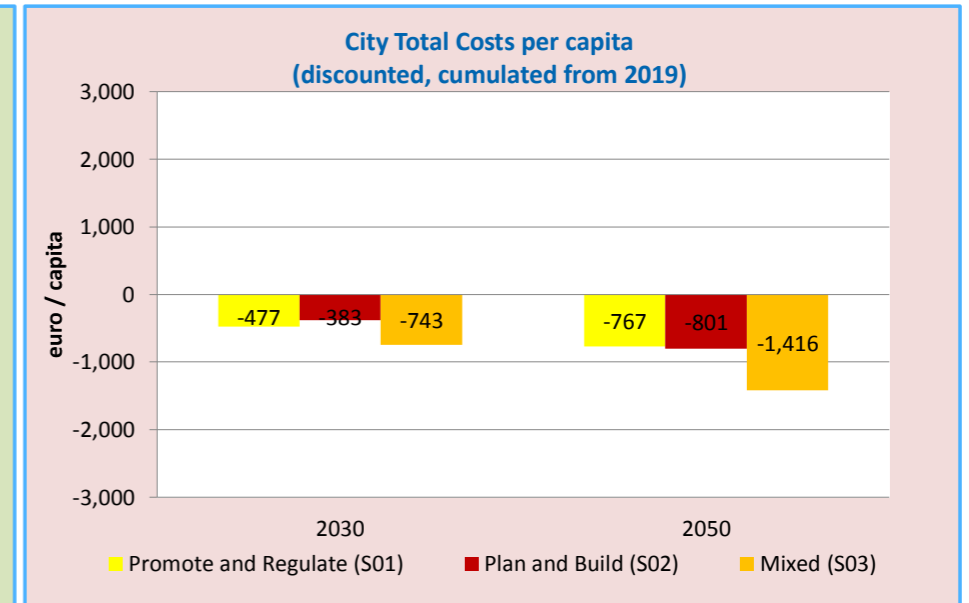
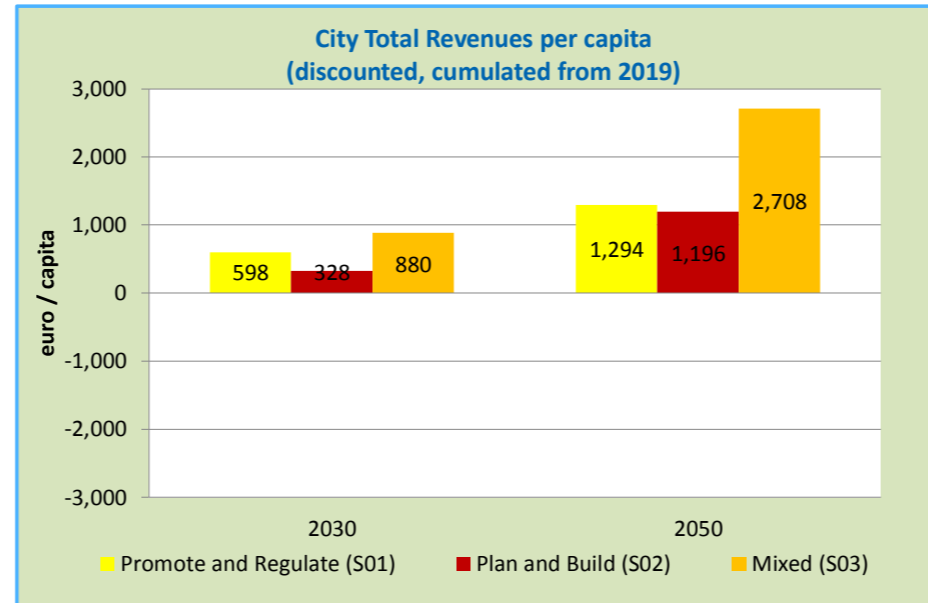
ECONOMIC OUTPUTS PER CAPITA (discounted, cumulated from 2019)*

City total revenues [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	598	1,294
Plan and Build (S02)	0	328	1,196
Mixed (S03)	0	880	2,708

City total costs [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	477	767
Plan and Build (S02)	0	383	801
Mixed (S03)	0	743	1,416

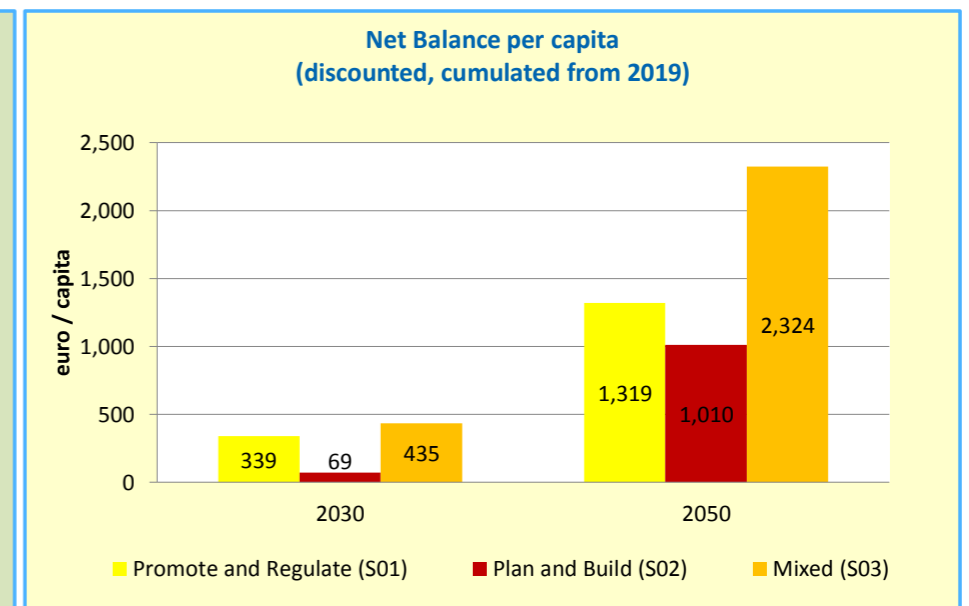
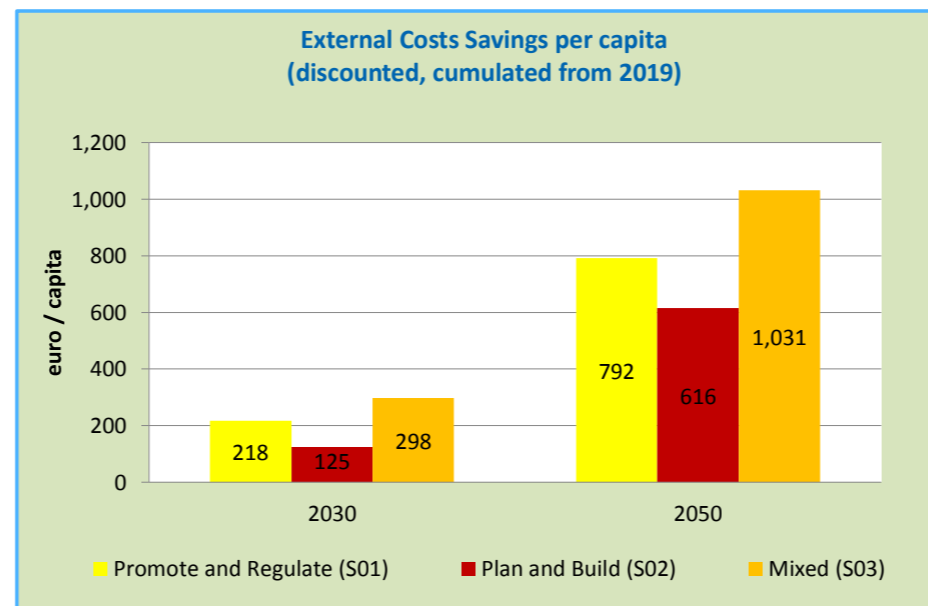


External costs savings [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	218	792
Plan and Build (S02)	0	125	616
Mixed (S03)	0	298	1,031

Net balance [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	339	1,319
Plan and Build (S02)	0	69	1,010
Mixed (S03)	0	435	2,324



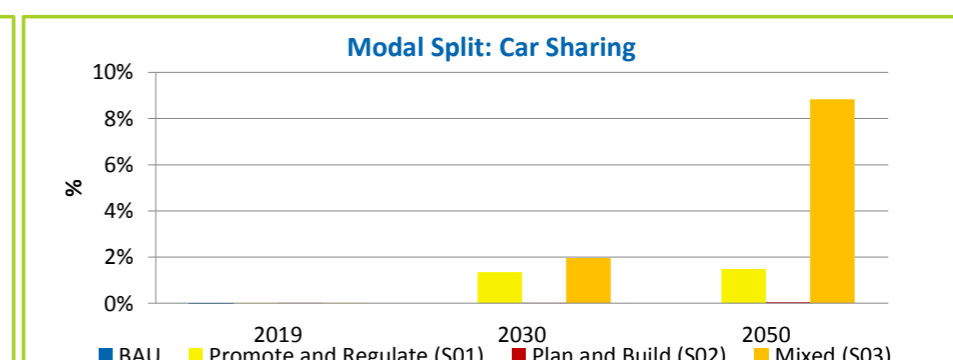
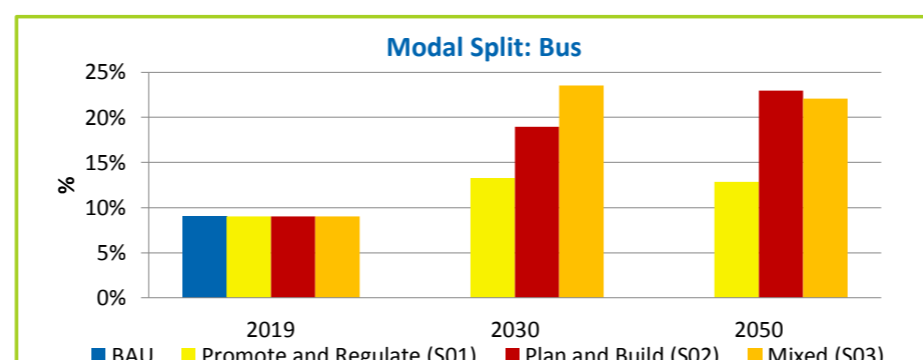
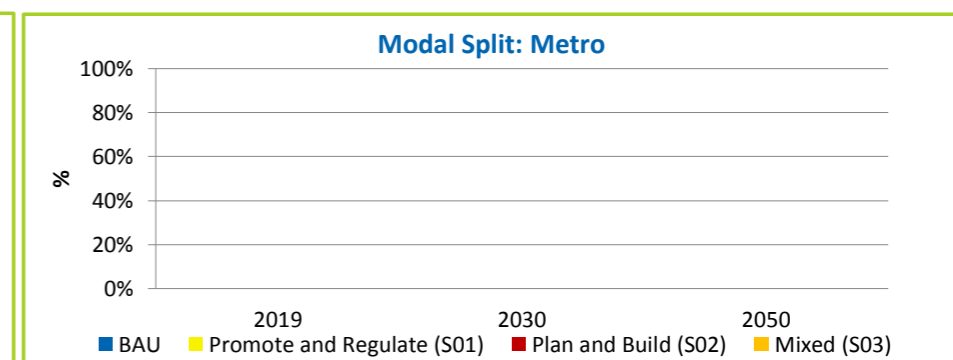
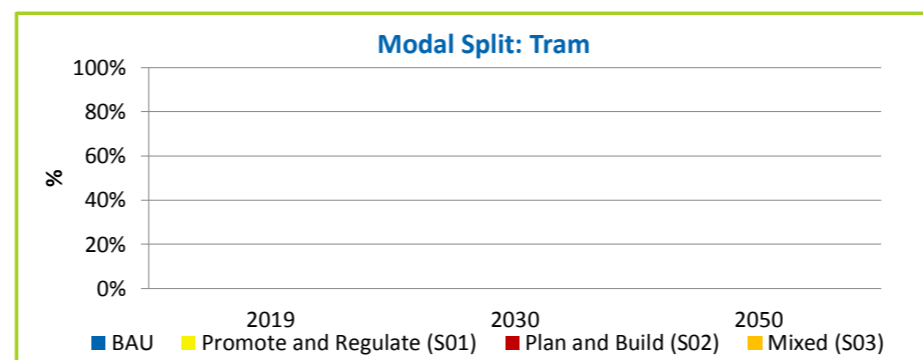
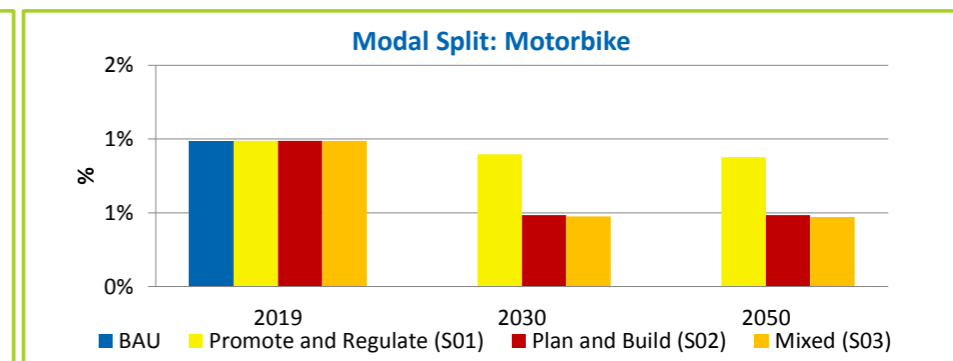
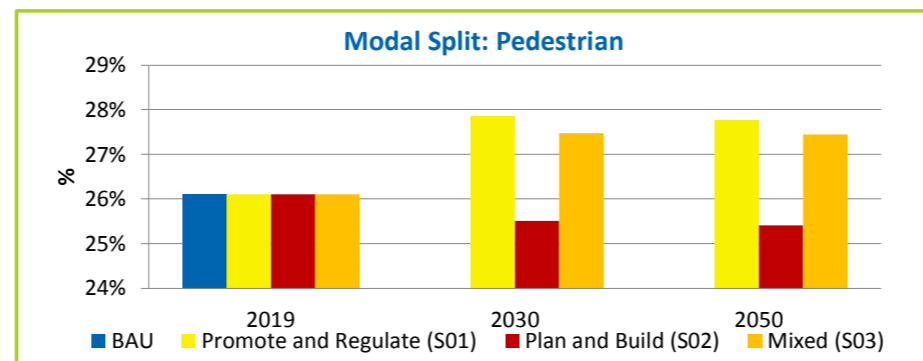
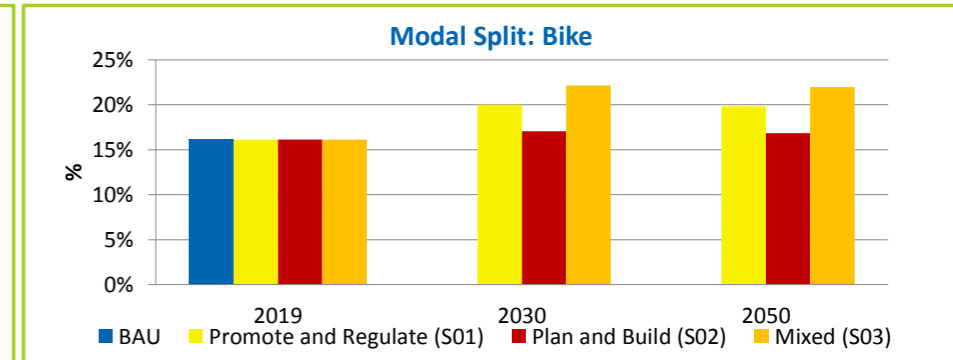
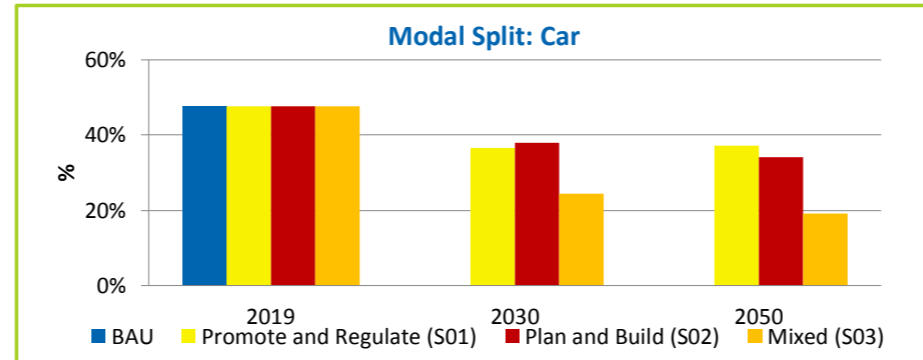
* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Small City - Central/Western Europe

TRANSPORT AND MOBILITY INDICATORS

Mode split [%]		2019	2030	2050
Scenario	Mode			
BAU	Pedestrian	26%		
BAU	Bike	16%		
BAU	Motorbike	1%		
BAU	Car	48%		
BAU	Bus	9%		
BAU	Tram	0%		
BAU	Metro	0%		
BAU	Car sharing	0%		
Promote and Regulate (S01)	Pedestrian	26%	28%	28%
Promote and Regulate (S01)	Bike	16%	20%	20%
Promote and Regulate (S01)	Motorbike	1%	1%	1%
Promote and Regulate (S01)	Car	48%	37%	37%
Promote and Regulate (S01)	Bus	9%	13%	13%
Promote and Regulate (S01)	Tram	0%	0%	0%
Promote and Regulate (S01)	Metro	0%	0%	0%
Promote and Regulate (S01)	Car sharing	0%	1%	1%
Plan and Build (S02)	Pedestrian	26%	26%	25%
Plan and Build (S02)	Bike	16%	17%	17%
Plan and Build (S02)	Motorbike	1%	0%	0%
Plan and Build (S02)	Car	48%	38%	34%
Plan and Build (S02)	Bus	9%	19%	23%
Plan and Build (S02)	Tram	0%	0%	0%
Plan and Build (S02)	Metro	0%	0%	0%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Pedestrian	26%	27%	27%
Mixed (S03)	Bike	16%	22%	22%
Mixed (S03)	Motorbike	1%	0%	0%
Mixed (S03)	Car	48%	24%	19%
Mixed (S03)	Bus	9%	24%	22%
Mixed (S03)	Tram	0%	0%	0%
Mixed (S03)	Metro	0%	0%	0%
Mixed (S03)	Car sharing	0%	2%	9%



ALL INDICATORS

Small City - Central/Western Europe

TRANSPORT AND MOBILITY INDICATORS

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
BAU	521		
Promote and Regulate (S01)	521	456	455
Plan and Build (S02)	521	462	435
Mixed (S03)	521	374	330

Congestion and delays index (SUMI)

Scenario	2019	2030	2050
BAU	9.49		
Promote and Regulate (S01)	9.49	9.87	9.85
Plan and Build (S02)	9.49	9.75	9.87
Mixed (S03)	9.49	10.00	10.00

Public transport occupancy levels [pass/vehicle]

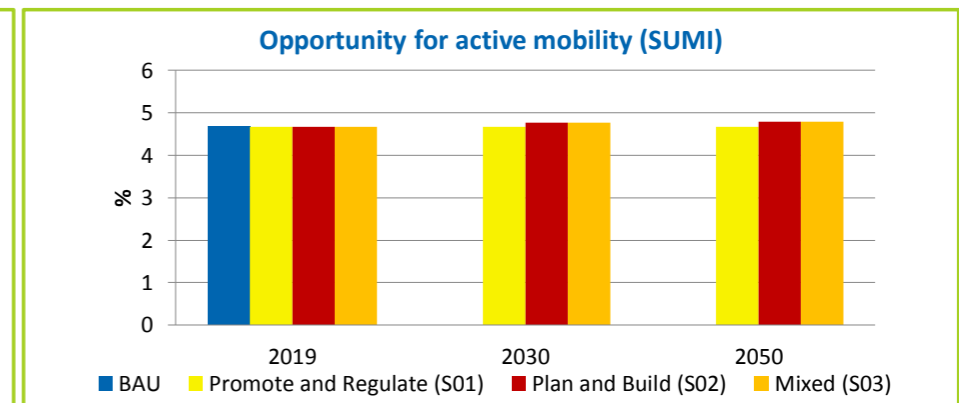
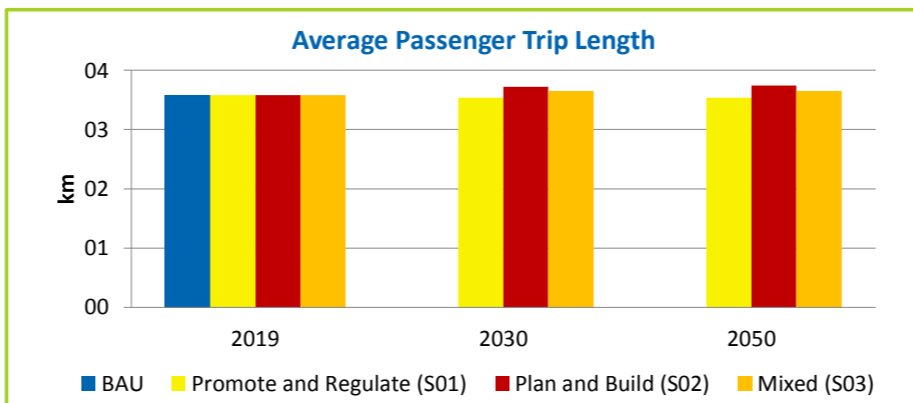
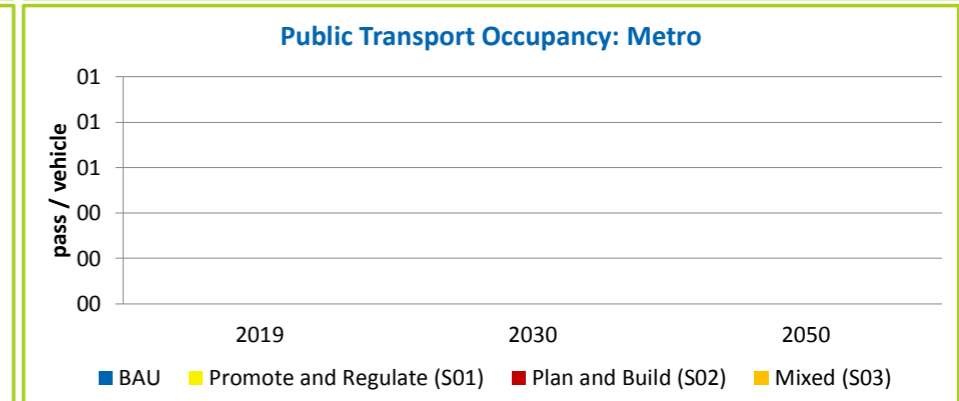
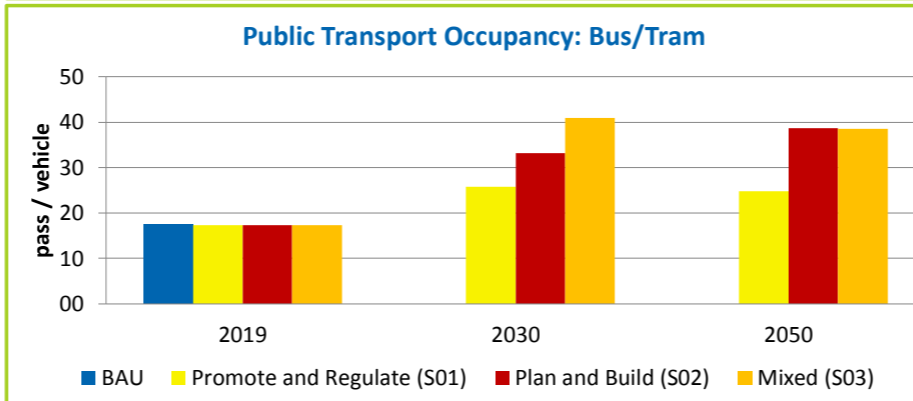
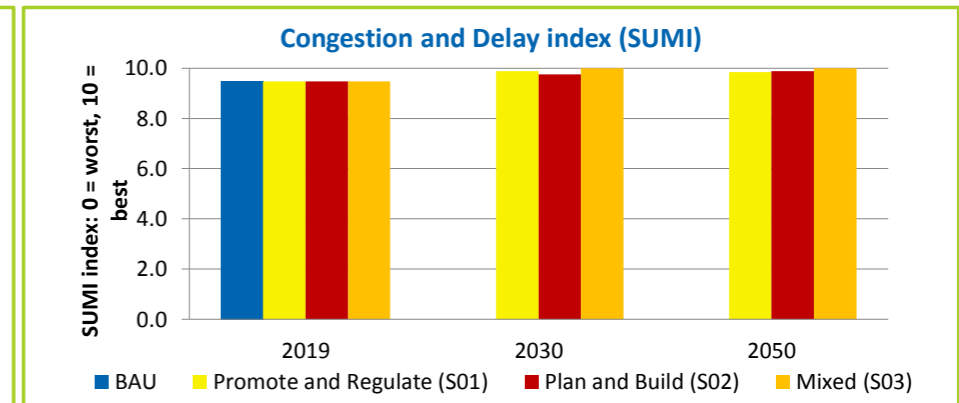
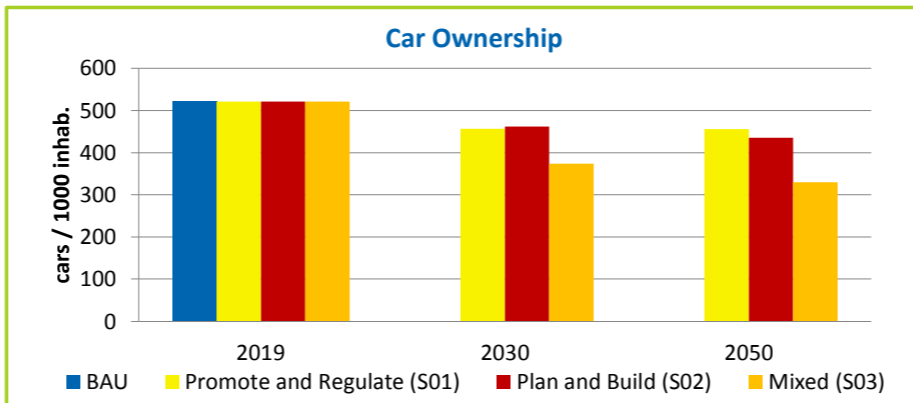
Scenario	PT mode	2019	2030	2050
BAU	Bus/tram	17.3		
BAU	Metro	0.0		
Promote and Regulate (S01)	Bus/tram	17.3	25.8	24.8
Promote and Regulate (S01)	Metro	0.0	0.0	0.0
Plan and Build (S02)	Bus/tram	17.3	33.2	38.7
Plan and Build (S02)	Metro	0.0	0.0	0.0
Mixed (S03)	Bus/tram	17.32	40.95	38.56
Mixed (S03)	Metro	0.00	0.00	0.00

Average passenger trip length [km]

Scenario	2019	2030	2050
BAU	3.6		
Promote and Regulate (S01)	3.6	3.5	3.5
Plan and Build (S02)	3.6	3.7	3.7
Mixed (S03)	3.6	3.7	3.7

Opportunity for active mobility (SUMI) [%]

Scenario	2019	2030	2050
BAU	4.67		
Promote and Regulate (S01)	4.67	4.67	4.67
Plan and Build (S02)	4.67	4.77	4.79
Mixed (S03)	4.67	4.77	4.79



ALL INDICATORS

Small City - Central/Western Europe

TRANSPORT AND MOBILITY INDICATORS

Penetration of alternatively fuelled car vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	Hybrid electric	3%		
BAU	Battery electric	1%		
BAU	fuel cells	0%		
Scenarios	Hybrid electric	3%	4%	32%
Scenarios	Battery electric	1%	26%	63%
Scenarios	fuel cells	0%	2%	5%

Penetration of alternatively fuelled bus vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	CNG	0%		
BAU	Hybrid electric	0.0%		
BAU	Battery electric	0.2%		
Scenarios	CNG	0%	0%	1%
Scenarios	Hybrid electric	0%	0%	0%
Scenarios	Battery electric	0%	52%	67%

Vehicles-km by mode: cars and car-sharing cars [million vkm/year]

Scenario	2019	2030	2050
BAU	100		
Promote and Regulate (S01)	100	79	81
Plan and Build (S02)	100	85	79
Mixed (S03)	100	55	60

Vehicles-km by mode: trucks [million vkm/year]

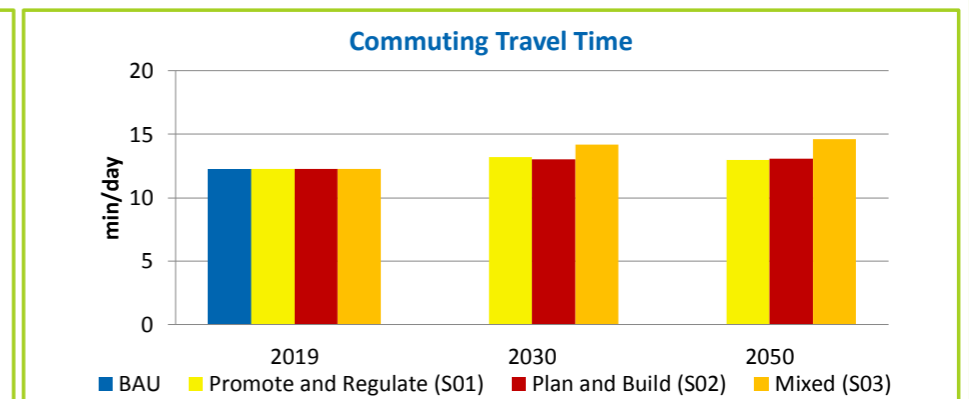
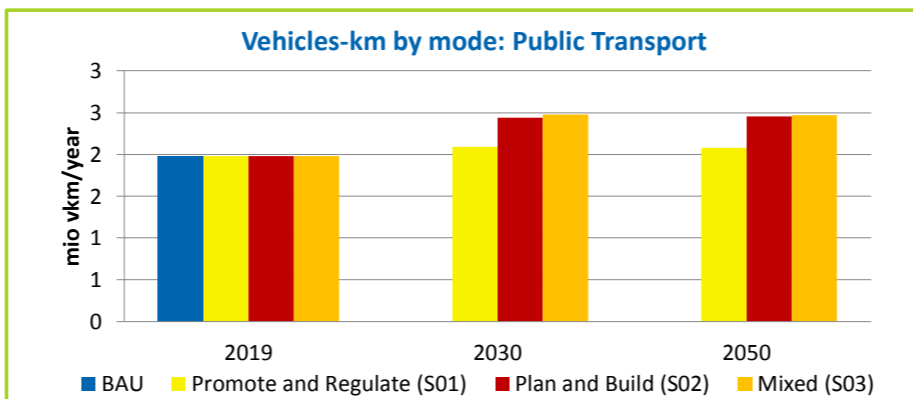
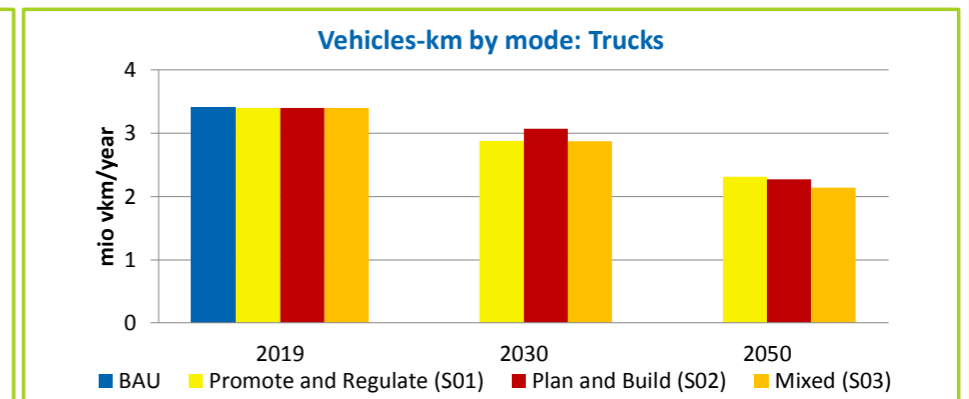
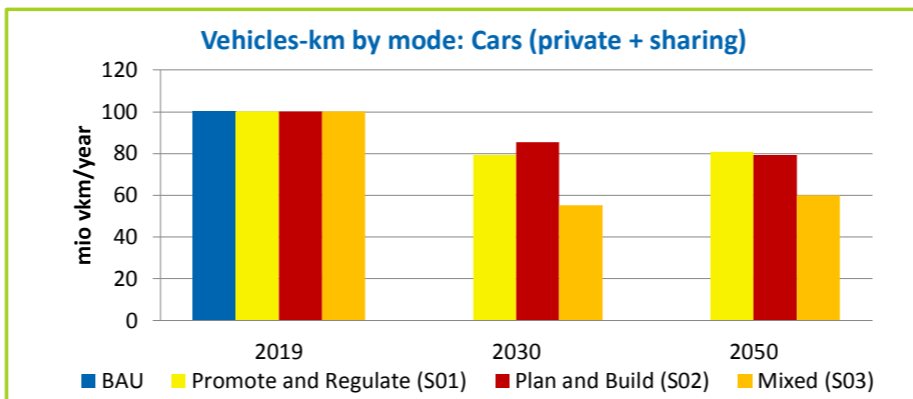
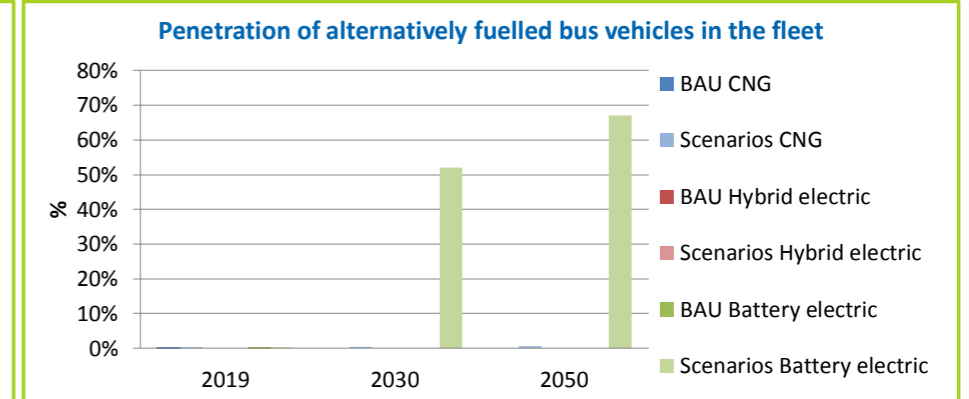
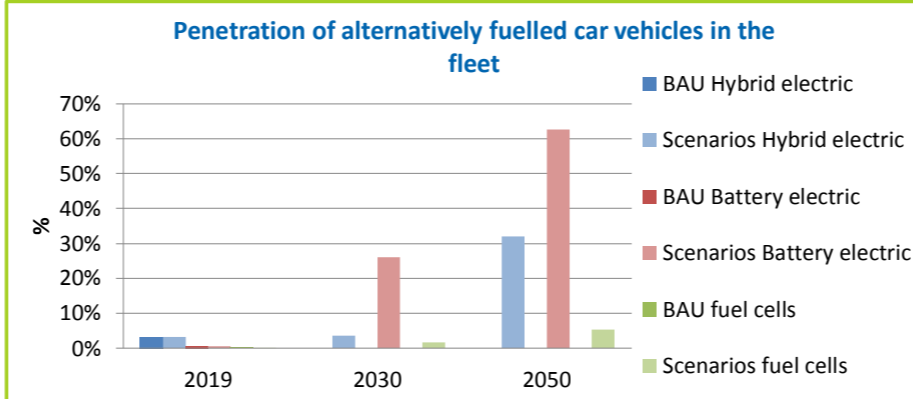
Scenario	2019	2030	2050
BAU	3.4		
Promote and Regulate (S01)	3	3	2
Plan and Build (S02)	3.4	3.1	2.3
Mixed (S03)	3.4	2.9	2.1

Vehicles-km by mode: Public Transport [million vkm/year]

Scenario	2019	2030	2050
BAU	2.0		
Promote and Regulate (S01)	2.0	2.1	2.1
Plan and Build (S02)	2.0	2.4	2.5
Mixed (S03)	2.0	2.5	2.5

Commuting travel time (SUMI) [min/day]

Scenario	2019	2030	2050
BAU	12.3		
Promote and Regulate (S01)	12.3	13.2	13.0
Plan and Build (S02)	12.3	13.0	13.1
Mixed (S03)	12.3	14.2	14.6



ALL INDICATORS

Small City - Central/Western Europe

ENVIRONMENT AND SAFETY INDICATORS

Air pollutant emissions (SUMI: PM2.5, Nox) [kg PM2.5 eq/capita]

Scenario	2019	2030	2050
BAU	0.4		
Promote and regulate (S01)	0.4	0.2	0.0
Plan and Build (S02)	0.4	0.2	0.0
Mixed (S03)	0.4	0.2	0.0

Air pollutant emissions (CO, VOC) [kg / capita]

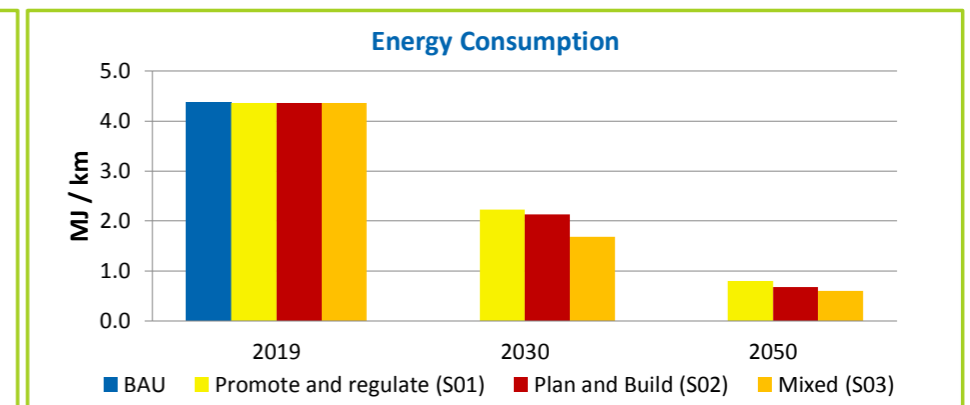
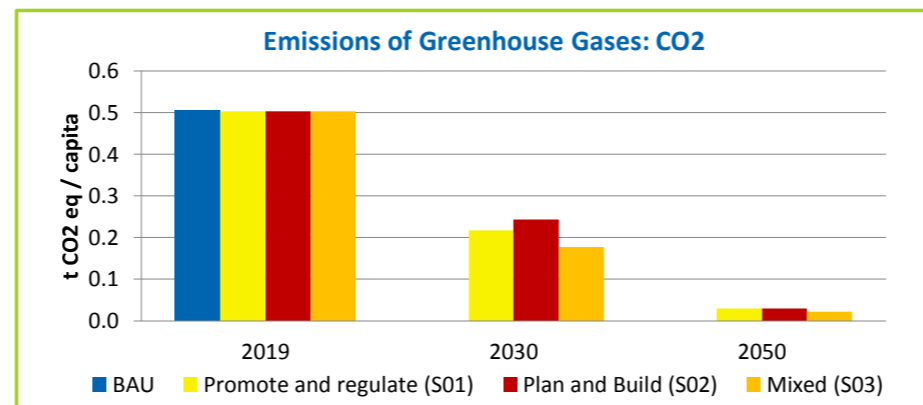
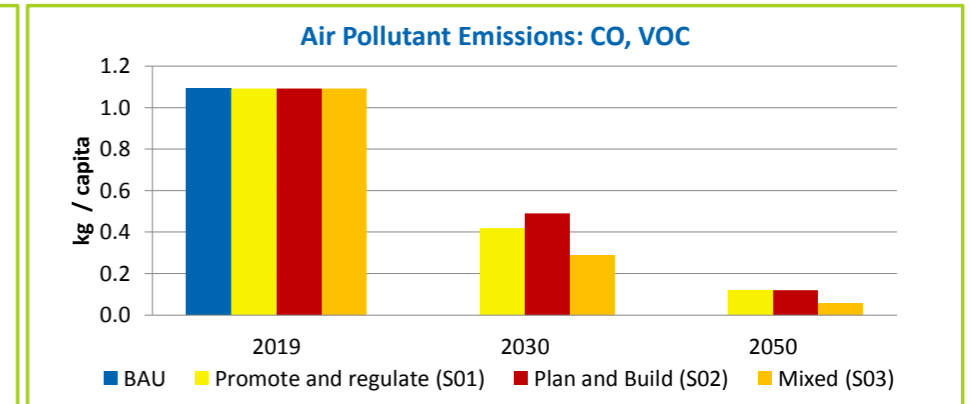
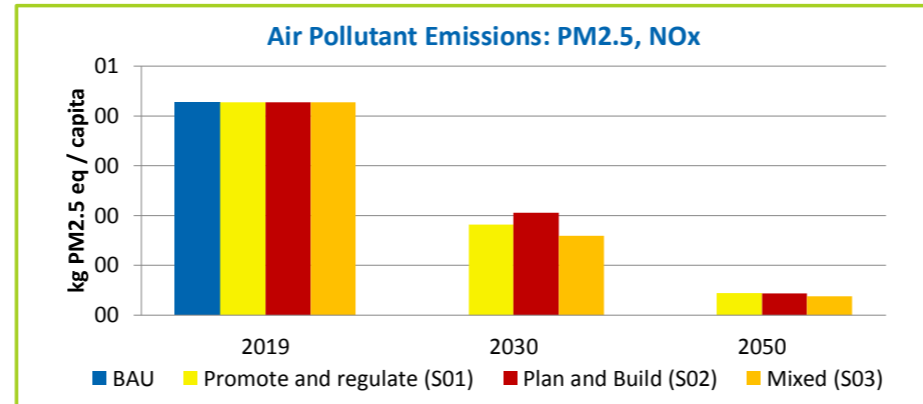
Scenario	2019	2030	2050
BAU	1		
Promote and regulate (S01)	1	0	0
Plan and Build (S02)	1.1	0.5	0.1
Mixed (S03)	1.1	0.3	0.1

Emissions of Greenhouse Gases [t CO2 eq / capita per year]

Scenario	2019	2030	2050
BAU	0.504		
Promote and regulate (S01)	0.504	0.218	0.029
Plan and Build (S02)	0.504	0.244	0.029
Mixed (S03)	0.504	0.177	0.022

Energy consumption [MJ / km]

Scenario	2019	2030	2050
BAU	4.4		
Promote and regulate (S01)	4.4	2.2	0.8
Plan and Build (S02)	4.4	2.1	0.7
Mixed (S03)	4.4	1.7	0.6



ALL INDICATORS

Small City - Central/Western Europe

ENVIRONMENT AND SAFETY INDICATORS

Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	1.6		
Promote and regulate (S01)	1.6	0.9	0.8
Plan and Build (S02)	1.6	1.2	0.8
Mixed (S03)	1.6	0.6	0.5

Fatalities: active modes [fatalities / 100,000 inhab.]

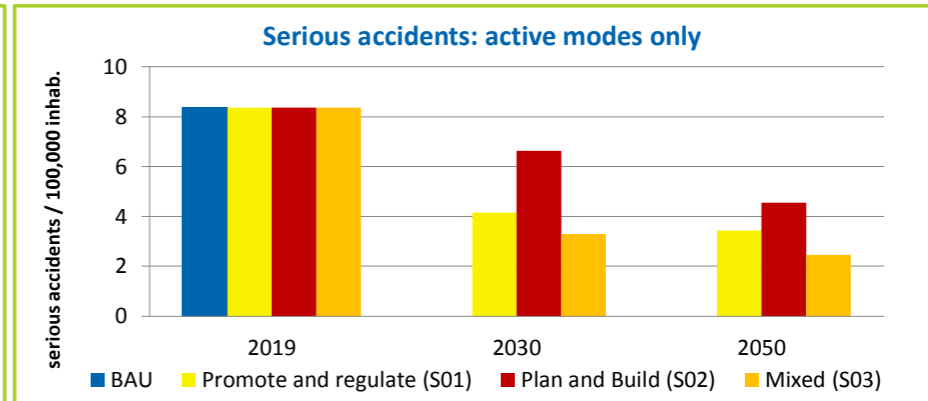
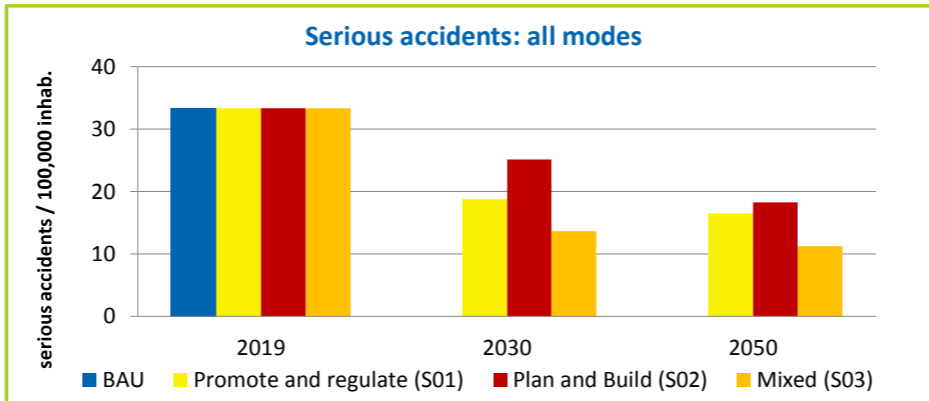
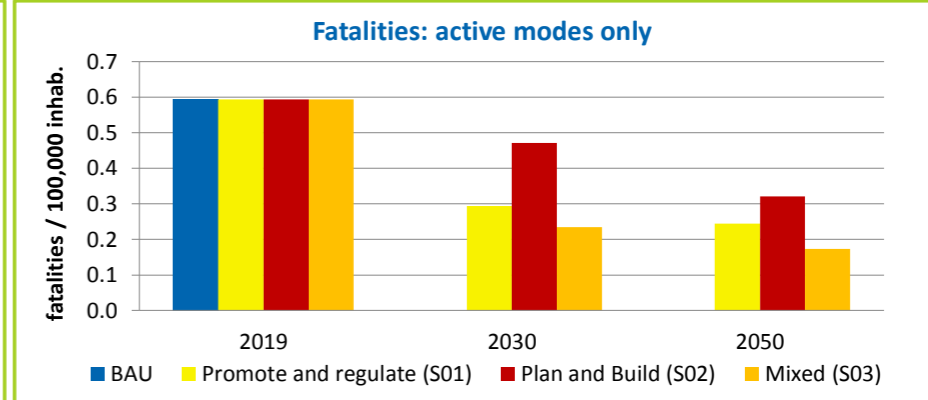
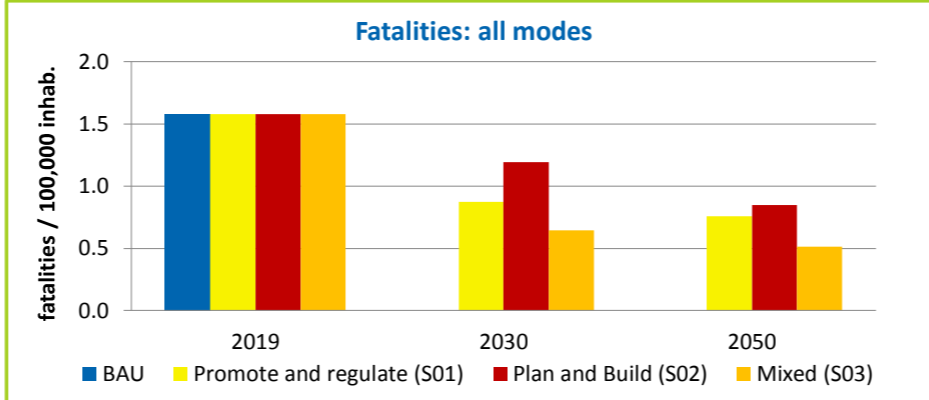
Scenario	2019	2030	2050
BAU	0.59		
Promote and regulate (S01)	0.59	0.29	0.24
Plan and Build (S02)	0.59	0.47	0.32
Mixed (S03)	0.59	0.23	0.17

Serious accidents [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	33		
Promote and regulate (S01)	33	19	17
Plan and Build (S02)	33	25	18
Mixed (S03)	33	14	11

Serious accidents: active modes [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	8		
Promote and regulate (S01)	8	4	3
Plan and Build (S02)	8	7	5
Mixed (S03)	8	3	2



ALL INDICATORS

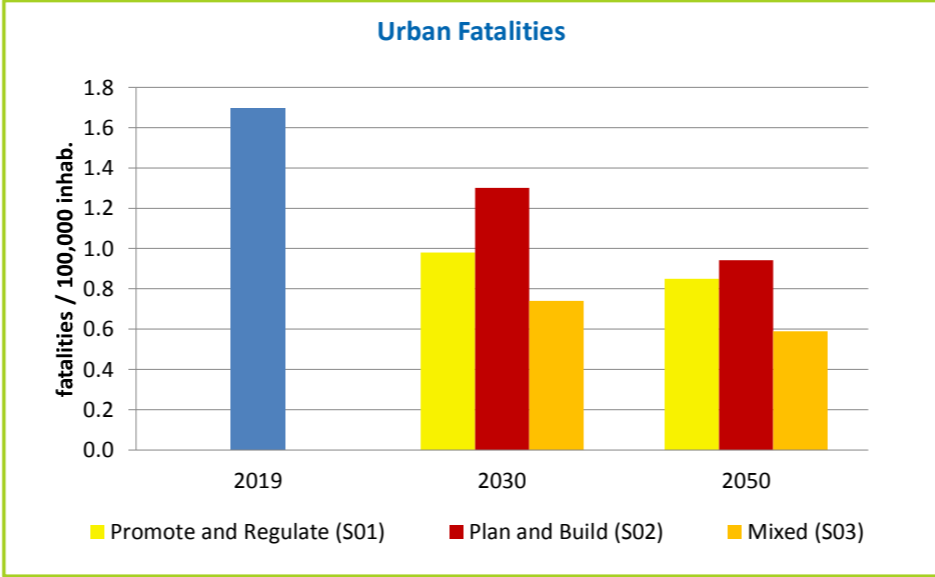
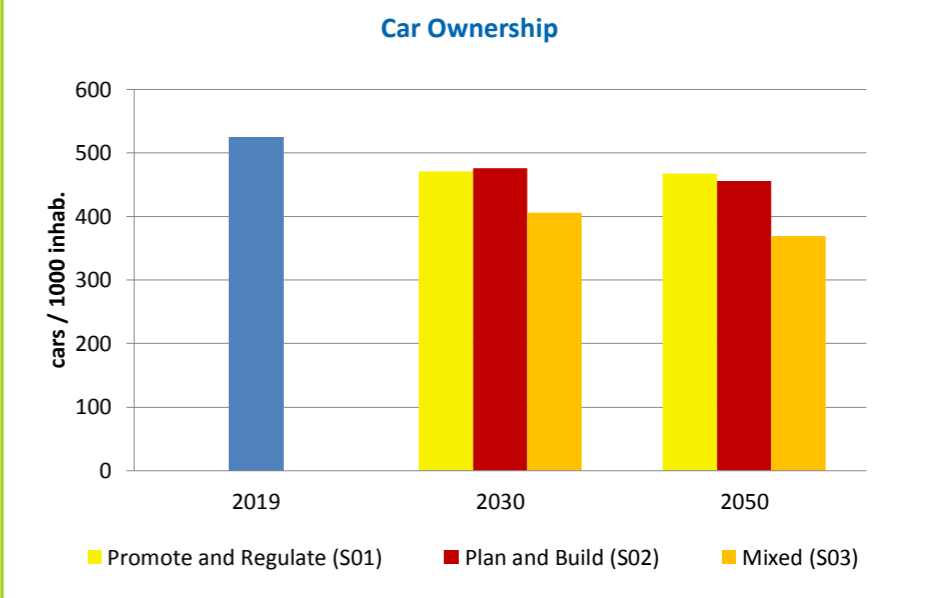
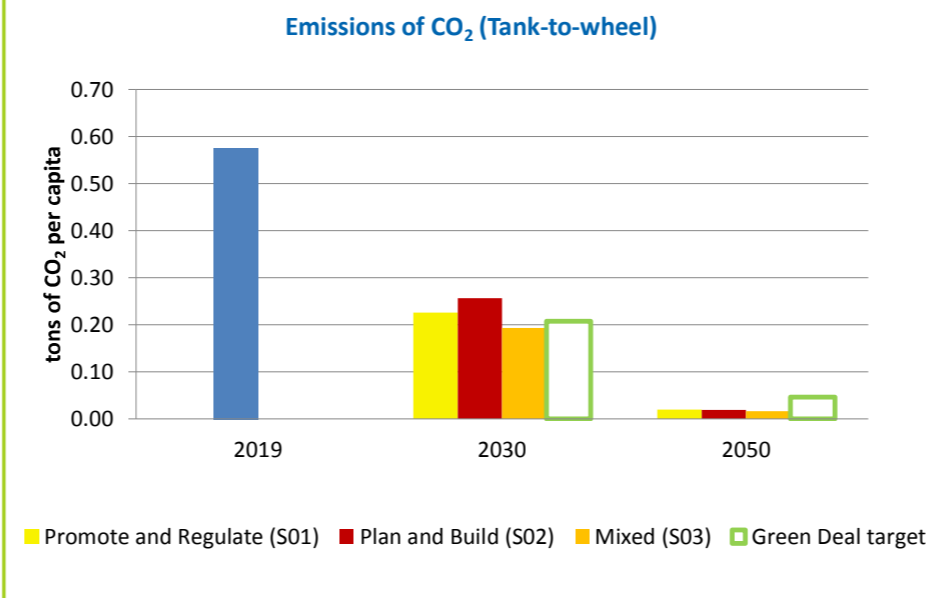
Small City - Northern Europe

EMISSIONS OF CO₂ (TANK-TO-WHEEL), CAR OWNERSHIP, FATALITIES

Emissions of CO ₂ (Tank-to-wheel) [t CO ₂ eq / capita per year]			
Scenario	2019	2030	2050
Promote and Regulate (S01)	0.576	0.226	0.020
Plan and Build (S02)	0.576	0.256	0.019
Mixed (S03)	0.576	0.193	0.016
Green Deal target		0.207	0.046

Car ownership level [cars / 1000 inhab.]			
Scenario	2019	2030	2050
Promote and Regulate (S01)	526	471	468
Plan and Build (S02)	526	476	456
Mixed (S03)	526	406	369

Urban Fatalities [fatalities / 100,000 inhab.]			
Scenario	2019	2030	2050
Promote and Regulate (S01)	1.696	0.980	0.850
Plan and Build (S02)	1.696	1.302	0.942
Mixed (S03)	1.696	0.738	0.588



KEY INDICATORS

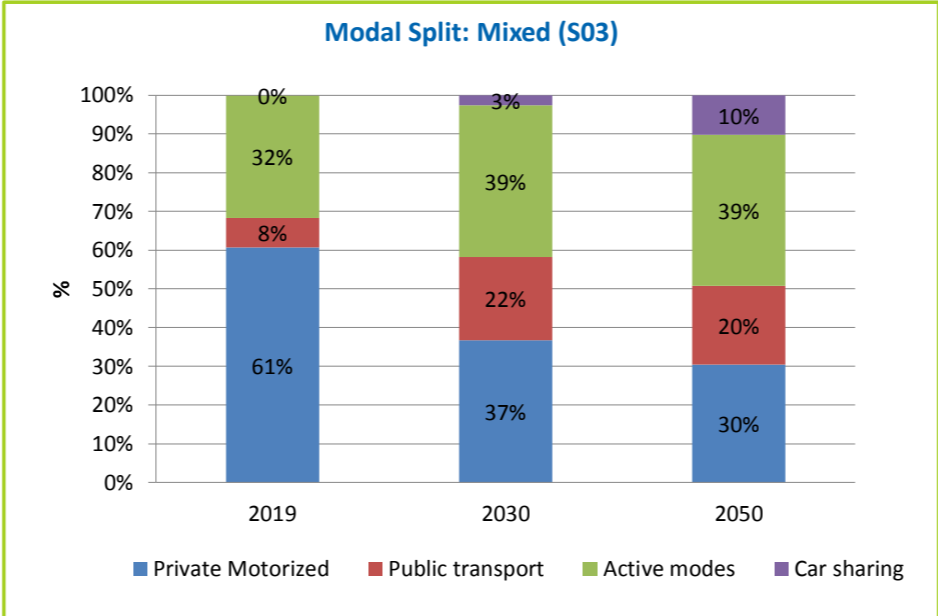
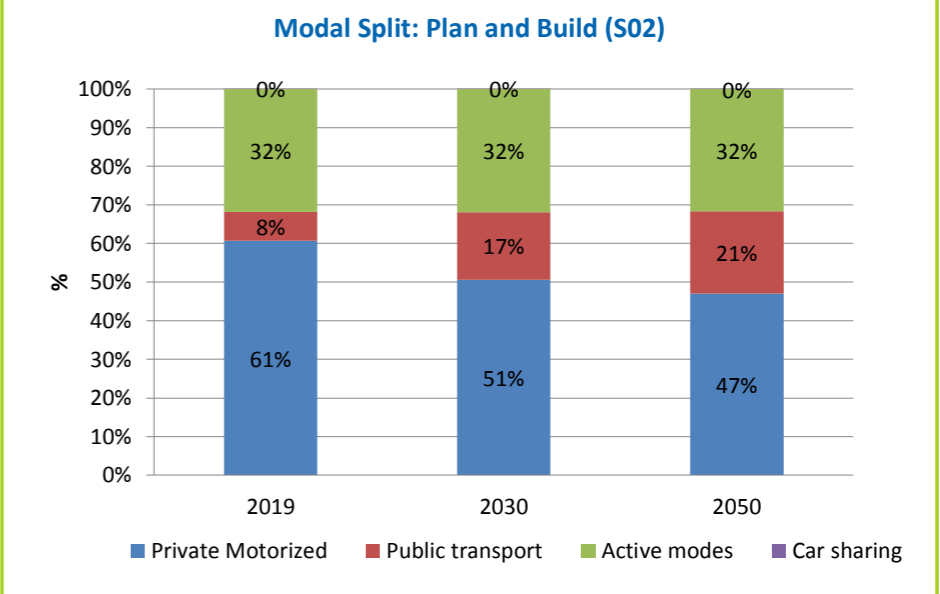
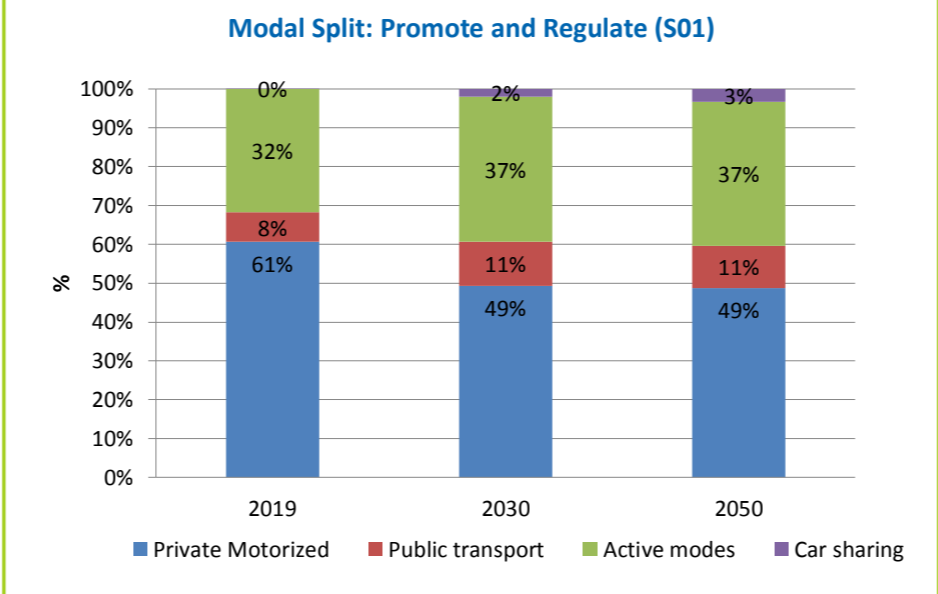


Small City - Northern Europe

MODAL SPLIT

Aggregate mode split [%]

Scenario	Mode	2019	2030	2050
Promote and Regulate (S01)	Private Motorized	61%	49%	49%
Promote and Regulate (S01)	Public transport	8%	11%	11%
Promote and Regulate (S01)	Active modes	32%	37%	37%
Promote and Regulate (S01)	Car sharing	0%	2%	3%
Plan and Build (S02)	Private Motorized	61%	51%	47%
Plan and Build (S02)	Public transport	8%	17%	21%
Plan and Build (S02)	Active modes	32%	32%	32%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Private Motorized	61%	37%	30%
Mixed (S03)	Public transport	8%	22%	20%
Mixed (S03)	Active modes	32%	39%	39%
Mixed (S03)	Car sharing	0%	3%	10%



KEY INDICATORS

Small City - Northern Europe

ECONOMIC OUTPUTS (discounted, cumulated from 2019)*

City total revenues [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	75	178
Plan and Build (S02)	0	45	165
Mixed (S03)	0	114	359

City total costs [mio euro]

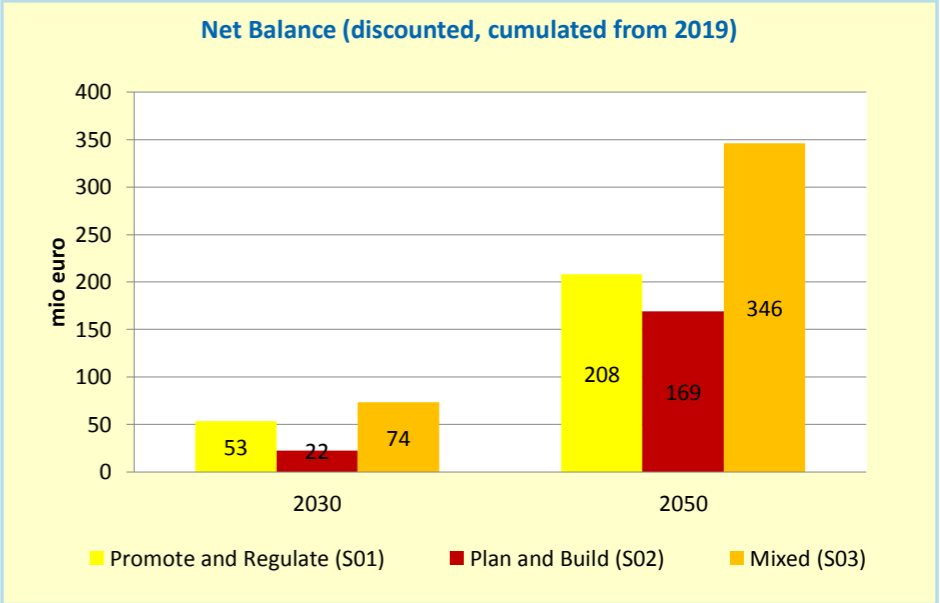
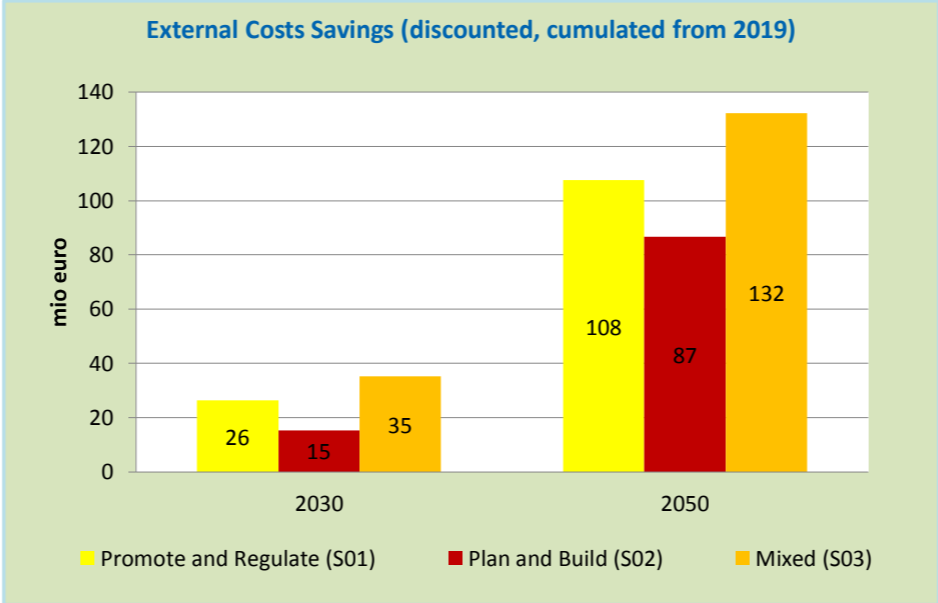
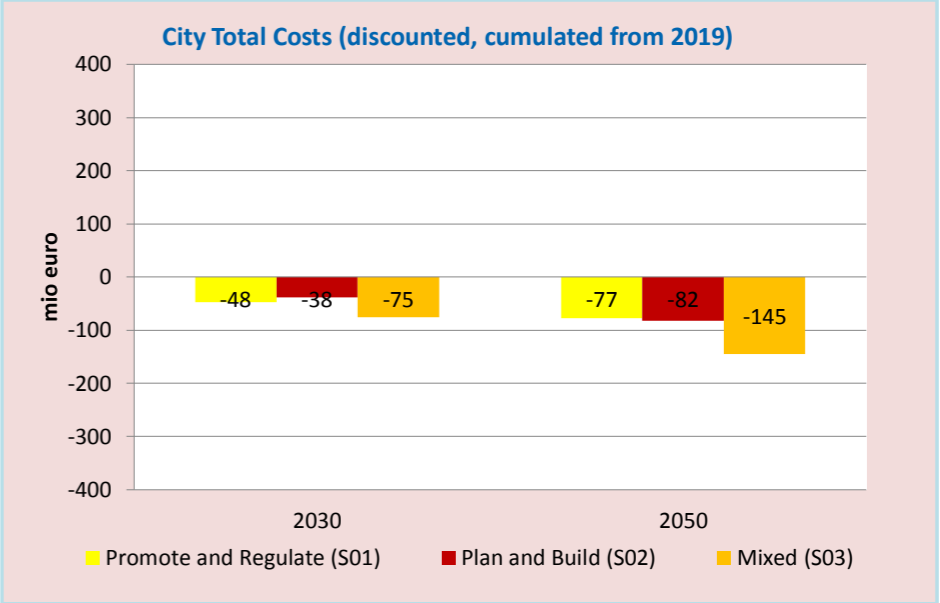
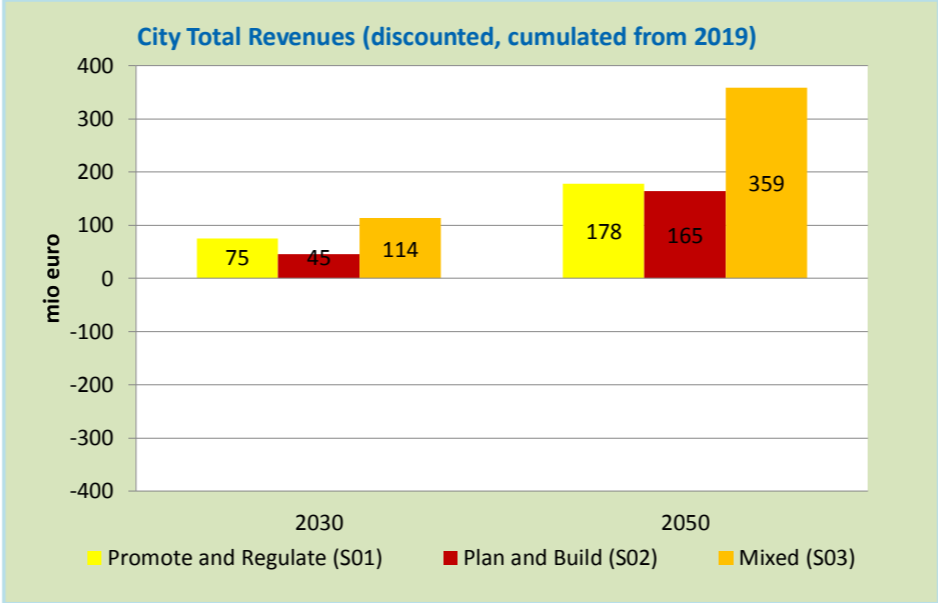
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	48	77
Plan and Build (S02)	0	38	82
Mixed (S03)	0	75	145

External costs savings [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	26	108
Plan and Build (S02)	0	15	87
Mixed (S03)	0	35	132

Net balance [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	53	208
Plan and Build (S02)	0	22	169
Mixed (S03)	0	74	346



* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS



Small City - Northern Europe

ECONOMIC OUTPUTS PER CAPITA (discounted, cumulated from 2019)*

City total revenues [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	715	1,699
Plan and Build (S02)	0	434	1,574
Mixed (S03)	0	1,087	3,430

City total costs [euro / capita]

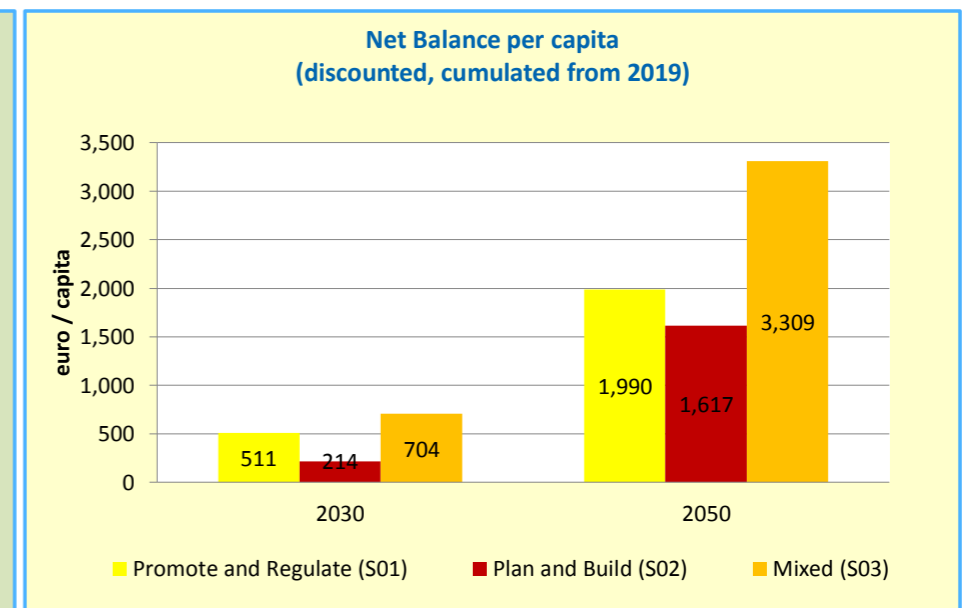
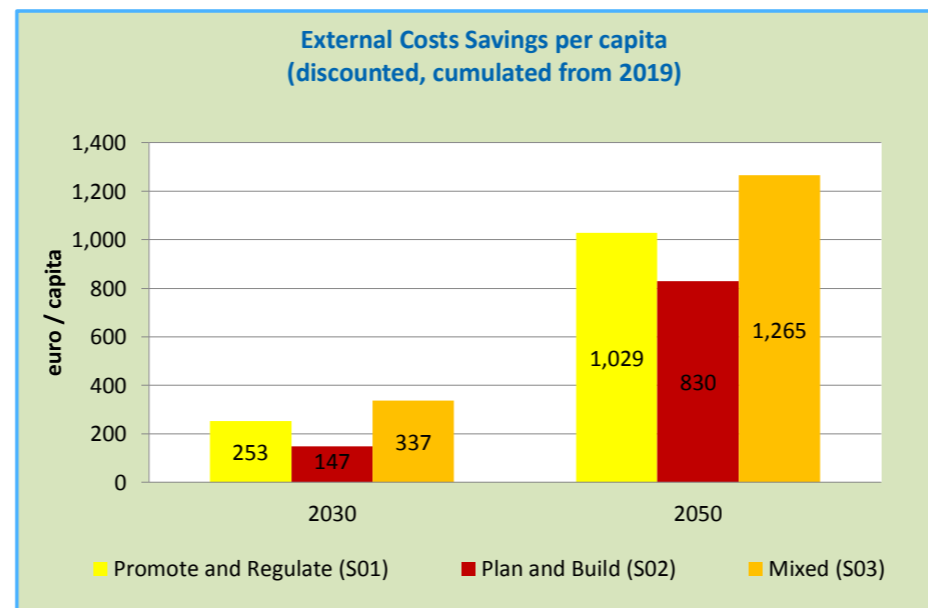
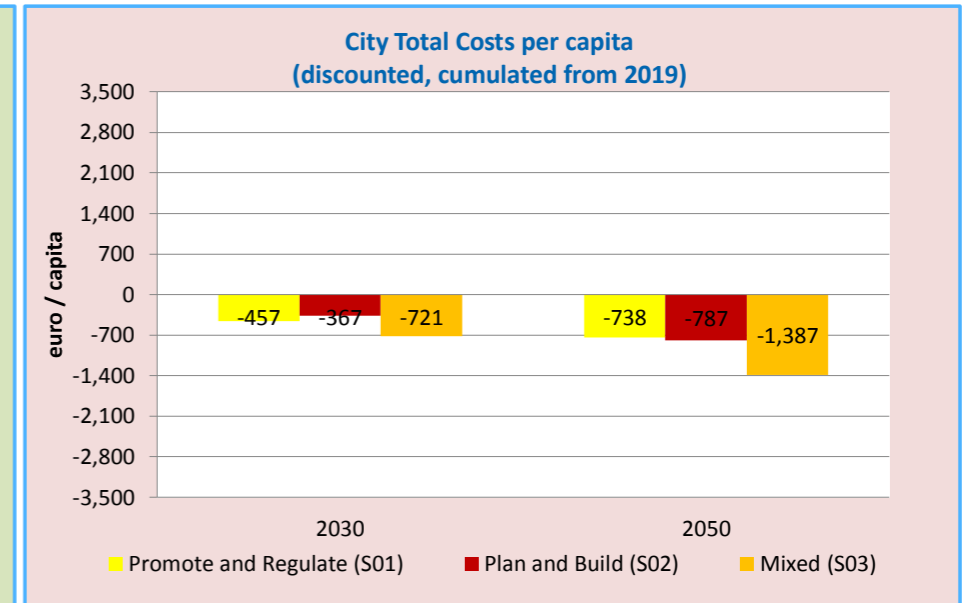
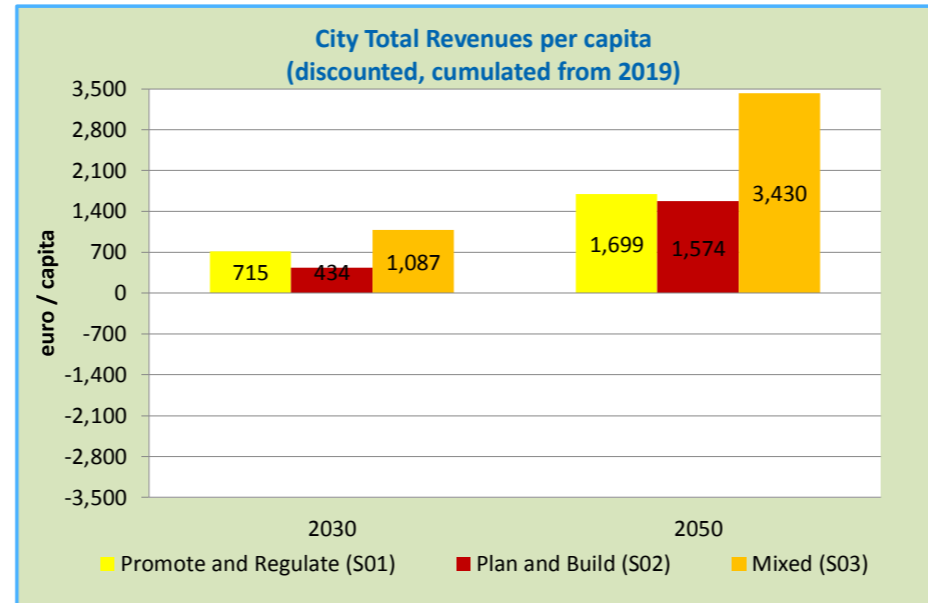
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	457	738
Plan and Build (S02)	0	367	787
Mixed (S03)	0	721	1,387

External costs savings [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	253	1,029
Plan and Build (S02)	0	147	830
Mixed (S03)	0	337	1,265

Net balance [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	511	1,990
Plan and Build (S02)	0	214	1,617
Mixed (S03)	0	704	3,309



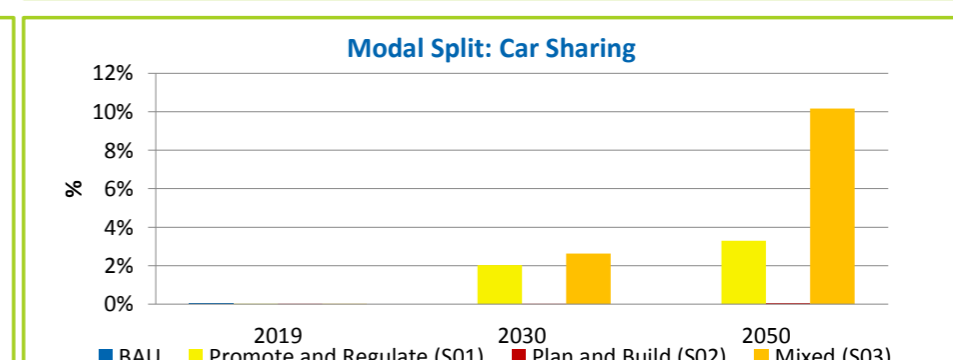
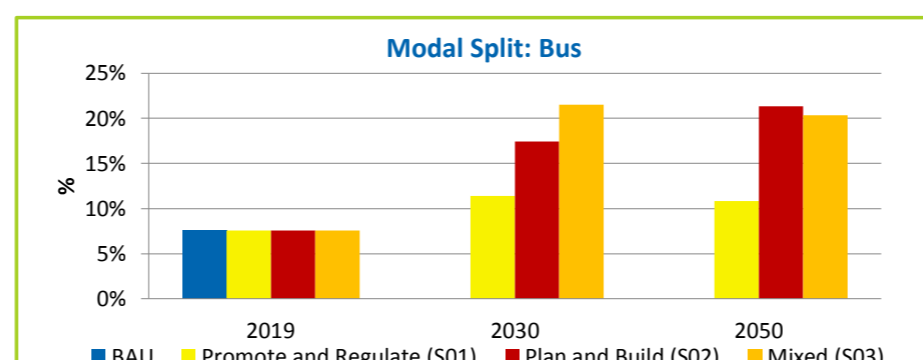
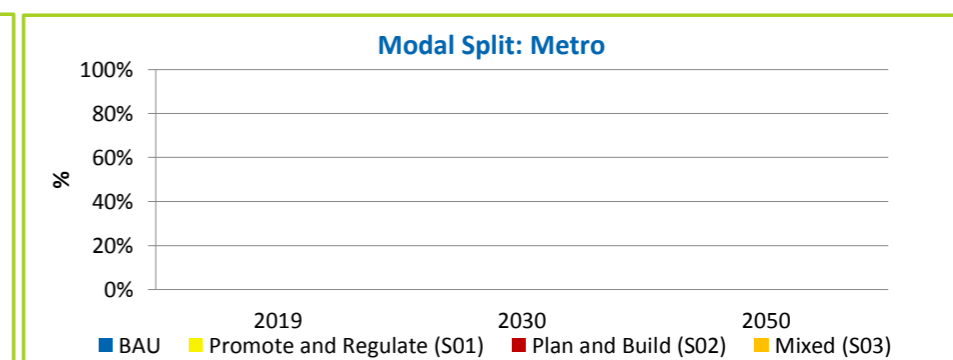
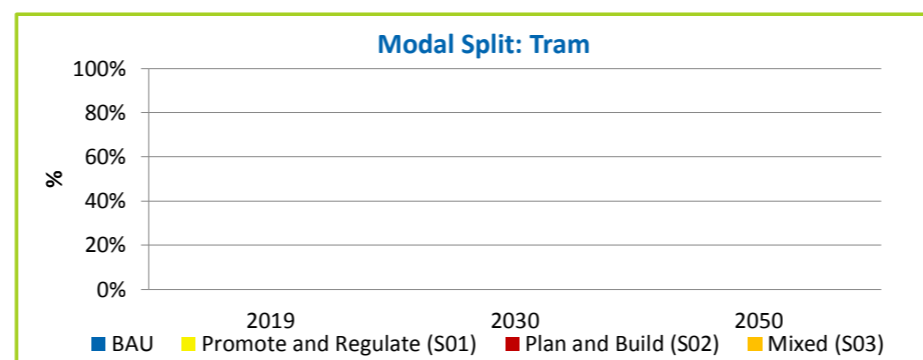
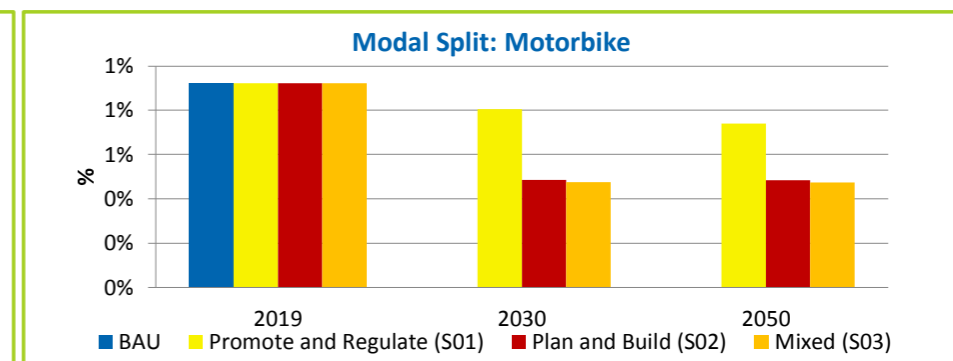
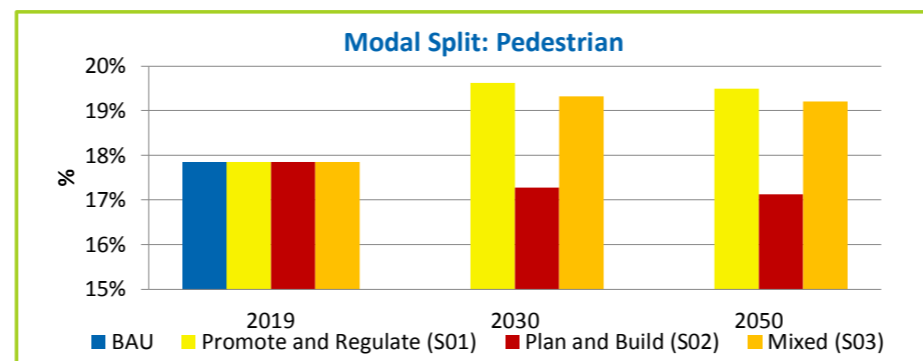
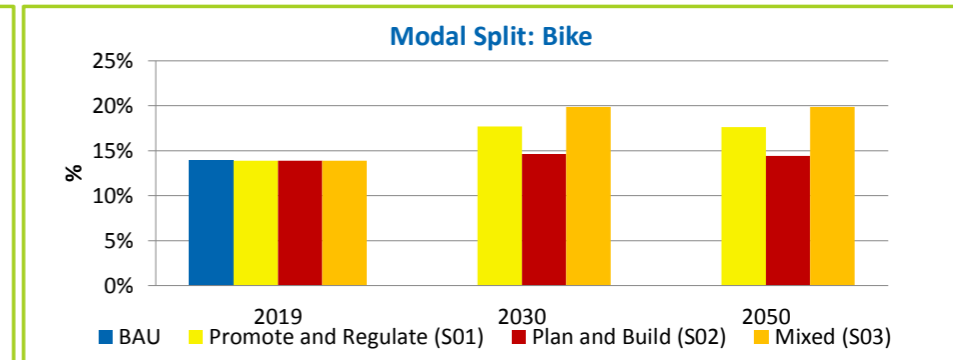
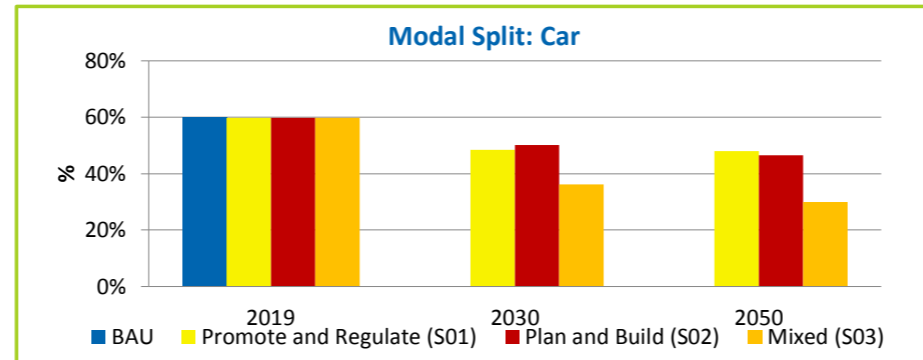
* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Small City - Northern Europe

TRANSPORT AND MOBILITY INDICATORS

Mode split [%]		2019	2030	2050
Scenario	Mode			
BAU	Pedestrian	18%		
BAU	Bike	14%		
BAU	Motorbike	1%		
BAU	Car	60%		
BAU	Bus	8%		
BAU	Tram	0%		
BAU	Metro	0%		
BAU	Car sharing	0%		
Promote and Regulate (S01)	Pedestrian	18%	20%	19%
Promote and Regulate (S01)	Bike	14%	18%	18%
Promote and Regulate (S01)	Motorbike	1%	1%	1%
Promote and Regulate (S01)	Car	60%	48%	48%
Promote and Regulate (S01)	Bus	8%	11%	11%
Promote and Regulate (S01)	Tram	0%	0%	0%
Promote and Regulate (S01)	Metro	0%	0%	0%
Promote and Regulate (S01)	Car sharing	0%	2%	3%
Plan and Build (S02)	Pedestrian	18%	17%	17%
Plan and Build (S02)	Bike	14%	15%	14%
Plan and Build (S02)	Motorbike	1%	0%	0%
Plan and Build (S02)	Car	60%	50%	47%
Plan and Build (S02)	Bus	8%	17%	21%
Plan and Build (S02)	Tram	0%	0%	0%
Plan and Build (S02)	Metro	0%	0%	0%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Pedestrian	18%	19%	19%
Mixed (S03)	Bike	14%	20%	20%
Mixed (S03)	Motorbike	1%	0%	0%
Mixed (S03)	Car	60%	36%	30%
Mixed (S03)	Bus	8%	22%	20%
Mixed (S03)	Tram	0%	0%	0%
Mixed (S03)	Metro	0%	0%	0%
Mixed (S03)	Car sharing	0%	3%	10%



ALL INDICATORS

Small City - Northern Europe

TRANSPORT AND MOBILITY INDICATORS

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
BAU	526		
Promote and Regulate (S01)	526	471	468
Plan and Build (S02)	526	476	456
Mixed (S03)	526	406	369

Congestion and delays index (SUMI)

Scenario	2019	2030	2050
BAU	9.48		
Promote and Regulate (S01)	9.48	9.88	9.88
Plan and Build (S02)	9.48	9.73	9.84
Mixed (S03)	9.48	10.00	10.00

Public transport occupancy levels [pass/vehicle]

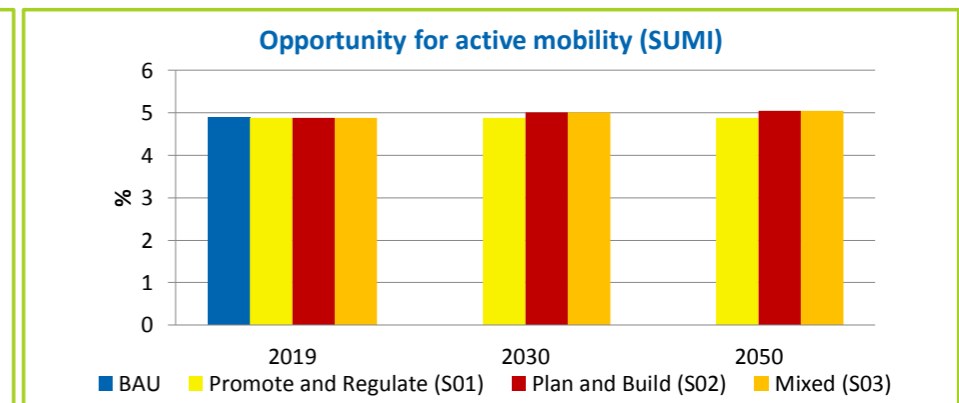
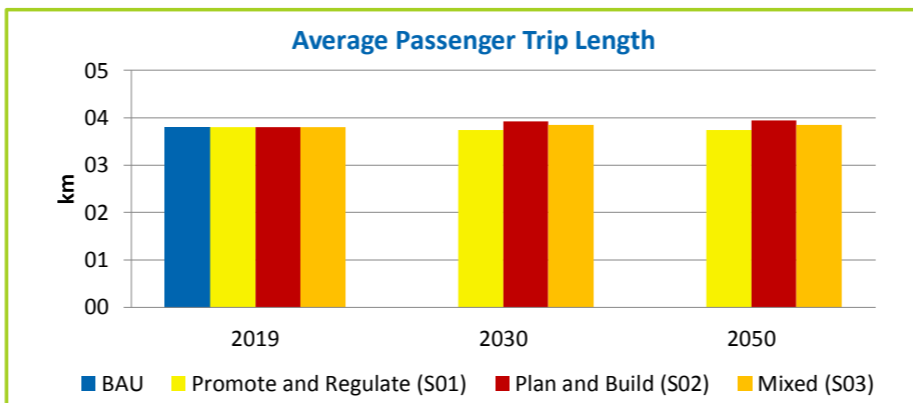
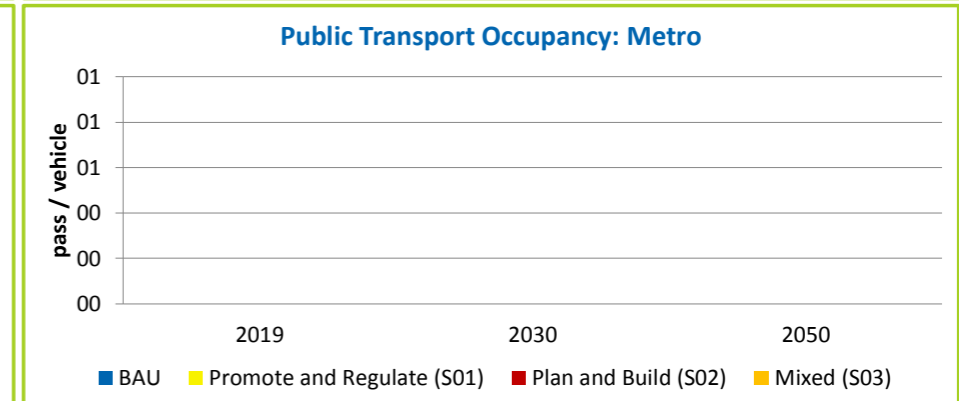
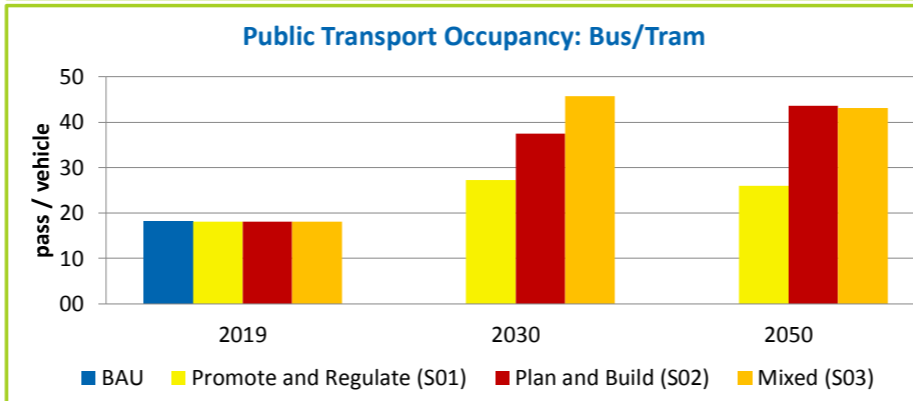
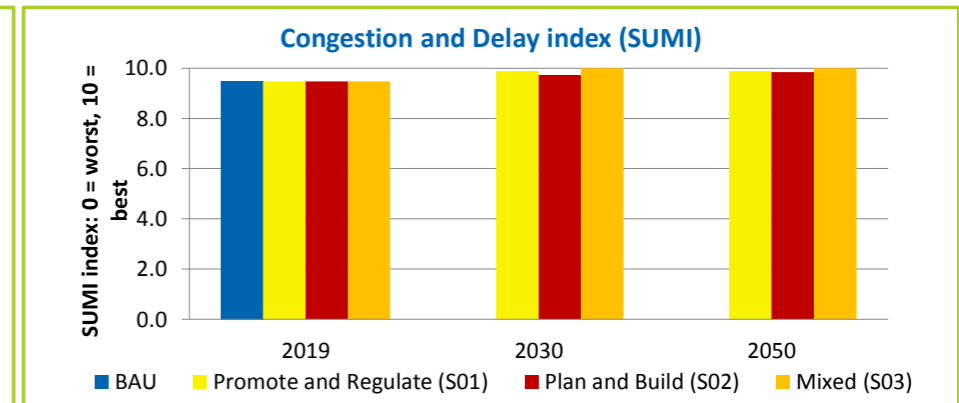
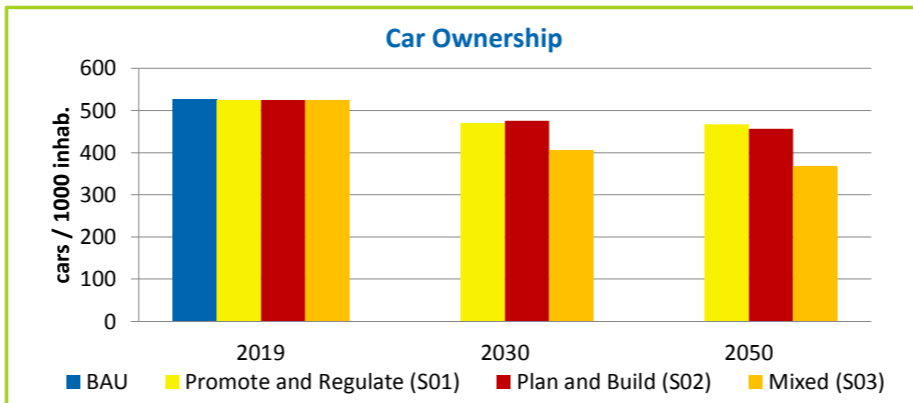
Scenario	PT mode	2019	2030	2050
BAU	Bus/tram	18.1		
BAU	Metro	0.0		
Promote and Regulate (S01)	Bus/tram	18.1	27.3	26.0
Promote and Regulate (S01)	Metro	0.0	0.0	0.0
Plan and Build (S02)	Bus/tram	18.1	37.4	43.7
Plan and Build (S02)	Metro	0.0	0.0	0.0
Mixed (S03)	Bus/tram	18.10	45.79	43.10
Mixed (S03)	Metro	0.00	0.00	0.00

Average passenger trip length [km]

Scenario	2019	2030	2050
BAU	3.8		
Promote and Regulate (S01)	3.8	3.7	3.7
Plan and Build (S02)	3.8	3.9	3.9
Mixed (S03)	3.8	3.8	3.9

Opportunity for active mobility (SUMI) [%]

Scenario	2019	2030	2050
BAU	4.88		
Promote and Regulate (S01)	4.88	4.88	4.88
Plan and Build (S02)	4.88	5.01	5.05
Mixed (S03)	4.88	5.01	5.05



ALL INDICATORS

Small City - Northern Europe

TRANSPORT AND MOBILITY INDICATORS

Penetration of alternatively fuelled car vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	Hybrid electric	3%		
BAU	Battery electric	0%		
BAU	fuel cells	0%		
Scenarios	Hybrid electric	3%	1%	9%
Scenarios	Battery electric	0%	44%	89%
Scenarios	fuel cells	0%	0%	2%

Penetration of alternatively fuelled bus vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	CNG	0%		
BAU	Hybrid electric	0.0%		
BAU	Battery electric	0.1%		
Scenarios	CNG	0%	0%	0%
Scenarios	Hybrid electric	0%	0%	0%
Scenarios	Battery electric	0%	67%	100%

Vehicles-km by mode: cars and car-sharing cars [million vkm/year]

Scenario	2019	2030	2050
BAU	129		
Promote and Regulate (S01)	129	104	106
Plan and Build (S02)	129	114	107
Mixed (S03)	129	76	81

Vehicles-km by mode: trucks [million vkm/year]

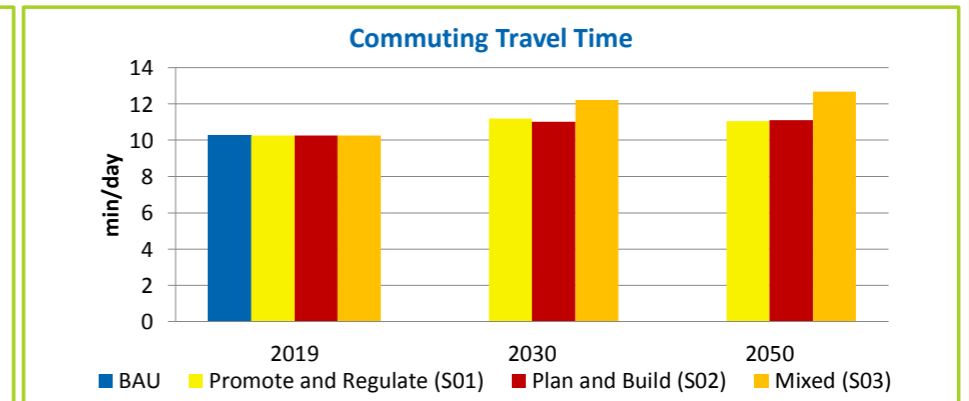
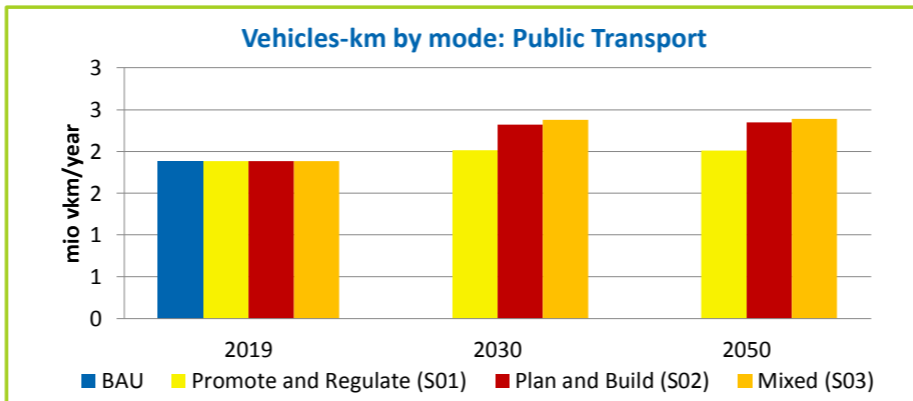
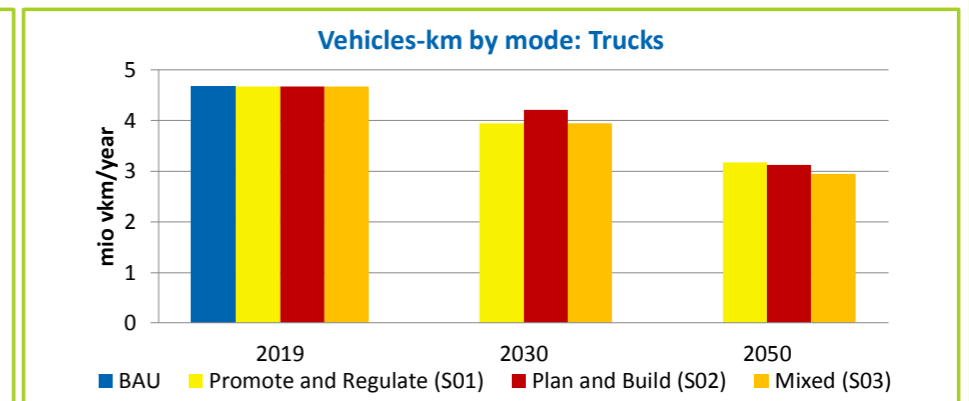
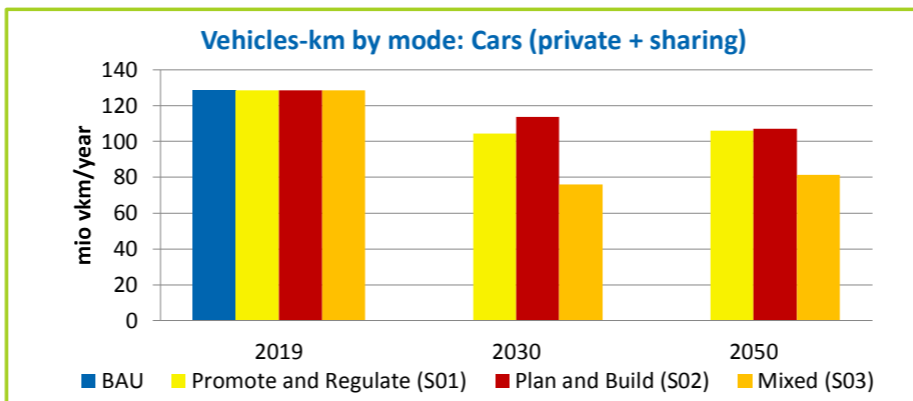
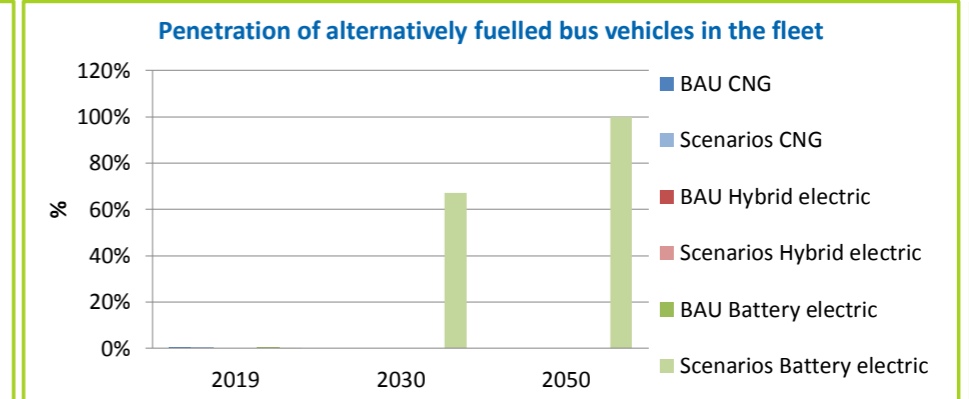
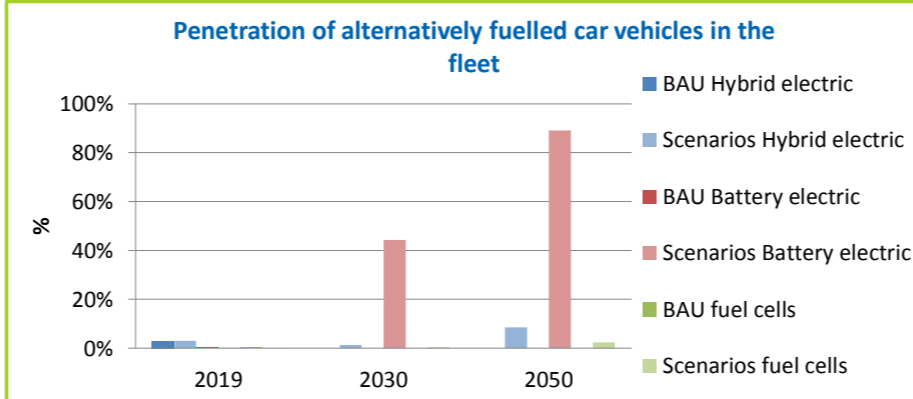
Scenario	2019	2030	2050
BAU	4.7		
Promote and Regulate (S01)	5	4	3
Plan and Build (S02)	4.7	4.2	3.1
Mixed (S03)	4.7	3.9	2.9

Vehicles-km by mode: Public Transport [million vkm/year]

Scenario	2019	2030	2050
BAU	1.9		
Promote and Regulate (S01)	1.9	2.0	2.0
Plan and Build (S02)	1.9	2.3	2.3
Mixed (S03)	1.9	2.4	2.4

Commuting travel time (SUMI) [min/day]

Scenario	2019	2030	2050
BAU	10.3		
Promote and Regulate (S01)	10.3	11.2	11.1
Plan and Build (S02)	10.3	11.0	11.1
Mixed (S03)	10.3	12.2	12.7



ALL INDICATORS

Small City - Northern Europe

ENVIRONMENT AND SAFETY INDICATORS

Air pollutant emissions (SUMI: PM2.5, Nox) [kg PM2.5 eq/capita]

Scenario	2019	2030	2050
BAU	0.6		
Promote and regulate (S01)	0.6	0.2	0.0
Plan and Build (S02)	0.6	0.3	0.0
Mixed (S03)	0.6	0.2	0.0

Air pollutant emissions (CO, VOC) [kg / capita]

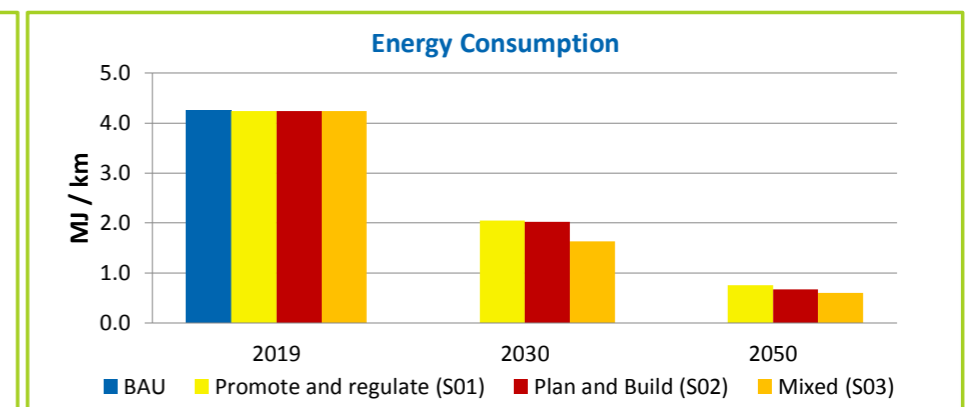
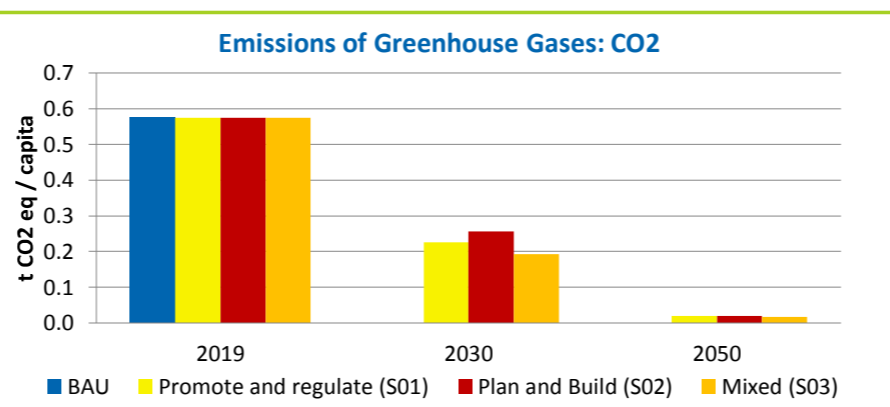
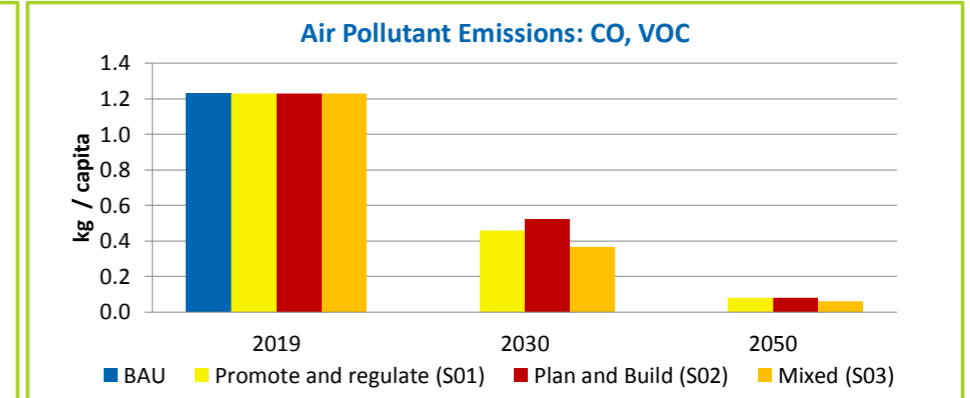
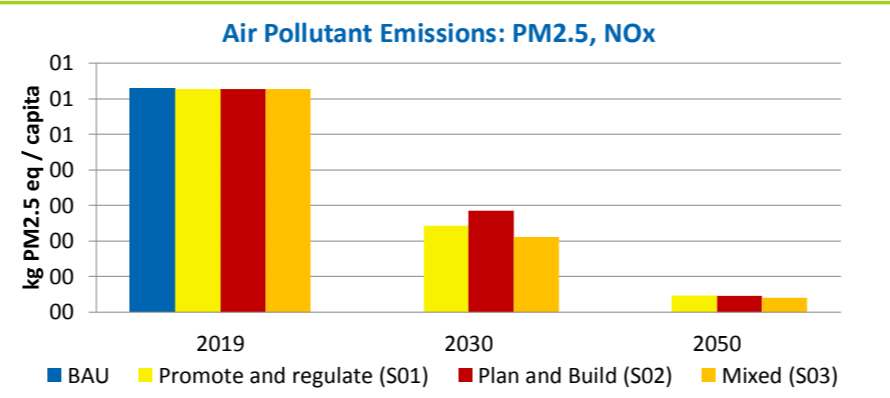
Scenario	2019	2030	2050
BAU	1		
Promote and regulate (S01)	1	0	0
Plan and Build (S02)	1.2	0.5	0.1
Mixed (S03)	1.2	0.4	0.1

Emissions of Greenhouse Gases [t CO2 eq / capita per year]

Scenario	2019	2030	2050
BAU	0.576		
Promote and regulate (S01)	0.576	0.226	0.020
Plan and Build (S02)	0.576	0.256	0.019
Mixed (S03)	0.576	0.193	0.016

Energy consumption [MJ / km]

Scenario	2019	2030	2050
BAU	4.2		
Promote and regulate (S01)	4.2	2.0	0.8
Plan and Build (S02)	4.2	2.0	0.7
Mixed (S03)	4.2	1.6	0.6



ALL INDICATORS

Small City - Northern Europe

ENVIRONMENT AND SAFETY INDICATORS

Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	1.7		
Promote and regulate (S01)	1.7	1.0	0.8
Plan and Build (S02)	1.7	1.3	0.9
Mixed (S03)	1.7	0.7	0.6

Fatalities: active modes [fatalities / 100,000 inhab.]

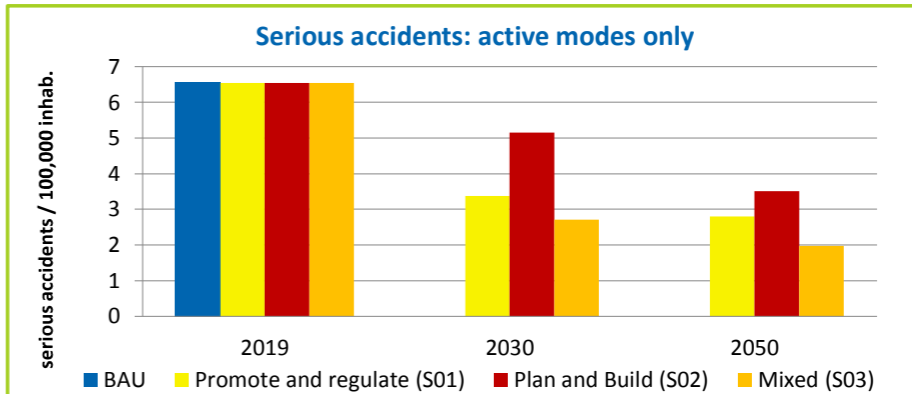
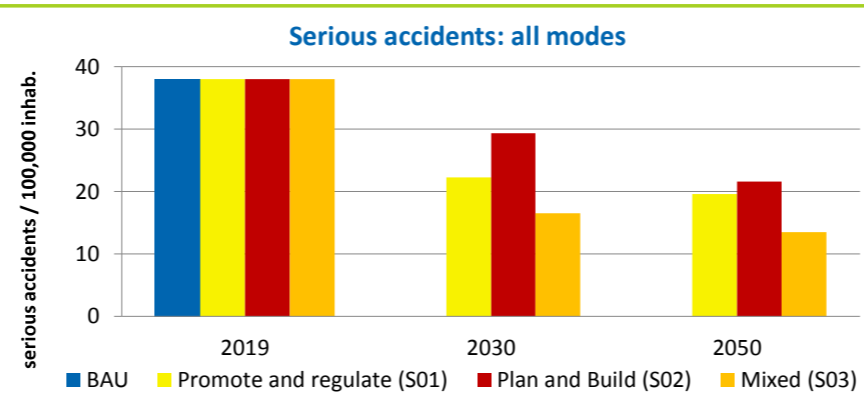
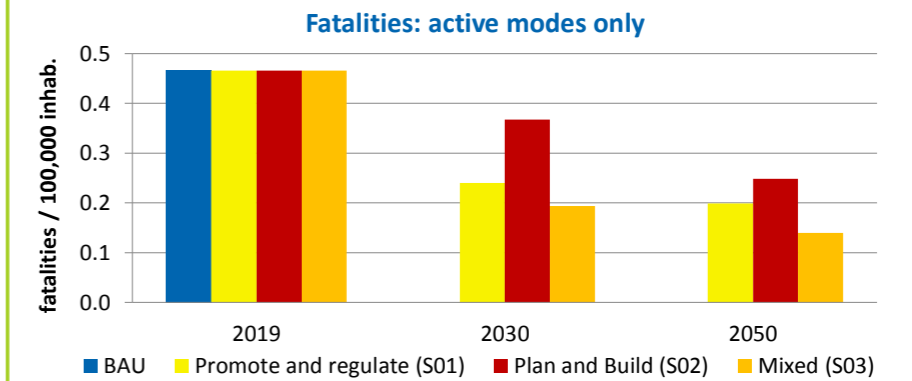
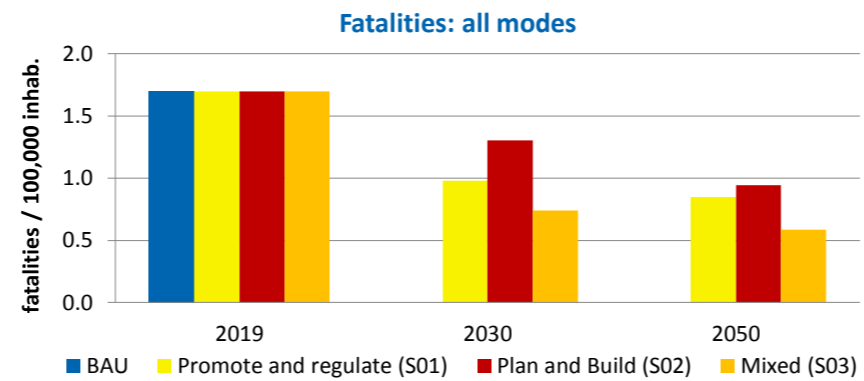
Scenario	2019	2030	2050
BAU	0.47		
Promote and regulate (S01)	0.47	0.24	0.20
Plan and Build (S02)	0.47	0.37	0.25
Mixed (S03)	0.47	0.19	0.14

Serious accidents [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	38		
Promote and regulate (S01)	38	22	20
Plan and Build (S02)	38	29	22
Mixed (S03)	38	17	14

Serious accidents: active modes [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	7		
Promote and regulate (S01)	7	3	3
Plan and Build (S02)	7	5	4
Mixed (S03)	7	3	2



ALL INDICATORS

Small City - Eastern Europe

EMISSIONS OF CO₂ (TANK-TO-WHEEL), CAR OWNERSHIP, FATALITIES

Emissions of CO₂ (Tank-to-wheel) [t CO₂ eq / capita per year]

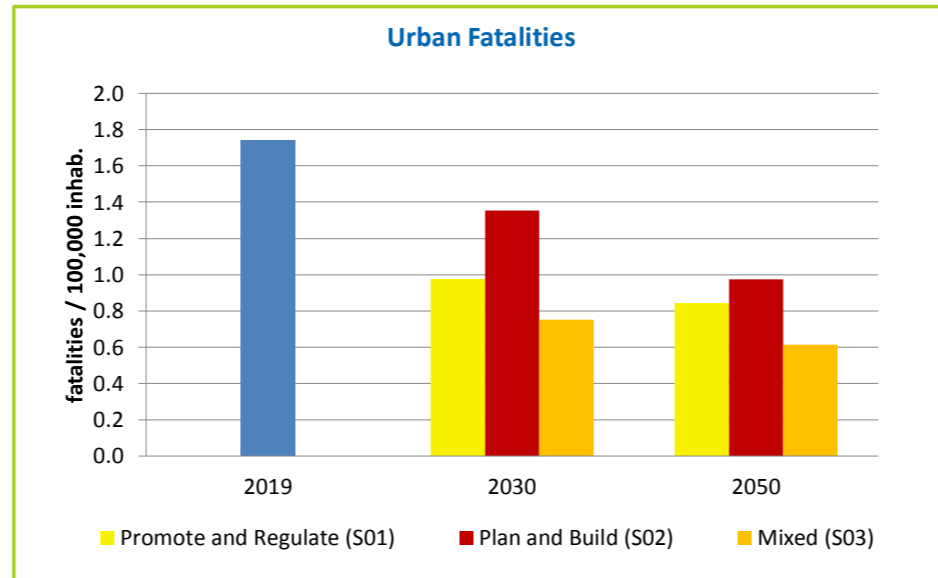
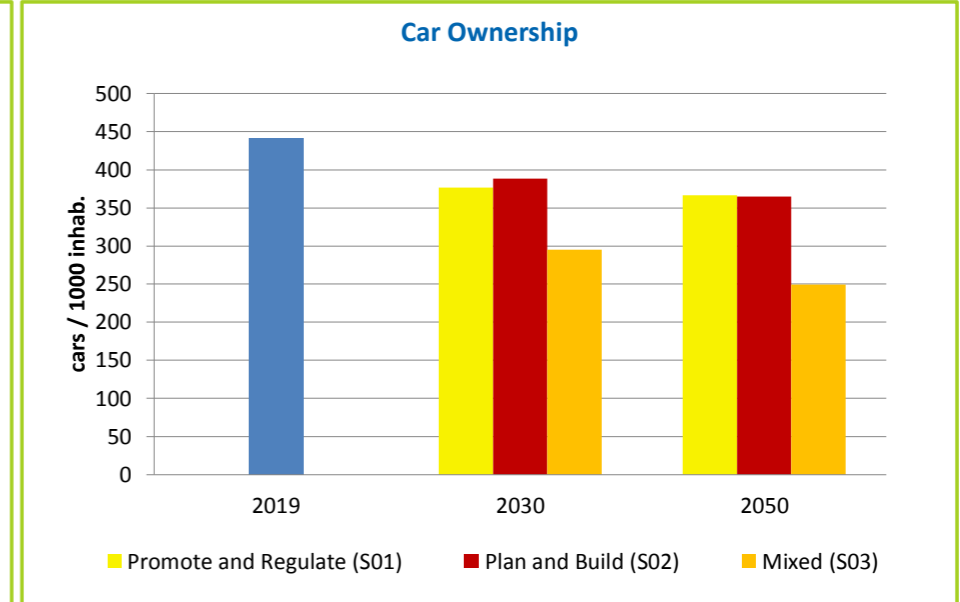
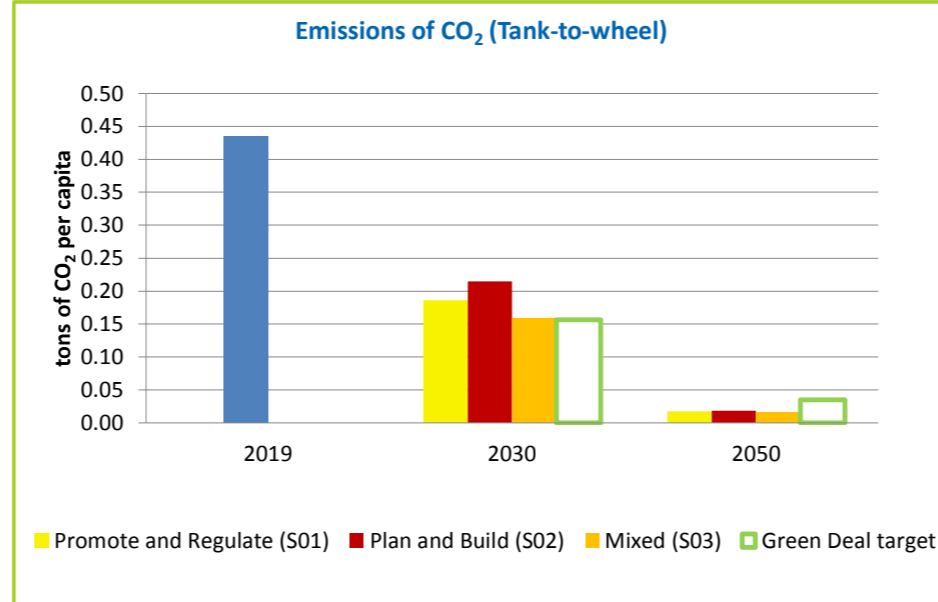
Scenario	2019	2030	2050
Promote and Regulate (S01)	0.435	0.186	0.017
Plan and Build (S02)	0.435	0.215	0.019
Mixed (S03)	0.435	0.159	0.016
Green Deal target		0.157	0.035

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	441	377	367
Plan and Build (S02)	441	388	365
Mixed (S03)	441	295	249

Urban Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	1.741	0.976	0.844
Plan and Build (S02)	1.741	1.352	0.974
Mixed (S03)	1.741	0.752	0.614



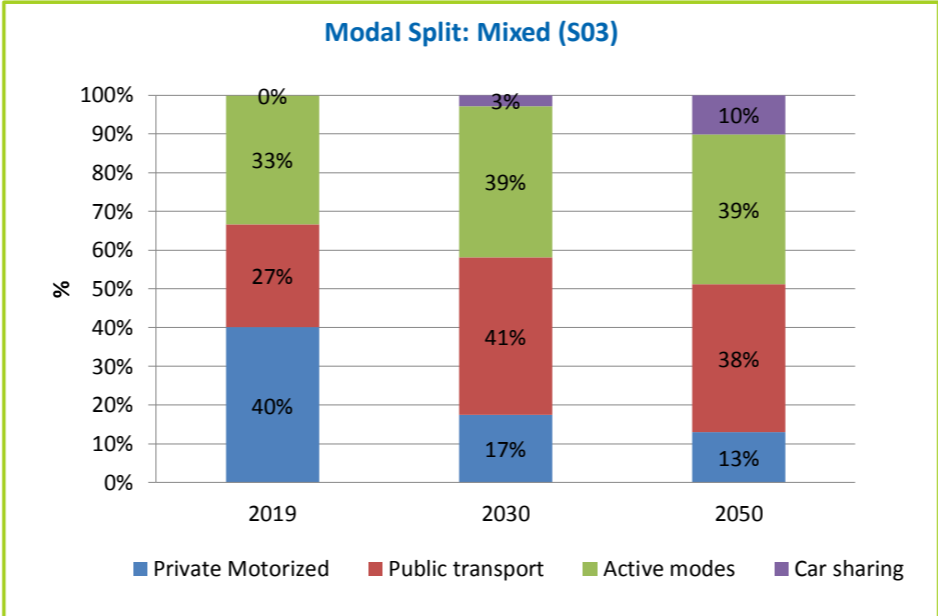
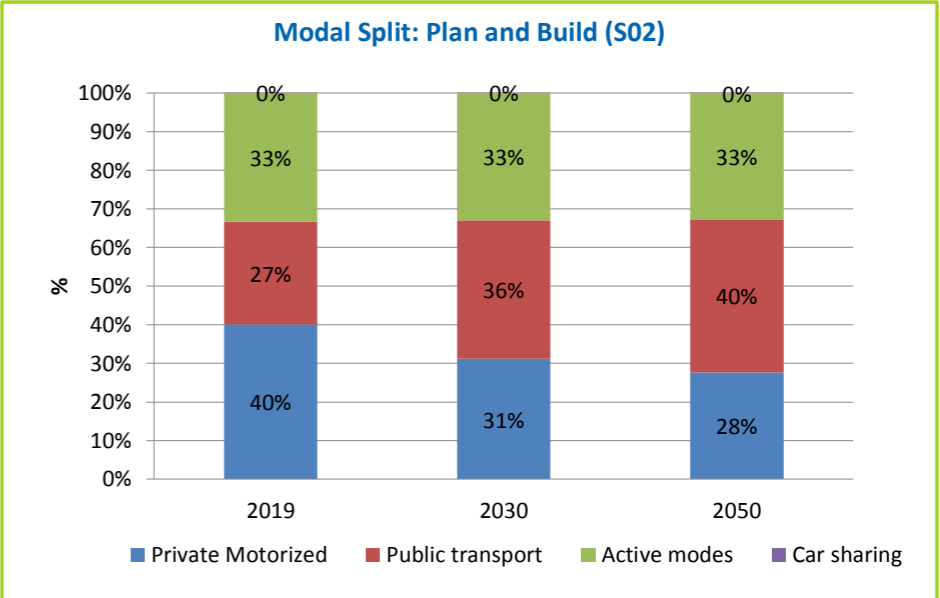
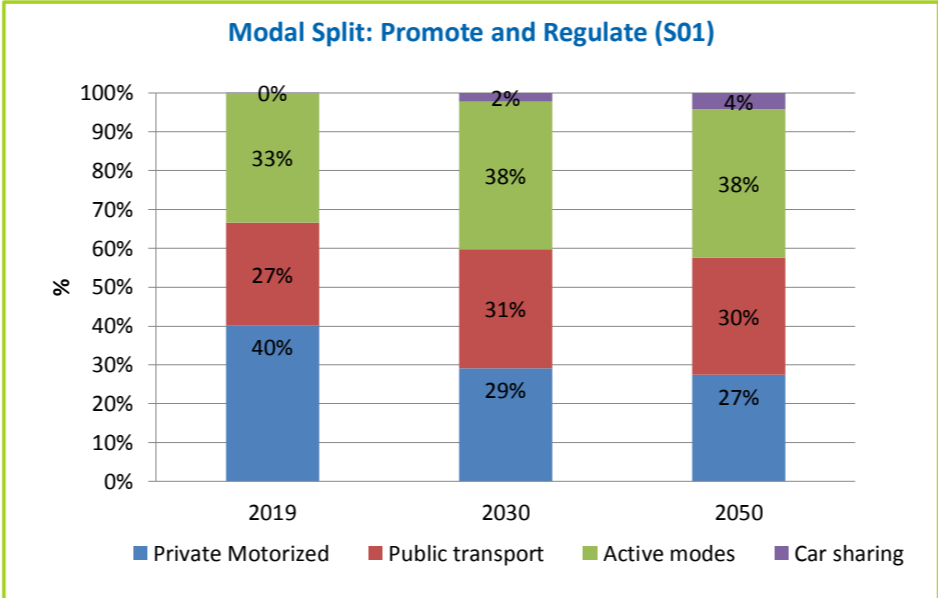
KEY INDICATORS

Small City - Eastern Europe

MODAL SPLIT

Aggregate mode split [%]

Scenario	Mode	2019	2030	2050
Promote and Regulate (S01)	Private Motorized	40%	29%	27%
Promote and Regulate (S01)	Public transport	27%	31%	30%
Promote and Regulate (S01)	Active modes	33%	38%	38%
Promote and Regulate (S01)	Car sharing	0%	2%	4%
Plan and Build (S02)	Private Motorized	40%	31%	28%
Plan and Build (S02)	Public transport	27%	36%	40%
Plan and Build (S02)	Active modes	33%	33%	33%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Private Motorized	40%	17%	13%
Mixed (S03)	Public transport	27%	41%	38%
Mixed (S03)	Active modes	33%	39%	39%
Mixed (S03)	Car sharing	0%	3%	10%



KEY INDICATORS

Small City - Eastern Europe

ECONOMIC OUTPUTS (discounted, cumulated from 2019)*

City total revenues [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	8	20
Plan and Build (S02)	0	4	10
Mixed (S03)	0	12	34

City total costs [mio euro]

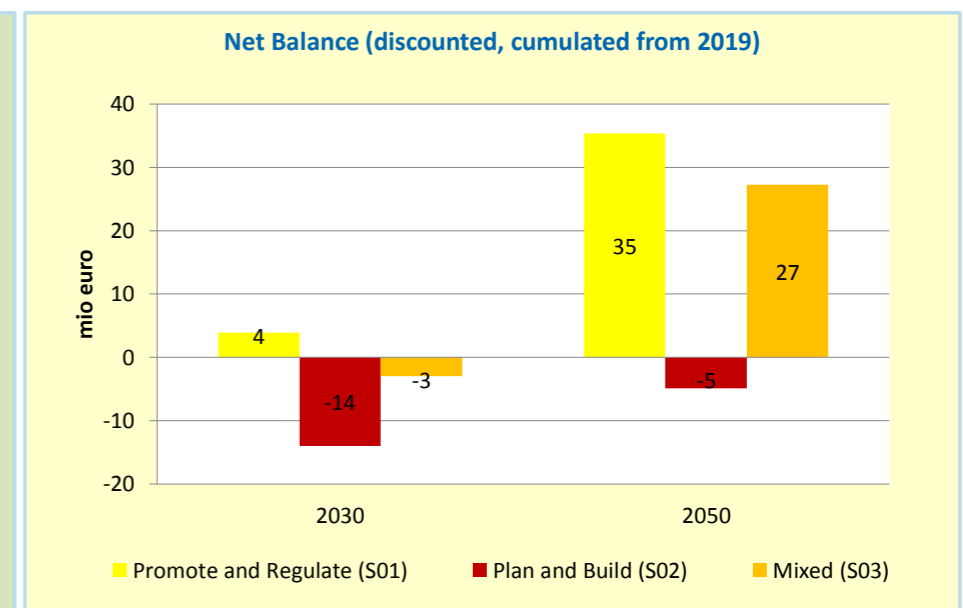
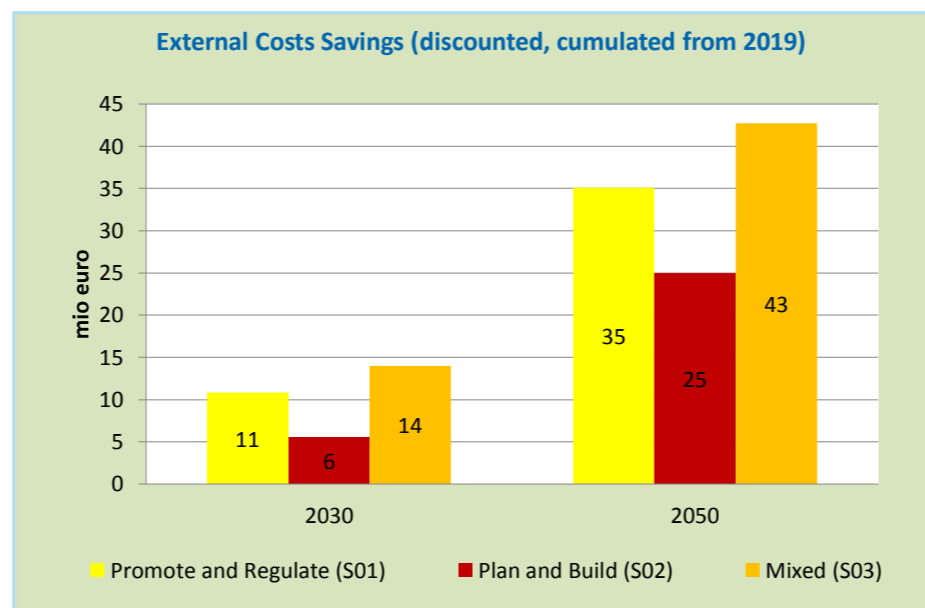
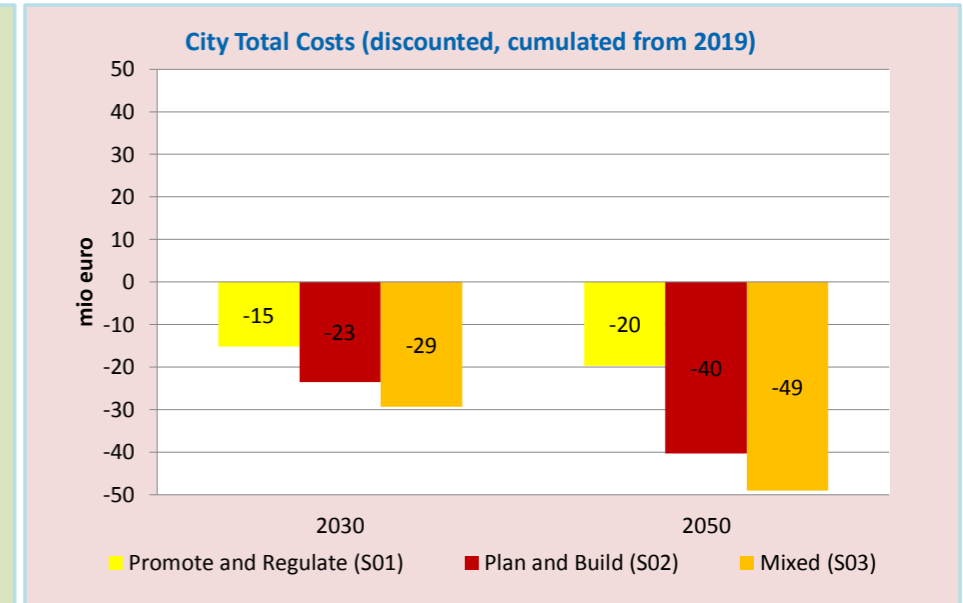
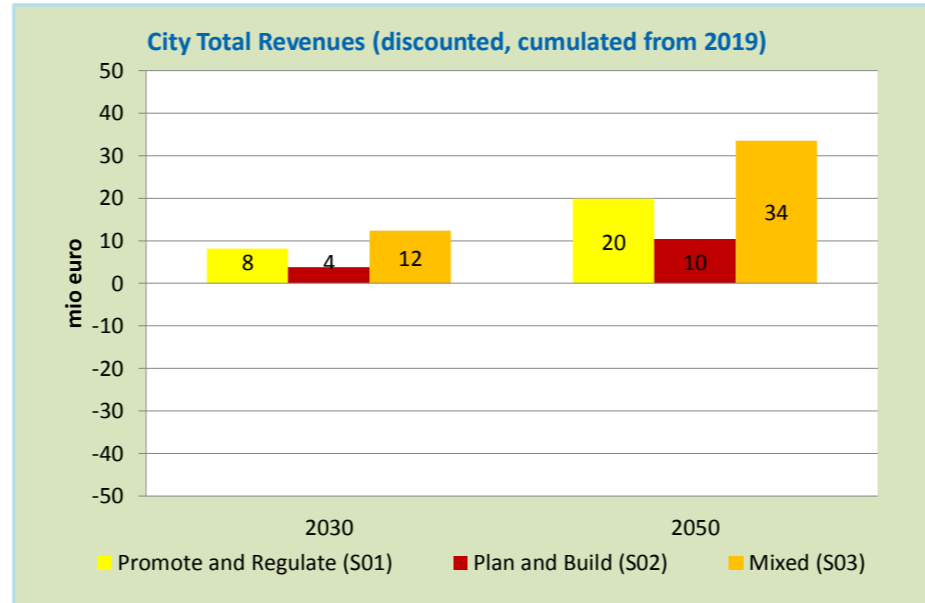
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	15	20
Plan and Build (S02)	0	23	40
Mixed (S03)	0	29	49

External costs savings [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	11	35
Plan and Build (S02)	0	6	25
Mixed (S03)	0	14	43

Net balance [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	4	35
Plan and Build (S02)	0	-14	-5
Mixed (S03)	0	-3	27



* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Small City - Eastern Europe

ECONOMIC OUTPUTS PER CAPITA (discounted, cumulated from 2019)*

City total revenues [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	155	374
Plan and Build (S02)	0	73	196
Mixed (S03)	0	233	631

City total costs [euro / capita]

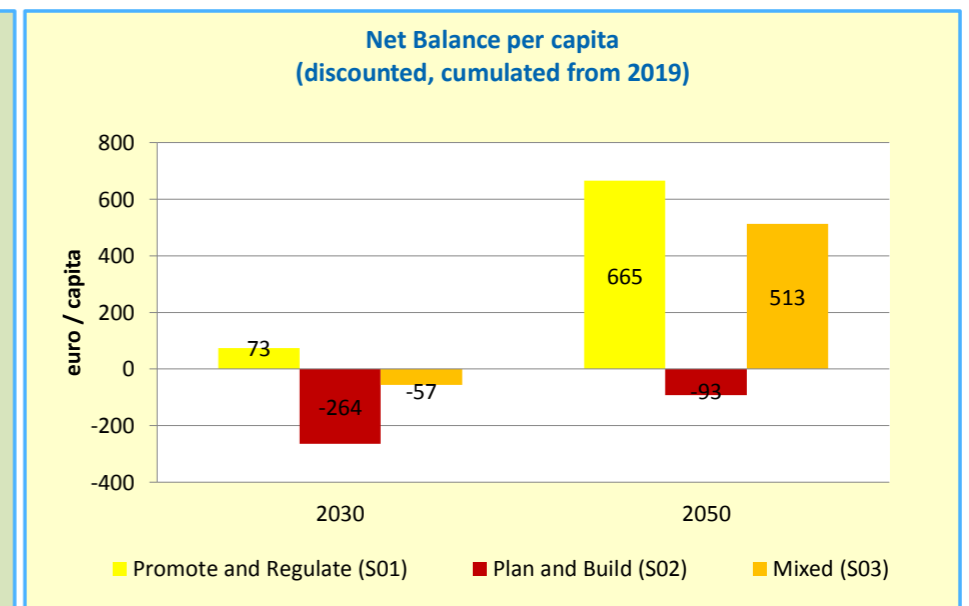
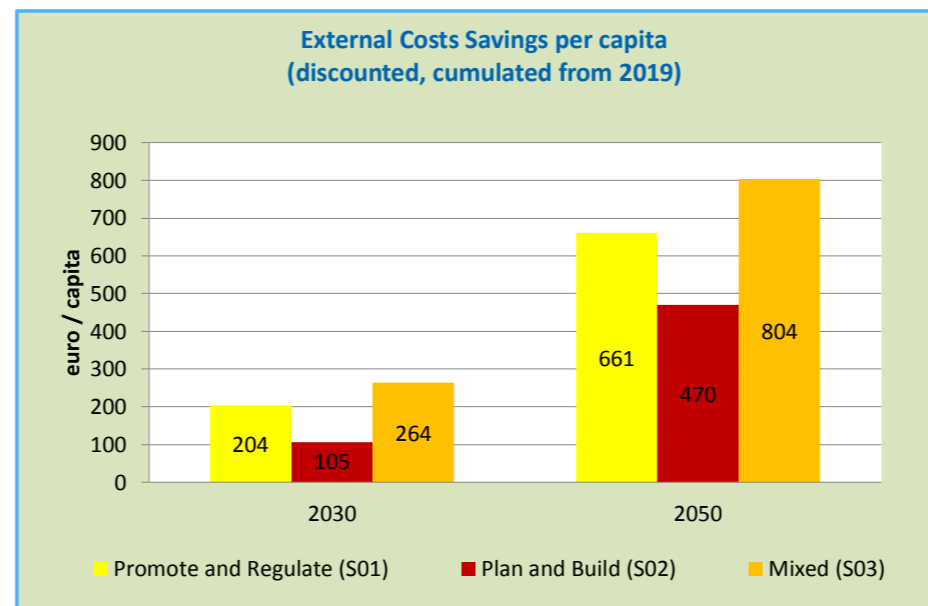
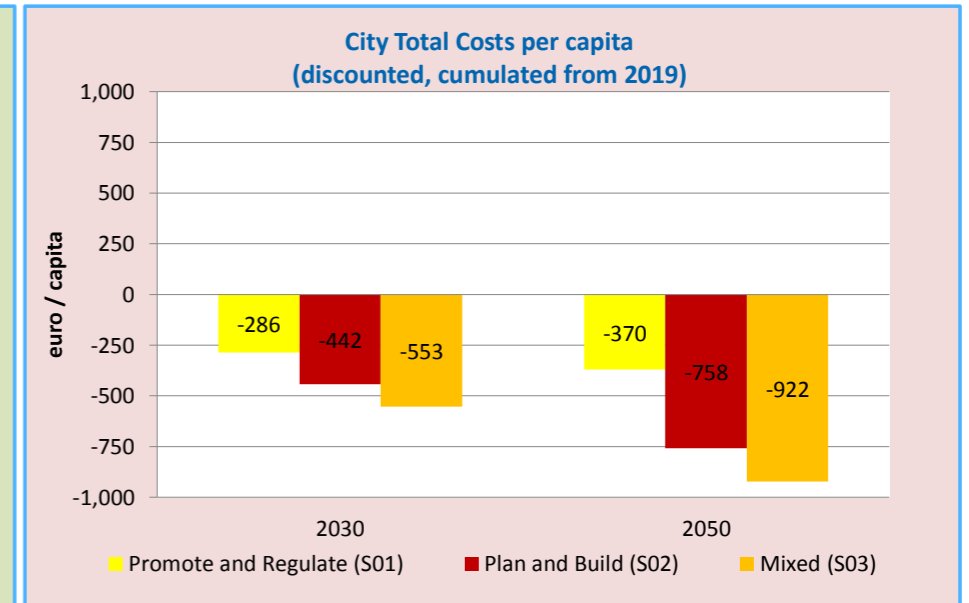
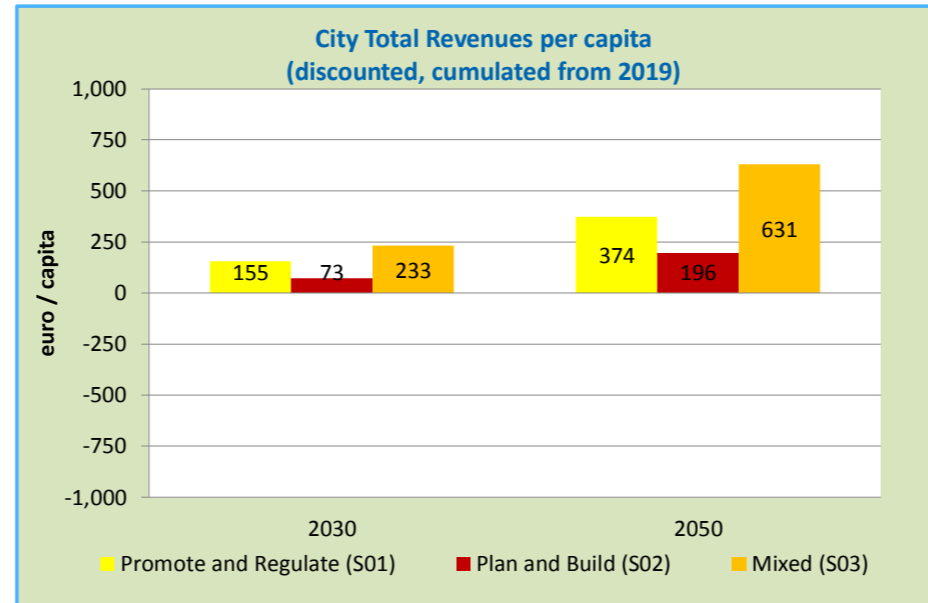
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	286	370
Plan and Build (S02)	0	442	758
Mixed (S03)	0	553	922

External costs savings [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	204	661
Plan and Build (S02)	0	105	470
Mixed (S03)	0	264	804

Net balance [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	73	665
Plan and Build (S02)	0	-264	-93
Mixed (S03)	0	-57	513



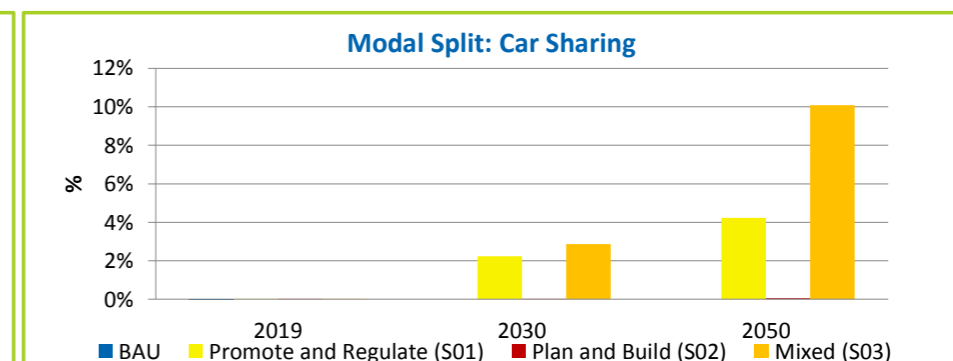
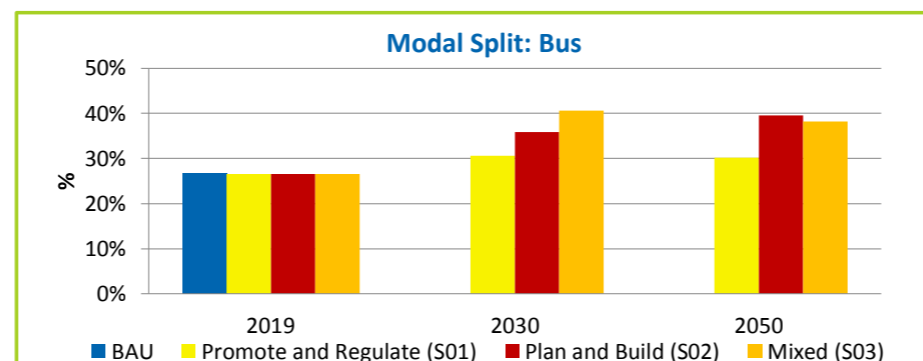
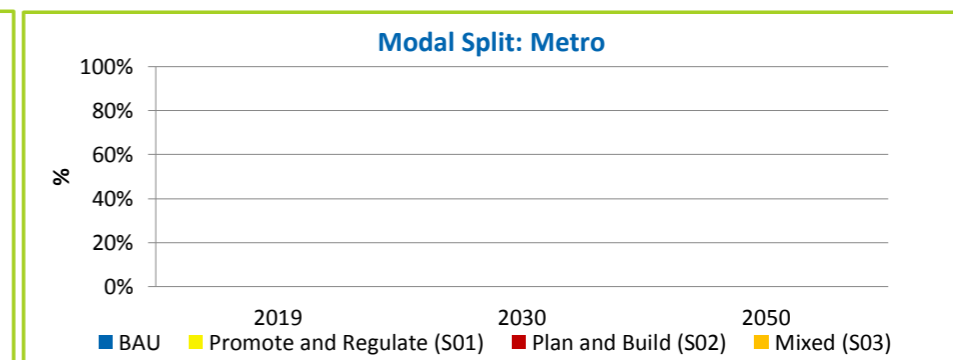
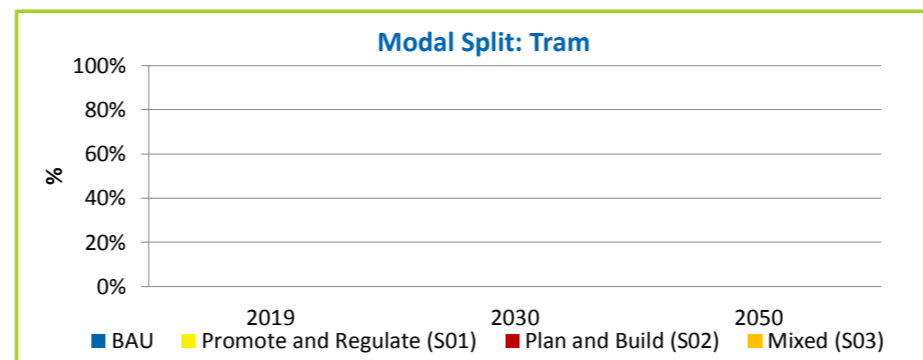
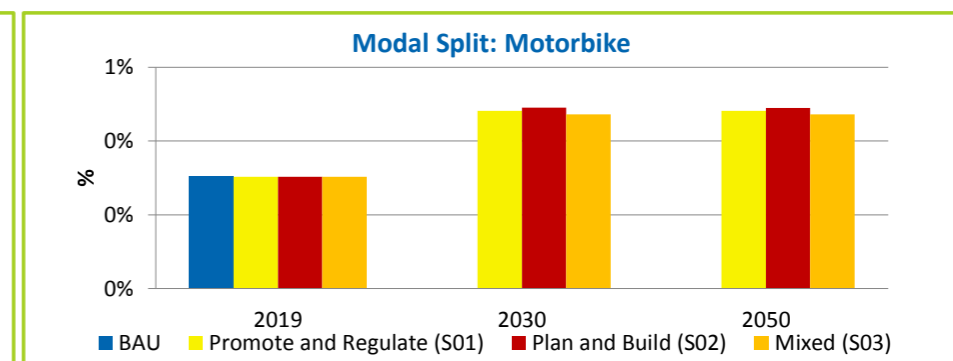
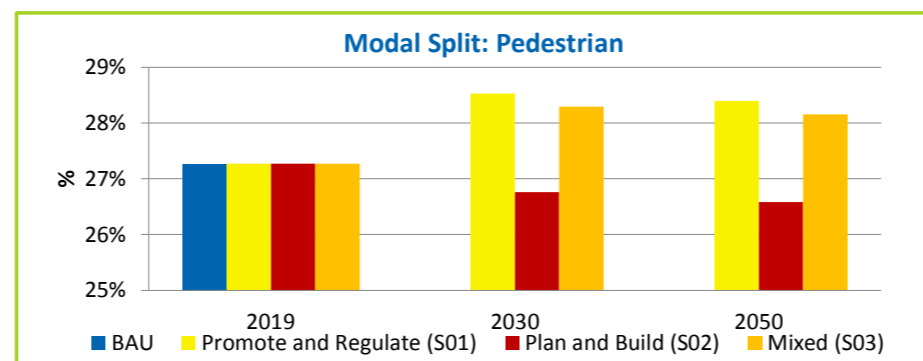
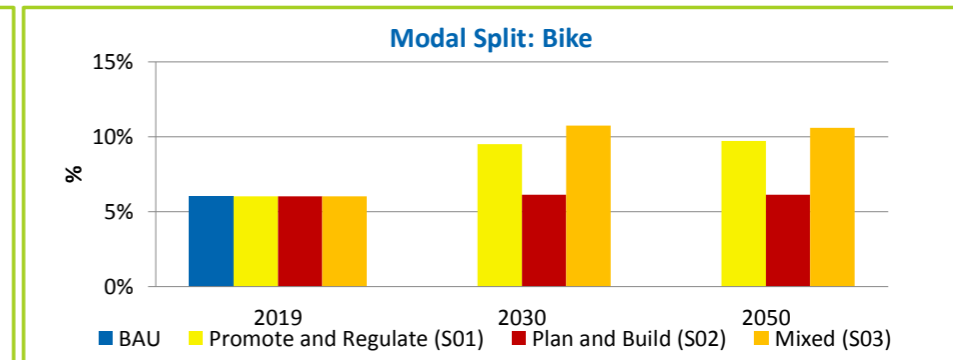
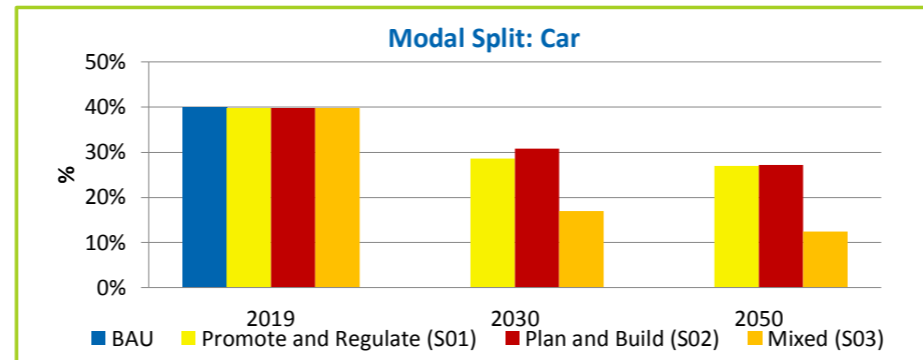
* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Small City - Eastern Europe

TRANSPORT AND MOBILITY INDICATORS

Mode split [%]		2019	2030	2050
Scenario	Mode			
BAU	Pedestrian	27%		
BAU	Bike	6%		
BAU	Motorbike	0%		
BAU	Car	40%		
BAU	Bus	27%		
BAU	Tram	0%		
BAU	Metro	0%		
BAU	Car sharing	0%		
Promote and Regulate (S01)	Pedestrian	27%	29%	28%
Promote and Regulate (S01)	Bike	6%	10%	10%
Promote and Regulate (S01)	Motorbike	0%	0%	0%
Promote and Regulate (S01)	Car	40%	29%	27%
Promote and Regulate (S01)	Bus	27%	31%	30%
Promote and Regulate (S01)	Tram	0%	0%	0%
Promote and Regulate (S01)	Metro	0%	0%	0%
Promote and Regulate (S01)	Car sharing	0%	2%	4%
Plan and Build (S02)	Pedestrian	27%	27%	27%
Plan and Build (S02)	Bike	6%	6%	6%
Plan and Build (S02)	Motorbike	0%	0%	0%
Plan and Build (S02)	Car	40%	31%	27%
Plan and Build (S02)	Bus	27%	36%	40%
Plan and Build (S02)	Tram	0%	0%	0%
Plan and Build (S02)	Metro	0%	0%	0%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Pedestrian	27%	28%	28%
Mixed (S03)	Bike	6%	11%	11%
Mixed (S03)	Motorbike	0%	0%	0%
Mixed (S03)	Car	40%	17%	12%
Mixed (S03)	Bus	27%	41%	38%
Mixed (S03)	Tram	0%	0%	0%
Mixed (S03)	Metro	0%	0%	0%
Mixed (S03)	Car sharing	0%	3%	10%



ALL INDICATORS

Small City - Eastern Europe

TRANSPORT AND MOBILITY INDICATORS

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
BAU	441		
Promote and Regulate (S01)	441	377	367
Plan and Build (S02)	441	388	365
Mixed (S03)	441	295	249

Congestion and delays index (SUMI)

Scenario	2019	2030	2050
BAU	9.56		
Promote and Regulate (S01)	9.56	9.97	10.00
Plan and Build (S02)	9.56	9.83	9.93
Mixed (S03)	9.56	10.00	10.00

Public transport occupancy levels [pass/vehicle]

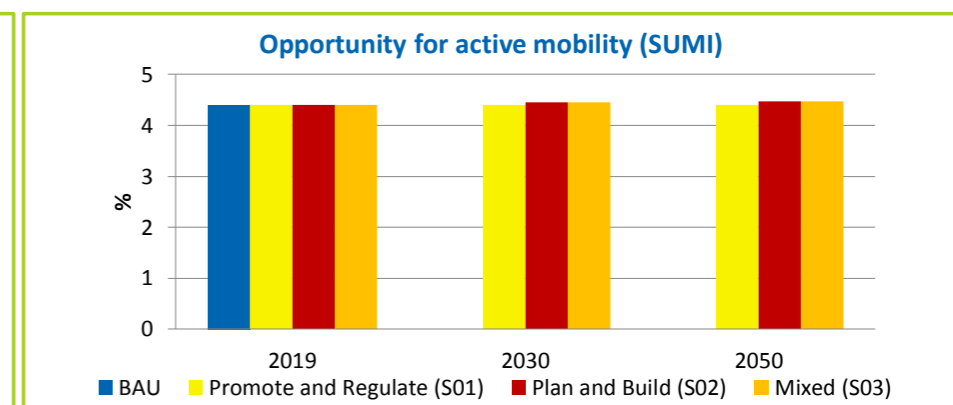
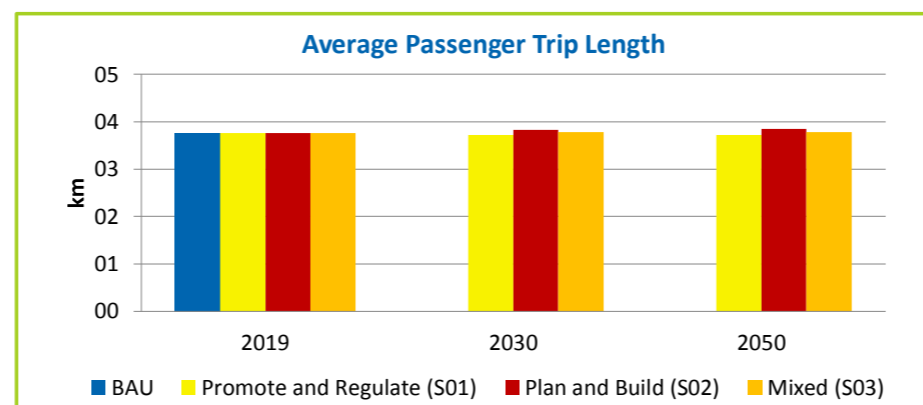
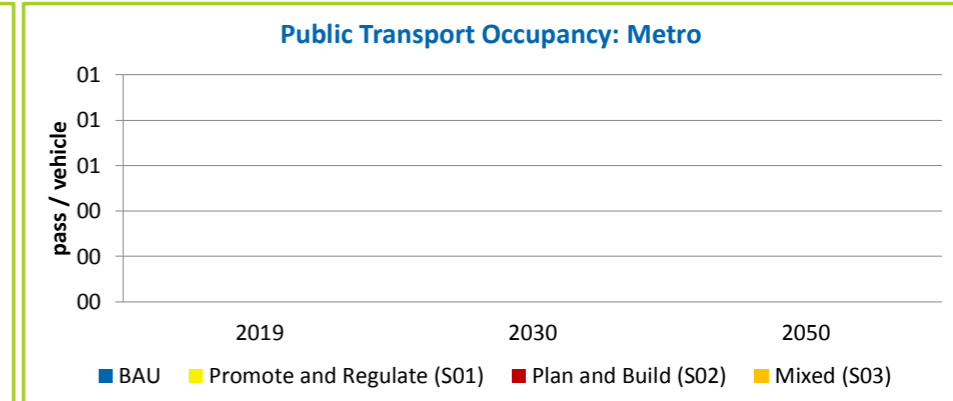
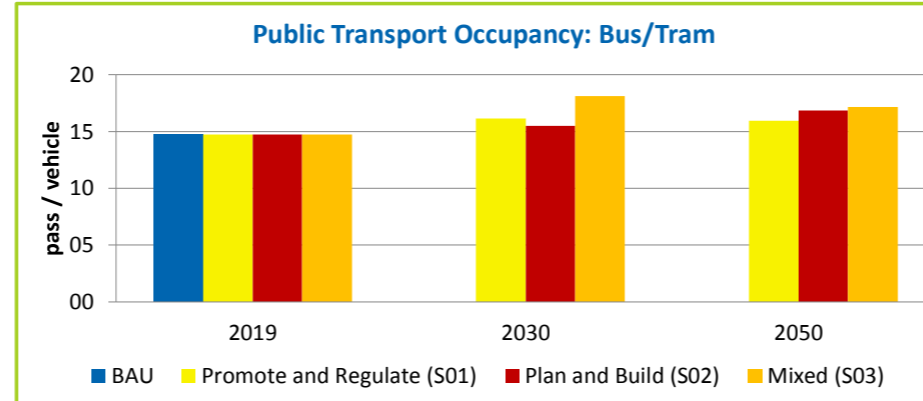
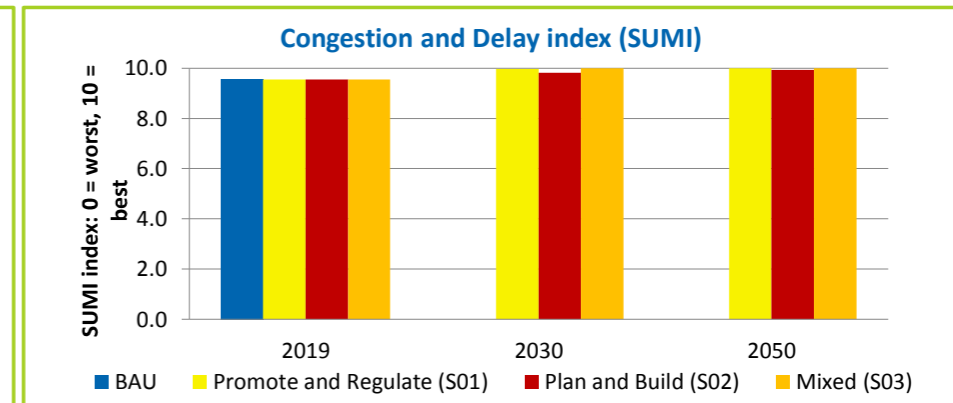
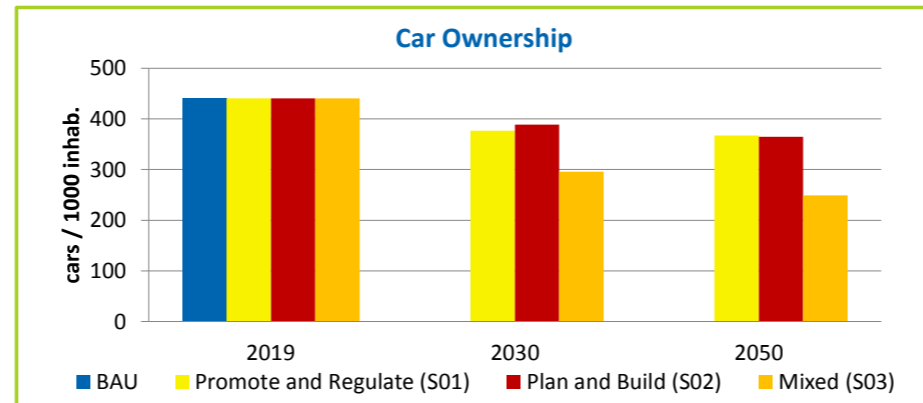
Scenario	PT mode	2019	2030	2050
BAU	Bus/tram	14.8		
BAU	Metro	0.0		
Promote and Regulate (S01)	Bus/tram	14.8	16.1	15.9
Promote and Regulate (S01)	Metro	0.0	0.0	0.0
Plan and Build (S02)	Bus/tram	14.8	15.5	16.9
Plan and Build (S02)	Metro	0.0	0.0	0.0
Mixed (S03)	Bus/tram	14.76	18.15	17.18
Mixed (S03)	Metro	0.00	0.00	0.00

Average passenger trip length [km]

Scenario	2019	2030	2050
BAU	3.8		
Promote and Regulate (S01)	3.8	3.7	3.7
Plan and Build (S02)	3.8	3.8	3.8
Mixed (S03)	3.8	3.8	3.8

Opportunity for active mobility (SUMI) [%]

Scenario	2019	2030	2050
BAU	4.40		
Promote and Regulate (S01)	4.40	4.40	4.40
Plan and Build (S02)	4.40	4.46	4.47
Mixed (S03)	4.40	4.46	4.47



ALL INDICATORS

Small City - Eastern Europe

TRANSPORT AND MOBILITY INDICATORS

Penetration of alternatively fuelled car vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	Hybrid electric	0%		
BAU	Battery electric	0%		
BAU	fuel cells	0%		
Scenarios	Hybrid electric	0%	2%	7%
Scenarios	Battery electric	0%	32%	84%
Scenarios	fuel cells	0%	0%	9%

Penetration of alternatively fuelled bus vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	CNG	0%		
BAU	Hybrid electric	0.0%		
BAU	Battery electric	0.5%		
Scenarios	CNG	0%	0%	0%
Scenarios	Hybrid electric	0%	0%	0%
Scenarios	Battery electric	1%	60%	79%

Vehicles-km by mode: cars and car-sharing cars [million vkm/year]

Scenario	2019	2030	2050
BAU	53		
Promote and Regulate (S01)	53	38	39
Plan and Build (S02)	53	42	39
Mixed (S03)	53	28	30

Vehicles-km by mode: trucks [million vkm/year]

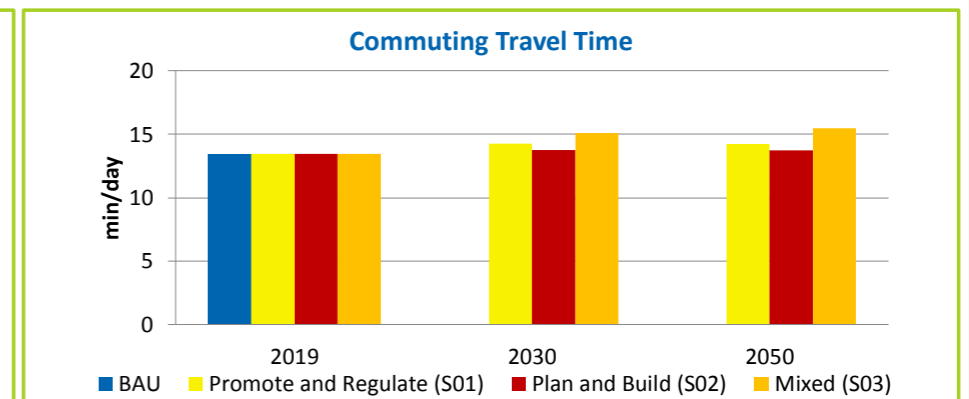
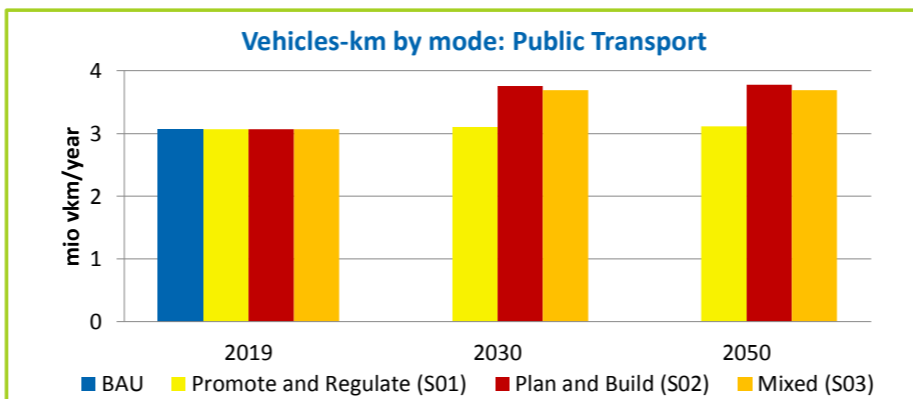
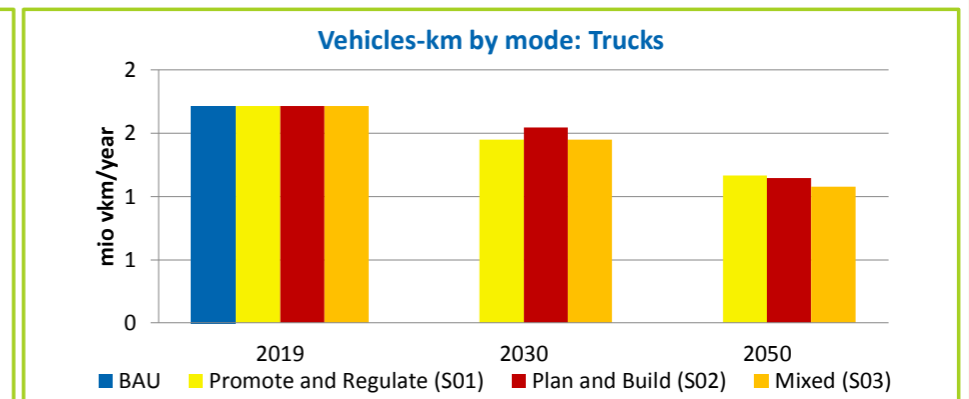
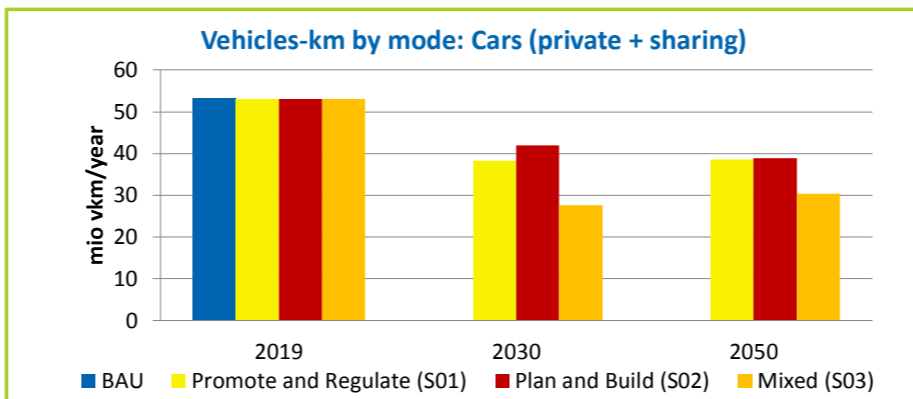
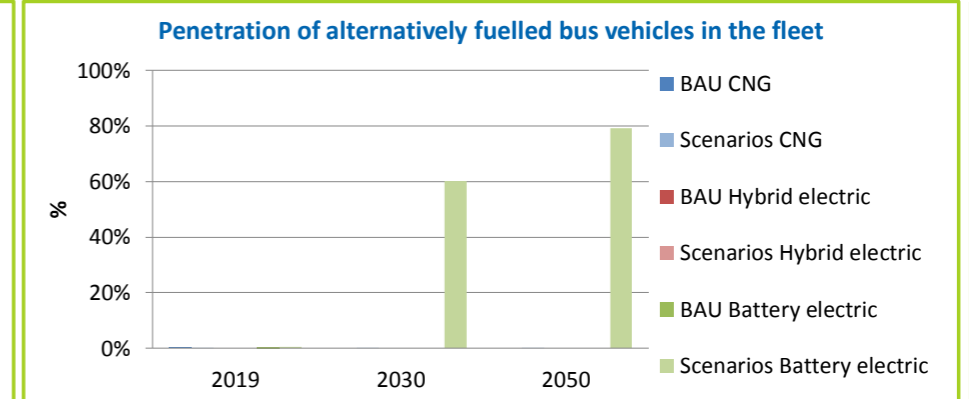
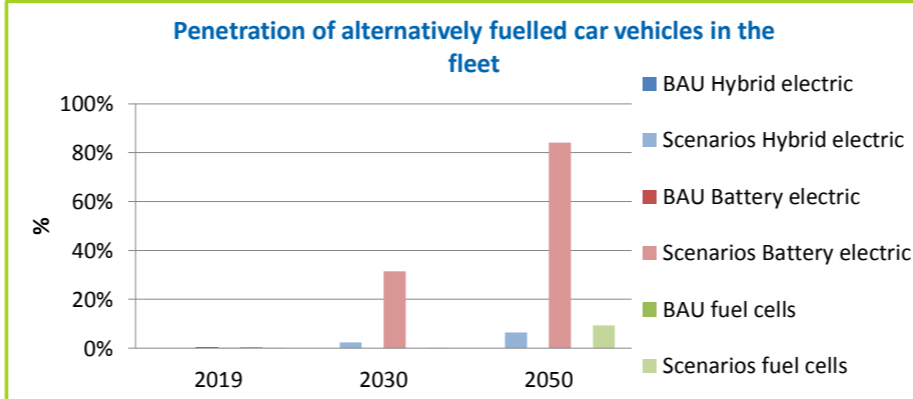
Scenario	2019	2030	2050
BAU	1.7		
Promote and Regulate (S01)	2	1	1
Plan and Build (S02)	1.7	1.5	1.1
Mixed (S03)	1.7	1.4	1.1

Vehicles-km by mode: Public Transport [million vkm/year]

Scenario	2019	2030	2050
BAU	3.1		
Promote and Regulate (S01)	3.1	3.1	3.1
Plan and Build (S02)	3.1	3.8	3.8
Mixed (S03)	3.1	3.7	3.7

Commuting travel time (SUMI) [min/day]

Scenario	2019	2030	2050
BAU	13.5		
Promote and Regulate (S01)	13.5	14.3	14.2
Plan and Build (S02)	13.5	13.8	13.7
Mixed (S03)	13.5	15.1	15.5



ALL INDICATORS

Small City - Eastern Europe

ENVIRONMENT AND SAFETY INDICATORS

Air pollutant emissions (SUMI: PM2.5, Nox) [kg PM2.5 eq/capita]

Scenario	2019	2030	2050
BAU	0.6		
Promote and regulate (S01)	0.6	0.2	0.0
Plan and Build (S02)	0.6	0.2	0.0
Mixed (S03)	0.6	0.2	0.0

Air pollutant emissions (CO, VOC) [kg / capita]

Scenario	2019	2030	2050
BAU	1		
Promote and regulate (S01)	1	0	0
Plan and Build (S02)	0.8	0.3	0.1
Mixed (S03)	0.8	0.2	0.0

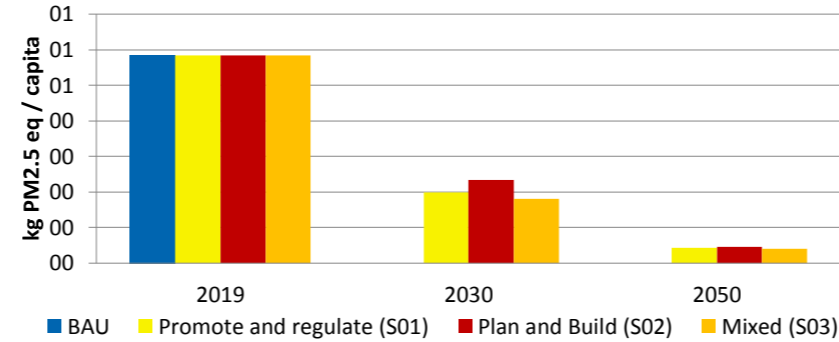
Emissions of Greenhouse Gases [t CO2 eq / capita per year]

Scenario	2019	2030	2050
BAU	0.435		
Promote and regulate (S01)	0.435	0.186	0.017
Plan and Build (S02)	0.435	0.215	0.019
Mixed (S03)	0.435	0.159	0.016

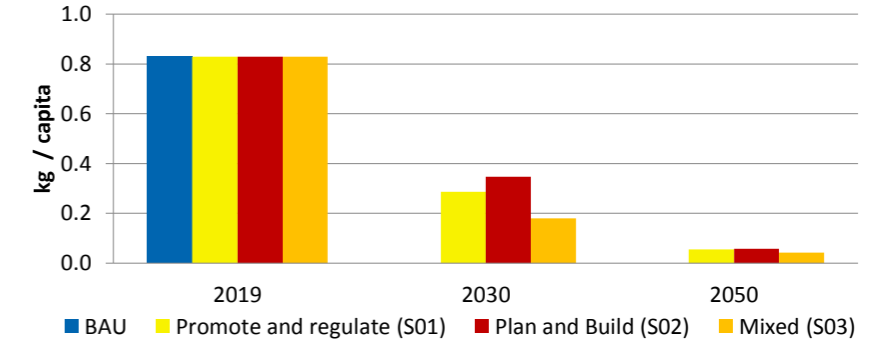
Energy consumption [MJ / km]

Scenario	2019	2030	2050
BAU	3.3		
Promote and regulate (S01)	3.3	1.7	0.7
Plan and Build (S02)	3.3	1.8	0.7
Mixed (S03)	3.3	1.4	0.6

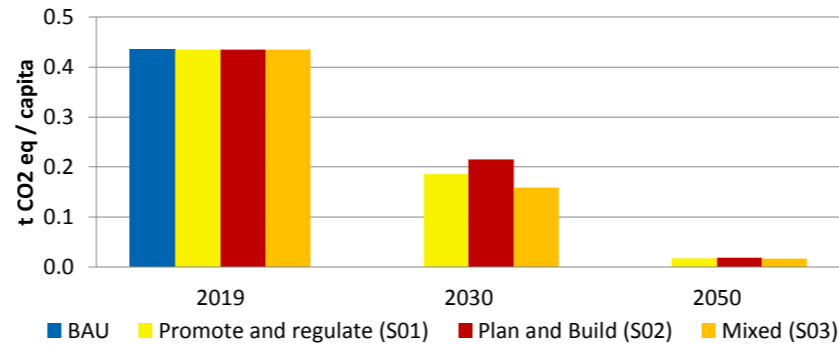
Air Pollutant Emissions: PM2.5, NOx



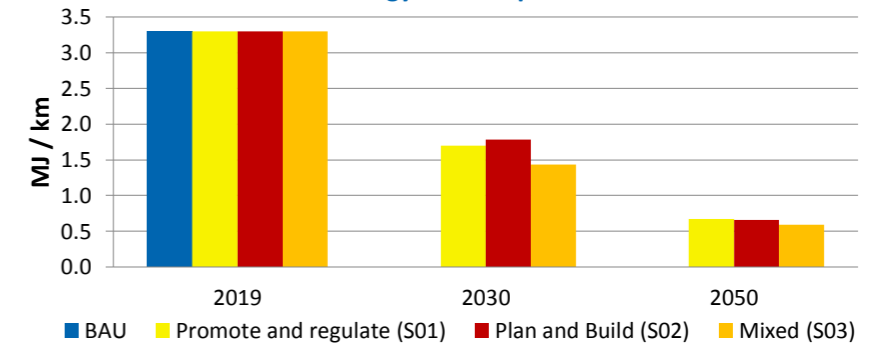
Air Pollutant Emissions: CO, VOC



Emissions of Greenhouse Gases: CO2



Energy Consumption



ALL INDICATORS

Small City - Eastern Europe

ENVIRONMENT AND SAFETY INDICATORS

Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	1.7		
Promote and regulate (S01)	1.7	1.0	0.8
Plan and Build (S02)	1.7	1.4	1.0
Mixed (S03)	1.7	0.8	0.6

Fatalities: active modes [fatalities / 100,000 inhab.]

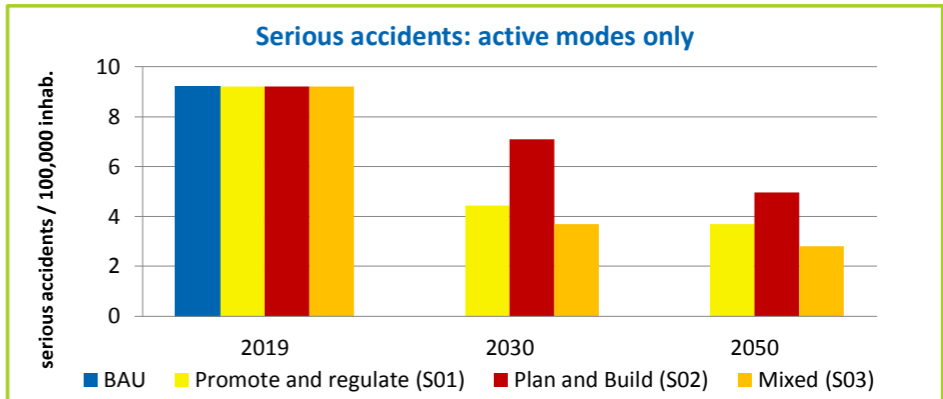
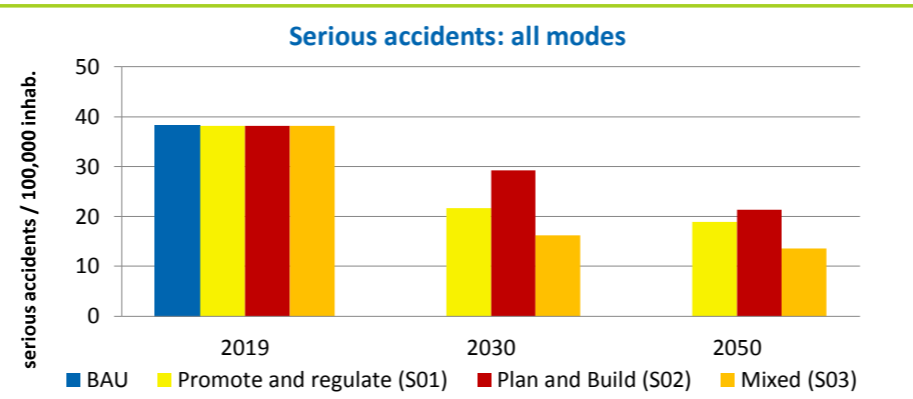
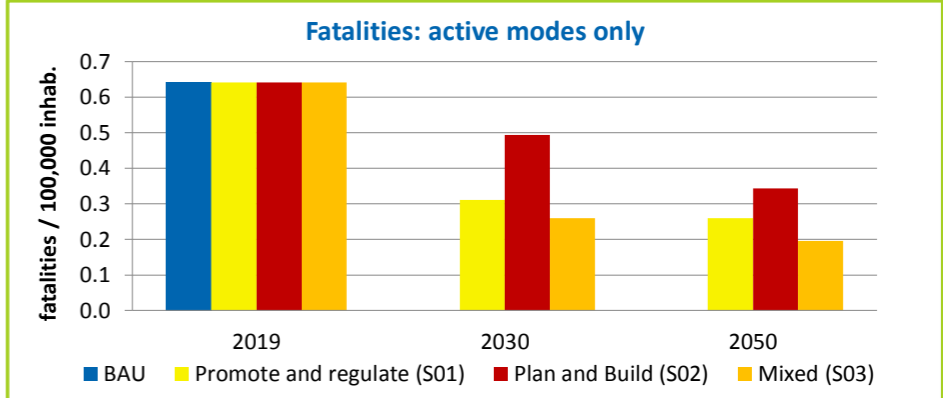
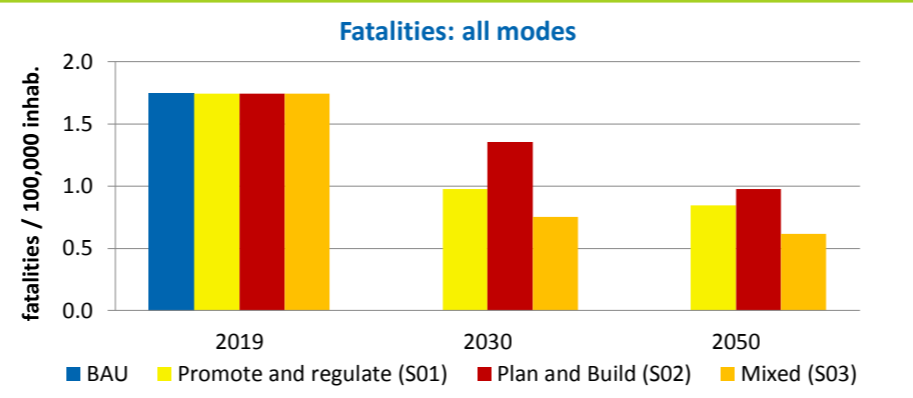
Scenario	2019	2030	2050
BAU	0.64		
Promote and regulate (S01)	0.64	0.31	0.26
Plan and Build (S02)	0.64	0.49	0.34
Mixed (S03)	0.64	0.26	0.20

Serious accidents [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	38		
Promote and regulate (S01)	38	22	19
Plan and Build (S02)	38	29	21
Mixed (S03)	38	16	14

Serious accidents: active modes [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	9		
Promote and regulate (S01)	9	4	4
Plan and Build (S02)	9	7	5
Mixed (S03)	9	4	3



ALL INDICATORS

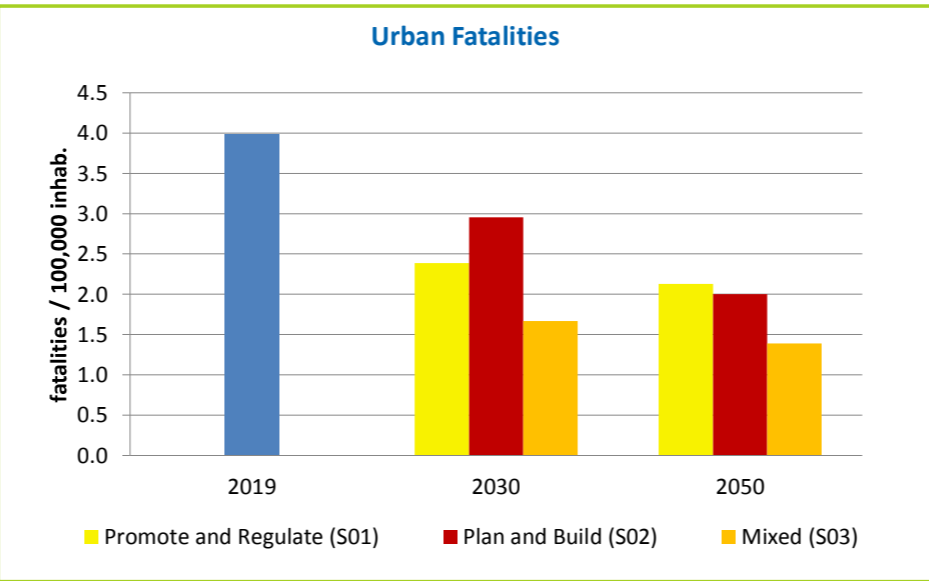
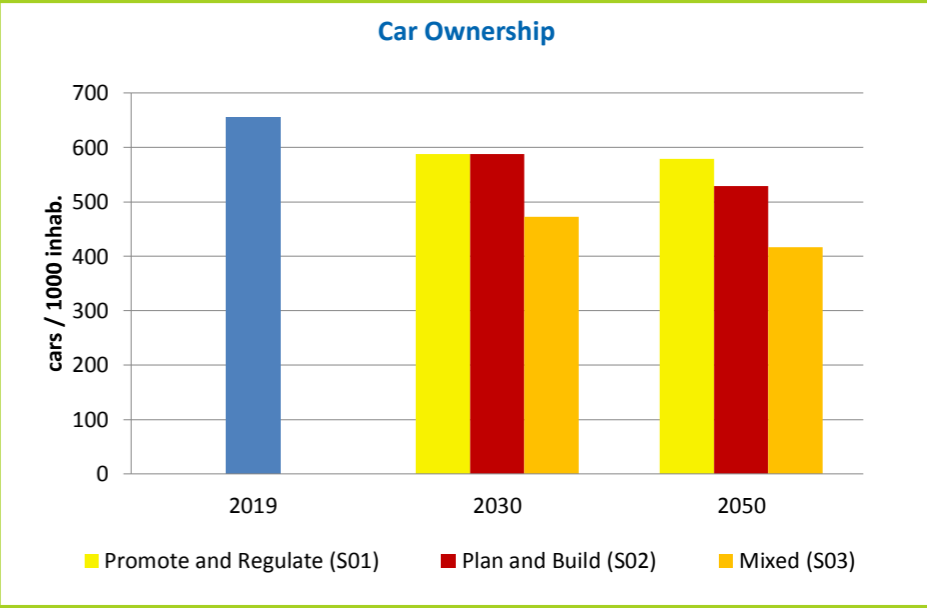
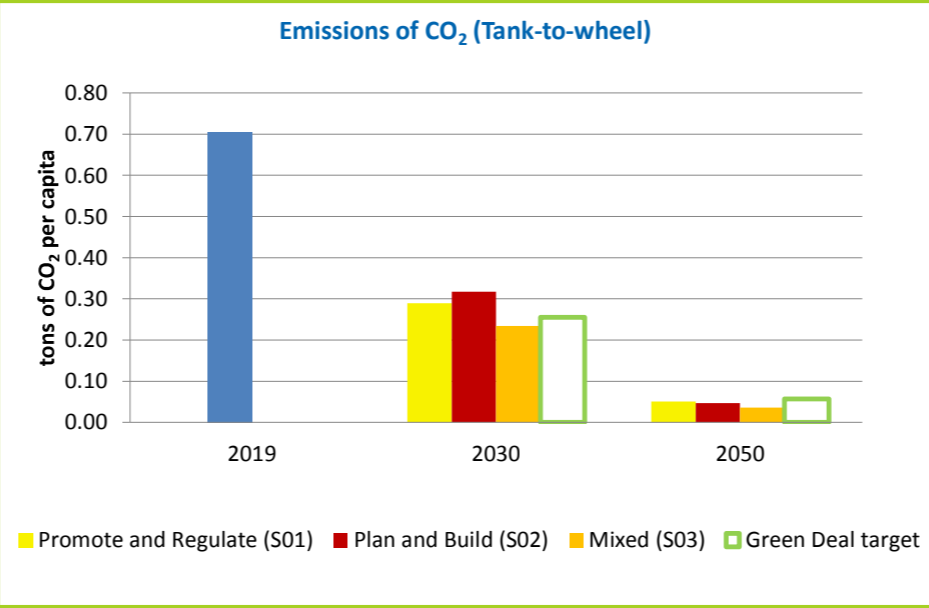
Medium City - Southern Europe

EMISSIONS OF CO₂ (TANK-TO-WHEEL), CAR OWNERSHIP, FATALITIES

Emissions of CO ₂ (Tank-to-wheel) [t CO ₂ eq / capita per year]			
Scenario	2019	2030	2050
Promote and Regulate (S01)	0.706	0.289	0.050
Plan and Build (S02)	0.706	0.318	0.047
Mixed (S03)	0.706	0.234	0.036
Green Deal target		0.254	0.056

Car ownership level [cars / 1000 inhab.]			
Scenario	2019	2030	2050
Promote and Regulate (S01)	655	588	579
Plan and Build (S02)	655	588	529
Mixed (S03)	655	472	416

Urban Fatalities [fatalities / 100,000 inhab.]			
Scenario	2019	2030	2050
Promote and Regulate (S01)	3.985	2.389	2.128
Plan and Build (S02)	3.985	2.956	2.003
Mixed (S03)	3.985	1.671	1.385



KEY INDICATORS

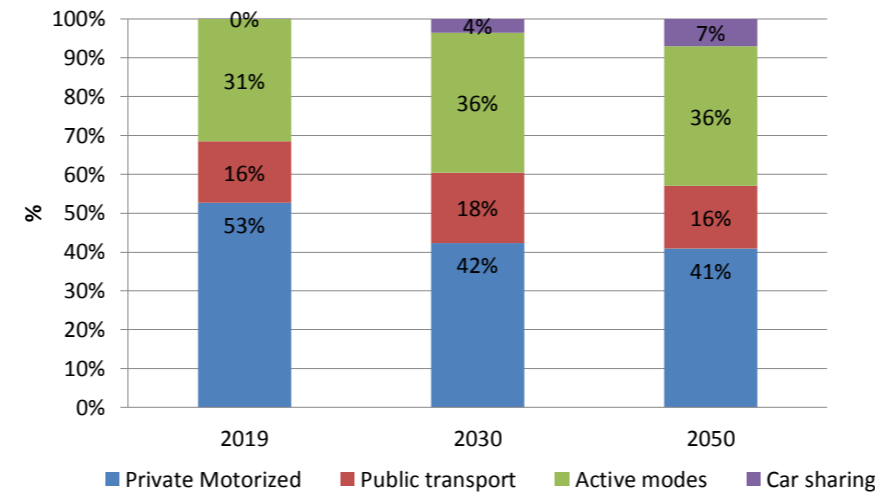
Medium City - Southern Europe

MODAL SPLIT

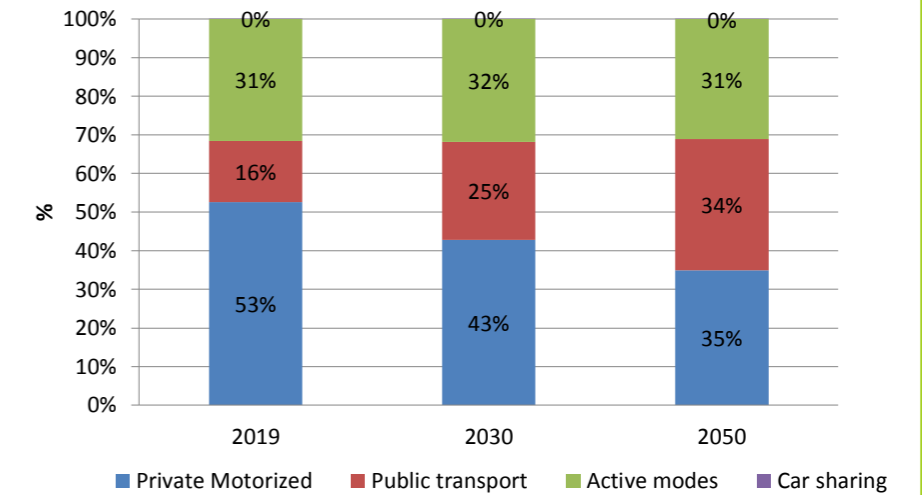
Aggregate mode split [%]

Scenario	Mode	2019	2030	2050
Promote and Regulate (S01)	Private Motorized	53%	42%	41%
Promote and Regulate (S01)	Public transport	16%	18%	16%
Promote and Regulate (S01)	Active modes	31%	36%	36%
Promote and Regulate (S01)	Car sharing	0%	4%	7%
Plan and Build (S02)	Private Motorized	53%	43%	35%
Plan and Build (S02)	Public transport	16%	25%	34%
Plan and Build (S02)	Active modes	31%	32%	31%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Private Motorized	53%	27%	21%
Mixed (S03)	Public transport	16%	30%	28%
Mixed (S03)	Active modes	31%	38%	38%
Mixed (S03)	Car sharing	0%	5%	13%

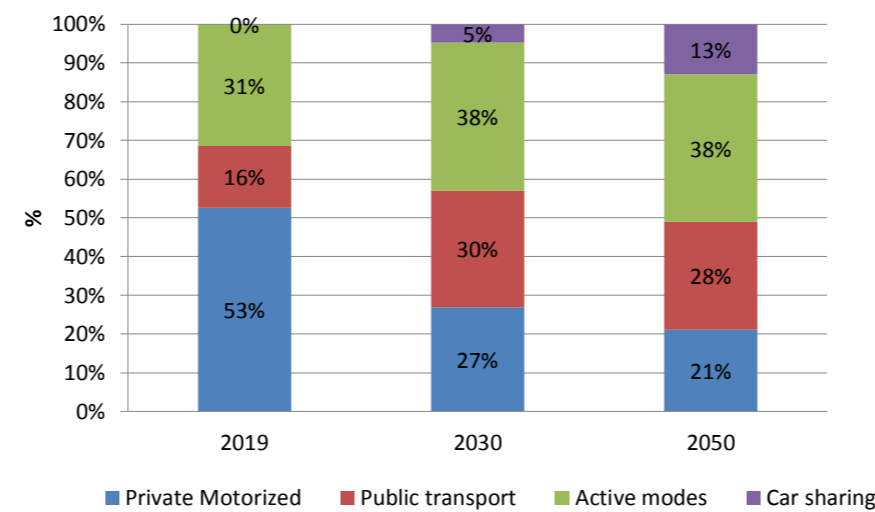
Modal Split: Promote and Regulate (S01)



Modal Split: Plan and Build (S02)



Modal Split: Mixed (S03)



KEY INDICATORS

Medium City - Southern Europe

ECONOMIC OUTPUTS (discounted, cumulated from 2019)*

City total revenues [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	77	231
Plan and Build (S02)	0	49	193
Mixed (S03)	0	159	477

City total costs [mio euro]

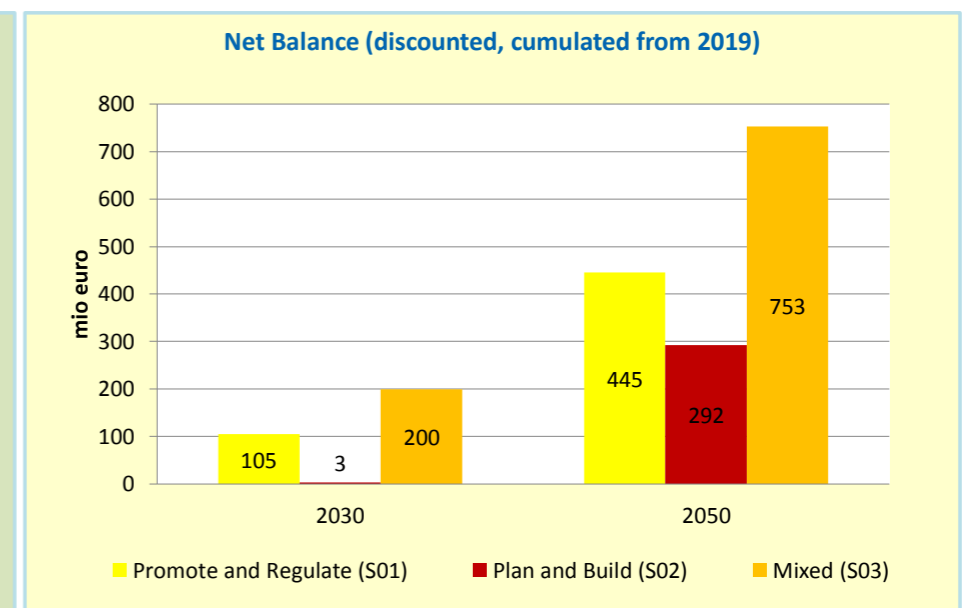
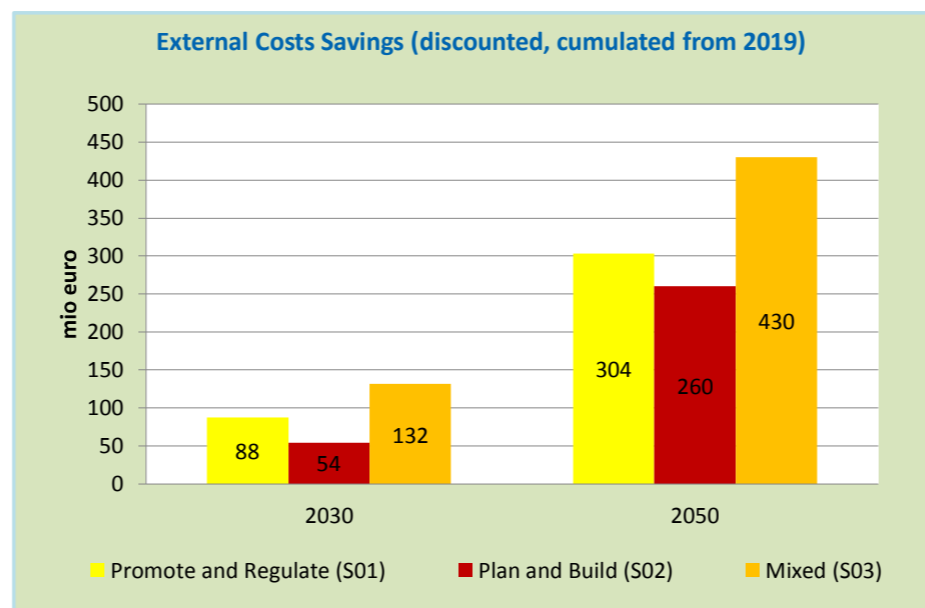
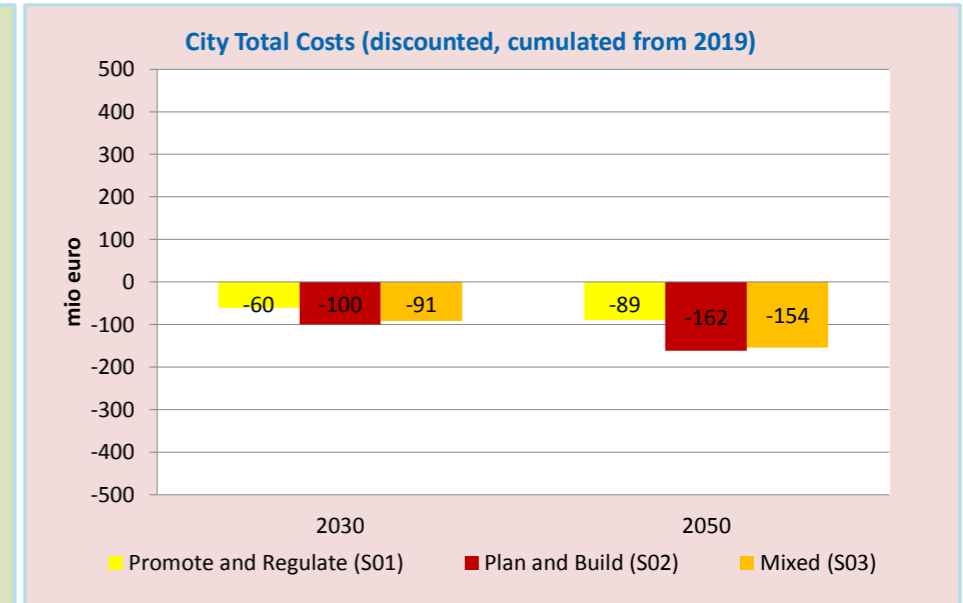
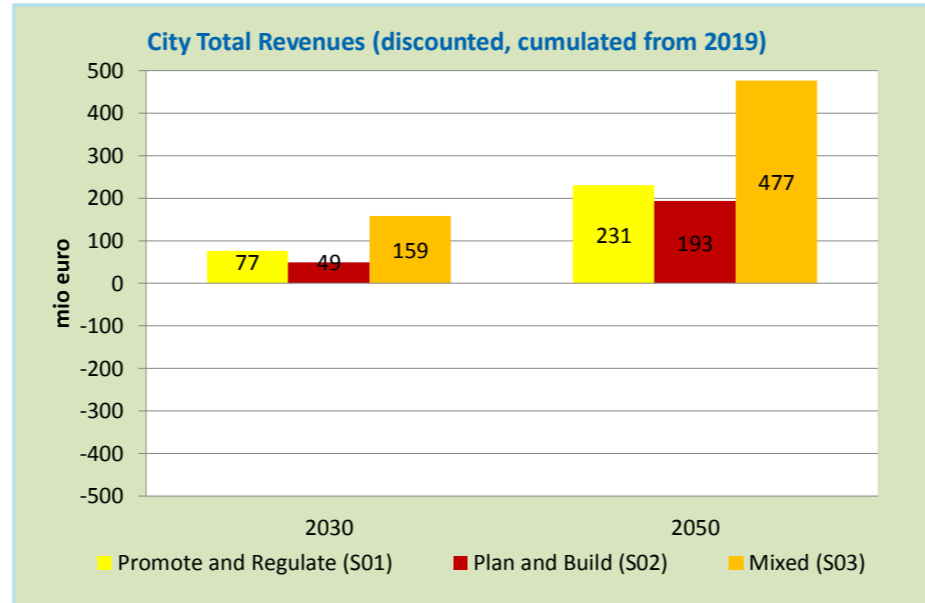
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	60	89
Plan and Build (S02)	0	100	162
Mixed (S03)	0	91	154

External costs savings [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	88	304
Plan and Build (S02)	0	54	260
Mixed (S03)	0	132	430

Net balance [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	105	445
Plan and Build (S02)	0	3	292
Mixed (S03)	0	200	753



* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Medium City - Southern Europe

ECONOMIC OUTPUTS PER CAPITA (discounted, cumulated from 2019)*

City total revenues [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	320	955
Plan and Build (S02)	0	202	801
Mixed (S03)	0	659	1,973

City total costs [euro / capita]

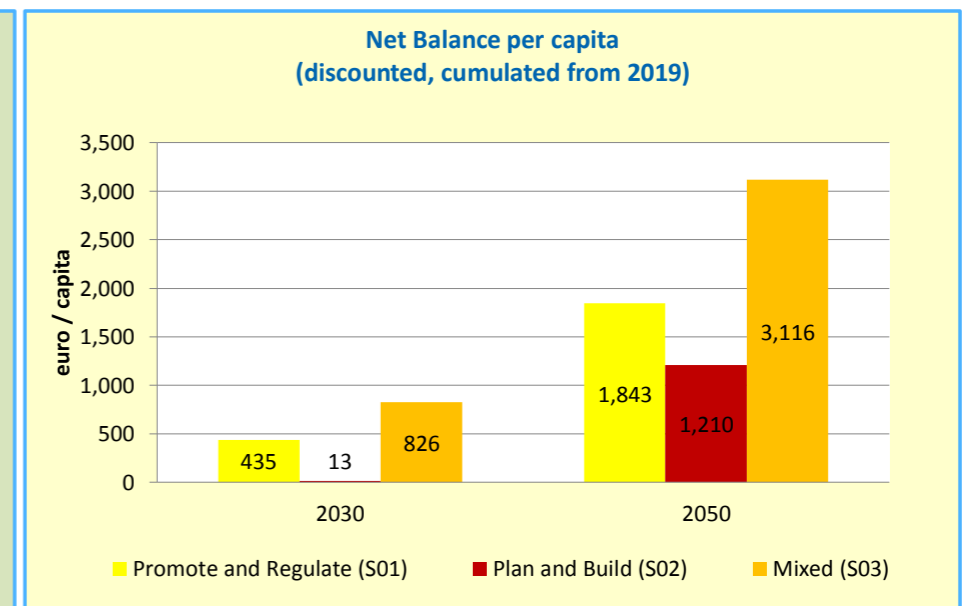
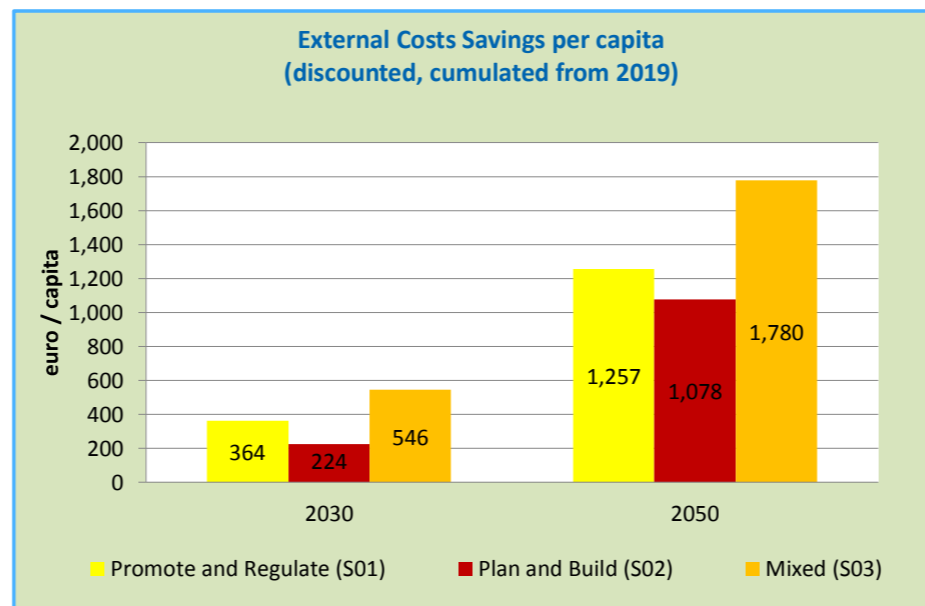
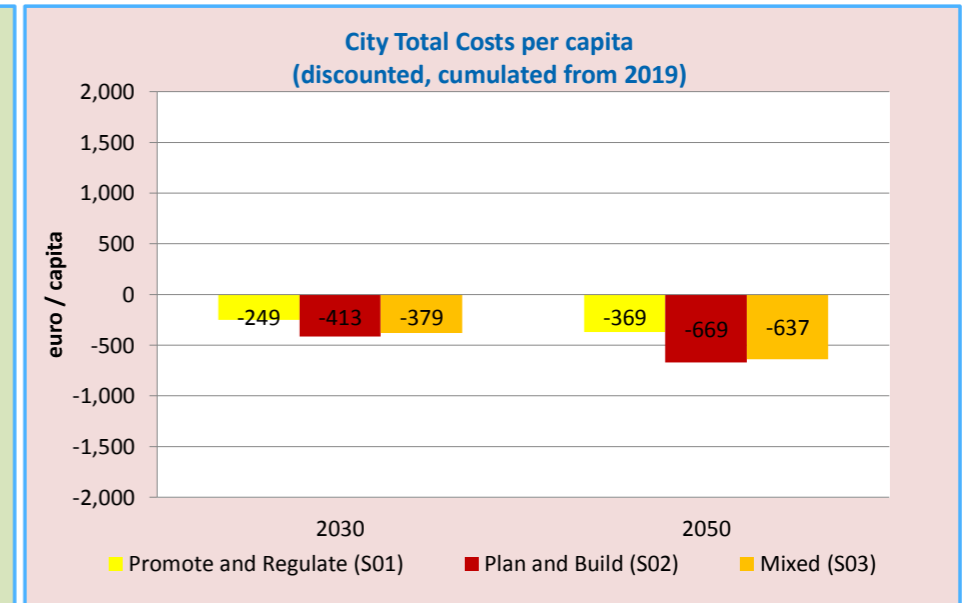
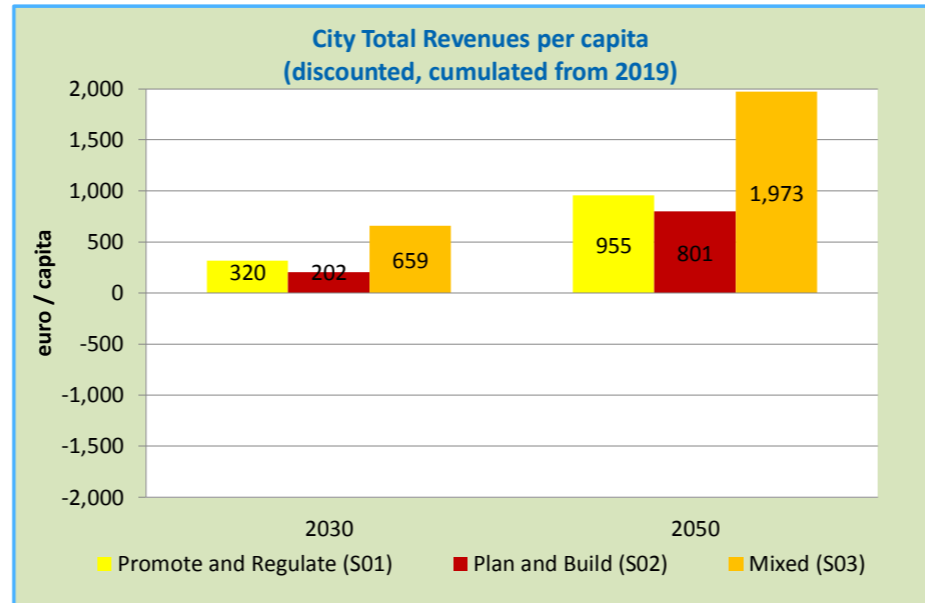
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	249	369
Plan and Build (S02)	0	413	669
Mixed (S03)	0	379	637

External costs savings [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	364	1,257
Plan and Build (S02)	0	224	1,078
Mixed (S03)	0	546	1,780

Net balance [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	435	1,843
Plan and Build (S02)	0	13	1,210
Mixed (S03)	0	826	3,116



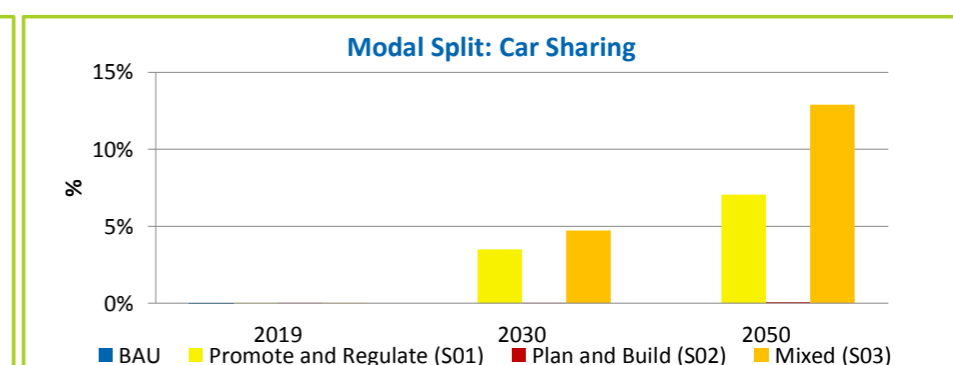
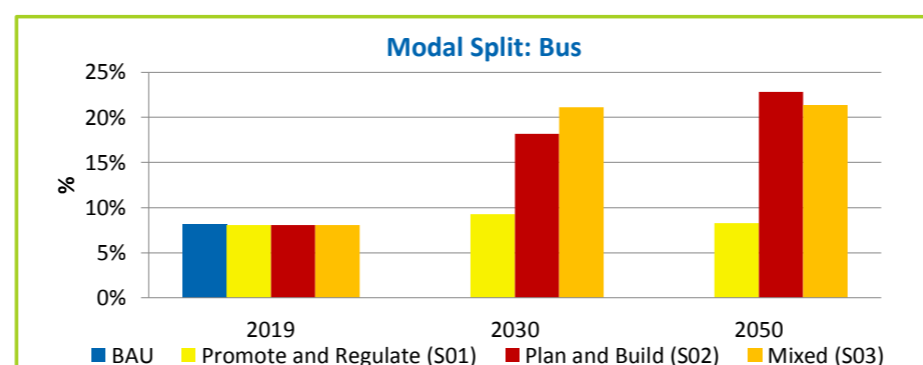
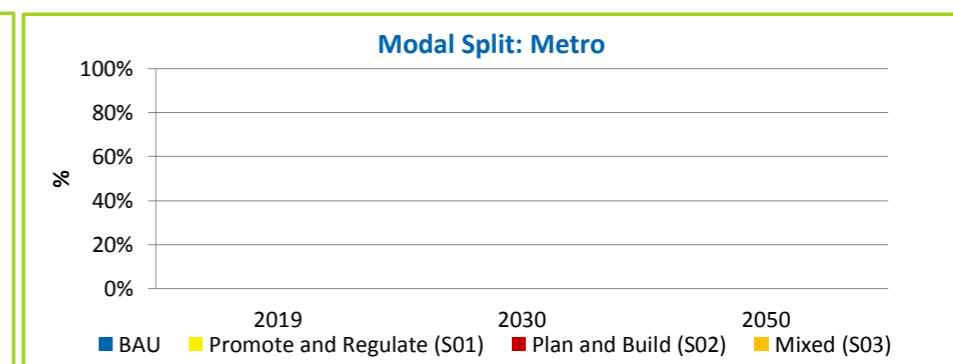
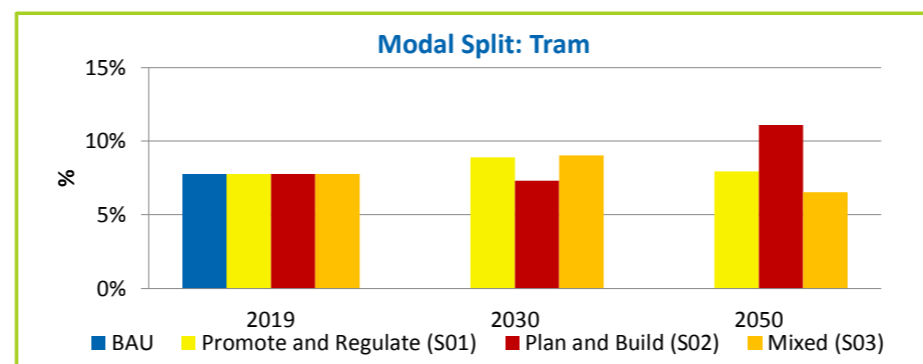
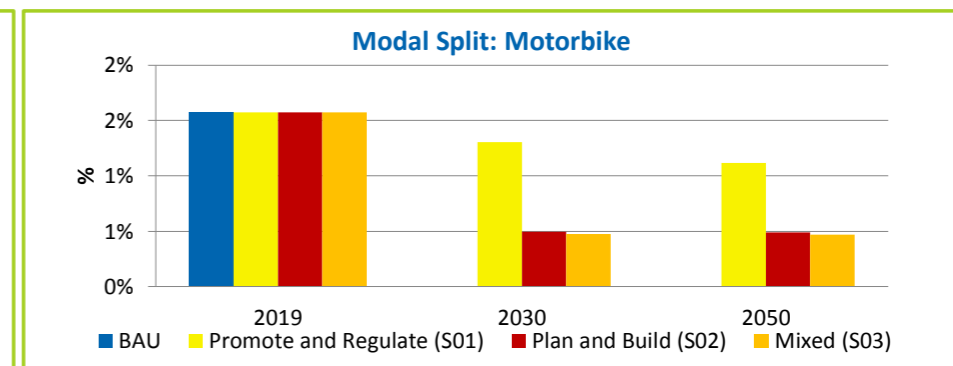
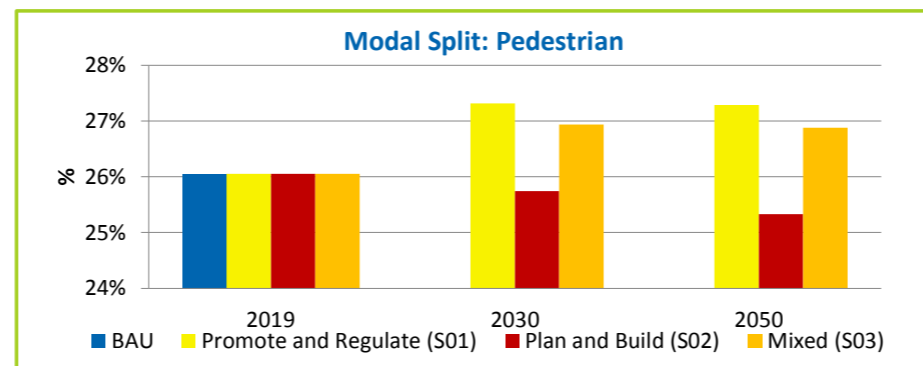
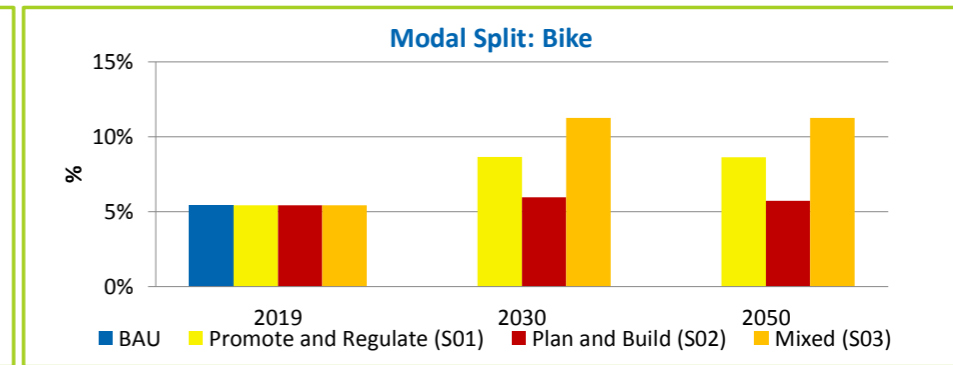
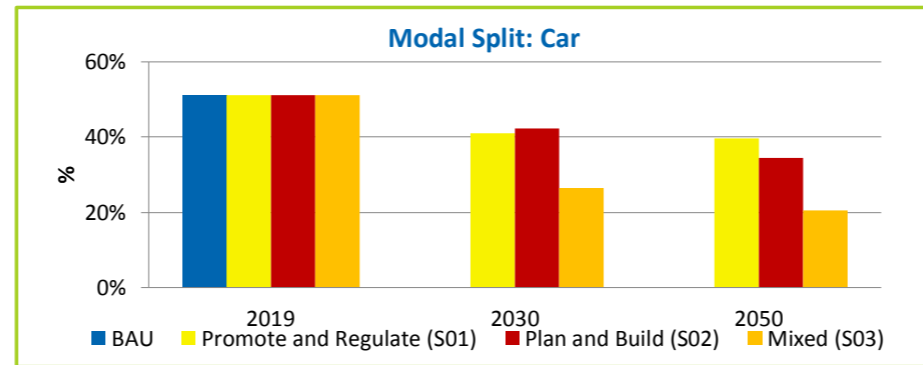
* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Medium City - Southern Europe

TRANSPORT AND MOBILITY INDICATORS

Mode split [%]					
Scenario	Mode	2019	2030	2050	
BAU	Pedestrian	26%			
BAU	Bike	5%			
BAU	Motorbike	2%			
BAU	Car	51%			
BAU	Bus	8%			
BAU	Tram	8%			
BAU	Metro	0%			
BAU	Car sharing	0%			
Promote and Regulate (S01)	Pedestrian	26%	27%	27%	
Promote and Regulate (S01)	Bike	5%	9%	9%	
Promote and Regulate (S01)	Motorbike	2%	1%	1%	
Promote and Regulate (S01)	Car	51%	41%	40%	
Promote and Regulate (S01)	Bus	8%	9%	8%	
Promote and Regulate (S01)	Tram	8%	9%	8%	
Promote and Regulate (S01)	Metro	0%	0%	0%	
Promote and Regulate (S01)	Car sharing	0%	4%	7%	
Plan and Build (S02)	Pedestrian	26%	26%	25%	
Plan and Build (S02)	Bike	5%	6%	6%	
Plan and Build (S02)	Motorbike	2%	0%	0%	
Plan and Build (S02)	Car	51%	42%	34%	
Plan and Build (S02)	Bus	8%	18%	23%	
Plan and Build (S02)	Tram	8%	7%	11%	
Plan and Build (S02)	Metro	0%	0%	0%	
Plan and Build (S02)	Car sharing	0%	0%	0%	
Mixed (S03)	Pedestrian	26%	27%	27%	
Mixed (S03)	Bike	5%	11%	11%	
Mixed (S03)	Motorbike	2%	0%	0%	
Mixed (S03)	Car	51%	26%	21%	
Mixed (S03)	Bus	8%	21%	21%	
Mixed (S03)	Tram	8%	9%	7%	
Mixed (S03)	Metro	0%	0%	0%	
Mixed (S03)	Car sharing	0%	5%	13%	



ALL INDICATORS

Medium City - Southern Europe

TRANSPORT AND MOBILITY INDICATORS

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
BAU	655		
Promote and Regulate (S01)	655	588	579
Plan and Build (S02)	655	588	529
Mixed (S03)	655	472	416

Congestion and delays index (SUMI)

Scenario	2019	2030	2050
BAU	9.51		
Promote and Regulate (S01)	9.51	9.80	9.81
Plan and Build (S02)	9.51	9.70	9.90
Mixed (S03)	9.51	10.00	10.00

Public transport occupancy levels [pass/vehicle]

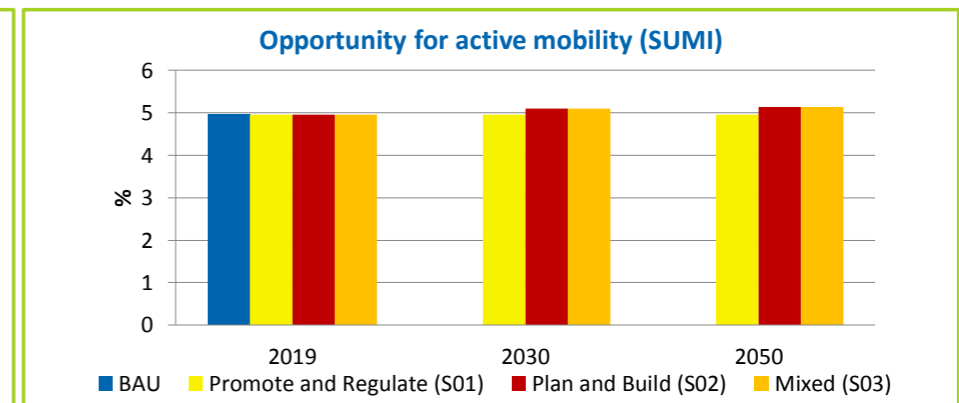
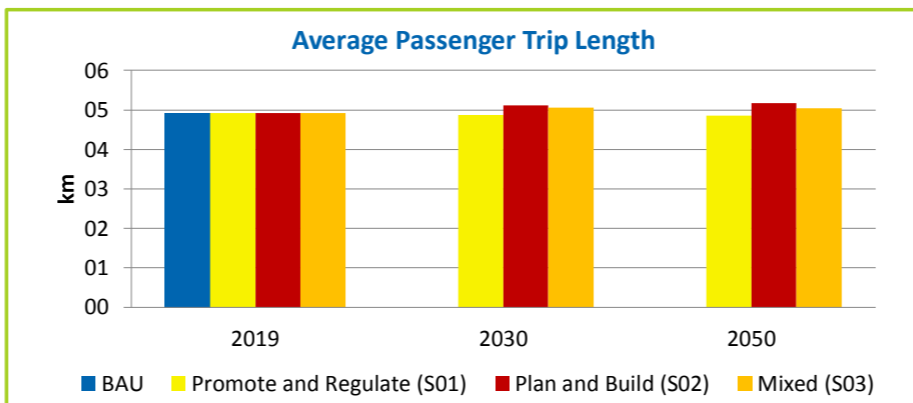
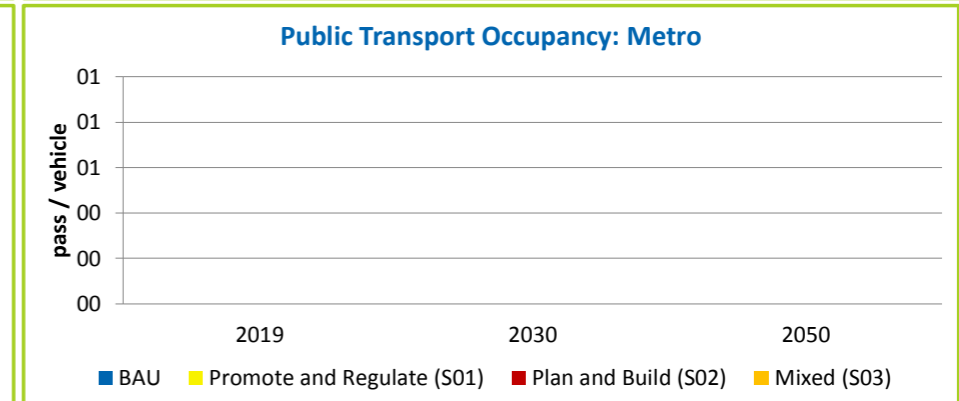
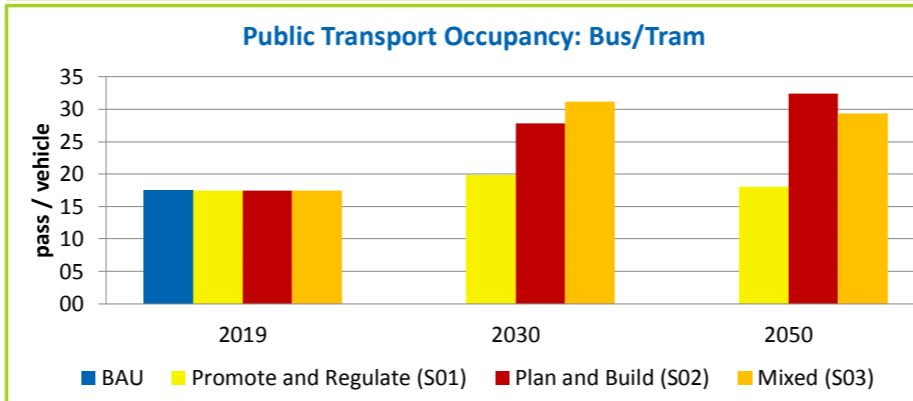
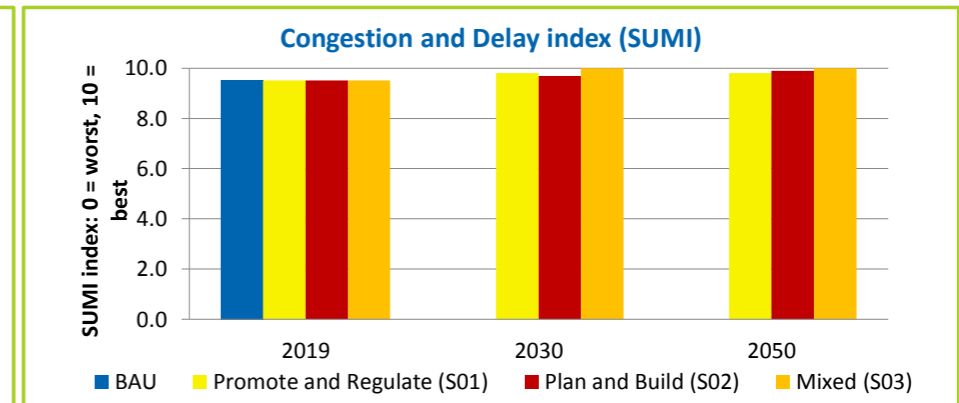
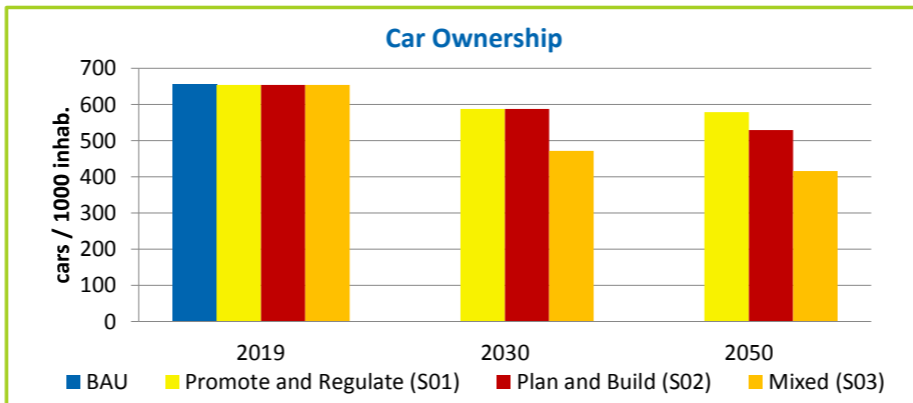
Scenario	PT mode	2019	2030	2050
BAU	Bus/tram	17.4		
BAU	Metro	0.0		
Promote and Regulate (S01)	Bus/tram	17.4	19.9	18.0
Promote and Regulate (S01)	Metro	0.0	0.0	0.0
Plan and Build (S02)	Bus/tram	17.4	27.8	32.4
Plan and Build (S02)	Metro	0.0	0.0	0.0
Mixed (S03)	Bus/tram	17.45	31.17	29.38
Mixed (S03)	Metro	0.00	0.00	0.00

Average passenger trip length [km]

Scenario	2019	2030	2050
BAU	4.9		
Promote and Regulate (S01)	4.9	4.9	4.9
Plan and Build (S02)	4.9	5.1	5.2
Mixed (S03)	4.9	5.1	5.0

Opportunity for active mobility (SUMI) [%]

Scenario	2019	2030	2050
BAU	4.97		
Promote and Regulate (S01)	4.97	4.97	4.97
Plan and Build (S02)	4.97	5.10	5.14
Mixed (S03)	4.97	5.10	5.14



ALL INDICATORS

Medium City - Southern Europe

TRANSPORT AND MOBILITY INDICATORS

Penetration of alternatively fuelled car vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	Hybrid electric	0%		
BAU	Battery electric	0%		
BAU	fuel cells	0%		
Scenarios	Hybrid electric	0%	1%	10%
Scenarios	Battery electric	0%	39%	52%
Scenarios	fuel cells	0%	0%	25%

Penetration of alternatively fuelled bus vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	CNG	4%		
BAU	Hybrid electric	0.0%		
BAU	Battery electric	0.3%		
Scenarios	CNG	4%	6%	7%
Scenarios	Hybrid electric	0%	0%	0%
Scenarios	Battery electric	0%	46%	51%

Vehicles-km by mode: cars and car-sharing cars [million vkm/year]

Scenario	2019	2030	2050
BAU	348		
Promote and Regulate (S01)	348	296	309
Plan and Build (S02)	348	300	259
Mixed (S03)	348	203	223

Vehicles-km by mode: trucks [million vkm/year]

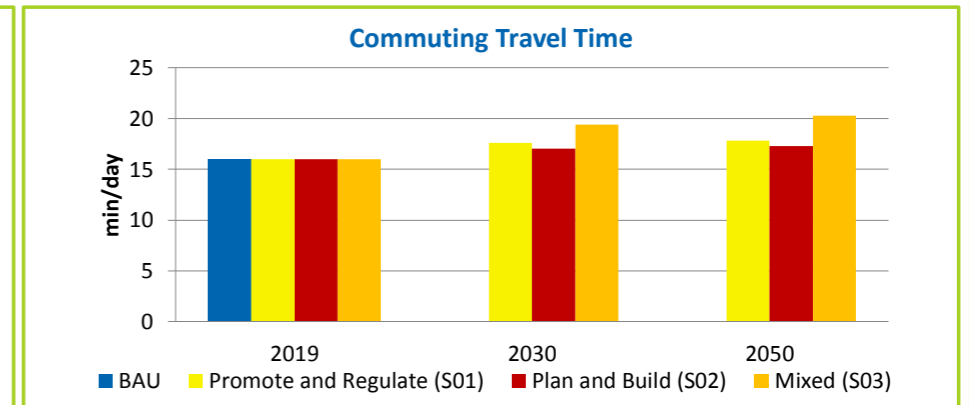
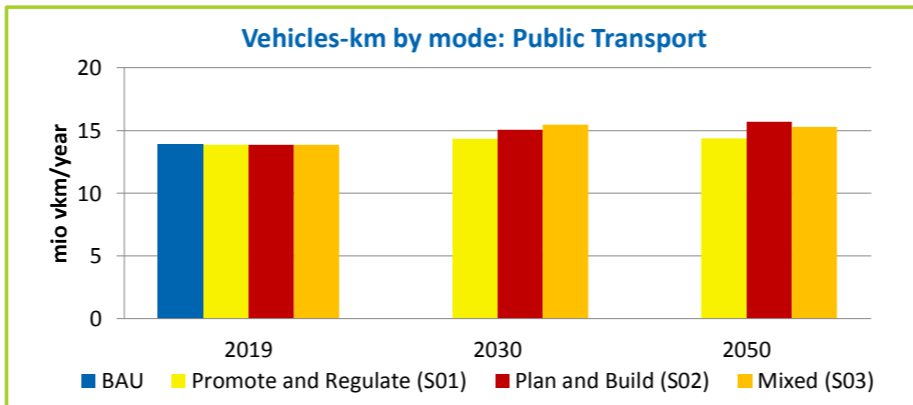
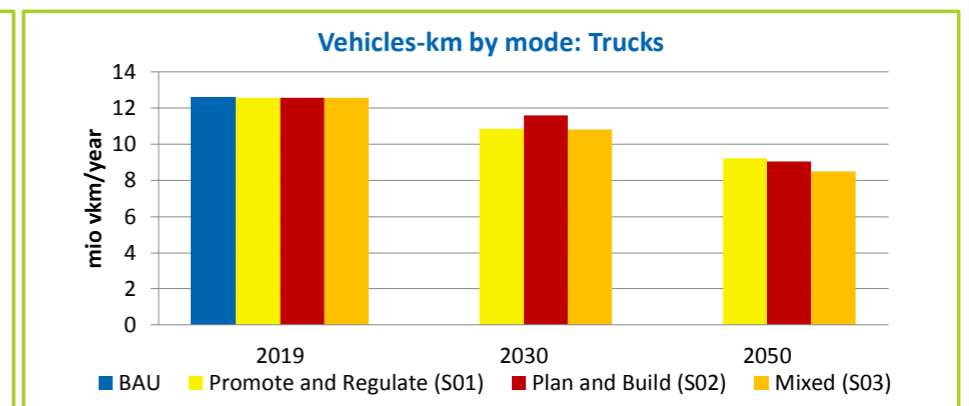
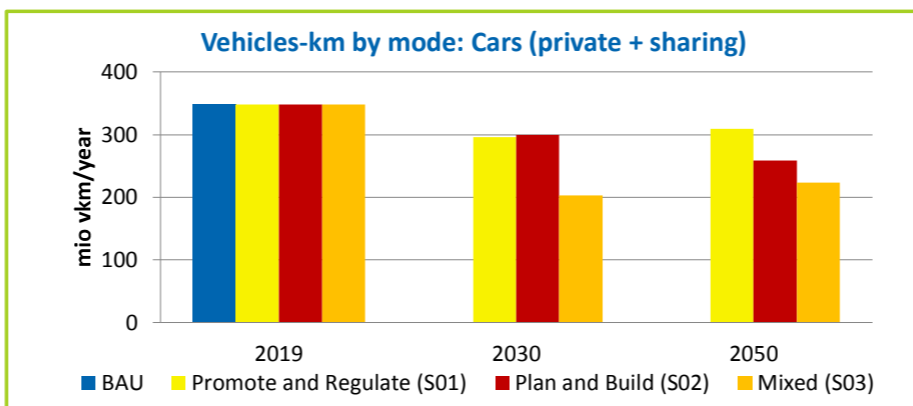
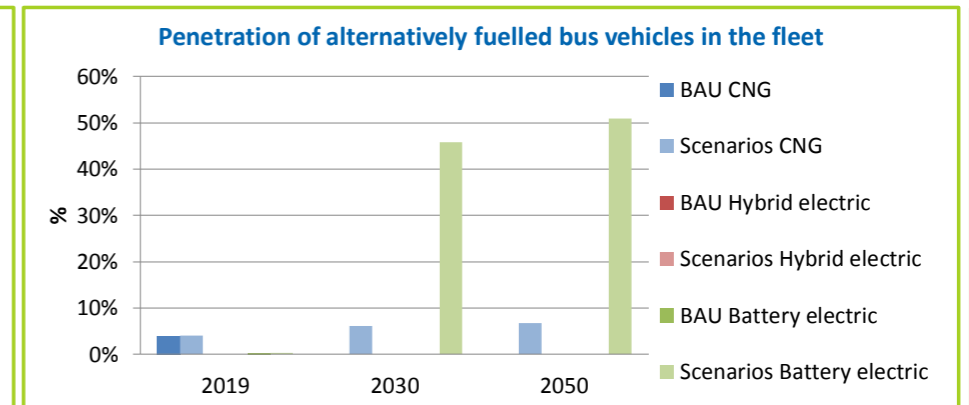
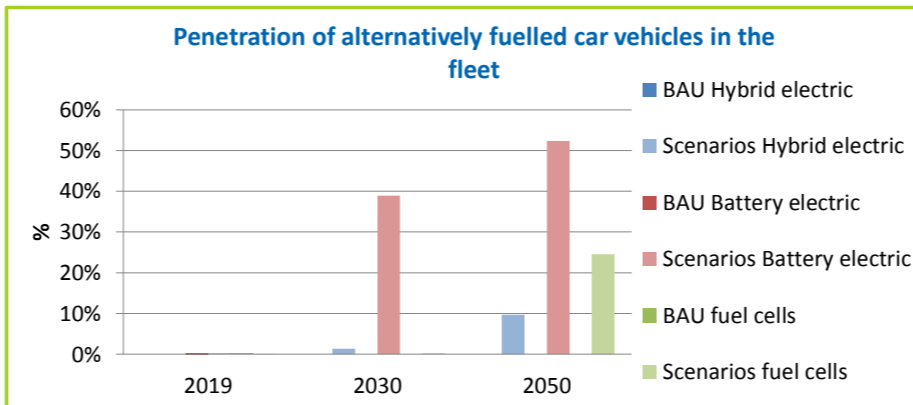
Scenario	2019	2030	2050
BAU	12.6		
Promote and Regulate (S01)	12.6	10.9	9.2
Plan and Build (S02)	12.6	11.6	9.1
Mixed (S03)	12.6	10.8	8.5

Vehicles-km by mode: Public Transport [million vkm/year]

Scenario	2019	2030	2050
BAU	13.9		
Promote and Regulate (S01)	13.9	14.3	14.4
Plan and Build (S02)	13.9	15.1	15.7
Mixed (S03)	13.9	15.4	15.3

Commuting travel time (SUMI) [min/day]

Scenario	2019	2030	2050
BAU	16.0		
Promote and Regulate (S01)	16.0	17.6	17.8
Plan and Build (S02)	16.0	17.0	17.3
Mixed (S03)	16.0	19.4	20.3



ALL INDICATORS

Medium City - Southern Europe

ENVIRONMENT AND SAFETY INDICATORS

Air pollutant emissions (SUMI: PM2.5, Nox) [kg PM2.5 eq/capita]

Scenario	2019	2030	2050
BAU	0.9		
Promote and regulate (S01)	0.9	0.4	0.1
Plan and Build (S02)	0.9	0.4	0.1
Mixed (S03)	0.9	0.3	0.1

Air pollutant emissions (CO, VOC) [kg / capita]

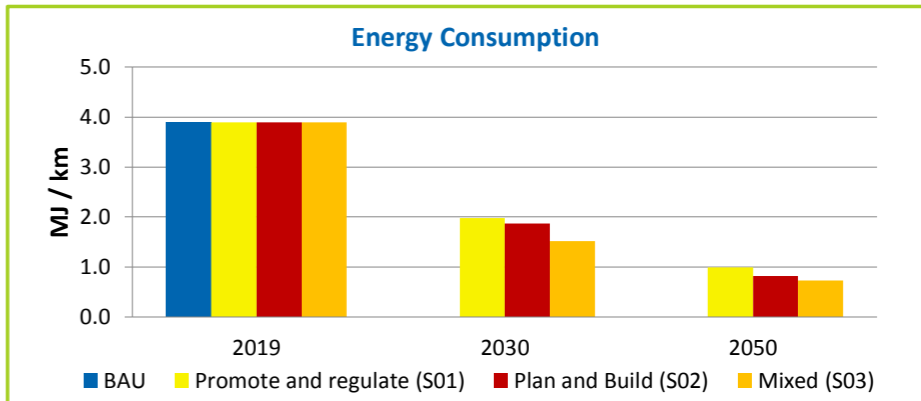
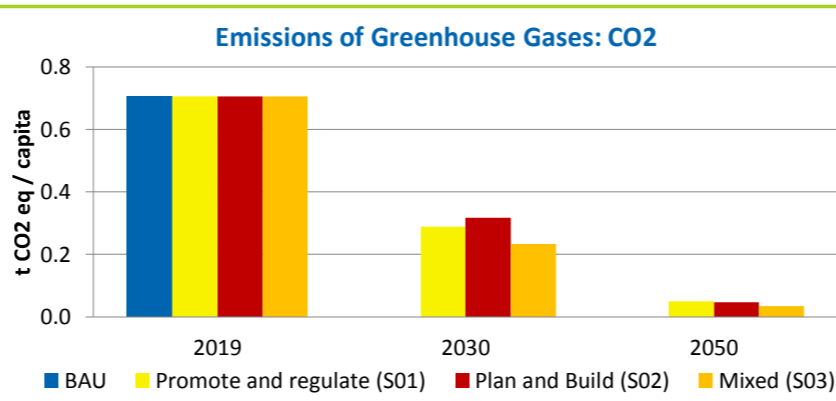
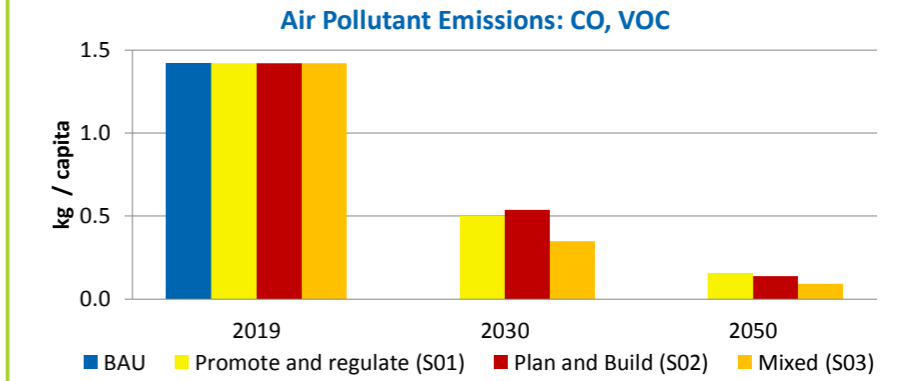
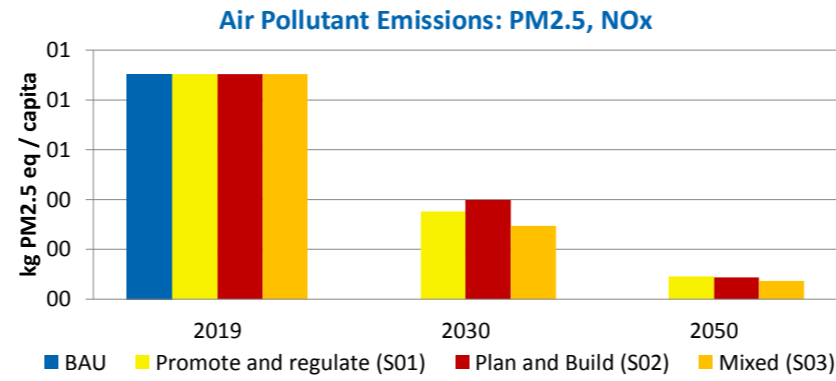
Scenario	2019	2030	2050
BAU	1		
Promote and regulate (S01)	1	1	0
Plan and Build (S02)	1.4	0.5	0.1
Mixed (S03)	1.4	0.3	0.1

Emissions of Greenhouse Gases [t CO2 eq / capita per year]

Scenario	2019	2030	2050
BAU	0.706		
Promote and regulate (S01)	0.706	0.289	0.050
Plan and Build (S02)	0.706	0.318	0.047
Mixed (S03)	0.706	0.234	0.036

Energy consumption [MJ / km]

Scenario	2019	2030	2050
BAU	3.9		
Promote and regulate (S01)	3.9	2.0	1.0
Plan and Build (S02)	3.9	1.9	0.8
Mixed (S03)	3.9	1.5	0.7



ALL INDICATORS

Medium City - Southern Europe

ENVIRONMENT AND SAFETY INDICATORS

Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	4.0		
Promote and regulate (S01)	4.0	2.4	2.1
Plan and Build (S02)	4.0	3.0	2.0
Mixed (S03)	4.0	1.7	1.4

Fatalities: active modes [fatalities / 100,000 inhab.]

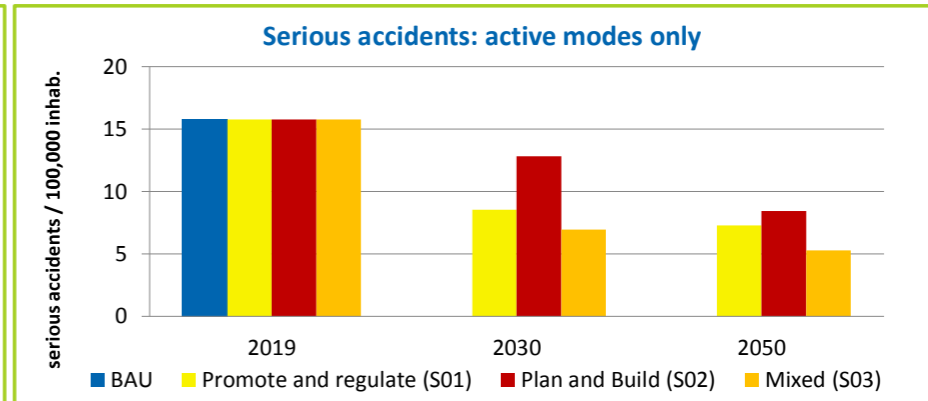
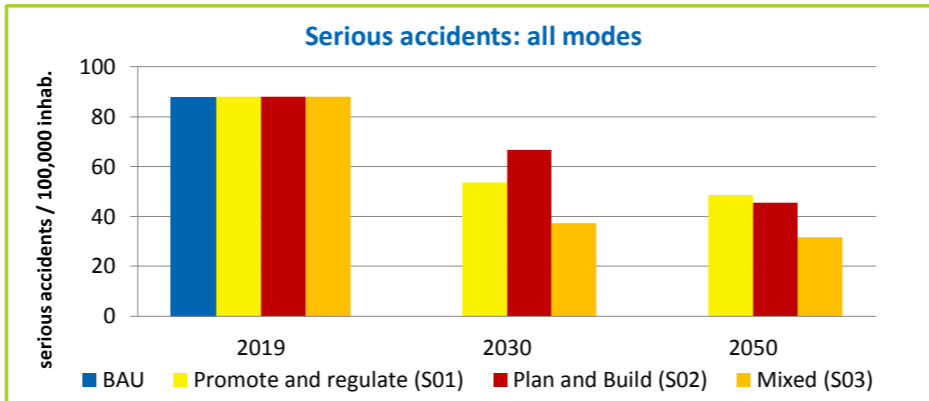
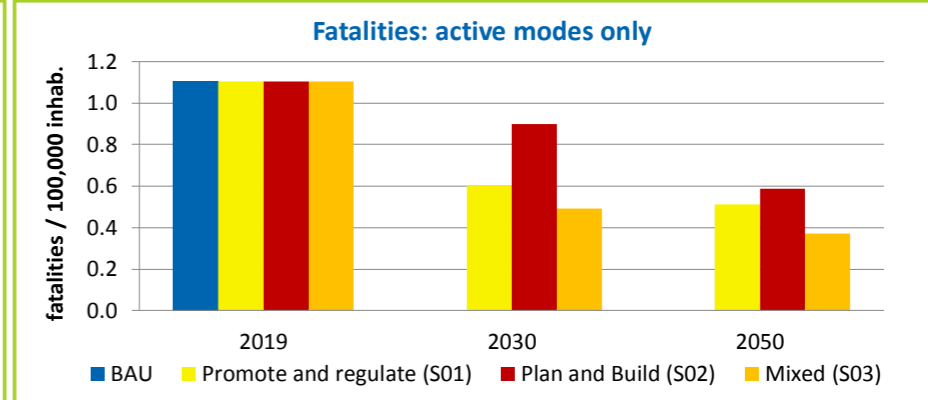
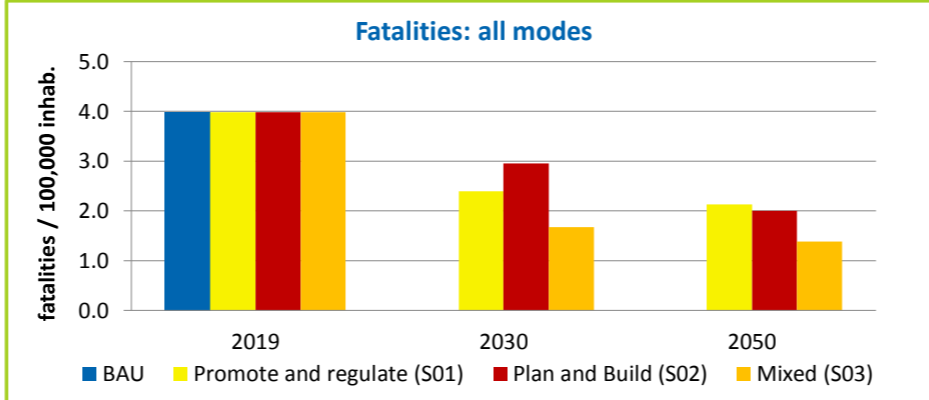
Scenario	2019	2030	2050
BAU	1.11		
Promote and regulate (S01)	1.11	0.60	0.51
Plan and Build (S02)	1.11	0.90	0.59
Mixed (S03)	1.11	0.49	0.37

Serious accidents [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	88		
Promote and regulate (S01)	88	54	49
Plan and Build (S02)	88	67	46
Mixed (S03)	88	37	32

Serious accidents: active modes [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	16		
Promote and regulate (S01)	16	9	7
Plan and Build (S02)	16	13	8
Mixed (S03)	16	7	5



ALL INDICATORS

Medium City - Central/Western Europe

EMISSIONS OF CO₂ (TANK-TO-WHEEL), CAR OWNERSHIP, FATALITIES

Emissions of CO₂ (Tank-to-wheel) [t CO₂ eq / capita per year]

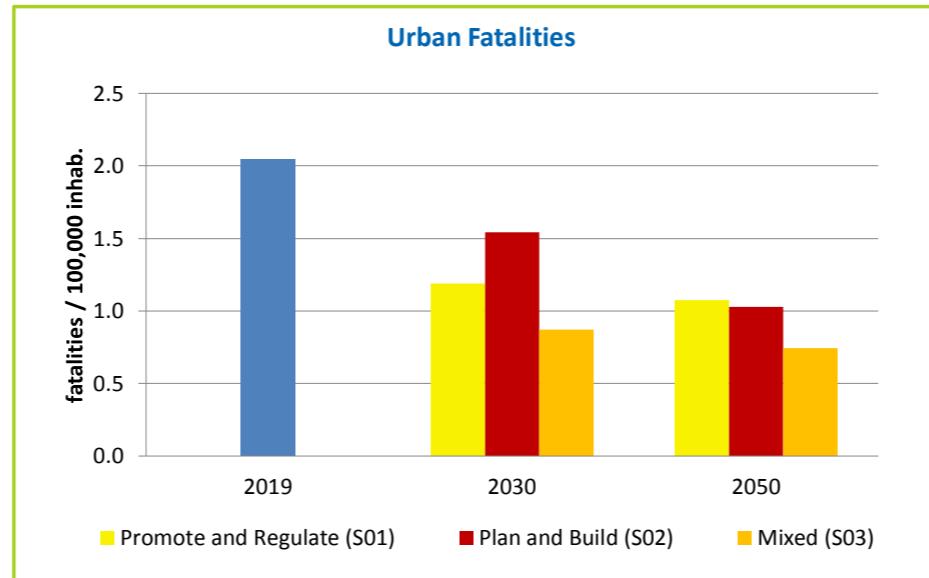
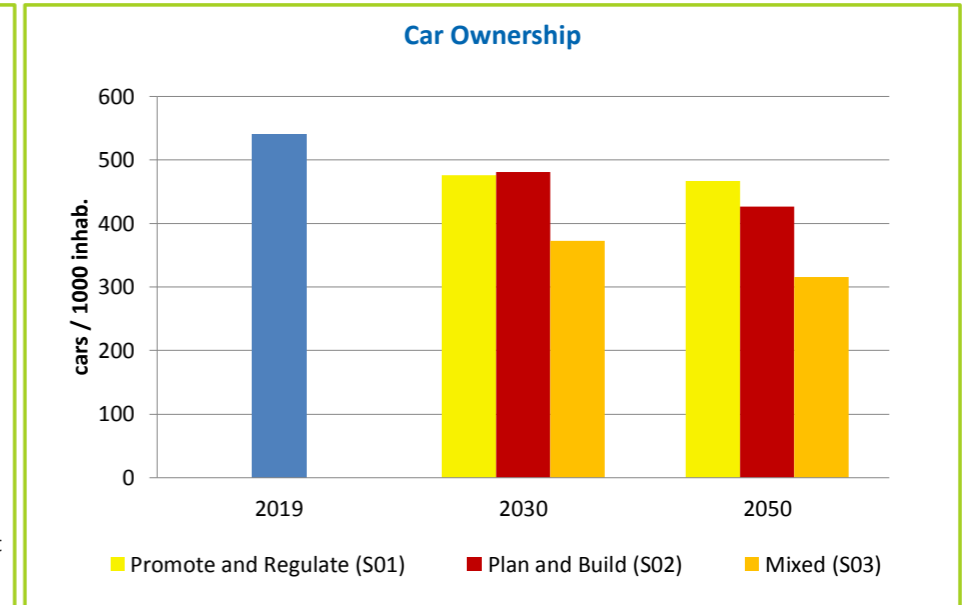
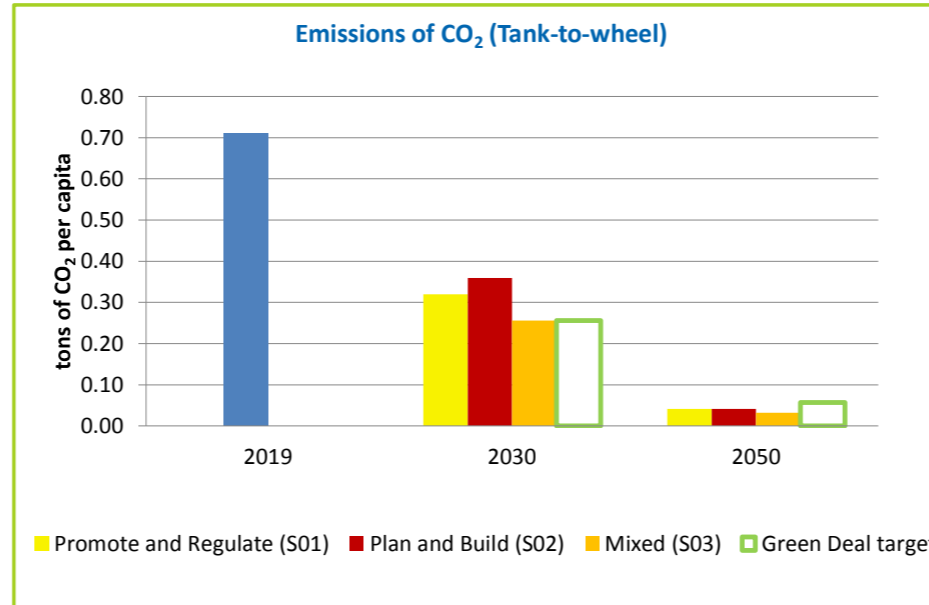
Scenario	2019	2030	2050
Promote and Regulate (S01)	0.710	0.319	0.042
Plan and Build (S02)	0.710	0.359	0.041
Mixed (S03)	0.710	0.255	0.032
Green Deal target		0.255	0.057

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	540	476	466
Plan and Build (S02)	540	481	427
Mixed (S03)	540	372	315

Urban Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	2.046	1.189	1.074
Plan and Build (S02)	2.046	1.541	1.027
Mixed (S03)	2.046	0.870	0.744



KEY INDICATORS

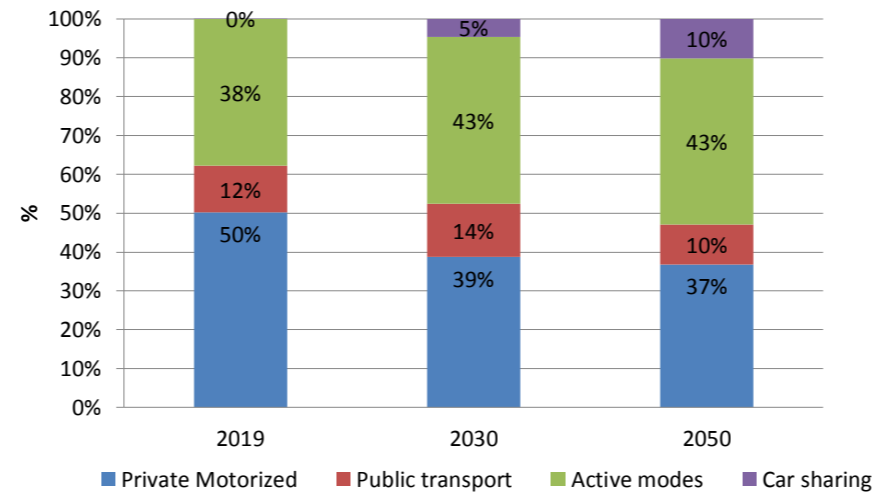
Medium City - Central/Western Europe

MODAL SPLIT

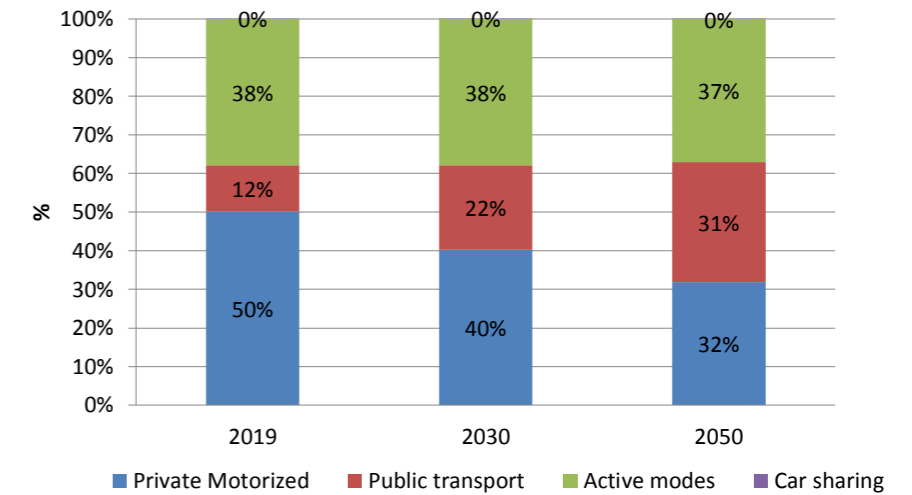
Aggregate mode split [%]

Scenario	Mode	2019	2030	2050
Promote and Regulate (S01)	Private Motorized	50%	39%	37%
Promote and Regulate (S01)	Public transport	12%	14%	10%
Promote and Regulate (S01)	Active modes	38%	43%	43%
Promote and Regulate (S01)	Car sharing	0%	5%	10%
Plan and Build (S02)	Private Motorized	50%	40%	32%
Plan and Build (S02)	Public transport	12%	22%	31%
Plan and Build (S02)	Active modes	38%	38%	37%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Private Motorized	50%	23%	17%
Mixed (S03)	Public transport	12%	26%	21%
Mixed (S03)	Active modes	38%	45%	45%
Mixed (S03)	Car sharing	0%	6%	17%

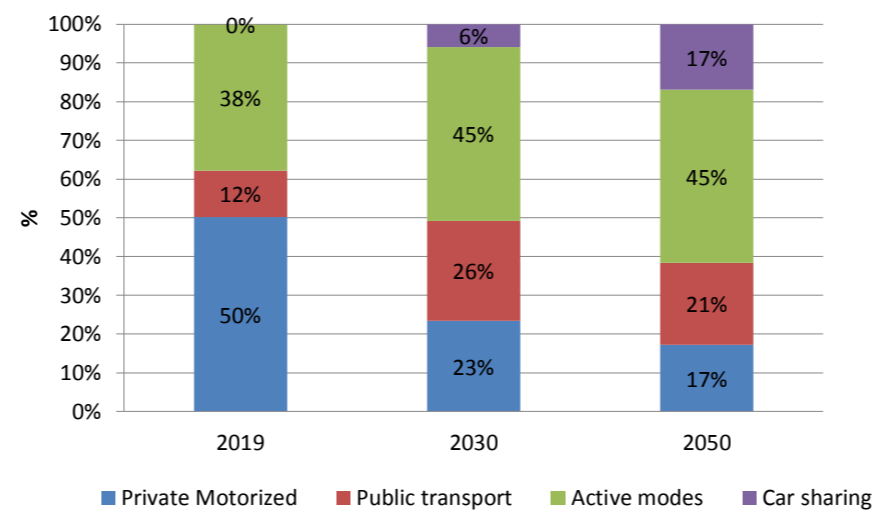
Modal Split: Promote and Regulate (S01)



Modal Split: Plan and Build (S02)



Modal Split: Mixed (S03)



KEY INDICATORS

Medium City - Central/Western Europe

ECONOMIC OUTPUTS (discounted, cumulated from 2019)*

City total revenues [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	253	798
Plan and Build (S02)	0	160	674
Mixed (S03)	0	507	1,581

City total costs [mio euro]

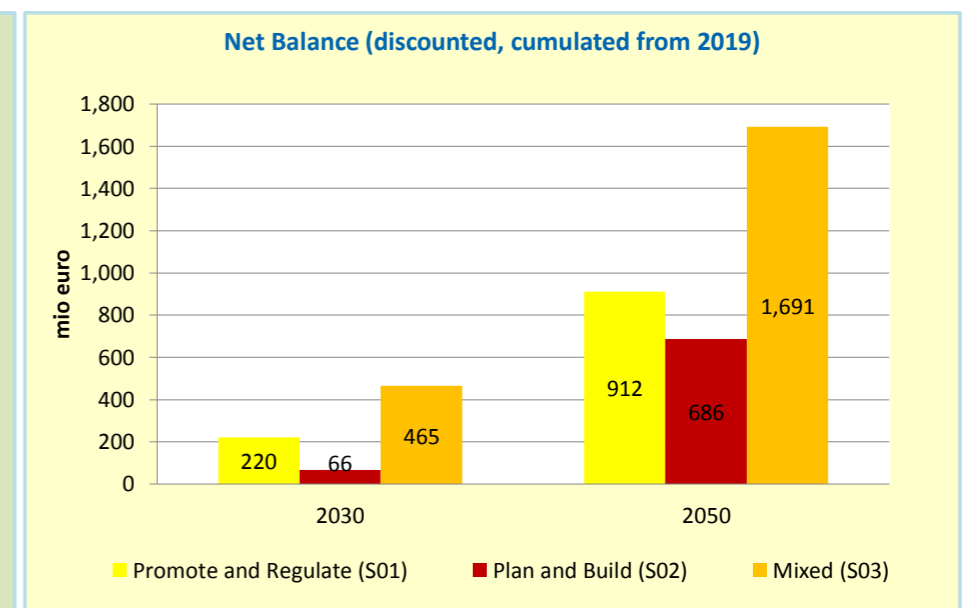
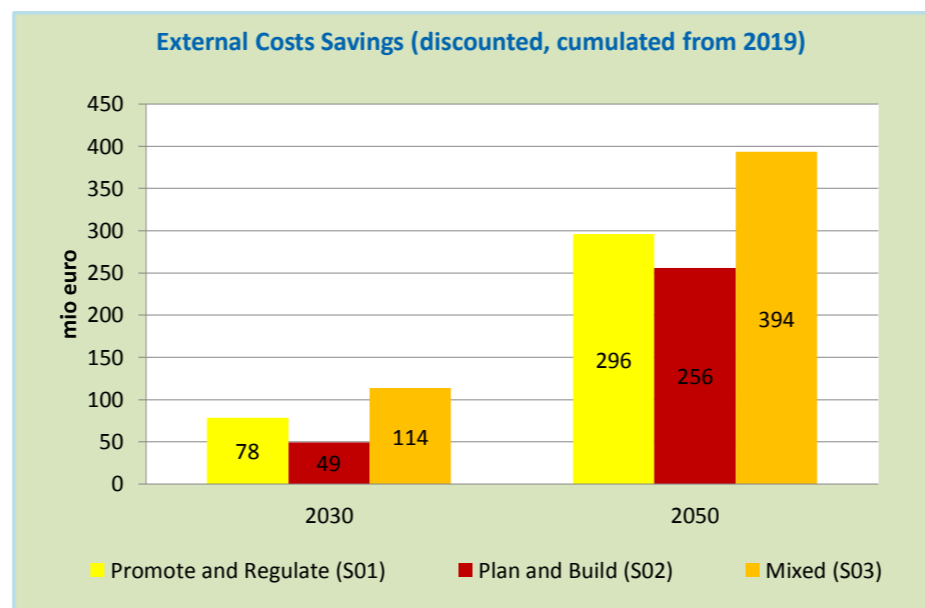
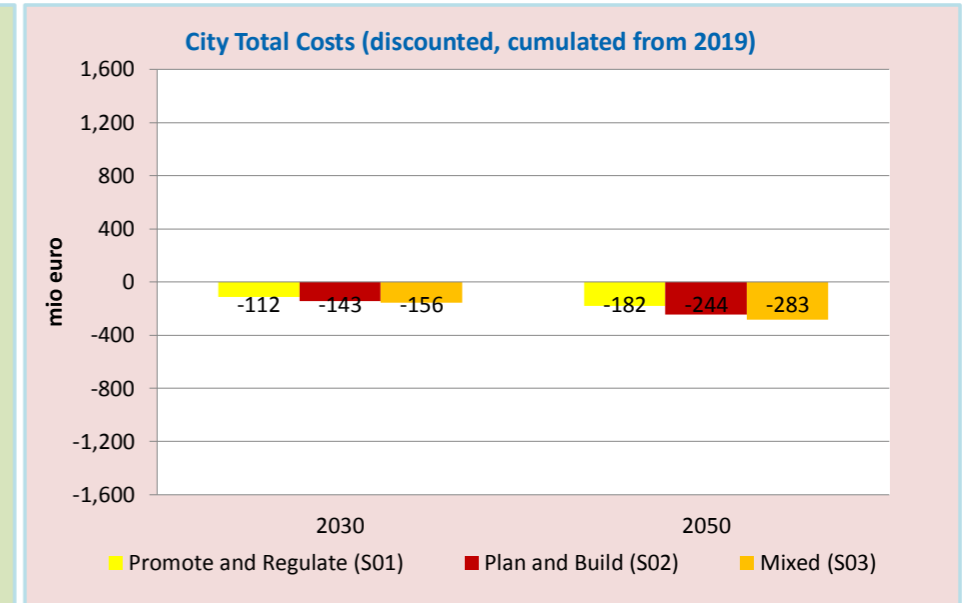
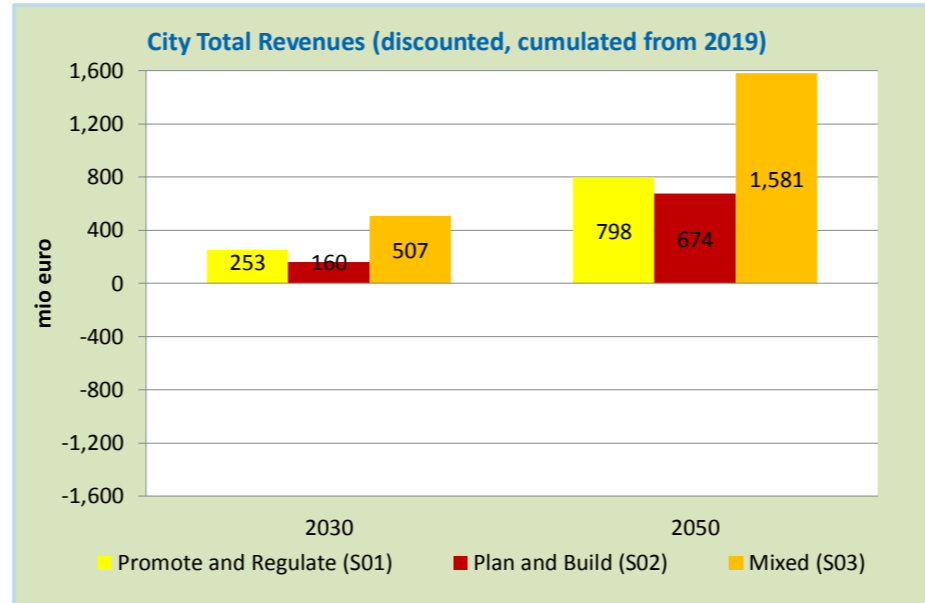
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	112	182
Plan and Build (S02)	0	143	244
Mixed (S03)	0	156	283

External costs savings [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	78	296
Plan and Build (S02)	0	49	256
Mixed (S03)	0	114	394

Net balance [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	220	912
Plan and Build (S02)	0	66	686
Mixed (S03)	0	465	1,691



* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Medium City - Central/Western Europe

ECONOMIC OUTPUTS PER CAPITA (discounted, cumulated from 2019)*

City total revenues [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	904	2,845
Plan and Build (S02)	0	571	2,402
Mixed (S03)	0	1,809	5,636

City total costs [euro / capita]

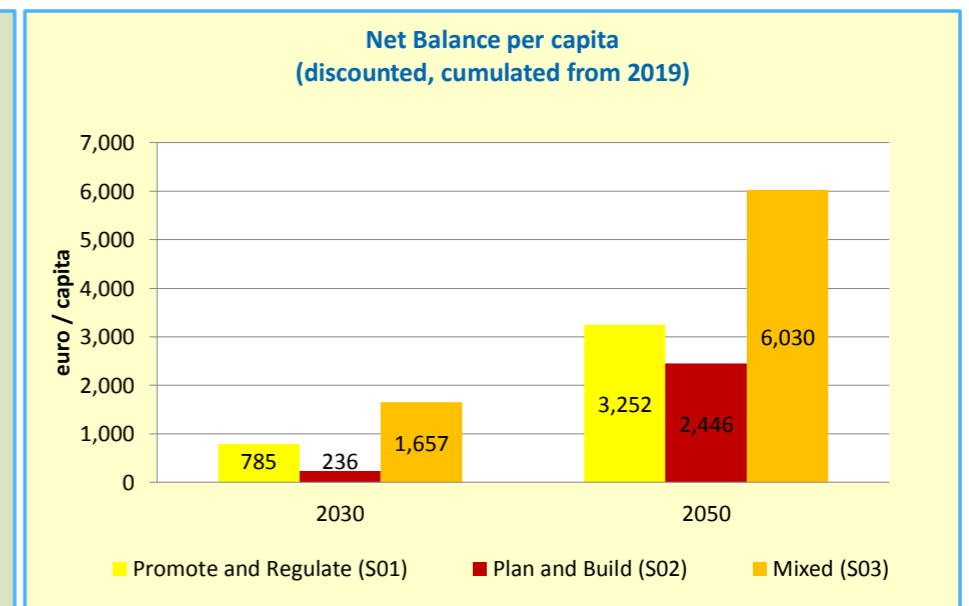
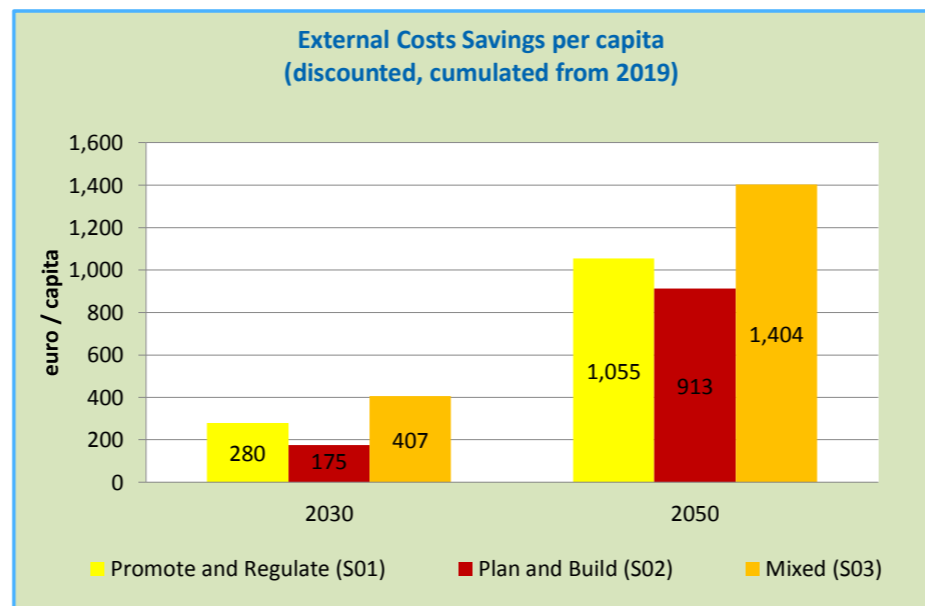
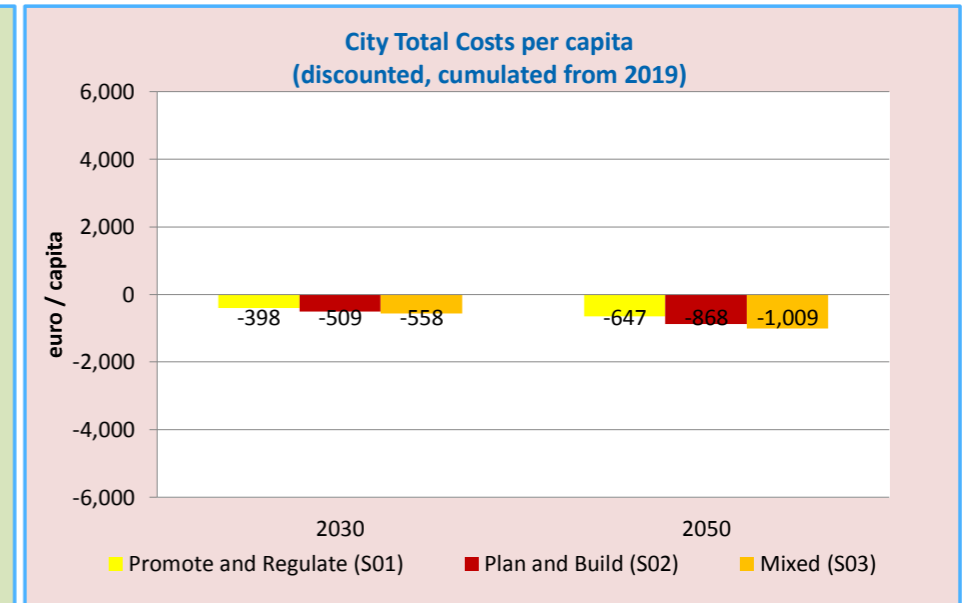
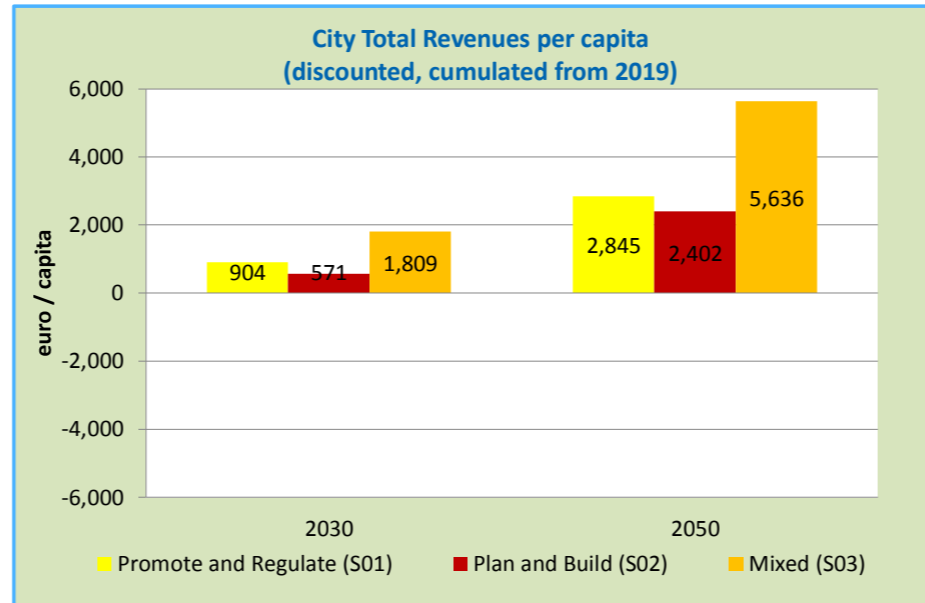
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	398	647
Plan and Build (S02)	0	509	868
Mixed (S03)	0	558	1,009

External costs savings [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	280	1,055
Plan and Build (S02)	0	175	913
Mixed (S03)	0	407	1,404

Net balance [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	785	3,252
Plan and Build (S02)	0	236	2,446
Mixed (S03)	0	1,657	6,030



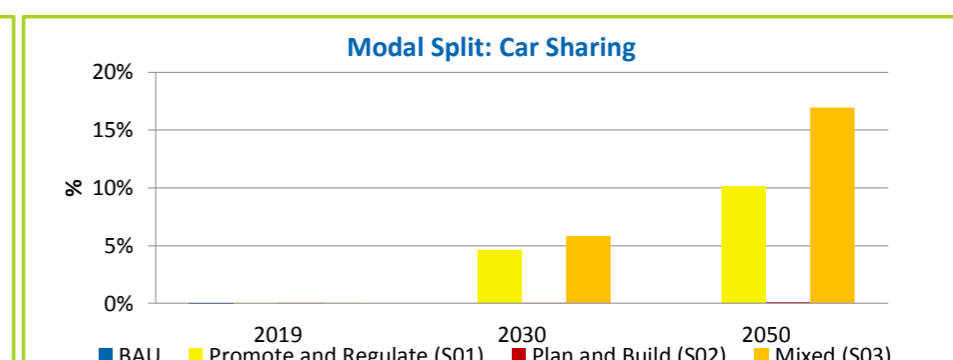
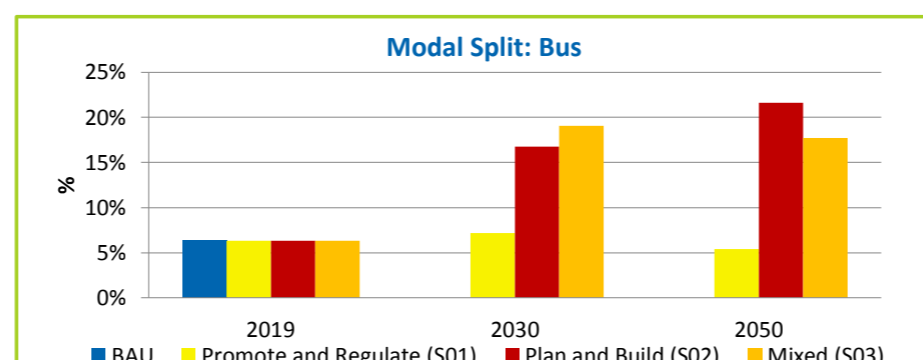
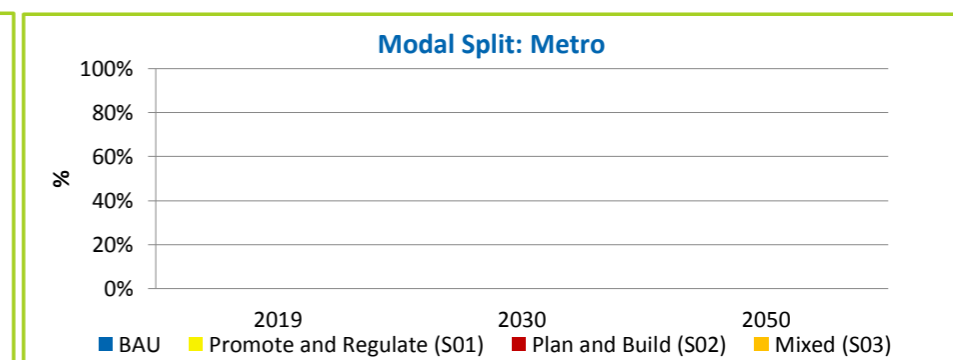
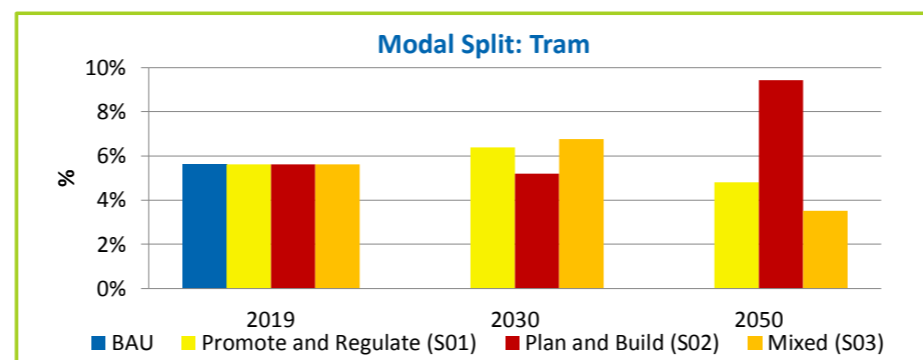
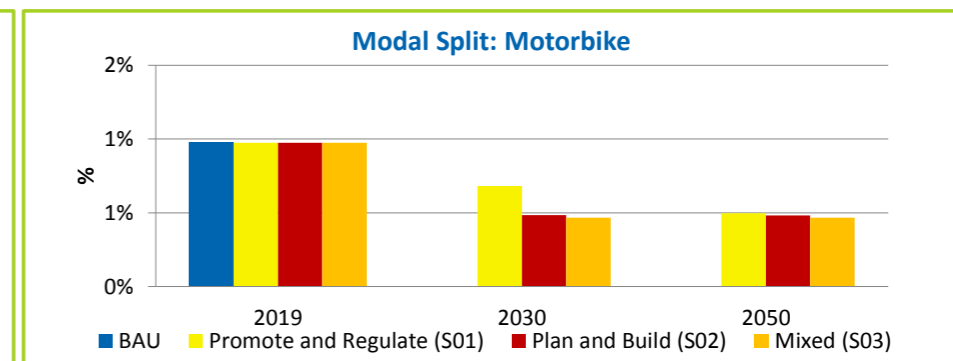
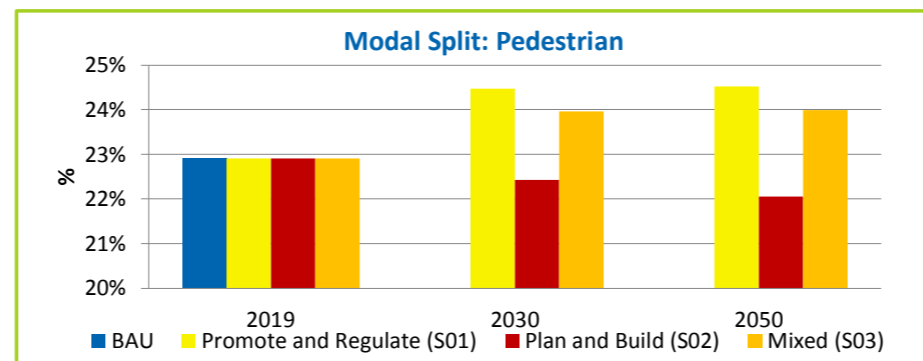
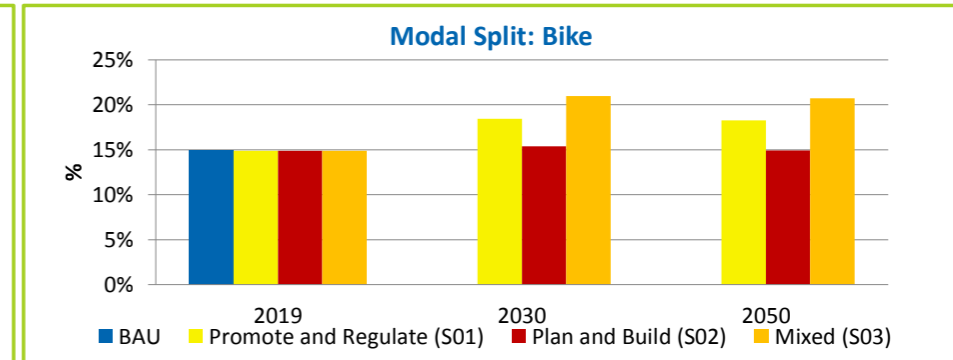
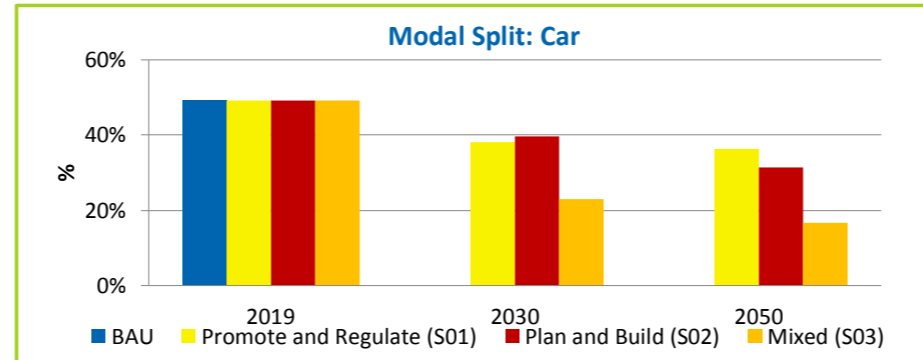
* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Medium City - Central/Western Europe

TRANSPORT AND MOBILITY INDICATORS

Mode split [%]		2019	2030	2050
Scenario	Mode			
BAU	Pedestrian	23%		
BAU	Bike	15%		
BAU	Motorbike	1%		
BAU	Car	49%		
BAU	Bus	6%		
BAU	Tram	6%		
BAU	Metro	0%		
BAU	Car sharing	0%		
Promote and Regulate (S01)	Pedestrian	23%	24%	25%
Promote and Regulate (S01)	Bike	15%	18%	18%
Promote and Regulate (S01)	Motorbike	1%	1%	0%
Promote and Regulate (S01)	Car	49%	38%	36%
Promote and Regulate (S01)	Bus	6%	7%	5%
Promote and Regulate (S01)	Tram	6%	6%	5%
Promote and Regulate (S01)	Metro	0%	0%	0%
Promote and Regulate (S01)	Car sharing	0%	5%	10%
Plan and Build (S02)	Pedestrian	23%	22%	22%
Plan and Build (S02)	Bike	15%	15%	15%
Plan and Build (S02)	Motorbike	1%	0%	0%
Plan and Build (S02)	Car	49%	40%	31%
Plan and Build (S02)	Bus	6%	17%	22%
Plan and Build (S02)	Tram	6%	5%	9%
Plan and Build (S02)	Metro	0%	0%	0%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Pedestrian	23%	24%	24%
Mixed (S03)	Bike	15%	21%	21%
Mixed (S03)	Motorbike	1%	0%	0%
Mixed (S03)	Car	49%	23%	17%
Mixed (S03)	Bus	6%	19%	18%
Mixed (S03)	Tram	6%	7%	4%
Mixed (S03)	Metro	0%	0%	0%
Mixed (S03)	Car sharing	0%	6%	17%



ALL INDICATORS

Medium City - Central/Western Europe

TRANSPORT AND MOBILITY INDICATORS

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
BAU	540		
Promote and Regulate (S01)	540	476	466
Plan and Build (S02)	540	481	427
Mixed (S03)	540	372	315

Congestion and delays index (SUMI)

Scenario	2019	2030	2050
BAU	9.50		
Promote and Regulate (S01)	9.50	9.92	9.91
Plan and Build (S02)	9.50	9.78	9.97
Mixed (S03)	9.50	10.00	10.00

Public transport occupancy levels [pass/vehicle]

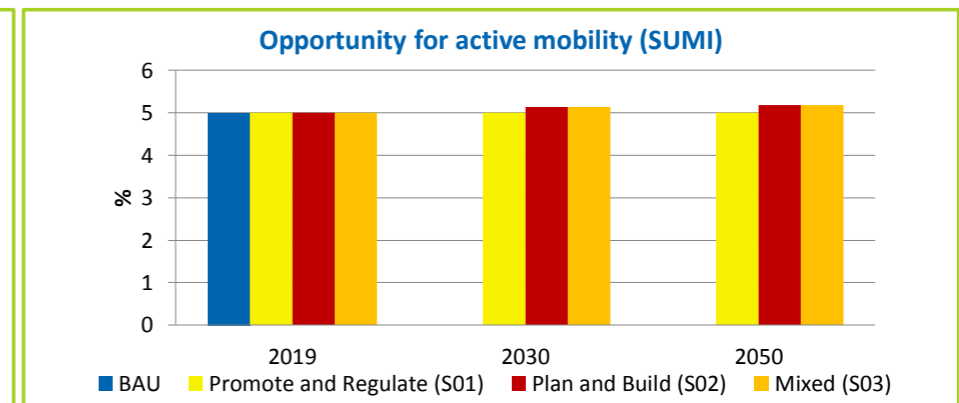
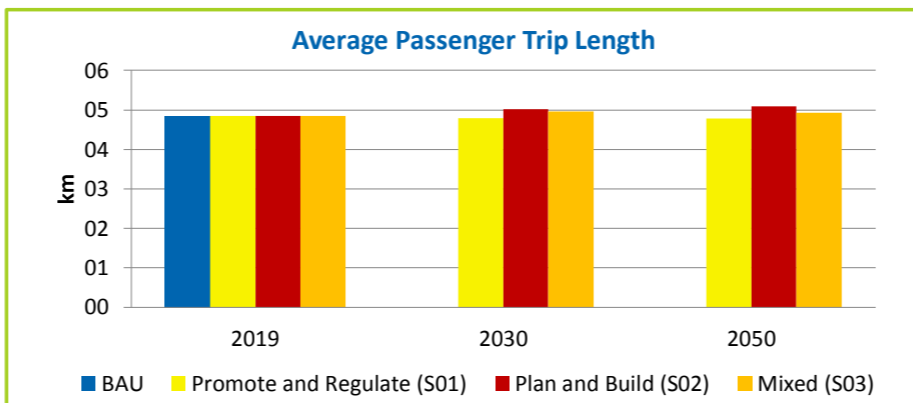
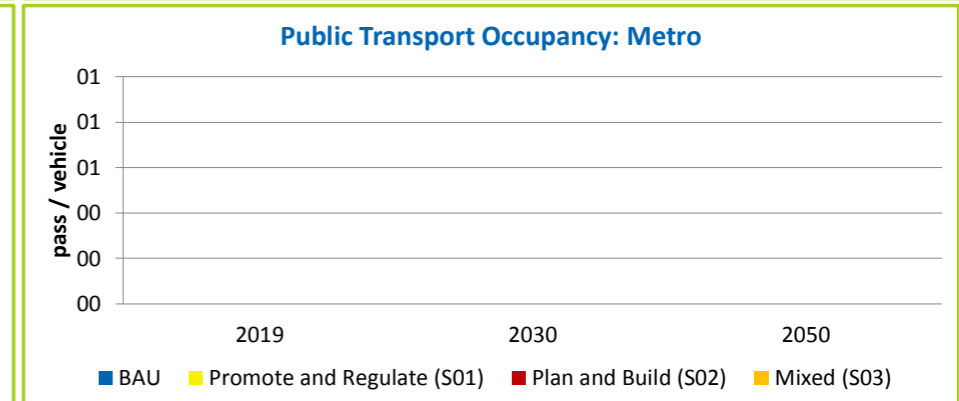
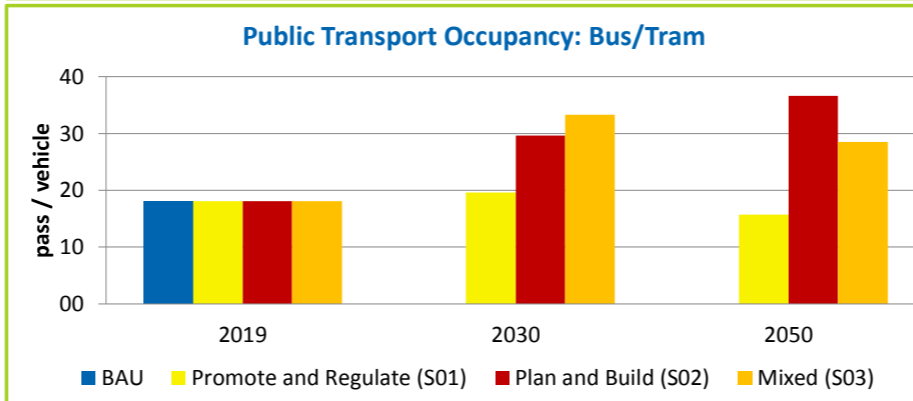
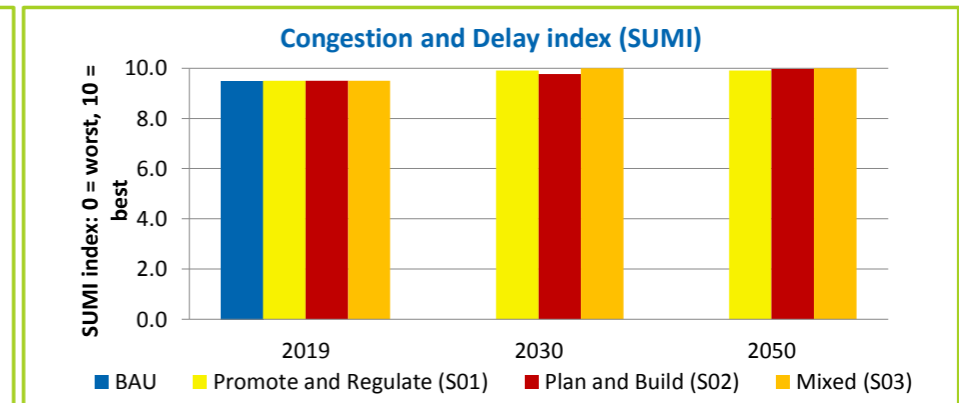
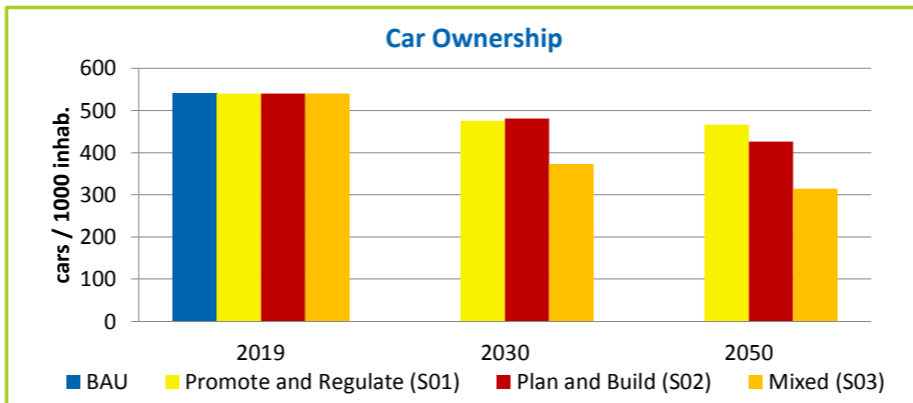
Scenario	PT mode	2019	2030	2050
BAU	Bus/tram	18.1		
BAU	Metro	0.0		
Promote and Regulate (S01)	Bus/tram	18.1	19.6	15.7
Promote and Regulate (S01)	Metro	0.0	0.0	0.0
Plan and Build (S02)	Bus/tram	18.1	29.6	36.6
Plan and Build (S02)	Metro	0.0	0.0	0.0
Mixed (S03)	Bus/tram	18.10	33.35	28.53
Mixed (S03)	Metro	0.00	0.00	0.00

Average passenger trip length [km]

Scenario	2019	2030	2050
BAU	4.9		
Promote and Regulate (S01)	4.9	4.8	4.8
Plan and Build (S02)	4.9	5.0	5.1
Mixed (S03)	4.9	5.0	4.9

Opportunity for active mobility (SUMI) [%]

Scenario	2019	2030	2050
BAU	5.00		
Promote and Regulate (S01)	5.00	5.00	5.00
Plan and Build (S02)	5.00	5.15	5.18
Mixed (S03)	5.00	5.15	5.18



ALL INDICATORS

Medium City - Central/Western Europe

TRANSPORT AND MOBILITY INDICATORS

Penetration of alternatively fuelled car vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	Hybrid electric	3%		
BAU	Battery electric	1%		
BAU	fuel cells	0%		
Scenarios	Hybrid electric	3%	3%	32%
Scenarios	Battery electric	1%	25%	63%
Scenarios	fuel cells	0%	2%	5%

Penetration of alternatively fuelled bus vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	CNG	0%		
BAU	Hybrid electric	0.0%		
BAU	Battery electric	0.3%		
Scenarios	CNG	0%	0%	0%
Scenarios	Hybrid electric	0%	0%	0%
Scenarios	Battery electric	0%	52%	67%

Vehicles-km by mode: cars and car-sharing cars [million vkm/year]

Scenario	2019	2030	2050
BAU	426		
Promote and Regulate (S01)	426	344	369
Plan and Build (S02)	426	350	297
Mixed (S03)	426	237	277

Vehicles-km by mode: trucks [million vkm/year]

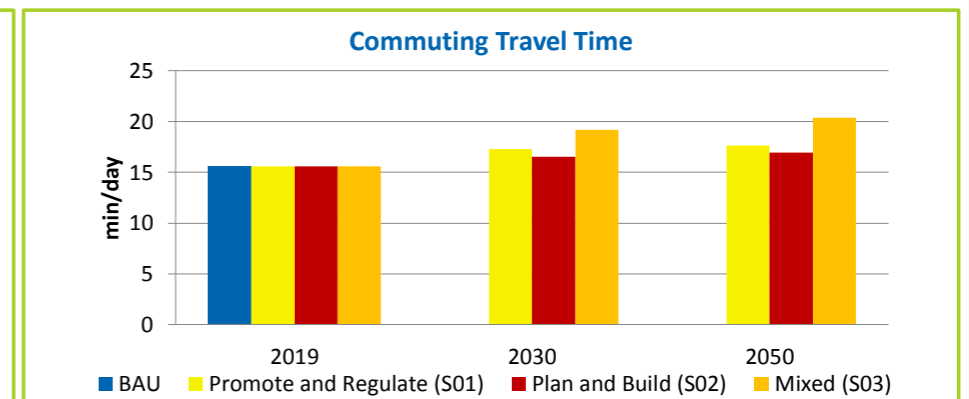
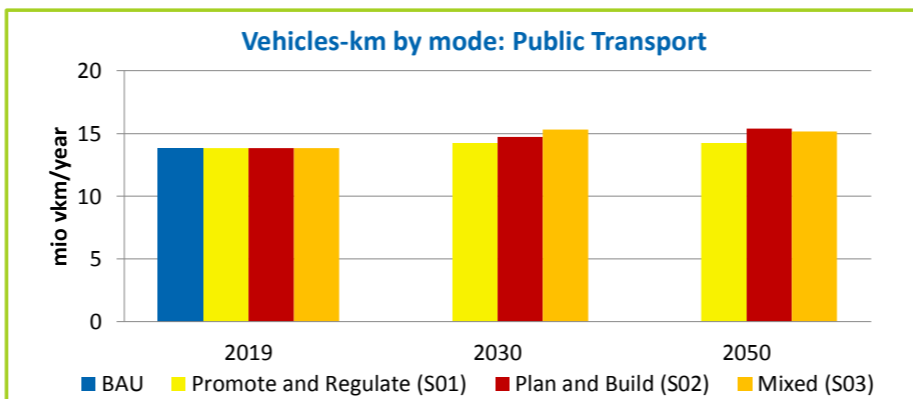
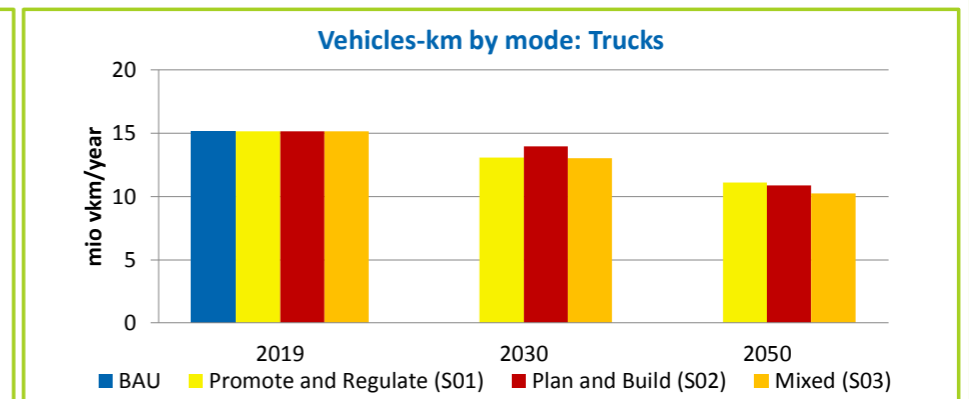
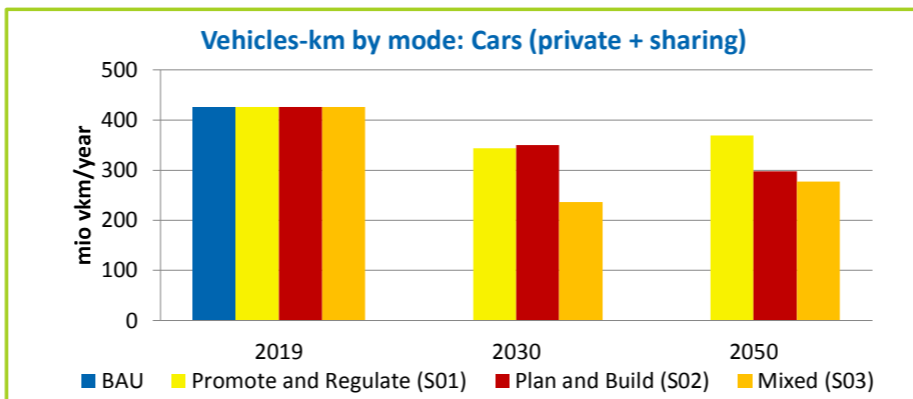
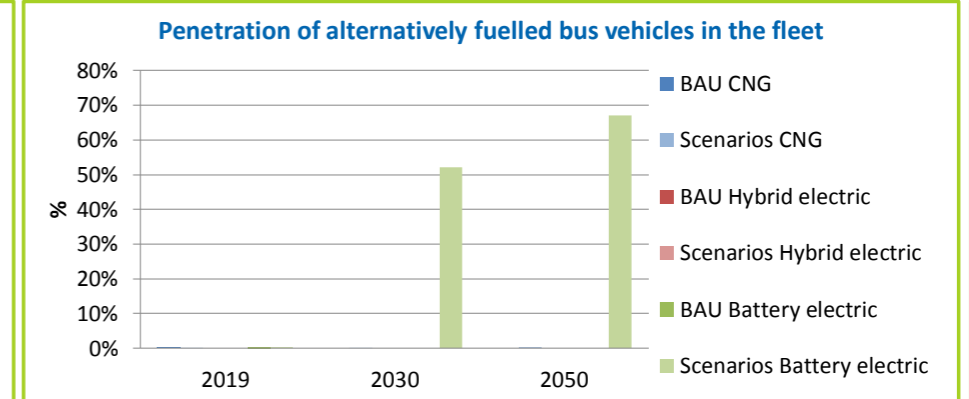
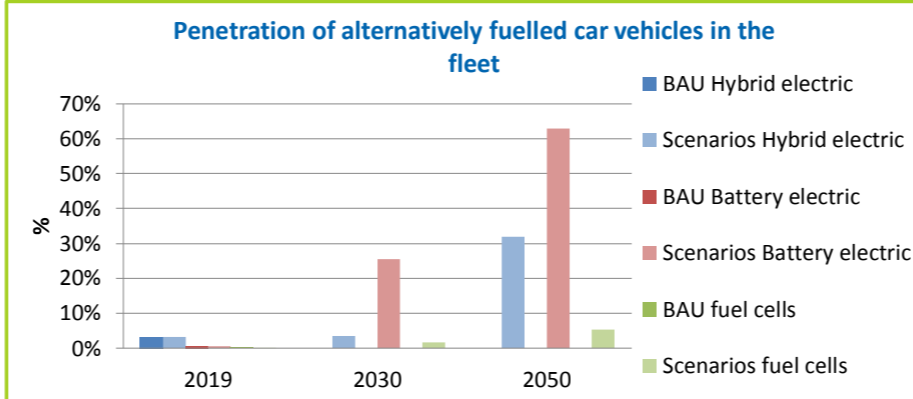
Scenario	2019	2030	2050
BAU	15.1		
Promote and Regulate (S01)	15	13	11
Plan and Build (S02)	15.1	14.0	10.9
Mixed (S03)	15.1	13.0	10.2

Vehicles-km by mode: Public Transport [million vkm/year]

Scenario	2019	2030	2050
BAU	13.8		
Promote and Regulate (S01)	13.8	14.2	14.2
Plan and Build (S02)	13.8	14.7	15.4
Mixed (S03)	13.8	15.3	15.2

Commuting travel time (SUMI) [min/day]

Scenario	2019	2030	2050
BAU	15.6		
Promote and Regulate (S01)	15.6	17.3	17.6
Plan and Build (S02)	15.6	16.6	16.9
Mixed (S03)	15.6	19.2	20.4



ALL INDICATORS

Medium City - Central/Western Europe

ENVIRONMENT AND SAFETY INDICATORS

Air pollutant emissions (SUMI: PM2.5, Nox) [kg PM2.5 eq/capita]

Scenario	2019	2030	2050
BAU	0.6		
Promote and regulate (S01)	0.6	0.3	0.1
Plan and Build (S02)	0.6	0.3	0.1
Mixed (S03)	0.6	0.2	0.1

Air pollutant emissions (CO, VOC) [kg / capita]

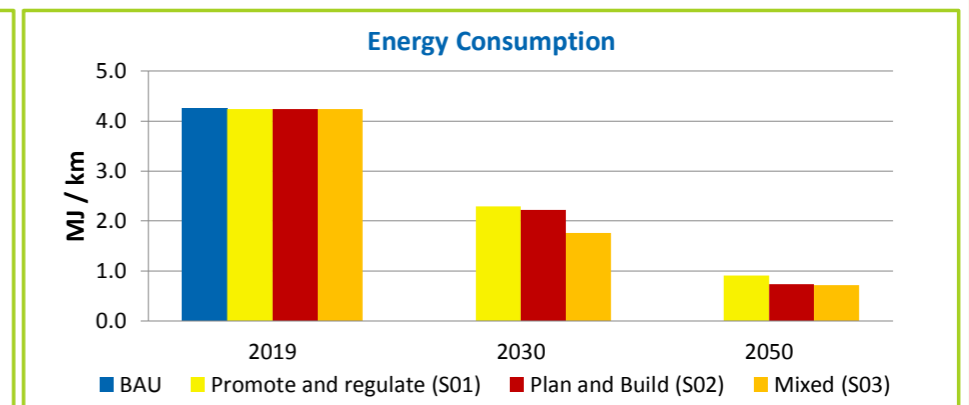
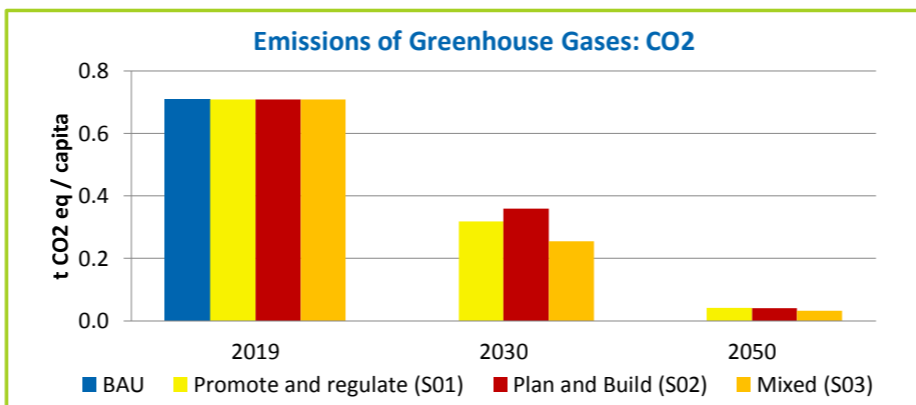
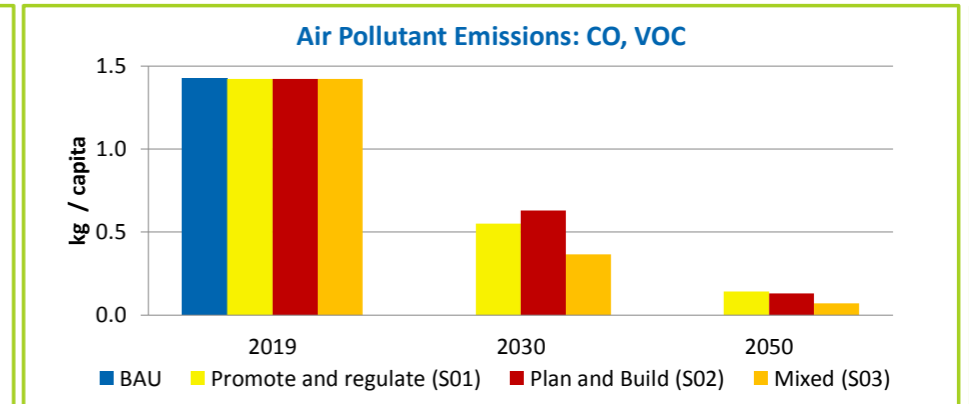
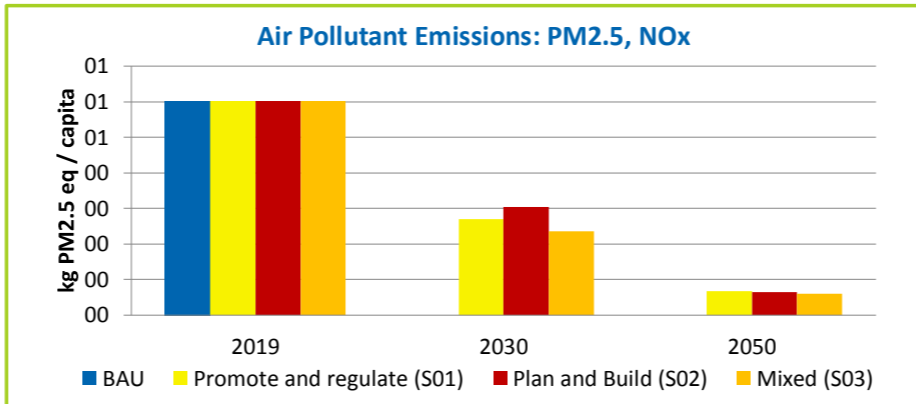
Scenario	2019	2030	2050
BAU	1		
Promote and regulate (S01)	1	1	0
Plan and Build (S02)	1.4	0.6	0.1
Mixed (S03)	1.4	0.4	0.1

Emissions of Greenhouse Gases [t CO2 eq / capita per year]

Scenario	2019	2030	2050
BAU	0.710		
Promote and regulate (S01)	0.710	0.319	0.042
Plan and Build (S02)	0.710	0.359	0.041
Mixed (S03)	0.710	0.255	0.032

Energy consumption [MJ / km]

Scenario	2019	2030	2050
BAU	4.2		
Promote and regulate (S01)	4.2	2.3	0.9
Plan and Build (S02)	4.2	2.2	0.7
Mixed (S03)	4.2	1.8	0.7



ALL INDICATORS

Medium City - Central/Western Europe

ENVIRONMENT AND SAFETY INDICATORS

Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	2.0		
Promote and regulate (S01)	2.0	1.2	1.1
Plan and Build (S02)	2.0	1.5	1.0
Mixed (S03)	2.0	0.9	0.7

Fatalities: active modes [fatalities / 100,000 inhab.]

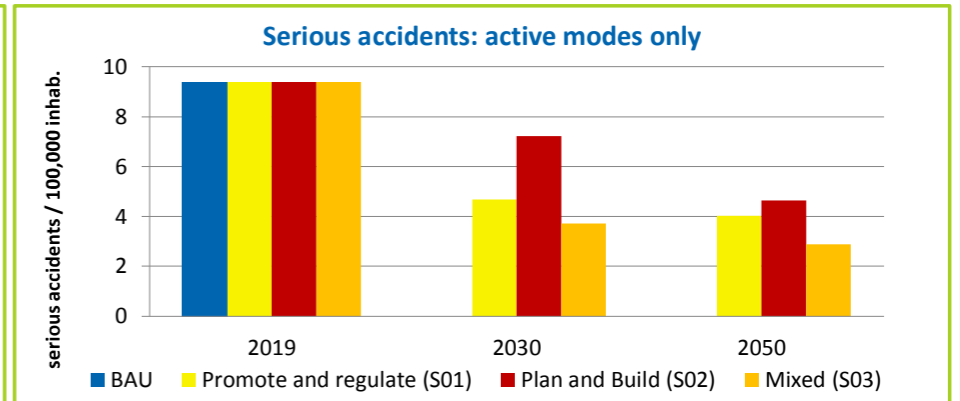
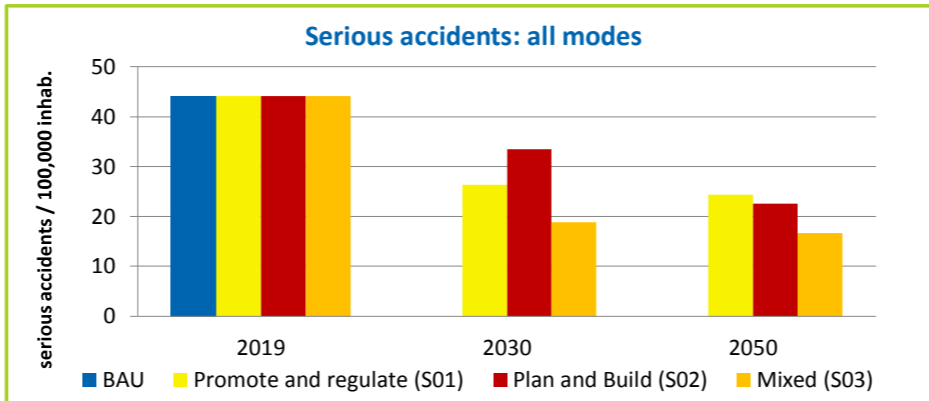
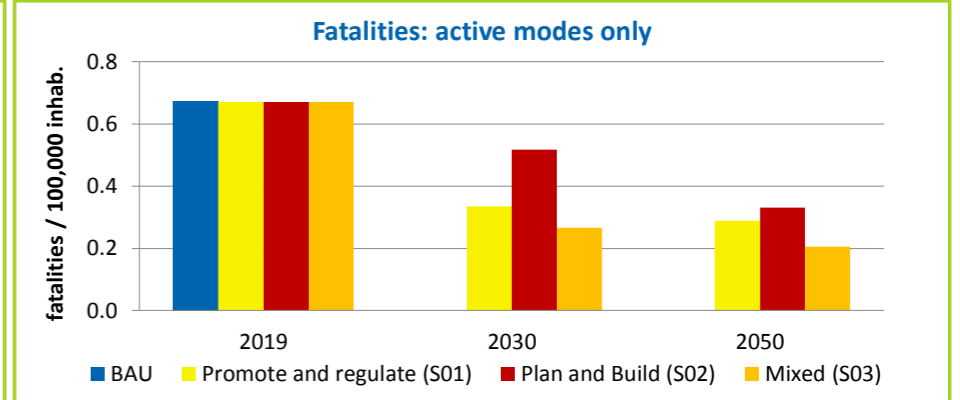
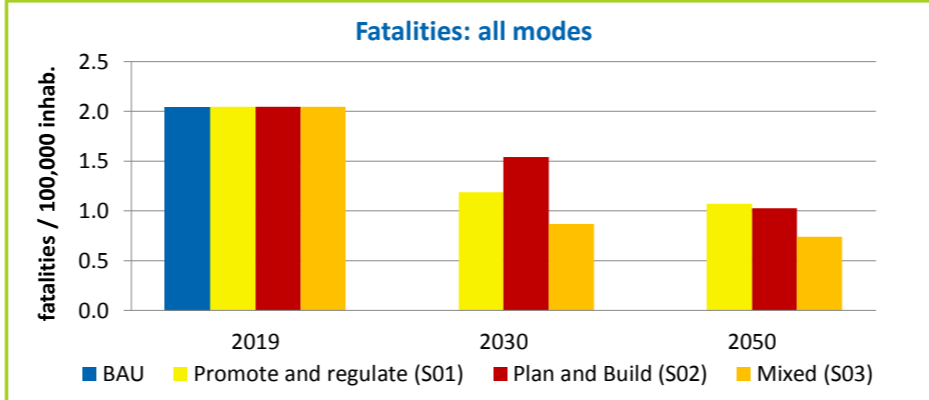
Scenario	2019	2030	2050
BAU	0.67		
Promote and regulate (S01)	0.67	0.33	0.29
Plan and Build (S02)	0.67	0.52	0.33
Mixed (S03)	0.67	0.27	0.20

Serious accidents [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	44		
Promote and regulate (S01)	44	26	24
Plan and Build (S02)	44	33	23
Mixed (S03)	44	19	17

Serious accidents: active modes [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	9		
Promote and regulate (S01)	9	5	4
Plan and Build (S02)	9	7	5
Mixed (S03)	9	4	3



ALL INDICATORS

Medium City - Northern Europe

EMISSIONS OF CO₂ (TANK-TO-WHEEL), CAR OWNERSHIP, FATALITIES

Emissions of CO₂ (Tank-to-wheel) [t CO₂ eq / capita per year]

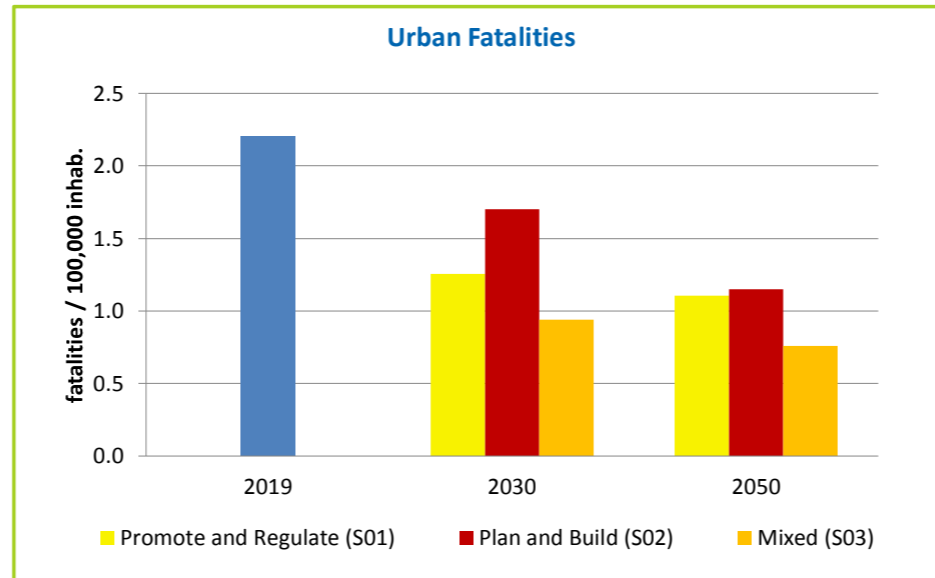
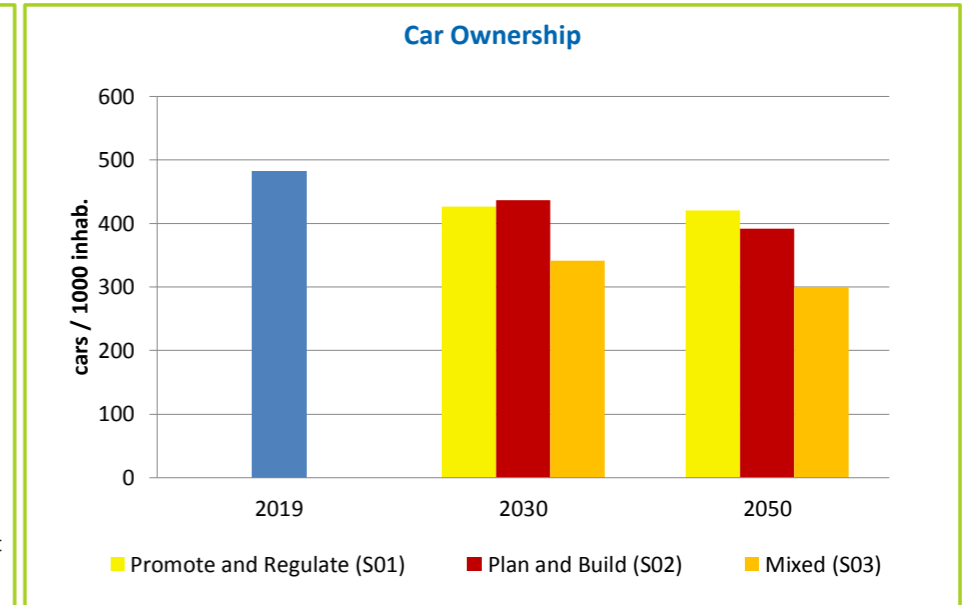
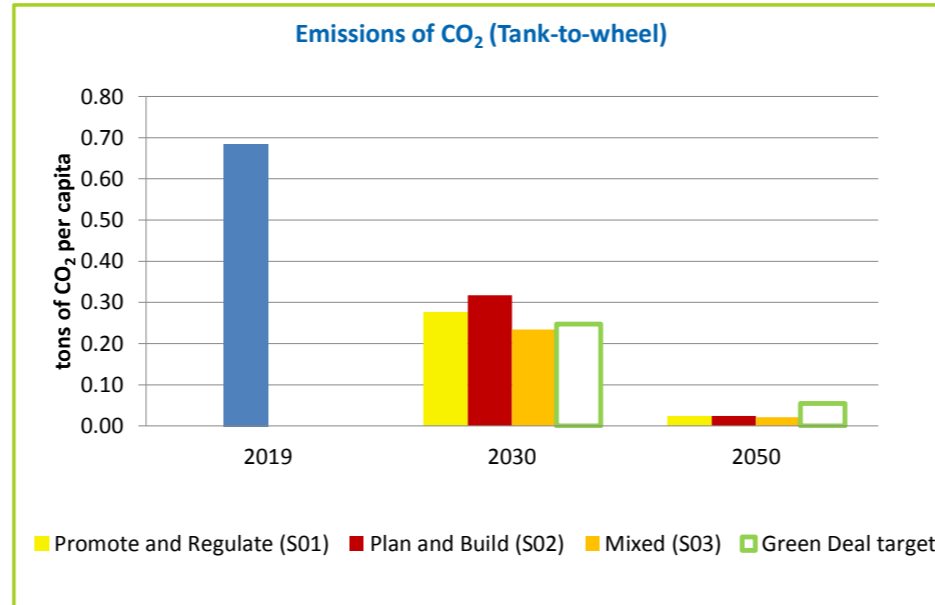
Scenario	2019	2030	2050
Promote and Regulate (S01)	0.685	0.277	0.024
Plan and Build (S02)	0.685	0.317	0.024
Mixed (S03)	0.685	0.233	0.020
Green Deal target		0.246	0.055

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	483	427	420
Plan and Build (S02)	483	437	392
Mixed (S03)	483	342	300

Urban Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	2.203	1.254	1.105
Plan and Build (S02)	2.203	1.702	1.150
Mixed (S03)	2.203	0.939	0.757



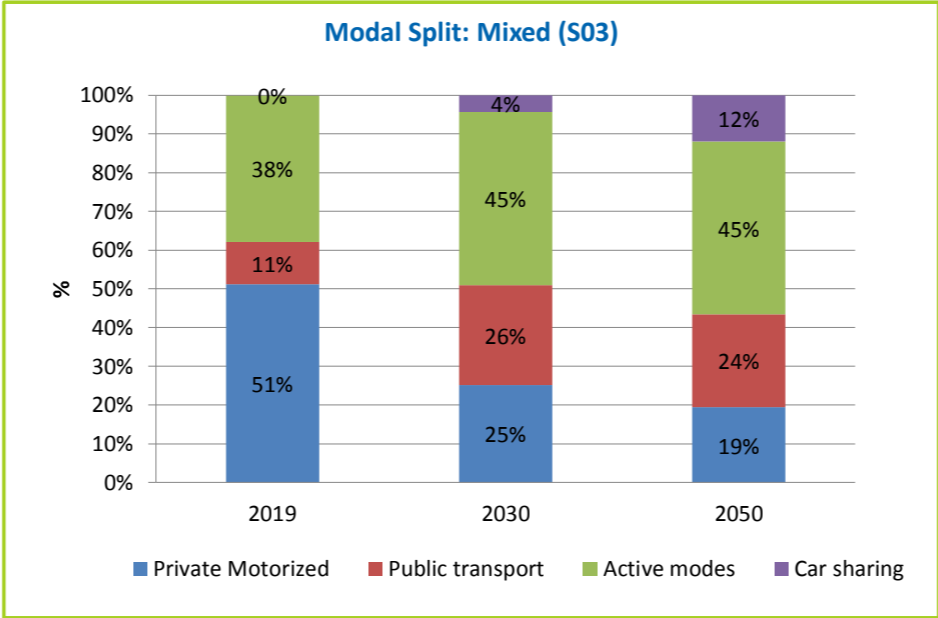
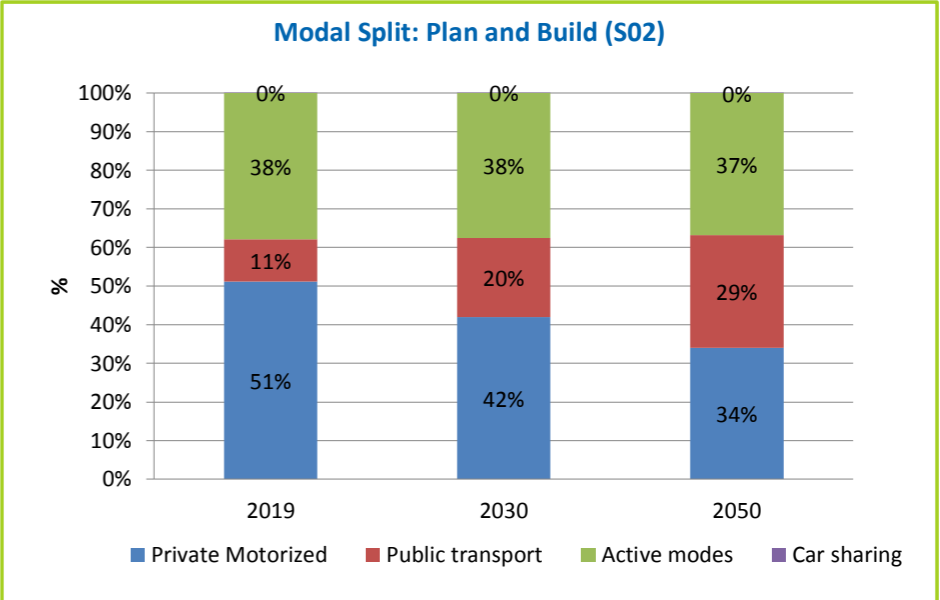
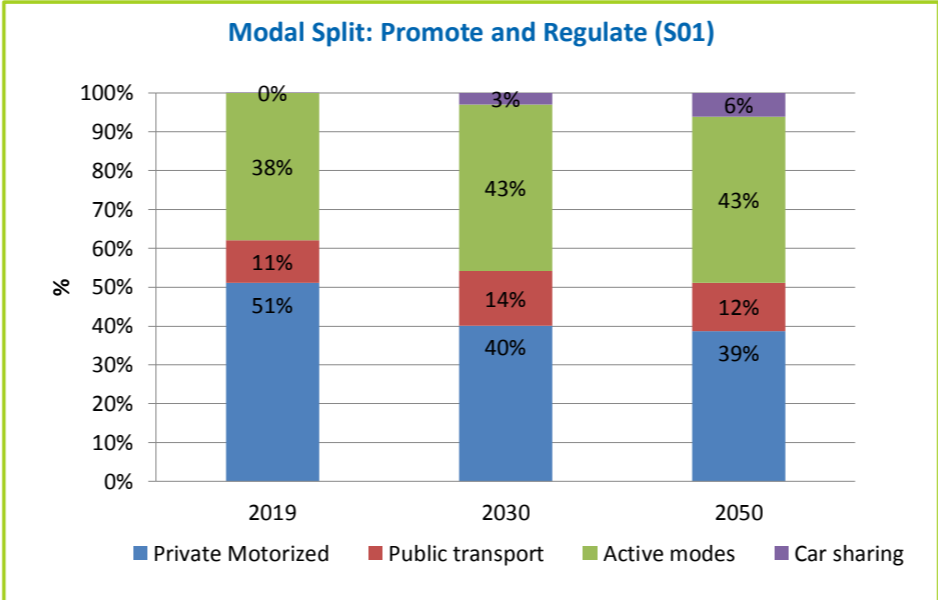
KEY INDICATORS

Medium City - Northern Europe

MODAL SPLIT

Aggregate mode split [%]

Scenario	Mode	2019	2030	2050
Promote and Regulate (S01)	Private Motorized	51%	40%	39%
Promote and Regulate (S01)	Public transport	11%	14%	12%
Promote and Regulate (S01)	Active modes	38%	43%	43%
Promote and Regulate (S01)	Car sharing	0%	3%	6%
Plan and Build (S02)	Private Motorized	51%	42%	34%
Plan and Build (S02)	Public transport	11%	20%	29%
Plan and Build (S02)	Active modes	38%	38%	37%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Private Motorized	51%	25%	19%
Mixed (S03)	Public transport	11%	26%	24%
Mixed (S03)	Active modes	38%	45%	45%
Mixed (S03)	Car sharing	0%	4%	12%



KEY INDICATORS

Medium City - Northern Europe

ECONOMIC OUTPUTS (discounted, cumulated from 2019)*

City total revenues [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	123	329
Plan and Build (S02)	0	73	298
Mixed (S03)	0	244	686

City total costs [mio euro]

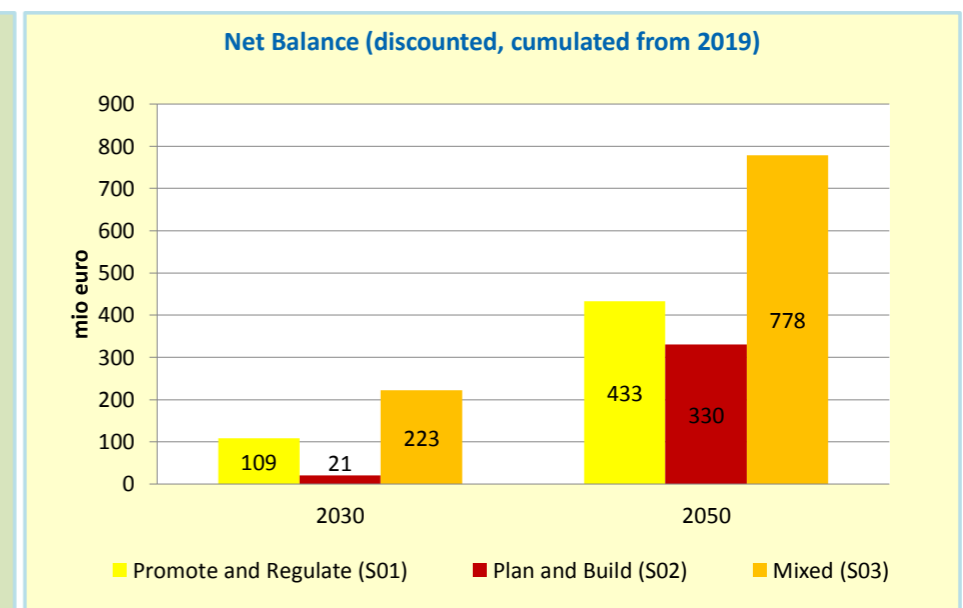
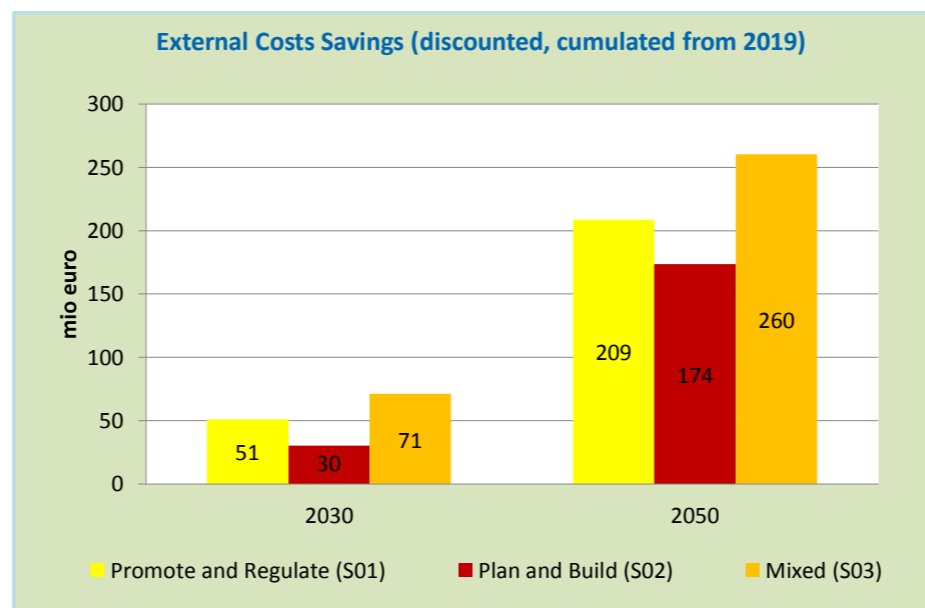
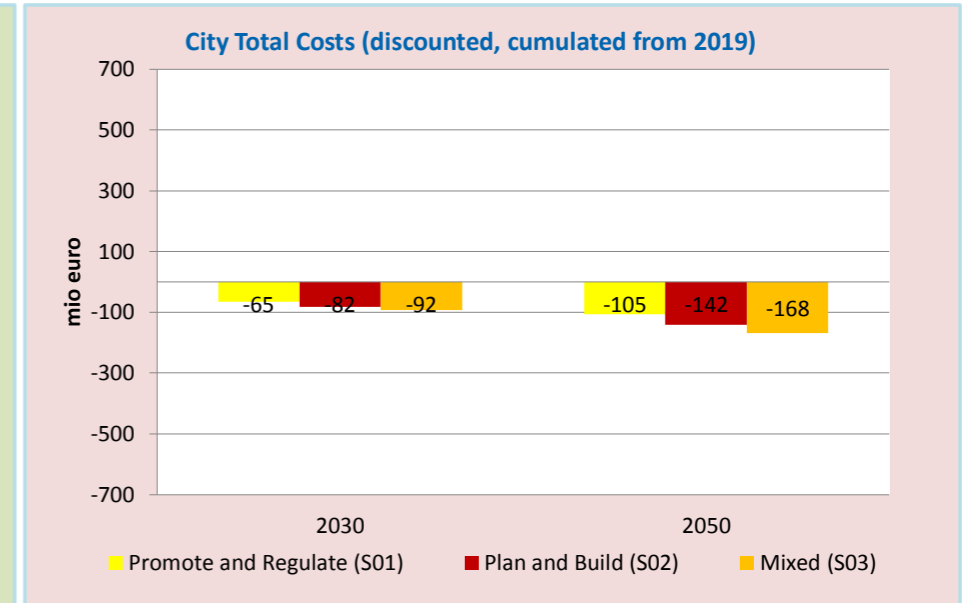
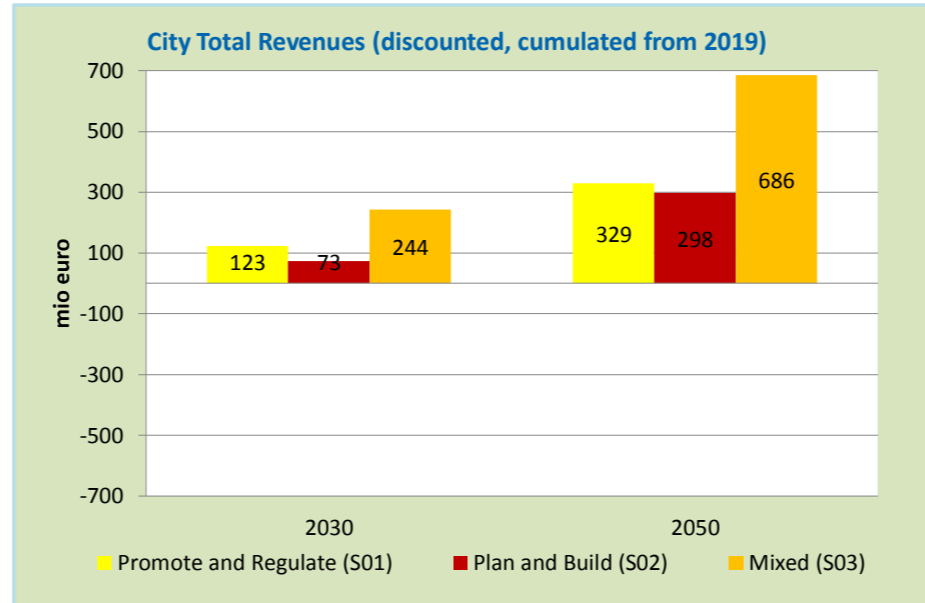
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	65	105
Plan and Build (S02)	0	82	142
Mixed (S03)	0	92	168

External costs savings [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	51	209
Plan and Build (S02)	0	30	174
Mixed (S03)	0	71	260

Net balance [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	109	433
Plan and Build (S02)	0	21	330
Mixed (S03)	0	223	778



* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Medium City - Northern Europe

ECONOMIC OUTPUTS PER CAPITA (discounted, cumulated from 2019)*

City total revenues [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	761	2,045
Plan and Build (S02)	0	451	1,849
Mixed (S03)	0	1,513	4,256

City total costs [euro / capita]

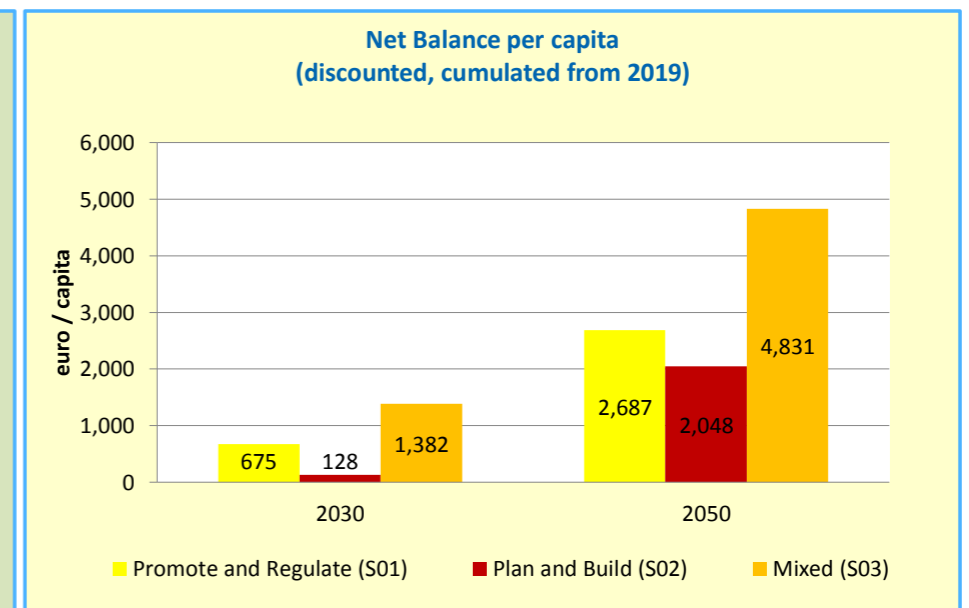
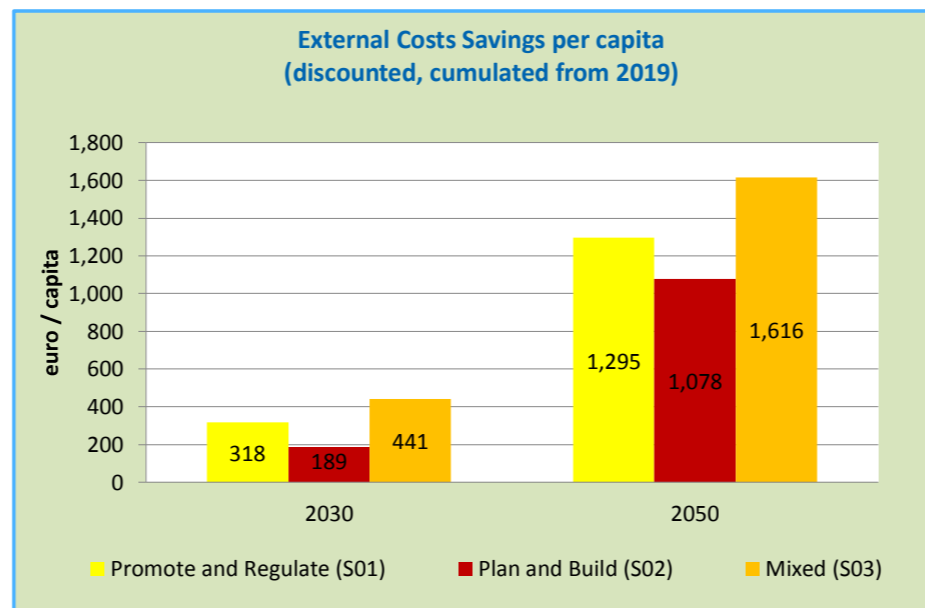
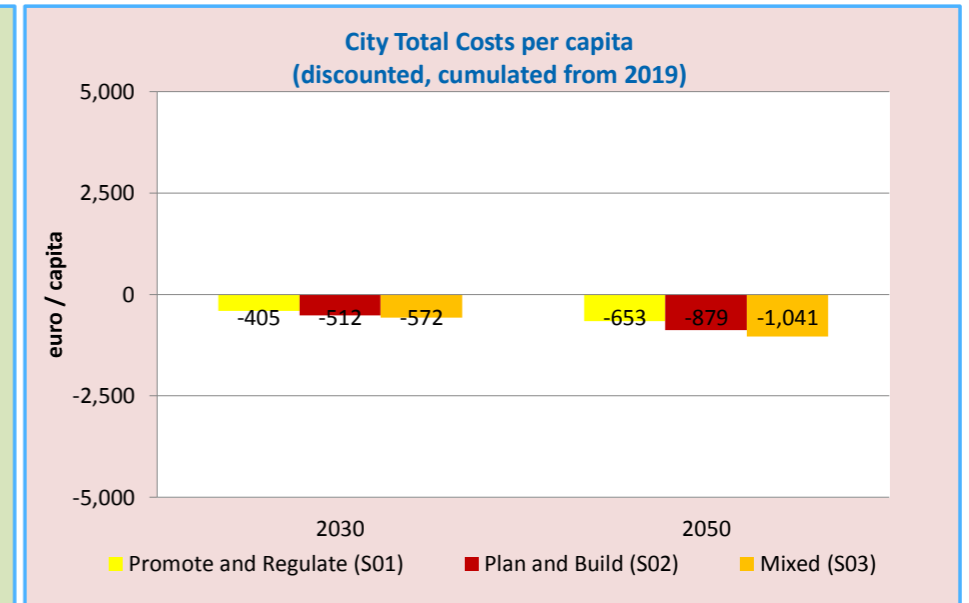
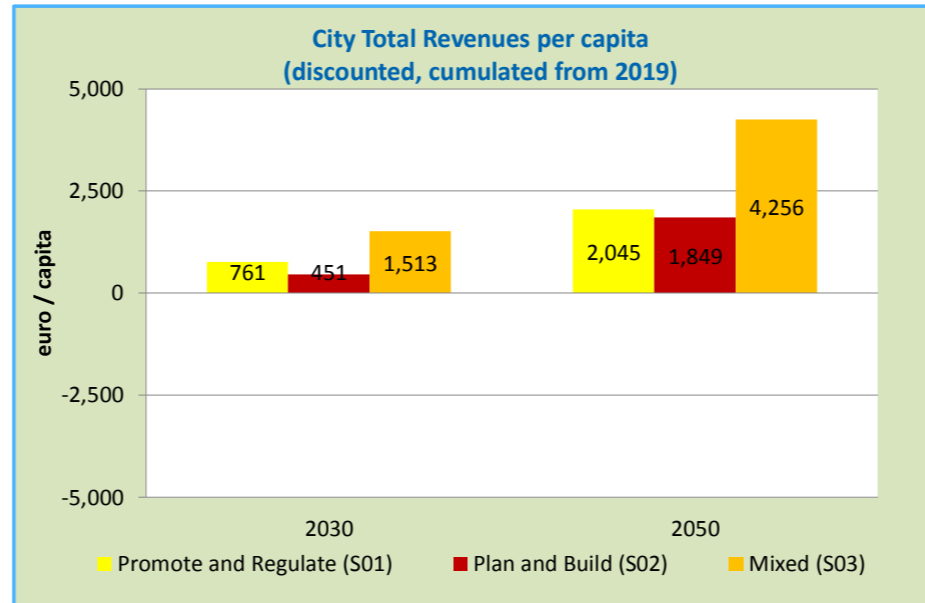
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	405	653
Plan and Build (S02)	0	512	879
Mixed (S03)	0	572	1,041

External costs savings [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	318	1,295
Plan and Build (S02)	0	189	1,078
Mixed (S03)	0	441	1,616

Net balance [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	675	2,687
Plan and Build (S02)	0	128	2,048
Mixed (S03)	0	1,382	4,831



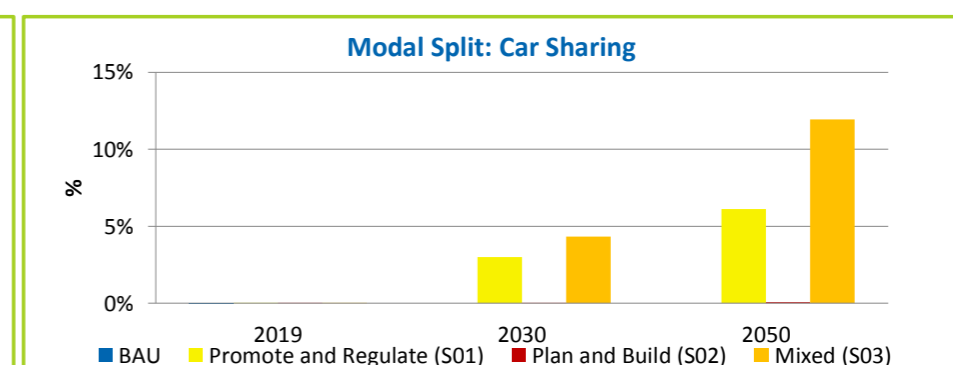
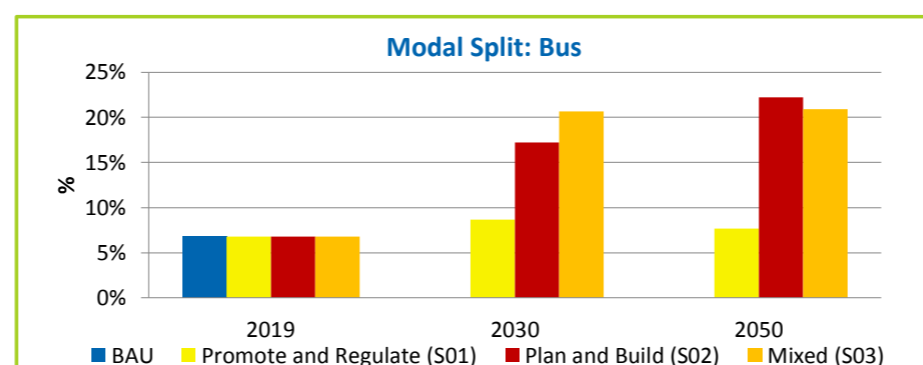
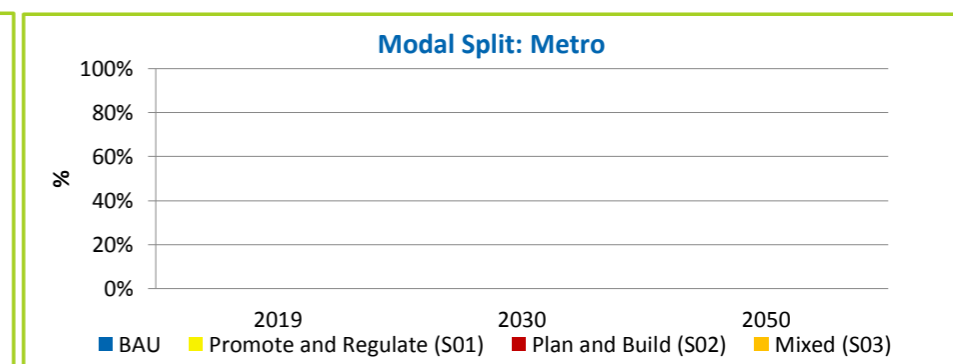
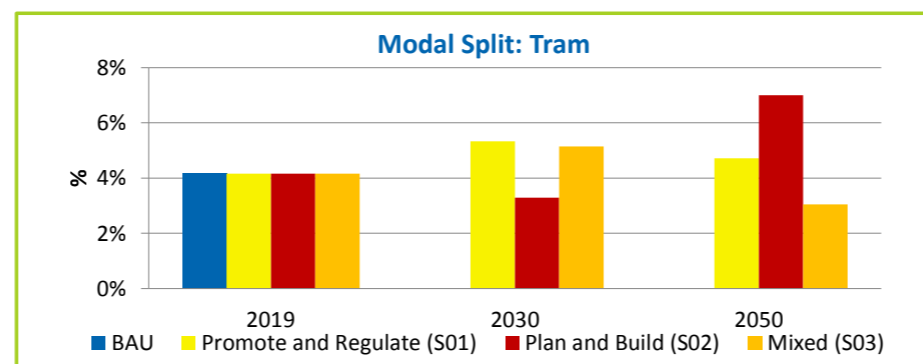
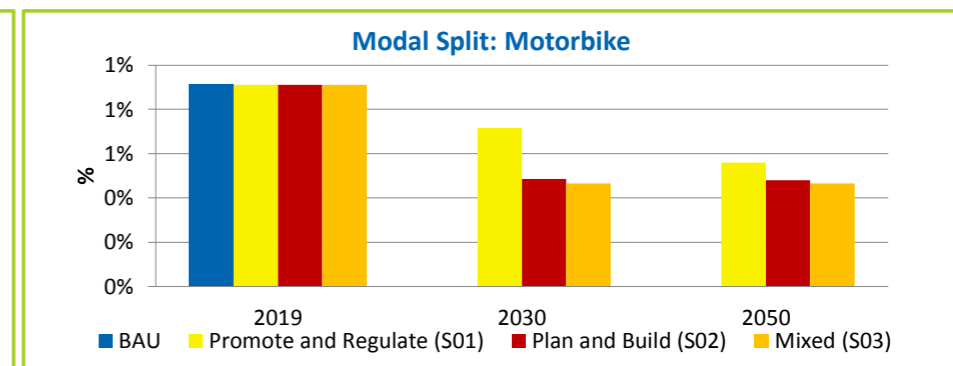
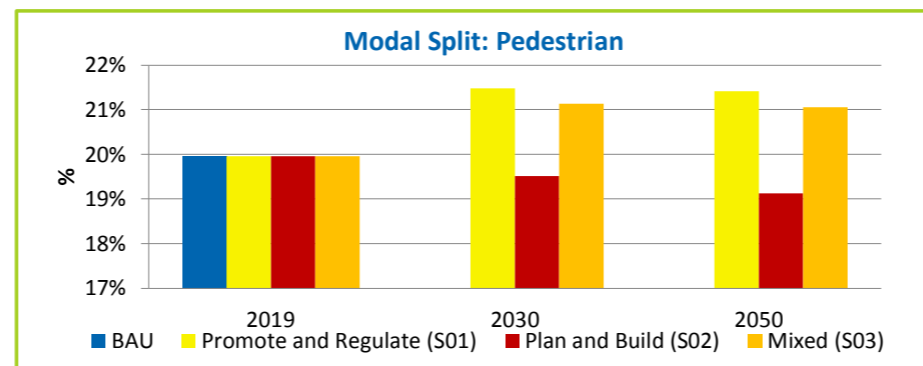
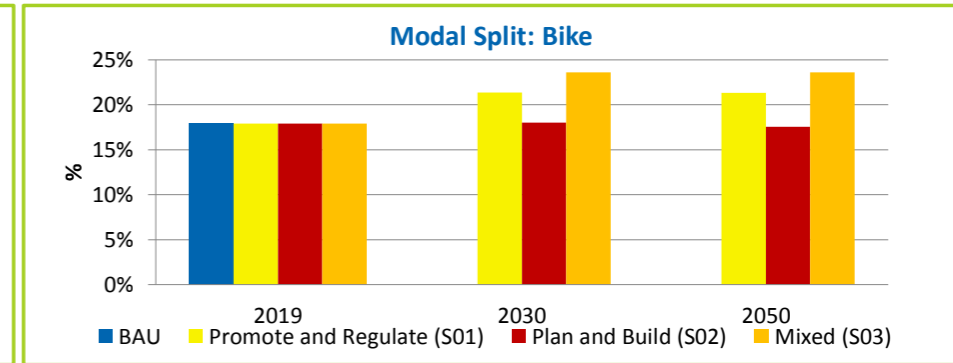
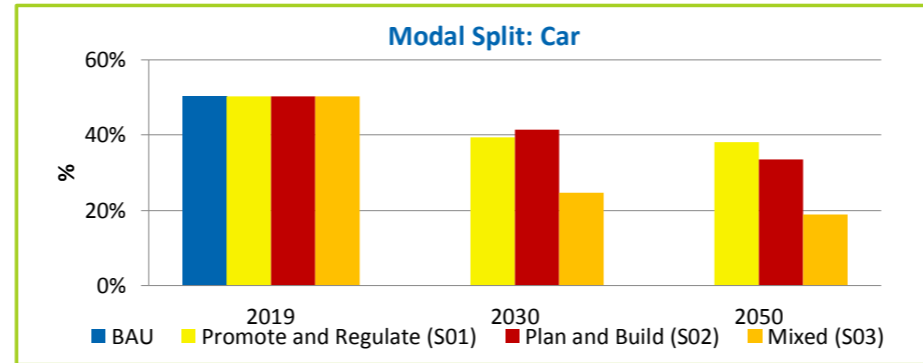
* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Medium City - Northern Europe

TRANSPORT AND MOBILITY INDICATORS

Mode split [%]					
Scenario	Mode	2019	2030	2050	
BAU	Pedestrian	20%			
BAU	Bike	18%			
BAU	Motorbike	1%			
BAU	Car	50%			
BAU	Bus	7%			
BAU	Tram	4%			
BAU	Metro	0%			
BAU	Car sharing	0%			
Promote and Regulate (S01)	Pedestrian	20%	21%	21%	
Promote and Regulate (S01)	Bike	18%	21%	21%	
Promote and Regulate (S01)	Motorbike	1%	1%	1%	
Promote and Regulate (S01)	Car	50%	39%	38%	
Promote and Regulate (S01)	Bus	7%	9%	8%	
Promote and Regulate (S01)	Tram	4%	5%	5%	
Promote and Regulate (S01)	Metro	0%	0%	0%	
Promote and Regulate (S01)	Car sharing	0%	3%	6%	
Plan and Build (S02)	Pedestrian	20%	20%	19%	
Plan and Build (S02)	Bike	18%	18%	18%	
Plan and Build (S02)	Motorbike	1%	0%	0%	
Plan and Build (S02)	Car	50%	41%	34%	
Plan and Build (S02)	Bus	7%	17%	22%	
Plan and Build (S02)	Tram	4%	3%	7%	
Plan and Build (S02)	Metro	0%	0%	0%	
Plan and Build (S02)	Car sharing	0%	0%	0%	
Mixed (S03)	Pedestrian	20%	21%	21%	
Mixed (S03)	Bike	18%	24%	24%	
Mixed (S03)	Motorbike	1%	0%	0%	
Mixed (S03)	Car	50%	25%	19%	
Mixed (S03)	Bus	7%	21%	21%	
Mixed (S03)	Tram	4%	5%	3%	
Mixed (S03)	Metro	0%	0%	0%	
Mixed (S03)	Car sharing	0%	4%	12%	



ALL INDICATORS

Medium City - Northern Europe

TRANSPORT AND MOBILITY INDICATORS

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
BAU	483		
Promote and Regulate (S01)	483	427	420
Plan and Build (S02)	483	437	392
Mixed (S03)	483	342	300

Congestion and delays index (SUMI)

Scenario	2019	2030	2050
BAU	9.50		
Promote and Regulate (S01)	9.50	9.94	9.94
Plan and Build (S02)	9.50	9.74	9.92
Mixed (S03)	9.50	10.00	10.00

Public transport occupancy levels [pass/vehicle]

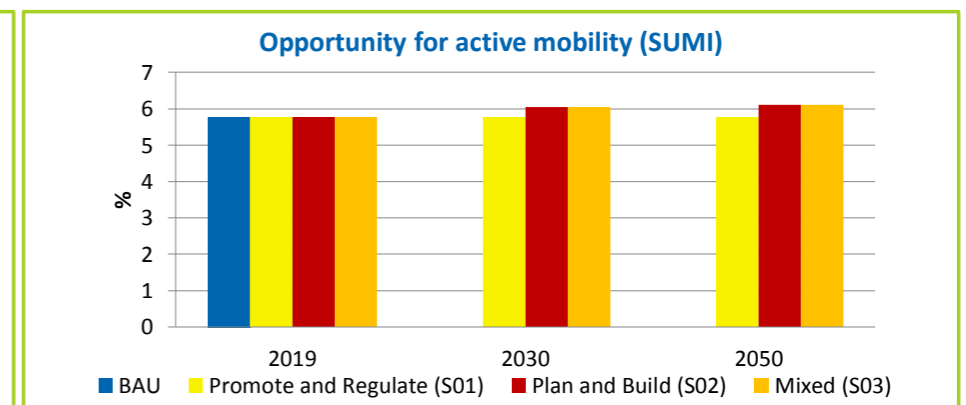
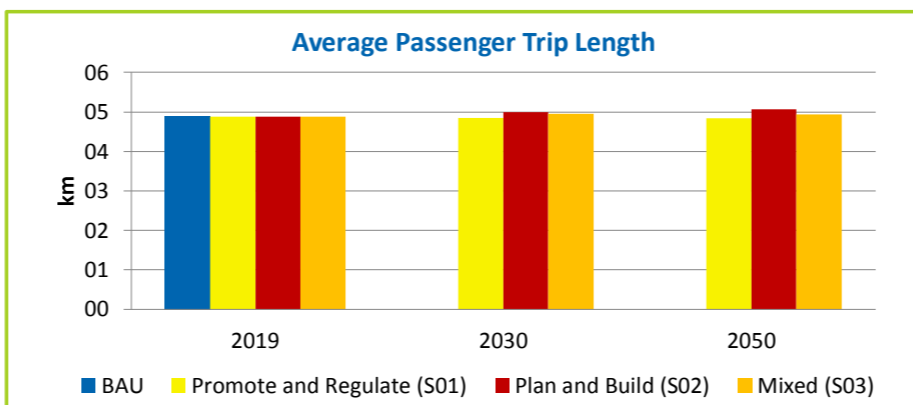
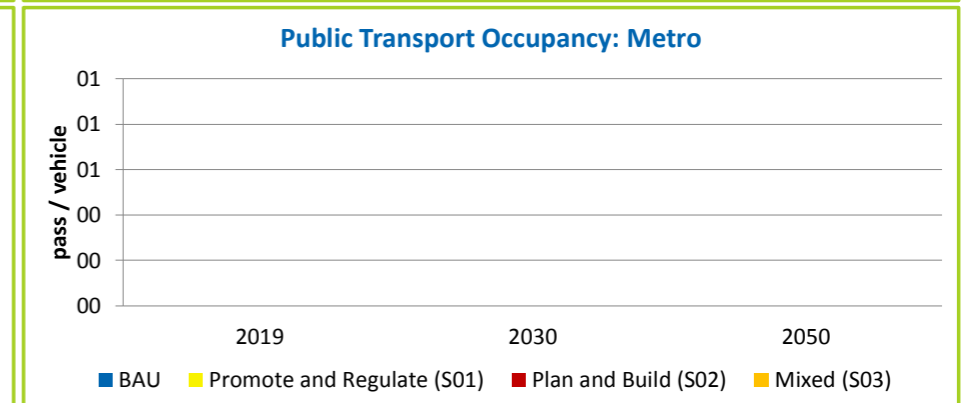
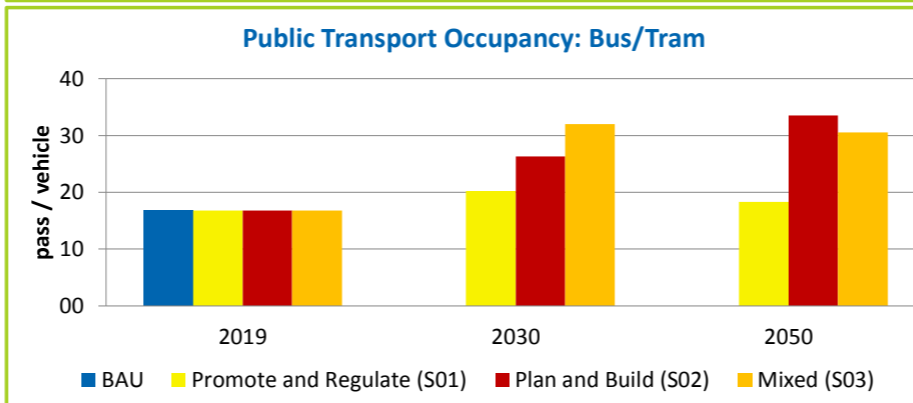
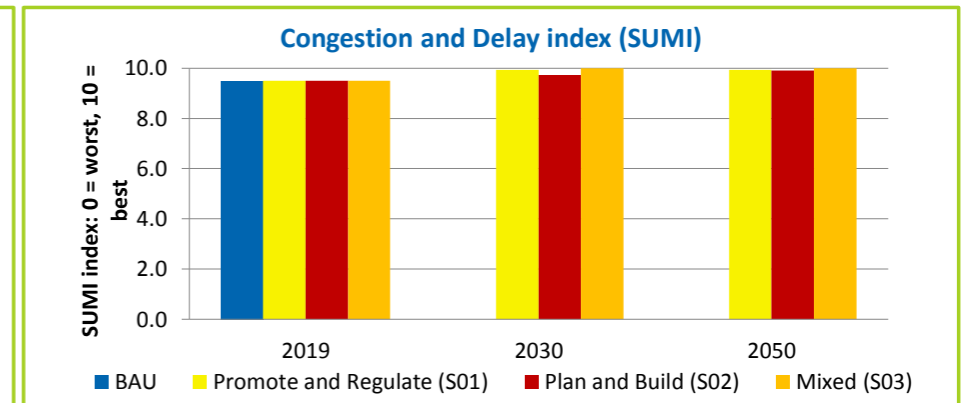
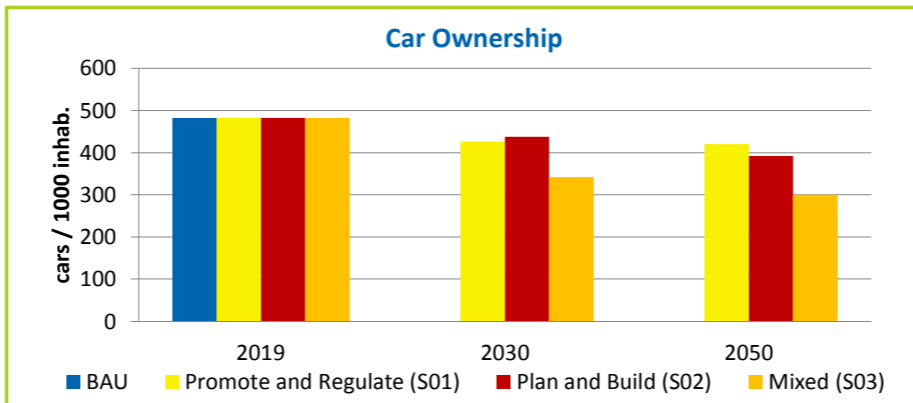
Scenario	PT mode	2019	2030	2050
BAU	Bus/tram	16.8		
BAU	Metro	0.0		
Promote and Regulate (S01)	Bus/tram	16.8	20.2	18.3
Promote and Regulate (S01)	Metro	0.0	0.0	0.0
Plan and Build (S02)	Bus/tram	16.8	26.3	33.6
Plan and Build (S02)	Metro	0.0	0.0	0.0
Mixed (S03)	Bus/tram	16.84	32.05	30.56
Mixed (S03)	Metro	0.00	0.00	0.00

Average passenger trip length [km]

Scenario	2019	2030	2050
BAU	4.9		
Promote and Regulate (S01)	4.9	4.8	4.8
Plan and Build (S02)	4.9	5.0	5.1
Mixed (S03)	4.9	4.9	4.9

Opportunity for active mobility (SUMI) [%]

Scenario	2019	2030	2050
BAU	5.78		
Promote and Regulate (S01)	5.78	5.78	5.78
Plan and Build (S02)	5.78	6.05	6.11
Mixed (S03)	5.78	6.05	6.11



ALL INDICATORS

Medium City - Northern Europe

TRANSPORT AND MOBILITY INDICATORS

Penetration of alternatively fuelled car vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	Hybrid electric	3%		
BAU	Battery electric	0%		
BAU	fuel cells	0%		
Scenarios	Hybrid electric	3%	1%	9%
Scenarios	Battery electric	0%	44%	89%
Scenarios	fuel cells	0%	0%	3%

Penetration of alternatively fuelled bus vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	CNG	9%		
BAU	Hybrid electric	0.0%		
BAU	Battery electric	0.7%		
Scenarios	CNG	9%	9%	7%
Scenarios	Hybrid electric	0%	0%	0%
Scenarios	Battery electric	1%	68%	100%

Vehicles-km by mode: cars and car-sharing cars [million vkm/year]

Scenario	2019	2030	2050
BAU	248		
Promote and Regulate (S01)	248	195	202
Plan and Build (S02)	248	212	184
Mixed (S03)	248	140	151

Vehicles-km by mode: trucks [million vkm/year]

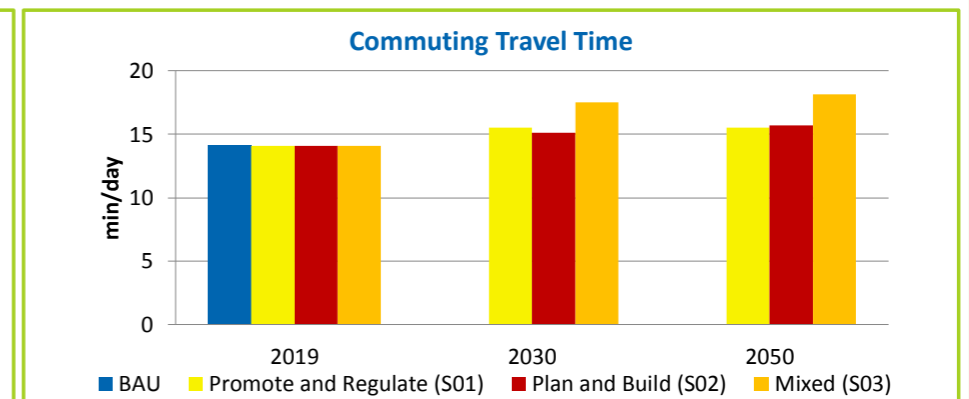
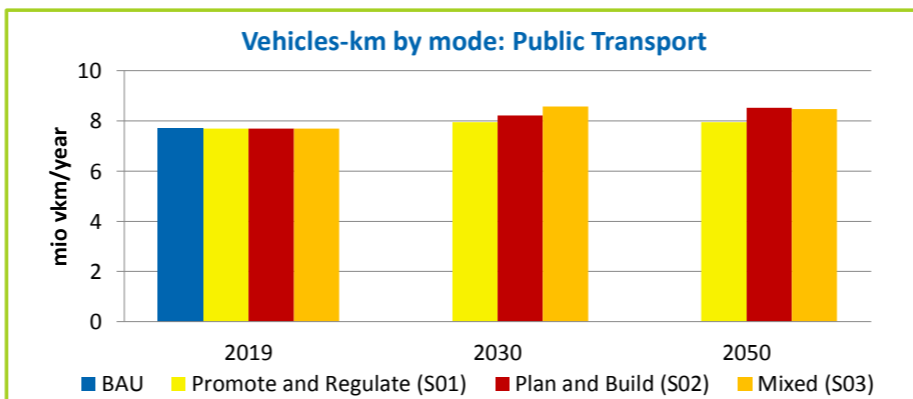
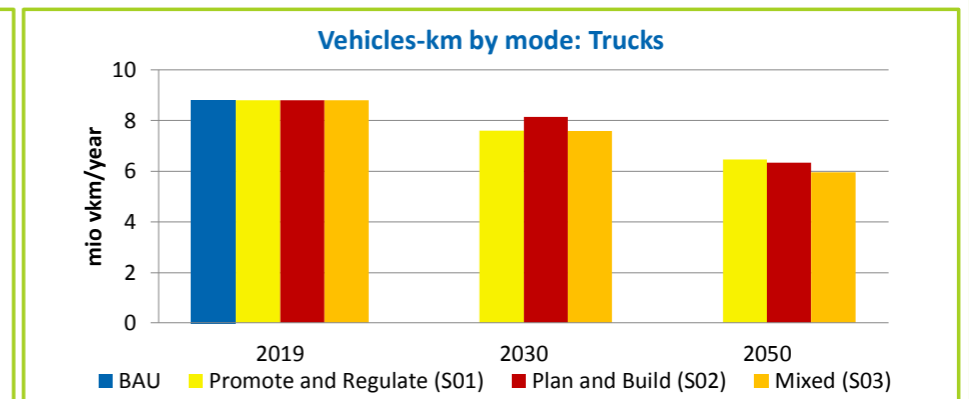
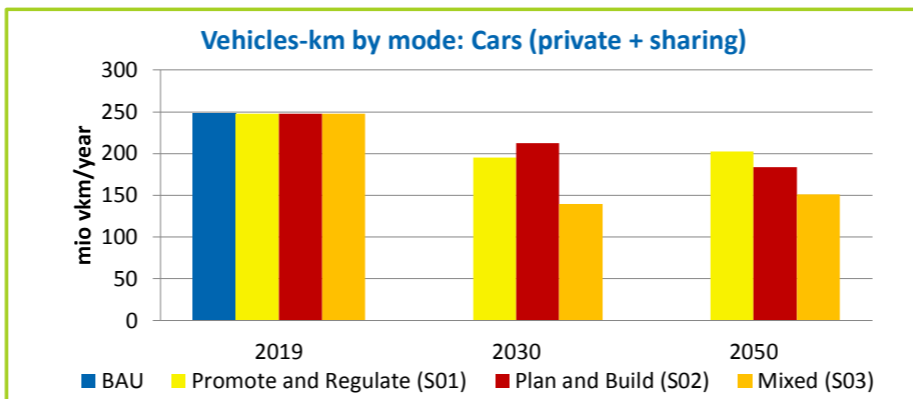
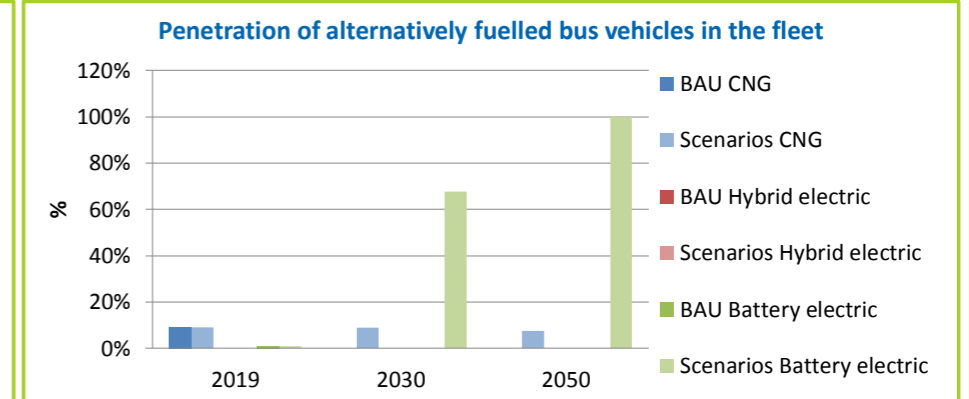
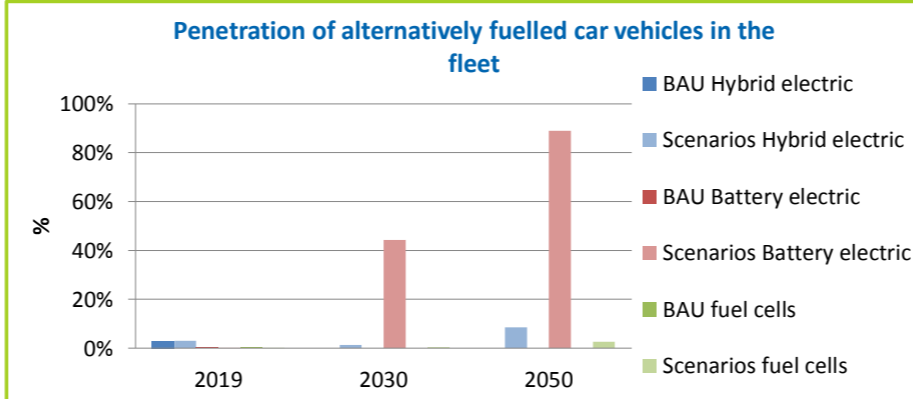
Scenario	2019	2030	2050
BAU	8.8		
Promote and Regulate (S01)	9	8	6
Plan and Build (S02)	8.8	8.1	6.3
Mixed (S03)	8.8	7.6	6.0

Vehicles-km by mode: Public Transport [million vkm/year]

Scenario	2019	2030	2050
BAU	7.7		
Promote and Regulate (S01)	7.7	7.9	7.9
Plan and Build (S02)	7.7	8.2	8.5
Mixed (S03)	7.7	8.6	8.5

Commuting travel time (SUMI) [min/day]

Scenario	2019	2030	2050
BAU	14.1		
Promote and Regulate (S01)	14.1	15.5	15.5
Plan and Build (S02)	14.1	15.1	15.7
Mixed (S03)	14.1	17.5	18.2



ALL INDICATORS

Medium City - Northern Europe

ENVIRONMENT AND SAFETY INDICATORS

Air pollutant emissions (SUMI: PM2.5, Nox) [kg PM2.5 eq/capita]

Scenario	2019	2030	2050
BAU	0.8		
Promote and regulate (S01)	0.8	0.3	0.1
Plan and Build (S02)	0.8	0.4	0.1
Mixed (S03)	0.8	0.3	0.1

Air pollutant emissions (CO, VOC) [kg / capita]

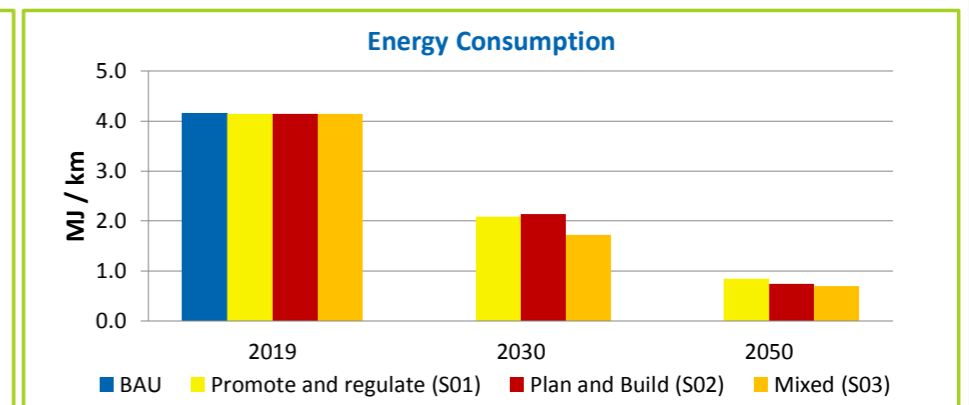
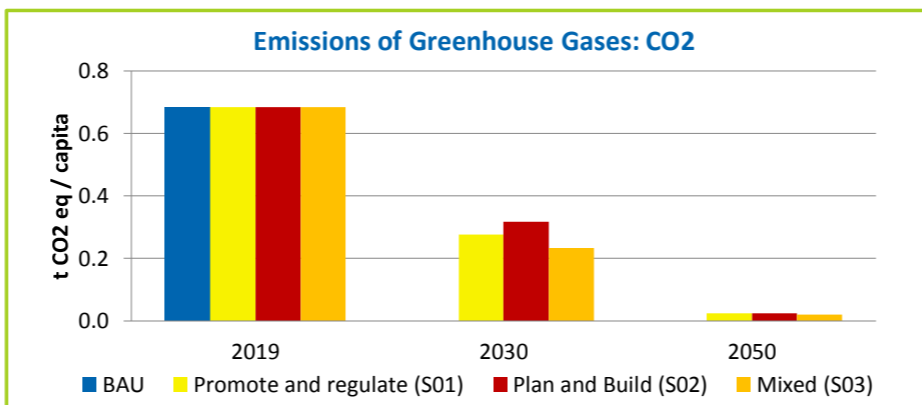
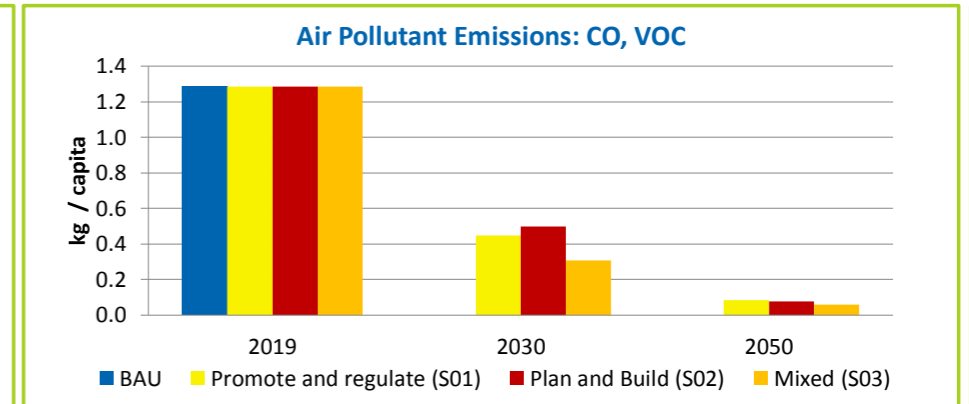
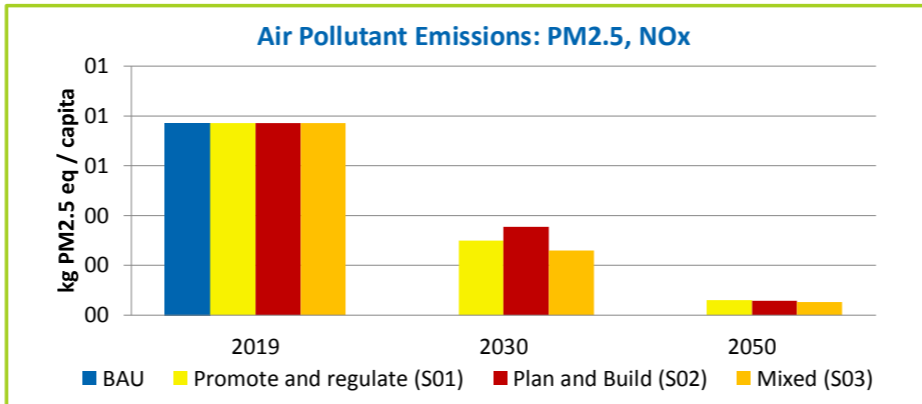
Scenario	2019	2030	2050
BAU	1		
Promote and regulate (S01)	1	0	0
Plan and Build (S02)	1.3	0.5	0.1
Mixed (S03)	1.3	0.3	0.1

Emissions of Greenhouse Gases [t CO2 eq / capita per year]

Scenario	2019	2030	2050
BAU	0.685		
Promote and regulate (S01)	0.685	0.277	0.025
Plan and Build (S02)	0.685	0.317	0.024
Mixed (S03)	0.685	0.233	0.021

Energy consumption [MJ / km]

Scenario	2019	2030	2050
BAU	4.1		
Promote and regulate (S01)	4.1	2.1	0.8
Plan and Build (S02)	4.1	2.1	0.7
Mixed (S03)	4.1	1.7	0.7



ALL INDICATORS

Medium City - Northern Europe

ENVIRONMENT AND SAFETY INDICATORS

Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	2.2		
Promote and regulate (S01)	2.2	1.3	1.1
Plan and Build (S02)	2.2	1.7	1.1
Mixed (S03)	2.2	0.9	0.8

Fatalities: active modes [fatalities / 100,000 inhab.]

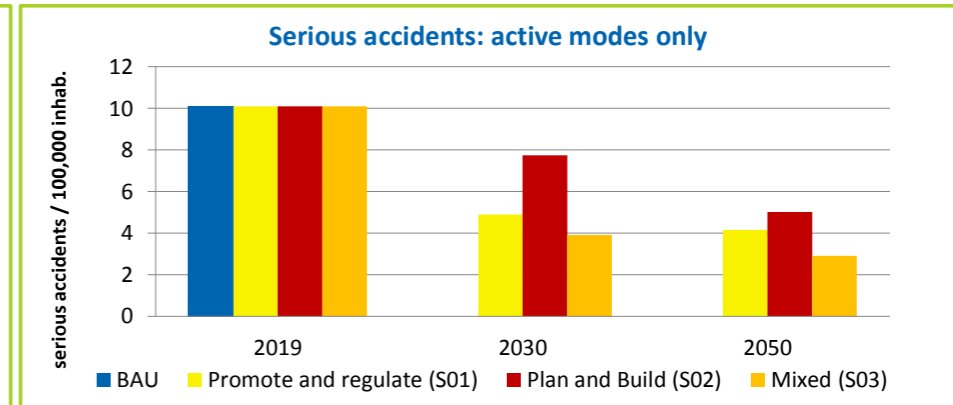
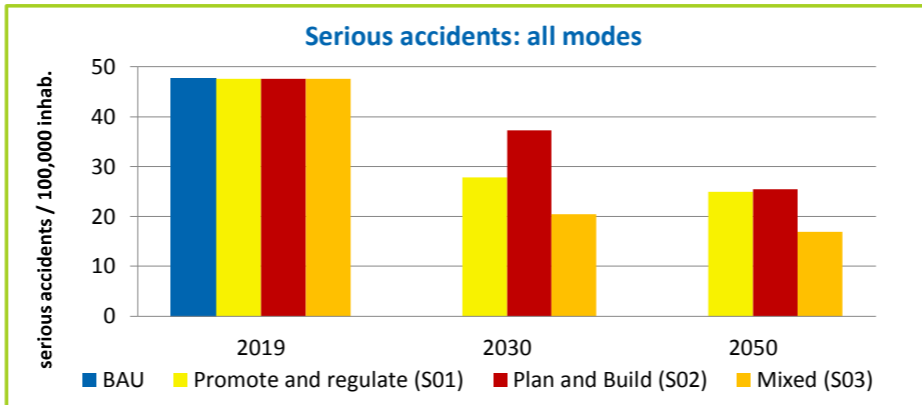
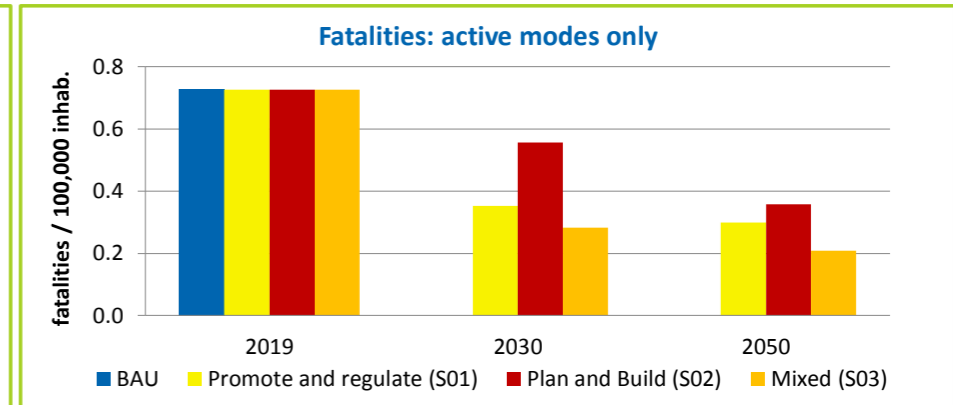
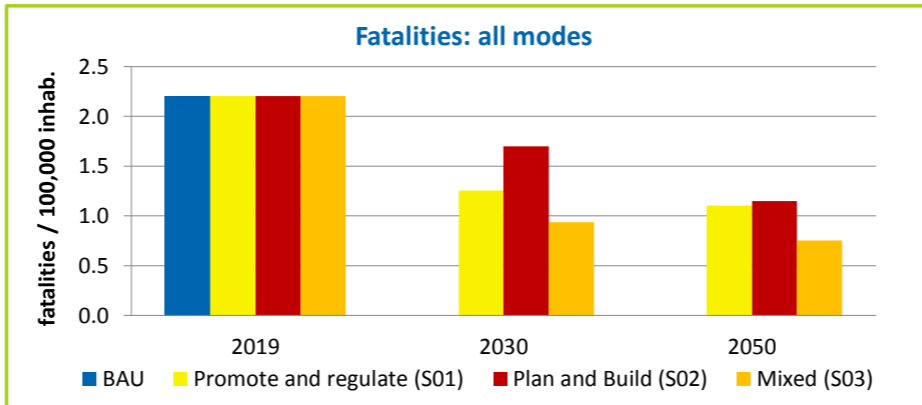
Scenario	2019	2030	2050
BAU	0.73		
Promote and regulate (S01)	0.73	0.35	0.30
Plan and Build (S02)	0.73	0.56	0.36
Mixed (S03)	0.73	0.28	0.21

Serious accidents [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	48		
Promote and regulate (S01)	48	28	25
Plan and Build (S02)	48	37	25
Mixed (S03)	48	20	17

Serious accidents: active modes [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	10		
Promote and regulate (S01)	10	5	4
Plan and Build (S02)	10	8	5
Mixed (S03)	10	4	3



ALL INDICATORS

Medium City - Eastern Europe

EMISSIONS OF CO₂ (TANK-TO-WHEEL), CAR OWNERSHIP, FATALITIES

Emissions of CO₂ (Tank-to-wheel) [t CO₂ eq / capita per year]

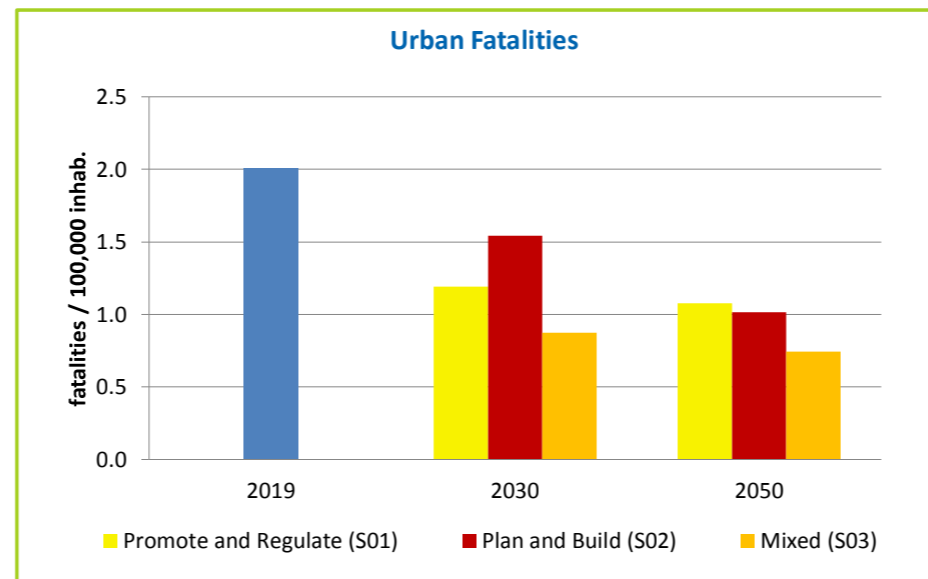
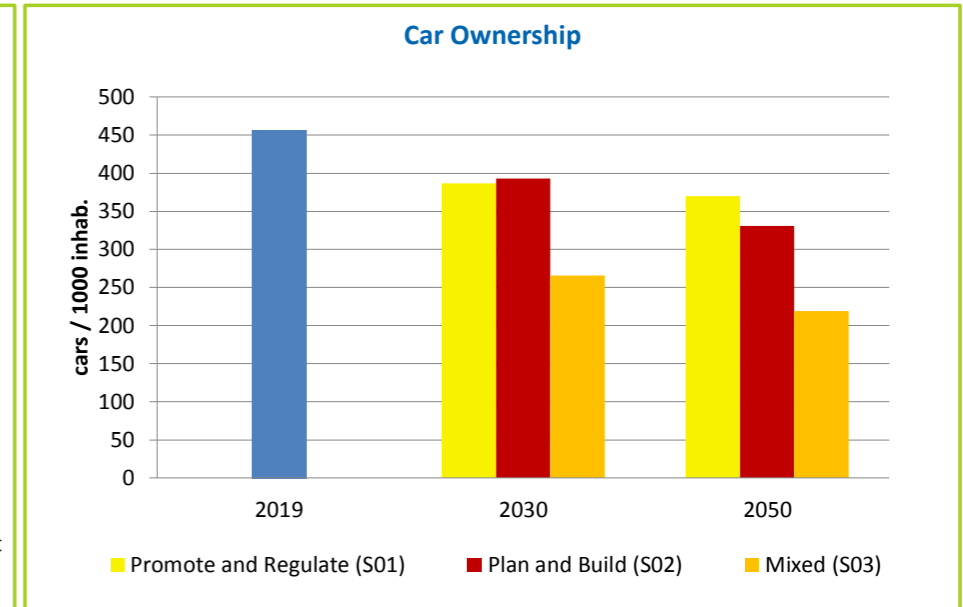
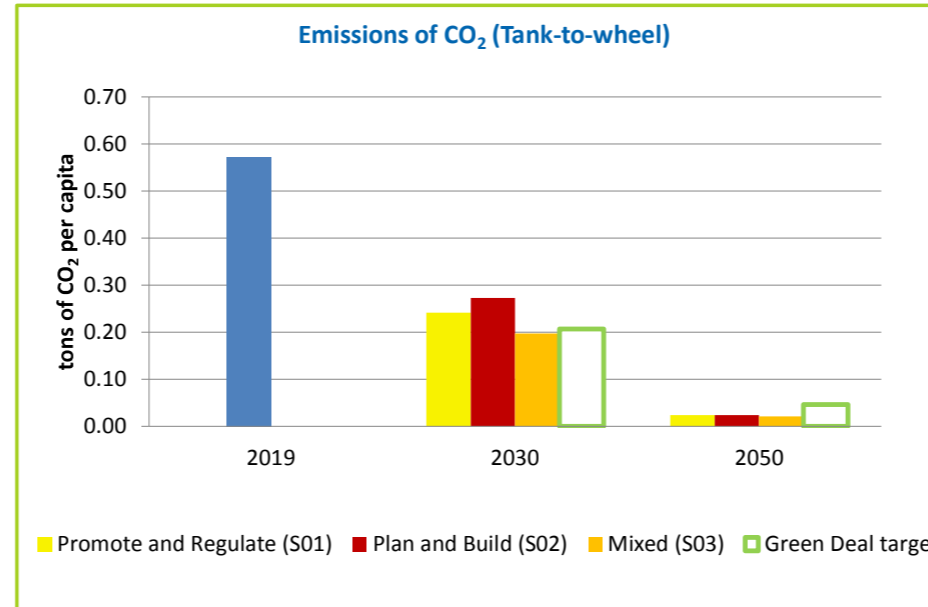
Scenario	2019	2030	2050
Promote and Regulate (S01)	0.572	0.241	0.023
Plan and Build (S02)	0.572	0.273	0.023
Mixed (S03)	0.572	0.197	0.021
Green Deal target		0.206	0.046

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	457	387	370
Plan and Build (S02)	457	393	331
Mixed (S03)	457	265	219

Urban Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	2.010	1.194	1.077
Plan and Build (S02)	2.010	1.541	1.014
Mixed (S03)	2.010	0.874	0.743



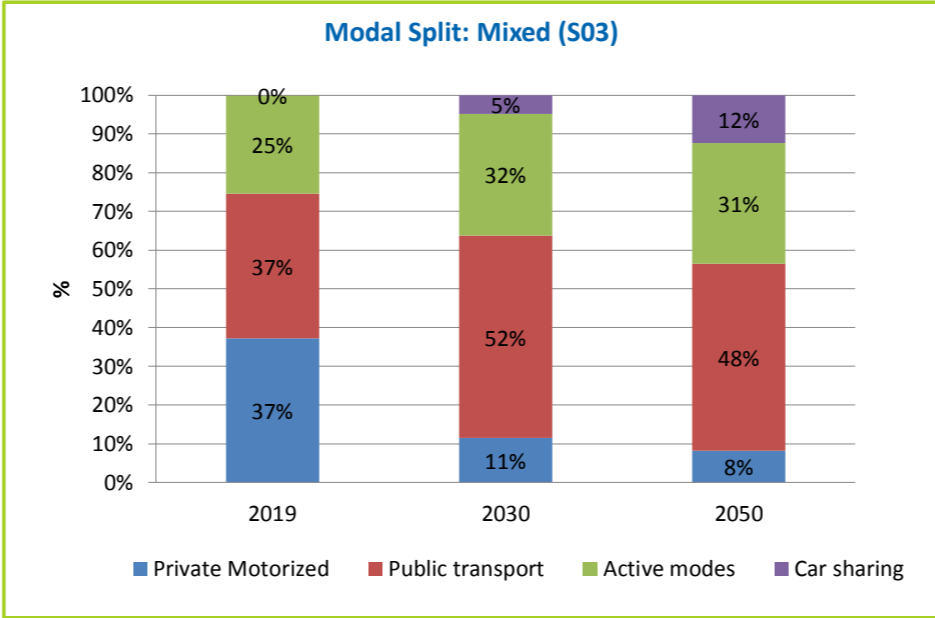
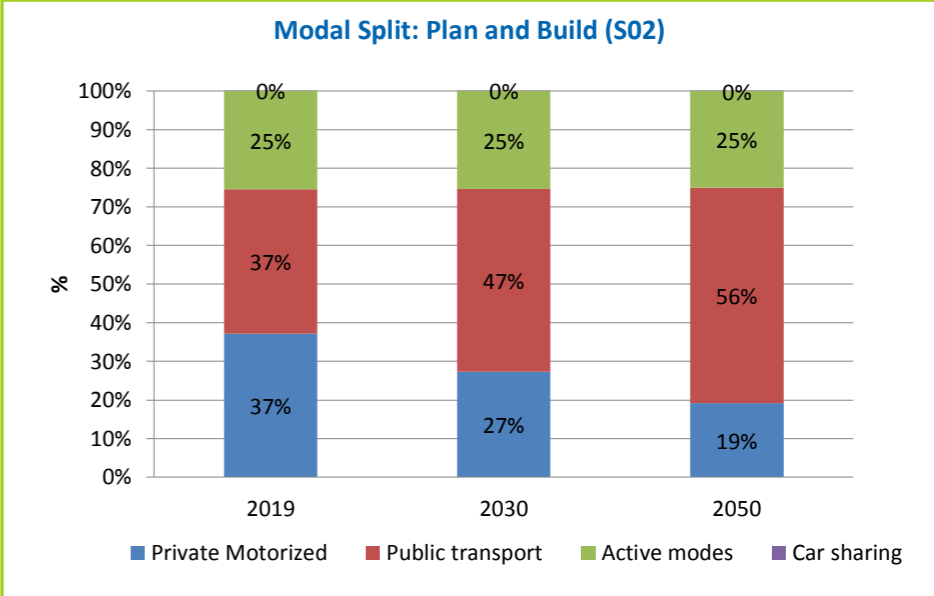
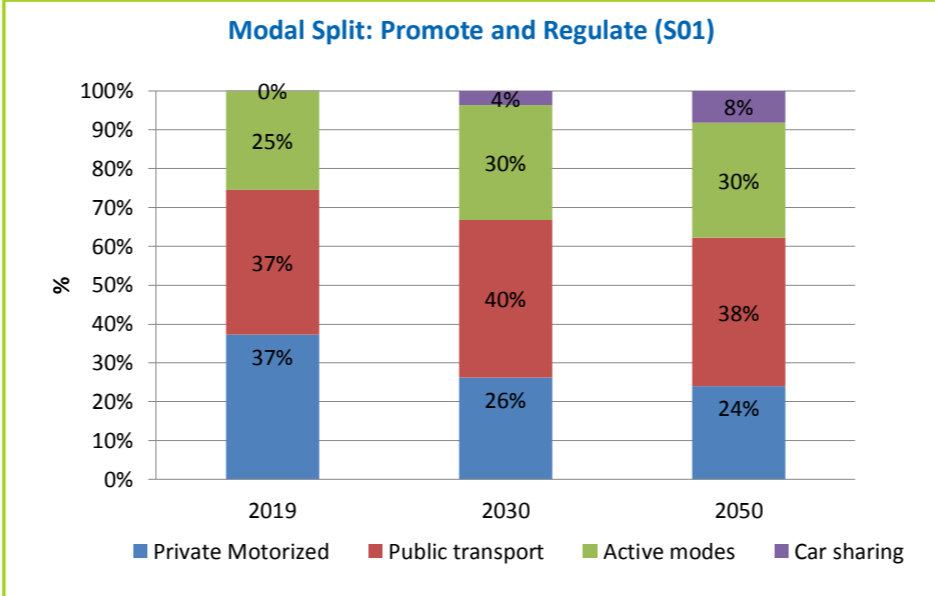
KEY INDICATORS

Medium City - Eastern Europe

MODAL SPLIT

Aggregate mode split [%]

Scenario	Mode	2019	2030	2050
Promote and Regulate (S01)	Private Motorized	37%	26%	24%
Promote and Regulate (S01)	Public transport	37%	40%	38%
Promote and Regulate (S01)	Active modes	25%	30%	30%
Promote and Regulate (S01)	Car sharing	0%	4%	8%
Plan and Build (S02)	Private Motorized	37%	27%	19%
Plan and Build (S02)	Public transport	37%	47%	56%
Plan and Build (S02)	Active modes	25%	25%	25%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Private Motorized	37%	11%	8%
Mixed (S03)	Public transport	37%	52%	48%
Mixed (S03)	Active modes	25%	32%	31%
Mixed (S03)	Car sharing	0%	5%	12%



KEY INDICATORS

Medium City - Eastern Europe

ECONOMIC OUTPUTS (discounted, cumulated from 2019)*

City total revenues [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	39	118
Plan and Build (S02)	0	20	64
Mixed (S03)	0	77	203

City total costs [mio euro]

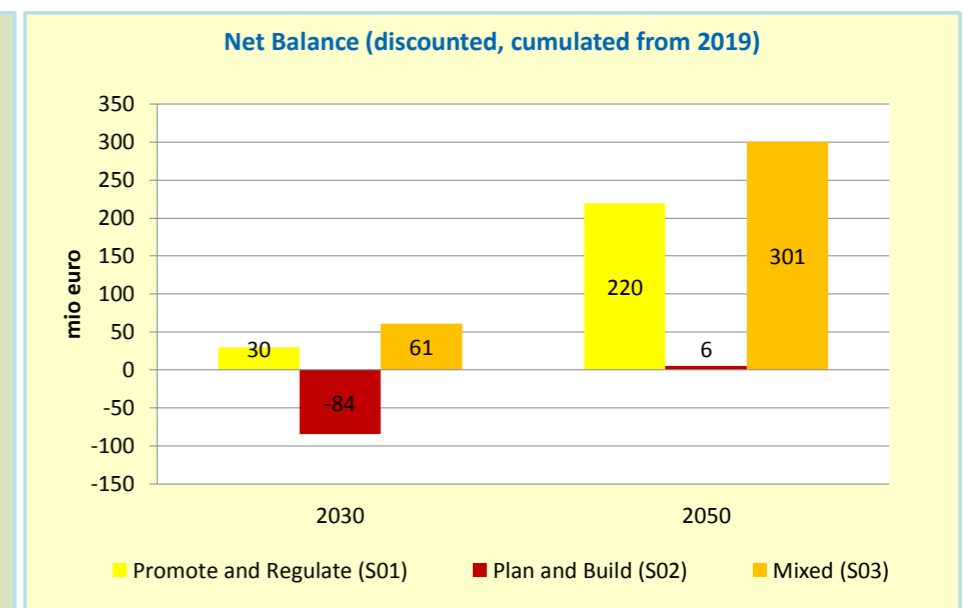
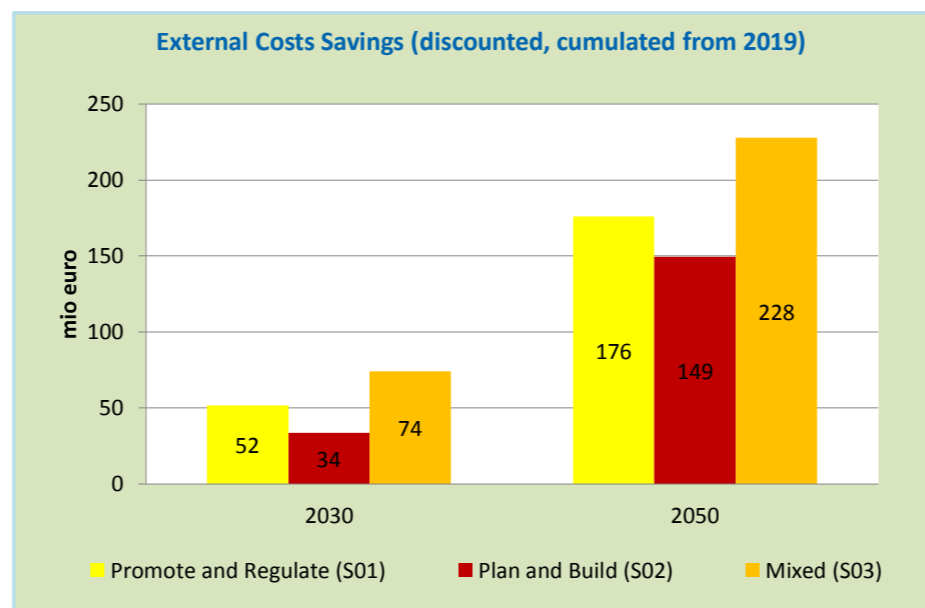
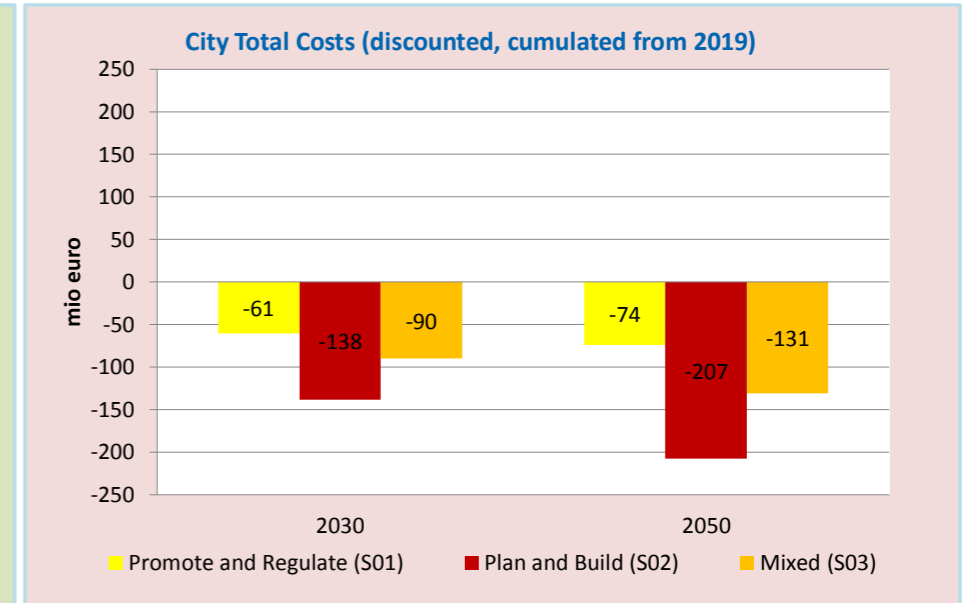
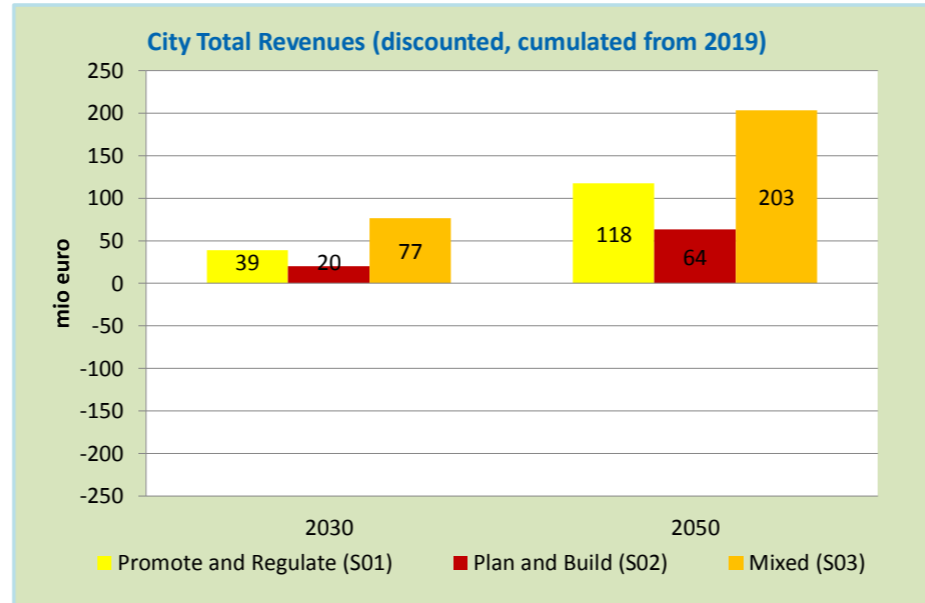
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	61	74
Plan and Build (S02)	0	138	207
Mixed (S03)	0	90	131

External costs savings [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	52	176
Plan and Build (S02)	0	34	149
Mixed (S03)	0	74	228

Net balance [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	30	220
Plan and Build (S02)	0	-84	6
Mixed (S03)	0	61	301



* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Medium City - Eastern Europe

ECONOMIC OUTPUTS PER CAPITA (discounted, cumulated from 2019)*

City total revenues [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	178	539
Plan and Build (S02)	0	93	291
Mixed (S03)	0	351	930

City total costs [euro / capita]

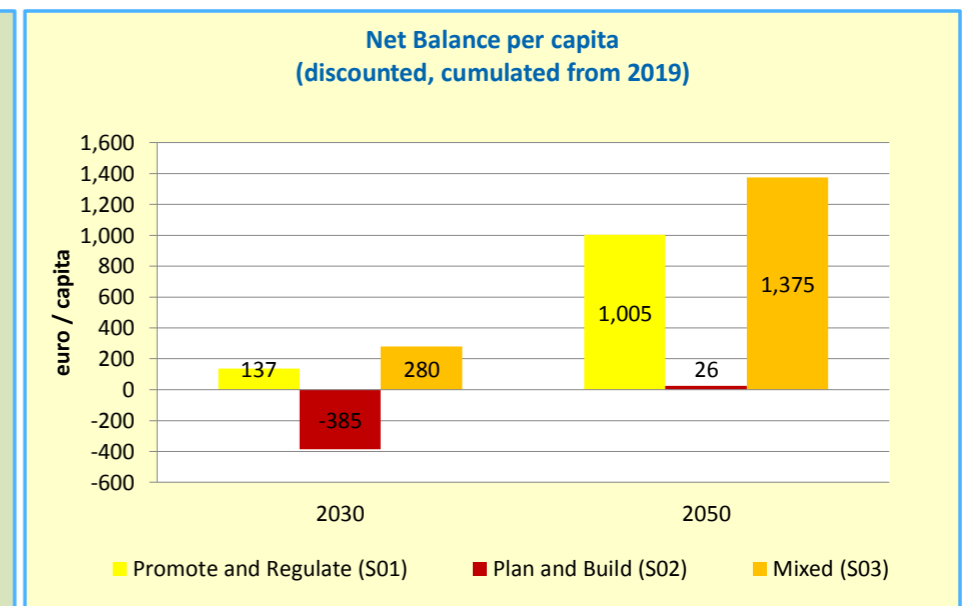
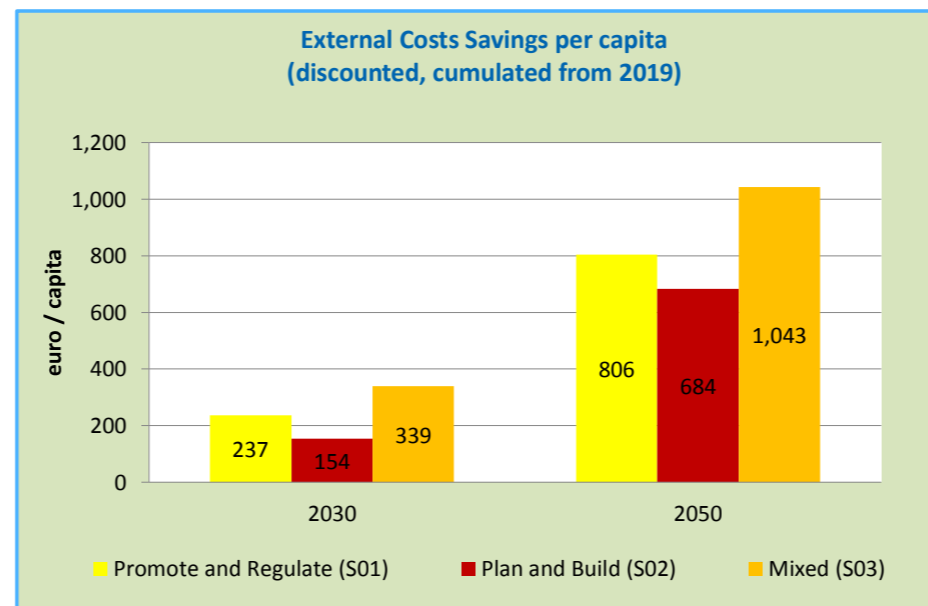
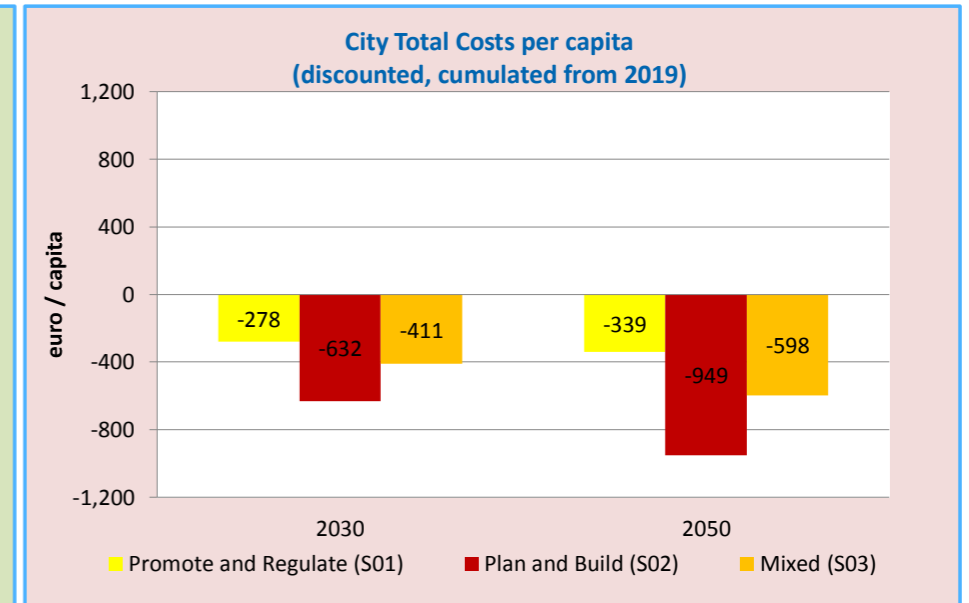
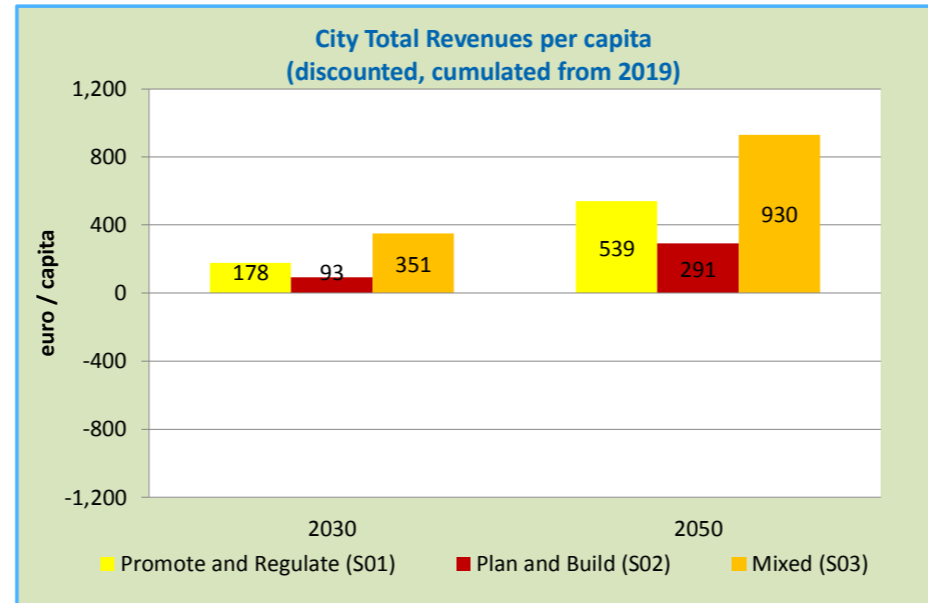
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	278	339
Plan and Build (S02)	0	632	949
Mixed (S03)	0	411	598

External costs savings [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	237	806
Plan and Build (S02)	0	154	684
Mixed (S03)	0	339	1,043

Net balance [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	137	1,005
Plan and Build (S02)	0	-385	26
Mixed (S03)	0	280	1,375



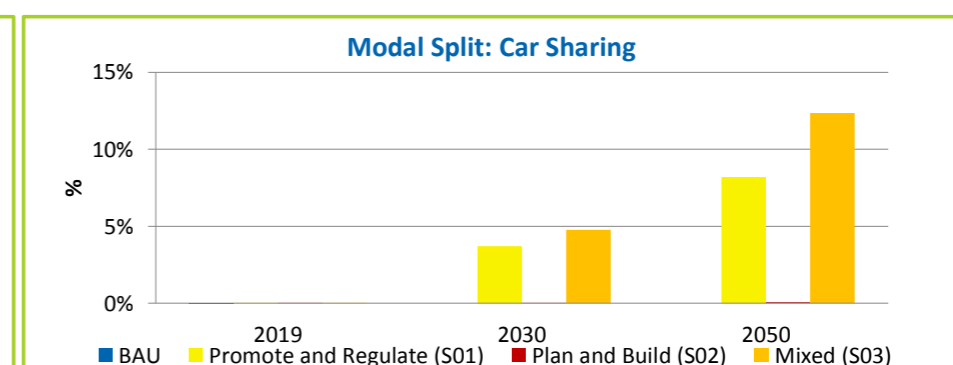
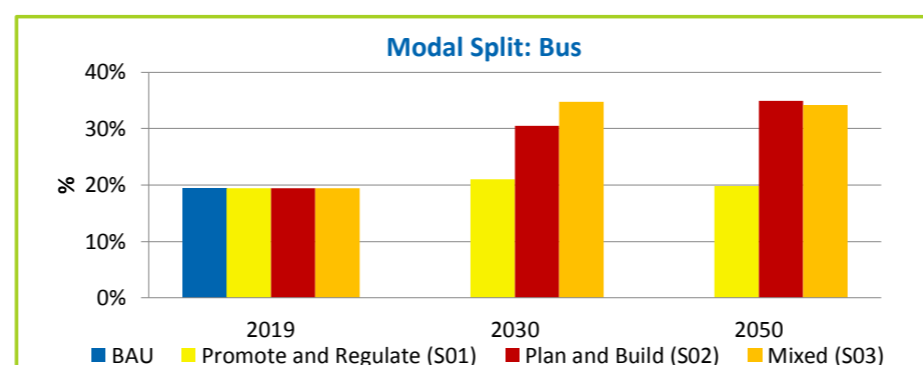
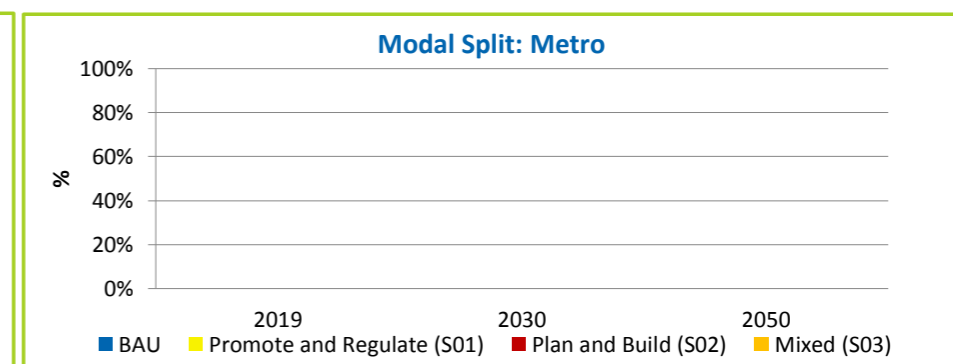
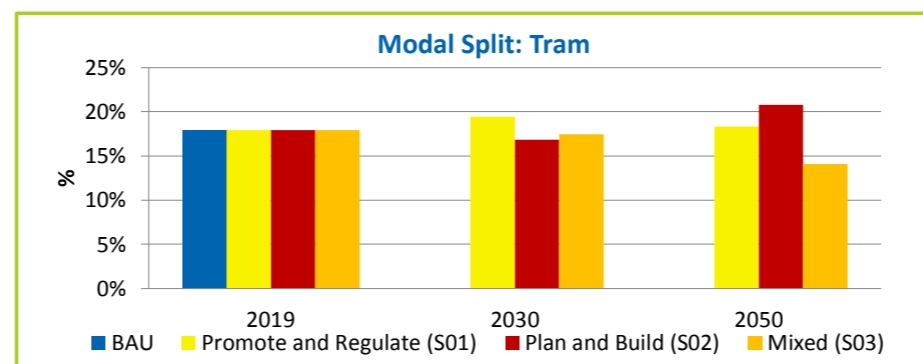
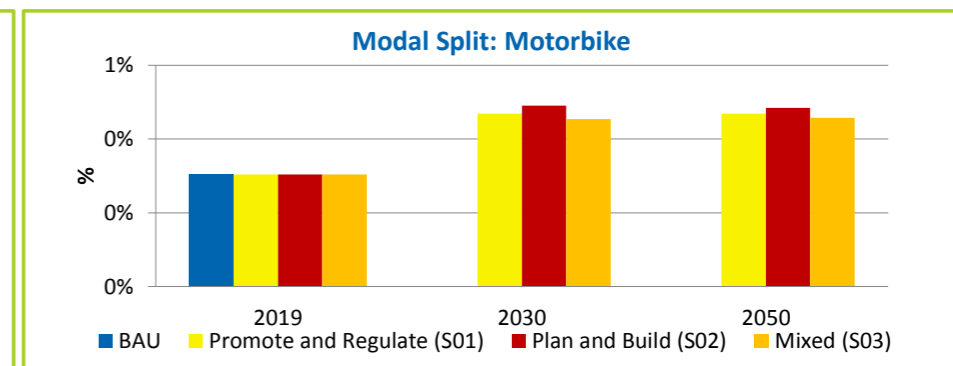
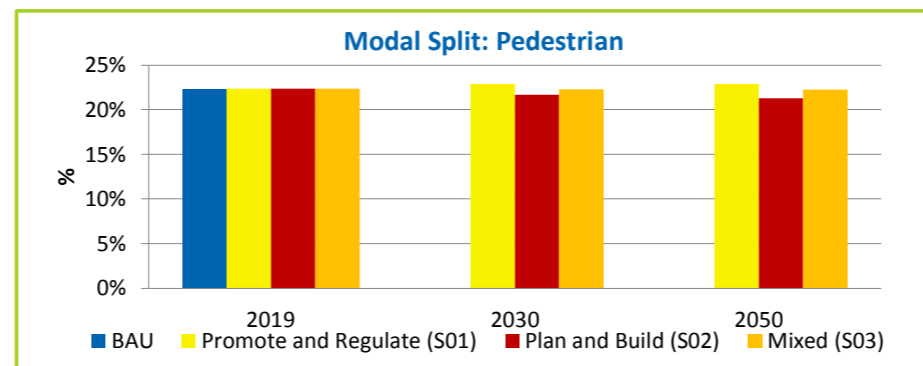
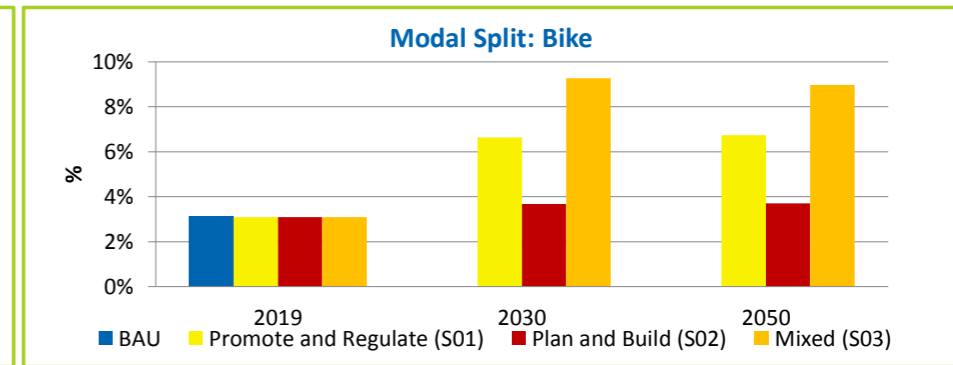
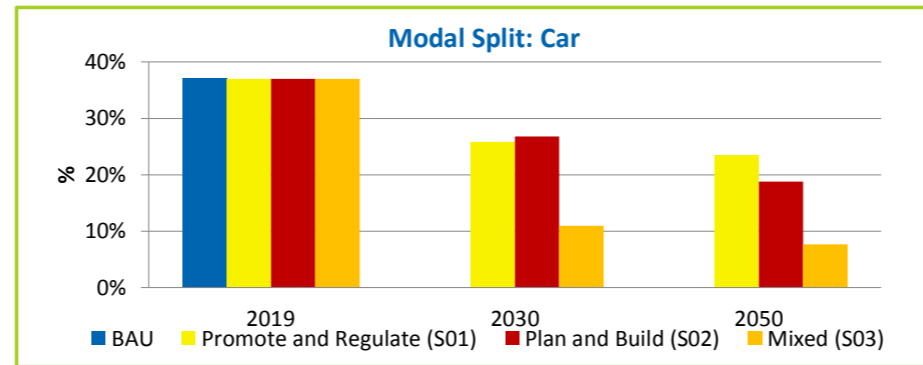
* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Medium City - Eastern Europe

TRANSPORT AND MOBILITY INDICATORS

Mode split [%]					
Scenario	Mode	2019	2030	2050	
BAU	Pedestrian	22%			
BAU	Bike	3%			
BAU	Motorbike	0%			
BAU	Car	37%			
BAU	Bus	19%			
BAU	Tram	18%			
BAU	Metro	0%			
BAU	Car sharing	0%			
Promote and Regulate (S01)	Pedestrian	22%	23%	23%	
Promote and Regulate (S01)	Bike	3%	7%	7%	
Promote and Regulate (S01)	Motorbike	0%	0%	0%	
Promote and Regulate (S01)	Car	37%	26%	24%	
Promote and Regulate (S01)	Bus	19%	21%	20%	
Promote and Regulate (S01)	Tram	18%	19%	18%	
Promote and Regulate (S01)	Metro	0%	0%	0%	
Promote and Regulate (S01)	Car sharing	0%	4%	8%	
Plan and Build (S02)	Pedestrian	22%	22%	21%	
Plan and Build (S02)	Bike	3%	4%	4%	
Plan and Build (S02)	Motorbike	0%	0%	0%	
Plan and Build (S02)	Car	37%	27%	19%	
Plan and Build (S02)	Bus	19%	30%	35%	
Plan and Build (S02)	Tram	18%	17%	21%	
Plan and Build (S02)	Metro	0%	0%	0%	
Plan and Build (S02)	Car sharing	0%	0%	0%	
Mixed (S03)	Pedestrian	22%	22%	22%	
Mixed (S03)	Bike	3%	9%	9%	
Mixed (S03)	Motorbike	0%	0%	0%	
Mixed (S03)	Car	37%	11%	8%	
Mixed (S03)	Bus	19%	35%	34%	
Mixed (S03)	Tram	18%	17%	14%	
Mixed (S03)	Metro	0%	0%	0%	
Mixed (S03)	Car sharing	0%	5%	12%	



ALL INDICATORS

Medium City - Eastern Europe

TRANSPORT AND MOBILITY INDICATORS

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
BAU	457		
Promote and Regulate (S01)	457	387	370
Plan and Build (S02)	457	393	331
Mixed (S03)	457	265	219

Congestion and delays index (SUMI)

Scenario	2019	2030	2050
BAU	9.59		
Promote and Regulate (S01)	9.59	9.91	9.93
Plan and Build (S02)	9.59	9.80	9.97
Mixed (S03)	9.59	10.00	10.00

Public transport occupancy levels [pass/vehicle]

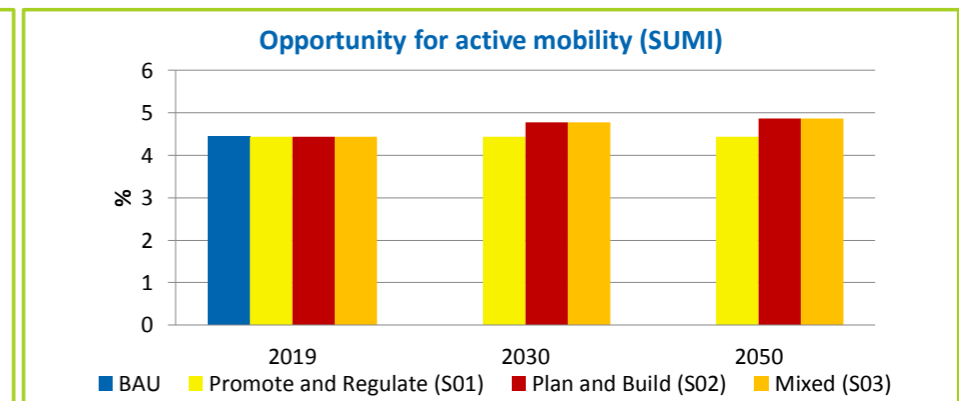
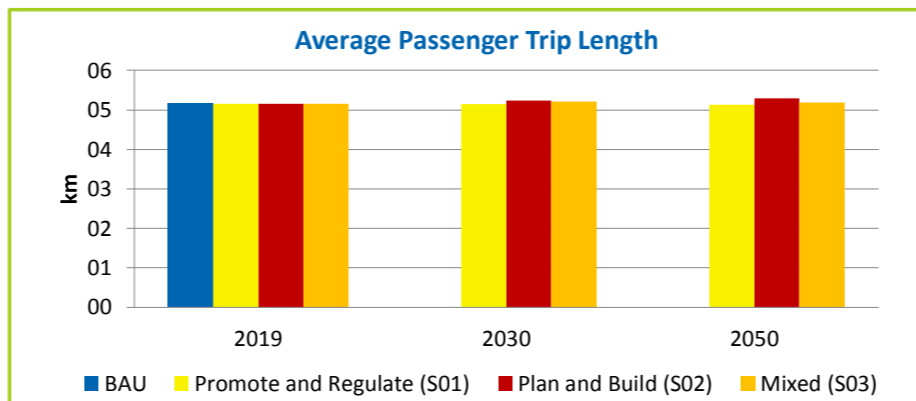
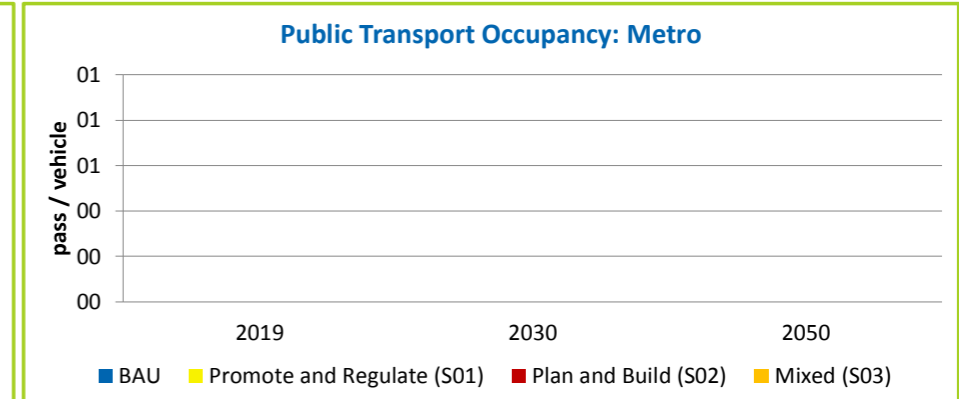
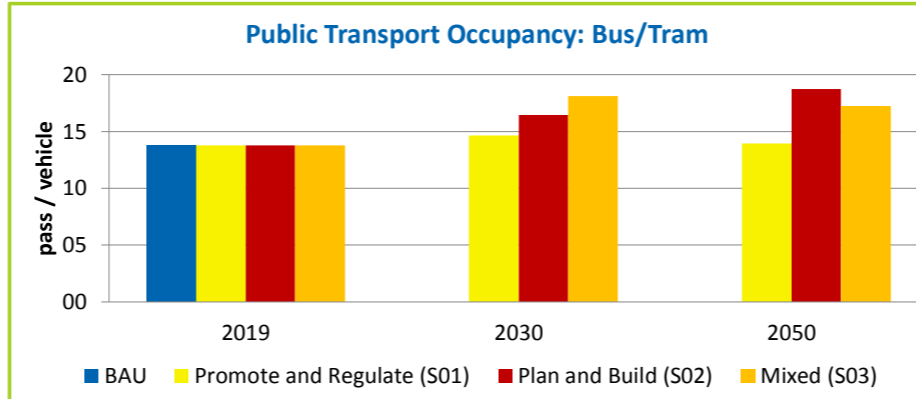
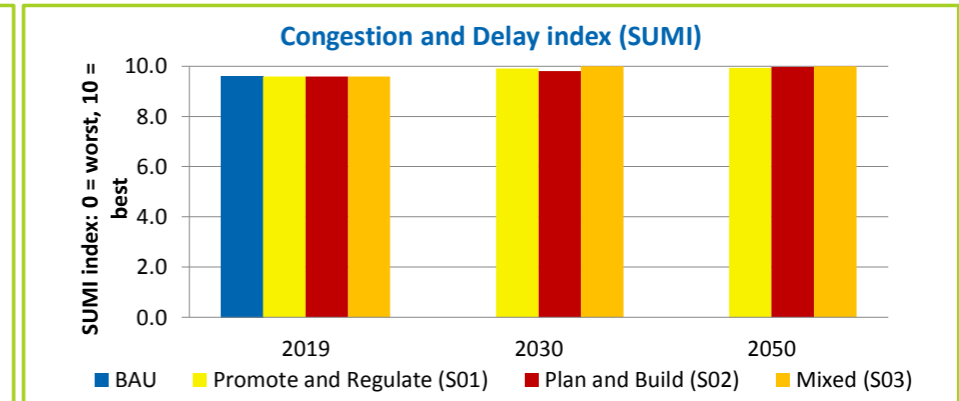
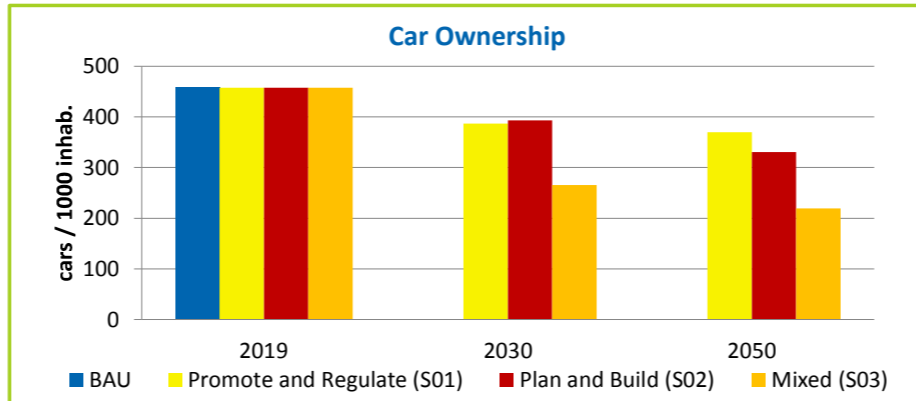
Scenario	PT mode	2019	2030	2050
BAU	Bus/tram	13.8		
BAU	Metro	0.0		
Promote and Regulate (S01)	Bus/tram	13.8	14.7	13.9
Promote and Regulate (S01)	Metro	0.0	0.0	0.0
Plan and Build (S02)	Bus/tram	13.8	16.4	18.7
Plan and Build (S02)	Metro	0.0	0.0	0.0
Mixed (S03)	Bus/tram	13.79	18.14	17.26
Mixed (S03)	Metro	0.00	0.00	0.00

Average passenger trip length [km]

Scenario	2019	2030	2050
BAU	5.2		
Promote and Regulate (S01)	5.2	5.1	5.1
Plan and Build (S02)	5.2	5.2	5.3
Mixed (S03)	5.2	5.2	5.2

Opportunity for active mobility (SUMI) [%]

Scenario	2019	2030	2050
BAU	4.43		
Promote and Regulate (S01)	4.43	4.43	4.43
Plan and Build (S02)	4.43	4.78	4.86
Mixed (S03)	4.43	4.78	4.86



ALL INDICATORS

Medium City - Eastern Europe

TRANSPORT AND MOBILITY INDICATORS

Penetration of alternatively fuelled car vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	Hybrid electric	0%		
BAU	Battery electric	0%		
BAU	fuel cells	0%		
Scenarios	Hybrid electric	0%	2%	7%
Scenarios	Battery electric	0%	31%	84%
Scenarios	fuel cells	0%	0%	9%

Penetration of alternatively fuelled bus vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	CNG	1%		
BAU	Hybrid electric	0.0%		
BAU	Battery electric	0.4%		
Scenarios	CNG	1%	1%	1%
Scenarios	Hybrid electric	0%	0%	0%
Scenarios	Battery electric	0%	60%	79%

Vehicles-km by mode: cars and car-sharing cars [million vkm/year]

Scenario	2019	2030	2050
BAU	272		
Promote and Regulate (S01)	272	212	223
Plan and Build (S02)	272	222	184
Mixed (S03)	272	147	169

Vehicles-km by mode: trucks [million vkm/year]

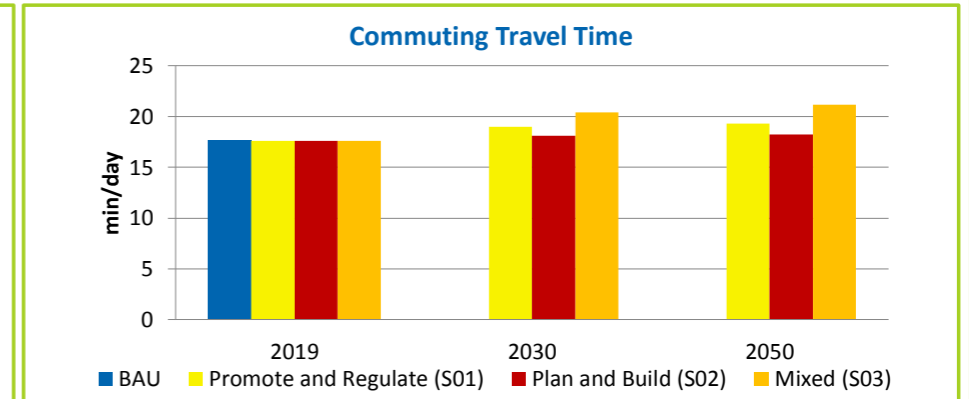
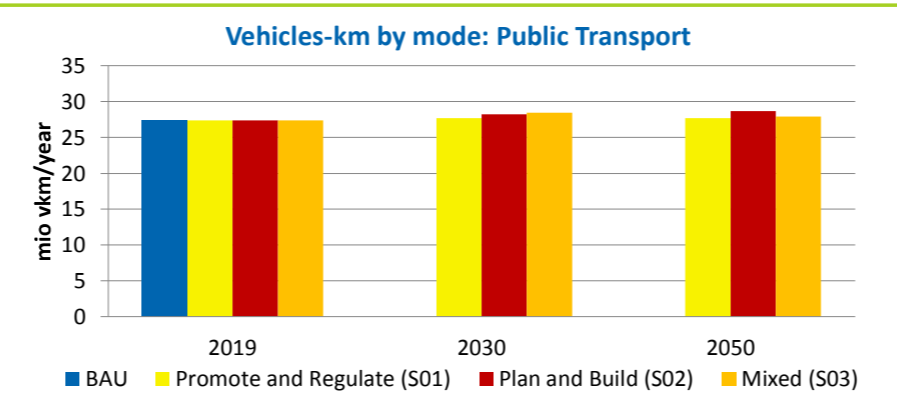
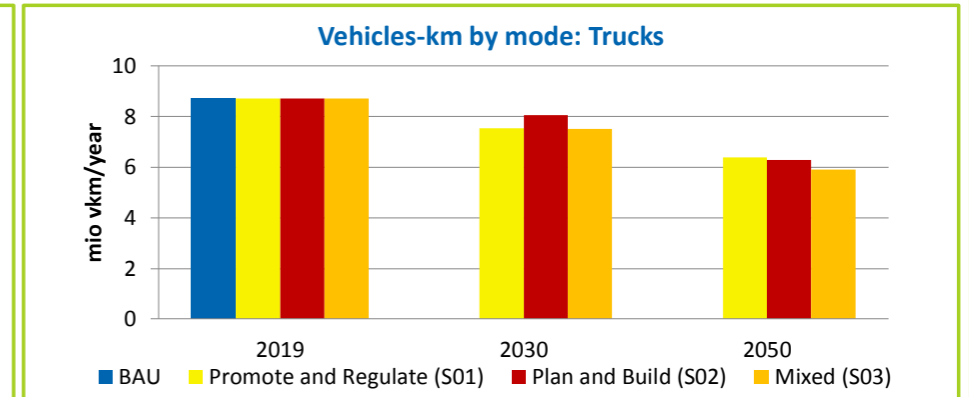
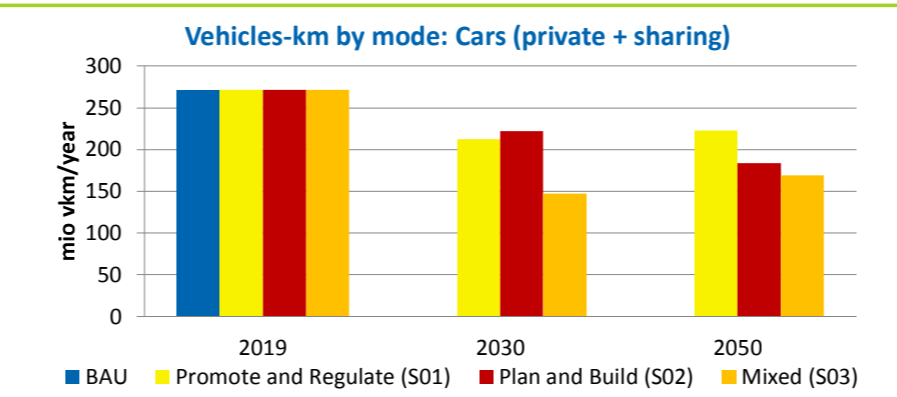
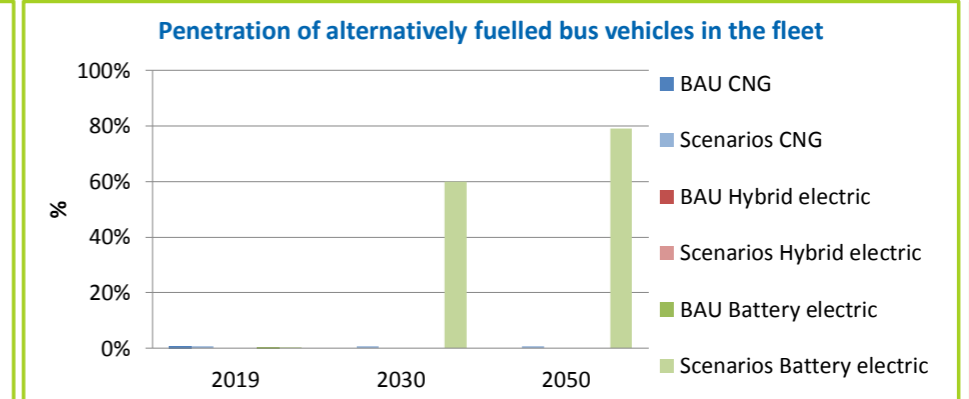
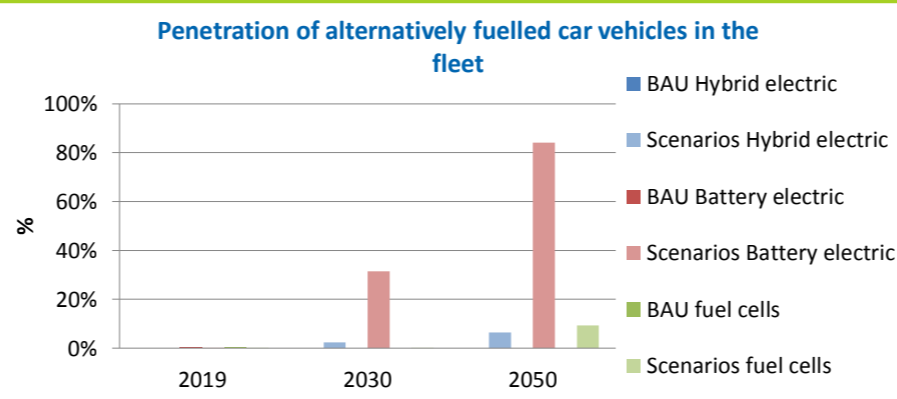
Scenario	2019	2030	2050
BAU	8.7		
Promote and Regulate (S01)	9	8	6
Plan and Build (S02)	8.7	8.1	6.3
Mixed (S03)	8.7	7.5	5.9

Vehicles-km by mode: Public Transport [million vkm/year]

Scenario	2019	2030	2050
BAU	27.4		
Promote and Regulate (S01)	27.4	27.7	27.7
Plan and Build (S02)	27.4	28.2	28.7
Mixed (S03)	27.4	28.5	28.0

Commuting travel time (SUMI) [min/day]

Scenario	2019	2030	2050
BAU	17.6		
Promote and Regulate (S01)	17.6	19.0	19.3
Plan and Build (S02)	17.6	18.1	18.2
Mixed (S03)	17.6	20.4	21.2



ALL INDICATORS

Medium City - Eastern Europe

ENVIRONMENT AND SAFETY INDICATORS

Air pollutant emissions (SUMI: PM2.5, Nox) [kg PM2.5 eq/capita]

Scenario	2019	2030	2050
BAU	0.8		
Promote and regulate (S01)	0.8	0.3	0.1
Plan and Build (S02)	0.8	0.3	0.1
Mixed (S03)	0.8	0.2	0.1

Air pollutant emissions (CO, VOC) [kg / capita]

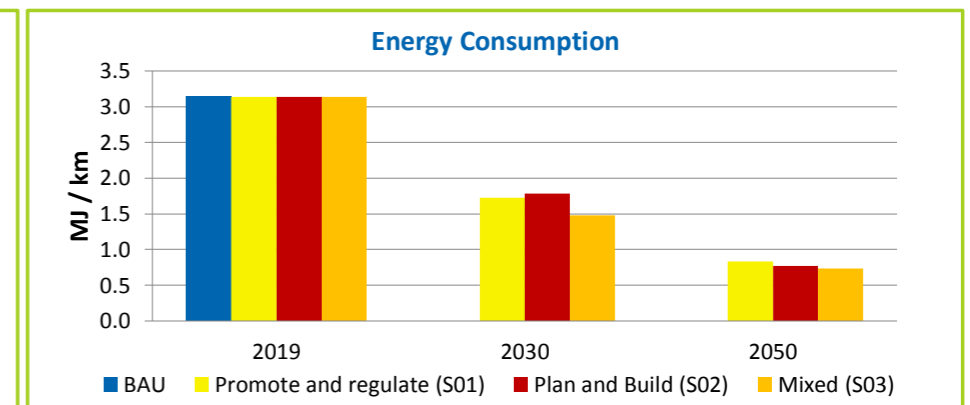
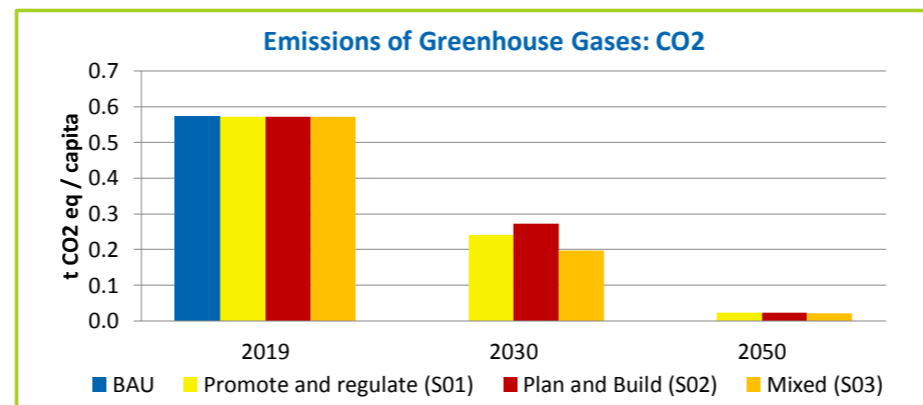
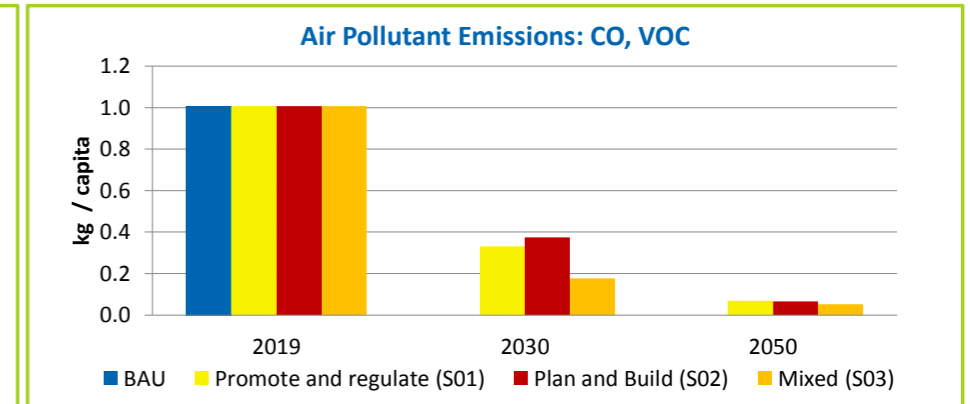
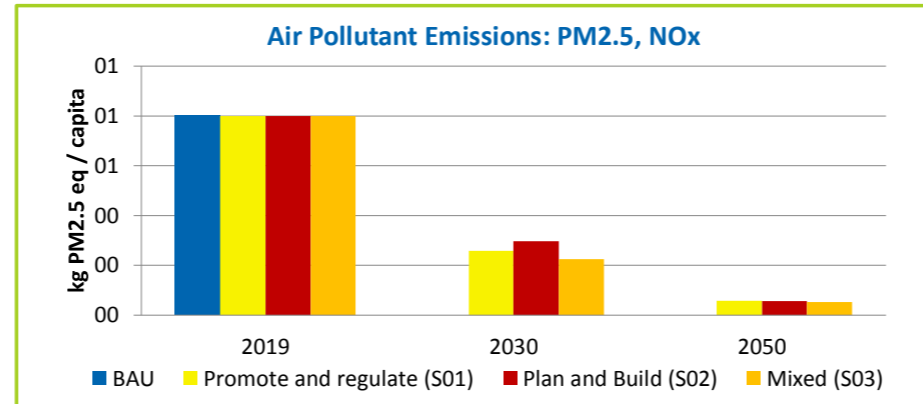
Scenario	2019	2030	2050
BAU	1		
Promote and regulate (S01)	1	0	0
Plan and Build (S02)	1.0	0.4	0.1
Mixed (S03)	1.0	0.2	0.1

Emissions of Greenhouse Gases [t CO2 eq / capita per year]

Scenario	2019	2030	2050
BAU	0.572		
Promote and regulate (S01)	0.572	0.241	0.023
Plan and Build (S02)	0.572	0.273	0.023
Mixed (S03)	0.572	0.197	0.021

Energy consumption [MJ / km]

Scenario	2019	2030	2050
BAU	3.1		
Promote and regulate (S01)	3.1	1.7	0.8
Plan and Build (S02)	3.1	1.8	0.8
Mixed (S03)	3.1	1.5	0.7



ALL INDICATORS

Medium City - Eastern Europe

ENVIRONMENT AND SAFETY INDICATORS

Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	2.0		
Promote and regulate (S01)	2.0	1.2	1.1
Plan and Build (S02)	2.0	1.5	1.0
Mixed (S03)	2.0	0.9	0.7

Fatalities: active modes [fatalities / 100,000 inhab.]

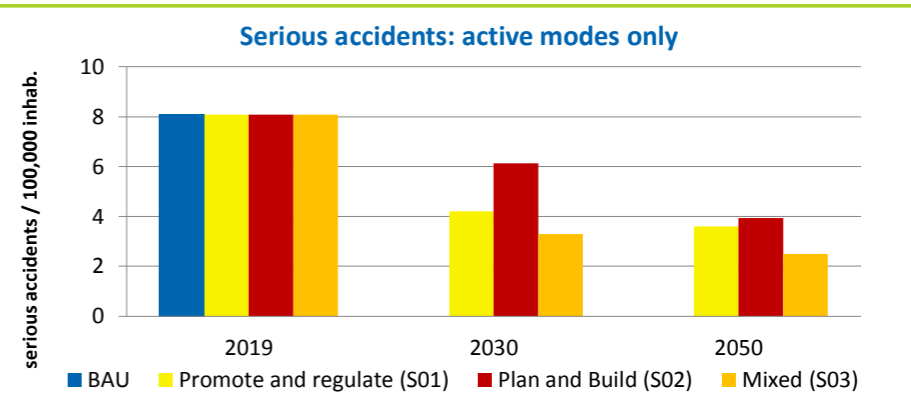
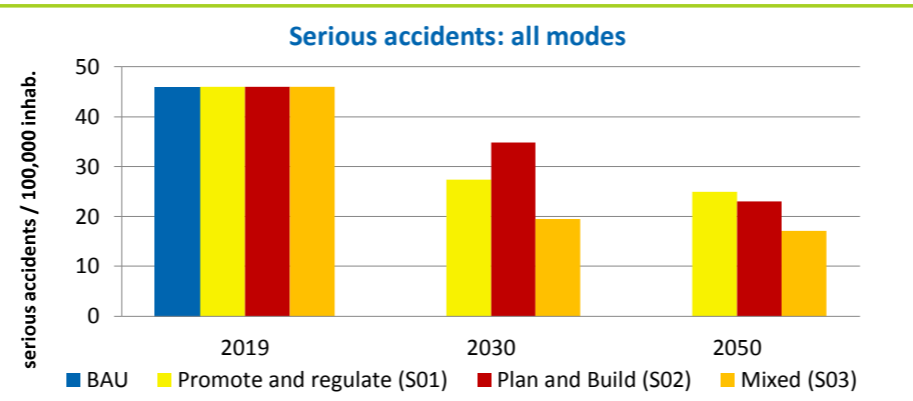
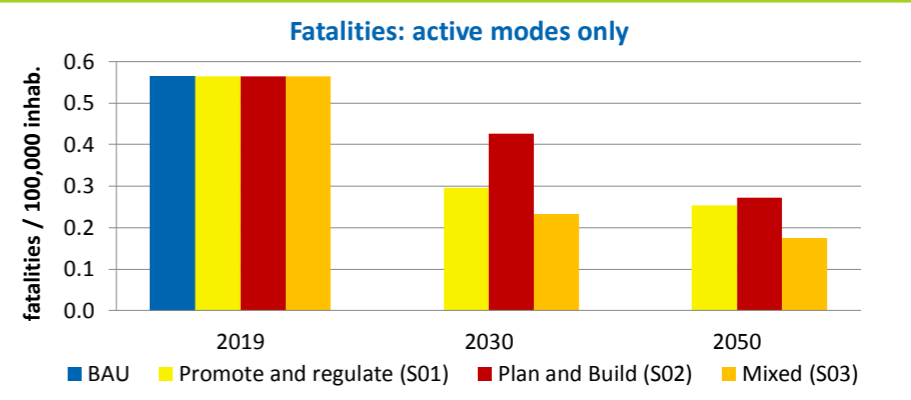
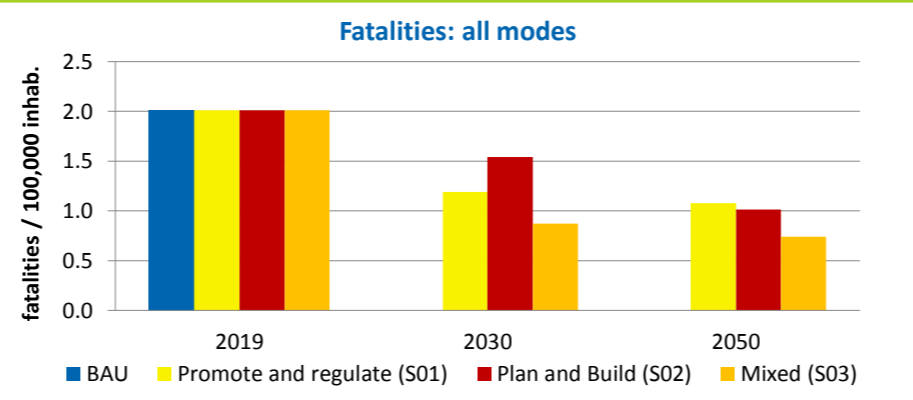
Scenario	2019	2030	2050
BAU	0.56		
Promote and regulate (S01)	0.56	0.30	0.25
Plan and Build (S02)	0.56	0.43	0.27
Mixed (S03)	0.56	0.23	0.18

Serious accidents [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	46		
Promote and regulate (S01)	46	27	25
Plan and Build (S02)	46	35	23
Mixed (S03)	46	20	17

Serious accidents: active modes [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	8		
Promote and regulate (S01)	8	4	4
Plan and Build (S02)	8	6	4
Mixed (S03)	8	3	3



ALL INDICATORS

Large City - Southern Europe

EMISSIONS OF CO₂ (TANK-TO-WHEEL), CAR OWNERSHIP, FATALITIES

Emissions of CO₂ (Tank-to-wheel) [t CO₂ eq / capita per year]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0.682	0.282	0.045
Plan and Build (S02)	0.682	0.327	0.045
Mixed (S03)	0.682	0.240	0.035
Green Deal target		0.246	0.055

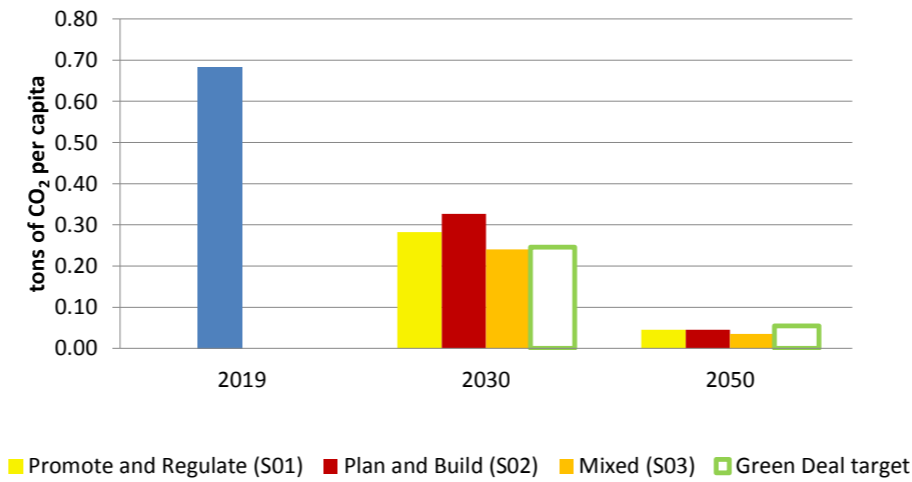
Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	484	408	387
Plan and Build (S02)	484	446	353
Mixed (S03)	484	338	243

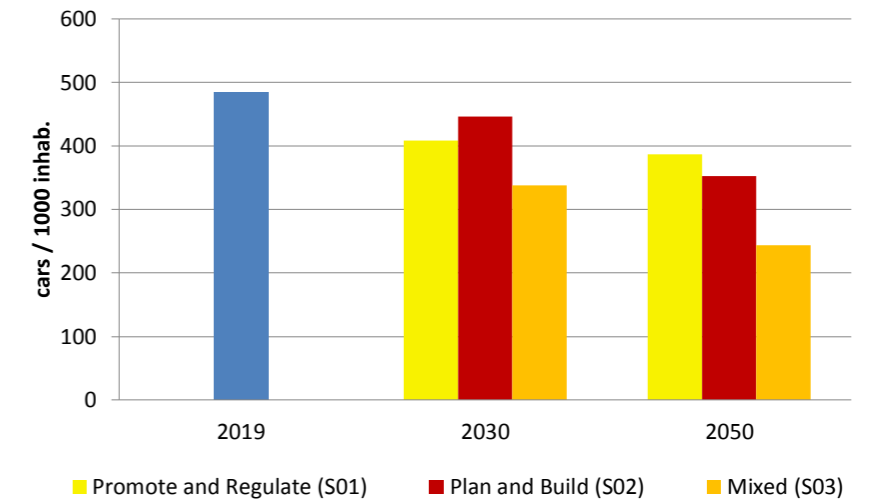
Urban Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	3.799	2.200	2.014
Plan and Build (S02)	3.799	2.968	1.768
Mixed (S03)	3.799	1.669	1.462

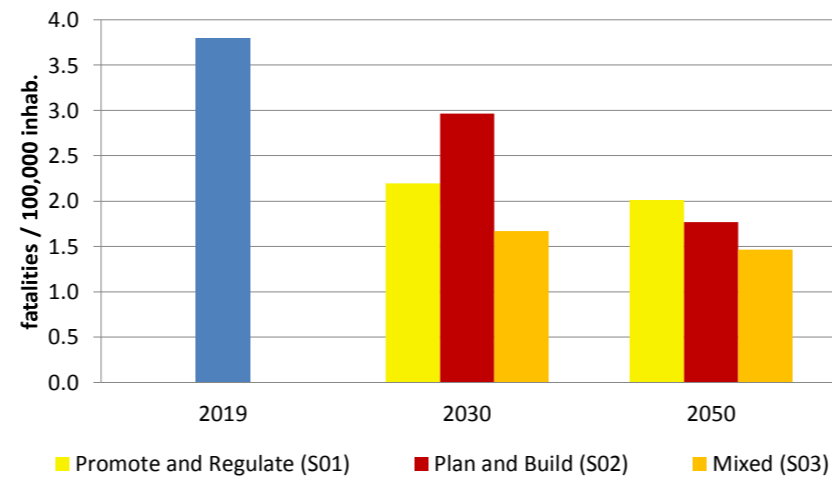
Emissions of CO₂ (Tank-to-wheel)



Car Ownership



Urban Fatalities



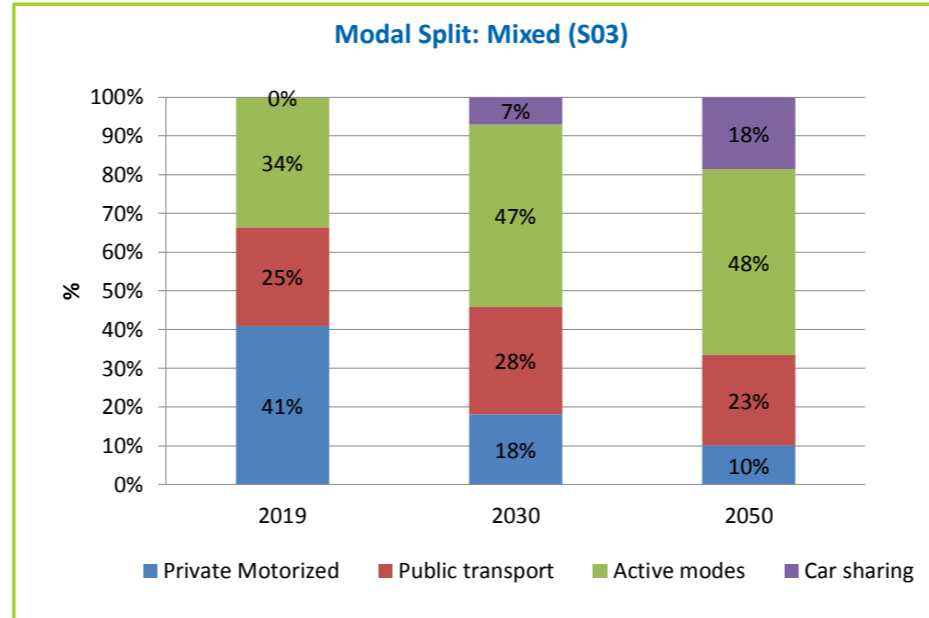
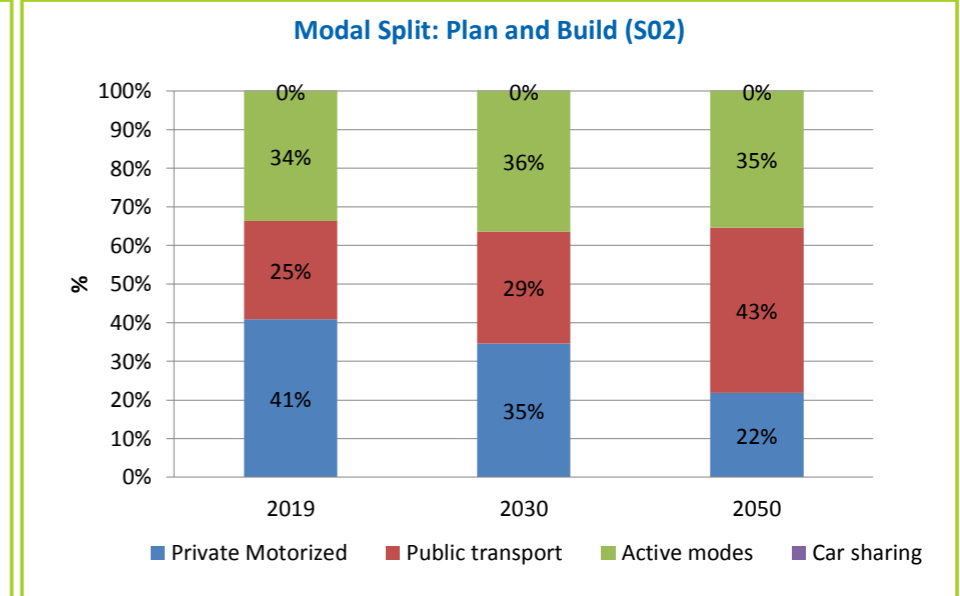
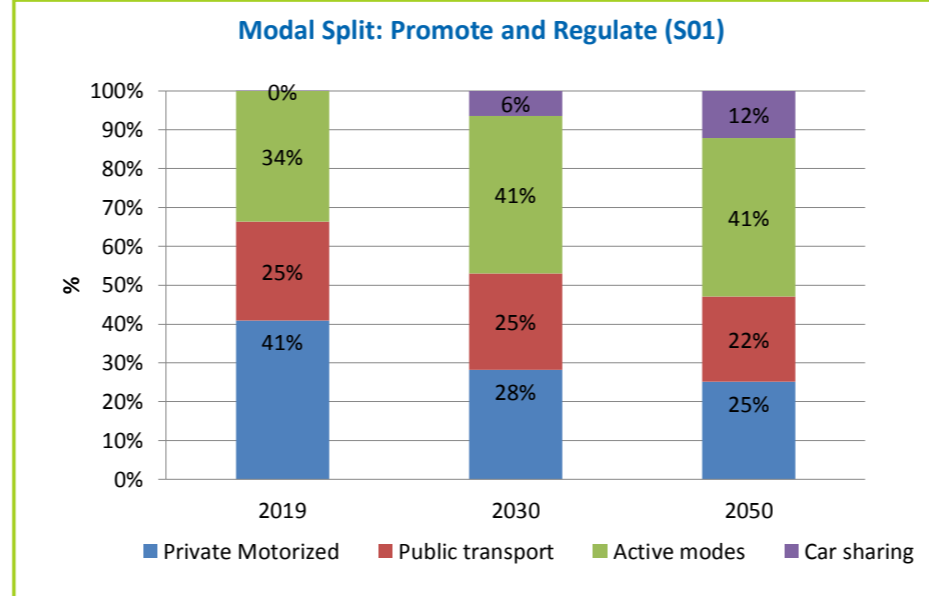
KEY INDICATORS

Large City - Southern Europe

MODAL SPLIT

Aggregate mode split [%]

Scenario	Mode	2019	2030	2050
Promote and Regulate (S01)	Private Motorized	41%	28%	25%
Promote and Regulate (S01)	Public transport	25%	25%	22%
Promote and Regulate (S01)	Active modes	34%	41%	41%
Promote and Regulate (S01)	Car sharing	0%	6%	12%
Plan and Build (S02)	Private Motorized	41%	35%	22%
Plan and Build (S02)	Public transport	25%	29%	43%
Plan and Build (S02)	Active modes	34%	36%	35%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Private Motorized	41%	18%	10%
Mixed (S03)	Public transport	25%	28%	23%
Mixed (S03)	Active modes	34%	47%	48%
Mixed (S03)	Car sharing	0%	7%	18%



KEY INDICATORS

Large City - Southern Europe

ECONOMIC OUTPUTS (discounted, cumulated from 2019)*

City total revenues [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	358	1,410
Plan and Build (S02)	0	97	691
Mixed (S03)	0	549	1,963

City total costs [mio euro]

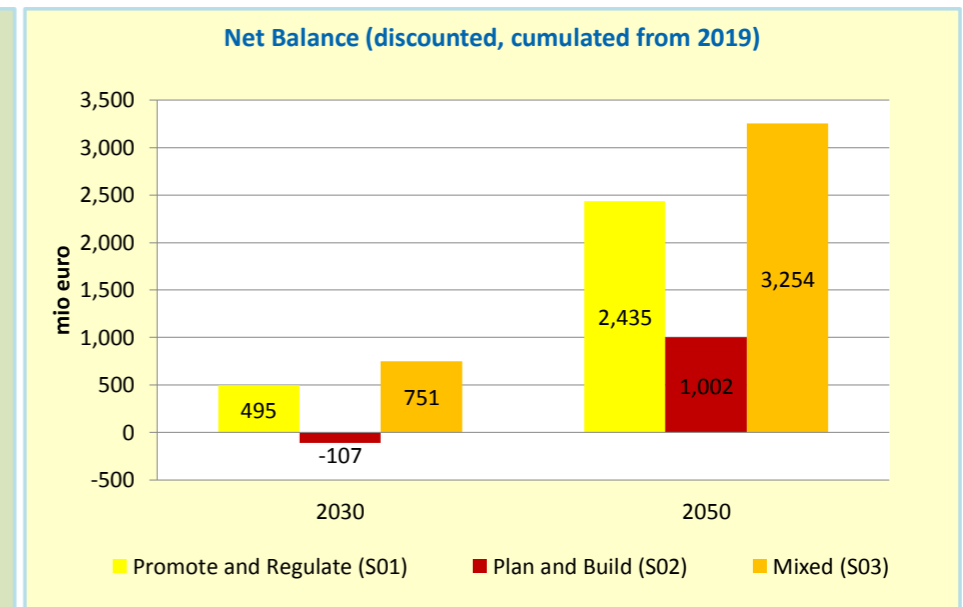
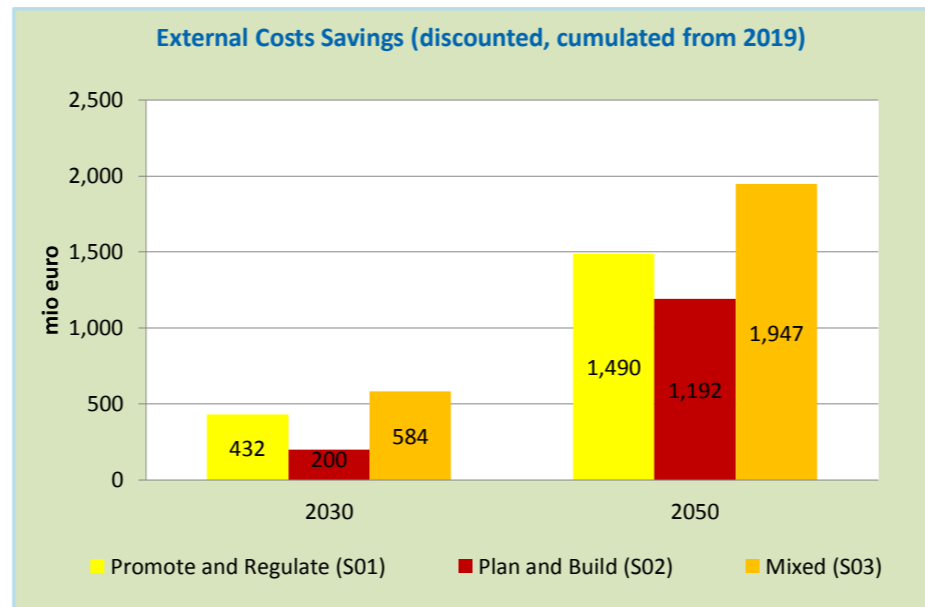
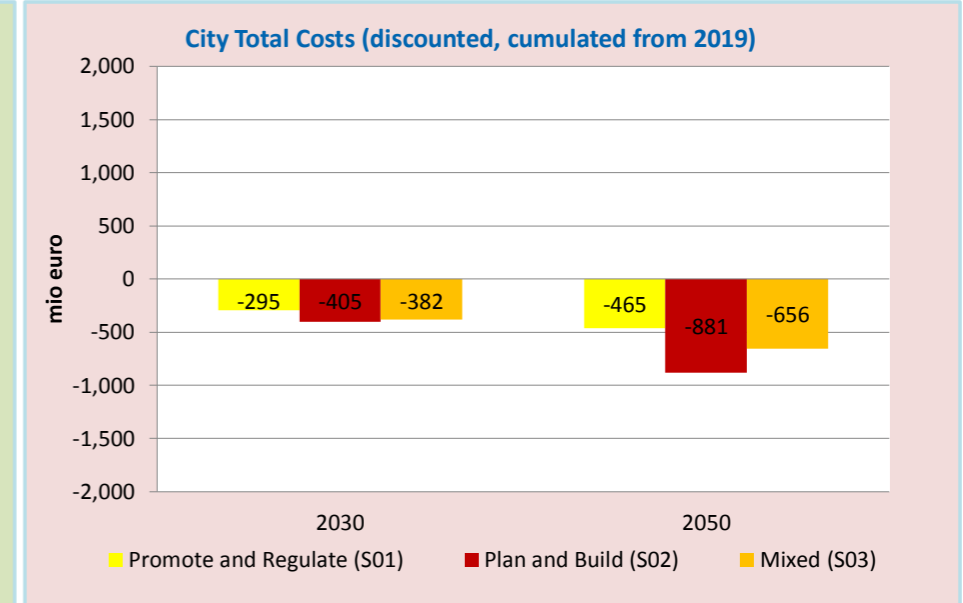
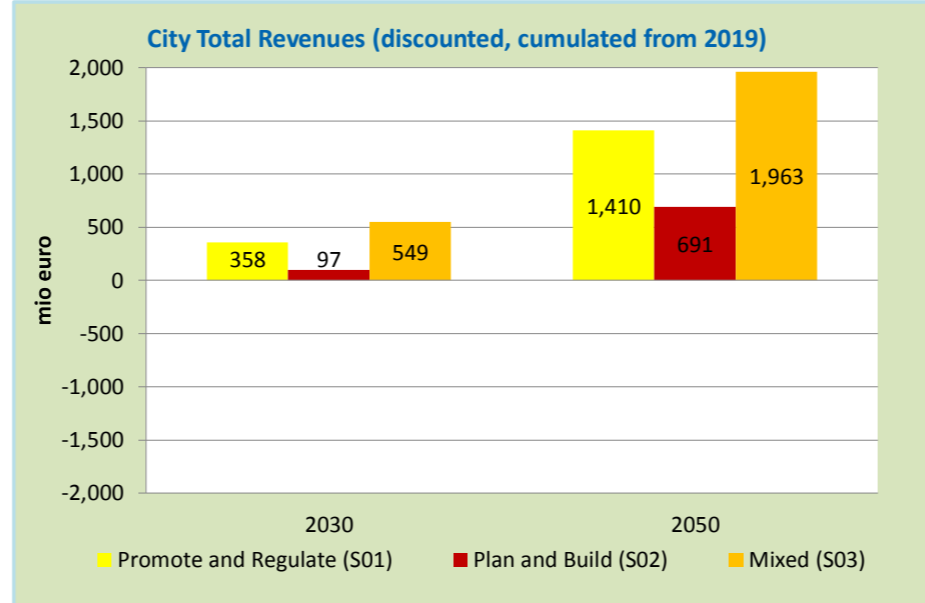
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	295	465
Plan and Build (S02)	0	405	881
Mixed (S03)	0	382	656

External costs savings [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	432	1,490
Plan and Build (S02)	0	200	1,192
Mixed (S03)	0	584	1,947

Net balance [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	495	2,435
Plan and Build (S02)	0	-107	1,002
Mixed (S03)	0	751	3,254



* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

Large City - Southern Europe

ECONOMIC OUTPUTS PER CAPITA (discounted, cumulated from 2019)*

City total revenues [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	308	1,211
Plan and Build (S02)	0	84	594
Mixed (S03)	0	472	1,686

City total costs [euro / capita]

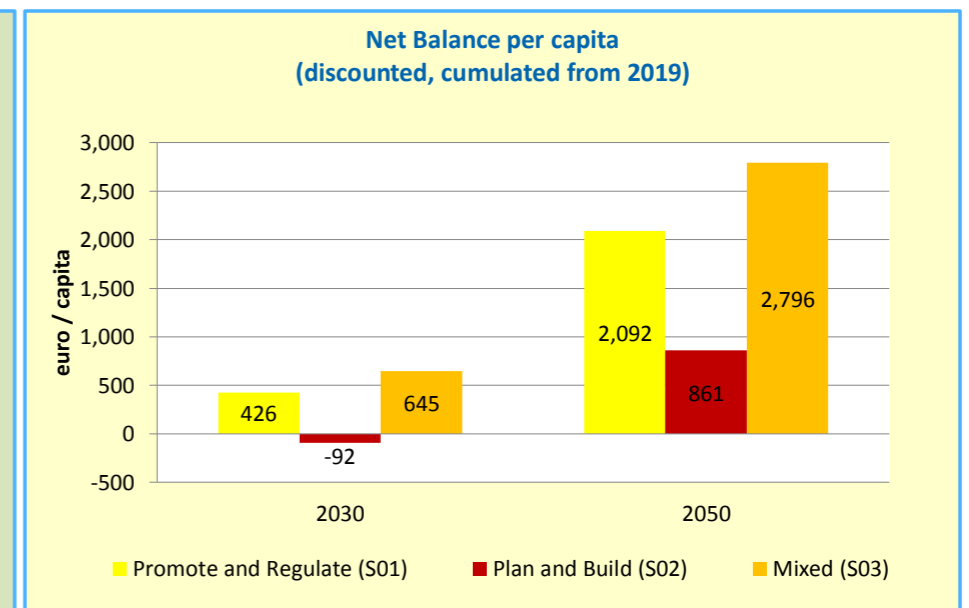
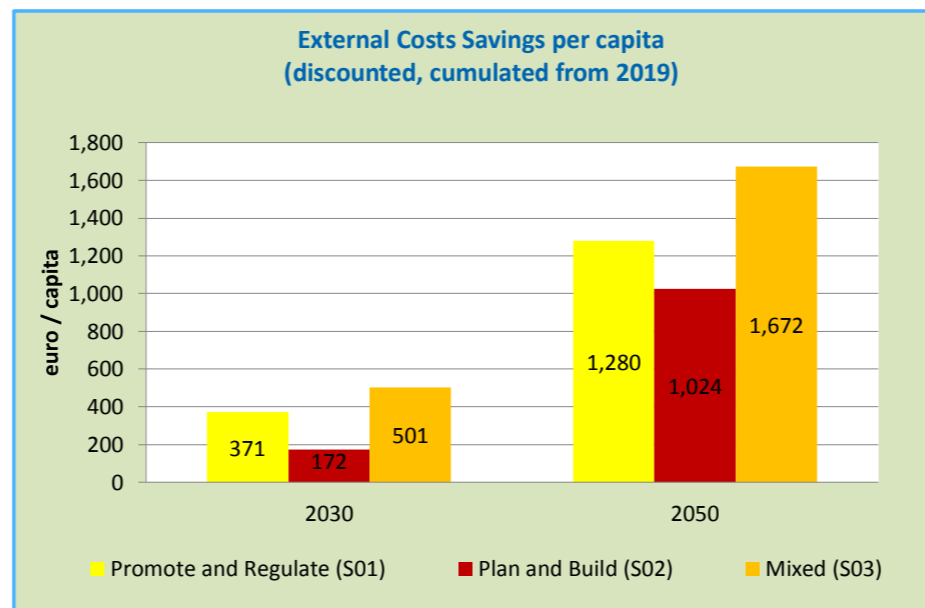
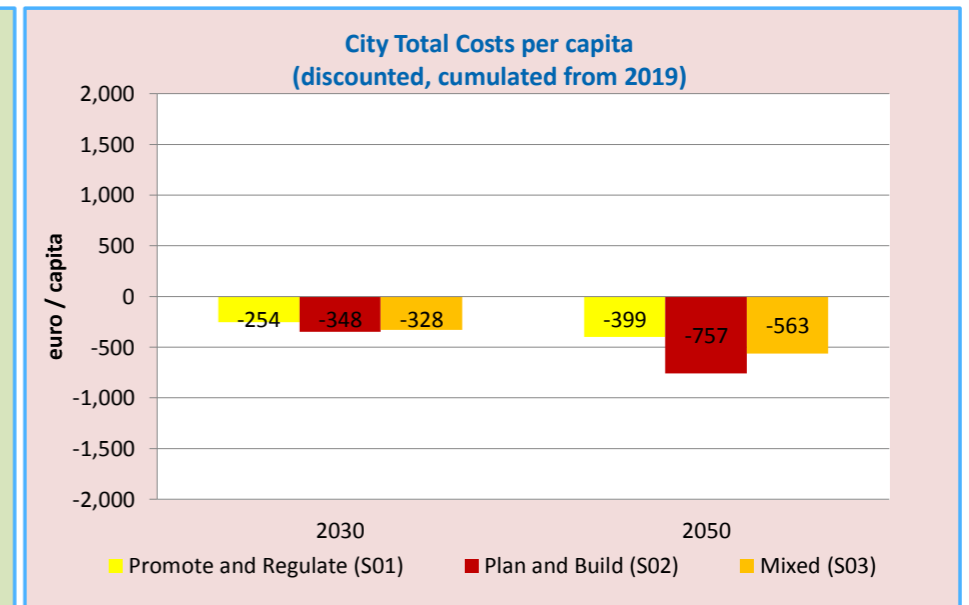
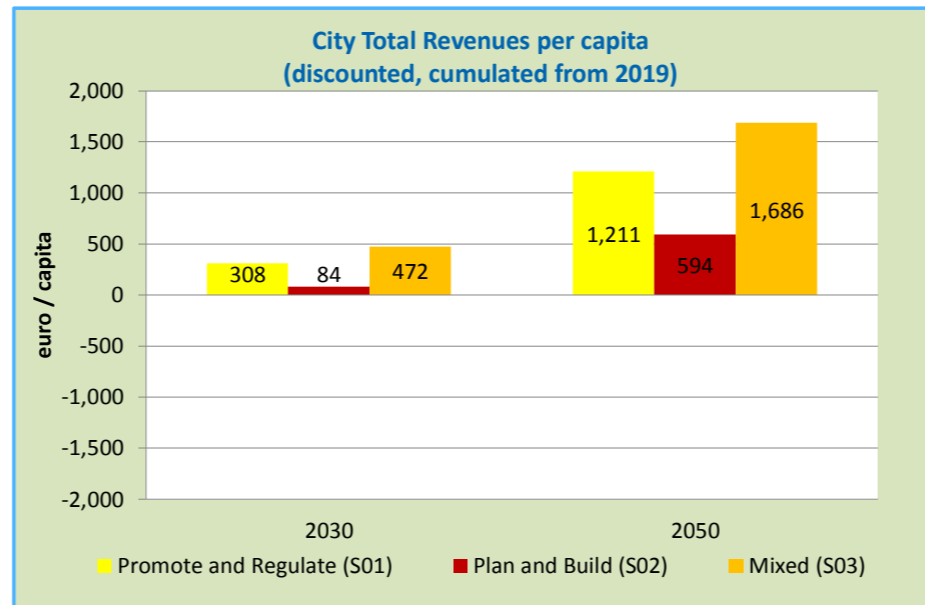
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	254	399
Plan and Build (S02)	0	348	757
Mixed (S03)	0	328	563

External costs savings [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	371	1,280
Plan and Build (S02)	0	172	1,024
Mixed (S03)	0	501	1,672

Net balance [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	426	2,092
Plan and Build (S02)	0	-92	861
Mixed (S03)	0	645	2,796



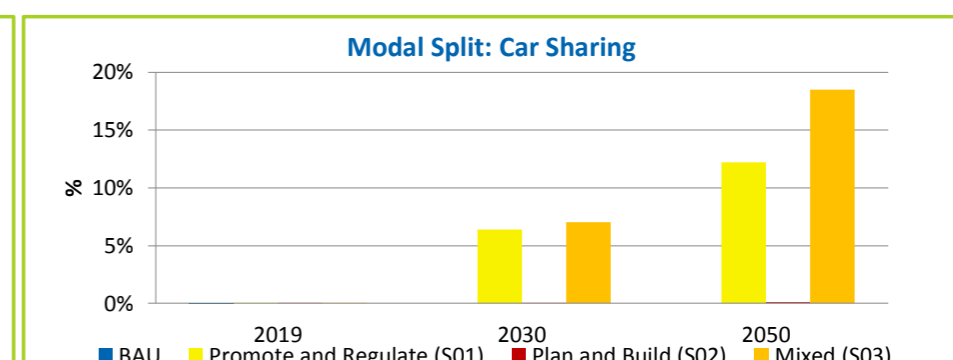
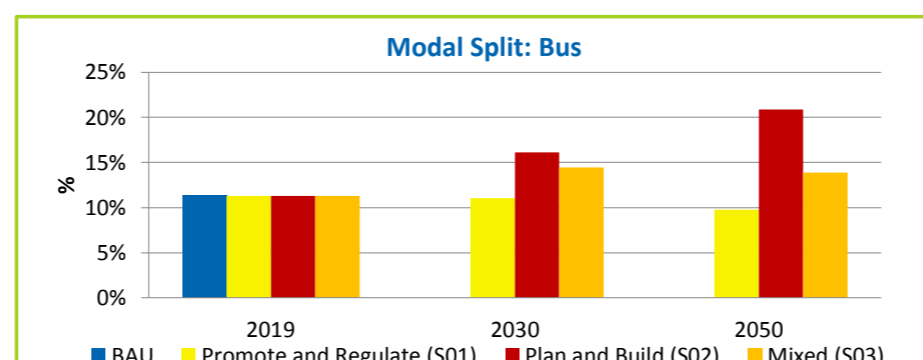
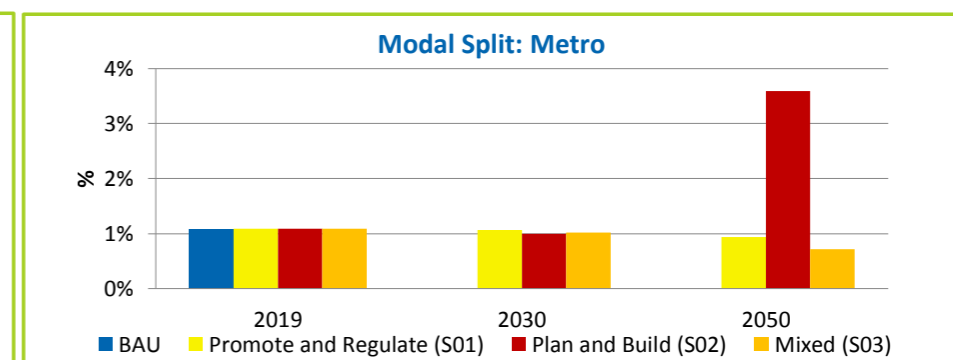
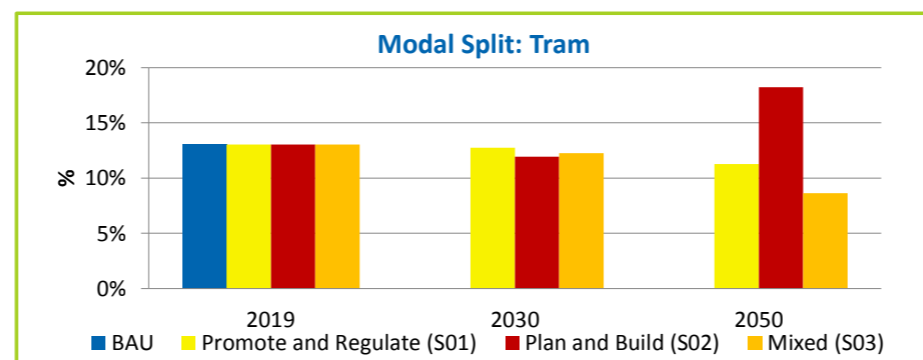
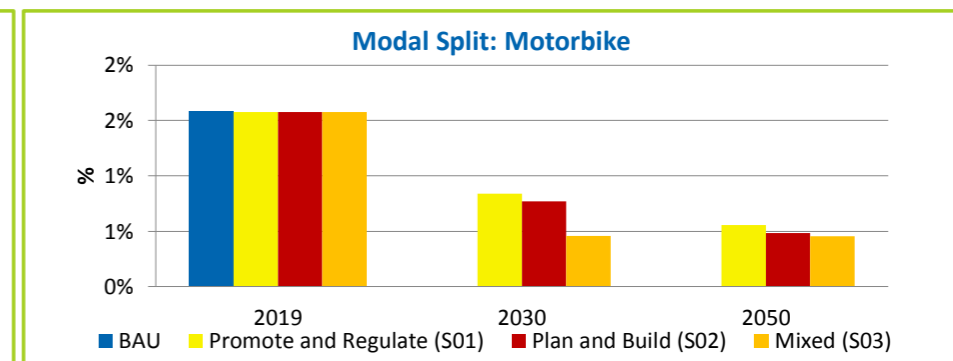
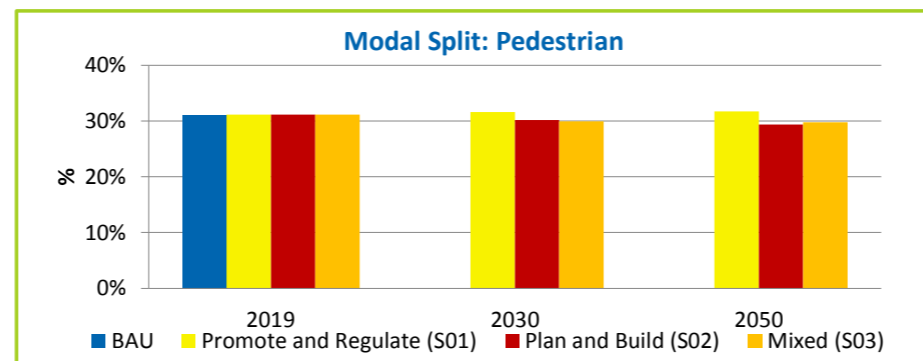
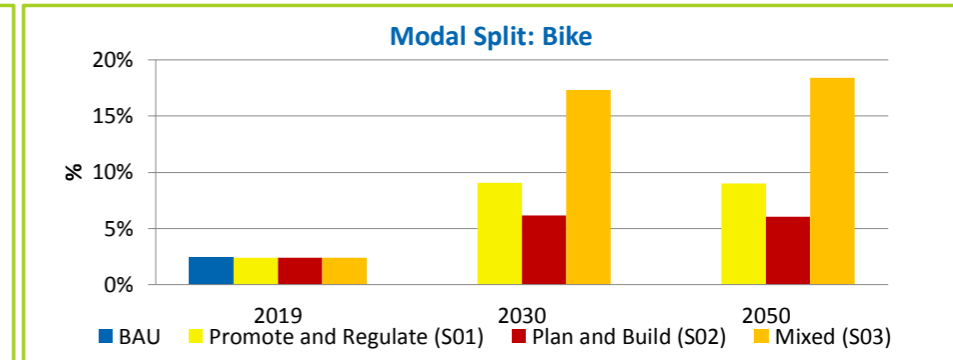
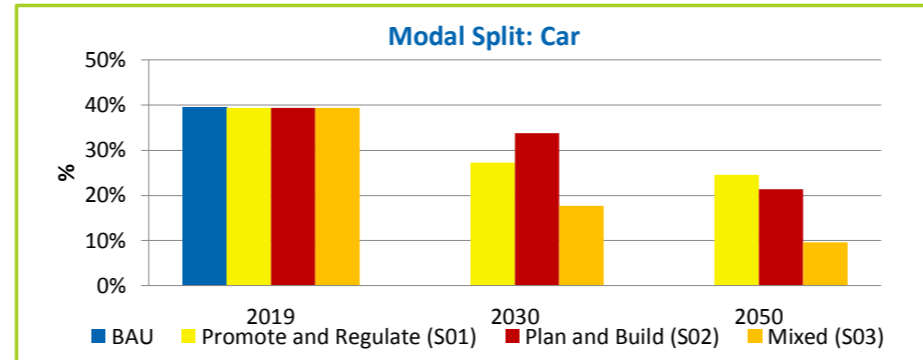
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KEY INDICATORS

Large City - Southern Europe

TRANSPORT AND MOBILITY INDICATORS

Mode split [%]					
Scenario	Mode	2019	2030	2050	
BAU	Pedestrian	31%			
BAU	Bike	2%			
BAU	Motorbike	2%			
BAU	Car	39%			
BAU	Bus	11%			
BAU	Tram	13%			
BAU	Metro	1%			
BAU	Car sharing	0%			
Promote and Regulate (S01)	Pedestrian	31%	32%	32%	
Promote and Regulate (S01)	Bike	2%	9%	9%	
Promote and Regulate (S01)	Motorbike	2%	1%	1%	
Promote and Regulate (S01)	Car	39%	27%	25%	
Promote and Regulate (S01)	Bus	11%	11%	10%	
Promote and Regulate (S01)	Tram	13%	13%	11%	
Promote and Regulate (S01)	Metro	1%	1%	1%	
Promote and Regulate (S01)	Car sharing	0%	6%	12%	
Plan and Build (S02)	Pedestrian	31%	30%	29%	
Plan and Build (S02)	Bike	2%	6%	6%	
Plan and Build (S02)	Motorbike	2%	1%	0%	
Plan and Build (S02)	Car	39%	34%	21%	
Plan and Build (S02)	Bus	11%	16%	21%	
Plan and Build (S02)	Tram	13%	12%	18%	
Plan and Build (S02)	Metro	1%	1%	4%	
Plan and Build (S02)	Car sharing	0%	0%	0%	
Mixed (S03)	Pedestrian	31%	30%	30%	
Mixed (S03)	Bike	2%	17%	18%	
Mixed (S03)	Motorbike	2%	0%	0%	
Mixed (S03)	Car	39%	18%	10%	
Mixed (S03)	Bus	11%	14%	14%	
Mixed (S03)	Tram	13%	12%	9%	
Mixed (S03)	Metro	1%	1%	1%	
Mixed (S03)	Car sharing	0%	7%	18%	



ALL INDICATORS

Large City - Southern Europe

TRANSPORT AND MOBILITY INDICATORS

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
BAU	484		
Promote and Regulate (S01)	484	408	387
Plan and Build (S02)	484	446	353
Mixed (S03)	484	338	243

Congestion and delays index (SUMI)

Scenario	2019	2030	2050
BAU	9.55		
Promote and Regulate (S01)	9.55	9.88	9.90
Plan and Build (S02)	9.55	9.75	10.00
Mixed (S03)	9.55	10.00	10.00

Public transport occupancy levels [pass/vehicle]

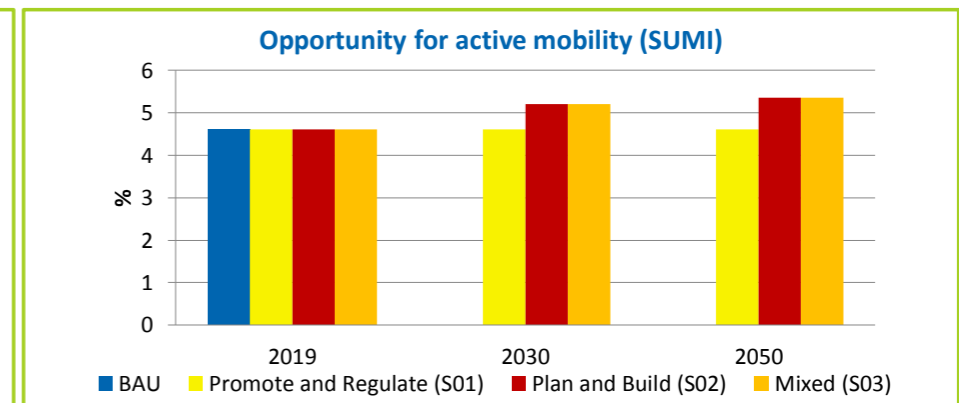
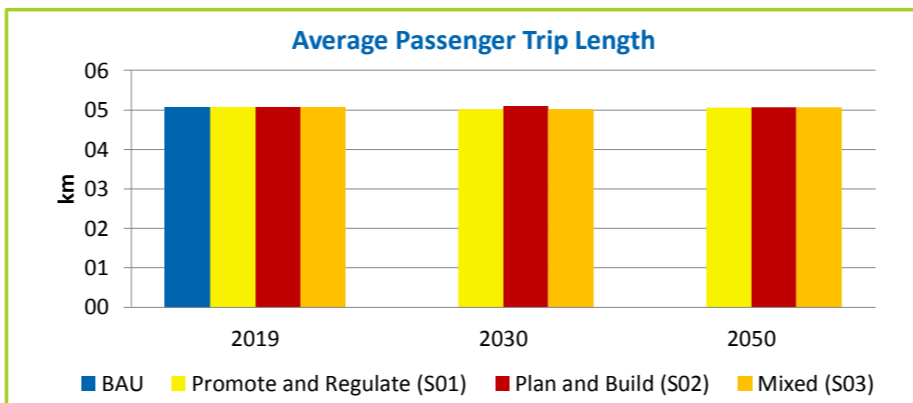
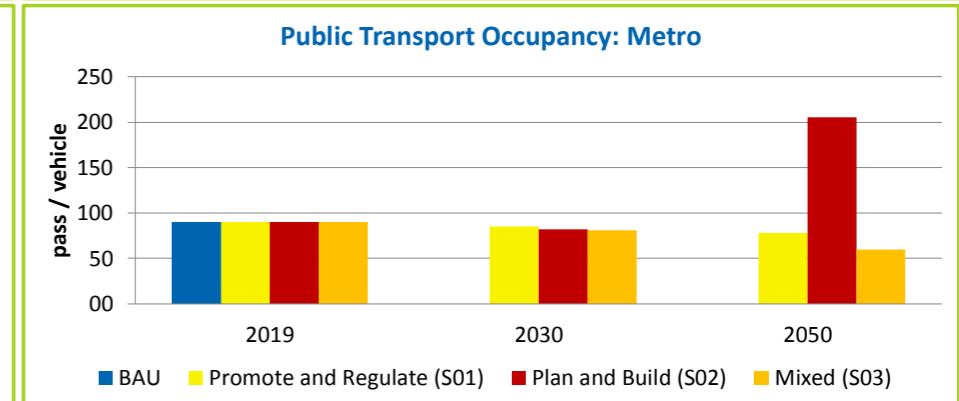
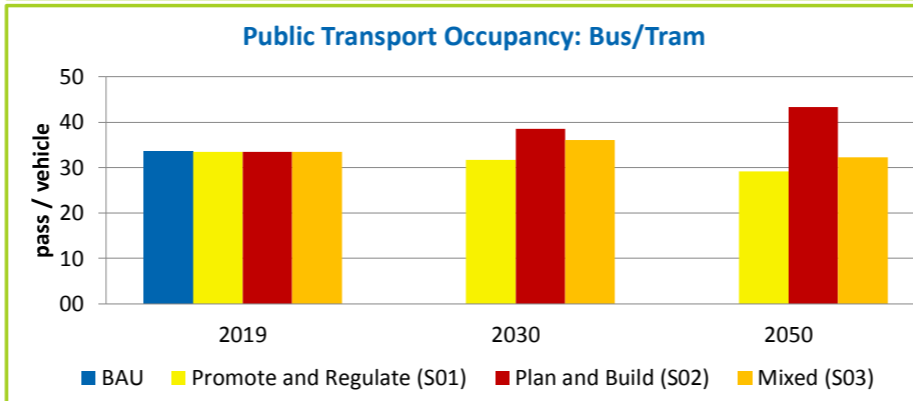
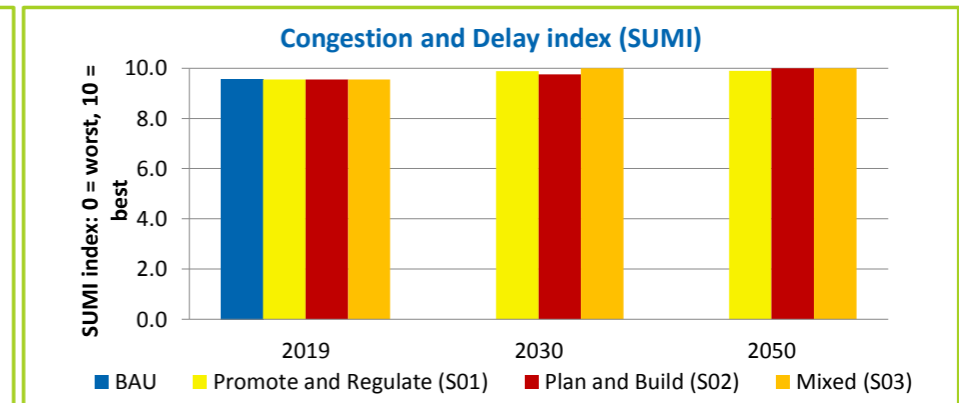
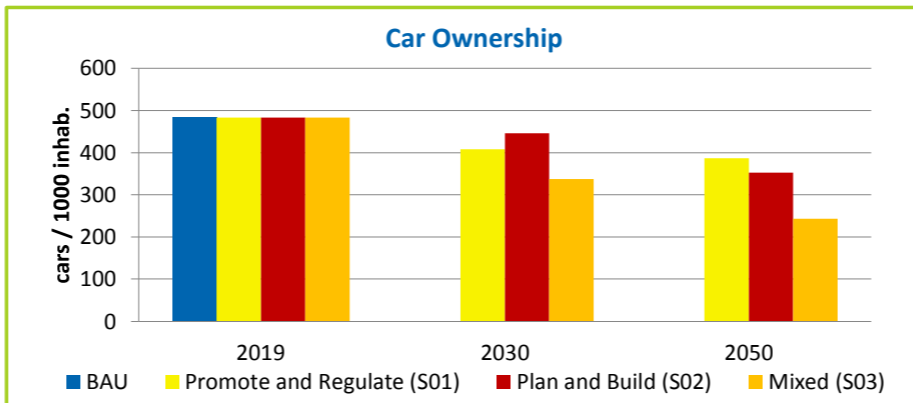
Scenario	PT mode	2019	2030	2050
BAU	Bus/tram	33.5		
BAU	Metro	89.8		
Promote and Regulate (S01)	Bus/tram	33.5	31.7	29.2
Promote and Regulate (S01)	Metro	89.8	85.0	78.3
Plan and Build (S02)	Bus/tram	33.5	38.6	43.4
Plan and Build (S02)	Metro	89.8	82.0	205.4
Mixed (S03)	Bus/tram	33.49	36.05	32.27
Mixed (S03)	Metro	89.84	81.16	59.78

Average passenger trip length [km]

Scenario	2019	2030	2050
BAU	5.1		
Promote and Regulate (S01)	5.1	5.0	5.1
Plan and Build (S02)	5.1	5.1	5.1
Mixed (S03)	5.1	5.0	5.1

Opportunity for active mobility (SUMI) [%]

Scenario	2019	2030	2050
BAU	4.61		
Promote and Regulate (S01)	4.61	4.61	4.61
Plan and Build (S02)	4.61	5.20	5.35
Mixed (S03)	4.61	5.20	5.35



ALL INDICATORS

Large City - Southern Europe

TRANSPORT AND MOBILITY INDICATORS

Penetration of alternatively fuelled car vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	Hybrid electric	0%		
BAU	Battery electric	0%		
BAU	fuel cells	0%		
Scenarios	Hybrid electric	0%	1%	10%
Scenarios	Battery electric	0%	39%	53%
Scenarios	fuel cells	0%	0%	25%

Penetration of alternatively fuelled bus vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	CNG	2%		
BAU	Hybrid electric	0.0%		
BAU	Battery electric	0.2%		
Scenarios	CNG	2%	4%	4%
Scenarios	Hybrid electric	0%	0%	0%
Scenarios	Battery electric	0%	46%	51%

Vehicles-km by mode: cars and car-sharing cars [million vkm/year]

Scenario	2019	2030	2050
BAU	1629		
Promote and Regulate (S01)	1629	1369	1481
Plan and Build (S02)	1629	1381	1029
Mixed (S03)	1629	1014	1197

Vehicles-km by mode: trucks [million vkm/year]

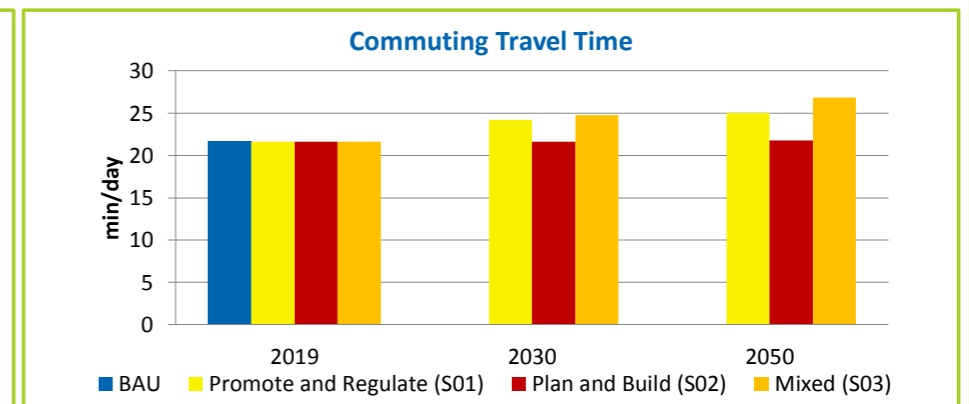
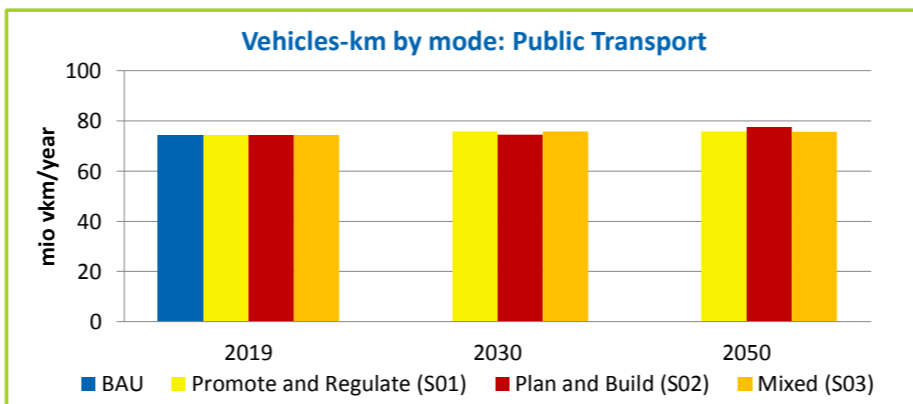
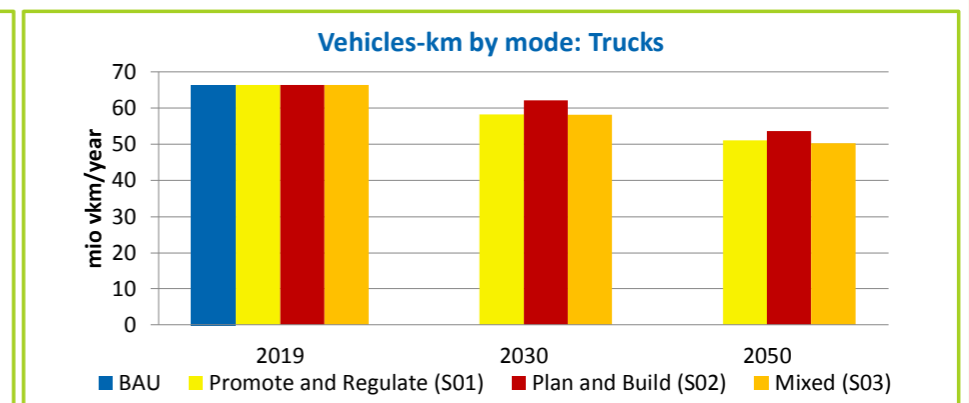
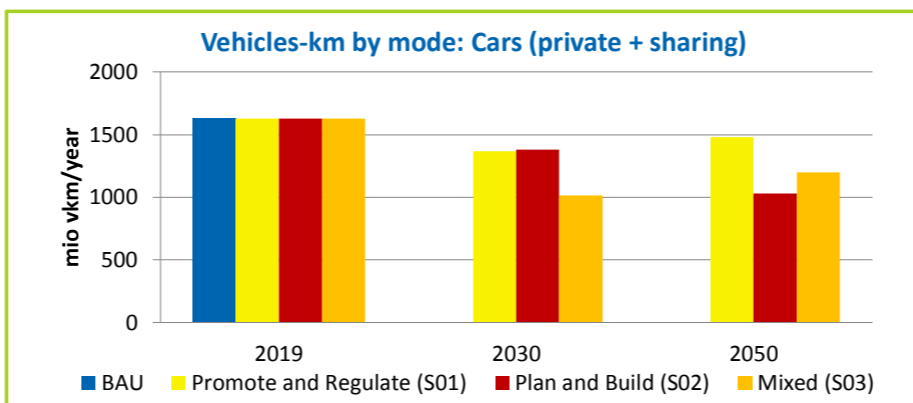
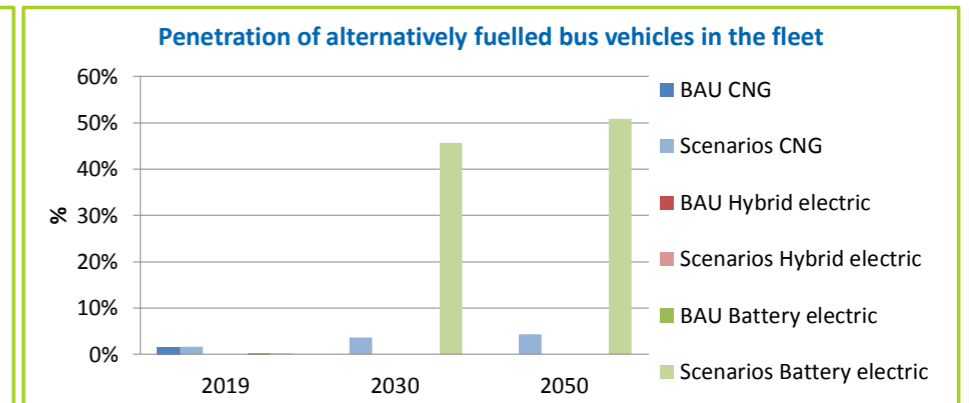
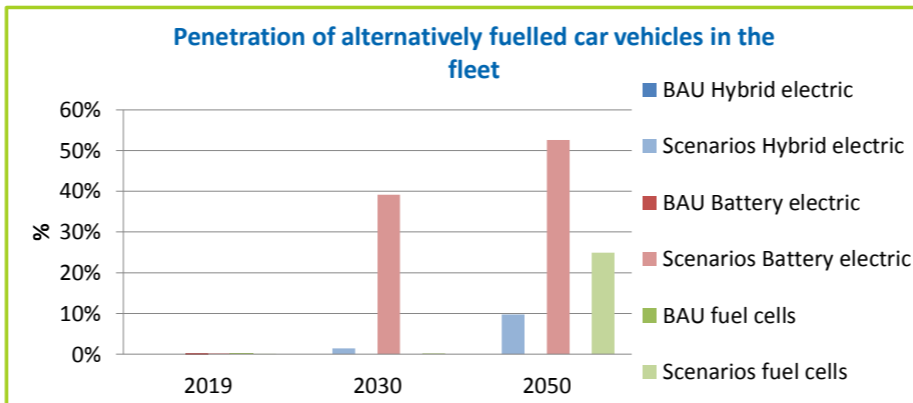
Scenario	2019	2030	2050
BAU	66.4		
Promote and Regulate (S01)	66	58	51
Plan and Build (S02)	66.4	62.2	53.7
Mixed (S03)	66.4	58.2	50.2

Vehicles-km by mode: Public Transport [million vkm/year]

Scenario	2019	2030	2050
BAU	74.3		
Promote and Regulate (S01)	74.3	75.8	75.9
Plan and Build (S02)	74.3	74.6	77.6
Mixed (S03)	74.3	75.9	75.6

Commuting travel time (SUMI) [min/day]

Scenario	2019	2030	2050
BAU	21.6		
Promote and Regulate (S01)	21.6	24.2	25.0
Plan and Build (S02)	21.6	21.6	21.8
Mixed (S03)	21.6	24.8	26.9



ALL INDICATORS

Large City - Southern Europe

ENVIRONMENT AND SAFETY INDICATORS

Air pollutant emissions (SUMI: PM2.5, Nox) [kg PM2.5 eq/capita]

Scenario	2019	2030	2050
BAU	0.9		
Promote and regulate (S01)	0.9	0.3	0.1
Plan and Build (S02)	0.9	0.4	0.1
Mixed (S03)	0.9	0.3	0.1

Air pollutant emissions (CO, VOC) [kg / capita]

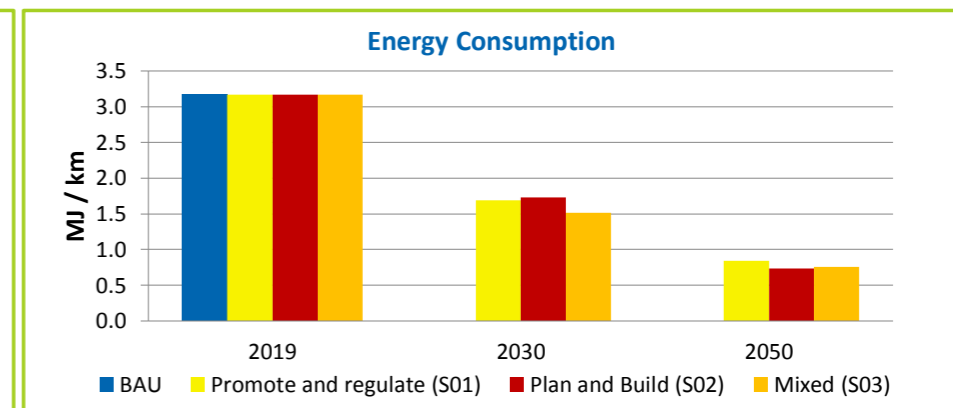
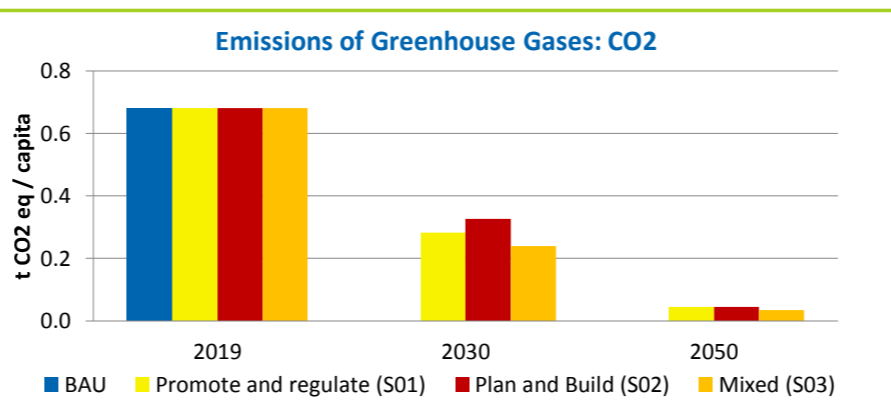
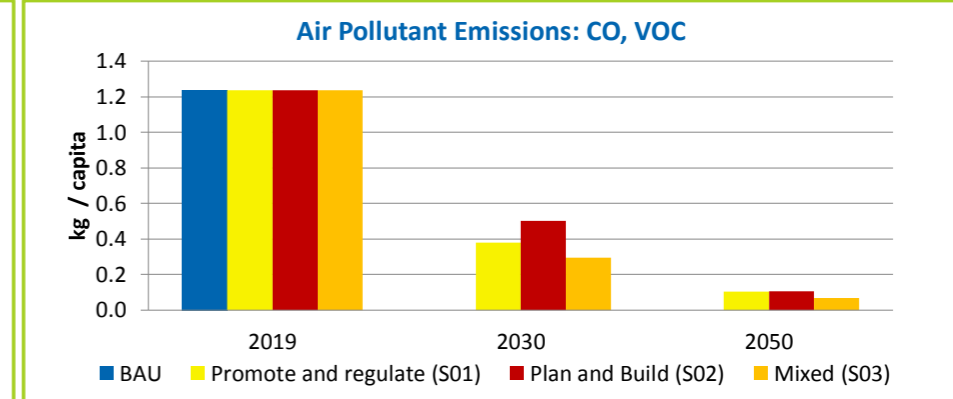
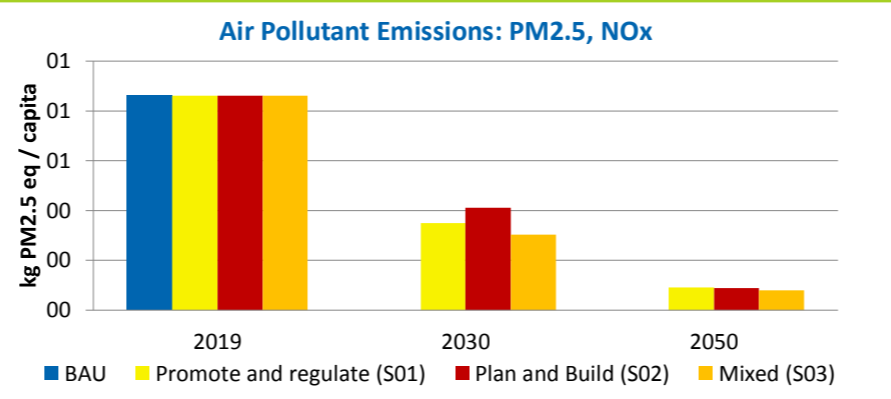
Scenario	2019	2030	2050
BAU	1		
Promote and regulate (S01)	1	0	0
Plan and Build (S02)	1.2	0.5	0.1
Mixed (S03)	1.2	0.3	0.1

Emissions of Greenhouse Gases [t CO2 eq / capita per year]

Scenario	2019	2030	2050
BAU	0.682		
Promote and regulate (S01)	0.682	0.282	0.045
Plan and Build (S02)	0.682	0.327	0.045
Mixed (S03)	0.682	0.240	0.035

Energy consumption [MJ / km]

Scenario	2019	2030	2050
BAU	3.2		
Promote and regulate (S01)	3.2	1.7	0.8
Plan and Build (S02)	3.2	1.7	0.7
Mixed (S03)	3.2	1.5	0.8



ALL INDICATORS

Large City - Southern Europe

ENVIRONMENT AND SAFETY INDICATORS

Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	3.8		
Promote and regulate (S01)	3.8	2.2	2.0
Plan and Build (S02)	3.8	3.0	1.8
Mixed (S03)	3.8	1.7	1.5

Fatalities: active modes [fatalities / 100,000 inhab.]

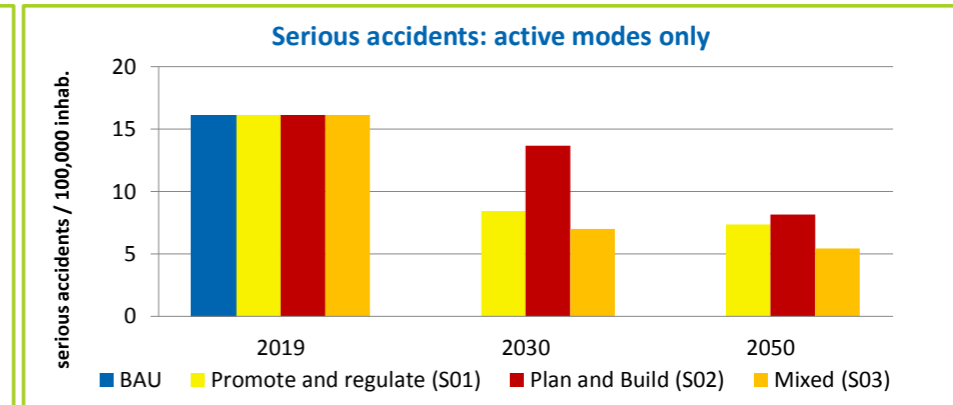
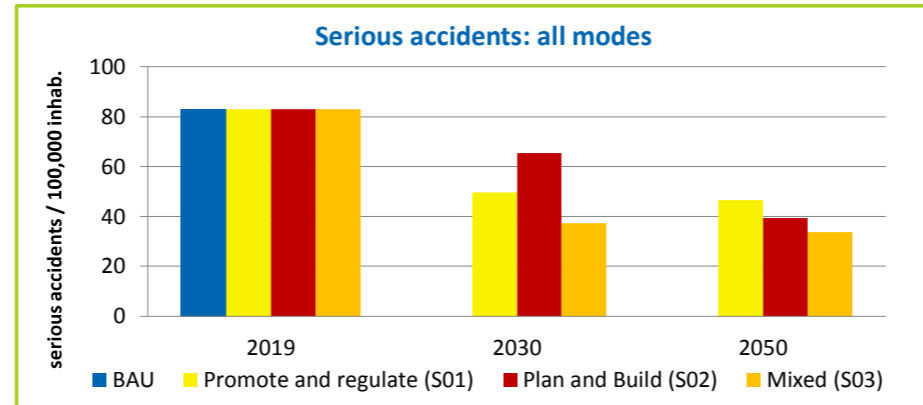
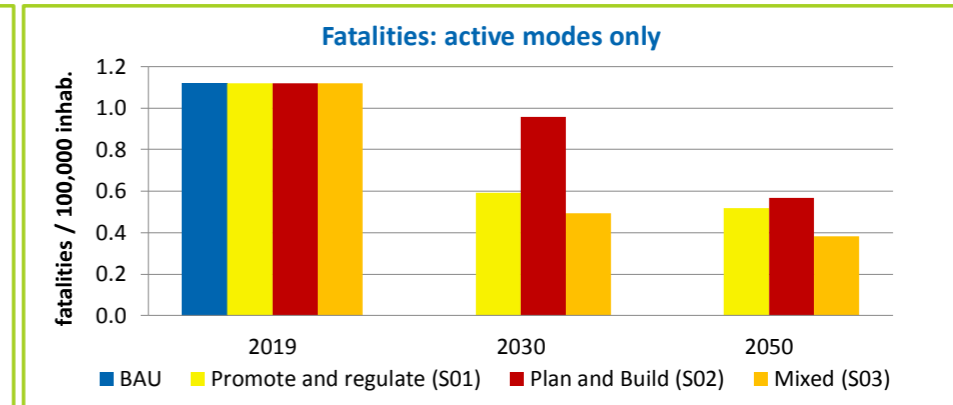
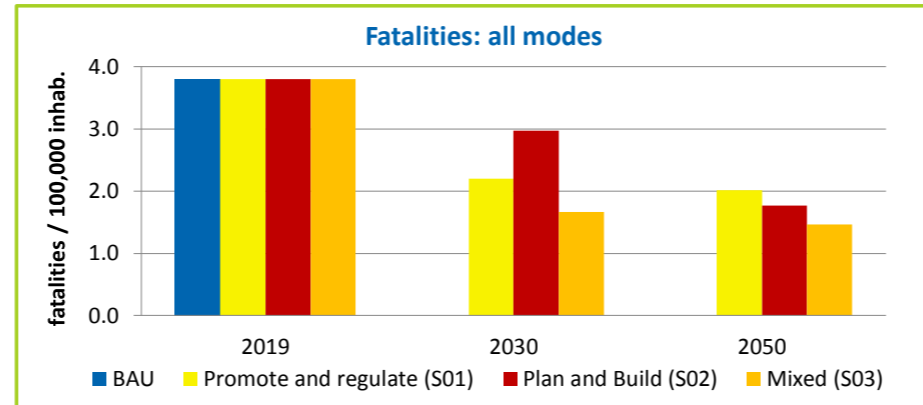
Scenario	2019	2030	2050
BAU	1.12		
Promote and regulate (S01)	1.12	0.59	0.52
Plan and Build (S02)	1.12	0.96	0.57
Mixed (S03)	1.12	0.49	0.38

Serious accidents [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	83		
Promote and regulate (S01)	83	50	46
Plan and Build (S02)	83	65	39
Mixed (S03)	83	37	34

Serious accidents: active modes [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	16		
Promote and regulate (S01)	16	8	7
Plan and Build (S02)	16	14	8
Mixed (S03)	16	7	5



ALL INDICATORS

Large City - Central/Western Europe

EMISSIONS OF CO₂ (TANK-TO-WHEEL), CAR OWNERSHIP, FATALITIES

Emissions of CO₂ (Tank-to-wheel) [t CO₂ eq / capita per year]

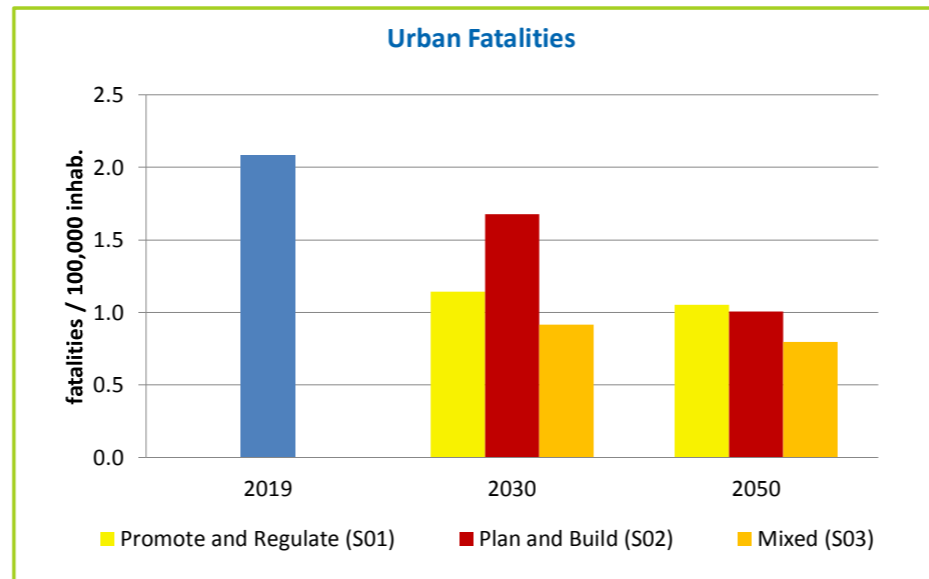
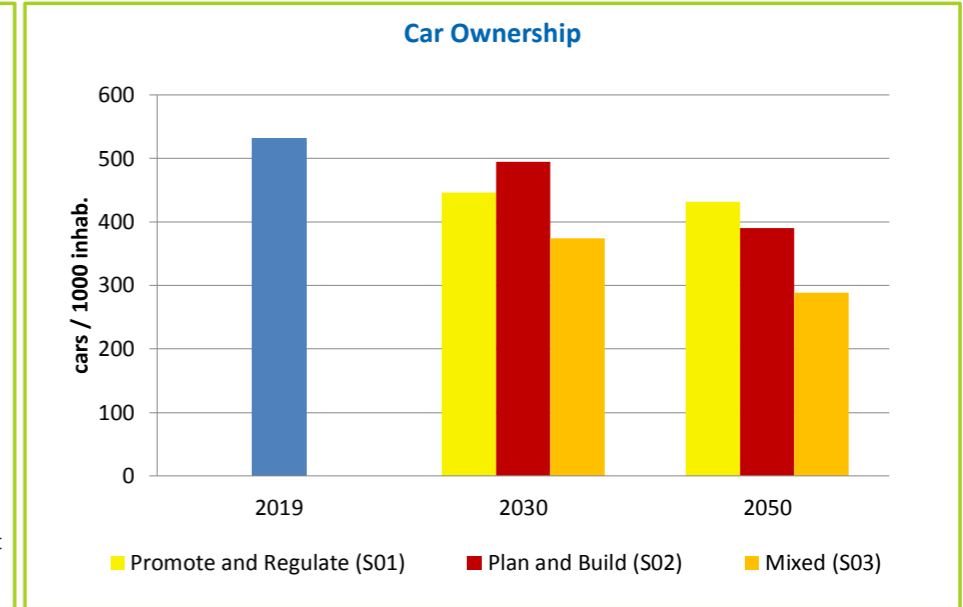
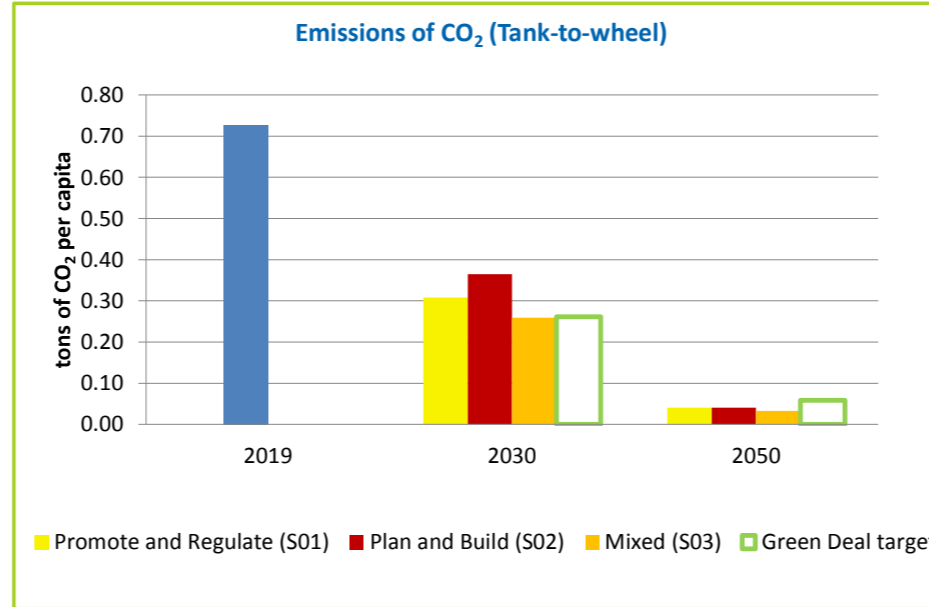
Scenario	2019	2030	2050
Promote and Regulate (S01)	0.727	0.307	0.041
Plan and Build (S02)	0.727	0.364	0.041
Mixed (S03)	0.727	0.259	0.032
Green Deal target		0.262	0.058

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	531	446	432
Plan and Build (S02)	531	495	390
Mixed (S03)	531	374	289

Urban Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	2.084	1.142	1.051
Plan and Build (S02)	2.084	1.676	1.007
Mixed (S03)	2.084	0.913	0.795



KEY INDICATORS

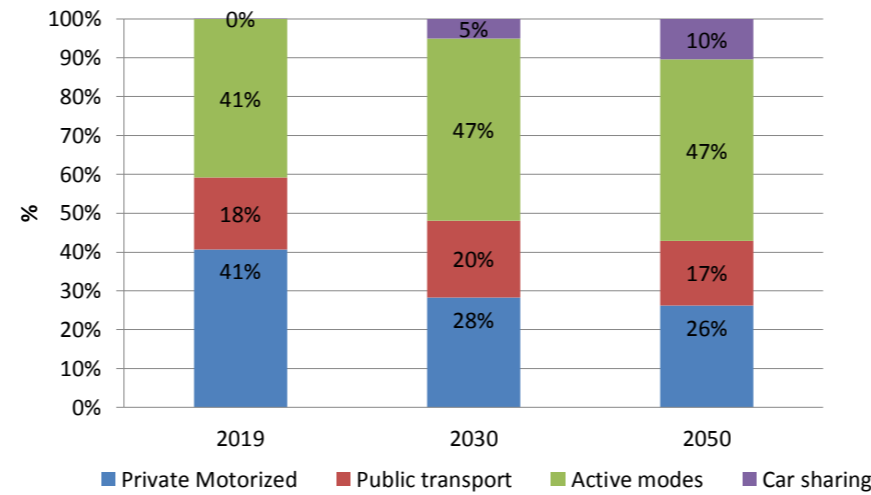
Large City - Central/Western Europe

MODAL SPLIT

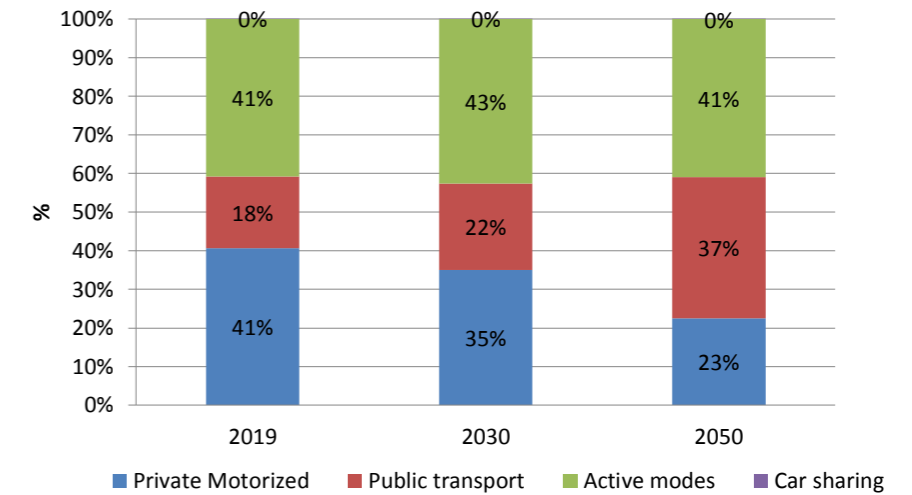
Aggregate mode split [%]

Scenario	Mode	2019	2030	2050
Promote and Regulate (S01)	Private Motorized	41%	28%	26%
Promote and Regulate (S01)	Public transport	18%	20%	17%
Promote and Regulate (S01)	Active modes	41%	47%	47%
Promote and Regulate (S01)	Car sharing	0%	5%	10%
Plan and Build (S02)	Private Motorized	41%	35%	23%
Plan and Build (S02)	Public transport	18%	22%	37%
Plan and Build (S02)	Active modes	41%	43%	41%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Private Motorized	41%	19%	12%
Mixed (S03)	Public transport	18%	23%	19%
Mixed (S03)	Active modes	41%	52%	52%
Mixed (S03)	Car sharing	0%	6%	17%

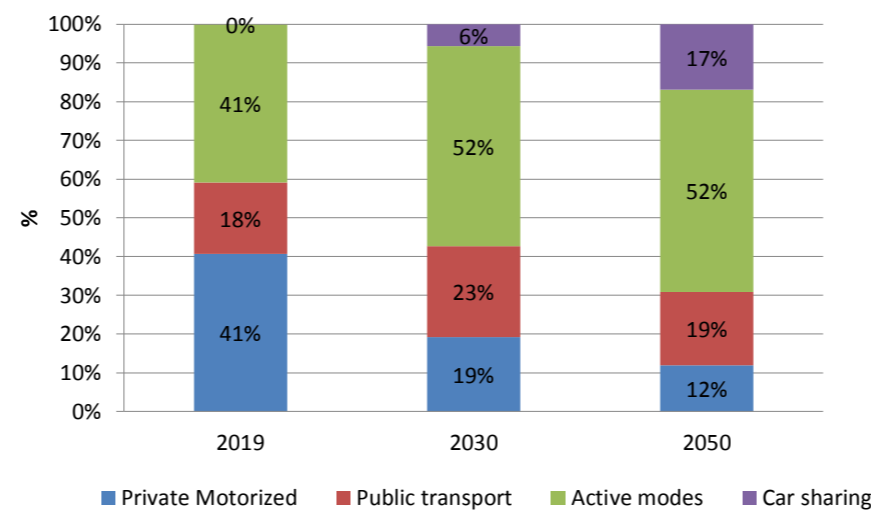
Modal Split: Promote and Regulate (S01)



Modal Split: Plan and Build (S02)



Modal Split: Mixed (S03)



KEY INDICATORS

Large City - Central/Western Europe

ECONOMIC OUTPUTS (discounted, cumulated from 2019)*

City total revenues [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	1,020	3,506
Plan and Build (S02)	0	157	1,009
Mixed (S03)	0	1,298	4,618

City total costs [mio euro]

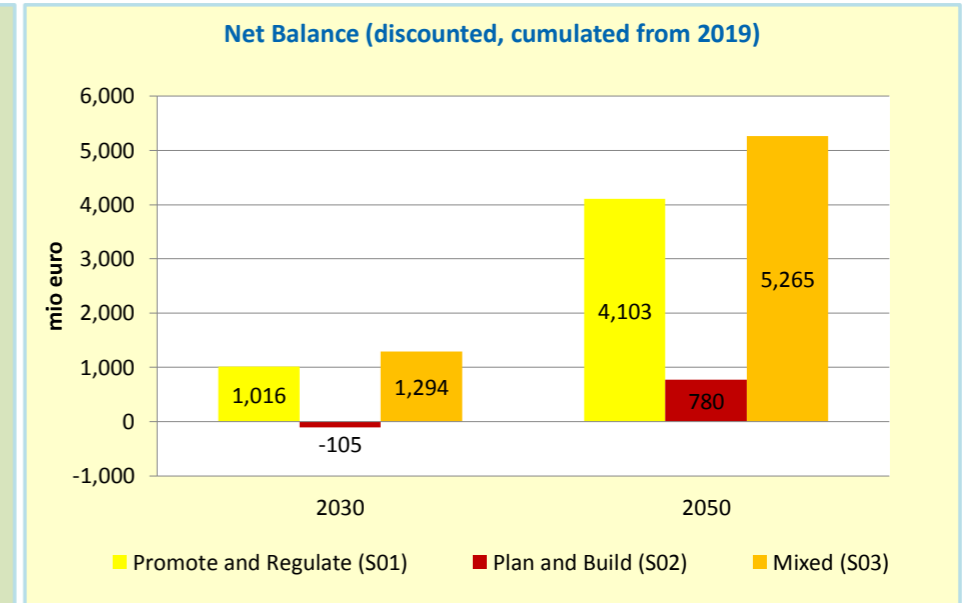
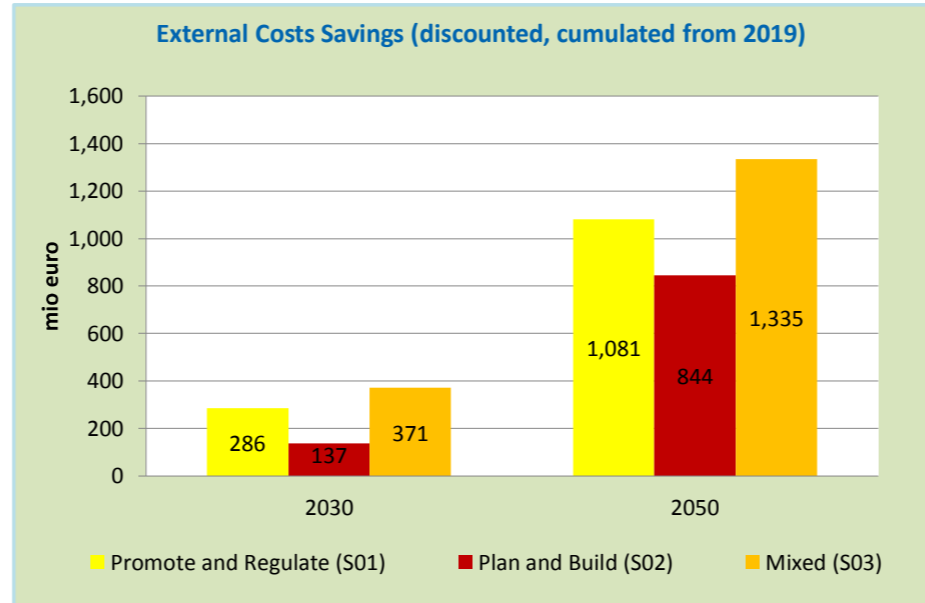
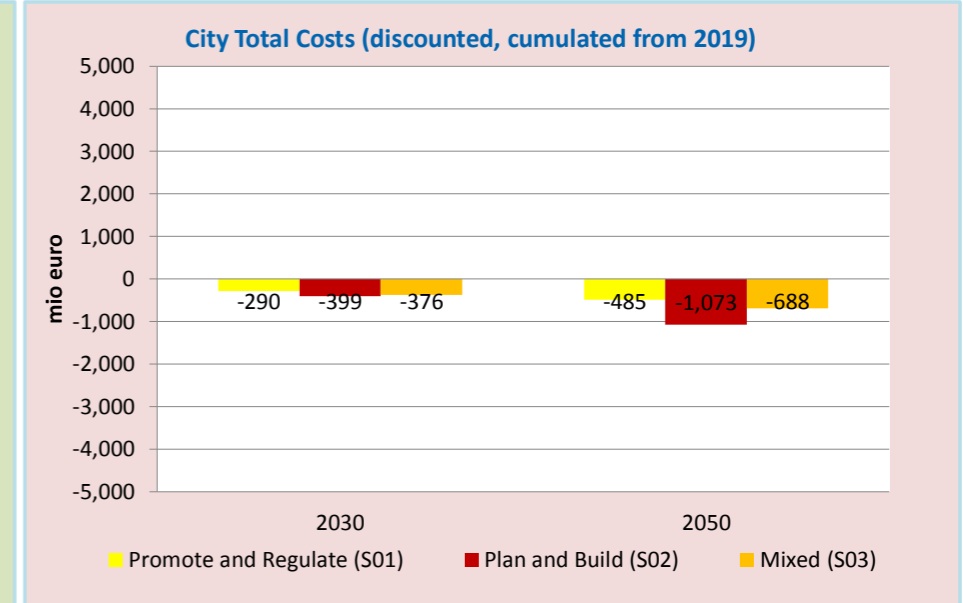
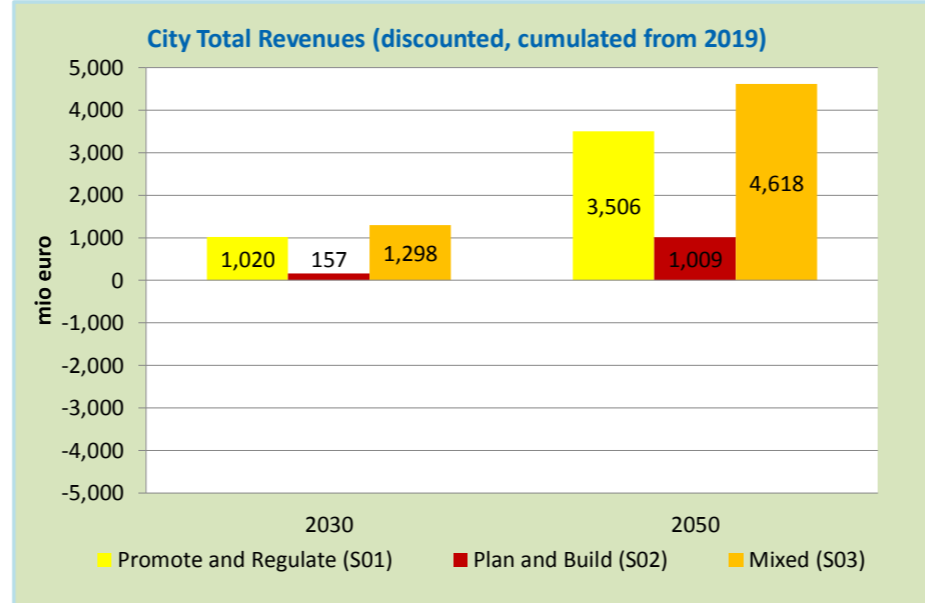
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	290	485
Plan and Build (S02)	0	399	1,073
Mixed (S03)	0	376	688

External costs savings [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	286	1,081
Plan and Build (S02)	0	137	844
Mixed (S03)	0	371	1,335

Net balance [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	1,016	4,103
Plan and Build (S02)	0	-105	780
Mixed (S03)	0	1,294	5,265



* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Large City - Central/Western Europe

ECONOMIC OUTPUTS PER CAPITA (discounted, cumulated from 2019)*

City total revenues [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	1,062	3,651
Plan and Build (S02)	0	163	1,051
Mixed (S03)	0	1,352	4,809

City total costs [euro / capita]

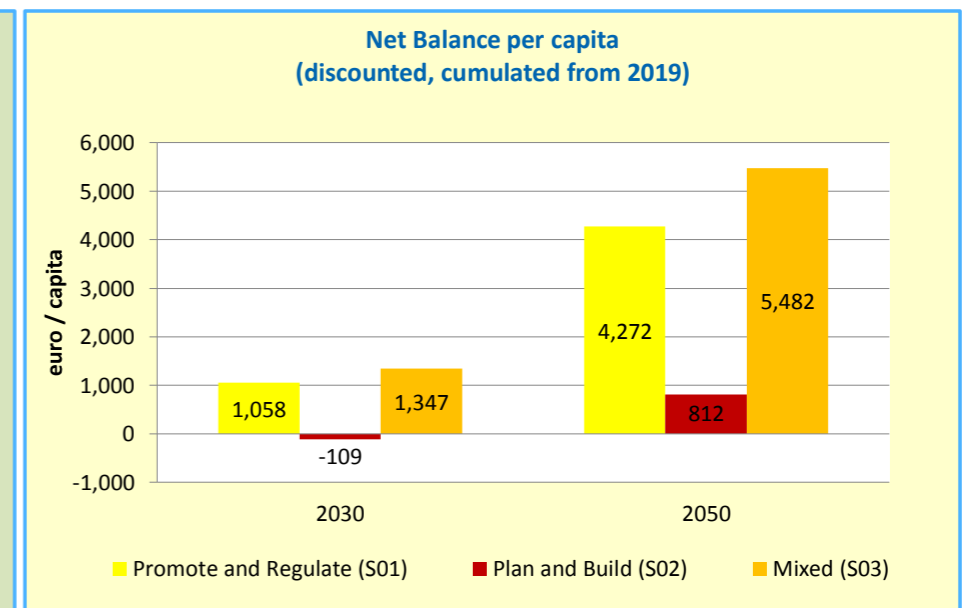
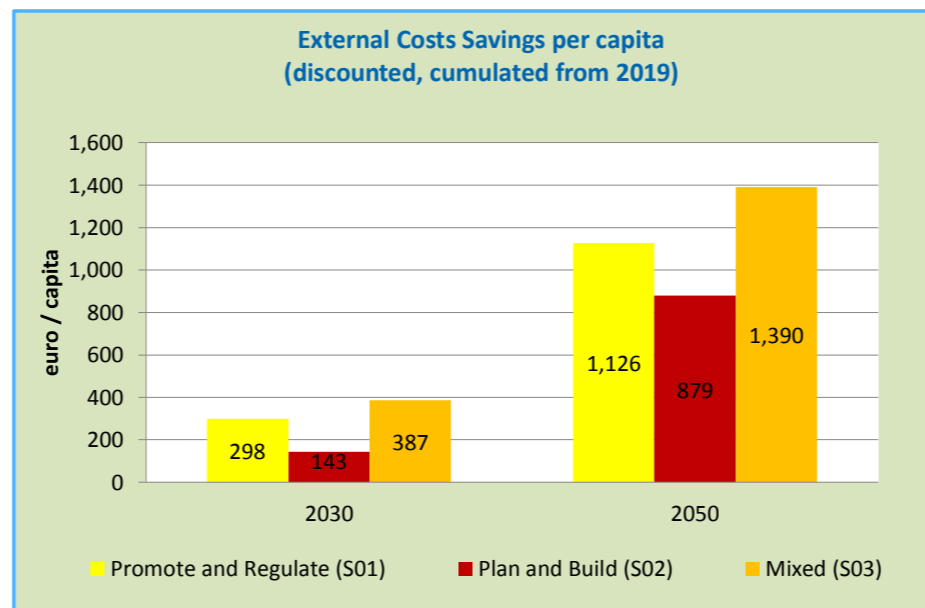
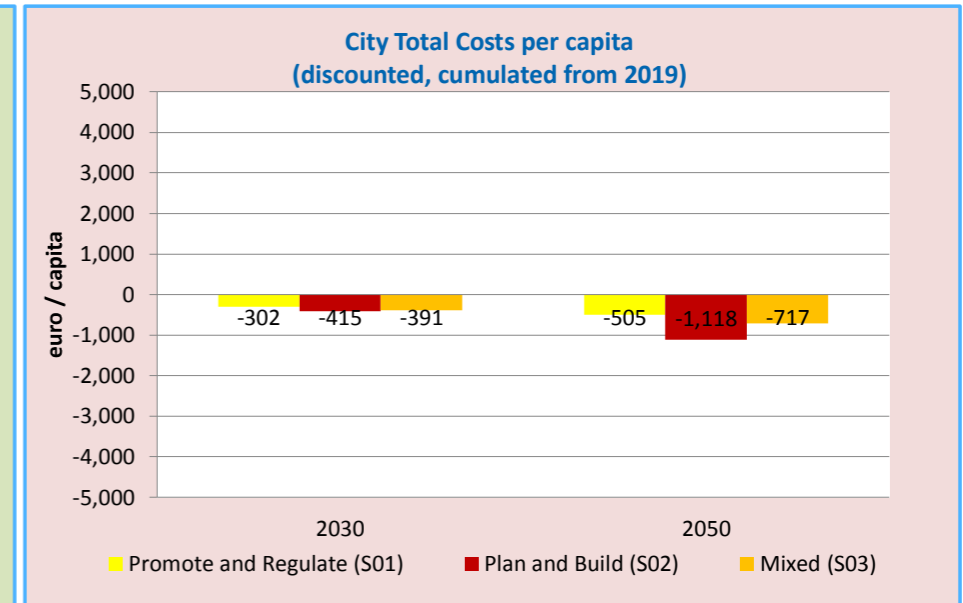
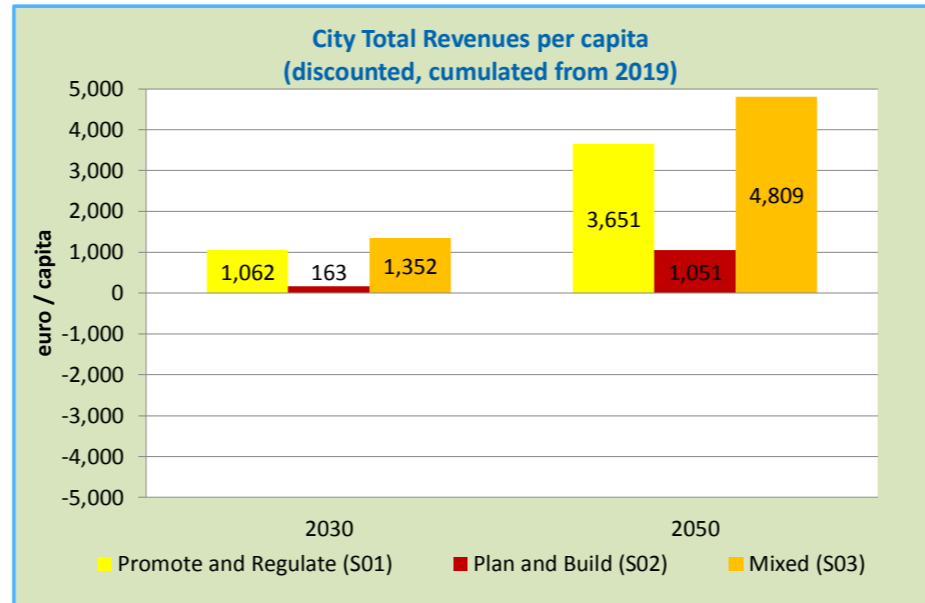
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	302	505
Plan and Build (S02)	0	415	1,118
Mixed (S03)	0	391	717

External costs savings [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	298	1,126
Plan and Build (S02)	0	143	879
Mixed (S03)	0	387	1,390

Net balance [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	1,058	4,272
Plan and Build (S02)	0	-109	812
Mixed (S03)	0	1,347	5,482



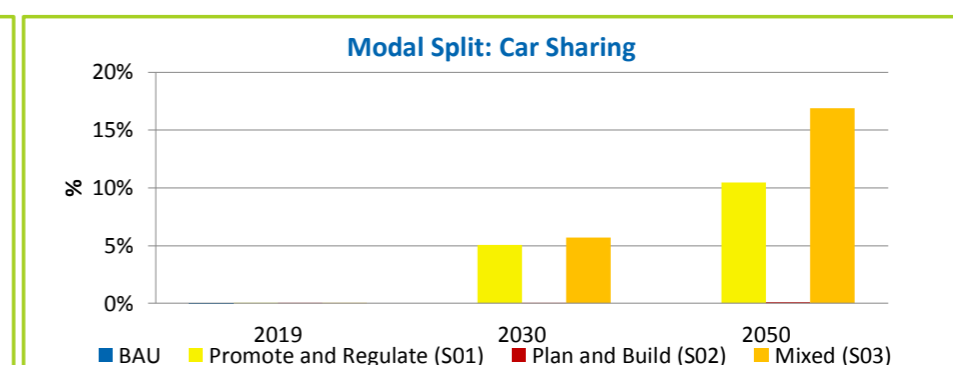
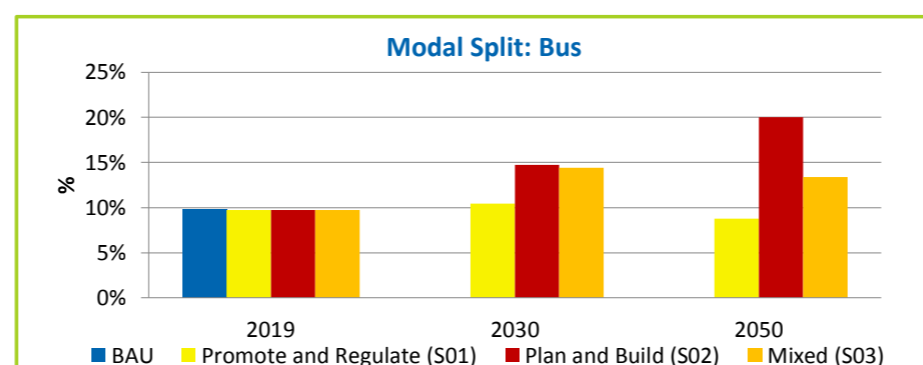
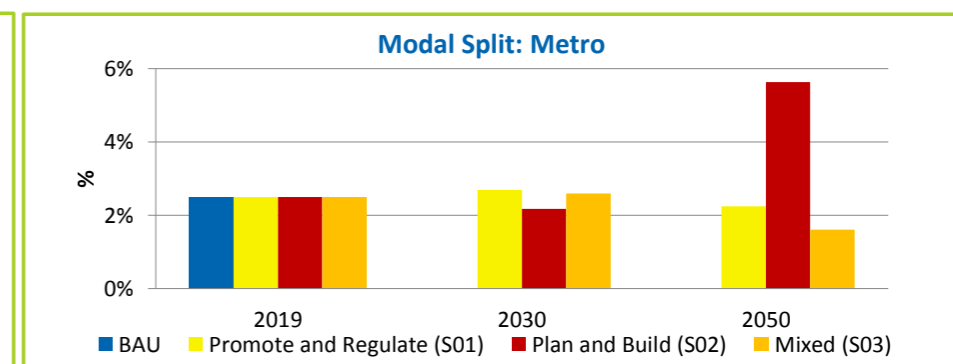
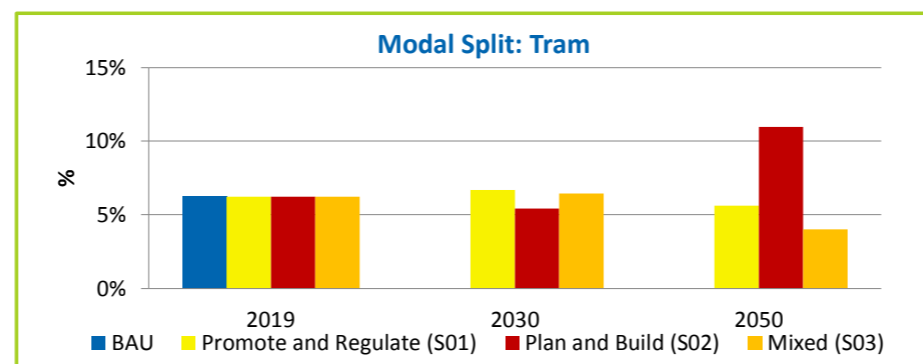
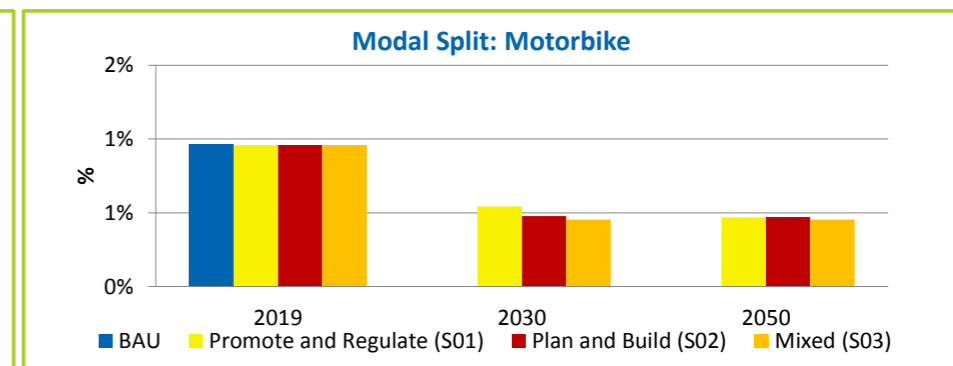
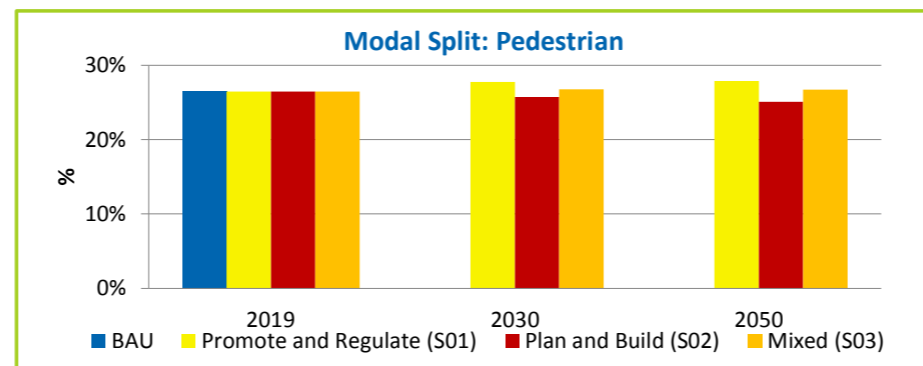
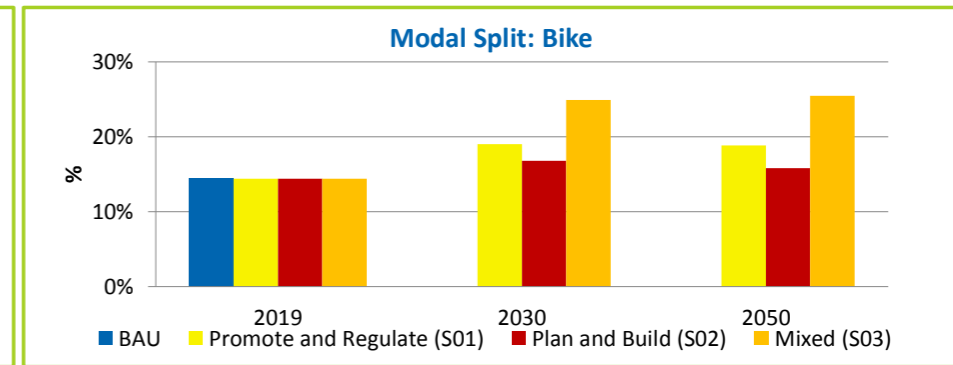
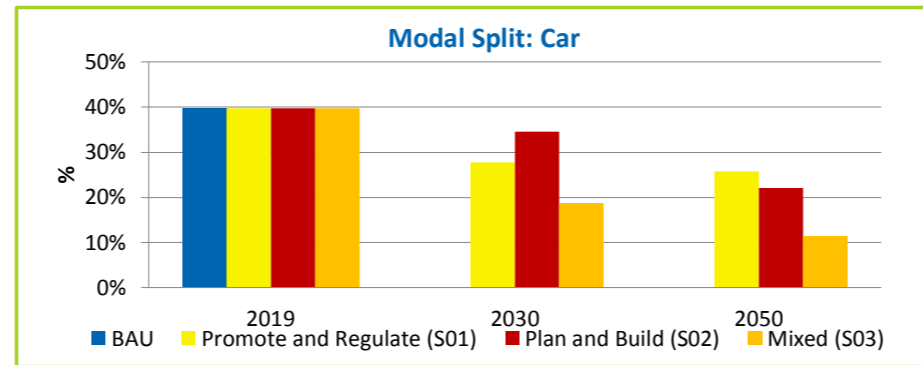
* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Large City - Central/Western Europe

TRANSPORT AND MOBILITY INDICATORS

Mode split [%]					
Scenario	Mode	2019	2030	2050	
BAU	Pedestrian	26%			
BAU	Bike	14%			
BAU	Motorbike	1%			
BAU	Car	40%			
BAU	Bus	10%			
BAU	Tram	6%			
BAU	Metro	3%			
BAU	Car sharing	0%			
Promote and Regulate (S01)	Pedestrian	26%	28%	28%	
Promote and Regulate (S01)	Bike	14%	19%	19%	
Promote and Regulate (S01)	Motorbike	1%	1%	0%	
Promote and Regulate (S01)	Car	40%	28%	26%	
Promote and Regulate (S01)	Bus	10%	10%	9%	
Promote and Regulate (S01)	Tram	6%	7%	6%	
Promote and Regulate (S01)	Metro	3%	3%	2%	
Promote and Regulate (S01)	Car sharing	0%	5%	10%	
Plan and Build (S02)	Pedestrian	26%	26%	25%	
Plan and Build (S02)	Bike	14%	17%	16%	
Plan and Build (S02)	Motorbike	1%	0%	0%	
Plan and Build (S02)	Car	40%	35%	22%	
Plan and Build (S02)	Bus	10%	15%	20%	
Plan and Build (S02)	Tram	6%	5%	11%	
Plan and Build (S02)	Metro	3%	2%	6%	
Plan and Build (S02)	Car sharing	0%	0%	0%	
Mixed (S03)	Pedestrian	26%	27%	27%	
Mixed (S03)	Bike	14%	25%	25%	
Mixed (S03)	Motorbike	1%	0%	0%	
Mixed (S03)	Car	40%	19%	11%	
Mixed (S03)	Bus	10%	14%	13%	
Mixed (S03)	Tram	6%	6%	4%	
Mixed (S03)	Metro	3%	3%	2%	
Mixed (S03)	Car sharing	0%	6%	17%	



ALL INDICATORS

Large City - Central/Western Europe

TRANSPORT AND MOBILITY INDICATORS

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
BAU	531		
Promote and Regulate (S01)	531	446	432
Plan and Build (S02)	531	495	390
Mixed (S03)	531	374	289

Congestion and delays index (SUMI)

Scenario	2019	2030	2050
BAU	9.53		
Promote and Regulate (S01)	9.53	9.83	9.82
Plan and Build (S02)	9.53	9.62	9.93
Mixed (S03)	9.53	10.00	10.00

Public transport occupancy levels [pass/vehicle]

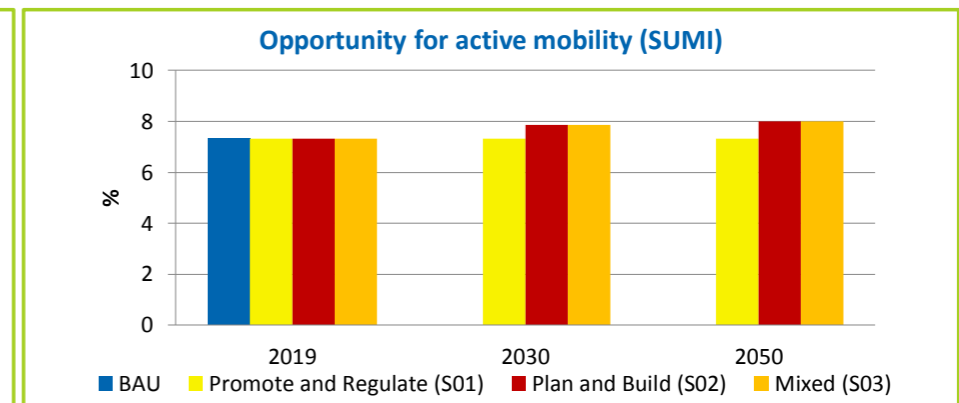
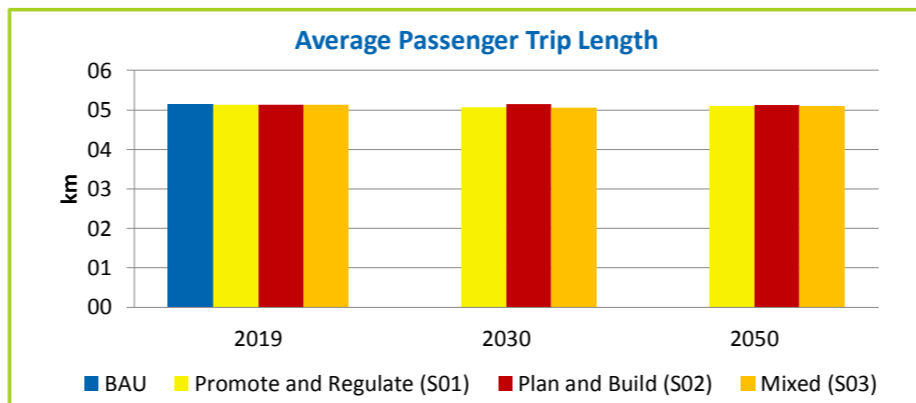
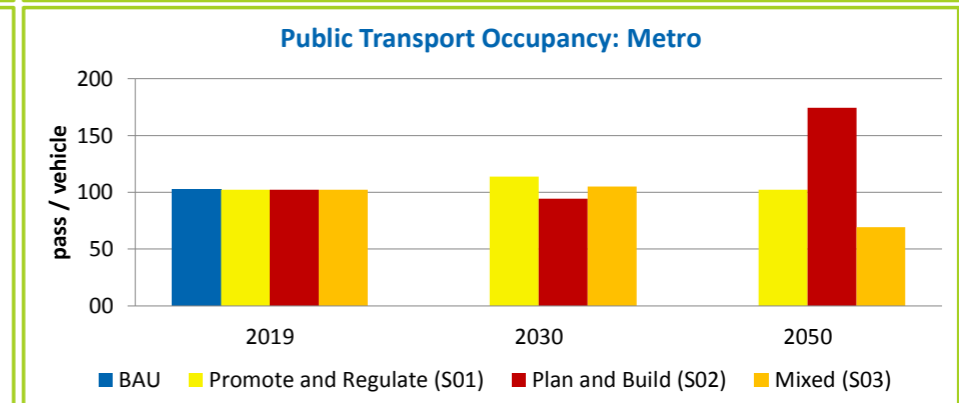
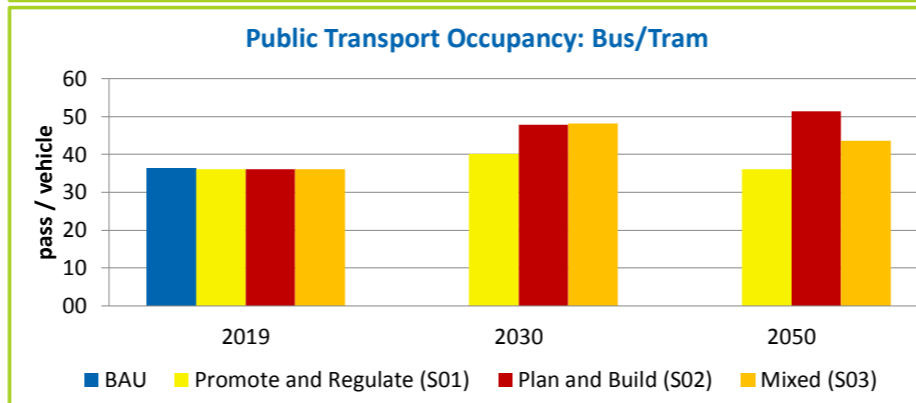
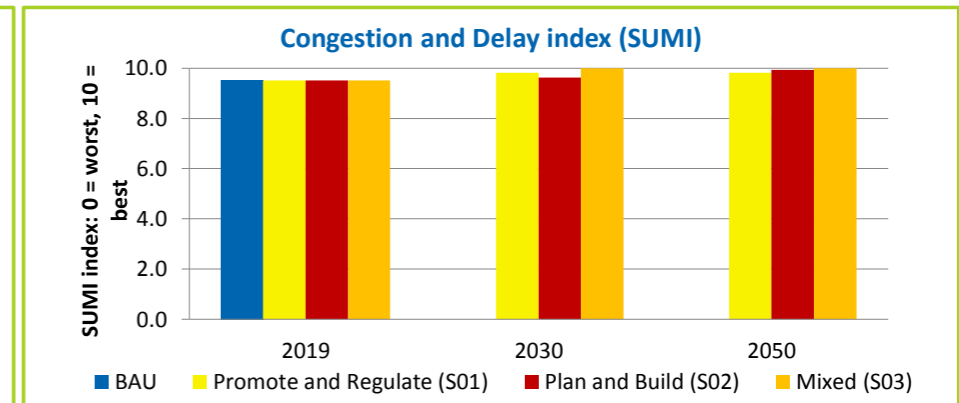
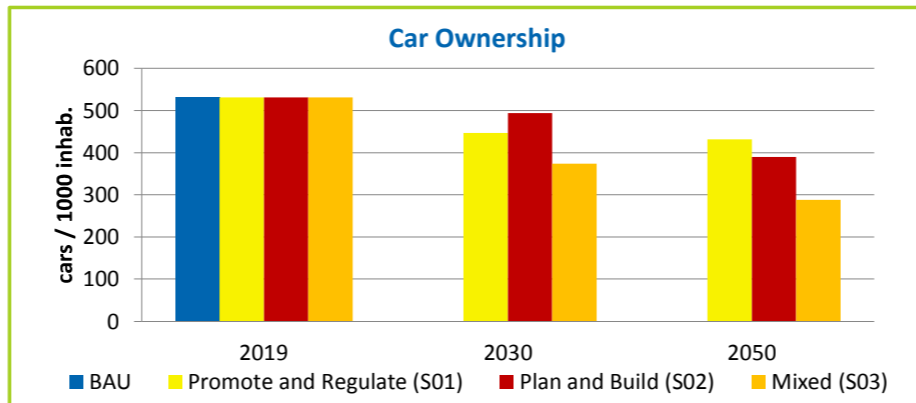
Scenario	PT mode	2019	2030	2050
BAU	Bus/tram	36.1		
BAU	Metro	102.4		
Promote and Regulate (S01)	Bus/tram	36.1	40.1	36.1
Promote and Regulate (S01)	Metro	102.4	113.8	102.3
Plan and Build (S02)	Bus/tram	36.1	47.9	51.4
Plan and Build (S02)	Metro	102.4	94.3	174.5
Mixed (S03)	Bus/tram	36.09	48.21	43.70
Mixed (S03)	Metro	102.35	105.07	69.38

Average passenger trip length [km]

Scenario	2019	2030	2050
BAU	5.1		
Promote and Regulate (S01)	5.1	5.1	5.1
Plan and Build (S02)	5.1	5.1	5.1
Mixed (S03)	5.1	5.0	5.1

Opportunity for active mobility (SUMI) [%]

Scenario	2019	2030	2050
BAU	7.33		
Promote and Regulate (S01)	7.33	7.33	7.33
Plan and Build (S02)	7.33	7.86	7.99
Mixed (S03)	7.33	7.86	7.99



ALL INDICATORS

Large City - Central/Western Europe

TRANSPORT AND MOBILITY INDICATORS

Penetration of alternatively fuelled car vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	Hybrid electric	3%		
BAU	Battery electric	1%		
BAU	fuel cells	0%		
Scenarios	Hybrid electric	3%	4%	32%
Scenarios	Battery electric	1%	26%	62%
Scenarios	fuel cells	0%	2%	6%

Penetration of alternatively fuelled bus vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	CNG	0%		
BAU	Hybrid electric	0.0%		
BAU	Battery electric	0.2%		
Scenarios	CNG	0%	1%	1%
Scenarios	Hybrid electric	0%	0%	0%
Scenarios	Battery electric	0%	52%	67%

Vehicles-km by mode: cars and car-sharing cars [million vkm/year]

Scenario	2019	2030	2050
BAU	1280		
Promote and Regulate (S01)	1280	1141	1249
Plan and Build (S02)	1280	1229	919
Mixed (S03)	1280	863	1031

Vehicles-km by mode: trucks [million vkm/year]

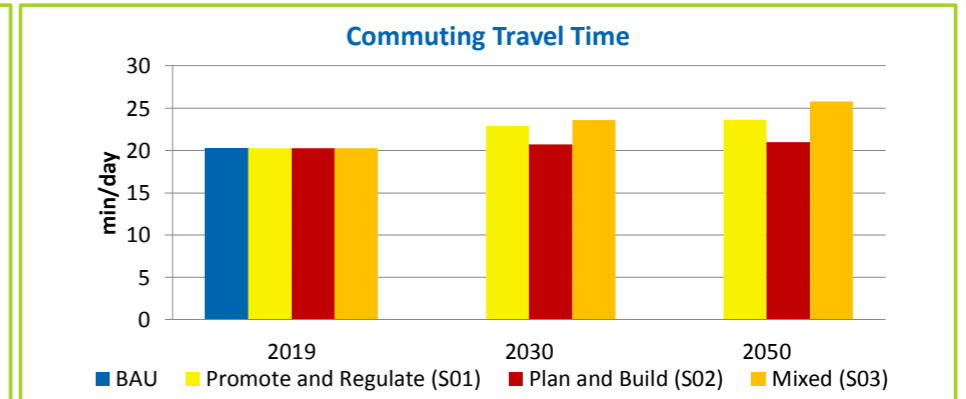
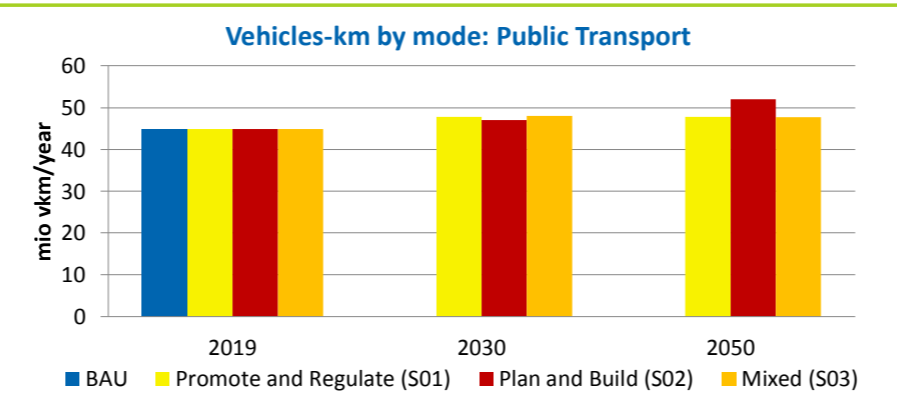
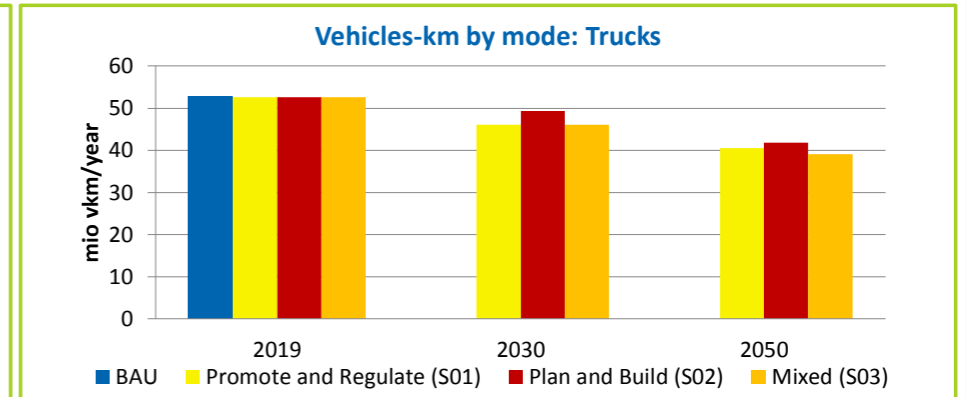
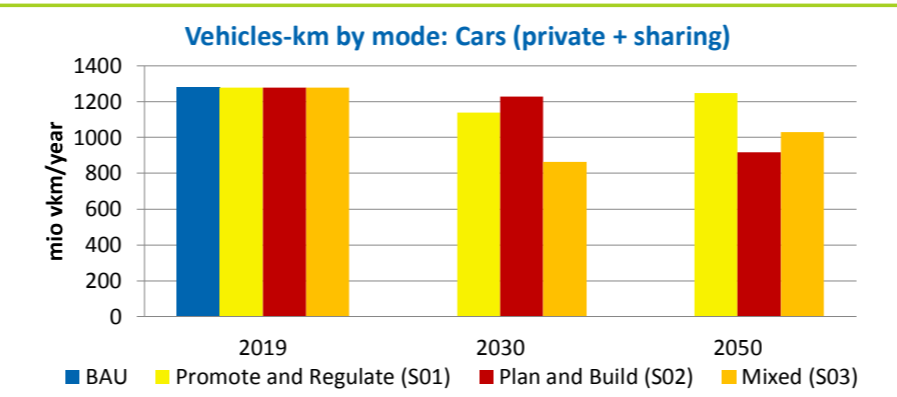
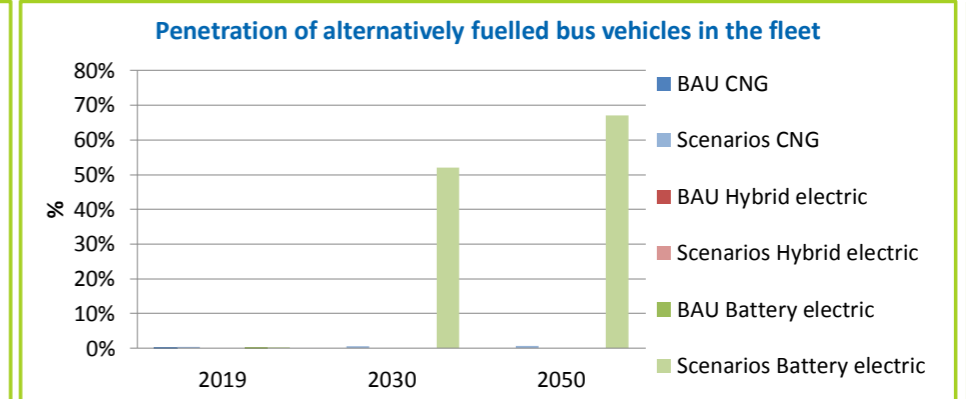
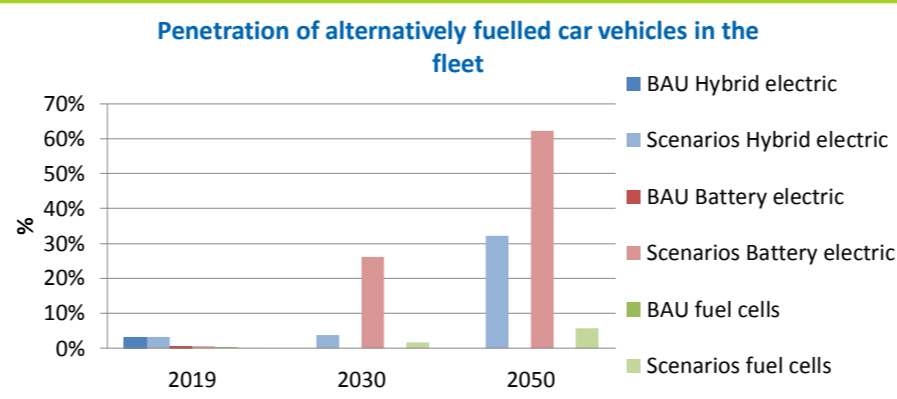
Scenario	2019	2030	2050
BAU	52.6		
Promote and Regulate (S01)	53	46	40
Plan and Build (S02)	52.6	49.3	41.8
Mixed (S03)	52.6	46.1	39.1

Vehicles-km by mode: Public Transport [million vkm/year]

Scenario	2019	2030	2050
BAU	44.9		
Promote and Regulate (S01)	44.9	47.8	47.8
Plan and Build (S02)	44.9	47.1	52.0
Mixed (S03)	44.9	48.0	47.7

Commuting travel time (SUMI) [min/day]

Scenario	2019	2030	2050
BAU	20.3		
Promote and Regulate (S01)	20.3	22.9	23.7
Plan and Build (S02)	20.3	20.7	21.0
Mixed (S03)	20.3	23.6	25.8



ALL INDICATORS

Large City - Central/Western Europe

ENVIRONMENT AND SAFETY INDICATORS

Air pollutant emissions (SUMI: PM2.5, Nox) [kg PM2.5 eq/capita]

Scenario	2019	2030	2050
BAU	0.6		
Promote and regulate (S01)	0.6	0.3	0.1
Plan and Build (S02)	0.6	0.3	0.1
Mixed (S03)	0.6	0.2	0.1

Air pollutant emissions (CO, VOC) [kg / capita]

Scenario	2019	2030	2050
BAU	1		
Promote and regulate (S01)	1	0	0
Plan and Build (S02)	1.3	0.6	0.1
Mixed (S03)	1.3	0.3	0.1

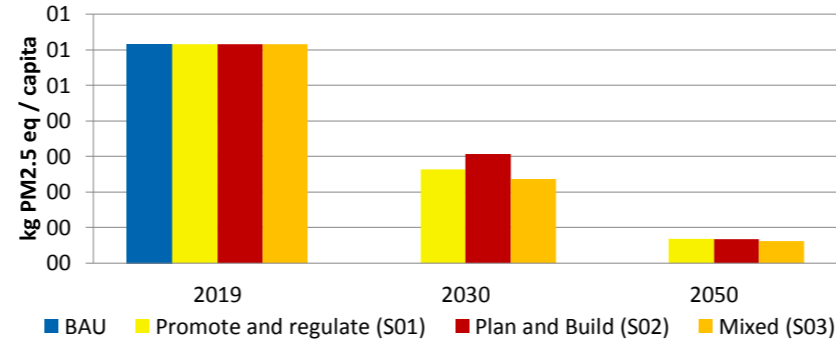
Emissions of Greenhouse Gases [t CO2 eq / capita per year]

Scenario	2019	2030	2050
BAU	0.727		
Promote and regulate (S01)	0.727	0.307	0.041
Plan and Build (S02)	0.727	0.364	0.041
Mixed (S03)	0.727	0.259	0.032

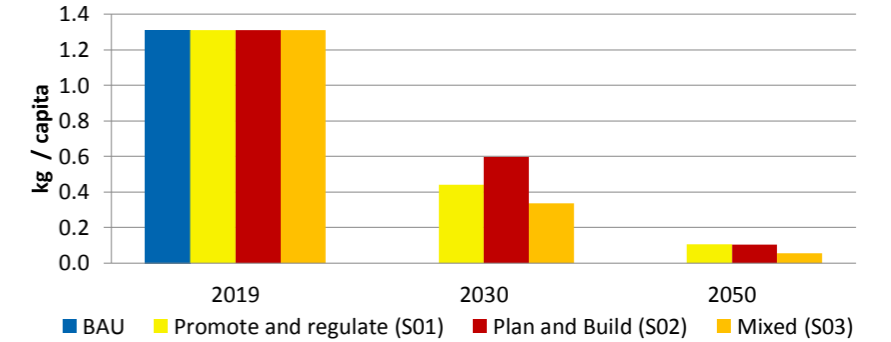
Energy consumption [MJ / km]

Scenario	2019	2030	2050
BAU	3.5		
Promote and regulate (S01)	3.5	1.8	0.7
Plan and Build (S02)	3.5	1.9	0.6
Mixed (S03)	3.5	1.6	0.7

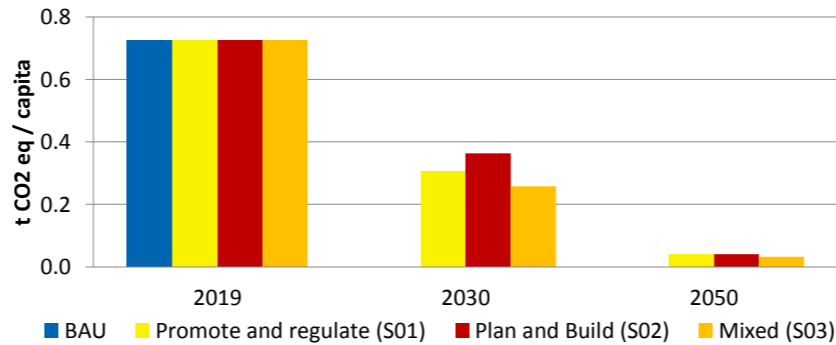
Air Pollutant Emissions: PM2.5, NOx



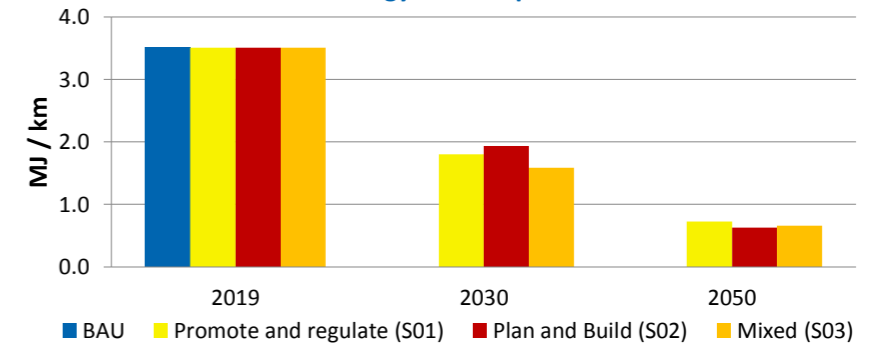
Air Pollutant Emissions: CO, VOC



Emissions of Greenhouse Gases: CO2



Energy Consumption



ALL INDICATORS

Large City - Central/Western Europe

ENVIRONMENT AND SAFETY INDICATORS

Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	2.1		
Promote and regulate (S01)	2.1	1.1	1.1
Plan and Build (S02)	2.1	1.7	1.0
Mixed (S03)	2.1	0.9	0.8

Fatalities: active modes [fatalities / 100,000 inhab.]

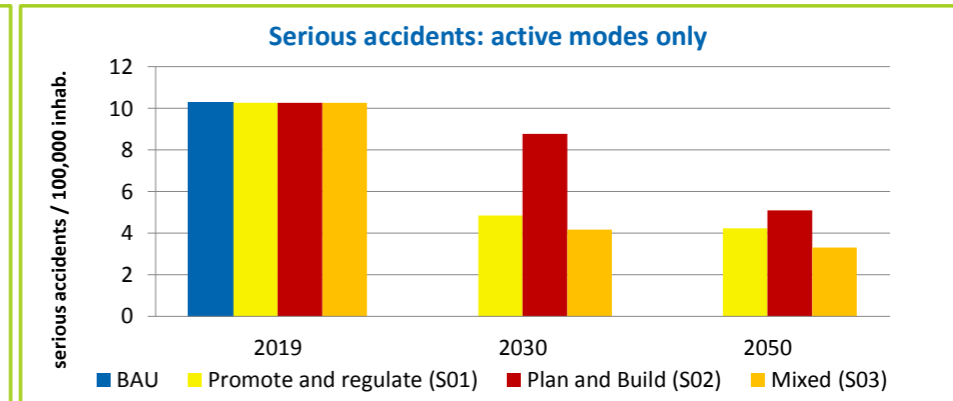
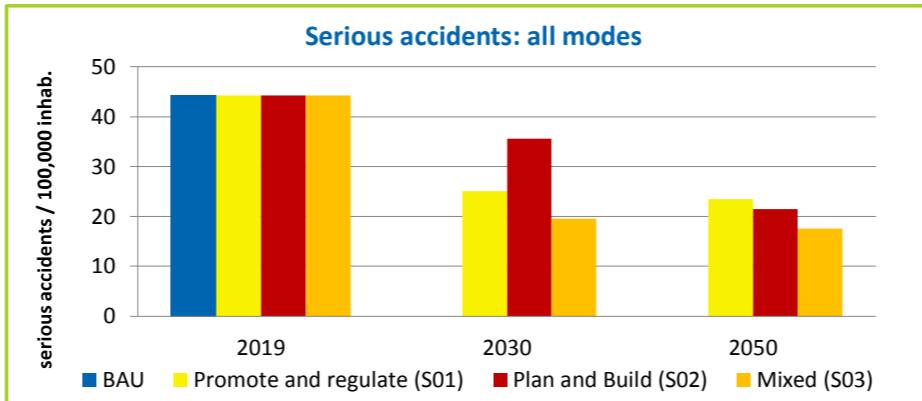
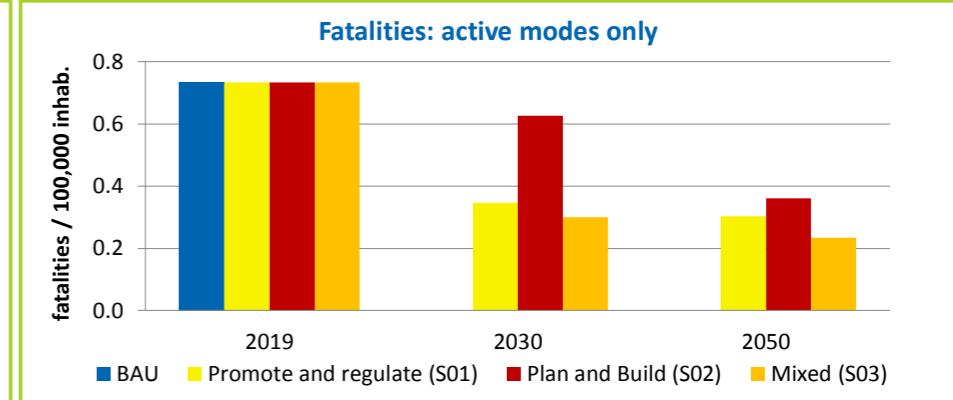
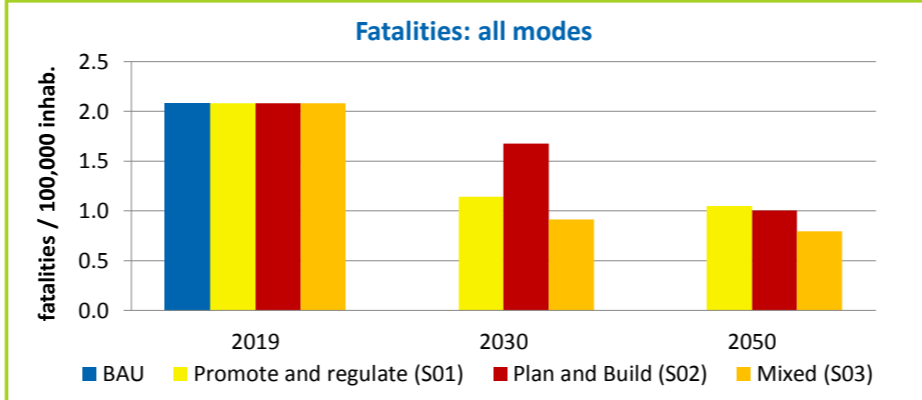
Scenario	2019	2030	2050
BAU	0.73		
Promote and regulate (S01)	0.73	0.35	0.30
Plan and Build (S02)	0.73	0.63	0.36
Mixed (S03)	0.73	0.30	0.23

Serious accidents [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	44		
Promote and regulate (S01)	44	25	24
Plan and Build (S02)	44	36	21
Mixed (S03)	44	20	18

Serious accidents: active modes [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	10		
Promote and regulate (S01)	10	5	4
Plan and Build (S02)	10	9	5
Mixed (S03)	10	4	3



ALL INDICATORS

Large City - Northern Europe

EMISSIONS OF CO₂ (TANK-TO-WHEEL), CAR OWNERSHIP, FATALITIES

Emissions of CO₂ (Tank-to-wheel) [t CO₂ eq / capita per year]

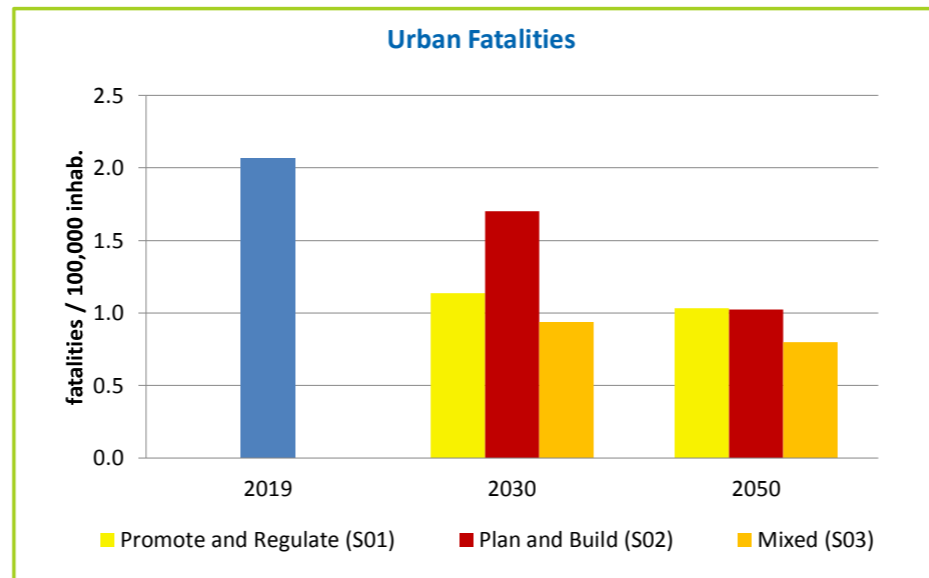
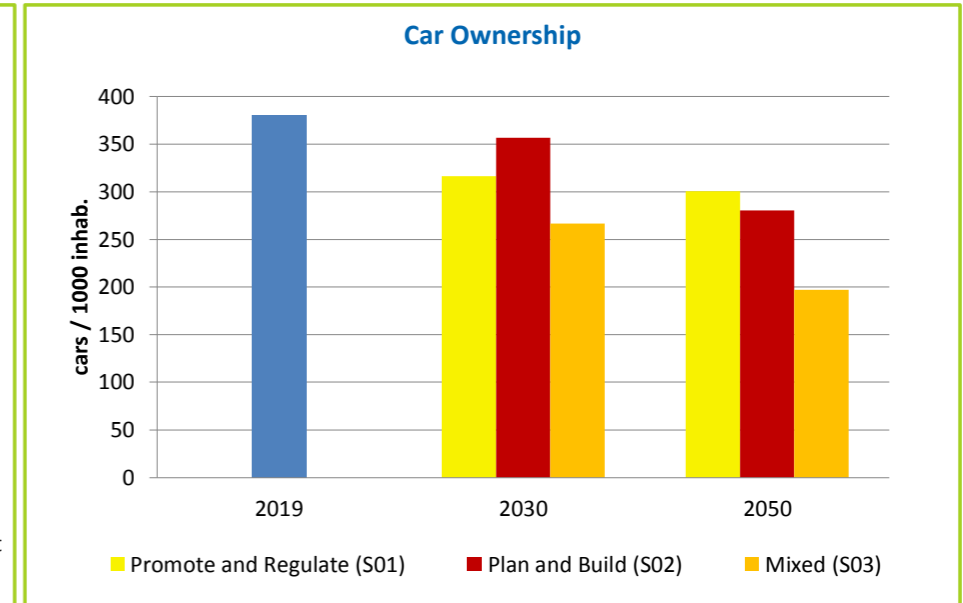
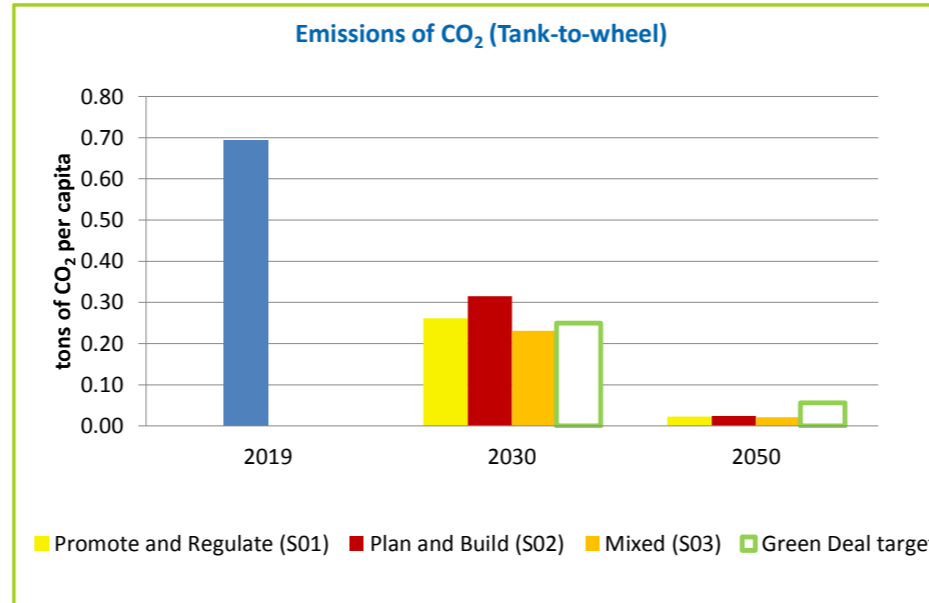
Scenario	2019	2030	2050
Promote and Regulate (S01)	0.693	0.262	0.023
Plan and Build (S02)	0.693	0.315	0.023
Mixed (S03)	0.693	0.231	0.020
Green Deal target		0.249	0.055

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	381	317	301
Plan and Build (S02)	381	357	280
Mixed (S03)	381	266	197

Urban Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	2.065	1.137	1.032
Plan and Build (S02)	2.065	1.701	1.025
Mixed (S03)	2.065	0.937	0.798



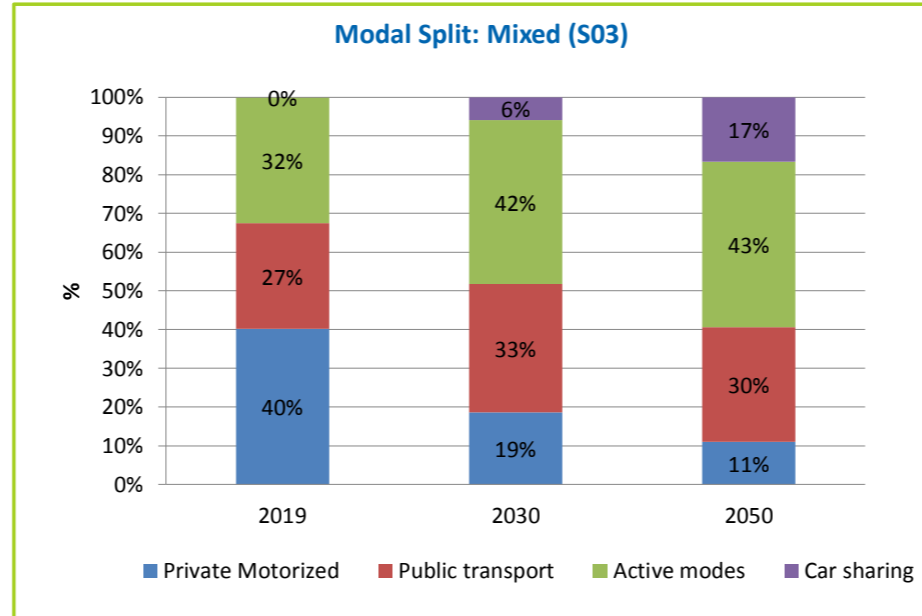
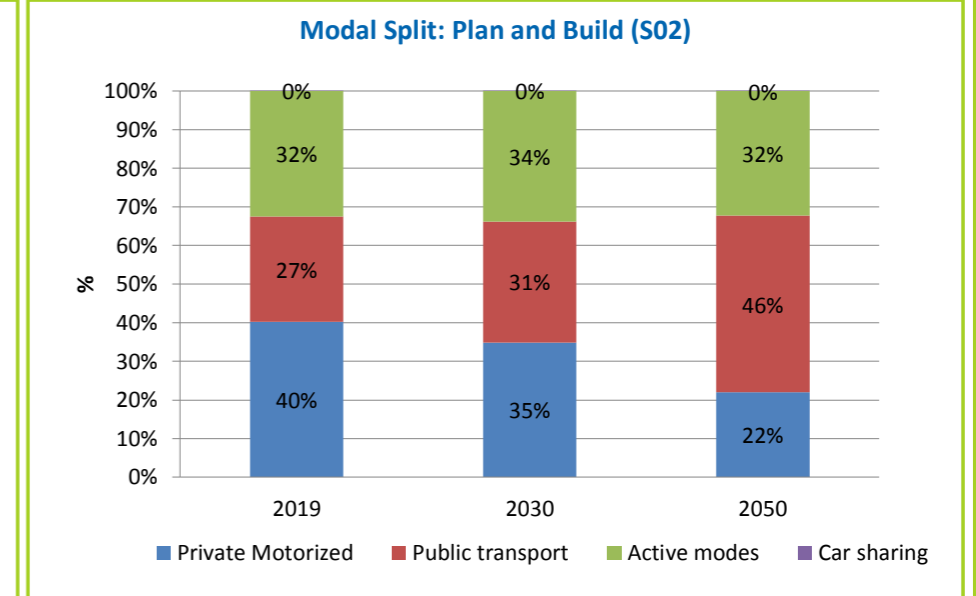
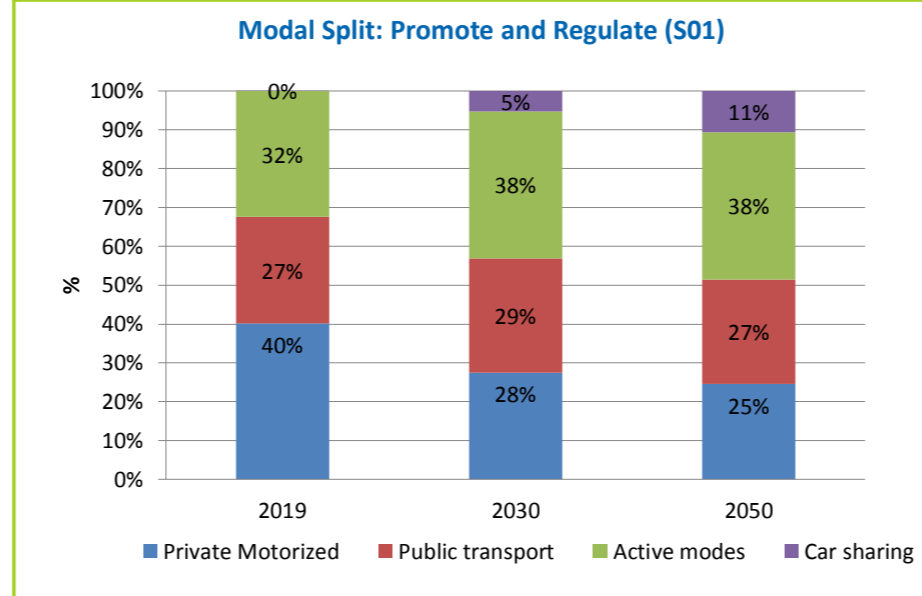
KEY INDICATORS

Large City - Northern Europe

MODAL SPLIT

Aggregate mode split [%]

Scenario	Mode	2019	2030	2050
Promote and Regulate (S01)	Private Motorized	40%	28%	25%
Promote and Regulate (S01)	Public transport	27%	29%	27%
Promote and Regulate (S01)	Active modes	32%	38%	38%
Promote and Regulate (S01)	Car sharing	0%	5%	11%
Plan and Build (S02)	Private Motorized	40%	35%	22%
Plan and Build (S02)	Public transport	27%	31%	46%
Plan and Build (S02)	Active modes	32%	34%	32%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Private Motorized	40%	19%	11%
Mixed (S03)	Public transport	27%	33%	30%
Mixed (S03)	Active modes	32%	42%	43%
Mixed (S03)	Car sharing	0%	6%	17%



KEY INDICATORS

Large City - Northern Europe

ECONOMIC OUTPUTS (discounted, cumulated from 2019)*

City total revenues [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	511	1,859
Plan and Build (S02)	0	109	681
Mixed (S03)	0	690	2,430

City total costs [mio euro]

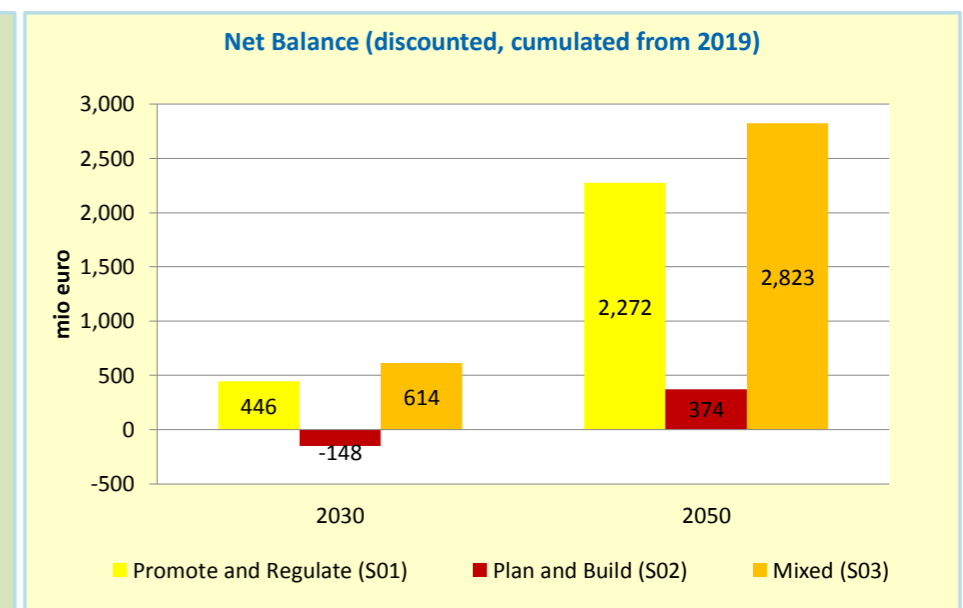
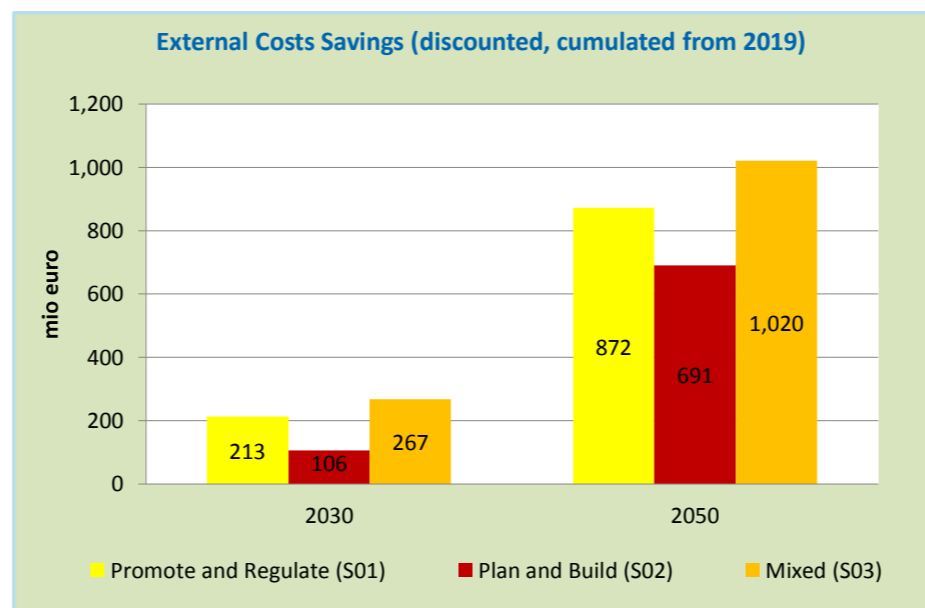
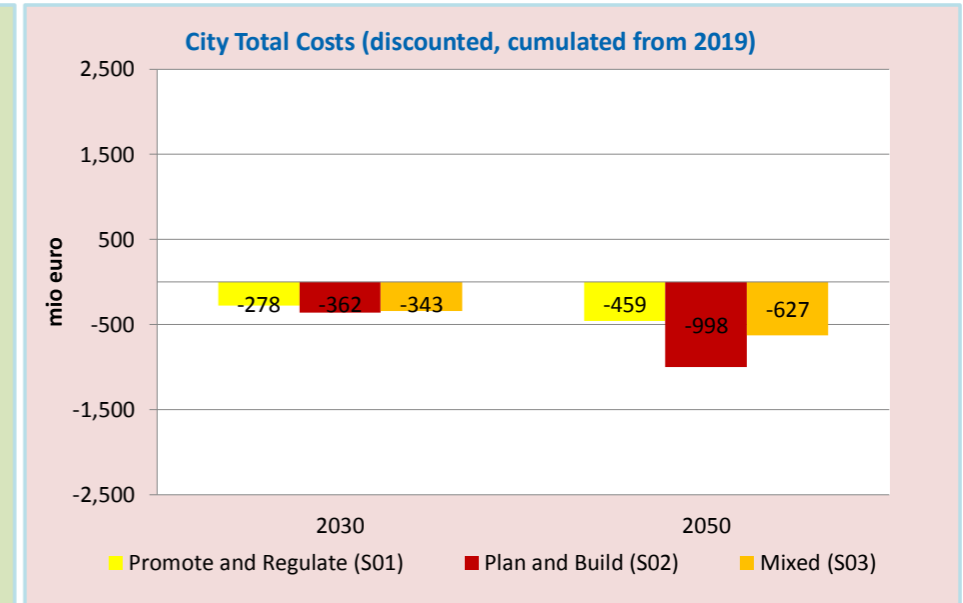
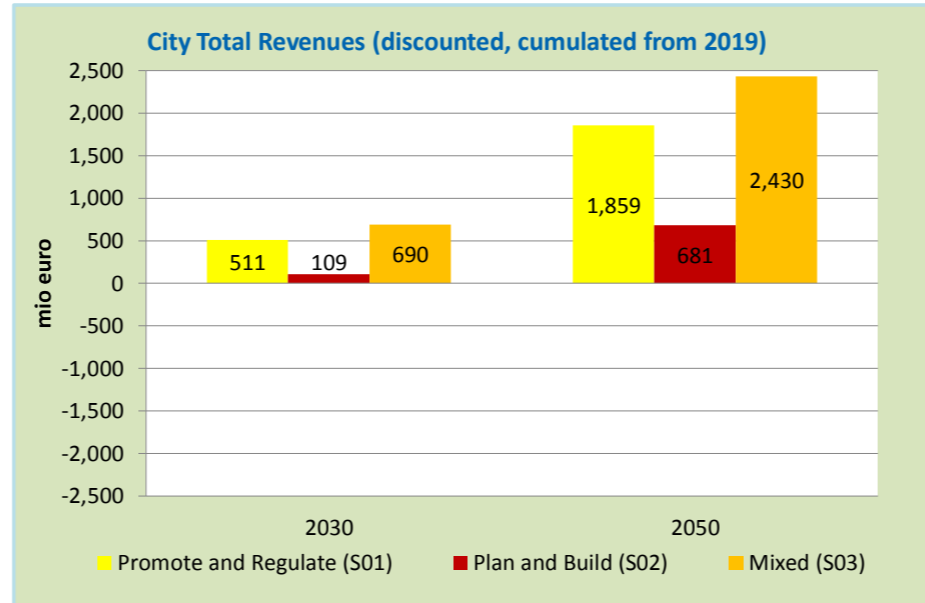
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	278	459
Plan and Build (S02)	0	362	998
Mixed (S03)	0	343	627

External costs savings [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	213	872
Plan and Build (S02)	0	106	691
Mixed (S03)	0	267	1,020

Net balance [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	446	2,272
Plan and Build (S02)	0	-148	374
Mixed (S03)	0	614	2,823



* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Large City - Northern Europe

ECONOMIC OUTPUTS PER CAPITA (discounted, cumulated from 2019)*

City total revenues [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	783	2,845
Plan and Build (S02)	0	167	1,043
Mixed (S03)	0	1,056	3,719

City total costs [euro / capita]

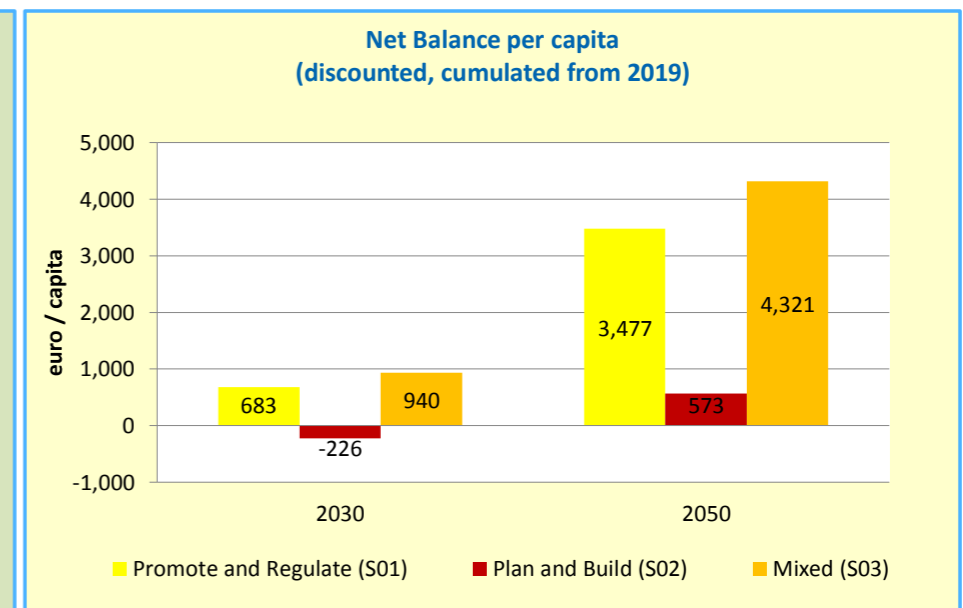
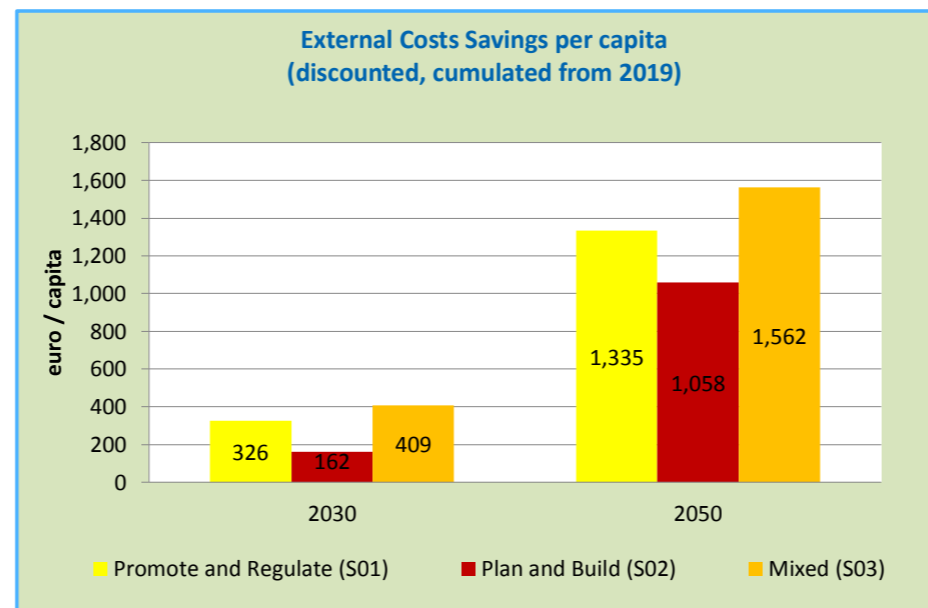
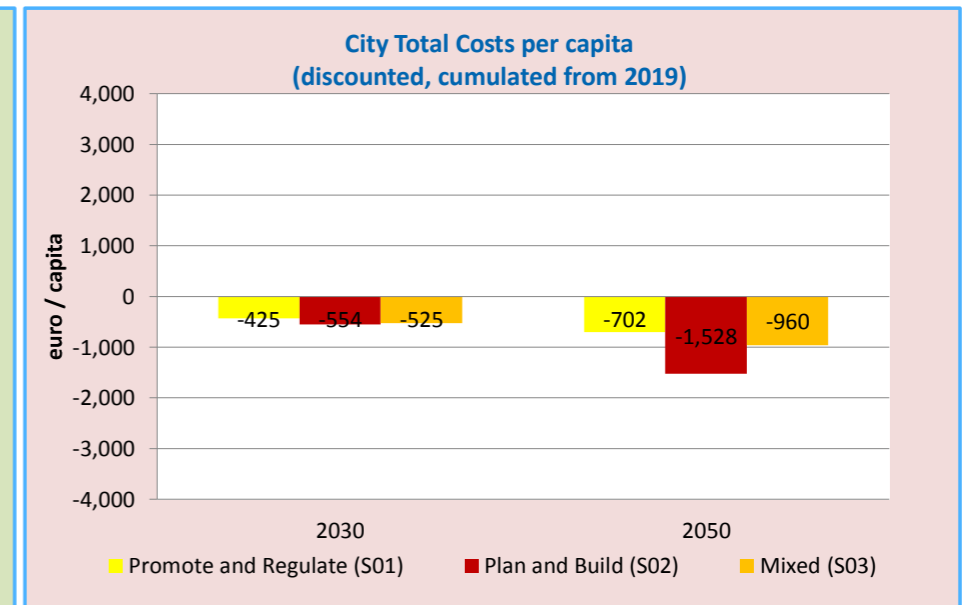
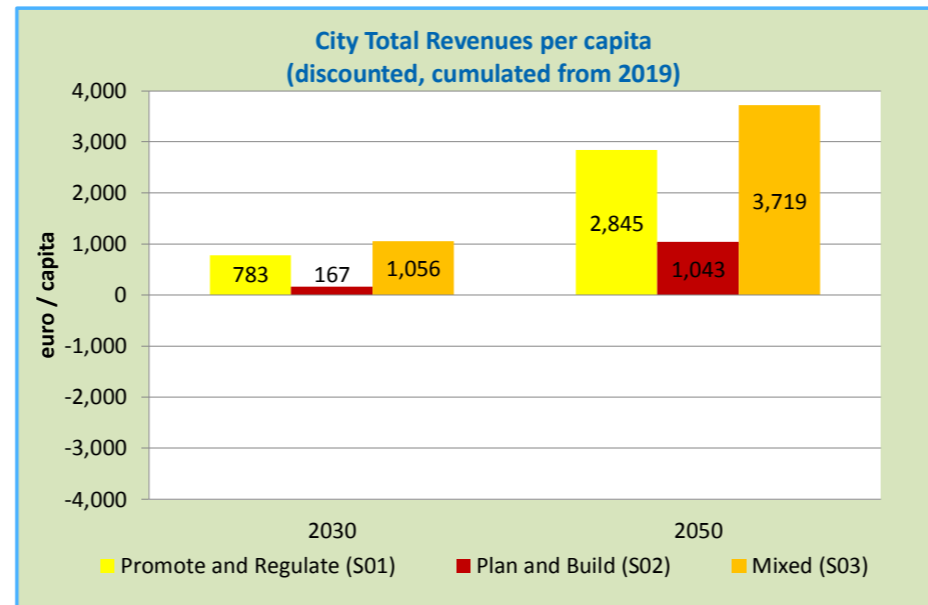
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	425	702
Plan and Build (S02)	0	554	1,528
Mixed (S03)	0	525	960

External costs savings [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	326	1,335
Plan and Build (S02)	0	162	1,058
Mixed (S03)	0	409	1,562

Net balance [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	683	3,477
Plan and Build (S02)	0	-226	573
Mixed (S03)	0	940	4,321



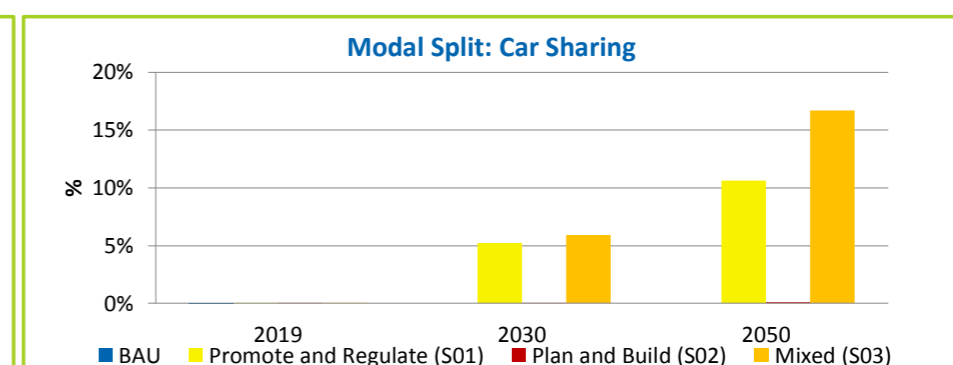
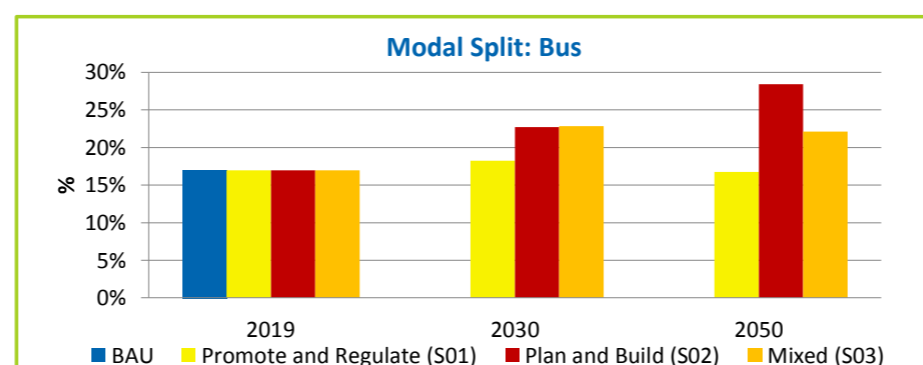
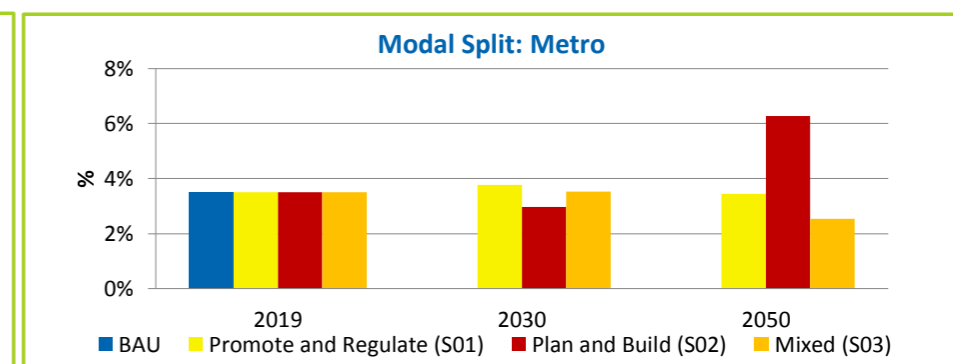
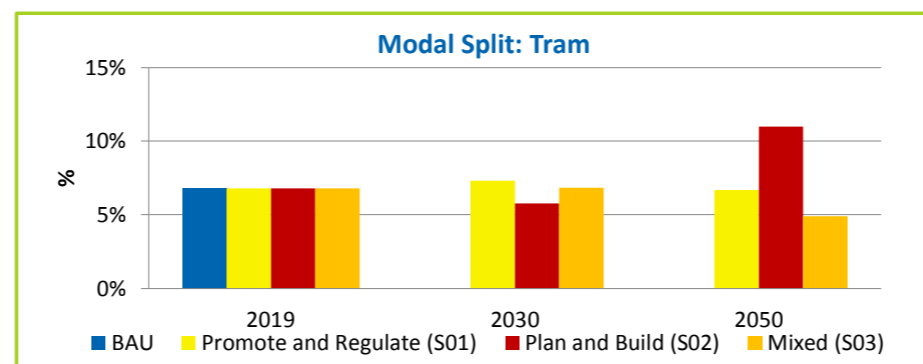
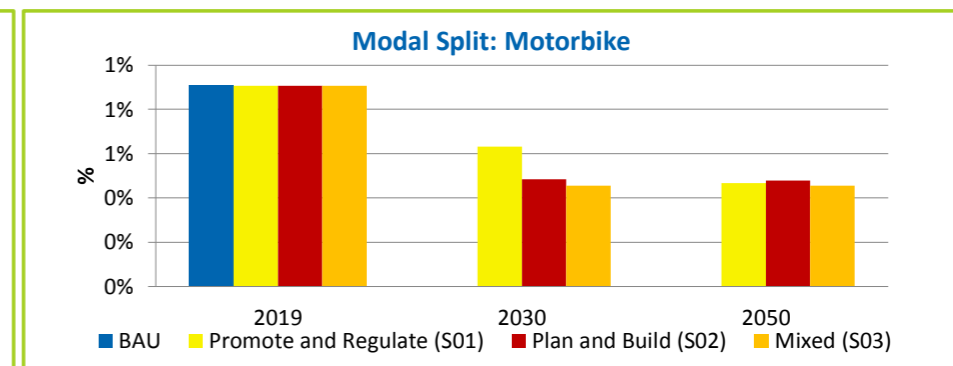
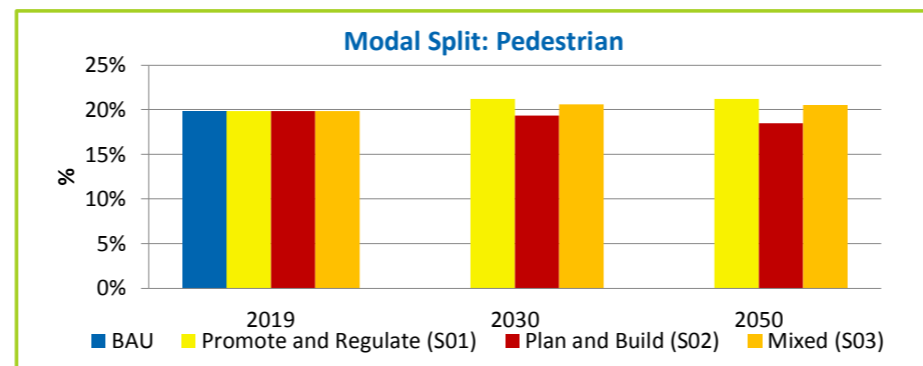
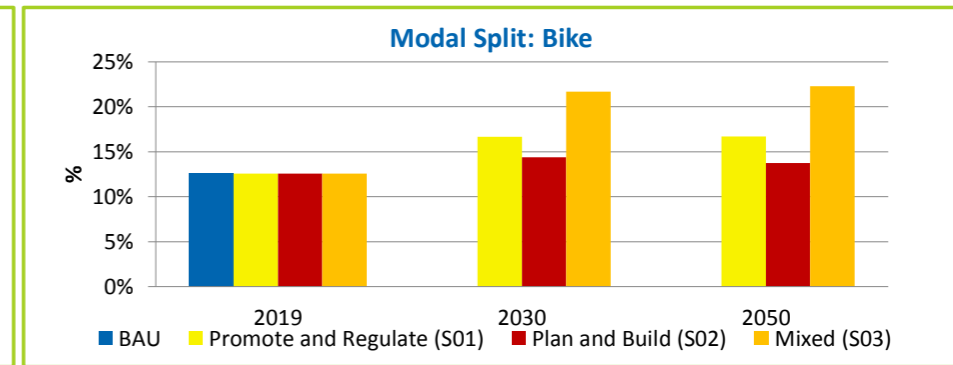
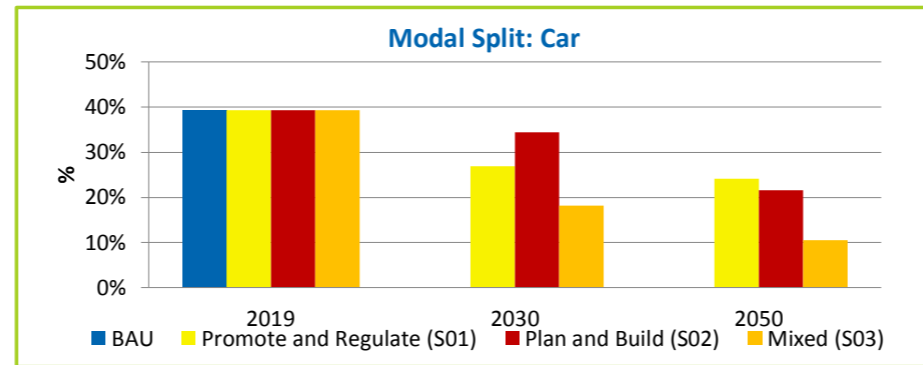
* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Large City - Northern Europe

TRANSPORT AND MOBILITY INDICATORS

Mode split [%]				
Scenario	Mode	2019	2030	2050
BAU	Pedestrian	20%		
BAU	Bike	13%		
BAU	Motorbike	1%		
BAU	Car	39%		
BAU	Bus	17%		
BAU	Tram	7%		
BAU	Metro	4%		
BAU	Car sharing	0%		
Promote and Regulate (S01)	Pedestrian	20%	21%	21%
Promote and Regulate (S01)	Bike	13%	17%	17%
Promote and Regulate (S01)	Motorbike	1%	1%	0%
Promote and Regulate (S01)	Car	39%	27%	24%
Promote and Regulate (S01)	Bus	17%	18%	17%
Promote and Regulate (S01)	Tram	7%	7%	7%
Promote and Regulate (S01)	Metro	4%	4%	3%
Promote and Regulate (S01)	Car sharing	0%	5%	11%
Plan and Build (S02)	Pedestrian	20%	19%	18%
Plan and Build (S02)	Bike	13%	14%	14%
Plan and Build (S02)	Motorbike	1%	0%	0%
Plan and Build (S02)	Car	39%	34%	22%
Plan and Build (S02)	Bus	17%	23%	28%
Plan and Build (S02)	Tram	7%	6%	11%
Plan and Build (S02)	Metro	4%	3%	6%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Pedestrian	20%	21%	21%
Mixed (S03)	Bike	13%	22%	22%
Mixed (S03)	Motorbike	1%	0%	0%
Mixed (S03)	Car	39%	18%	10%
Mixed (S03)	Bus	17%	23%	22%
Mixed (S03)	Tram	7%	7%	5%
Mixed (S03)	Metro	4%	4%	3%
Mixed (S03)	Car sharing	0%	6%	17%



ALL INDICATORS

Large City - Northern Europe

TRANSPORT AND MOBILITY INDICATORS

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
BAU	381		
Promote and Regulate (S01)	381	317	301
Plan and Build (S02)	381	357	280
Mixed (S03)	381	266	197

Congestion and delays index (SUMI)

Scenario	2019	2030	2050
BAU	9.55		
Promote and Regulate (S01)	9.55	9.87	9.88
Plan and Build (S02)	9.55	9.61	9.90
Mixed (S03)	9.55	10.00	10.00

Public transport occupancy levels [pass/vehicle]

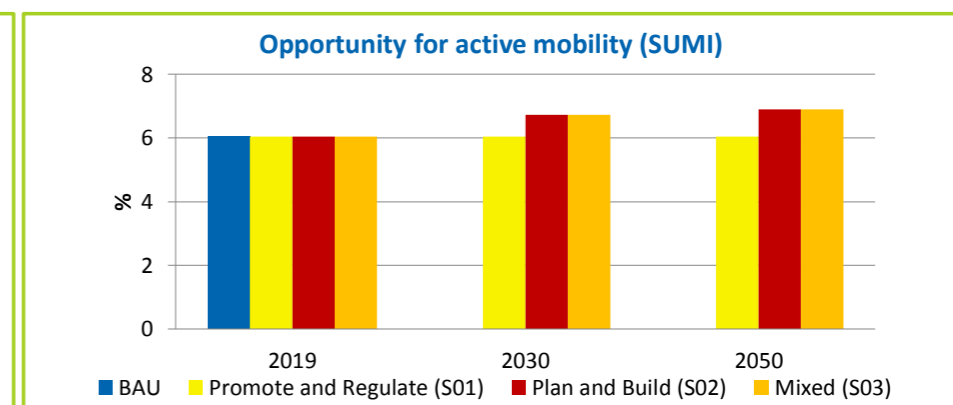
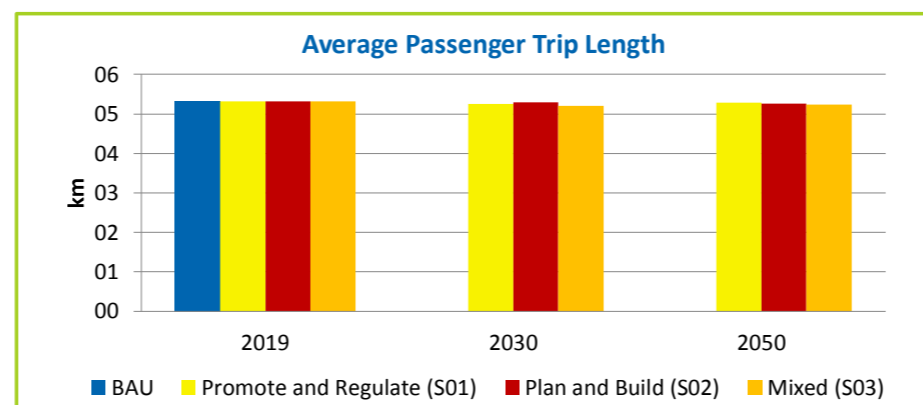
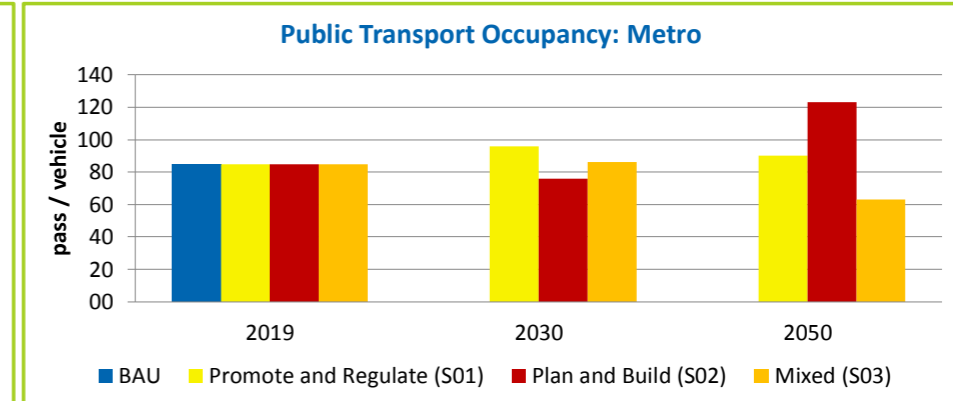
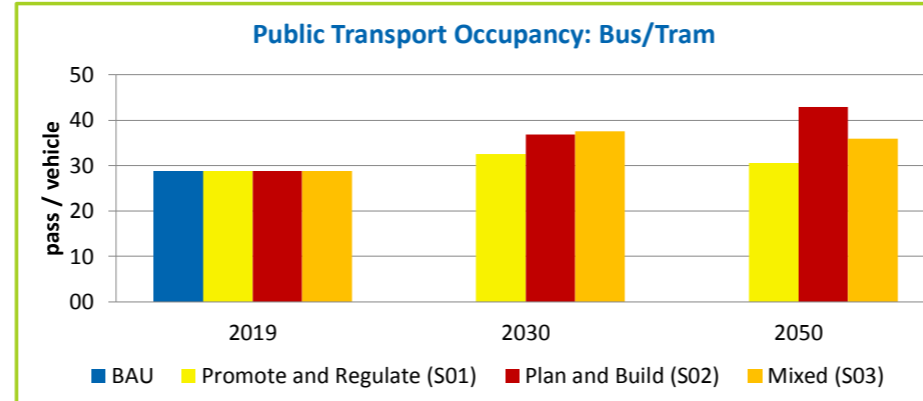
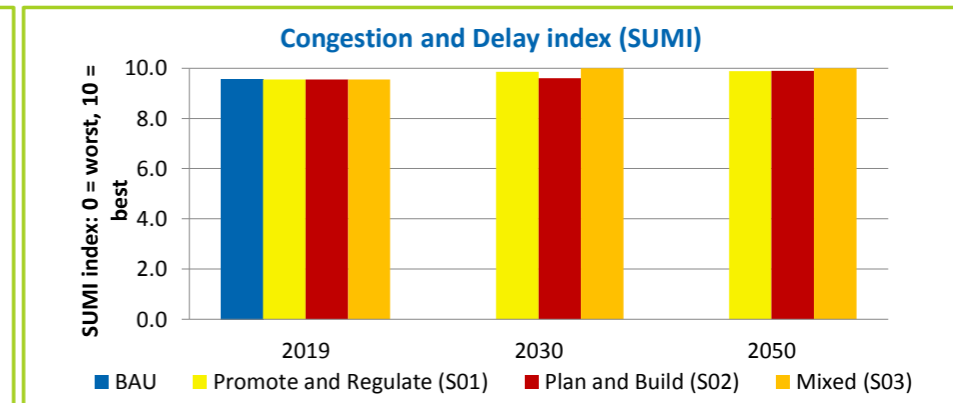
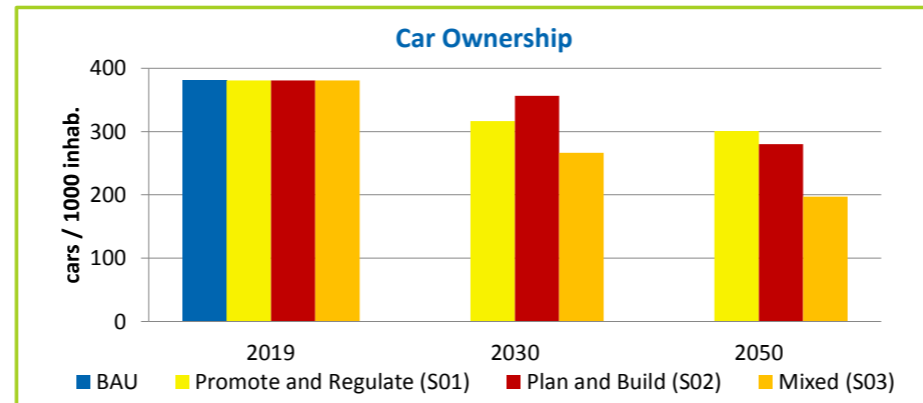
Scenario	PT mode	2019	2030	2050
BAU	Bus/tram	28.8		
BAU	Metro	84.9		
Promote and Regulate (S01)	Bus/tram	28.8	32.6	30.6
Promote and Regulate (S01)	Metro	84.9	96.0	90.1
Plan and Build (S02)	Bus/tram	28.8	36.9	42.9
Plan and Build (S02)	Metro	84.9	75.9	123.0
Mixed (S03)	Bus/tram	28.81	37.55	35.95
Mixed (S03)	Metro	84.92	86.06	63.14

Average passenger trip length [km]

Scenario	2019	2030	2050
BAU	5.3		
Promote and Regulate (S01)	5.3	5.3	5.3
Plan and Build (S02)	5.3	5.3	5.3
Mixed (S03)	5.3	5.2	5.2

Opportunity for active mobility (SUMI) [%]

Scenario	2019	2030	2050
BAU	6.05		
Promote and Regulate (S01)	6.05	6.05	6.05
Plan and Build (S02)	6.05	6.73	6.90
Mixed (S03)	6.05	6.73	6.90



ALL INDICATORS

Large City - Northern Europe

TRANSPORT AND MOBILITY INDICATORS

Penetration of alternatively fuelled car vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	Hybrid electric	3%		
BAU	Battery electric	0%		
BAU	fuel cells	0%		
Scenarios	Hybrid electric	3%	1%	9%
Scenarios	Battery electric	0%	44%	88%
Scenarios	fuel cells	0%	1%	3%

Penetration of alternatively fuelled bus vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	CNG	5%		
BAU	Hybrid electric	0.0%		
BAU	Battery electric	0.9%		
Scenarios	CNG	5%	4%	3%
Scenarios	Hybrid electric	0%	0%	0%
Scenarios	Battery electric	1%	68%	100%

Vehicles-km by mode: cars and car-sharing cars [million vkm/year]

Scenario	2019	2030	2050
BAU	857		
Promote and Regulate (S01)	857	753	809
Plan and Build (S02)	857	852	641
Mixed (S03)	857	597	687

Vehicles-km by mode: trucks [million vkm/year]

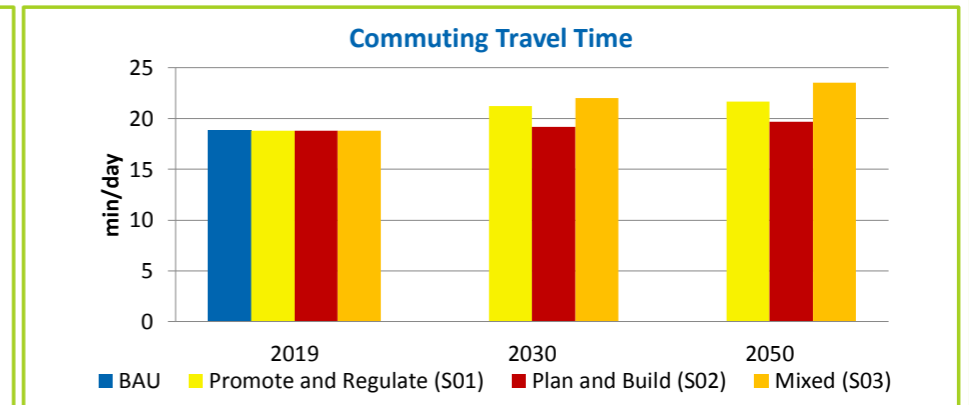
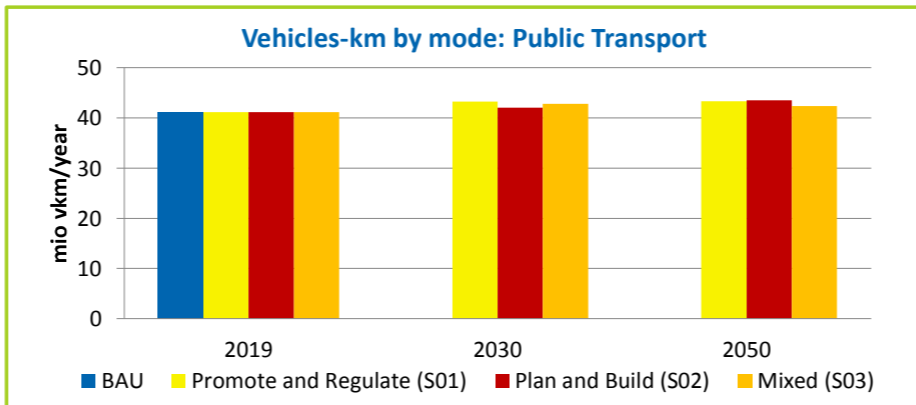
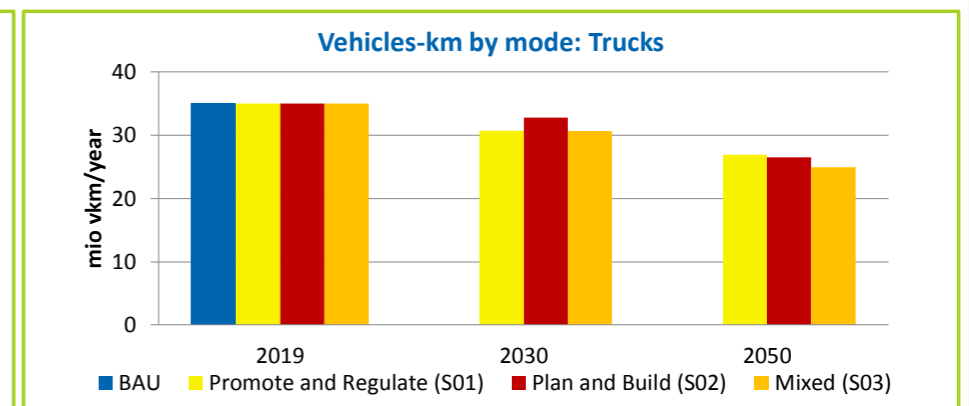
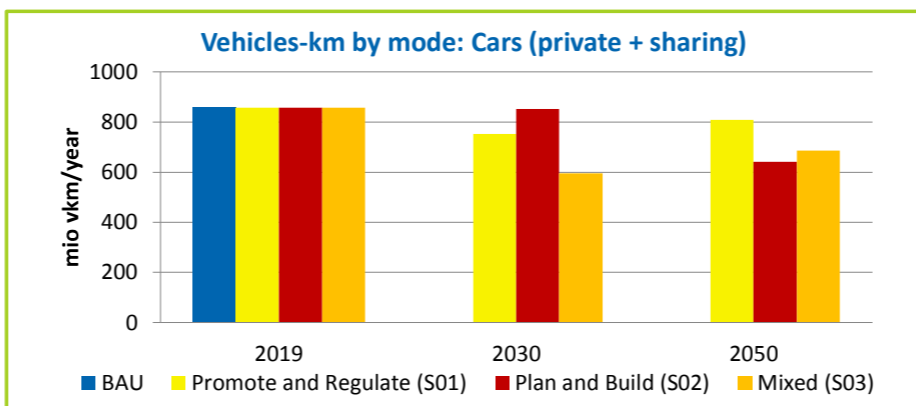
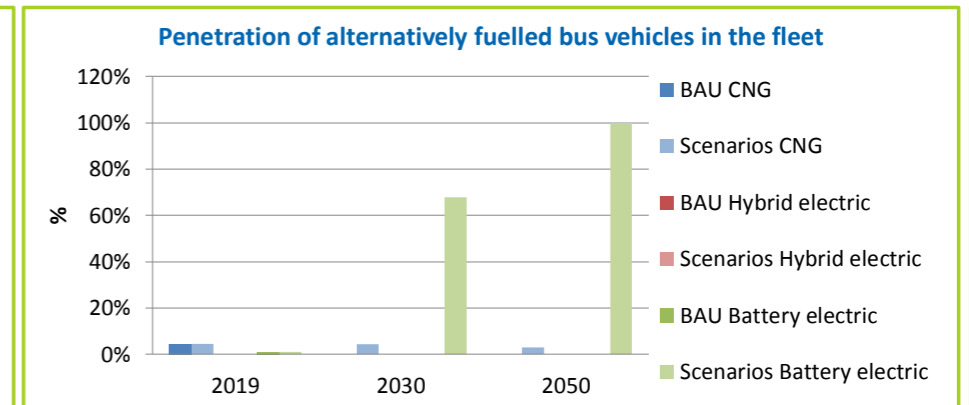
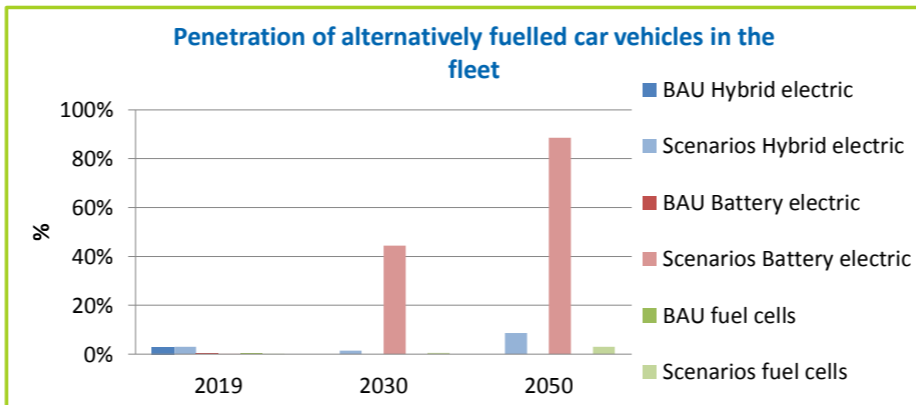
Scenario	2019	2030	2050
BAU	35.0		
Promote and Regulate (S01)	35	31	27
Plan and Build (S02)	35.0	32.8	26.5
Mixed (S03)	35.0	30.7	25.0

Vehicles-km by mode: Public Transport [million vkm/year]

Scenario	2019	2030	2050
BAU	41.2		
Promote and Regulate (S01)	41.2	43.2	43.3
Plan and Build (S02)	41.2	42.0	43.5
Mixed (S03)	41.2	42.8	42.4

Commuting travel time (SUMI) [min/day]

Scenario	2019	2030	2050
BAU	18.8		
Promote and Regulate (S01)	18.8	21.2	21.7
Plan and Build (S02)	18.8	19.2	19.7
Mixed (S03)	18.8	22.0	23.5



ALL INDICATORS

Large City - Northern Europe

ENVIRONMENT AND SAFETY INDICATORS

Air pollutant emissions (SUMI: PM2.5, Nox) [kg PM2.5 eq/capita]

Scenario	2019	2030	2050
BAU	0.8		
Promote and regulate (S01)	0.8	0.3	0.1
Plan and Build (S02)	0.8	0.4	0.1
Mixed (S03)	0.8	0.3	0.1

Air pollutant emissions (CO, VOC) [kg / capita]

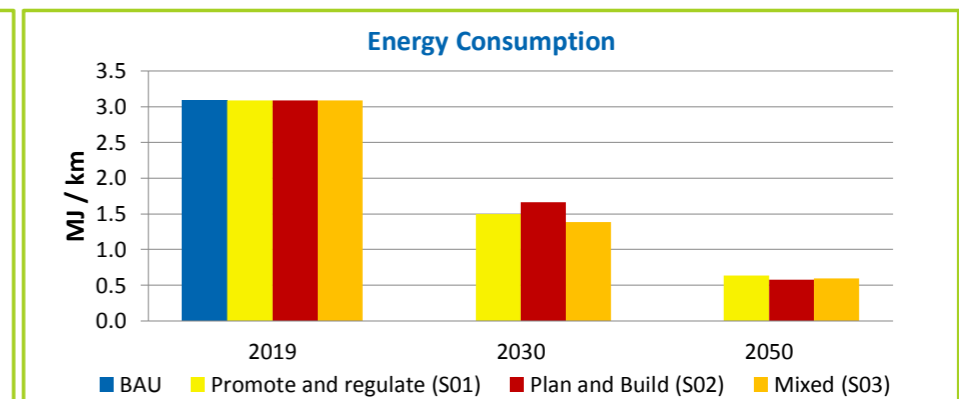
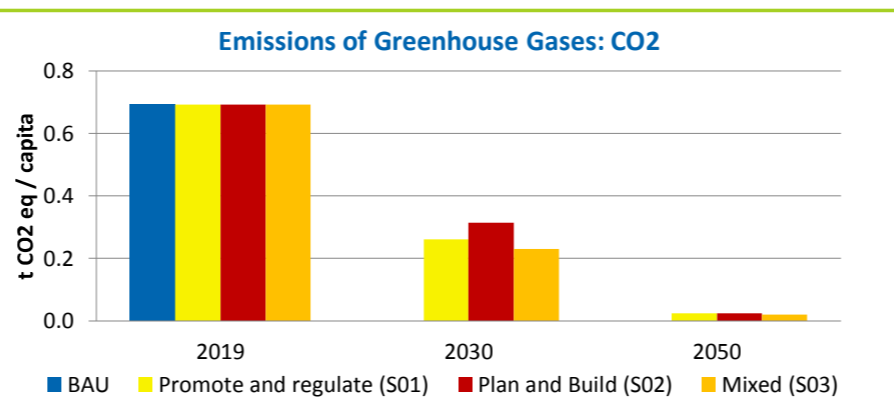
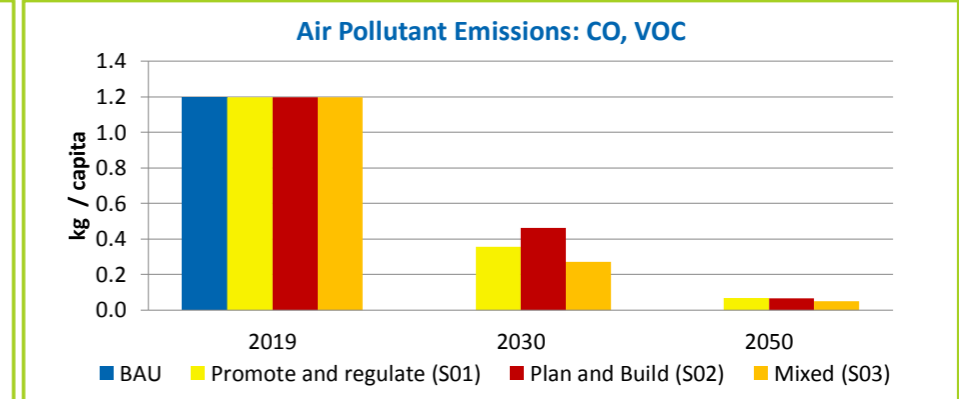
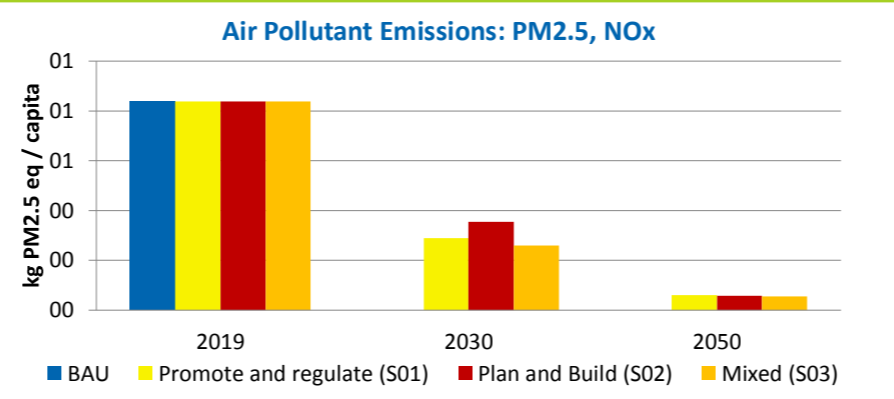
Scenario	2019	2030	2050
BAU	1		
Promote and regulate (S01)	1	0	0
Plan and Build (S02)	1.2	0.5	0.1
Mixed (S03)	1.2	0.3	0.1

Emissions of Greenhouse Gases [t CO2 eq / capita per year]

Scenario	2019	2030	2050
BAU	0.693		
Promote and regulate (S01)	0.693	0.262	0.024
Plan and Build (S02)	0.693	0.315	0.024
Mixed (S03)	0.693	0.231	0.021

Energy consumption [MJ / km]

Scenario	2019	2030	2050
BAU	3.1		
Promote and regulate (S01)	3.1	1.5	0.6
Plan and Build (S02)	3.1	1.7	0.6
Mixed (S03)	3.1	1.4	0.6



ALL INDICATORS

Large City - Northern Europe

ENVIRONMENT AND SAFETY INDICATORS

Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	2.1		
Promote and regulate (S01)	2.1	1.1	1.0
Plan and Build (S02)	2.1	1.7	1.0
Mixed (S03)	2.1	0.9	0.8

Fatalities: active modes [fatalities / 100,000 inhab.]

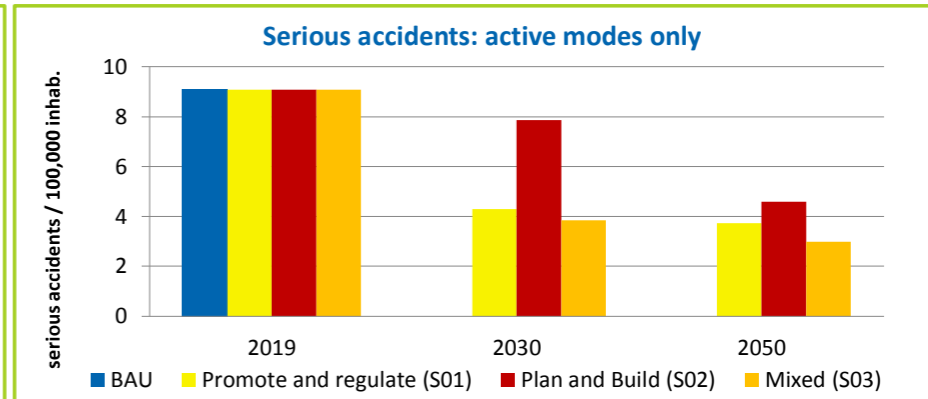
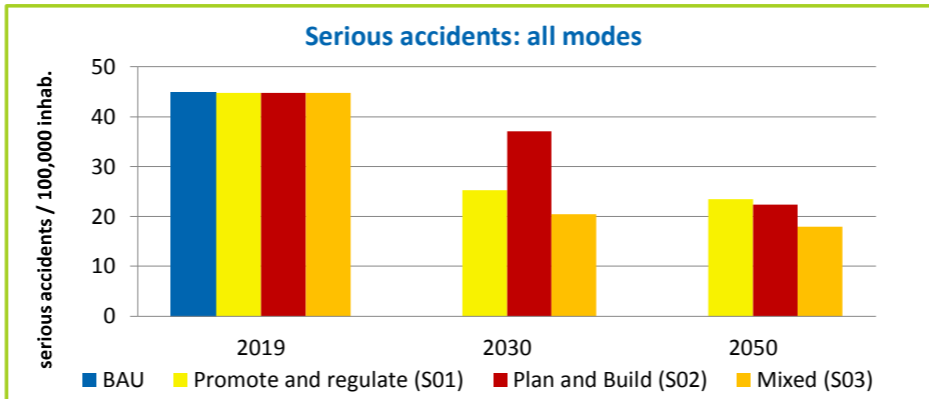
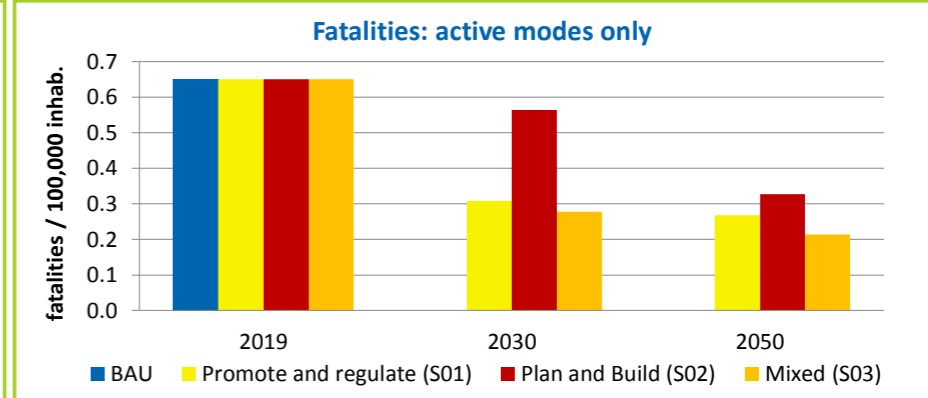
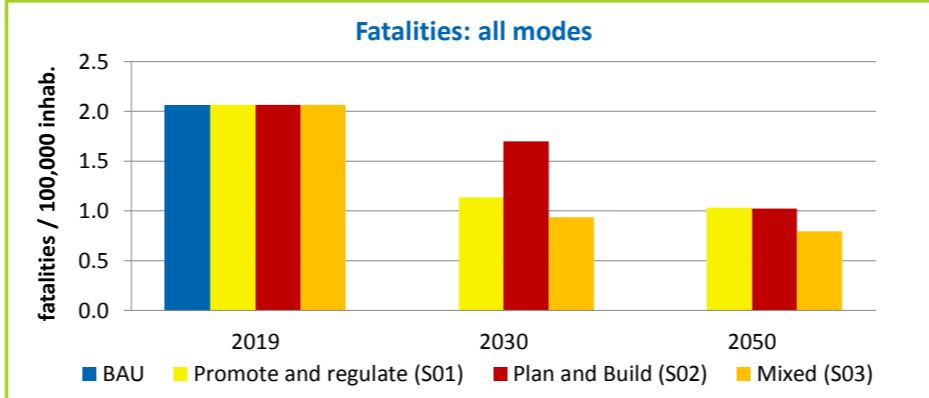
Scenario	2019	2030	2050
BAU	0.65		
Promote and regulate (S01)	0.65	0.31	0.27
Plan and Build (S02)	0.65	0.56	0.33
Mixed (S03)	0.65	0.28	0.21

Serious accidents [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	45		
Promote and regulate (S01)	45	25	23
Plan and Build (S02)	45	37	22
Mixed (S03)	45	20	18

Serious accidents: active modes [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	9		
Promote and regulate (S01)	9	4	4
Plan and Build (S02)	9	8	5
Mixed (S03)	9	4	3



ALL INDICATORS

Large City - Eastern Europe

EMISSIONS OF CO₂ (TANK-TO-WHEEL), CAR OWNERSHIP, FATALITIES

Emissions of CO₂ (Tank-to-wheel) [t CO₂ eq / capita per year]

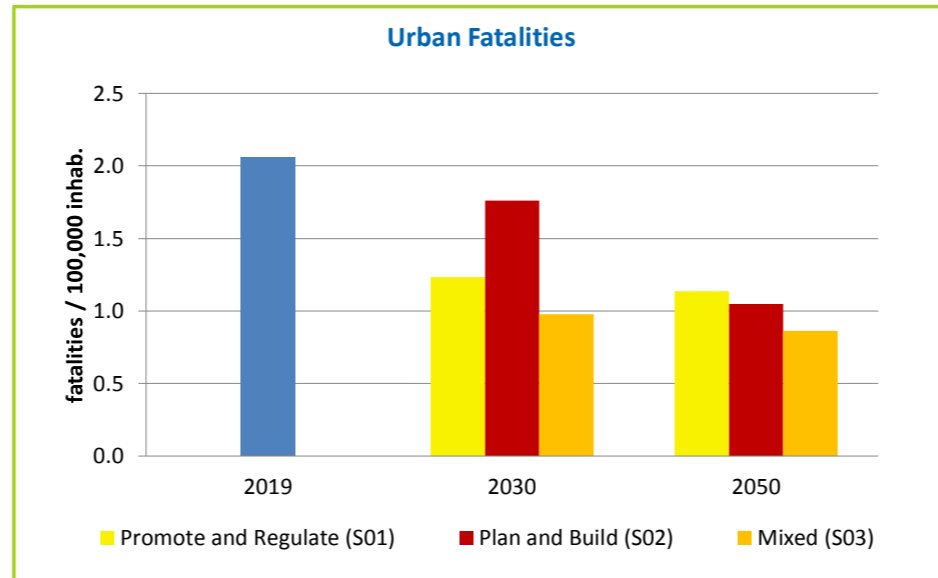
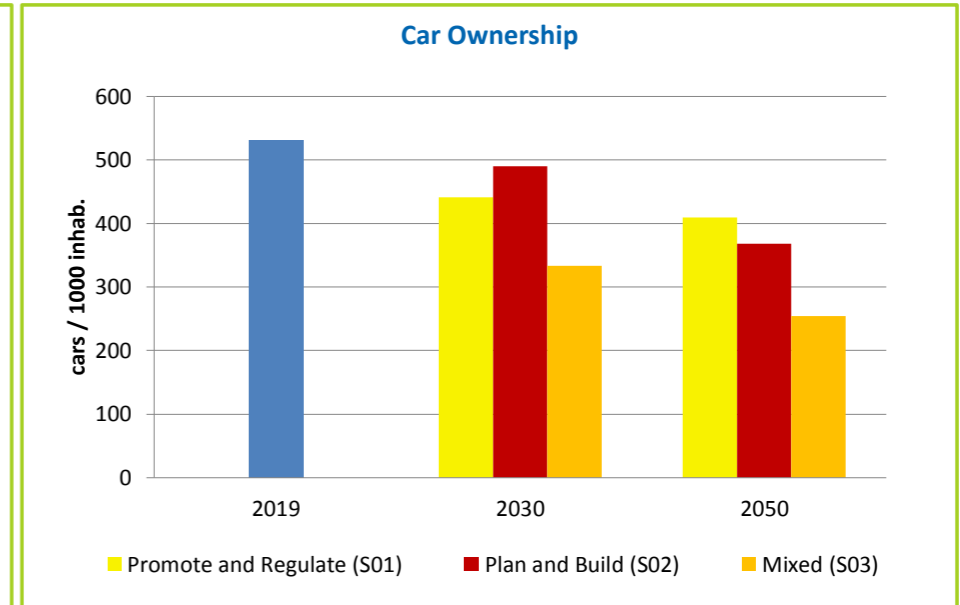
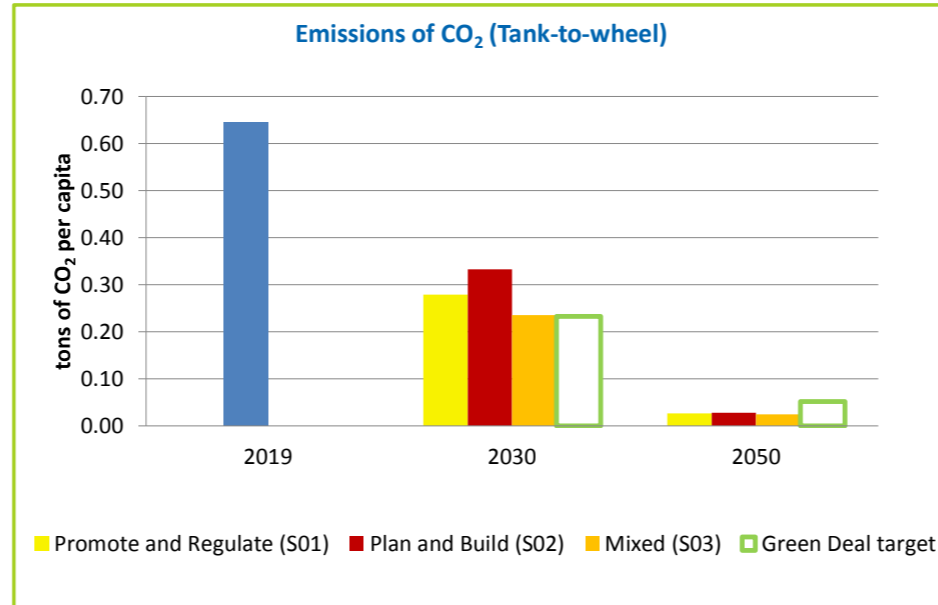
Scenario	2019	2030	2050
Promote and Regulate (S01)	0.645	0.279	0.026
Plan and Build (S02)	0.645	0.332	0.027
Mixed (S03)	0.645	0.235	0.024
Green Deal target		0.232	0.052

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	531	441	409
Plan and Build (S02)	531	491	369
Mixed (S03)	531	334	254

Urban Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
Promote and Regulate (S01)	2.059	1.234	1.136
Plan and Build (S02)	2.059	1.760	1.049
Mixed (S03)	2.059	0.978	0.861



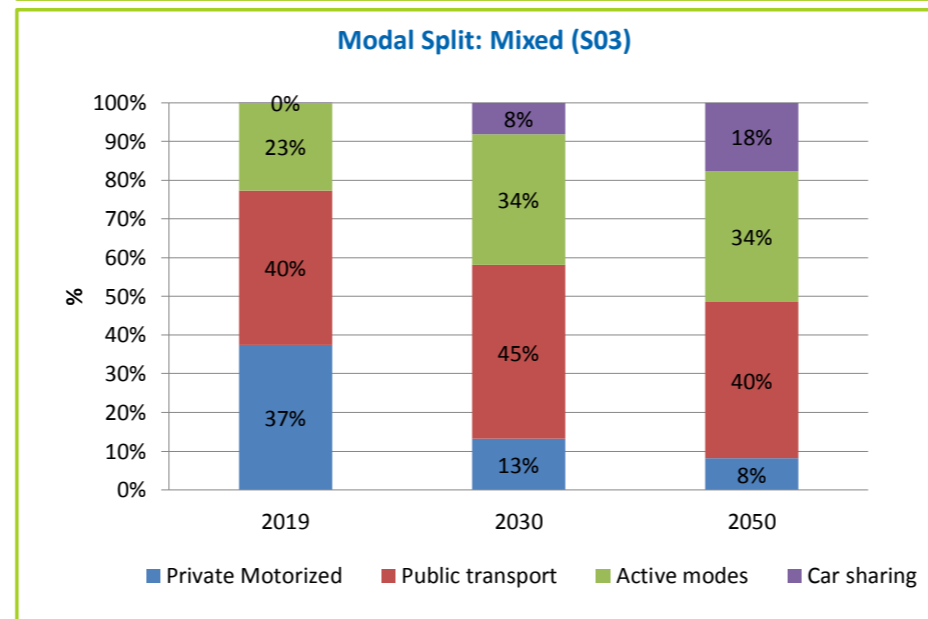
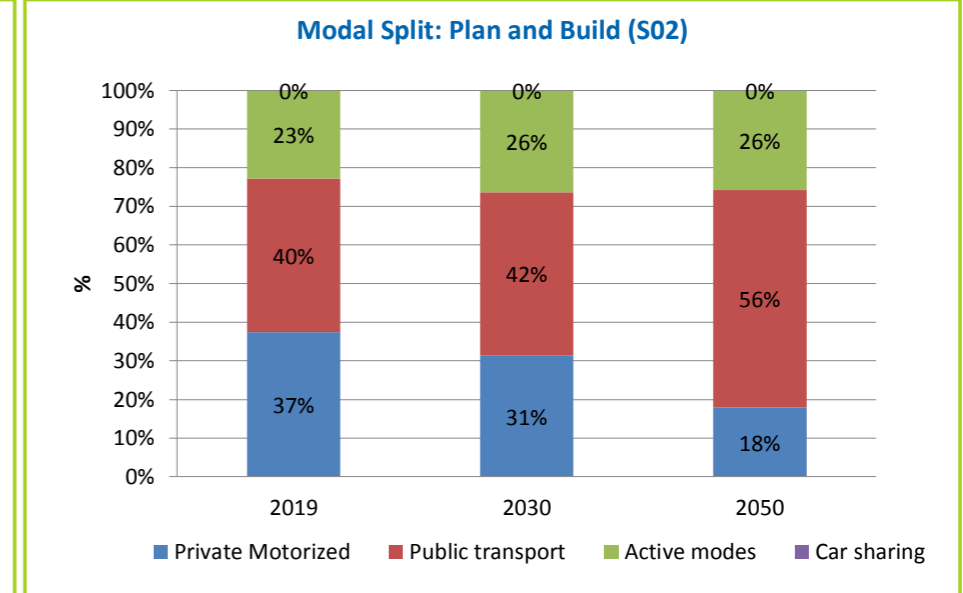
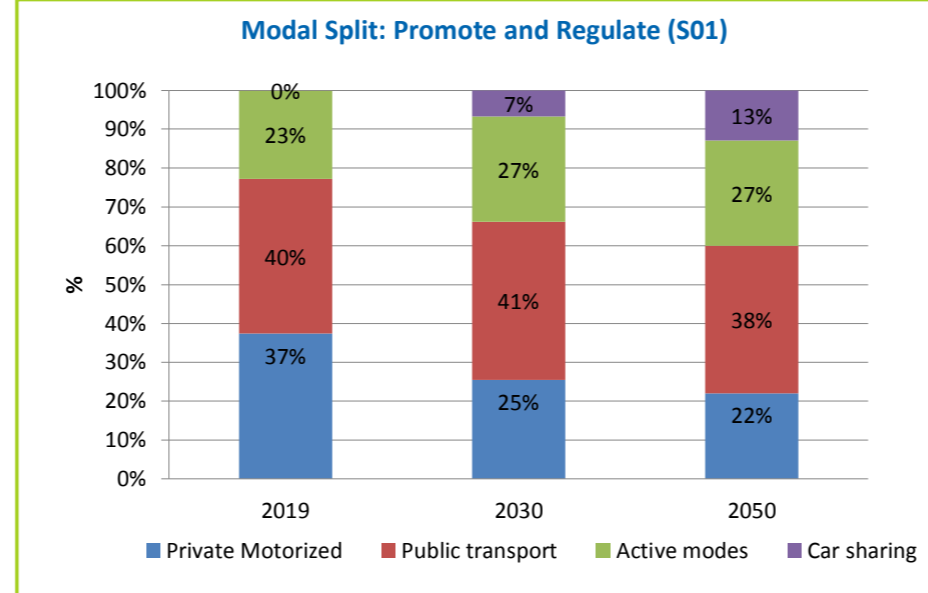
KEY INDICATORS

Large City - Eastern Europe

MODAL SPLIT

Aggregate mode split [%]

Scenario	Mode	2019	2030	2050
Promote and Regulate (S01)	Private Motorized	37%	25%	22%
Promote and Regulate (S01)	Public transport	40%	41%	38%
Promote and Regulate (S01)	Active modes	23%	27%	27%
Promote and Regulate (S01)	Car sharing	0%	7%	13%
Plan and Build (S02)	Private Motorized	37%	31%	18%
Plan and Build (S02)	Public transport	40%	42%	56%
Plan and Build (S02)	Active modes	23%	26%	26%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Private Motorized	37%	13%	8%
Mixed (S03)	Public transport	40%	45%	40%
Mixed (S03)	Active modes	23%	34%	34%
Mixed (S03)	Car sharing	0%	8%	18%



KEY INDICATORS

Large City - Eastern Europe

ECONOMIC OUTPUTS (discounted, cumulated from 2019)*

City total revenues [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	391	1,271
Plan and Build (S02)	0	26	181
Mixed (S03)	0	635	1,763

City total costs [mio euro]

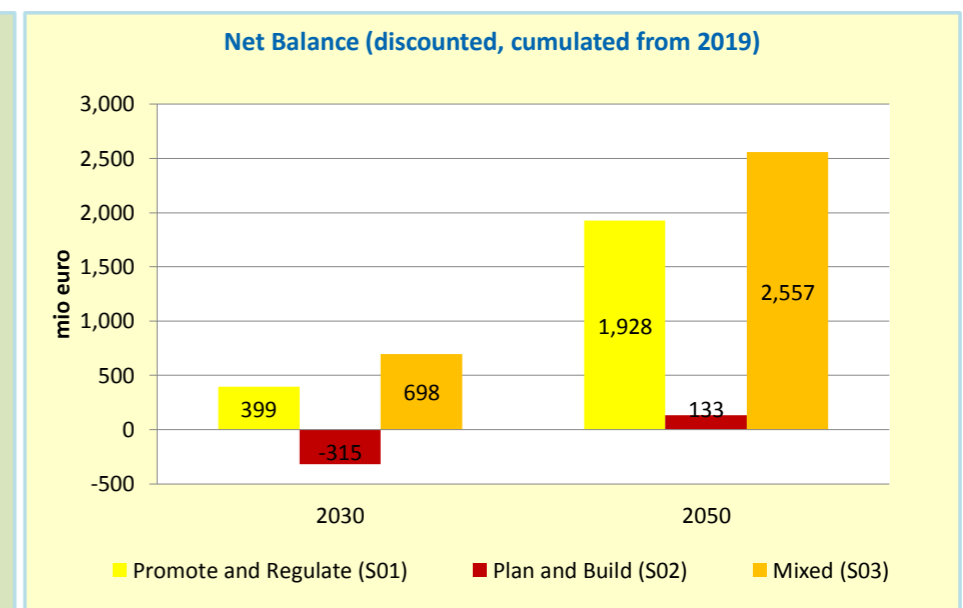
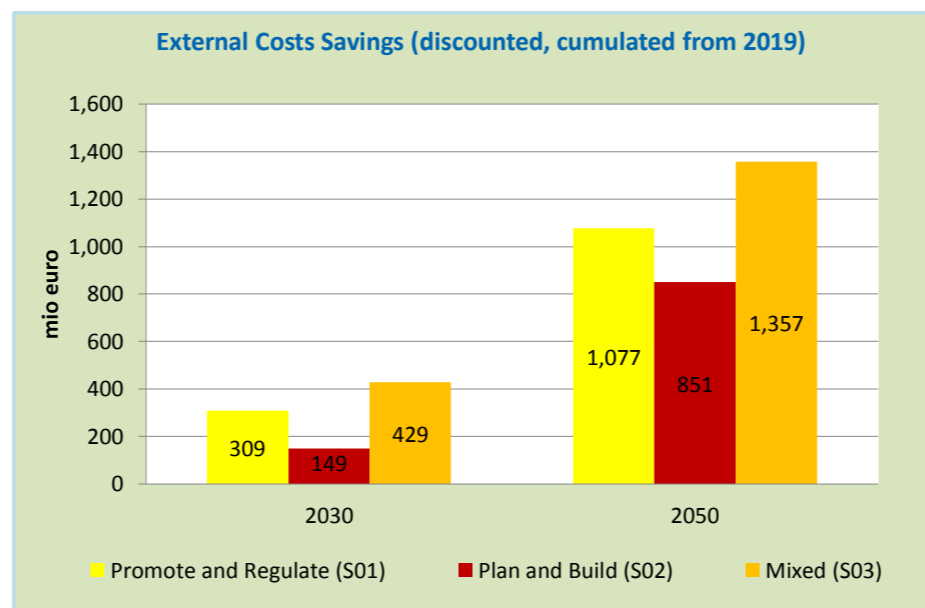
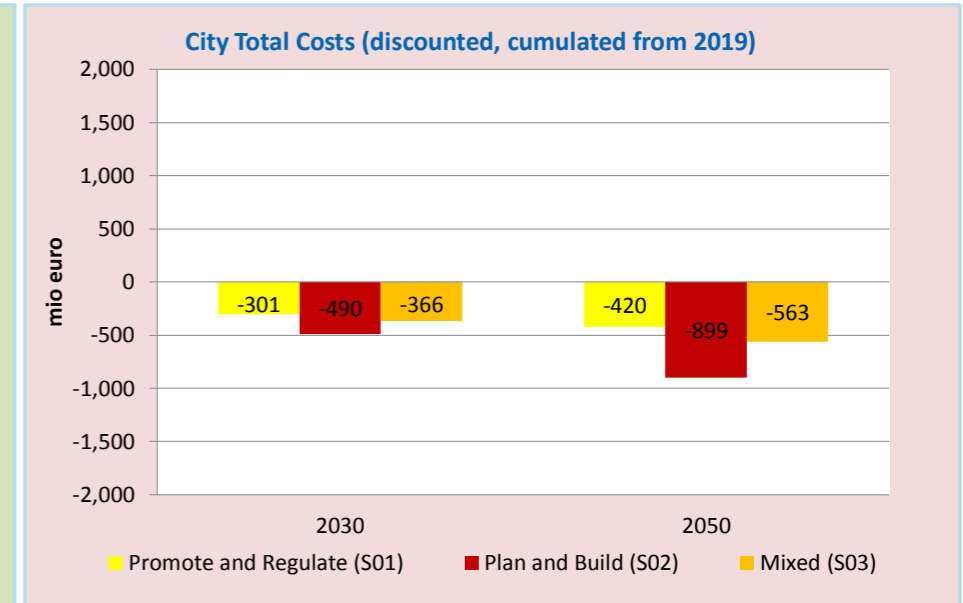
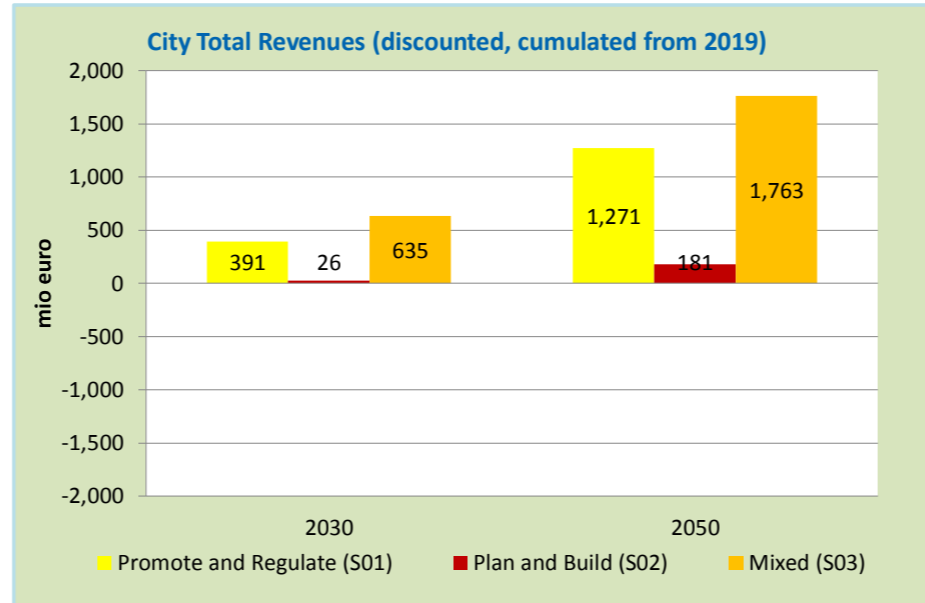
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	301	420
Plan and Build (S02)	0	490	899
Mixed (S03)	0	366	563

External costs savings [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	309	1,077
Plan and Build (S02)	0	149	851
Mixed (S03)	0	429	1,357

Net balance [mio euro]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	399	1,928
Plan and Build (S02)	0	-315	133
Mixed (S03)	0	698	2,557



* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Large City - Eastern Europe

ECONOMIC OUTPUTS PER CAPITA (discounted, cumulated from 2019)*

City total revenues [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	305	994
Plan and Build (S02)	0	20	142
Mixed (S03)	0	497	1,379

City total costs [euro / capita]

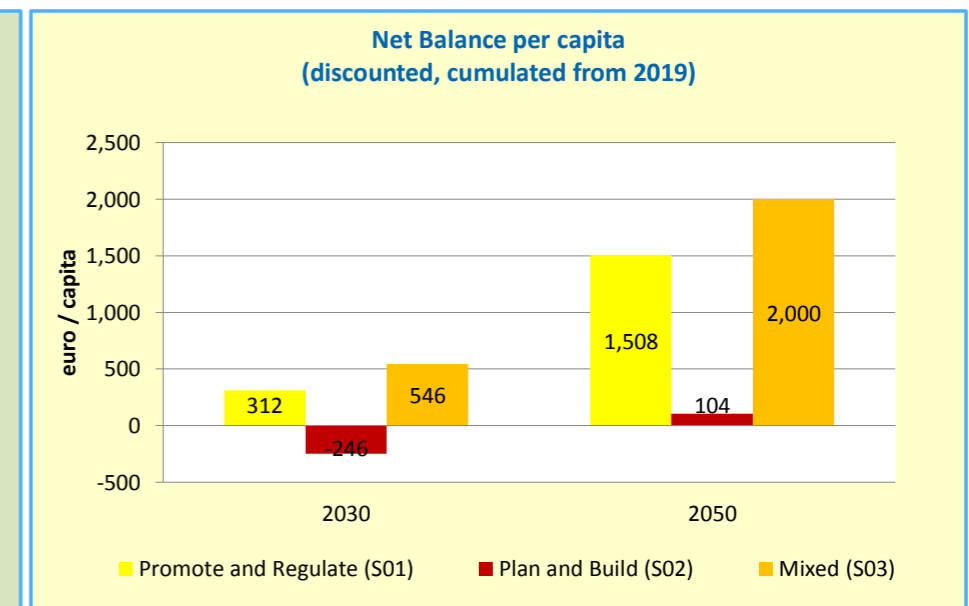
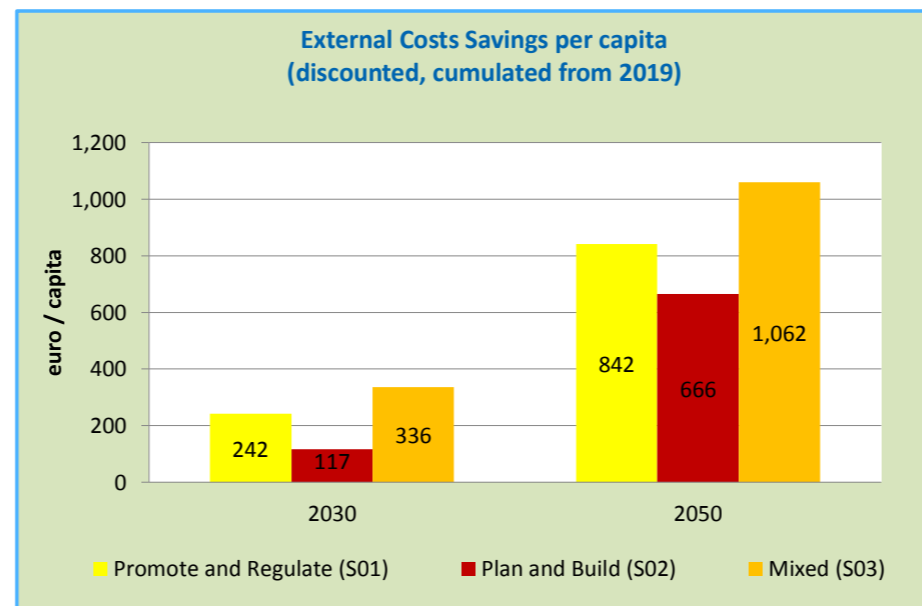
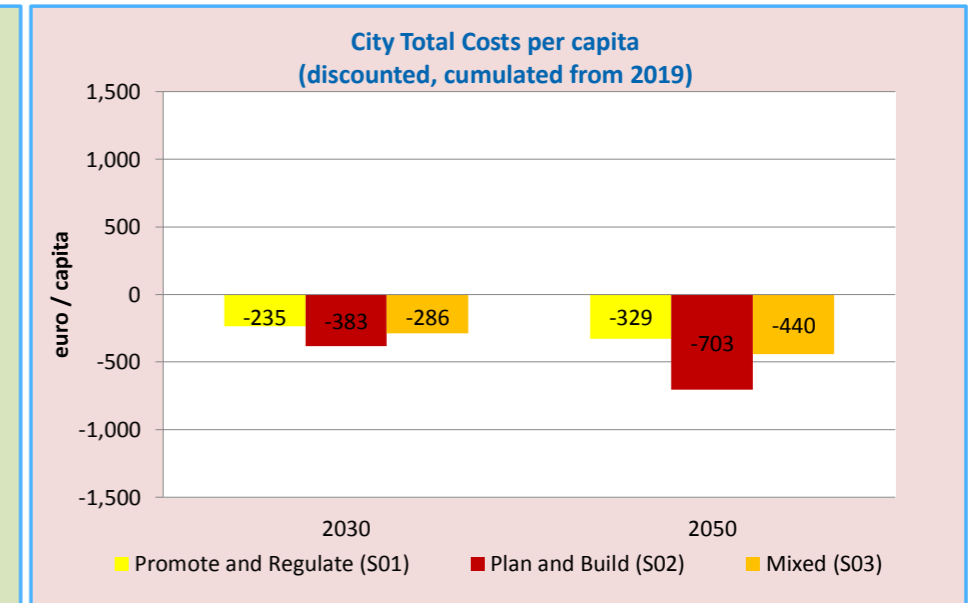
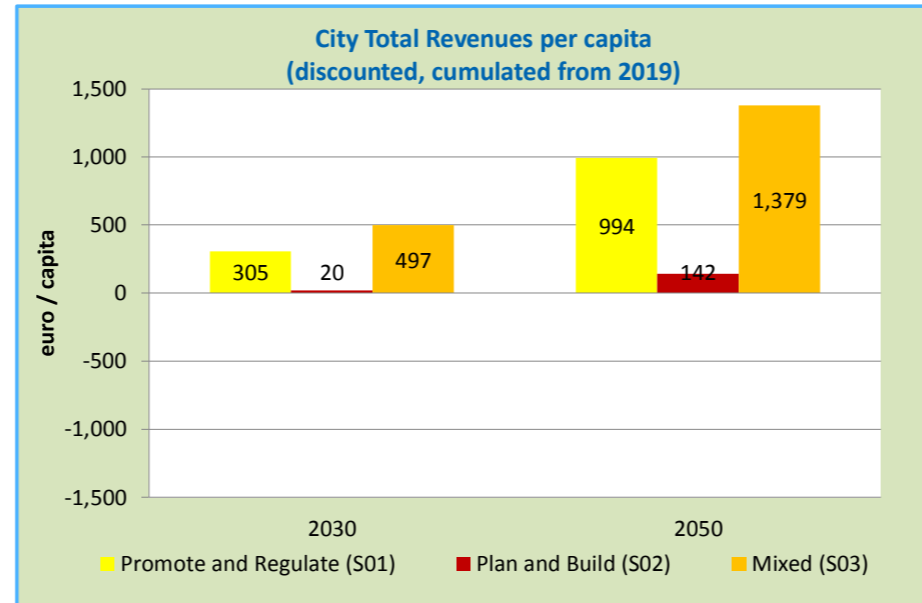
Scenario	2019	2030	2050
Promote and Regulate (S01)	0	235	329
Plan and Build (S02)	0	383	703
Mixed (S03)	0	286	440

External costs savings [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	242	842
Plan and Build (S02)	0	117	666
Mixed (S03)	0	336	1,062

Net balance [euro / capita]

Scenario	2019	2030	2050
Promote and Regulate (S01)	0	312	1,508
Plan and Build (S02)	0	-246	104
Mixed (S03)	0	546	2,000



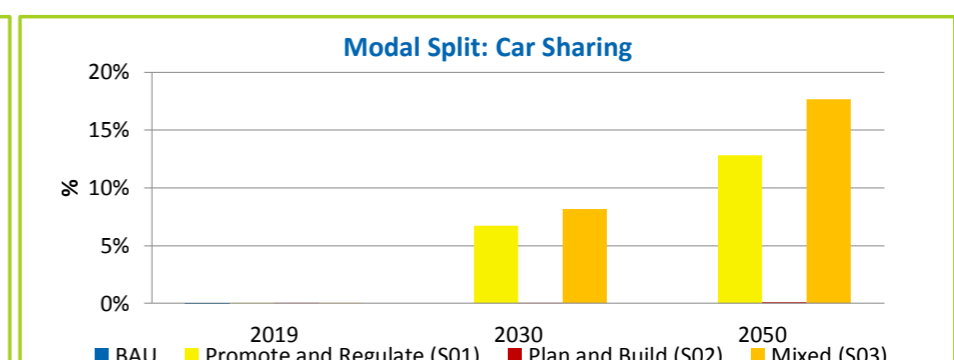
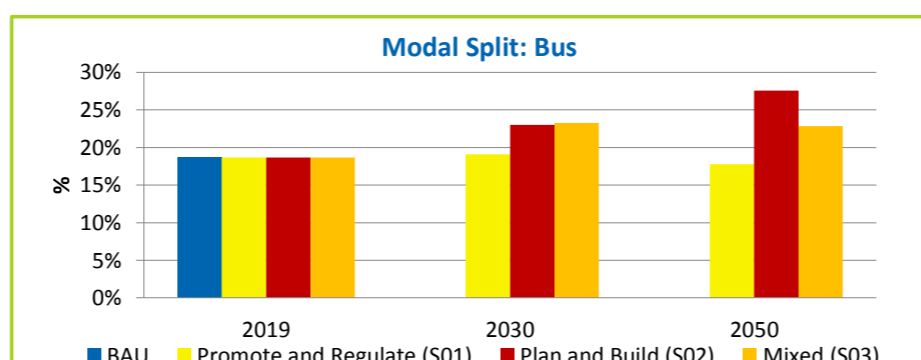
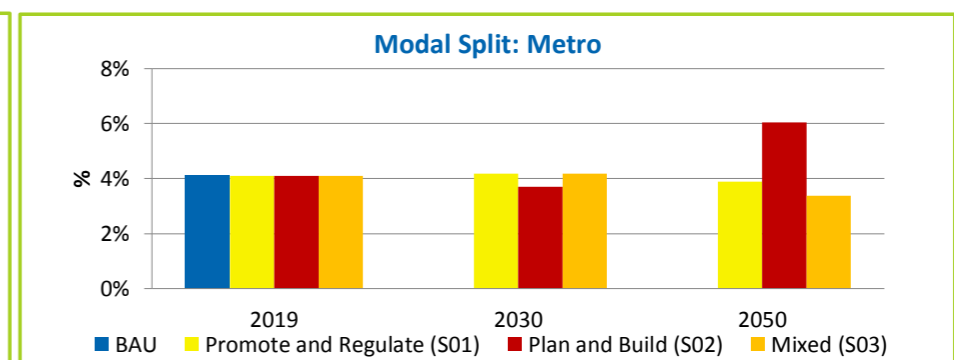
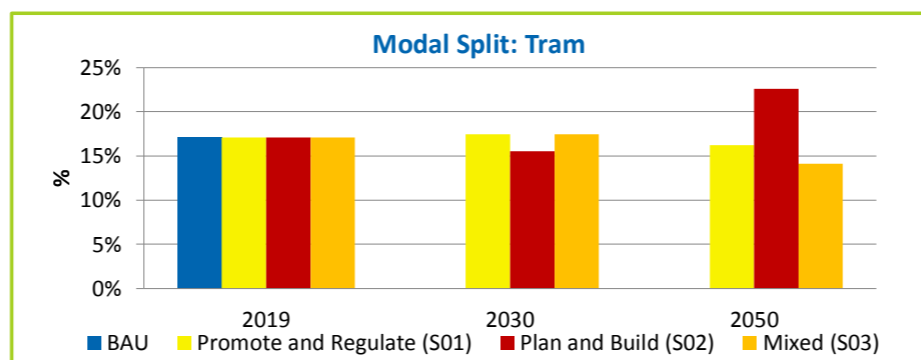
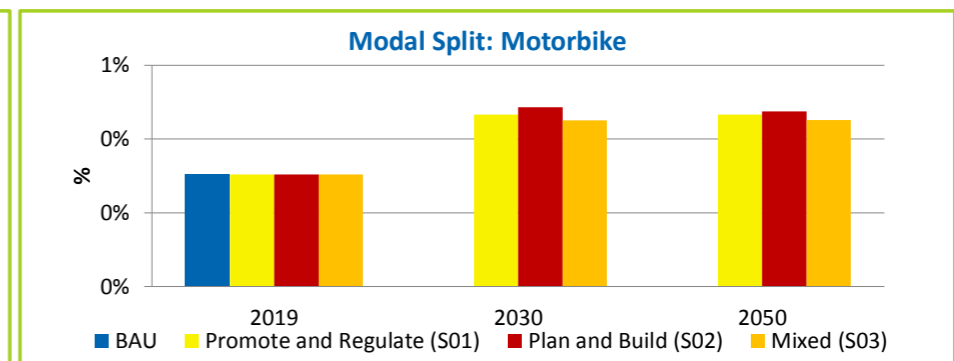
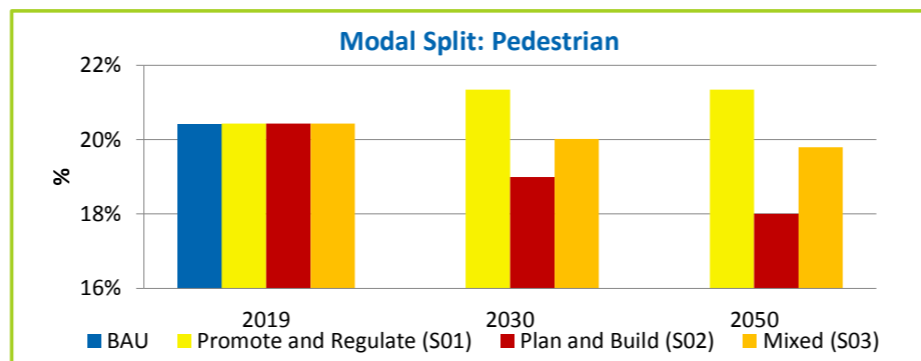
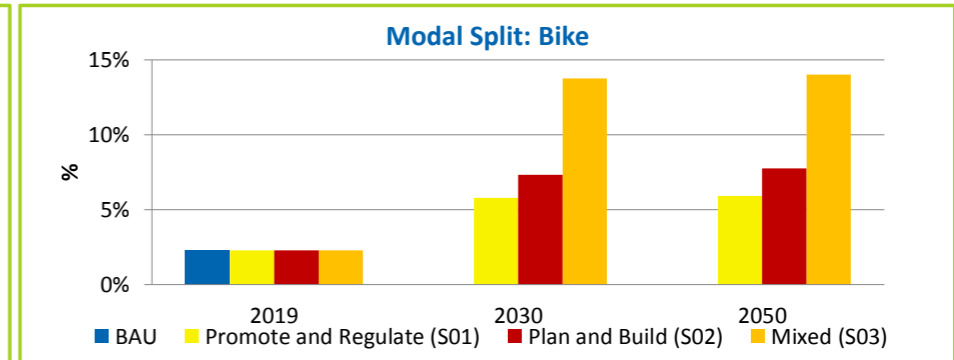
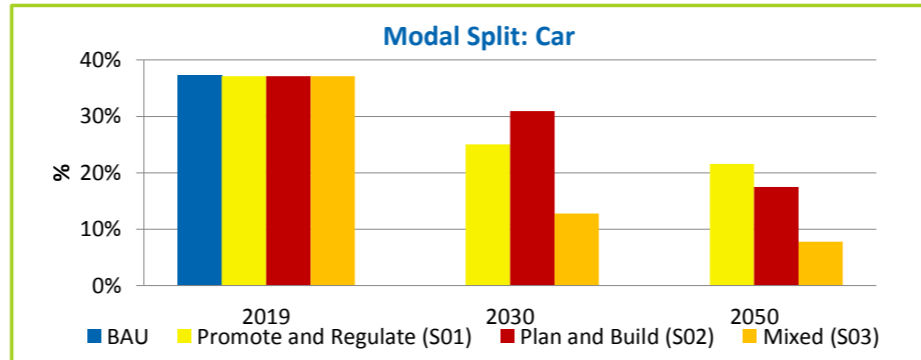
* Costs and Revenues are the incremental ones associated with the implemented policies and with respect to the BAU (in which no policy measures are activated)

KEY INDICATORS

Large City - Eastern Europe

TRANSPORT AND MOBILITY INDICATORS

Mode split [%]				
Scenario	Mode	2019	2030	2050
BAU	Pedestrian	20%		
BAU	Bike	2%		
BAU	Motorbike	0%		
BAU	Car	37%		
BAU	Bus	19%		
BAU	Tram	17%		
BAU	Metro	4%		
BAU	Car sharing	0%		
Promote and Regulate (S01)	Pedestrian	20%	21%	21%
Promote and Regulate (S01)	Bike	2%	6%	6%
Promote and Regulate (S01)	Motorbike	0%	0%	0%
Promote and Regulate (S01)	Car	37%	25%	22%
Promote and Regulate (S01)	Bus	19%	19%	18%
Promote and Regulate (S01)	Tram	17%	17%	16%
Promote and Regulate (S01)	Metro	4%	4%	4%
Promote and Regulate (S01)	Car sharing	0%	7%	13%
Plan and Build (S02)	Pedestrian	20%	19%	18%
Plan and Build (S02)	Bike	2%	7%	8%
Plan and Build (S02)	Motorbike	0%	0%	0%
Plan and Build (S02)	Car	37%	31%	17%
Plan and Build (S02)	Bus	19%	23%	28%
Plan and Build (S02)	Tram	17%	15%	23%
Plan and Build (S02)	Metro	4%	4%	6%
Plan and Build (S02)	Car sharing	0%	0%	0%
Mixed (S03)	Pedestrian	20%	20%	20%
Mixed (S03)	Bike	2%	14%	14%
Mixed (S03)	Motorbike	0%	0%	0%
Mixed (S03)	Car	37%	13%	8%
Mixed (S03)	Bus	19%	23%	23%
Mixed (S03)	Tram	17%	17%	14%
Mixed (S03)	Metro	4%	4%	3%
Mixed (S03)	Car sharing	0%	8%	18%



ALL INDICATORS

Large City - Eastern Europe

TRANSPORT AND MOBILITY INDICATORS

Car ownership level [cars / 1000 inhab.]

Scenario	2019	2030	2050
BAU	531		
Promote and Regulate (S01)	531	441	409
Plan and Build (S02)	531	491	369
Mixed (S03)	531	334	254

Congestion and delays index (SUMI)

Scenario	2019	2030	2050
BAU	9.58		
Promote and Regulate (S01)	9.58	9.92	9.94
Plan and Build (S02)	9.58	9.74	9.99
Mixed (S03)	9.58	10.00	10.00

Public transport occupancy levels [pass/vehicle]

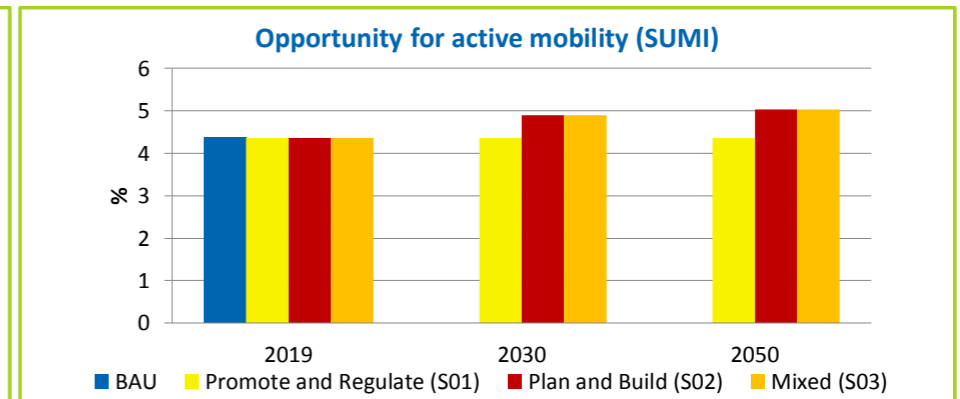
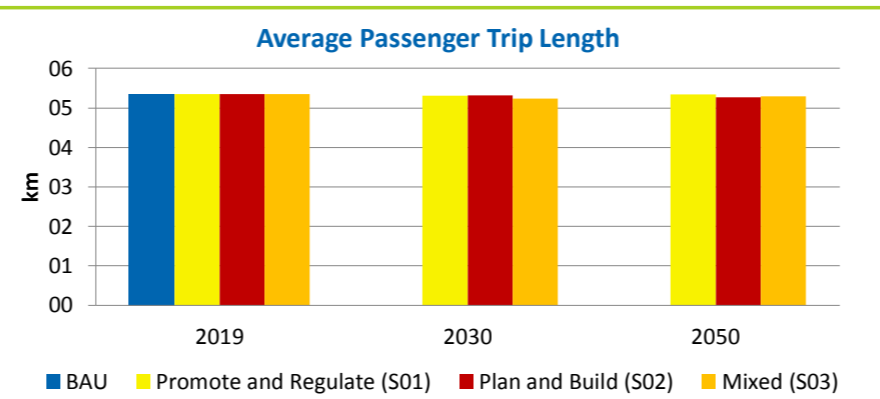
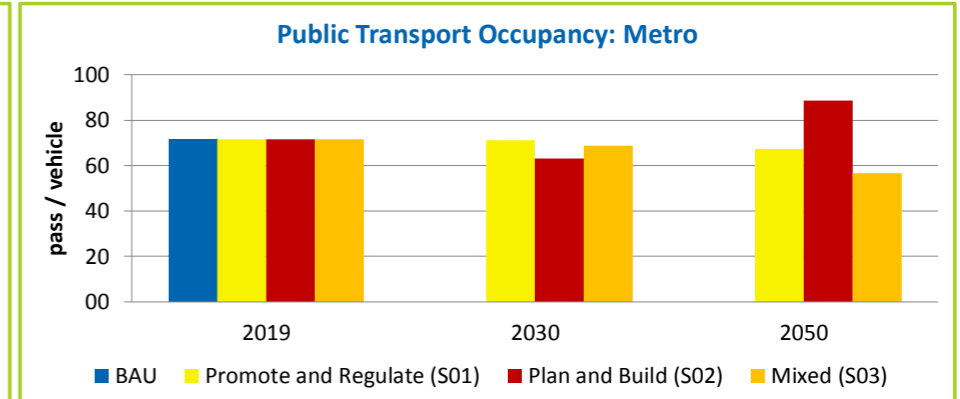
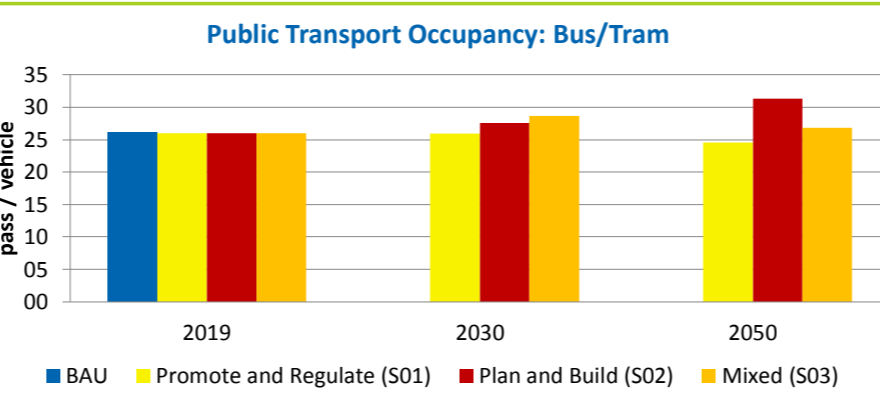
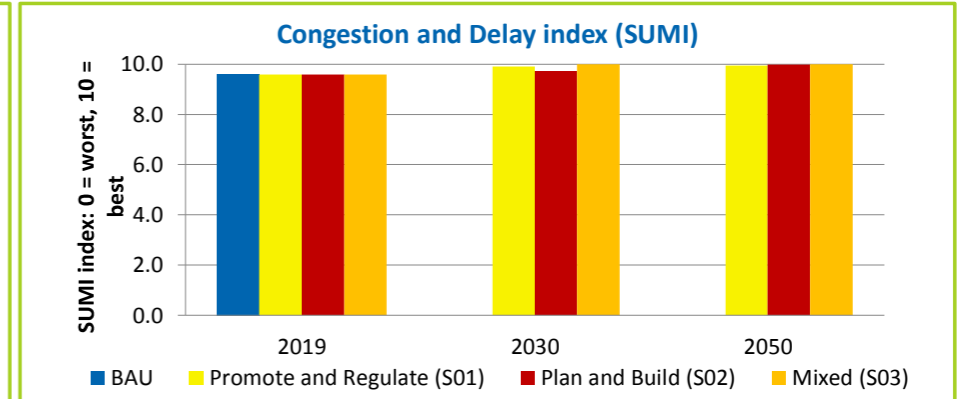
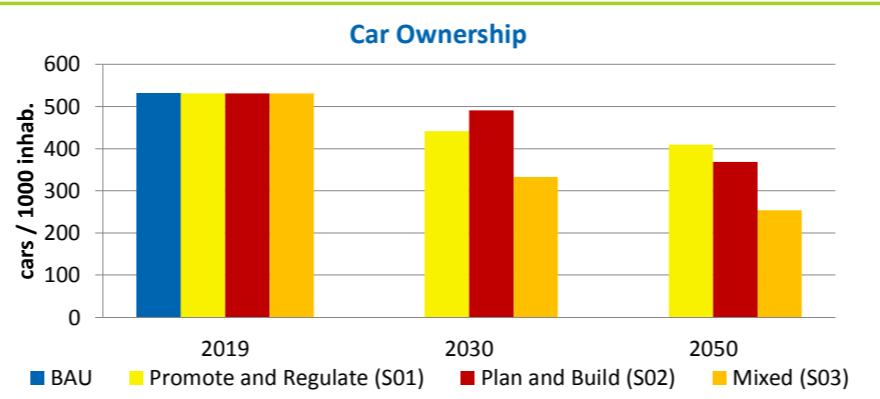
Scenario	PT mode	2019	2030	2050
BAU	Bus/tram	26.0		
BAU	Metro	71.5		
Promote and Regulate (S01)	Bus/tram	26.0	25.9	24.6
Promote and Regulate (S01)	Metro	71.5	71.2	67.4
Plan and Build (S02)	Bus/tram	26.0	27.5	31.3
Plan and Build (S02)	Metro	71.5	63.1	88.7
Mixed (S03)	Bus/tram	26.05	28.64	26.88
Mixed (S03)	Metro	71.46	68.74	56.53

Average passenger trip length [km]

Scenario	2019	2030	2050
BAU	5.4		
Promote and Regulate (S01)	5.4	5.3	5.3
Plan and Build (S02)	5.4	5.3	5.3
Mixed (S03)	5.4	5.2	5.3

Opportunity for active mobility (SUMI) [%]

Scenario	2019	2030	2050
BAU	4.36		
Promote and Regulate (S01)	4.36	4.36	4.36
Plan and Build (S02)	4.36	4.90	5.03
Mixed (S03)	4.36	4.90	5.03



ALL INDICATORS

Large City - Eastern Europe

TRANSPORT AND MOBILITY INDICATORS

Penetration of alternatively fuelled car vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	Hybrid electric	0%		
BAU	Battery electric	0%		
BAU	fuel cells	0%		
Scenarios	Hybrid electric	0%	2%	7%
Scenarios	Battery electric	0%	32%	84%
Scenarios	fuel cells	0%	0%	10%

Penetration of alternatively fuelled bus vehicles in the fleet [%]

Scenario	Fuel type	2019	2030	2050
BAU	CNG	0%		
BAU	Hybrid electric	0.0%		
BAU	Battery electric	0.2%		
Scenarios	CNG	0%	0%	0%
Scenarios	Hybrid electric	0%	0%	0%
Scenarios	Battery electric	0%	60%	79%

Vehicles-km by mode: cars and car-sharing cars [million vkm/year]

Scenario	2019	2030	2050
BAU	1716		
Promote and Regulate (S01)	1716	1427	1530
Plan and Build (S02)	1716	1520	1106
Mixed (S03)	1716	1076	1274

Vehicles-km by mode: trucks [million vkm/year]

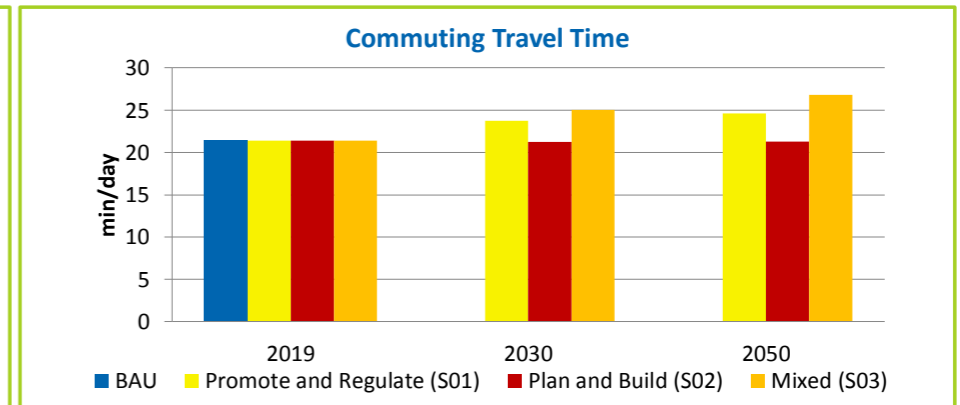
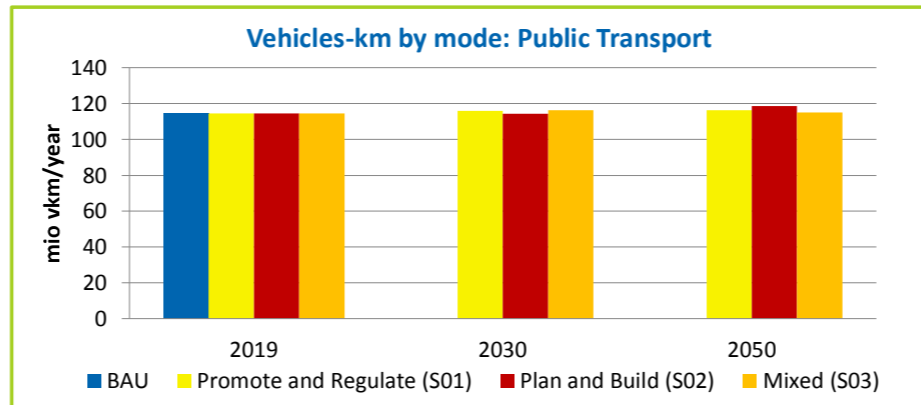
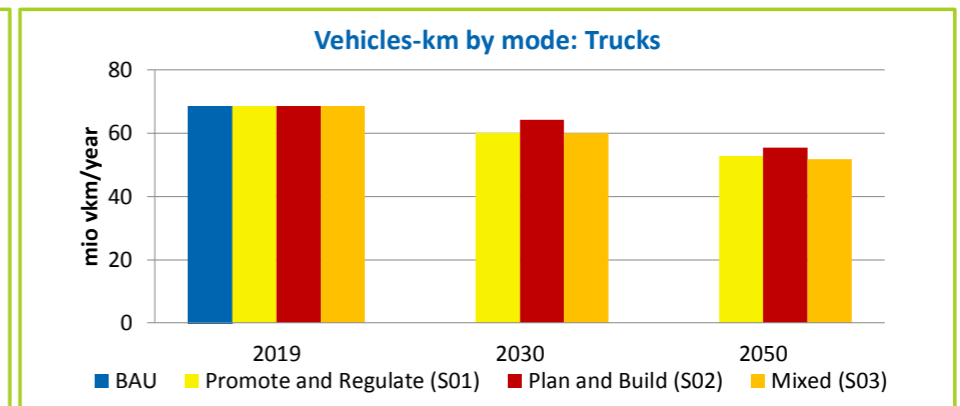
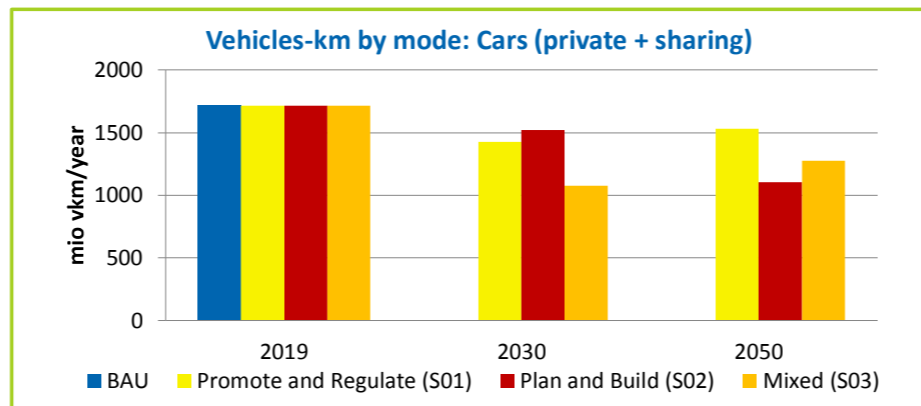
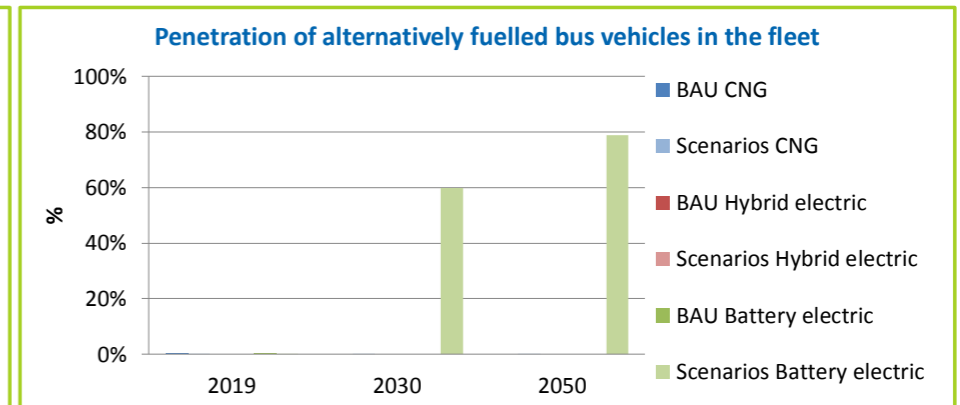
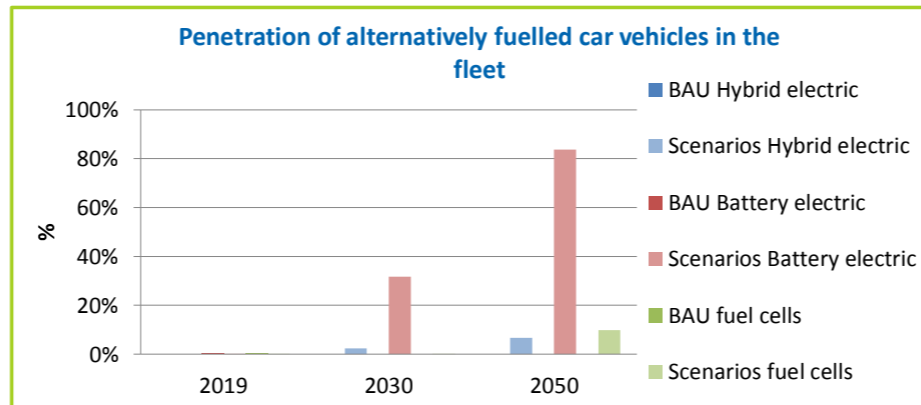
Scenario	2019	2030	2050
BAU	68.6		
Promote and Regulate (S01)	69	60	53
Plan and Build (S02)	68.6	64.3	55.5
Mixed (S03)	68.6	60.1	51.9

Vehicles-km by mode: Public Transport [million vkm/year]

Scenario	2019	2030	2050
BAU	114.4		
Promote and Regulate (S01)	114.4	116.1	116.4
Plan and Build (S02)	114.4	114.2	118.5
Mixed (S03)	114.4	116.2	115.1

Commuting travel time (SUMI) [min/day]

Scenario	2019	2030	2050
BAU	21.4		
Promote and Regulate (S01)	21.4	23.7	24.6
Plan and Build (S02)	21.4	21.2	21.3
Mixed (S03)	21.4	25.0	26.8



ALL INDICATORS

Large City - Eastern Europe

ENVIRONMENT AND SAFETY INDICATORS

Air pollutant emissions (SUMI: PM2.5, Nox) [kg PM2.5 eq/capita]

Scenario	2019	2030	2050
BAU	0.8		
Promote and regulate (S01)	0.8	0.3	0.1
Plan and Build (S02)	0.8	0.3	0.1
Mixed (S03)	0.8	0.3	0.1

Air pollutant emissions (CO, VOC) [kg / capita]

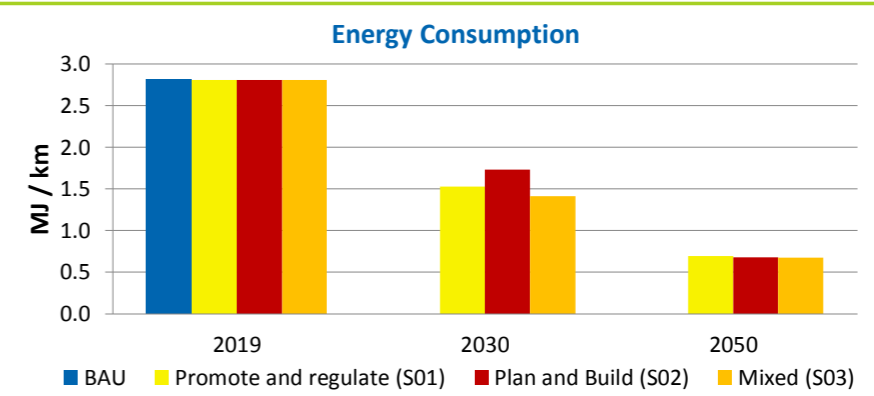
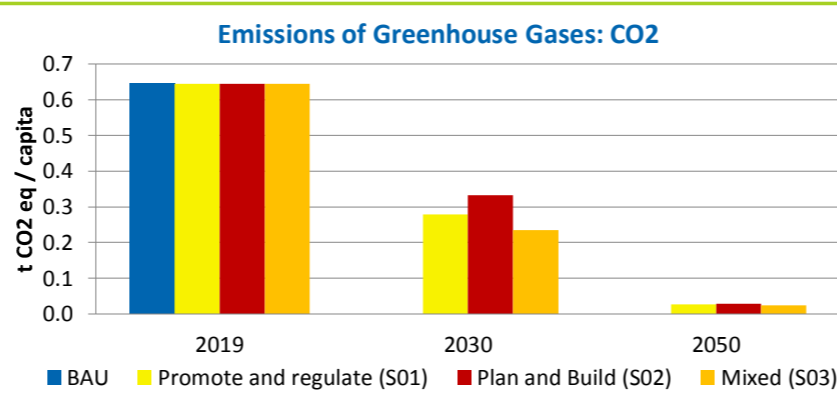
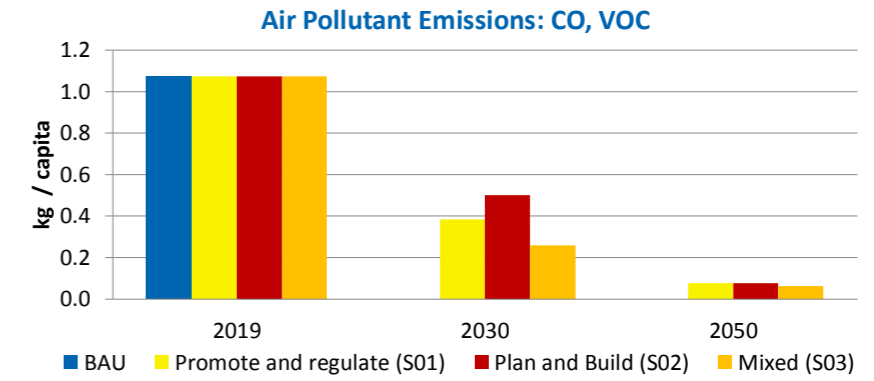
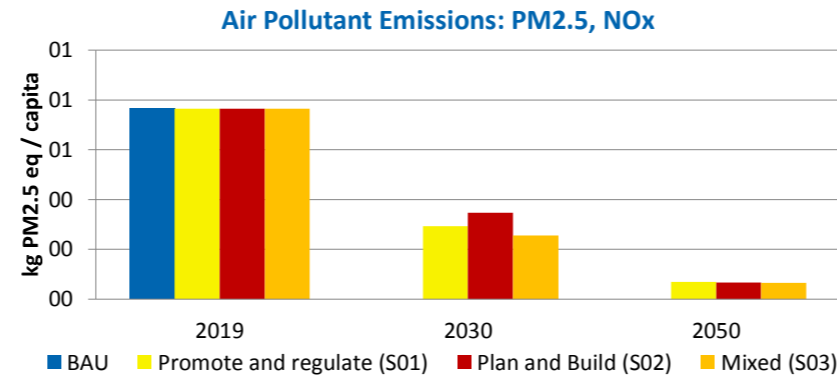
Scenario	2019	2030	2050
BAU	1		
Promote and regulate (S01)	1	0	0
Plan and Build (S02)	1.1	0.5	0.1
Mixed (S03)	1.1	0.3	0.1

Emissions of Greenhouse Gases [t CO2 eq / capita per year]

Scenario	2019	2030	2050
BAU	0.645		
Promote and regulate (S01)	0.645	0.279	0.026
Plan and Build (S02)	0.645	0.332	0.027
Mixed (S03)	0.645	0.235	0.024

Energy consumption [MJ / km]

Scenario	2019	2030	2050
BAU	2.8		
Promote and regulate (S01)	2.8	1.5	0.7
Plan and Build (S02)	2.8	1.7	0.7
Mixed (S03)	2.8	1.4	0.7



ALL INDICATORS

Large City - Eastern Europe

ENVIRONMENT AND SAFETY INDICATORS

Fatalities [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	2.1		
Promote and regulate (S01)	2.1	1.2	1.1
Plan and Build (S02)	2.1	1.8	1.0
Mixed (S03)	2.1	1.0	0.9

Fatalities: active modes [fatalities / 100,000 inhab.]

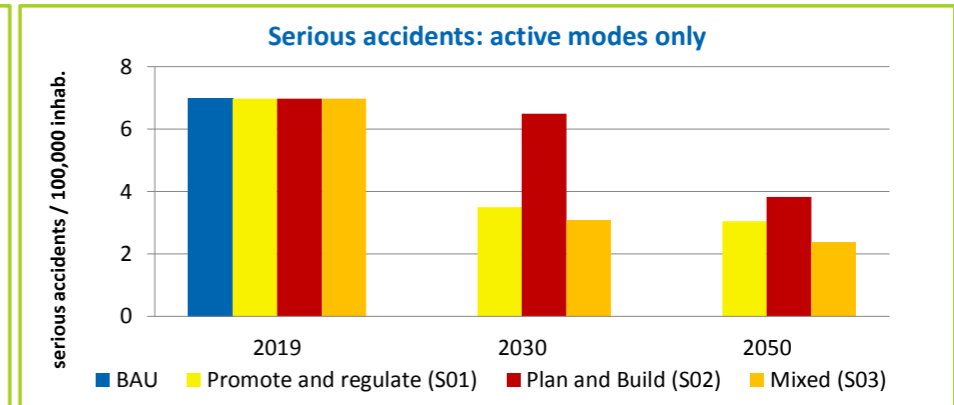
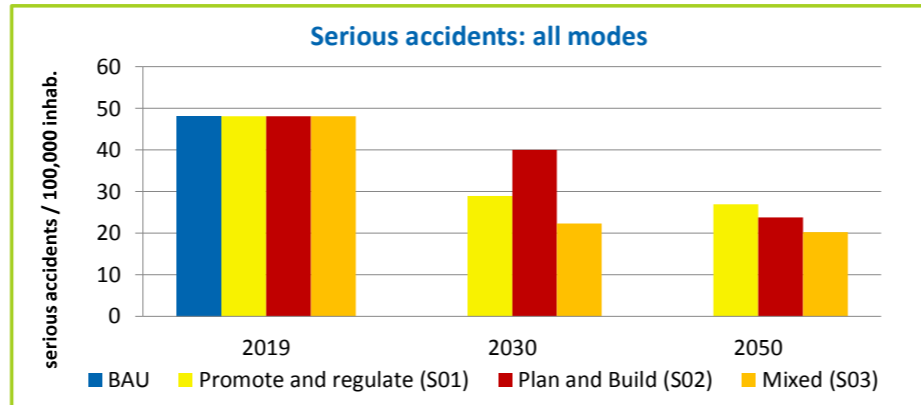
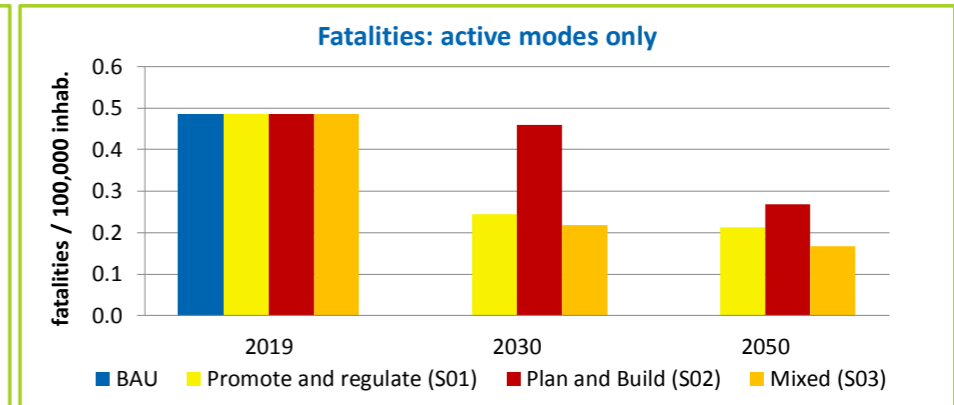
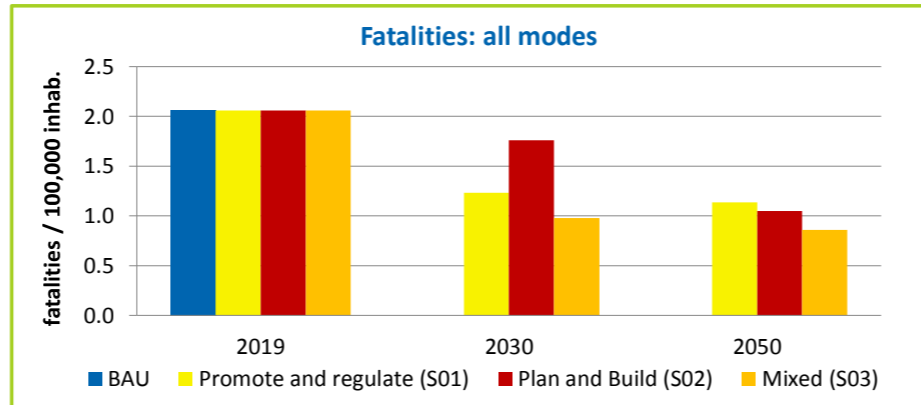
Scenario	2019	2030	2050
BAU	0.49		
Promote and regulate (S01)	0.49	0.25	0.21
Plan and Build (S02)	0.49	0.46	0.27
Mixed (S03)	0.49	0.22	0.17

Serious accidents [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	48		
Promote and regulate (S01)	48	29	27
Plan and Build (S02)	48	40	24
Mixed (S03)	48	22	20

Serious accidents: active modes [fatalities / 100,000 inhab.]

Scenario	2019	2030	2050
BAU	7		
Promote and regulate (S01)	7	3	3
Plan and Build (S02)	7	6	4
Mixed (S03)	7	3	2



ALL INDICATORS

Annex II - List of EU27 cities



List of all EU27 cities (population >50,000 inhabitants) according to Eurostat:

Country	City	Population (2019)	Size	Geographic Area
Austria	Graz	267.888	Medium City	Central Europe
Austria	Innsbruck	123.519	Medium City	Central Europe
Austria	Klagenfurt	96.045	Small City	Central Europe
Austria	Linz	192.658	Medium City	Central Europe
Austria	Salzburg	146.251	Medium City	Central Europe
Austria	Wien	1.753.996	Large City	Central Europe
Belgium	Antwerpen	515.133	Large City	Central Europe
Belgium	Brugge	118.106	Medium City	Central Europe
Belgium	Bruxelles / Brussel	1.185.836	Large City	Central Europe
Belgium	Charleroi	203.341	Medium City	Central Europe
Belgium	Gent	254.715	Medium City	Central Europe
Belgium	Kortrijk	75.822	Small City	Central Europe
Belgium	Leuven	99.025	Small City	Central Europe
Belgium	Liège	382.016	Medium City	Central Europe
Belgium	Mons	94.743	Small City	Central Europe
Belgium	Namur	111.026	Medium City	Central Europe
Belgium	Oostende	70.842	Small City	Central Europe
Bulgaria	Blagoevgrad	70.085	Small City	Eastern Europe
Bulgaria	Burgas	200.870	Medium City	Eastern Europe
Bulgaria	Dobrich	87.495	Small City	Eastern Europe
Bulgaria	Haskovo	73.524	Small City	Eastern Europe
Bulgaria	Pazardzhik	70.092	Small City	Eastern Europe
Bulgaria	Pernik	76.346	Small City	Eastern Europe
Bulgaria	Pleven	101.617	Medium City	Eastern Europe
Bulgaria	Plovdiv	341.682	Medium City	Eastern Europe
Bulgaria	Ruse	146.648	Medium City	Eastern Europe
Bulgaria	Shumen	78.468	Small City	Eastern Europe
Bulgaria	Sliven	88.940	Small City	Eastern Europe
Bulgaria	Sofia	1.224.697	Large City	Eastern Europe
Bulgaria	Stara Zagora	137.200	Medium City	Eastern Europe
Bulgaria	Varna	335.309	Medium City	Eastern Europe
Bulgaria	Veliko Tarnovo	68.722	Small City	Eastern Europe
Bulgaria	Vratsa	56.338	Small City	Eastern Europe
Bulgaria	Yambol	71.184	Small City	Eastern Europe
Croatia	Osijek	105.645	Medium City	Southern Europe
Croatia	Pula - Pola	56.405	Small City	Southern Europe
Croatia	Rijeka	121.775	Medium City	Southern Europe
Croatia	Slavonski Brod	56.416	Small City	Southern Europe

Country	City	Population (2019)	Size	Geographic Area
Croatia	Split	173.031	Medium City	Southern Europe
Croatia	Zadar	75.156	Small City	Southern Europe
Croatia	Zagreb	799.787	Large City	Southern Europe
Cyprus	Lefkosia	243.013	Medium City	Southern Europe
Czech Republic	Brno	378.514	Medium City	Eastern Europe
Czech Republic	Ceské Budejovice	93.617	Small City	Eastern Europe
Czech Republic	Chomutov-Jirkov	68.781	Small City	Eastern Europe
Czech Republic	Havírov	74.749	Small City	Eastern Europe
Czech Republic	Hradec Králové	92.989	Small City	Eastern Europe
Czech Republic	Jihlava	50.689	Small City	Eastern Europe
Czech Republic	Karviná	55.592	Small City	Eastern Europe
Czech Republic	Kladno	68.696	Small City	Eastern Europe
Czech Republic	Liberec	103.113	Medium City	Eastern Europe
Czech Republic	Most	66.927	Small City	Eastern Europe
Czech Republic	Olomouc	99.998	Small City	Eastern Europe
Czech Republic	Ostrava	293.704	Medium City	Eastern Europe
Czech Republic	Pardubice	89.986	Small City	Eastern Europe
Czech Republic	Plzen	169.753	Medium City	Eastern Europe
Czech Republic	Praha	1.269.684	Large City	Eastern Europe
Czech Republic	Ústí nad Labem	93.366	Small City	Eastern Europe
Czech Republic	Zlín	75.222	Small City	Eastern Europe
Denmark	Aalborg	201.259	Medium City	Northern Europe
Denmark	Århus	314.865	Medium City	Northern Europe
Denmark	København	549.344	Large City	Northern Europe
Denmark	Odense	191.742	Medium City	Northern Europe
Estonia	Narva	58.124	Small City	Eastern Europe
Estonia	Tallinn	415.924	Medium City	Eastern Europe
Estonia	Tartu	96.972	Small City	Eastern Europe
Finland	Espoo / Esbo	269.789	Medium City	Northern Europe
Finland	Helsinki / Helsingfors	626.198	Large City	Northern Europe
Finland	Jyväskylä	136.691	Medium City	Northern Europe
Finland	Kuopio	112.029	Medium City	Northern Europe
Finland	Lahti / Lahtis	112.646	Medium City	Northern Europe
Finland	Oulu	187.643	Medium City	Northern Europe
Finland	Tampere / Tammerfors	224.788	Medium City	Northern Europe
Finland	Turku / Åbo	184.955	Medium City	Northern Europe
Finland	Vantaa / Vanda	214.618	Medium City	Northern Europe
France	Aix-en-Provence	141.955	Medium City	Central Europe

Country	City	Population (2019)	Size	Geographic Area
France	Ajaccio	81.985	Small City	Central Europe
France	Albi	81.222	Small City	Central Europe
France	Amiens	136.601	Medium City	Central Europe
France	Angers	176.599	Medium City	Central Europe
France	Angoulême	103.972	Medium City	Central Europe
France	Annecy	123.443	Medium City	Central Europe
France	Annemasse	60.365	Small City	Central Europe
France	Argenteuil - Bezons	134.404	Medium City	Central Europe
France	Arras	69.024	Small City	Central Europe
France	Aubagne	103.700	Medium City	Central Europe
France	Avignon	108.555	Medium City	Central Europe
France	Bayonne	112.056	Medium City	Central Europe
France	Beauvais	79.188	Small City	Central Europe
France	Belfort	64.816	Small City	Central Europe
France	Besançon	116.421	Medium City	Central Europe
France	Béziers	74.940	Small City	Central Europe
France	Bordeaux	625.725	Large City	Central Europe
France	Boulogne-sur-Mer	77.008	Small City	Central Europe
France	Bourges	66.166	Small City	Central Europe
France	Brest	139.652	Medium City	Central Europe
France	Brive-la-Gaillarde	78.035	Small City	Central Europe
France	CA Brie Francilienne	60.133	Small City	Central Europe
France	CA de la Vallée de Montmorency	109.270	Medium City	Central Europe
France	CA de Seine Essonne	68.936	Small City	Central Europe
France	CA de Sophia-Antipolis	174.328	Medium City	Central Europe
France	CA des deux Rives de la Seine	65.289	Small City	Central Europe
France	CA des Lacs de l'Essonne	59.066	Small City	Central Europe
France	CA du Plateau de Saclay	97.955	Small City	Central Europe
France	CA du Val d'Orge	130.406	Medium City	Central Europe
France	CA du Val d'Yerres	91.221	Small City	Central Europe
France	CA Europ' Essonne	138.263	Medium City	Central Europe
France	CA le Parisis	92.346	Small City	Central Europe

Country	City	Population (2019)	Size	Geographic Area
France	CA les Portes de l'Essonne	52.921	Small City	Central Europe
France	CA Marne et Chantereine	77.330	Small City	Central Europe
France	CA Sénart - Val de Seine	82.362	Small City	Central Europe
France	CA Val de France	140.161	Medium City	Central Europe
France	CA Val et Forêt	85.124	Small City	Central Europe
France	Caen	145.255	Medium City	Central Europe
France	Calais	74.182	Small City	Central Europe
France	Cannes	73.744	Small City	Central Europe
France	CC de la Boucle de la Seine	170.865	Medium City	Central Europe
France	Cergy-Pontoise	195.261	Medium City	Central Europe
France	Châlons-en-Champagne	63.611	Small City	Central Europe
France	Chalon-sur-Saône	105.565	Medium City	Central Europe
France	Chambéry	86.644	Small City	Central Europe
France	Charleville-Mézières	67.427	Small City	Central Europe
France	Chartres	76.530	Small City	Central Europe
France	Châteauroux	71.944	Small City	Central Europe
France	Cherbourg	80.660	Small City	Central Europe
France	Clermont-Ferrand	192.679	Medium City	Central Europe
France	Colmar	68.671	Small City	Central Europe
France	Compiègne	70.086	Small City	Central Europe
France	Creil	73.510	Small City	Central Europe
France	Dijon	195.495	Medium City	Central Europe
France	Douai	87.269	Small City	Central Europe
France	Dunkerque	137.803	Medium City	Central Europe
France	Evreux	81.135	Small City	Central Europe
France	Evry	115.330	Medium City	Central Europe
France	Fort-de-France	103.456	Medium City	Central Europe
France	Fréjus	87.433	Small City	Central Europe
France	Grenoble	304.381	Medium City	Central Europe
France	Hénin - Carvin	124.430	Medium City	Central Europe
France	La Rochelle	82.206	Small City	Central Europe
France	Le Havre	197.005	Medium City	Central Europe
France	Le Mans	150.976	Medium City	Central Europe
France	Lens - Liévin	181.710	Medium City	Central Europe

Country	City	Population (2019)	Size	Geographic Area
France	Lille	898.549	Large City	Central Europe
France	Limoges	145.304	Medium City	Central Europe
France	Lorient	79.713	Small City	Central Europe
France	Lyon	1.051.974	Large City	Central Europe
France	Mantes en Yvelines	86.474	Small City	Central Europe
France	Marne la Vallée	87.458	Small City	Central Europe
France	Marseille	889.442	Large City	Central Europe
France	Martigues	65.367	Small City	Central Europe
France	Meaux	62.806	Small City	Central Europe
France	Melun	84.233	Small City	Central Europe
France	Metz	167.083	Medium City	Central Europe
France	Montbéliard	116.558	Medium City	Central Europe
France	Montpellier	293.374	Medium City	Central Europe
France	Mulhouse	180.473	Medium City	Central Europe
France	Nancy	203.299	Medium City	Central Europe
France	Nantes	434.513	Medium City	Central Europe
France	Nice	672.790	Large City	Central Europe
France	Nîmes	149.367	Medium City	Central Europe
France	Niort	104.152	Medium City	Central Europe
France	Orléans	204.593	Medium City	Central Europe
France	Paris	9.735.003	Large City	Central Europe
France	Pau	110.729	Medium City	Central Europe
France	Perpignan	130.262	Medium City	Central Europe
France	Poitiers	97.791	Small City	Central Europe
France	Quimper	87.218	Small City	Central Europe
France	Reims	208.948	Medium City	Central Europe
France	Rennes	213.024	Medium City	Central Europe
France	Rouen	308.672	Medium City	Central Europe
France	Saint Denis	145.786	Medium City	Central Europe
France	Saint-Brieuc	64.952	Small City	Central Europe
France	Saint-Etienne	193.428	Medium City	Central Europe
France	Saint-Nazaire	68.914	Small City	Central Europe
France	Saint-Quentin	55.416	Small City	Central Europe
France	Saint-Quentin en Yvelines	144.671	Medium City	Central Europe
France	Strasbourg	399.797	Medium City	Central Europe
France	Tarbes	73.750	Small City	Central Europe
France	Toulon	328.520	Medium City	Central Europe
France	Toulouse	592.826	Large City	Central Europe
France	Tours	240.929	Medium City	Central Europe

Country	City	Population (2019)	Size	Geographic Area
France	Troyes	105.343	Medium City	Central Europe
France	Valence	93.186	Small City	Central Europe
France	Valenciennes	103.232	Medium City	Central Europe
France	Vannes	134.808	Medium City	Central Europe
France	Versailles	181.876	Medium City	Central Europe
Germany	Aachen	245.588	Medium City	Central Europe
Germany	Aschaffenburg	68.947	Small City	Central Europe
Germany	Augsburg	282.499	Medium City	Central Europe
Germany	Bamberg	73.592	Small City	Central Europe
Germany	Bayreuth	72.720	Small City	Central Europe
Germany	Bergisch Gladbach	110.116	Medium City	Central Europe
Germany	Berlin	3.507.630	Large City	Central Europe
Germany	Bielefeld	330.450	Medium City	Central Europe
Germany	Bocholt, Stadt	71.208	Small City	Central Europe
Germany	Bochum	364.855	Medium City	Central Europe
Germany	Bonn	319.090	Medium City	Central Europe
Germany	Bottrop	116.928	Medium City	Central Europe
Germany	Brandenburg an der Havel	71.580	Small City	Central Europe
Germany	Braunschweig	247.998	Medium City	Central Europe
Germany	Bremen	556.625	Large City	Central Europe
Germany	Bremerhaven	111.616	Medium City	Central Europe
Germany	Celle	69.547	Small City	Central Europe
Germany	Chemnitz	244.597	Medium City	Central Europe
Germany	Cottbus	100.210	Medium City	Central Europe
Germany	Darmstadt	152.992	Medium City	Central Europe
Germany	Dessau-Roßlau	83.255	Small City	Central Europe
Germany	Dortmund	581.424	Large City	Central Europe
Germany	Dresden	538.649	Large City	Central Europe
Germany	Duisburg	492.263	Medium City	Central Europe
Germany	Düren, Stadt	90.552	Small City	Central Europe
Germany	Düsseldorf	605.914	Large City	Central Europe
Germany	Erfurt	208.343	Medium City	Central Europe
Germany	Erlangen	108.146	Medium City	Central Europe
Germany	Essen	576.604	Large City	Central Europe
Germany	Esslingen am Neckar	91.145	Small City	Central Europe
Germany	Flensburg	86.525	Small City	Central Europe
Germany	Frankfurt (Oder)	58.374	Small City	Central Europe
Germany	Frankfurt am Main	719.536	Large City	Central Europe

Country	City	Population (2019)	Size	Geographic Area
Germany	Freiburg im Breisgau	224.401	Medium City	Central Europe
Germany	Friedrichshafen	58.995	Small City	Central Europe
Germany	Fulda	66.403	Small City	Central Europe
Germany	Fürth	122.330	Medium City	Central Europe
Germany	Gelsenkirchen	259.258	Medium City	Central Europe
Germany	Gera	95.276	Small City	Central Europe
Germany	Gießen	82.652	Small City	Central Europe
Germany	Görlitz	55.237	Small City	Central Europe
Germany	Göttingen	118.465	Medium City	Central Europe
Germany	Greifswald	57.223	Small City	Central Europe
Germany	Hagen	187.736	Medium City	Central Europe
Germany	Halle an der Saale	235.112	Medium City	Central Europe
Germany	Hamburg	1.786.490	Large City	Central Europe
Germany	Hamm	178.451	Medium City	Central Europe
Germany	Hanau	92.177	Small City	Central Europe
Germany	Hannover	526.342	Large City	Central Europe
Germany	Heidelberg	155.151	Medium City	Central Europe
Germany	Heilbronn	121.909	Medium City	Central Europe
Germany	Herne	156.518	Medium City	Central Europe
Germany	Hildesheim	101.660	Medium City	Central Europe
Germany	Ingolstadt	131.488	Medium City	Central Europe
Germany	Iserlohn	93.365	Small City	Central Europe
Germany	Jena	108.806	Medium City	Central Europe
Germany	Kaiserslautern	98.518	Small City	Central Europe
Germany	Karlsruhe	303.677	Medium City	Central Europe
Germany	Kassel	197.060	Medium City	Central Europe
Germany	Kempten (Allgäu)	66.252	Small City	Central Europe
Germany	Kiel	243.777	Medium City	Central Europe
Germany	Koblenz	111.434	Medium City	Central Europe
Germany	Köln	1.051.645	Large City	Central Europe
Germany	Konstanz	82.647	Small City	Central Europe
Germany	Krefeld	225.662	Medium City	Central Europe
Germany	Landshut	68.279	Small City	Central Europe
Germany	Leipzig	552.435	Large City	Central Europe
Germany	Leverkusen	162.017	Medium City	Central Europe
Germany	Lübeck	214.301	Medium City	Central Europe
Germany	Ludwigsburg	91.031	Small City	Central Europe
Germany	Ludwigshafen am Rhein	165.167	Medium City	Central Europe

Country	City	Population (2019)	Size	Geographic Area
Germany	Lüneburg	73.972	Small City	Central Europe
Germany	Magdeburg	234.229	Medium City	Central Europe
Germany	Mainz	208.837	Medium City	Central Europe
Germany	Mannheim	303.438	Medium City	Central Europe
Germany	Marburg	75.027	Small City	Central Europe
Germany	Moers	103.886	Medium City	Central Europe
Germany	Mönchengladbach	258.579	Medium City	Central Europe
Germany	Mülheim a.d.Ruhr	168.754	Medium City	Central Europe
Germany	München	1.427.029	Large City	Central Europe
Germany	Münster	303.674	Medium City	Central Europe
Germany	Neubrandenburg	63.907	Small City	Central Europe
Germany	Neumünster	78.352	Small City	Central Europe
Germany	Neuss	152.864	Medium City	Central Europe
Germany	Neu-Ulm	56.098	Small City	Central Europe
Germany	Nürnberg	506.436	Large City	Central Europe
Germany	Oberhausen	210.693	Medium City	Central Europe
Germany	Offenbach am Main	122.643	Medium City	Central Europe
Germany	Offenburg	58.471	Small City	Central Europe
Germany	Oldenburg (Oldenburg)	163.296	Medium City	Central Europe
Germany	Osnabrück	160.832	Medium City	Central Europe
Germany	Paderborn	146.996	Medium City	Central Europe
Germany	Passau	50.635	Small City	Central Europe
Germany	Pforzheim	120.999	Medium City	Central Europe
Germany	Plauen	64.775	Small City	Central Europe
Germany	Potsdam	167.316	Medium City	Central Europe
Germany	Recklinghausen	114.422	Medium City	Central Europe
Germany	Regensburg	144.344	Medium City	Central Europe
Germany	Remscheid	110.104	Medium City	Central Europe
Germany	Reutlingen	113.397	Medium City	Central Europe
Germany	Rosenheim	61.660	Small City	Central Europe
Germany	Rostock	205.504	Medium City	Central Europe
Germany	Saarbrücken	178.330	Medium City	Central Europe
Germany	Salzgitter	101.477	Medium City	Central Europe
Germany	Sankt Augustin	55.188	Small City	Central Europe
Germany	Schweinfurt	52.668	Small City	Central Europe
Germany	Schwerin	94.127	Small City	Central Europe
Germany	Siegen	101.380	Medium City	Central Europe
Germany	Sindelfingen	62.807	Small City	Central Europe

Country	City	Population (2019)	Size	Geographic Area
Germany	Solingen	157.790	Medium City	Central Europe
Germany	Speyer	50.163	Small City	Central Europe
Germany	Stralsund	58.227	Small City	Central Europe
Germany	Stuttgart	616.753	Large City	Central Europe
Germany	Trier	109.100	Medium City	Central Europe
Germany	Tübingen	87.467	Small City	Central Europe
Germany	Ulm	122.356	Medium City	Central Europe
Germany	Villingen-Schwenningen	82.945	Small City	Central Europe
Germany	Weimar	64.162	Small City	Central Europe
Germany	Wetzlar	51.862	Small City	Central Europe
Germany	Wiesbaden	275.786	Medium City	Central Europe
Germany	Wilhelmshaven	76.694	Small City	Central Europe
Germany	Witten	96.519	Small City	Central Europe
Germany	Wolfsburg	122.997	Medium City	Central Europe
Germany	Wuppertal	348.960	Medium City	Central Europe
Germany	Würzburg	126.507	Medium City	Central Europe
Germany	Zwickau	91.175	Small City	Central Europe
Greece	Athina	664.046	Large City	Southern Europe
Greece	Ioannina	80.371	Small City	Southern Europe
Greece	Irakleio	151.324	Medium City	Southern Europe
Greece	Kalamata	62.409	Small City	Southern Europe
Greece	Kavala	58.790	Small City	Southern Europe
Greece	Larisa	146.926	Medium City	Southern Europe
Greece	Pátra	170.896	Medium City	Southern Europe
Greece	Thessaloniki	315.196	Medium City	Southern Europe
Greece	Volos	86.046	Small City	Southern Europe
Hungary	Békéscsaba	59.709	Small City	Eastern Europe
Hungary	Budapest	1.745.407	Large City	Eastern Europe
Hungary	Debrecen	204.093	Medium City	Eastern Europe
Hungary	Eger	53.860	Small City	Eastern Europe
Hungary	Győr	129.507	Medium City	Eastern Europe
Hungary	Kaposvár	62.547	Small City	Eastern Europe
Hungary	Kecskemét	111.367	Medium City	Eastern Europe
Hungary	Miskolc	160.211	Medium City	Eastern Europe
Hungary	Nyíregyháza	118.009	Medium City	Eastern Europe
Hungary	Pécs	147.045	Medium City	Eastern Europe
Hungary	Sopron	62.208	Small City	Eastern Europe
Hungary	Szeged	162.470	Medium City	Eastern Europe
Hungary	Székesfehérvár	98.590	Small City	Eastern Europe

Country	City	Population (2019)	Size	Geographic Area
Hungary	Szolnok	71.938	Small City	Eastern Europe
Hungary	Szombathely	77.870	Small City	Eastern Europe
Hungary	Tatabánya	66.096	Small City	Eastern Europe
Hungary	Veszprém	60.113	Small City	Eastern Europe
Hungary	Zalaegerszeg	58.225	Small City	Eastern Europe
Ireland	Cork	118.713	Medium City	Northern Europe
Ireland	Dublin	516.255	Large City	Northern Europe
Ireland	Galway	73.963	Small City	Northern Europe
Ireland	Limerick	56.980	Small City	Northern Europe
Italy	Acireale	51.972	Small City	Southern Europe
Italy	Alessandria	92.427	Small City	Southern Europe
Italy	Altamura	70.092	Small City	Southern Europe
Italy	Ancona	100.586	Medium City	Southern Europe
Italy	Andria	99.899	Small City	Southern Europe
Italy	Anzio	52.492	Small City	Southern Europe
Italy	Arezzo	98.812	Small City	Southern Europe
Italy	Asti	75.410	Small City	Southern Europe
Italy	Avellino	54.482	Small City	Southern Europe
Italy	Bagheria	54.690	Small City	Southern Europe
Italy	Bari	320.090	Medium City	Southern Europe
Italy	Barletta	94.347	Small City	Southern Europe
Italy	Battipaglia	50.684	Small City	Southern Europe
Italy	Bergamo	118.532	Medium City	Southern Europe
Italy	Bisceglie	55.062	Small City	Southern Europe
Italy	Bitonto	55.179	Small City	Southern Europe
Italy	Bologna	384.478	Medium City	Southern Europe
Italy	Bolzano	105.629	Medium City	Southern Europe
Italy	Brescia	193.921	Medium City	Southern Europe
Italy	Brindisi	87.696	Small City	Southern Europe
Italy	Busto Arsizio	81.976	Small City	Southern Europe
Italy	Cagliari	152.310	Medium City	Southern Europe
Italy	Carpi	69.888	Small City	Southern Europe
Italy	Caserta	75.676	Small City	Southern Europe
Italy	Catania	304.437	Medium City	Southern Europe
Italy	Catanzaro	89.603	Small City	Southern Europe
Italy	Cerignola	57.273	Small City	Southern Europe
Italy	Como	84.019	Small City	Southern Europe
Italy	Cosenza	67.773	Small City	Southern Europe
Italy	Cremona	71.523	Small City	Southern Europe
Italy	Ferrara	132.739	Medium City	Southern Europe

Country	City	Population (2019)	Size	Geographic Area
Italy	Firenze	372.085	Medium City	Southern Europe
Italy	Foggia	150.486	Medium City	Southern Europe
Italy	Forlì	117.550	Medium City	Southern Europe
Italy	Gallarate	52.513	Small City	Southern Europe
Italy	Gela	75.158	Small City	Southern Europe
Italy	Genova	582.940	Large City	Southern Europe
Italy	Giugliano in Campania	117.787	Medium City	Southern Europe
Italy	Grosseto	80.961	Small City	Southern Europe
Italy	La Spezia	93.241	Small City	Southern Europe
Italy	L'Aquila	69.263	Small City	Southern Europe
Italy	Latina	123.838	Medium City	Southern Europe
Italy	Lecce	92.858	Small City	Southern Europe
Italy	Livorno	158.181	Medium City	Southern Europe
Italy	Massa	69.007	Small City	Southern Europe
Italy	Matera	60.285	Small City	Southern Europe
Italy	Messina	237.784	Medium City	Southern Europe
Italy	Milano	1.326.033	Large City	Southern Europe
Italy	Modena	183.995	Medium City	Southern Europe
Italy	Molfetta	59.705	Small City	Southern Europe
Italy	Monza	122.438	Medium City	Southern Europe
Italy	Napoli	966.390	Large City	Southern Europe
Italy	Novara	103.438	Medium City	Southern Europe
Italy	Padova	209.144	Medium City	Southern Europe
Italy	Palermo	664.484	Large City	Southern Europe
Italy	Parma	188.901	Medium City	Southern Europe
Italy	Pavia	71.050	Small City	Southern Europe
Italy	Perugia	164.664	Medium City	Southern Europe
Italy	Pesaro	94.721	Small City	Southern Europe
Italy	Pescara	119.524	Medium City	Southern Europe
Italy	Piacenza	102.153	Medium City	Southern Europe
Italy	Pisa	88.611	Small City	Southern Europe
Italy	Pordenone	51.255	Small City	Southern Europe
Italy	Potenza	66.933	Small City	Southern Europe
Italy	Prato	190.463	Medium City	Southern Europe
Italy	Ragusa	71.859	Small City	Southern Europe
Italy	Ravenna	157.263	Medium City	Southern Europe
Italy	Reggio di Calabria	180.971	Medium City	Southern Europe
Italy	Reggio nell'Emilia	168.904	Medium City	Southern Europe
Italy	Rimini	146.126	Medium City	Southern Europe

Country	City	Population (2019)	Size	Geographic Area
Italy	Roma	2.783.652	Large City	Southern Europe
Italy	Salerno	133.500	Medium City	Southern Europe
Italy	Sassari	126.146	Medium City	Southern Europe
Italy	Savona	60.798	Small City	Southern Europe
Italy	Siracusa	120.592	Medium City	Southern Europe
Italy	Taranto	198.728	Medium City	Southern Europe
Italy	Terni	110.703	Medium City	Southern Europe
Italy	Torino	879.323	Large City	Southern Europe
Italy	Trani	55.852	Small City	Southern Europe
Italy	Trapani	68.314	Small City	Southern Europe
Italy	Trento	117.092	Medium City	Southern Europe
Italy	Treviso	83.423	Small City	Southern Europe
Italy	Trieste	203.306	Medium City	Southern Europe
Italy	Udine	99.294	Small City	Southern Europe
Italy	Varese	80.406	Small City	Southern Europe
Italy	Venezia	261.671	Medium City	Southern Europe
Italy	Verona	257.000	Medium City	Southern Europe
Italy	Vicenza	112.087	Medium City	Southern Europe
Latvia	Daugavpils	86.872	Small City	Eastern Europe
Latvia	Jelgava	57.248	Small City	Eastern Europe
Latvia	Liepaja	71.730	Small City	Eastern Europe
Latvia	Riga	641.739	Large City	Eastern Europe
Lithuania	Alytus	55.250	Small City	Eastern Europe
Lithuania	Kaunas	300.667	Medium City	Eastern Europe
Lithuania	Klaipeda	155.274	Medium City	Eastern Europe
Lithuania	Panevezys	94.204	Small City	Eastern Europe
Lithuania	Siauliai	104.332	Medium City	Eastern Europe
Lithuania	Vilnius	541.920	Large City	Eastern Europe
Luxembourg	Luxembourg	105.385	Medium City	Central Europe
Malta	Valletta	222.362	Medium City	Southern Europe
Netherlands	Almelo	72.638	Small City	Central Europe
Netherlands	Almere	196.838	Medium City	Central Europe
Netherlands	Alphen aan den Rijn	94.296	Small City	Central Europe
Netherlands	Amersfoort	150.879	Medium City	Central Europe
Netherlands	Apeldoorn	158.253	Medium City	Central Europe
Netherlands	Assen	67.508	Small City	Central Europe
Netherlands	Bergen op Zoom	66.325	Small City	Central Europe
Netherlands	Breda	178.998	Medium City	Central Europe
Netherlands	Deventer	98.857	Small City	Central Europe

Country	City	Population (2019)	Size	Geographic Area
Netherlands	Enschede	158.396	Medium City	Central Europe
Netherlands	Gouda	71.417	Small City	Central Europe
Netherlands	Greater Alkmaar	125.096	Medium City	Central Europe
Netherlands	Greater Amsterdam	856.242	Large City	Central Europe
Netherlands	Greater Arnhem	156.836	Medium City	Central Europe
Netherlands	Greater Ede	123.706	Medium City	Central Europe
Netherlands	Greater Eindhoven	236.442	Medium City	Central Europe
Netherlands	Greater Haarlem	194.276	Medium City	Central Europe
Netherlands	Greater Heemskerk	93.417	Small City	Central Europe
Netherlands	Greater Heerlen	125.454	Medium City	Central Europe
Netherlands	Greater Leiden	167.656	Medium City	Central Europe
Netherlands	Greater Middelburg	92.615	Small City	Central Europe
Netherlands	Greater Nissewaard	92.254	Small City	Central Europe
Netherlands	Greater Rotterdam	817.352	Large City	Central Europe
Netherlands	Greater 's-Gravenhage	587.690	Large City	Central Europe
Netherlands	Greater Sittard-Geleen	103.694	Medium City	Central Europe
Netherlands	Greater Soest	70.487	Small City	Central Europe
Netherlands	Greater Utrecht	360.427	Medium City	Central Europe
Netherlands	Groningen	201.510	Medium City	Central Europe
Netherlands	Haarlemmermeer	145.712	Medium City	Central Europe
Netherlands	Helmond	89.550	Small City	Central Europe
Netherlands	Hengelo	80.888	Small City	Central Europe
Netherlands	Hilversum	87.208	Small City	Central Europe
Netherlands	Hoorn	71.698	Small City	Central Europe
Netherlands	Leeuwarden	104.071	Medium City	Central Europe
Netherlands	Lelystad	76.169	Small City	Central Europe
Netherlands	Maastricht	121.510	Medium City	Central Europe
Netherlands	Nijmegen	168.815	Medium City	Central Europe
Netherlands	Oss	90.729	Small City	Central Europe
Netherlands	Purmerend	79.665	Small City	Central Europe
Netherlands	Roosendaal	77.118	Small City	Central Europe
Netherlands	's-Hertogenbosch	145.845	Medium City	Central Europe
Netherlands	Tilburg	210.465	Medium City	Central Europe
Netherlands	Veenendaal	64.700	Small City	Central Europe
Netherlands	Venlo	100.394	Medium City	Central Europe

Country	City	Population (2019)	Size	Geographic Area
Netherlands	Zaanstad	150.624	Medium City	Central Europe
Netherlands	Zoetermeer	123.321	Medium City	Central Europe
Netherlands	Zwolle	123.333	Medium City	Central Europe
Poland	Białystok	294.990	Medium City	Eastern Europe
Poland	Bielsko-Biała	173.896	Medium City	Eastern Europe
Poland	Bydgoszcz	360.339	Medium City	Eastern Europe
Poland	Bytom	174.144	Medium City	Eastern Europe
Poland	Chelm	65.602	Small City	Eastern Europe
Poland	Chorzów	110.951	Medium City	Eastern Europe
Poland	Częstochowa	233.178	Medium City	Eastern Europe
Poland	Elbląg	123.296	Medium City	Eastern Europe
Poland	Elk	59.703	Small City	Eastern Europe
Poland	Gdańsk	460.991	Medium City	Eastern Europe
Poland	Gdynia	248.382	Medium City	Eastern Europe
Poland	Gliwice	185.736	Medium City	Eastern Europe
Poland	Głogów	69.069	Small City	Eastern Europe
Poland	Gniezno	69.993	Small City	Eastern Europe
Poland	Górnosławski Związek Metropolitalny	1.910.788	Large City	Eastern Europe
Poland	Gorzów Wielkopolski	124.413	Medium City	Eastern Europe
Poland	Grudziądz	97.815	Small City	Eastern Europe
Poland	Inowrocław	75.255	Small City	Eastern Europe
Poland	Jastrzebie-Zdrój	91.464	Small City	Eastern Europe
Poland	Jelenia Góra	82.426	Small City	Eastern Europe
Poland	Kalisz	104.292	Medium City	Eastern Europe
Poland	Katowice	305.683	Medium City	Eastern Europe
Poland	Kielce	200.370	Medium City	Eastern Europe
Poland	Konin	77.457	Small City	Eastern Europe
Poland	Koszalin	109.088	Medium City	Eastern Europe
Poland	Kraków	759.584	Large City	Eastern Europe
Poland	Legnica	102.184	Medium City	Eastern Europe
Poland	Leszno	64.660	Small City	Eastern Europe
Poland	Łódź	715.338	Large City	Eastern Europe
Poland	Lomża	62.843	Small City	Eastern Europe
Poland	Lubin	74.382	Small City	Eastern Europe
Poland	Lublin	345.391	Medium City	Eastern Europe
Poland	Nowy Sącz	84.063	Small City	Eastern Europe
Poland	Olsztyn	174.642	Medium City	Eastern Europe

Country	City	Population (2019)	Size	Geographic Area
Poland	Opole	120.934	Medium City	Eastern Europe
Poland	Ostrów Wielkopolski	72.871	Small City	Eastern Europe
Poland	Ostrowiec Swietokrzyski	72.544	Small City	Eastern Europe
Poland	Pabianice	68.035	Small City	Eastern Europe
Poland	Pila	74.673	Small City	Eastern Europe
Poland	Piotrków Trybunalski	76.105	Small City	Eastern Europe
Poland	Plock	123.246	Medium City	Eastern Europe
Poland	Poznan	549.504	Large City	Eastern Europe
Poland	Przemysl	64.021	Small City	Eastern Europe
Poland	Radom	218.993	Medium City	Eastern Europe
Poland	Ruda Slaska	141.890	Medium City	Eastern Europe
Poland	Rybnik	140.490	Medium City	Eastern Europe
Poland	Rzeszów	182.573	Medium City	Eastern Europe
Poland	Siedlce	76.456	Small City	Eastern Europe
Poland	Slupsk	94.383	Small City	Eastern Europe
Poland	Sosnowiec	212.331	Medium City	Eastern Europe
Poland	Stalowa Wola	63.982	Small City	Eastern Europe
Poland	Stargard Szczecinski	69.436	Small City	Eastern Europe
Poland	Suwalki	69.312	Small City	Eastern Europe
Poland	Swidnica	59.484	Small City	Eastern Europe
Poland	Szczecin	408.465	Medium City	Eastern Europe
Poland	Tarnów	112.510	Medium City	Eastern Europe
Poland	Tczew	60.690	Small City	Eastern Europe
Poland	Tomaszów Mazowiecki	65.174	Small City	Eastern Europe
Poland	Torun	203.956	Medium City	Eastern Europe
Poland	Tychy	128.964	Medium City	Eastern Europe
Poland	Walbrzych	118.436	Medium City	Eastern Europe
Poland	Warszawa	1.720.964	Large City	Eastern Europe
Poland	Wloclawek	115.179	Medium City	Eastern Europe
Poland	Wroclaw	632.244	Large City	Eastern Europe
Poland	Zabrze	178.832	Medium City	Eastern Europe
Poland	Zamosc	65.427	Small City	Eastern Europe
Poland	Zgierz	57.715	Small City	Eastern Europe
Poland	Zielona Góra	118.886	Medium City	Eastern Europe
Poland	Zory	62.063	Small City	Eastern Europe

Country	City	Population (2019)	Size	Geographic Area
Portugal	Almada	170.711	Medium City	Southern Europe
Portugal	Amadora	177.840	Medium City	Southern Europe
Portugal	Aveiro	77.680	Small City	Southern Europe
Portugal	Barreiro	76.811	Small City	Southern Europe
Portugal	Braga	181.783	Medium City	Southern Europe
Portugal	Coimbra	136.763	Medium City	Southern Europe
Portugal	Faro	61.760	Small City	Southern Europe
Portugal	Funchal	106.887	Medium City	Southern Europe
Portugal	Gondomar	166.824	Medium City	Southern Europe
Portugal	Guimarães	155.260	Medium City	Southern Europe
Portugal	Lisboa	516.335	Large City	Southern Europe
Portugal	Matosinhos	174.581	Medium City	Southern Europe
Portugal	Odivelas	153.321	Medium City	Southern Europe
Portugal	Paredes	86.564	Small City	Southern Europe
Portugal	Ponta Delgada	68.441	Small City	Southern Europe
Portugal	Porto	221.430	Medium City	Southern Europe
Portugal	Póvoa de Varzim	62.851	Small City	Southern Europe
Portugal	Seixal	163.652	Medium City	Southern Europe
Portugal	Setúbal	118.075	Medium City	Southern Europe
Portugal	Sintra	383.046	Medium City	Southern Europe
Portugal	Valongo	95.409	Small City	Southern Europe
Portugal	Viana do Castelo	86.478	Small City	Southern Europe
Portugal	Vila Franca de Xira	139.900	Medium City	Southern Europe
Portugal	Vila Nova de Gaia	301.517	Medium City	Southern Europe
Portugal	Viseu	98.138	Small City	Southern Europe
Romania	Alba Iulia	74.001	Small City	Eastern Europe
Romania	Arad	179.492	Medium City	Eastern Europe
Romania	Bacau	196.323	Medium City	Eastern Europe
Romania	Baia Mare	148.177	Medium City	Eastern Europe
Romania	Bârlad	73.195	Small City	Eastern Europe
Romania	Bistrita	93.369	Small City	Eastern Europe
Romania	Botosani	122.890	Medium City	Eastern Europe
Romania	Braila	212.031	Medium City	Eastern Europe
Romania	Brasov	291.232	Medium City	Eastern Europe
Romania	Bucuresti	2.128.954	Large City	Eastern Europe
Romania	Buzau	136.366	Medium City	Eastern Europe
Romania	Calarasi	77.879	Small City	Eastern Europe
Romania	Cluj-Napoca	321.864	Medium City	Eastern Europe
Romania	Constanta	318.396	Medium City	Eastern Europe
Romania	Craiova	306.504	Medium City	Eastern Europe

Country	City	Population (2019)	Size	Geographic Area
Romania	Drobeta-Turnu Severin	110.357	Medium City	Eastern Europe
Romania	Focsani	94.653	Small City	Eastern Europe
Romania	Galati	305.761	Medium City	Eastern Europe
Romania	Giurgiu	69.449	Small City	Eastern Europe
Romania	Iasi	357.379	Medium City	Eastern Europe
Romania	Oradea	223.123	Medium City	Eastern Europe
Romania	Piatra Neamt	115.812	Medium City	Eastern Europe
Romania	Pitesti	176.993	Medium City	Eastern Europe
Romania	Ploiesti	233.915	Medium City	Eastern Europe
Romania	Râmnicu Vâlcea	118.911	Medium City	Eastern Europe
Romania	Roman	71.169	Small City	Eastern Europe
Romania	Satu Mare	123.043	Medium City	Eastern Europe
Romania	Sibiu	169.529	Medium City	Eastern Europe
Romania	Slatina	84.896	Small City	Eastern Europe
Romania	Suceava	118.636	Medium City	Eastern Europe
Romania	Târgoviste	94.054	Small City	Eastern Europe
Romania	Târgu Jiu	97.069	Small City	Eastern Europe
Romania	Târgu Mures	150.660	Medium City	Eastern Europe
Romania	Timisoara	332.449	Medium City	Eastern Europe
Romania	Tulcea	89.932	Small City	Eastern Europe
Slovakia	Banská Bystrica	79.107	Small City	Eastern Europe
Slovakia	Bratislava	420.929	Medium City	Eastern Europe
Slovakia	Kosice	239.638	Medium City	Eastern Europe
Slovakia	Nitra	77.948	Small City	Eastern Europe
Slovakia	Presov	90.364	Small City	Eastern Europe
Slovakia	Trencín	55.722	Small City	Eastern Europe
Slovakia	Trnava	65.785	Small City	Eastern Europe
Slovakia	Zilina	81.196	Small City	Eastern Europe
Slovenia	Ljubljana	285.445	Medium City	Southern Europe
Slovenia	Maribor	111.606	Medium City	Southern Europe
Spain	A Coruña	244.938	Medium City	Southern Europe
Spain	Albacete	172.599	Medium City	Southern Europe
Spain	Alcalá de Guadaíra	75.113	Small City	Southern Europe
Spain	Alcalá de Henares	198.710	Medium City	Southern Europe
Spain	Alcobendas	113.346	Medium City	Southern Europe
Spain	Alcorcón	168.809	Medium City	Southern Europe
Spain	Alcoy	59.168	Small City	Southern Europe
Spain	Algeciras	118.988	Medium City	Southern Europe
Spain	Alicante/Alacant	331.861	Medium City	Southern Europe

Country	City	Population (2019)	Size	Geographic Area
Spain	Almería	194.074	Medium City	Southern Europe
Spain	Arrecife	58.201	Small City	Southern Europe
Spain	Ávila	57.998	Small City	Southern Europe
Spain	Avilés	80.853	Small City	Southern Europe
Spain	Badajoz	150.693	Medium City	Southern Europe
Spain	Badalona	218.050	Medium City	Southern Europe
Spain	Barakaldo	100.322	Medium City	Southern Europe
Spain	Barcelona	1.615.264	Large City	Southern Europe
Spain	Barcelona	3.445.031	Large City	Southern Europe
Spain	Benalmádena	67.715	Small City	Southern Europe
Spain	Benidorm	69.179	Small City	Southern Europe
Spain	Bilbao	347.439	Medium City	Southern Europe
Spain	Bilbao	791.365	Large City	Southern Europe
Spain	Burgos	177.413	Medium City	Southern Europe
Spain	Cáceres	95.845	Small City	Southern Europe
Spain	Cádiz	120.348	Medium City	Southern Europe
Spain	Cartagena	215.610	Medium City	Southern Europe
Spain	Castelldefels	64.366	Small City	Southern Europe
Spain	Castellón de la Plana/Castelló de la Plana	173.922	Medium City	Southern Europe
Spain	Cerdanyola del Vallès	57.604	Small City	Southern Europe
Spain	Ceuta	84.482	Small City	Southern Europe
Spain	Chiclana de la Frontera	83.378	Small City	Southern Europe
Spain	Ciudad Real	74.715	Small City	Southern Europe
Spain	Collado Villalba	62.512	Small City	Southern Europe
Spain	Córdoba	327.245	Medium City	Southern Europe
Spain	Cornellà de Llobregat	86.856	Small City	Southern Europe
Spain	Coslada	86.583	Small City	Southern Europe
Spain	Cuenca	54.999	Small City	Southern Europe
Spain	Dos Hermanas	131.130	Medium City	Southern Europe
Spain	Elche/Elx	229.296	Medium City	Southern Europe
Spain	Elda	53.347	Small City	Southern Europe
Spain	Elda	87.208	Small City	Southern Europe
Spain	Ferrol	69.278	Small City	Southern Europe
Spain	Fuengirola	76.319	Small City	Southern Europe
Spain	Fuenlabrada	195.534	Medium City	Southern Europe

Country	City	Population (2019)	Size	Geographic Area
Spain	Gandia	76.054	Small City	Southern Europe
Spain	Getafe	175.499	Medium City	Southern Europe
Spain	Getxo	79.077	Small City	Southern Europe
Spain	Gijón	274.379	Medium City	Southern Europe
Spain	Girona	98.311	Small City	Southern Europe
Spain	Granada	235.931	Medium City	Southern Europe
Spain	Granada	399.629	Medium City	Southern Europe
Spain	Granollers	60.270	Small City	Southern Europe
Spain	Guadalajara	84.376	Small City	Southern Europe
Spain	Huelva	146.279	Medium City	Southern Europe
Spain	Igualada	61.487	Small City	Southern Europe
Spain	Irun	61.498	Small City	Southern Europe
Spain	Jaén	115.107	Medium City	Southern Europe
Spain	Jerez de la Frontera	212.425	Medium City	Southern Europe
Spain	Las Palmas	380.417	Medium City	Southern Europe
Spain	Leganés	187.407	Medium City	Southern Europe
Spain	León	127.960	Medium City	Southern Europe
Spain	L'Hospitalet de Llobregat	256.828	Medium City	Southern Europe
Spain	Linares	58.448	Small City	Southern Europe
Spain	Línea de la Concepción, La	63.534	Small City	Southern Europe
Spain	Lleida	138.547	Medium City	Southern Europe
Spain	Logroño	151.842	Medium City	Southern Europe
Spain	Lorca	92.645	Small City	Southern Europe
Spain	Lugo	98.275	Small City	Southern Europe
Spain	Madrid	3.198.292	Large City	Southern Europe
Spain	Madrid	4.920.683	Large City	Southern Europe
Spain	Majadahonda	70.777	Small City	Southern Europe
Spain	Málaga	568.565	Large City	Southern Europe
Spain	Manresa	75.875	Small City	Southern Europe
Spain	Marbella	140.288	Medium City	Southern Europe
Spain	Mataró	125.288	Medium City	Southern Europe
Spain	Melilla	84.546	Small City	Southern Europe
Spain	Mérida	59.204	Small City	Southern Europe
Spain	Mollet del Vallès	51.637	Small City	Southern Europe
Spain	Móstoles	206.270	Medium City	Southern Europe
Spain	Murcia	442.395	Medium City	Southern Europe
Spain	Ourense	106.428	Medium City	Southern Europe

Country	City	Population (2019)	Size	Geographic Area
Spain	Oviedo	222.475	Medium City	Southern Europe
Spain	Palencia	79.753	Small City	Southern Europe
Spain	Palma de Mallorca	404.744	Medium City	Southern Europe
Spain	Pamplona/Iruña	197.336	Medium City	Southern Europe
Spain	Pamplona/Iruña	323.776	Medium City	Southern Europe
Spain	Parla	125.689	Medium City	Southern Europe
Spain	Paterna	68.618	Small City	Southern Europe
Spain	Ponferrada	66.828	Small City	Southern Europe
Spain	Pontevedra	82.722	Small City	Southern Europe
Spain	Pozuelo de Alarcón	84.866	Small City	Southern Europe
Spain	Prat de Llobregat, El	63.503	Small City	Southern Europe
Spain	Puerto de la Cruz	66.269	Small City	Southern Europe
Spain	Puerto de Santa María, El	88.627	Small City	Southern Europe
Spain	Reus	104.844	Medium City	Southern Europe
Spain	Rivas-Vaciamadrid	84.400	Small City	Southern Europe
Spain	Rozas de Madrid, Las	93.255	Small City	Southern Europe
Spain	Rubí	75.198	Small City	Southern Europe
Spain	Sabadell	209.039	Medium City	Southern Europe
Spain	Sagunto	65.294	Small City	Southern Europe
Spain	Salamanca	147.256	Medium City	Southern Europe
Spain	San Cristóbal de la Laguna	153.626	Medium City	Southern Europe
Spain	San Fernando	96.014	Small City	Southern Europe
Spain	San Sebastián de los Reyes	84.700	Small City	Southern Europe
Spain	San Sebastián/Donostia	186.351	Medium City	Southern Europe
Spain	San Vicente del Raspeig/Sant Vicent del Raspeig	57.272	Small City	Southern Europe
Spain	Sanlúcar de Barrameda	67.627	Small City	Southern Europe
Spain	Sant Boi de Llobregat	82.833	Small City	Southern Europe
Spain	Sant Cugat del Vallès	87.894	Small City	Southern Europe

Country	City	Population (2019)	Size	Geographic Area
Spain	Santa Coloma de Gramenet	118.721	Medium City	Southern Europe
Spain	Santa Cruz de Tenerife	205.174	Medium City	Southern Europe
Spain	Santa Cruz de Tenerife	359.183	Medium City	Southern Europe
Spain	Santa Lucía de Tirajana	69.433	Small City	Southern Europe
Spain	Santander	174.730	Medium City	Southern Europe
Spain	Santiago de Compostela	96.068	Small City	Southern Europe
Spain	Sevilla	694.269	Large City	Southern Europe
Spain	Sevilla	880.293	Large City	Southern Europe
Spain	Talavera de la Reina	85.640	Small City	Southern Europe
Spain	Tarragona	132.621	Medium City	Southern Europe
Spain	Telde	101.994	Medium City	Southern Europe
Spain	Terrassa	216.279	Medium City	Southern Europe
Spain	Toledo	83.822	Small City	Southern Europe
Spain	Torrejón de Ardoz	126.913	Medium City	Southern Europe
Spain	Torrelavega	52.306	Small City	Southern Europe
Spain	Torremolinos	67.986	Small City	Southern Europe
Spain	Torrent	80.990	Small City	Southern Europe
Spain	Torrevieja	90.254	Small City	Southern Europe
Spain	Valdemoro	74.109	Small City	Southern Europe
Spain	Valencia	790.856	Large City	Southern Europe
Spain	Valencia	1.391.224	Large City	Southern Europe
Spain	Valladolid	304.722	Medium City	Southern Europe
Spain	Vigo	294.818	Medium City	Southern Europe
Spain	Viladecans	65.677	Small City	Southern Europe
Spain	Vilanova i la Geltrú	66.219	Small City	Southern Europe
Spain	Vitoria/Gasteiz	244.769	Medium City	Southern Europe
Spain	Zamora	63.651	Small City	Southern Europe
Spain	Zaragoza	670.964	Large City	Southern Europe
Sweden	Borås	110.453	Medium City	Northern Europe
Sweden	Göteborg	547.018	Large City	Northern Europe
Sweden	Helsingborg	141.926	Medium City	Northern Europe
Sweden	Jönköping	133.694	Medium City	Northern Europe
Sweden	Linköping	153.890	Medium City	Northern Europe
Sweden	Lund	119.908	Medium City	Northern Europe

Country	City	Population (2019)	Size	Geographic Area
Sweden	Malmö	321.654	Medium City	Northern Europe
Sweden	Norrköping	140.145	Medium City	Northern Europe
Sweden	Örebro	144.681	Medium City	Northern Europe
Sweden	Stockholm	916.568	Large City	Northern Europe
Sweden	Umeå	121.479	Medium City	Northern Europe
Sweden	Uppsala	211.491	Medium City	Northern Europe
Sweden	Västerås	148.777	Medium City	Northern Europe

Source: Eurostat Database (<https://ec.europa.eu/eurostat/web/cities/data/database>)