EUROPEAN
COMMISSION

Brussels, 10.12.2020
SWD(2020) 410 final

COMMISSION STAFF WORKING DOCUMENT

EVALUATION

of the

White Paper

Roadmap to a Single European Transport Area -Towards a competitive and resource efficient transport system

{SWD(2020) 411 final}

Table of contents

Glossary

Term or acronym	*Meaning or definition*
BEV	Battery electric vehicle
CEF	Connecting Europe Facility
CEN & CENELEC	European Committee for Standardization (CEN) & European Committee for Electrotechnical Standardization (CENELEC)
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
EAFO	European Alternative Fuels Observatory
ECAC	European Civil Aviation Conference
ECTRI	European Conference of Transport Research Institutes
EEA	European Environment Agency
ECAC	European Civil Aviation Conference
ECTRI	European Conference of Transport Research Institutes
EGNOS	European Geostationary Navigation Overlay System
ERTMS	European Rail Traffic Management System
ETCS	European Train Control System (signalling)
EU ETS	EU Emission Trading System
GHG	Greenhouse gas
GSM-R	Global System for Mobile Communications – Railway or GSM-Railway is an international wireless communications standard for railway communication and applications.
ICAO	International Civil Aviation Organization
ILO	International Labor Organization
IMO	International Maritime Organization
INEA	Innovation and Networks Executive Agency
IPCC	Intergovernmental Panel on Climate Change
ITS	Intelligent Transport Systems (for road transport)
MaaS	Mobility as a service (A type of service that through a joint digital channel enables users to plan, book, and pay for multiple types of mobility services. The concept describes a shift away from personally-owned modes of transport and towards mobility provided as a service.)

NAIADES	Navigation And Inland Waterway Action and Development in Europe
PHEV	Plug-in hybrid electric vehicle
PPP	Public Private Partnership
RIS	River Information System
SDGs	Sustainable Development Goals
SESAR	Single European Sky Air Traffic Management Research (component of innovation and deployment strategy for air traffic management)
SUMP	Sustainable Urban Mobility Plan
TEN-T	Trans-European Network for Transport (infrastructure)
UITP	International Association of Public Transport
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change

1. INTRODUCTION – PURPOSE AND SCOPE OF THE EVALUATION

Transport is a fundamental sector for and of the economy. The EU has a key role to play in designing and implementing transport policies that address the needs of a Union built on the principles of free cross-border movement of people and goods. Transport services embrace a complex network of more than a million private and public companies in the EU, employing more than 10 million people and providing goods and services to citizens and businesses in the EU and its trading partners. Transport also provides mobility for Europeans, thus contributing significantly to the free movement of people within the internal market.

Efficient transport services and infrastructure are vital to exploiting the economic strengths of all regions of the European Union, to supporting the internal market and growth, and to enabling economic and social cohesion. They also influence trade competitiveness, as the availability, price, and quality of transport services have strong implications on production processes and the choice of trading partners. With such a central role, transport is by definition also inter-related with various policy areas, such as environmental and social policies.

Mobility does not come free for those who use it and it is not without consequences to our society. Despite important policy measures, greenhouse gas (GHG) emissions from the EU transport sector have increased over time. Our mobility and transport causes external costs, not just in terms of CO_2 emissions and pollution, but also from road crashes, noise, congestion, etc.

The 2011 White Paper 'Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system'[1] has identified the need to tackle the challenge of breaking the transport system's dependence on fossil fuel without sacrificing its efficiency and compromising mobility. As the paramount objective of European transport policy, it has set the establishment of a transport system that underpins European economic progress, enhances competitiveness and offers high quality mobility services while using resources more efficiently.

The specific objectives of the White Paper are to reduce GHG emissions by 60% by 2050 compared to 1990, limit the growth of congestion and reduce oil dependency for a more sustainable transport system. The White Paper has put forward a comprehensive list of initiatives to achieve these objectives. It also has set ten goals for a competitive and resource efficient transport system, to serve as benchmarks for achieving the 60% GHG reduction objective.

The White Paper provides a framework for EU transport policy actions addressing the challenges outlined above, with a focus on reducing greenhouse gas emissions, limiting

[1] COM(2011) 144 final.

the growth of congestion and reducing fossil fuel dependency for a more sustainable transport system.

The purpose of this Staff Working Document is to present the findings of the ex-post evaluation of the White Paper. While the White Paper defines a long-term vision until 2050 for the transport sector, to date, the Commission has acted upon almost all of the 40 action points of the programme and the large majority of the 132 initiatives planned have been delivered by the Commission. Considering also the various important policy, socio-economic and technological developments since 2011, it has appeared timely to carry out an evaluation of the 2011 White Paper.

The results of the evaluation inform the forthcoming sustainable and smart mobility strategy of the European Commission. In particular, the results of this evaluation have fed into the analysis of the current situation and developments in EU transport carried out in the framework of the staff working document accompanying the strategy.

The evaluation covers all intervention areas of the 2011 White Paper since its adoption. It looks at the identified needs for transport policy, the objectives and goals set, the proposed initiatives, reached outcomes of the initiatives under the 40 action points so far and their results, as well as the overall impact of the strategy since it was put in place.

The impact and results of the strategy, until now and estimated until 2050, are assessed in view of their effectiveness, efficiency, internal and external coherence, EU added value and relevance.

The geographical scope of the evaluation covers the 27 Member States of the EU.

2. BACKGROUND TO THE INTERVENTION

2.1. Context and scope of the 2011 White Paper

The SWD accompanying the White Paper[2] has identified three main problems transport was facing in 2011: (i) an increasing oil price and persistent oil dependency, (ii) growing congestion and poor connectivity, (iii) a deteriorating climate and local environment (i.e. pollution).

According to the SWD, these problems would need to be addressed in light of increasing challenges and constraints. Competition in world transport markets and equipment industry was expected to grow. Against the backdrop of tighter public budgets in the aftermath of the financial crisis of 2008/09, the already declining trend in transport infrastructure financing should further intensify.

In response to these trends, the Commission has adopted on 28 March 2011 the White Paper 'Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system'. It sets out a strategy that aims at introducing

[2] SEC(2011) 391 final.

profound structural changes to transform the transport sector. It covers four broad areas of intervention:

1. Single European Transport Area: a true internal market for rail services, completion of the Single European Sky, capacity and quality of airports, a maritime "Blue Belt" and market access to ports, a sustainable framework for inland navigation, review legislation on road haulage, multimodal transport of goods through e-Freight, a social code for road transport workers, a social agenda for maritime transport, a socially responsible aviation sector, an evaluation of the EU approach to jobs and working conditions across transport modes, air cargo and land transport security, a 'zero-vision' on road safety, civil aviation safety, rail safety, safer shipping, transport of dangerous goods, as well as improved passengers' rights and awareness thereof.[3]
2. Innovation: acceleration of the deployment of alternative fuels and vehicle technologies, and of smart solutions for multimodal traffic management and transport information systems. A more comprehensive approach to innovation will bring together planning (urban mobility plans), funding, regulatory, technical standards, behavioural aspects (e.g. vehicle labelling for emissions and efficiency, eco-driving) and infrastructure aspects.
3. Infrastructure and smart funding: creation of a 'Core' TEN-T Network as a backbone of a truly multimodal European network, multimodal freight corridors for sustainable and intelligent transport networks, new sources of and mechanisms for funding, smart pricing and taxation.
4. External dimension: continuation of the efforts to open international market, promote European technical standards and defend with one voice EU global business in maritime and aviation.

For each of these areas, a programme is defined with 40 action points, containing specific initiatives. Typically, the proposed initiatives within each action point are of different nature, different time horizon and different economic or political relevance.

On 16 June 2011, the Council, in its conclusions, has welcomed the White Paper and confirmed the objectives laid down therein for EU transport policy.

On 15 December 2011, the European Parliament has adopted a resolution in which it approves the 10 goals for a competitive and resource-efficient transport system and the goals set in the White Paper for 2050 and 2030, but considers that more specific provisions are required for the period to 2020 with regard to funding and the general challenges facing transport.

[3] The Special Eurobarometer No 485 (2019) on Passenger Rights has highlighted that less than half (43%) of the respondents who had travelled by at least one long-distance mode in the preceding year have been aware of passenger rights at EU level.

On 9 September 2015, the European Parliament has adopted another resolution in which it reiterates its support for the goals set out in the White Paper and its ambition of reaching a competitive and resource-efficient transport system.

2.2. General and specific objectives

The general objective of the policy strategy in the White Paper, in line with the flagship initiative "Resource efficient Europe" set up in the Europe 2020 Strategy and the new Energy Efficiency Plan 2011, is to help establish a transport system that underpins European economic progress, enhances competitiveness and offers high quality mobility services while using resources more efficiently. In practice, transport has to use less and cleaner energy, better exploit a modern infrastructure and reduce its negative impact on the environment and key natural assets like water, land and ecosystems.

This objective requires particular attention to the most pressing challenges faced by the transport sector according to the analysis accompanying the White Paper: vulnerability to oil price increases, growing network congestion and GHG emissions. The impact assessment accompanying the White Paper[4] has identified three specific objectives:

- A reduction of GHG emissions that is consistent with the overall target for the EU of reducing emissions by 80-95% by 2050 compared to 1990. Transport-related emissions of CO2 should be reduced by around 60% by 2050 compared to 1990[5], in line with the 2011 Roadmap for moving to a competitive low carbon economy in 2050 {COM(2011) 112}.
- A drastic decrease in the oil dependency ratio of transport-related activities by 2050.
- Limiting the growth of congestion.

These specific objectives are derived from the analysis of the vision for transport by 2050 and are translating into ten headline goals (Annex 2). The latter can be considered long-term objectives for the interventions in the four broad areas of the policy strategy. They serve as benchmark for measuring the progress made in achieving the objectives of the White Paper. Some goals refer to the year 2030, others to 2050.

Thus, the evaluation of the 2011 White Paper assesses the performance of the policy strategy not only with a view to the achievement of the specific objectives, but also in the light of its effect on the other elements of the broader objective of EU transport policy.

A graphic representation of the intervention logic of the White Paper 2011 can be found in Annex 3.

[4] SEC(2011) 358 final.
[5] The 60% emissions reduction target covers aviation, but excludes international maritime.

2.3. Baseline and points of comparison

The impact assessment accompanying the White Paper has shown that in the absence of additional EU level action total transport activity would continue to grow strongly, after a decrease due to the 2008-2009 financial crisis. The various transport modes have in general been expected to maintain their relative importance at EU level, with road transport maintaining its dominant role in both passenger and freight transport.

Energy demand in transport has been predicted to continue to increase by 2050, driven mainly by aviation and road freight transport. At the same time, the EU transport system has been projected to remain extremely dependent on the use of fossil fuels.

CO_2 emissions from transport[6] have been expected to stabilise by 2050 relative to their 2005 levels, driven by the CO_2 standards in place for new passenger cars, some uptake of biofuels and electrification of road and rail transport. However, they have been projected to still be significantly higher than their 1990 levels. External costs of transport have been expected to continue growing over time.

High congestion levels have been expected to seriously affect road transport in several EU countries by 2030 in the absence of effective countervailing measures such as road pricing. While urban congestion would mainly depend on car ownership levels, urban sprawl and the availability of public transport alternatives, congestion on the inter-urban network would be the result of a growing freight demand across specific corridors at their points of intersection with links serving local traffic.

The impact assessment has concluded that the unsustainable features of the EU transport system were likely to worsen in a context of growing transport activity.

A Baseline scenario has been developed for the purpose of the current evaluation, showing the projected developments of the EU transport system up to 2050 without the White Paper initiatives. It builds on the Baseline scenario of the impact assessment accompanying the White Paper but takes into account the revised macro-economic framework, fuel price projections and changes in technology costs.

The Baseline scenario shows that despite reductions in technology costs and the revised macro-economic and fuel price framework, CO_2 emissions from transport[7] would stabilise by 2030 and increase by 4% by 2050 relative to 2010, in absence of additional policies beyond 2011. Compared to 1990, the reference year for the White Paper objectives, CO_2 emissions from transport would still be 29% higher in 2050.

No significant progress would take place in the oil dependency ratio by 2050 relative to 2010. The oil dependency ratio would only decrease by about 2 percentage points between 2010 and 2050.

[6] Excluding international maritime, in line with the 2011 White Paper target for 2050.
[7] Excluding international maritime, in line with the 2011 White Paper target for 2050.

High congestion levels are still projected by 2050 in the Baseline scenario, with delay costs expected to increase by 34% between 2010 and 2050. More details on the assumptions underpinning the Baseline scenario and its results are provided in Annex 5.

3. IMPLEMENTATION / STATE OF PLAY

As already noted in the implementation report of 2016 on the White Paper,[8] the Commission has made significant progress since the adoption of the White Paper, having acted upon most of the 40 action points of the programme. Since then, new initiatives have followed or accompanied those defined in 2011 and they form part of the overall picture.

In the last ten years, the Commission has taken several initiatives to further foster the development of the Single European Transport Area. Progress towards this goal has been made for all transport modes, for instance with the 4th Railway Package, the Blue Belt initiatives for maritime transport, the EU Aviation Strategy and the NAIADES Programme for inland waterways. Besides introducing social standards, mainly for road haulage and updating in 2018 the standards of the Maritime Labour Convention,[9] the Commission has also supported the social dialogue through the sectoral social dialogue committees covering all transport sectors.

The adoption of the European Accessibility Act[10] should help improve the accessibility of transport services for elderly and disabled people.

3.1. Single European Transport Area

The 4th Railway Package is set to complete the market opening process by dismantling the remaining legal monopolies in domestic passenger markets. It introduces the principle of competitive tendering for public service contracts and improves the way infrastructure is governed to create a non-discriminatory environment. In parallel, the Commission proposed in 2017[11] to amend the legislative framework applicable to rail passenger rights, where the new rules for improved passengers' protection are expected to enter into force in early 2021.

[8] SWD(2016) 226 final.

[9] Council Directive (EU) 2018/131 of 23 January 2018 implementing the Agreement concluded by the European Community Shipowners' Associations (ECSA) and the European Transport Workers' Federation (ETF) to amend Directive 2009/13/EC in accordance with the amendments of 2014 to the Maritime Labour Convention, 2006, as approved by the International Labour Conference on 11 June, OJ L 22, 26.1.2018, p. 28–33.

[10] Directive (EU) 2019/882 of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services, OJ L 151, 7.6.2019, p. 70–115.

[11] Proposal for a Regulation of the European Parliament and of the Council on rail passengers' rights and obligations (recast), COM(2017) 548 final.
The Commission's legislative proposal was preceded by a COM report on the application of the rail passenger rights regulation (COM(2013)587 final); COM Interpretative guidelines (OJ 220/1 of 4.7.2015) and a COM report on the exemptions from the regulation granted by Member States were adopted for rail passenger rights (COM(2015)117 final).

As to the passenger rights in the bus and coach sector, also the EU rules for access to the international long-distance coach market have entered into force in December 2011.[12] While this Regulation made the rules clearer and less complex, improving enforcement and reducing unnecessary administrative burden, the internal market for buses and coaches remains incomplete. The coach sector encounters obstacles in national markets hindering the development of services, both nationally and across borders, such as discrimination in access to terminals and excessive administrative costs of entry into the national markets.

To tackle these issues, the Commission has proposed in 2017 a revision of the EU legislation aiming at a major liberalisation of the bus and coach market, for which inter-institutional negotiations are still ongoing. At the same time, the Commission has proposed to revise the rules on access to the road haulage market together with the social rules for road transport and a revision of the road charging rules, including those on pricing for the use of infrastructure and the ones on electronic tolling. The new Directive on the interoperability of electronic tolls[13] clarifies the rules and should level the playing field on the market of electronic toll provision. In addition, it will update technological requirements to today's standards, and help Member States recover tolls unpaid by users of vehicles registered abroad.

While the new rules on electronic toll collection and the revision of the internal market and social rules have been adopted by the EU legislator in April 2019 and July 2020 respectively, the proposal on road pricing rules (review of the Eurovignette Directive)[14] is still under negotiation between the European Parliament and the Council.

The revised social and market rules[15] bring clarity on minimum standards for social protection and pay of posted workers in the road transport sector and help to eliminate illicit employment and business practices, such as letterbox companies and nomadic drivers. The newly created European Labour Authority (ELA) will be a key tool to facilitate the application and enforcement of EU rules in this area, improving the functioning of the Single Market.

In the maritime sector, progress could be witnessed already before 2018 be with the entry into force of the Directive incorporating the 2006 ILO Maritime Convention in EU law,[16] as well as the inclusion of seafarers in the scope of five EU labour Directives.[17] Also in other sectors actions have been taken at the EU level, such as the

[12] Regulation (EC) No 1073/2009 of the European Parliament and of the Council of 21 October 2009 on common rules for access to the international market for coach and bus services, and amending Regulation (EC) No 561/2006, OJ L 300, 14.11.2009, p. 88–105.
[13] Directive (EU) 2019/520 of the European Parliament and of the Council of 19 March 2019 on the interoperability of electronic road toll systems and facilitating cross-border exchange of information on the failure to pay road fees in the Union, OJ L 91, 29.3.2019, p. 45–76.
[14] COM(2017) 275 final.
[15] Regulations (EU) 2020/1054 and 2020/1055 and Directive (EU) 2020/1057, published in OJ L 249, 31.7.2020.
[16] Council Directive 2009/13/EC of 16 February 2009 implementing the Agreement concluded by the European Community Shipowners' Associations (ECSA) and the European Transport Workers' Federation (ETF) on the Maritime Labour Convention, 2006, and amending Directive 1999/63/EC, OJ L 124, 20.5.2009, p. 30–50.
[17] Directive (EU) 2015/1794 of the European Parliament and of the Council of 6 October 2015 amending Directives 2008/94/EC, 2009/38/EC and 2002/14/EC of the European Parliament and of the Council, and Council Directives 98/59/EC and 2001/23/EC, as regards seafarers, OJ L 263, 8.10.2015, p. 1–5.

legislation on working time for the inland waterway sector[18] and the flight time limitations[19] for the civil aviation sector. However, some issues still remain to be resolved.

For road safety, the Commission has adopted in 2010 Road Safety Policy Orientations[20] that have set a goal of halving the number of road fatalities by 2020 and that included a mix of initiatives, focusing on improving vehicle safety, the safety of infrastructure and road users' behaviour. Faced with stagnation in the reduction of EU-wide fatality figures, the Commission in 2018 has adopted the Road Safety Policy Framework 2021-2030 as part of the Third Mobility Package, along with a Strategic Action Plan on Road Safety, which have set a new target for 2021-30 to reduce deaths and – for the first time – serious injuries by 50%.[21]

In terms of vehicle safety, safety technologies and type-approval requirements have been significantly upgraded. Lane departure warning and advanced emergency braking for lorries have been regulated as from 2015 in the General Safety Regulation[22] and anti-lock braking systems are mandatory for motorcycles in the EU since 2016. In 2019, the General Safety Regulation has been reviewed again[23], requiring cars, trucks and buses to be fitted with a range of safety technologies. The Directive on the Management of Infrastructure Safety has also been upgraded in 2019[24] as well as the legal framework for the training of professional drivers (2018).[25] A package of measures on roadworthiness testing has been adopted (2014)[26] and rules on the cross-border pursuit of road traffic offences have been introduced (2011, re-published in 2015).[27]

In the area of maritime transport the Commission has taken initiatives to consolidate the internal market for sea shipping services and better connect EU ports to create an EU

[18] Council Directive 2014/112/EU of 19 December 2014 implementing the European Agreement concerning certain aspects of the organisation of working time in inland waterway transport, concluded by the European Barge Union (EBU), the European Skippers Organisation (ESO) and the European Transport Workers' Federation (ETF), OJ L 367, 23.12.2014, p. 86–95.

[19] Commission Regulation (EU) No 83/2014 of 29 January 2014 amending Regulation (EU) No 965/2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council, OJ L 28, 31.1.2014, p. 17–29.

[20] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Towards a European road safety area: policy orientations on road safety 2011-2020', COM(2010) 389 final.

[21] COM(2018) 293 final.

[22] Regulation (EC) No 661/2009 of the European Parliament and of the Council of 13 July 2009 concerning type-approval requirements for the general safety of motor vehicles, their trailers and systems, components and separate technical units intended therefor, OJ L 200, 31.7.2009, p. 1.

[23] Regulation (EU) 2019/2144 of the European Parliament and of the Council of 27 November 2019 on type-approval requirements for motor vehicles and their trailers, OJ L 325, 16.12.2019, p. 1.

[24] Directive (EU) 2019/1936 of the European Parliament and of the Council of 23 October 2019 amending Directive 2008/96/EC on road infrastructure safety management, OJ L 305, 26.11.2019, p. 1.

[25] Directive (EU) 2018/645 of the European Parliament and of the Council of 18 April 2018 amending Directive 2003/59/EC on the initial qualification and periodic training of drivers of certain road vehicles for the carriage of goods or passengers and Directive 2006/126/EC on driving licences, OJ L 112, 2.5.2018, p. 29.

[26] Directive 2014/45/EU of the European Parliament and of the Council of 3 April 2014 on periodic roadworthiness tests for motor vehicles and their trailers, OJ L 127, 29.4.2014, p. 51; Directive 2014/46/EU of the European Parliament and of the Council of 3 April 2014 amending Council Directive 1999/37/EC on the registration documents for vehicles, OJ L 127, 29.4.2014, p. 129; Directive 2014/47/EU of the European Parliament and of the Council of 3 April 2014 on the technical roadside inspection of the roadworthiness of commercial vehicles circulating in the Union, OJ L 127, 29.4.2014, p. 134.

[27] Directive (EU) 2015/413 of the European Parliament and of the Council of 11 March 2015 facilitating cross-border exchange of information on road-safety-related traffic offences, OJ L 68, 13.3.2015, p. 9.

maritime transport space without barriers. The establishment of a European Maritime Single Window environment, by 2025, is central to simplifying and harmonising reporting formalities, reducing administrative and custom costs, and taking full advantage of digital means to optimise logistic chains.

The Combined Transport Directive[28] is the only EU legal instrument that directly supports the shift from road freight to lower emission transport modes (inland waterways, maritime transport and rail). Over the last 25 years, the directive has helped to shift a considerable amount of freight away from road. However, shortcomings in its implementation (ambiguous language, outdated provisions and limited support measures) have diminished its impact. With a proposal in 2017, the Commission sought to simplify the rules for combined transport and to make it more attractive through economic incentives, while the overall objective remained encouraging the shift of goods from road transport to more environmentally friendly modes. However, the necessity of increasing the share in total transport of sustainable transport modes under the European Green Deal requires stronger support for multimodal solutions. The current proposal is insufficient therefore and also lacks agreement among co-legislators. Thus, the Commission has withdrawn the proposal in 2020, while envisaging to table a new proposal in 2022.

In the area of air transport, the White Paper pleaded in favour of a truly seamless Single European Sky (SES) and deploy the future air traffic management system (SESAR). The Commission has proposed various legislative and regulatory initiatives since 2011 to further implement and improve the Single European Sky mechanisms. Reference is made to the recast proposal made in 2013 (SES2+)[29] aiming to reform the SES framework, as well as the amended recast proposal put forward in 2020, inspired by the same objectives but updated compared to the initial proposal.[30] Furthermore, the Commission has significantly reinforced its relationship with Eurocontrol over the past years including the conclusion of a High level agreement between the European Union and Eurocontrol in 2013.

In 2015, the Commission adopted the EU Aviation Strategy. The strategy seeks to improve services, market access and investment opportunities with third countries, whilst guaranteeing a level playing field, reduce capacity constraints and improve efficiency and connectivity. At the same time it maintains high EU safety and security standards.

3.2. Investments into research and infrastructure

Considerable investment has taken place in the EU in the FP7 and Horizon 2020 research and development programs to support progress with technological and non-technological innovation. In this context, an important role has been played both by transport

[28] Council Directive 92/106/EEC of 7 December 1992 on the establishment of common rules for certain types of combined transport of goods between Member State, OJ L 368, 17.12.1992, p. 38–42.
[29] COM(2013) 409 final.
[30] COM(2020) 579 final. The proposal is complemented by a proposal to amend the rules regarding the European Union Aviation Safety Agency contained in Regulation (EU) 2018/1138: COM(2020)577.

collaborative Research and Innovation and related Partnerships (European Green Vehicles Initiative, Shift2Rail, SESAR, Clean Sky, Fuel Cells and Hydrogen Joint Undertaking) funded under the EU framework programmes for research and innovation.

To develop the Trans-European Transport Network (TEN-T Network), the EU adopted a Regulation in 2013[31] providing Union guidelines which set an EU-wide framework for transport infrastructure enhancement across all Member States. They enable the coherent identification of projects of common interest and give direction to transport investment. The Regulation establishes a legally binding obligation to develop the so-called "Core" and "Comprehensive" TEN-T Networks. The TEN-T Regulation covers all transport modes and connections between them (ports, airports and other transport terminals). It sets standards and requirements to be met along the whole network, and it includes smart and innovative components to facilitate efficient infrastructure use and high-quality services.

The Core Network as the strategically most important part of the TEN-T shall be completed by 2030 within the EU as well as through the extension to the neighbouring regions (following high-level agreements with European Economic Area countries, Switzerland, Eastern Partnership and Western Balkans and the ongoing preparatory work with the Southern Mediterranean partners). Along the existing part of the TEN-T, efforts are still needed to fully comply with the standards set out in the Regulation. However, significant progress has already been made so far. Along the nine Core Network Corridors, for example: 89% of the rail infrastructure is electrified. 85% of the TEN-T inland waterways meet the technical requirement of depth and bridge height and a large part of the inland waterways is equipped for the EU-wide River Information Services (RIS). 89% of the TEN-T ports are connected to the railway network.

In addition, the Commission has presented in May 2018 the Communication *On the road to automated mobility: An EU strategy for mobility of the future*[32] a comprehensive EU approach towards connected and automated mobility setting out a clear, forward looking and ambitious European agenda. This agenda builds on the Low-Emission Mobility Strategy[33] and contributes to the White Paper objectives with a common vision for developing and deploying key technologies, services and infrastructure. It aims to ensure that EU legal and policy frameworks are ready to support the deployment of safe connected and automated mobility, while simultaneously addressing societal and environmental concerns which will be decisive for public acceptance.

[31] Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU, OJ L 348, 20.12.2013, p. 1–128.
[32] COM(2018) 283 final.
[33] COM(2016) 501 final.

3.3. Low-emission mobility

The three key objectives of the White Paper all refer to making transport more sustainable. The Commission has adopted an Urban Mobility Package in 2013 with the intention to promote the elaboration of Sustainable Urban Mobility Plans at city level.

An important milestone towards achieving the sustainability objectives of the White Paper has been the publication, by the Commission, of the European Strategy for Low-Emission Mobility in 2016. Its main elements consist in increasing the efficiency of the transport system by making the most of digital technologies, smart pricing and further encouraging greater use of more sustainable transport modes.

In addition, the strategy seeks to speed up the deployment of low-emission alternative energy for transport, to remove obstacles to the electrification of transport and to accelerate the transition towards low- and zero-emission vehicles.

The Commission has acted swiftly by adopting the proposals on the actions listed in the Action Plan of the strategy, notably through the adoption of the "Clean Energy for all Europeans" package in November 2016, the first Mobility Package in May 2017, the second Mobility Package in November 2017 and the third Mobility Package in May 2018.[34]

The Mobility Packages have introduced CO_2 emission performance standards for cars[35] as well as for light and heavy duty vehicles from 2025 and 2030.[36] The same Regulations have introduced the mandatory monitoring of in-use real world fuel consumption through onboard fuel consumption monitoring systems for both light and heavy vehicles which could serve as the basis for more effective CO_2 emission reductions and the foundation for "polluter pays" schemes.

Finally, the Packages have contained an action plan to boost investment in alternative fuel infrastructure[37] and develop a network of fast and interoperable recharging and fueling stations across the Union. The Commission has mobilised considerable investment of public and private market actors through the Connecting Europe Facility (CEF), the CEF blending facility and the CEF debt instrument.

Whereas the Mobility Packages primarily address road and to some extent waterborne transport, the EU also employs a 'basket of measures' to address the environmental footprint of aviation. These comprise market-based measures (the EU Emission Trading Scheme (ETS)[38], CORSIA[39]), improvements of technology and aircraft design (collaborative aviation research, Clean Sky[40], CO_2 standards for new aircraft), enhanced

[34] https://ec.europa.eu/transport/modes/road/road-initiatives_en.
[35] COM(2017) 676 final.
[36] COM(2018) 284 final.
[37] COM(2017) 652 final.
[38] The EU ETS is the EU emissions trading scheme, which covers aviation since 2012.
[39] CORSIA is the Carbon Offsetting and Reduction Scheme for International Aviation, set up by ICAO at global level.
[40] Clean Sky is a public private partnership for research on more environmentally efficient aircraft.

and traffic management operations (Single European Sky and the deployment of SESAR[41] technologies).

In 2018, the International Maritime Organization (IMO) has agreed to reduce total annual GHG emissions from international maritime transport by at least 50% by 2050 compared to 2008 (to be reviewed in 2023), while pursuing efforts to achieve full decarbonisation as soon as possible in this century. It also sets the goal to reduce the carbon intensity of international shipping by at least 40% by 2030, pursuing efforts towards 70% by 2050, compared to 2008. The EU is closely involved in work to develop measures for reaching these objectives at IMO level as shipping remains a fundamentally global business.

In 2018, the Commission has adopted a strategic long-term vision for a climate-neutral economy by 2050[42], engaging all sectors of the economy and society, to achieve the transition to a climate-neutral economy. The European Green Deal[43] of December 2019 and the 2030 Climate Target Plan[44] of September 2020 set a strategic framework for a climate-neutral EU economy by 2050, ensuring a just transition. To this end, the European Green Deal calls for a 90% reduction in transport emissions by 2050, in line with the analysis underpinning the long-term vision for a climate-neutral economy by 2050 and representing a different ambition compared to the GHG emission reduction goals of the White Paper.

The European Green Deal also aims to protect, conserve and enhance the EU's natural capital, and protect the health and well-being of people from environment-related risks and impacts, through the zero-pollution ambition for a toxic free environment.

4. METHOD

4.1. Short description of methodology

This evaluation focuses on a period between March 2011 and December 2020. It looks at the extent to which the White Paper has helped the EU transport system achieve the overall goal of EU transport policy, i.e. to help establish a transport system that underpins European economic progress, enhances competitiveness and offers high quality mobility services while using resources more efficiently. It examines to what extent the White Paper succeeded in addressing the three underlying objectives: 1) reducing GHG emissions, 2) reducing the oil dependency for transport-related activities and 3) limiting the growth of network congestion. The Commission’s assessment builds on an internal analysis of action implementation; external input, such as the stakeholder consultation; and an external support study. It reflects the Commission’s ongoing work and expert views, as well as documented sources.

[41] SESAR is the Single European Sky Air Traffic Management Research project.
[42] COM(2018) 773 final.
[43] COM(2019) 640 final.
[44] COM(2020) 562 final.

A support study has been carried out by an external consultant to provide data collection and analysis for this evaluation. The aim of the support study has been to provide an independent evidence-based assessment of the implementation of the actions of the White Paper between 2011 and 2019. The support study has been carried out between September 2019 and December 2020.

4.2. Data collection and analysis

The main research tools have included:

- Literature review to support the analysis of the evaluation questions. This has helped address evidence needs and gaps as they emerged and to extract relevant input to answer the evaluation questions.

- Data and information collected from European Commission services to establish the current status of implementation of the White Paper at EU level, including any changes and progress to date. In total, inputs covering 104 initiatives from 35 action points have been received.

- Data on the progress on the implementation of the White Paper at the Member State level (or by other actors where relevant). Data have been gathered, partially through requests to Commission desk officers, partially through two targeted online surveys among national authorities and among regional and local authorities. Targeted interviews with stakeholders from industry associations, transport service users (consumers), non-governmental organisations and international organisations, including EU institutions and bodies, have gathered input to the replies to the evaluation questions. A web-based open public consultation from July to September 2020 has gathered additional data and input from stakeholders to feed into the analysis of the evaluation.

Two scenarios have been quantified to assess the impact of the White Paper policies. The model-based assessment has been carried out using the PRIMES-TREMOVE transport model.

The two scenarios quantified are:

- The Baseline scenario, which denotes a possible trajectory of the EU transport system up to 2050 without additional policies assumed beyond 2011. This scenario provides an update of the Baseline scenario of the impact assessment accompanying the 2011 White Paper, taking into account the revised macro-economic framework, fuel price projections and technology costs assumptions.
- The Alternative scenario, which presents the evolution of the transport system until 2050 taking into consideration the initiatives adopted following the 2011 White Paper. The cut-off point for policy measures included in this scenario is end of 2018.

It is not possible to assess with certainty which initiatives have been adopted due to the decisive impetus produced by the 2011 White Paper and which initiatives would have been adopted even in its absence. Therefore, the comparison between the "Baseline" and the "Alternative" scenario provides insights in the expected maximum impacts up to 2050 as a result of the White Paper. Key modelling results have been used to reply to the evaluation questions, for the expected impacts by 2030 and 2050.

In line with the European Commission's guidelines for evaluations,[45] the evaluation includes an assessment of the White Paper against the Better Regulation guidelines using a number of evaluation questions, as set out in the evaluation roadmap.[46]

4.3. Limitations and robustness of findings

The methodology can be considered robust, since it relies on the triangulation of multiple sources of evidence and views with a wide set of analytical and methodological tools, including extensive desk research, data requests to various Commission services, strong stakeholder engagement through open and targeted consultations and quantitative modelling, which are considered to lead to robust findings in terms of evidence. Nevertheless, the support study has faced some limitations in the data collection, which could only partially be compensated.

4.3.1. Desk research

To establish the current status of implementation of the White Paper at the EU level, including any changes and progress to date, data have been collected from European Commission services. However, some initiatives refer to areas where the EU has no regulatory competence and implementation depends on the national or subnational level, or the social partners. The collection of information concerning these initiatives has proven to be challenging. Data gaps on the implementation status have largely been filled by desk research. Due to the nature of the White Paper being a broad policy strategy, it has proven challenging in some areas to attribute clear causal effects to the White Paper, given that other initiatives and factors in other policy areas (e.g. taxation) may have had impacts on the same areas.

4.3.2. Field research

Two online surveys have been developed. They have aimed at national authorities and regional, local and city authorities, respectively. These have been launched on 13 December 2019 and have remained open until 31 March 2020. Despite several reminders and contacts with umbrella organisations of regional and local authorities, only 17 responses have been received to the national authority survey and eight responses to the

[45] http://ec.europa.eu/smart-regulation/guidelines/toc_guide_en.htm

[46] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/2080-Evaluation-of-the-2011-White-Paper-on-Transport

regional authority survey. For the national authority survey, several national authorities have provided two responses, on behalf of different ministries within the Member State. As the responses had not been coordinated, and offered differing insights, both sets of responses have been included in the analysis.

The web-based open public consultation, on the other hand, has been received with a lot of interest among stakeholders, including public authorities, business organisations, trade unions and representatives of civil society and research. By the closure of the open public consultation, 684 replies have been submitted.

Following the closure of the targeted consultation and open public consultation, the results were incorporated into the evaluation question responses, to ensure that the views of key stakeholder groups were accounted for in the context of the evaluation. The consultation results were used to support the development of evaluation question responses, building on the findings from the modelling activities, desk research and indicator data.

5. ANALYSIS AND ANSWERS TO THE EVALUATION QUESTIONS

5.1. Effectiveness

5.1.1. Evaluation question #1: What progress has been made towards the objectives (both general and specific) and the headline goals of the White Paper? What has been the progress towards less oil-dependency, less congestion and less GHG emissions in terms of these objectives?

The reply to this question assesses the progress towards the specific objectives of the White Paper of reducing GHG emissions from transport, decreasing oil dependency and limiting the growth of congestion.

In addition, it evaluates the progress towards the ten headline goals set to achieve the reduction of GHG emissions from transport by 60% by 2050 compared to 1990 levels.

The analysis also attempts to measure progress in the achievement of the other objectives of the White Paper in terms of competitiveness of the EU transport sector, accessibility (i.e. satisfaction of mobility needs for passengers and freights), provision and quality of transport services (i.e. offering affordable, reliable, safe and secure transport services) and minimization of the remaining external costs of transport (i.e. accidents, noise and air pollution).

5.1.1.1. What progress has been made towards the specific objective of reducing the GHG emissions from transport by 60% by 2050 compared to 1990?

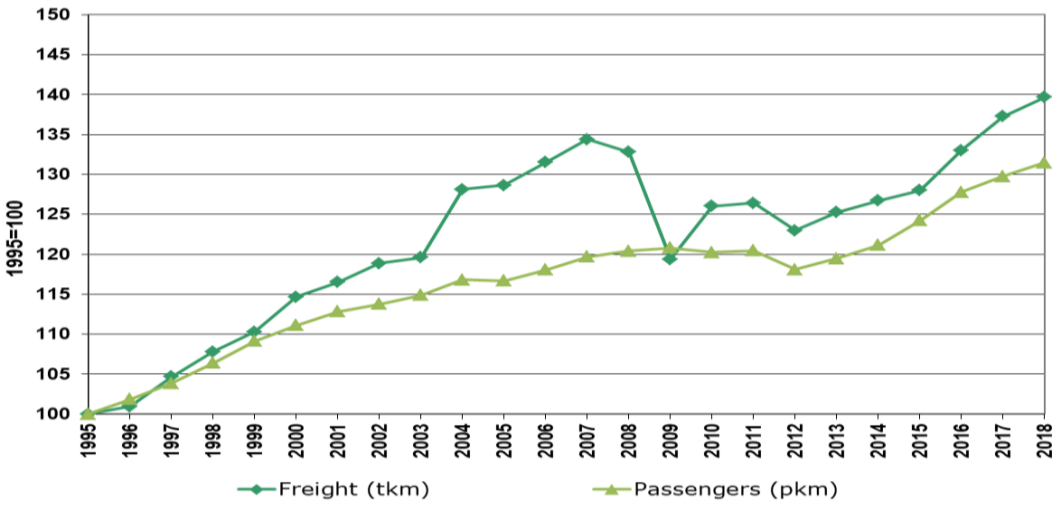
The overall goal set out in the White Paper is to reduce GHG emissions from transport (including international aviation but excluding international shipping) by 2050 to a level that is 60% below that of 1990. This includes the intermediate goal for 2030 of reducing greenhouse gas emissions from transport by 20% compared to 2008 levels. It is to be

noted that the White Paper does not assume a linear trajectory of emission reductions, but expects increased decarbonisation efforts after 2030, cleaner and more efficient technology becoming gradually more widespread. Similarly, emissions from international shipping are to be reduced by 40% (if feasible 50%) from 2005 levels by 2050.

Data from the European Environment Agency (EEA) show that in 2018 GHG emissions from transport in the EU-27 (including international aviation but excluding international shipping) have been still 32% above 1990 levels and that to meet the 60% greenhouse gas emission reduction target of the White Paper they need to fall by two-thirds by 2050.

Despite a decline between 2008 and 2013, GHG emissions from the EU-27 transport sector (including aviation and excluding international shipping) have been increasing since 2014 in the context of a period of low oil prices. The trend in emissions is also in line with transport activity of both passenger and freight, which has plateaued between 2007 and 2013 and has grown up again from 2014 onwards (see Figure 1).

Figure 1: Transport activity growth 1995-2018, EU-27



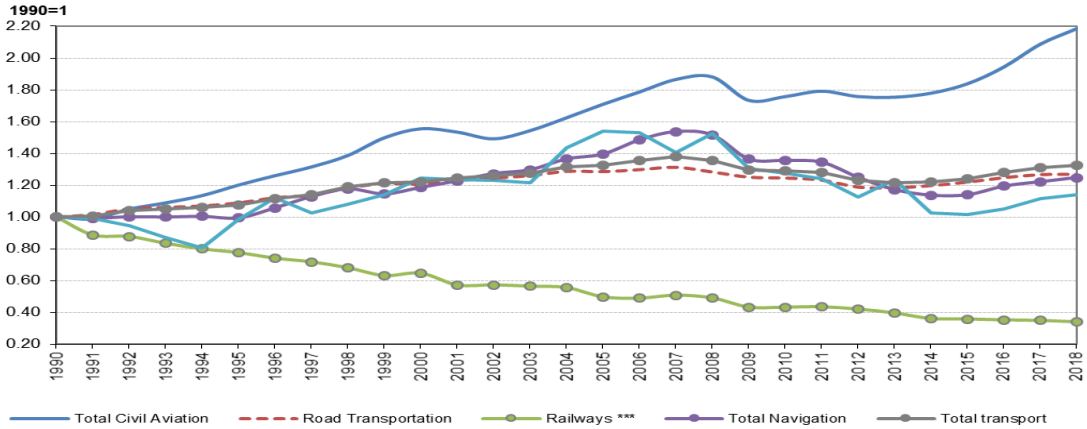
Source: European Commission: EU Transport in Figures. Statistical Pocketbook 2020.
Passenger transport includes passenger cars, powered two-wheelers, buses & coaches, tram & metro, railways, intra-EU air and sea. Freight transport includes road, rail, inland waterways, oil pipelines, intra-EU air and sea.

In comparison to 1990 levels, GHG emissions from international aviation have more than doubled (+141%), followed by increases in international shipping (+36%) and road transport (+27%) emissions. Emissions from aviation account for about 3% of the EU's total GHG emissions.[47]

[47] Based on EASA (2019): European Aviation Environmental Report 2019.

Compared with 2005, EU-27 GHG emissions from international shipping have been 10% lower in 2018. However, they will need to decrease by at least 56% by 2050 in order to meet the White Paper goal of a 40% reduction (if feasible 50%) in emissions from 2005 levels.

Figure 2: GHG emissions from transport by mode, including international bunkers: EU-27



Source: European Commission (2020): EU Transport in Figures. Statistical Pocketbook 2020. Including international bunkers and indirect CO_2 but excluding LULUCF.

5.1.1.2. What progress has been made towards the specific objective of decreasing the oil dependency ratio of transport-related activities by 2050?

According to Eurostat, in 2018 the EU-27 transport sector has been dependent on oil for 93% of its energy needs. Oil dependency has been slightly but gradually decreasing from 98% in 1990 and 95% in 2010. Transport remains one of the most oil dependent sectors of the economy.[48]

Gas oil and diesel oil have provided the highest share of fuels used in transport[49] in 2018. The increase in the use of electricity and biofuels in transport has been a main determinant of the decrease in fossil fuel dependency in recent years. Biofuels have accounted for 15.5 million tonnes in 2018, with a 23% increase in the 2011-2018 timeframe. The use of electricity in transport has registered a limited growth of about 2% during the same period.[50]

5.1.1.3. What progress has been made towards the specific objective of limiting the growth of congestion?

The cities of Rome, Berlin and Paris are among the most congested cities in the EU, as reported by the 2019 *INRIX Global Traffic Scorecard*.[51] In terms of hours lost yearly in

[48] Source: Eurostat, including international maritime transport.
[49] Including international maritime transport.
[50] Source: Eurostat.
[51] Source INRIX (2019): Global Traffic Scorecard. Intelligence that Moves the World.

congestion, the ranking places Rome first in the EU-27 (254 hours/year), followed by Paris (237 hours/year), and Berlin (154 hours/year).

The 2018 *Tom-Tom Traffic Index* shows how congestion has generally grown globally during the last decade. The comparison with the 2013 Traffic Index shows how congestion has evolved in a sample of European cities. Only 10 out of 57 cities have somehow improved their congestion levels. On the contrary, congestion has increased on average by 5% in most of the other cities, while in Budapest, Genoa, Lisbon and Barcelona, congestion has increased by 11%. Dublin is the city that has registered by far the largest deterioration of its congestion level (16%).[52]

A 2019 study for the Commission provides estimates on overall congestion costs for road transport (passenger and freight): for the year 2016, delay costs have accounted to 228 billion euro/year.[53]

Congestion does not only affect the road sector, but also air and rail transport.[54] In the period 2013-2015, air traffic in the continent has grown at a 5.5% yearly rate. In 2017, 1 043 million people have chosen to travel by air, a 7% increase compared to 2016.[55] *Airbus* has estimated that 30 airports in Europe would have surpassed their current capacity by 2020.[56] However, in light of the Covid-19 pandemic this estimation would need to be reviewed. Passenger traffic at selected major European airports (London Heathrow, Paris Charles de Gaulle, Frankfurt am Main, Amsterdam Schiphol, Madrid Barajas) has increased by an average 17% between 2012 and 2017. As estimated by Eurocontrol, total costs for delays in the countries of the European Civil Aviation Conference (ECAC) in 2018 have accounted to about 14.5 billion euro, mainly due to air traffic control staff shortages, capacity issues, strikes, bad weather and technical issues.[57]

5.1.1.4. What progress has been made towards the ten headline goals of the White Paper?

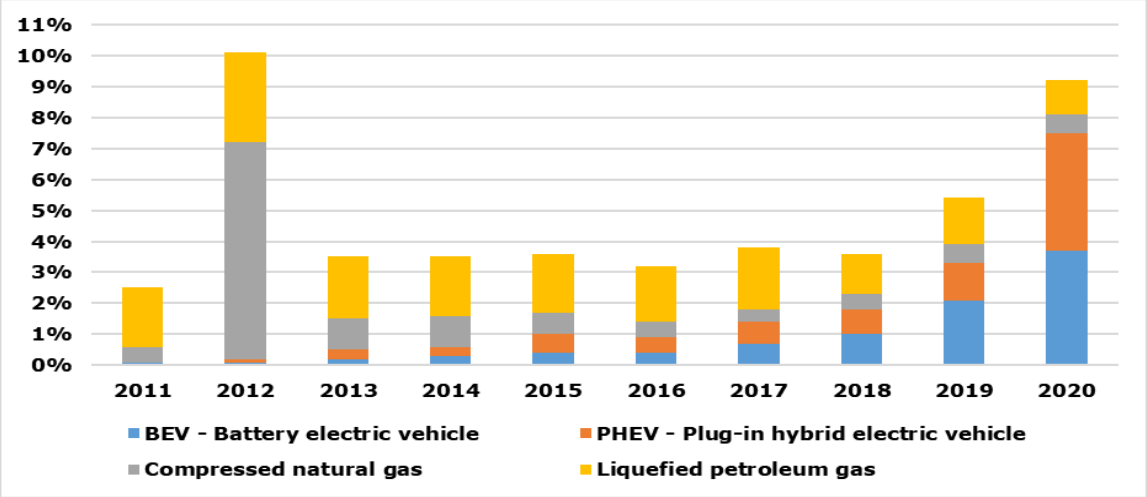
Goal 1: Halve the use of 'conventionally-fuelled' cars in urban transport by 2030; phase them out in cities by 2050; achieve essentially CO_2-free city logistics in major urban centres by 2030.

The number of new registered passenger cars powered by alternative fuels has been generally increasing in the EU-27 during the last years: between 2011 and 2020 (30 October) they have grown from 2.5% to 9.2% with a strongly increasing trend since 2018 especially for battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs).[58]

[52] Data source: Tom-Tom.
[53] The delay cost gives a value of the travel time lost relative to a free-flow situation. Source: CE Delft (2019): Handbook on the External Costs of Transport.
[54] Congestion in rail transport means that a rail network's capacity is exhausted. Delays in train schedules are not qualified as congestion.
[55] Source: Eurostat: https://ec.europa.eu/eurostat/statistics-explained/index.php/Air_transport_statistics
[56] Source: Airbus (2014): Global Market Forecast 2014-2033.
[57] Source: CE Delft (2019): Handbook on the External Costs of Transport.
[58] Source: European Alternative Fuels Observatory (EAFO).

These figures refer to the overall fleet, independently whether the vehicles are used for urban or non-urban transport.

Figure 3: Share of alternative fuel vehicles in total new passenger car registrations, EU27, 2011-2020



Source: European Alternative Fuels Observatory, AF Market Share New Registrations M1.

However, alternative fuel vehicles still make up for a relatively small share of the total passenger fleet and have a lower registration rate compared to conventionally fuelled vehicles. Leaving aside the strong increase in market share of alternative fuel vehicles in 2020 (which has also been due to the decline in sales of conventional cars), in 2019, the share of alternative fuel cars in new registrations of passenger cars has ranged from 11% in the Netherlands to 0.5% in Lithuania.[59]

As regards the goal of halving the use of conventionally fuelled cars in urban transport, a majority of regional authorities surveyed in the context of the external support study have admitted not having adopted specific measures in the field since the adoption of the White Paper in 2011.[60] Hundreds of European cities have urban vehicle access regulations. Entry can depend on vehicle emission, vehicle types and other factors. However, these entry regulations are often under the competence of local (not regional) authorities which have not been surveyed for this evaluation.

More specifically, while regional authorities have admitted lagging behind (only 2 out of 8 regional authorities have registered measures to halve the number of conventionally fuelled cars in cities), a slight majority of national authorities have considered having adopted relevant measures.

Cities in the EU are moving towards CO_2-free city logistics, an objective that the Commission has planned to achieve by 2030. This is expressed through an increasing number of low-emission zones that are installed in cities and urban agglomerations. The number of buses that are powered with alternative fuels has increased from 3 500 in 2011

[59] Source: European Alternative Fuels Observatory (EAFO).
[60] This does not preclude that they might have adopted measures to support the uptake of low and zero emission vehicles in general, even if not specifically targeted on urban transport.

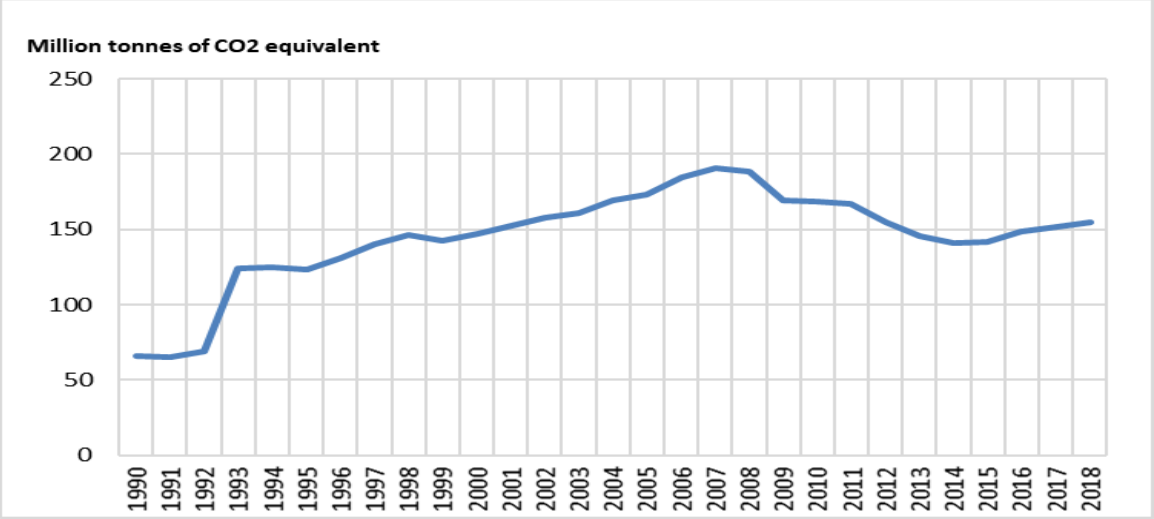
to 28 000 in 2020 in the EU (although not exclusively in urban areas). The market share of alternative fuel powered light commercial vehicles (N1) has increased from 0.7% to 2.1%. Nevertheless, urban freight transport accounts for 10% to 15% of total kilometres travelled, for about 25% of urban transport GHG emissions and 30% to 50% of all transport-related pollutants, such as particulate matter and NOx.[61]

Goal 2: Low-carbon sustainable fuels in aviation to reach 40% by 2050; also by 2050 reduce EU CO_2 emissions from maritime bunker fuels by 40% (if feasible 50%).

In recent years, the introduction of sustainable fuels and electro fuels have gained interest in air transport. To date, this potential remains however largely untapped as current production and use of SAF is close to 0.05% of total jet fuel consumption in the EU. Blended biofuels (a combination of kerosene and biofuels) are however only making up a very low share of total fuel uplift.[62] In 2018, global biofuel production has accounted for 15 million litres, hence only 0.1% of total aviation fuel consumption.[63]

According to EEA data, GHG emission from international maritime transport in EU-27 have been about 8% lower in 2018 relative to 2011. However, an increase of about 9% has been registered between 2015 and 2018 due to an increase in maritime transport activity, also linked to increased trade. Emissions are consequently expected to grow also in the coming years, if global trade continues to grow after the Covid-19 pandemic.

Figure 4: GHG emissions from inland waterways, national maritime and international maritime transport, EU-27, 2011-2018



Source: European Commission (2020): EU Transport in Figures. Statistical Pocketbook 2020.

[61] European Commission (2017): Final Report on The Use of Environmentally Friendly Freight Vehicles. Non-Binding Guidance Documents on Urban Logistics N° 5/6.
[62] https://www.iea.org/newsroom/news/2019/march/are-aviation-biofuels-ready-for-take-off.html.
[63] Idem.

Goal 3: 30% of road freight over 300 km should shift to other modes such as rail or waterborne transport by 2030, and more than 50% by 2050, facilitated by efficient and green freight corridors. To meet this goal will also require appropriate infrastructure to be developed.

Road transport continues to have the largest share of EU freight transport performance among inland transport modes. In 2018, road transport has accounted for 75% of the total inland freight transport (based on tonne-kilometres performed). The share of road has constantly increased between 2013 and 2018. By contrast, the share of rail in the inland transport performance has remained relatively stable since 2013 and below 20%. Between 2013 and 2018, the share of inland waterways in EU freight transport has constantly decreased from 7.4% to 6.0%.[64]

It should be kept in mind that the modal split and the associated shares of each transport mode are calculated with the total transport performance by the inland modes as denominator. This means that an increasing share of one mode does not necessarily express a higher transport performance for that mode. Instead, this may be a result of noticeable drops in other modes.

Road transport performance has been 12.7% higher in 2018 than in 2013. In contrast, over the same period the transport performance has decreased by -11.5 % for inland waterways but has increased by 10.5% for rail. Also the overall inland freight transport performance in the EU has increased by 10.5% in 2018 compared with 2013. It appears that rail freight in the EU keeps its share in an increasing freight performance, whereas road freight benefits more from the overall performance increase.[65] This could be due to a longer-term trend towards more flexible just-in-time deliveries and more demand for home deliveries of smaller volumes directly to end consumers.

Goal 4: By 2050, complete a European high-speed rail network. Triple the length of the existing high-speed rail network by 2030 and maintain a dense railway network in all Member States. By 2050 the majority of medium-distance passenger transport should go by rail.

The length of high-speed rail lines in the EU-27 has generally extended between 2010 and 2018. In specific terms, 2 634 km of new lines have been added to the 2010 European high-speed rail network reaching the length of 8 839 km in 2018.[66] This figure shows that EU countries are seeking to reach the objective of completing a European high-speed rail network, however efforts have so far resulted in limited improvements. The network represents currently about 50% of what would be its expected length after tripling it by 2030.

In the EU-27, the share of total rail passenger transport activity (in total passenger-kilometres) performed with high speed trains has only increased by 2.5 percentage points

[64] Source: Eurostat (2020): Statistics Explained. Freight transport statistics – modal split. https://ec.europa.eu/eurostat/statistics-explained/index.php/Freight_transport_statistics_-_modal_split
[65] Source: Eurostat (2020): Statistics Explained. Freight transport statistics – modal split.
[66] European Commission (2020): EU Transport in Figures. Statistical Pocketbook 2020.

between 2011 and 2018. However, over the same period the performance of rail passenger transport in terms of passenger-kilometres travelled has increased by 11.2%, more than the average for all passenger transport modes (9.2%). The respective performance increases of passenger cars and aviation have been 7.6% and 39.1%. In the modal split for passenger transport, passenger cars are still by far the most important transport mode.[67]

Goal 5: A fully functional and EU-wide multimodal TEN-T 'Core Network' by 2030, with a high quality and capacity network by 2050 and a corresponding set of information services.

About 126 700 line-km of Core Network infrastructure are included in the framework of the EU-wide multimodal TEN-T Comprehensive Network.

According to the progress report on the implementation of the TEN-T Network in 2016 and 2017,[68] the current state of implementation of TEN-T transport infrastructure at the level of the Core Network Corridors, in terms of compliance with the TEN-T Regulation requirements, reaches between 81% and 100% for most (ten out of 13) of the available indicators. This analysis needs to be put in the context of partly limited technical TEN-T standards compared to the real needs on the ground.

To give a concrete example: for the railway infrastructure network, compliance is already reached to a large extent in terms of electrification (89%), track gauge (86%), freight line speed (86%) and freight axle load (81%), whereas freight train length (43%) and especially the deployment of the European Rail Traffic Management System (ERMTS) (11%) are still lagging behind. However, a line may be fit for 740m train length but does not have enough sidings to ensure full interoperability in practice.

As for roads, the compliance with the criteria of express road/motorway is completely reached (100%). However, parts of the network may not have been maintained properly for a certain period, rendering a nominally compliant road not up to operational and safety standards.

The inland waterways are almost fully compliant with respect to RIS implementation (98%).

Goal 6: By 2050, connect all core network airports to the rail network, preferably high-speed; ensure that all core seaports are sufficiently connected to the rail freight and, where possible, inland waterway system.

In 2017, 89% of the core maritime ports are connected to rail, while the rail connection of airports lags a bit behind at 67%.[69]

[67] Idem.
[68] COM(2020) 433 final.
[69] Source: TENTec.

Goal 7: Deployment of the modernised air traffic management infrastructure (SESAR) in Europe by 2020 and completion of the European Common Aviation Area. Deployment of equivalent land and waterborne transport management systems (ERTMS, ITS, SSN and LRIT, RIS). Deployment of the European Global Navigation Satellite System (Galileo).

The SESAR innovation cycle is an essential component of an innovation and deployment strategy for air traffic management where new concepts flow from the definition phase to their deployment in the operational environment. Prior to 2014, the deployment of air traffic management components was done in a fragmented manner. As of 2014, major innovative air traffic management solutions with a high network value have been grouped in legally binding 'common projects' that are being deployed in a synchronised manner by the deployment manager and funded under the CEF programme. This new and relatively recent framework is a major step compared to past deployment initiatives.

European countries (including the EU, the United Kingdom, Switzerland and Norway) have so far put in operation the European Train Control System (ETCS) on some 8 850 km of tracks, most of them equipped also with GSM-R, of which 69% belong to Core Network Corridors. This means that almost 7% of the 128 300 km of European comprehensive network are currently in operation with ERTMS technologies.[70]

In terms of waterborne transport management systems, a recent evaluation of the River Information System (RIS) Directive[71] highlights that RIS technologies have been implemented in all relevant Member States, however with degrees of difference in relation to their conformity to the standards prescribed by the Directive. With the support of the CEF Monalisa[72] and FP7 EfficienSea2[73] projects, integrated sea traffic monitoring and maritime cloud service have become operational in the Baltic Sea. In 2016, almost 99% of the EU, Norway and Switzerland land masses was covered by services offered by the European Geostationary Navigation Overlay System (EGNOS), specifically the EGNOS Safety of Life Services.

Goal 8: By 2020, establish the framework for a European multimodal transport information management and payment system.

In line with Directive 2010/40/EU,[74] Member States have provided national reports on intelligent transport systems implementation. According to the reports and to national authorities, as of 2017, all 27 Member States and the United Kingdom have adopted specifications to ensure multimodal transport information and ticketing. In 2011, only 7 Member States adopted such a specification.

The development and implementation of integrated ticketing schemes is still heterogeneous across Member States and may diverge significantly throughout regions of

[70] Source: TENTec.
[71] Directive 2005/44/EC of the European Parliament and of the Council of 7 September 2005 on harmonised river information services (RIS) on inland waterways in the Community, OJ L 255, 30.9.2005, p. 152–159.
[72] https://www.seatrafficmanagement.info/
[73] https://efficiensea2.org/
[74] Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport, OJ L 207, 6.8.2010, p. 1–13.

the same country. Barriers and challenges to an EU-wide integration of ticketing schemes are mainly related to data access and cooperation between stakeholders.[75]

Goal 9: By 2050, move close to zero fatalities in road transport. In line with this goal, the EU aims at halving road casualties by 2020. Make sure that the EU is a world leader in safety and security of transport in all modes of transport.

The number of road deaths has decreased by 43% between 2001 and 2010 and by another 23% between 2010 and 2019. This shows that progress in reducing road fatalities in the EU has slowed down in recent years[76]. In 2019, 22 800 people have lost their lives on EU roads and about 135 000 have been seriously injured. The mid-term goal of halving the number of road deaths between 2010 and 2020 is likely to not be met.[77]

Goal 10: Move towards full application of "user pays" and "polluter pays" principles and private sector engagement to eliminate distortions, including harmful subsidies, generate revenues and ensure financing for future transport investments.

External costs[78] of transport refer to the difference between social costs (i.e. all costs to society due to the provision and use of transport infrastructure) and private costs of transport (i.e. the costs directly borne by the transport user).

The external and infrastructure costs of transport are, without policy intervention, generally not borne by the transport users and hence not taken into account when they make a transport decision. By internalising the external and infrastructure costs (i.e. making these costs part of the decision-making process) the efficiency of the transport system can be increased. This concept is at the basis of the application of the "user pays" and "polluter pays" principles.

The application of the "user pays" and "polluter pays" principles is here examined through the cost coverage ratio for each mode of transport, namely how much external and infrastructure costs are covered by taxation and other charges, as calculated in the 2019 study for the Commission 'State of play of Internalisation in the European Transport Sector'.

Table 1 below compares costs (external and variable infrastructure costs[79]) and revenues (taxes and charges) for each mode of transport in the EU (including the United Kingdom). It can be noted that internalisation of external costs is higher in rail (69%) and

[75] VVA et al. (2019): Remaining Challenges for EU-wide Integrated Ticketing and Payment Systems.
[76] European Commission (2020) EU Transport in Figures. Statistical Pocketbook 2020.
[77] EU Road Safety Policy Framework 2021-2030 - Next steps towards "Vision Zero" {SWD(2019) 283 final}. In 2020, massive reductions in traffic volumes due to COVID-19 related restrictions are likely to result in a number of road fatalities that is much lower than expected. However, even under these exceptional circumstances, it is unlikely that the goal will be reached.
[78] External costs include accidents, air pollution, climate change, noise, congestion, well-to-tank (WTT) emissions and habitat damages. Infrastructure costs pertain to infrastructure use and maintenance.
[79] Several cost coverage indicators can be assessed. There are good economic reasons to exclude fixed infrastructure costs from the calculation. This is also in line with the White Paper objective to recover wear and tear costs via user charges.

road transport (56%), compared to aviation (37%), inland water transport (12%) and maritime transport (4%)[80] [81].

Table 1: Total external and infrastructure costs vs. total taxes and charges, 2016, EU incl. UK

	Road	Rail	IWW	Maritime	Aviation
External Costs	€596bn	€17.88bn	€2.90bn	€43.63bn	€32.87bn
Variable Infrastructure Costs	€30.9bn	€10.6bn	€0.2bn	€0.04bn	€4.6bn
Taxes & Charges	€349.97bn	€19.58bn	€0.37bn	€1.83bn	€13.86bn
Cost Coverage Ratio	**56%**	**69%**	**12%**	**4%**	**37%**

Source: CE Delft (2019): State of Play of Internalisation in the European Transport Sector.
Congestion costs used in this table are the deadweight[82] costs and not the total delay costs. Maritime and aviation costs only cover a sample of ports and airports.

If fixed infrastructure costs are included, then road is the mode with the highest internalisation of external costs (45%).

In the framework of the White Paper programme, the new Directive on interoperability of electronic toll systems[83] is to be transposed by, and the ensuing national provisions are to apply from October 2021 and should ensure more efficient functioning of the European Electronic Toll Service, thereby reducing costs to Member States and road users. The new rules will also make the case of introducing modern and differentiated charging schemes more appealing, thus contributing to the wider application of the "polluter pays" principle.

As part of the revision of the rules on road pricing (the Eurovignette Directive)[84], the Commission has proposed to include cars, vans, buses and coaches in the scope of the Directive, extend the use of differentiated distance-based tolling, require the variation of charges based on the CO_2 emissions of vehicles, and allow proportionate and non-discriminatory congestion charging. While the European Parliament has adopted its position in October 2018, Member States have note found a common position until late in 2020.

[80] CE Delft (2019): State of play of Internalisation in the European Transport Sector.
[81] Overall, road is the mode paying the highest share of its total costs, less than 50%. However, there are good economic reasons to exclude fixed infrastructure costs.
[82] The delay cost gives a value of the travel time lost relative to a free-flow situation. The deadweight loss costs is the part of the delay costs which is regarded as a proper basis for transport pricing and amounts to about one sixth of the delay cost (39 billion euro in 2016).
[83] Directive (EU) 2019/520 of the European Parliament and of the Council of 19 March 2019 on the interoperability of electronic road toll systems and facilitating cross-border exchange of information on the failure to pay road fees in the Union, OJ L 91, 29.3.2019, p. 45–76.
[84] COM(2017) 275 final.

5.1.1.5. *What progress has been made towards the general objectives of the White Paper in terms of helping to establish a transport system that underpins European economic progress, enhances competitiveness and offers accessible high quality mobility services while using resources more efficiently?*

One of the key area of intervention of the White Paper is the completion of the Single European Transport Area with a view to underpinning economic progress and making the sector more competitive. The 4th Railway Package and other initiatives in the rail sector under the White Paper have led to considerable market opening. According to the Rail Market Monitoring Report of the Commission,[85] on average in the EU countries the market shares of competitors to the incumbent rail undertaking have increased between 2011 and 2016 from 19% to 25% for passenger rail transport and from 26% to 39% for freight rail transport. Although, for long-distance coach services, the opening to competition is less advanced, several countries in the EU have nevertheless opened their markets over the last years. The Blue Belt initiative and the European Maritime Single Window, as well as the Single European Sky initiative and the SESAR programme have considerably contributed to integrating the maritime and aviation transport markets and to reduce administrative burden for transport operators in these sectors.

Evidence from the targeted stakeholder consultation show that the quality of working conditions for those employed in the transport sector is perceived as generally improved since the launch of the White Paper: out of 61 respondents, 20 noted a slight to significant improvement, 11 noted no change, 7 noted slight deterioration and 2 noted significant deterioration. Civil society and research organisations are the group of respondents with the most negative viewpoint, with none out of its 8 respondents noting an improvement, whilst national and regional authorities tend to have the most positive views. New developments like automation and digitalisation are seen as potentially heavily impacting on jobs and future working conditions in transport as new technologies can create, replace, change, facilitate and re-organise labour. This process may be reinforced by new mobility service providers with disruptive business models.

Affordability of transport has not changed substantially between 2011 and 2018 in the EU-27. According to Eurostat data, the share of total household income spent on transport-related goods and services has remained basically unchanged throughout the years.[86]

Consumers' satisfaction with rail services in the EU (with the exclusion of Malta and Cyprus, but including the United Kingdom) is high with the overall ease of buying tickets and the quality of information about timetables and platforms (respectively 75% and 74% of users in 2018 have been either satisfied or very satisfied, losing 4 and 2 percentage points compared to 2011 levels). But only 64% have been happy with the availability of tickets for journeys using several trains and 62% for journeys using several transport modes.

[85] COM(2019) 51 final.
[86] Source: Eurostat data series 2019: Final consumption expenditure of households by consumption purpose (COICOP 3 digit) [nama_10_co3_p3].

Between 2011 and 2018, satisfaction with availability of seats, availability of parking facilities for cars and bikes at stations, cleanliness and maintenance of stations, ease and accessibility of complaint handling has been generally growing. On the other hand, users have been losing satisfaction with the quality of information on connecting services with other modes, frequency of trains, punctuality and reliability, provision of information during the journey and assistance on trains.[87]

As part of the White Paper initiatives, passenger rights are defined at EU level. The Commission has already stepped up efforts to make passenger rights clearer, and to raise awareness about these rights. According to a Eurobarometer survey,[88] 32% of all respondents know passenger rights exist in the EU, for air, rail, coach or ship or ferry transport. The percentage of travellers who feel they have been well informed about their rights by transport companies before travelling varies by transport mode: 40% for air passengers, 29% for ship or ferry passengers, 26% for rail passengers and 26% for coach passengers.

Of those who have experienced air travel disruption over the last 12 months, 53% have indicated that the airline has offered some form of help, whether passengers complained or not. Only 43% of rail passenger respondents, and 38% who had travelled by coach, ship or ferry indicated that transport companies have offered help in case of disruptions.

A large majority (81%) of those who have at some point requested assistance for a person with a disability or reduced mobility declare themselves satisfied with the transport company's response. Fewer (60%) express satisfaction when more than one mode was used.

Safety standards for all vehicle types have been significantly increased by the new General Safety Regulation[89] and, combined with improvements in infrastructure safety thanks to the revised Road Infrastructure Safety Management Directive[90] and other initiatives. This, together with other measures, should provide positive effects also in the future.

The majority of stakeholders surveyed envisages progress, although limited, in the reduction of external costs to society due to transport. However, it is hard to determine the extent of the progress. This is also due to the complexity of the factors surrounding

[87] Source: Eurobarometer surveys 2011, 2013, 2018.
[88] Eurobarometer 2019/485 (fieldwork: February 2019 - March 2019, published: January 2020) on Passenger rights.
[89] Regulation (EU) 2019/2144 of the European Parliament and of the Council of 27 November 2019 on type-approval requirements for motor vehicles and their trailers, and systems, components and separate technical units intended for such vehicles, as regards their general safety and the protection of vehicle occupants and vulnerable road users, amending Regulation (EU) 2018/858 of the European Parliament and of the Council and repealing Regulations (EC) No 78/2009, (EC) No 79/2009 and (EC) No 661/2009 of the European Parliament and of the Council and Commission Regulations (EC) No 631/2009, (EU) No 406/2010, (EU) No 672/2010, (EU) No 1003/2010, (EU) No 1005/2010, (EU) No 1008/2010, (EU) No 1009/2010, (EU) No 19/2011, (EU) No 109/2011, (EU) No 458/2011, (EU) No 65/2012, (EU) No 130/2012, (EU) No 347/2012, (EU) No 351/2012, (EU) No 1230/2012 and (EU) 2015/166, OJ L 325, 16.12.2019, p. 1–40.
[90] Directive (EU) 2019/1936 of 23 October 2019 amending Directive 2008/96/EC on road infrastructure safety management, OJ L 305, 26.11.2019, p. 1.

these developments. New ambitions outlined in the European Green Deal and the increased awareness of citizens could lead to significant progress by 2030.

5.1.2. Evaluation question #2: What is the expected progress by 2030 and 2050? How does this compare to what was initially expected in the impact assessment?

Specifically, to describe the expected impact of to the White Paper initiatives in combination with other EU policies in other sectors (e.g. environmental and energy policies) the external support study has modelled an 'Alternative' scenario, which includes policy measures adopted by the end of 2018 and quantifies their impact over time.

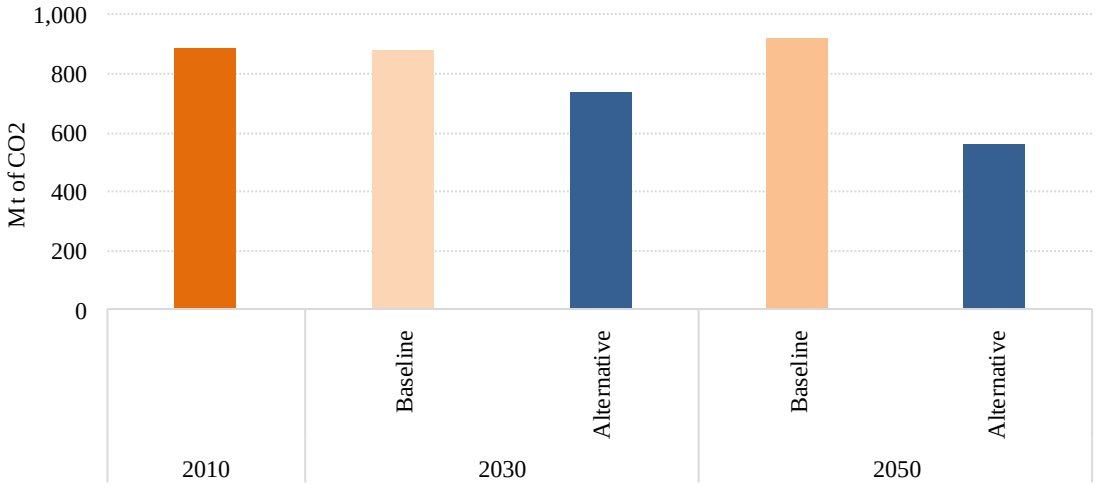
As explained above, it is not possible to assess with certainty which initiatives have been adopted following the 2011 White Paper and which initiatives would have been adopted even in its absence. However, the comparison between the 'Baseline' and the 'Alternative' scenario provides insights on maximum expected impacts of the White Paper by 2030 and 2050 on those indicators covered by the model. Results from the model are provided in the form of relevant indicators as identified in the evaluation matrix (Annex 6).

5.1.2.1. Expected progress on the three key goals

Results from the Alternative scenario show that for the EU-27 overall CO_2 emissions from transport (including international aviation, excluding international maritime shipping) would be 16% lower relative to the Baseline in 2030 and 39% lower in 2050. In particular, emissions from road transport in the Alternative scenario are projected to be 19% below the Baseline levels in 2030 and 46% lower in 2050. This is due to the CO_2 standards for new light duty vehicles and heavy duty vehicles post-2020, supported by the deployment of recharging and refuelling infrastructure, but also due to policies driving greater use of sustainable transport modes, such as for example the implementation of the TEN-T Core and Comprehensive Networks, or the 4th Railway Package.

Policies adopted after 2011 would contribute significantly towards the White Paper milestone for 2030 but fall short in delivering the 60% emissions reductions by 2050, showing around 40 percentage points gap relative to the target. In this context, it is important to note that the impact assessment accompanying the 2011 White Paper had assumed further intensification of policies after 2030, whereas the Alternative scenario only takes into account policies adopted by the end of 2018. The adopted policies would deliver additional emissions reductions after 2030 due to, for example, the turnover of the vehicle fleet and larger penetration of new vehicles which are subject to CO_2 standards, as well as the implementation of the Core TEN-T Network by 2030. However, their impacts would remain limited by 2050 in lack of additional policies or further intensification of existing policies.

Figure 5: CO2 emissions from transport in the Baseline and the Alternative scenario



Source: PRIMES-TREMOVE, E3 modelling.

The Alternative scenario projects substantial progress in reducing the oil dependency by 2050. Relative to the Baseline scenario, oil dependency would be about 17 percentage points lower by 2050 driven by the projected progress on electromobility, further electrification of rail and uptake of renewable and low carbon fuels. However, the transport sector is projected to still be dependent on oil and petroleum products for about 87% of its energy needs in 2030 and 77% in 2050.[91]

Concerning the objective of limiting the growth of congestion, projections show that in the EU-27 hours spent in road congestion annually will be growing compared to 2010 levels in both the Baseline and the Alternative scenarios. The Alternative scenario, accounting for policies adopted by the end of 2018, shows only limited decrease in the external costs of congestion relative to the Baseline (1.1% reduction in 2030 and 0.4% in 2050), driven mainly by greater use of more sustainable transport modes.

5.1.2.2. Expected progress on the ten headline goals

Progress is also expected by 2030 and 2050 towards the White Paper's 10 headline goals.

The current transport policies and measures would be sufficient to reach the objective of halving the use of 'conventionally-fuelled' cars in urban transport in the EU-27 by 2030, as defined at the time of the adoption of the 2011 White Paper[92], but not to phase them out by 2050. According to the Alternative scenario the share of transport activity of 'conventionally-fuelled cars' in the total urban passenger transport activity (expressed in passenger-kilometres) is projected to go down to 43% by 2030 but still be 16% in 2050. The decrease in their share is driven by both the uptake of electric vehicles and other alternative fuel vehicles, but also by the greater use of public transport.

[91] Oil dependency is calculated including international shipping.
[92] Conventionally-fuelled cars in this context refer to diesel and gasoline cars.

At the same time, the Covid-19 pandemic is likely to induce greater fear from infection when using public transport services. At this stage, long-term effects of the pandemic on the use of public transport in cities cannot be projected with certainty, but in the wake of the pandemic it could turn out to be challenging to increase the use of public transport. However, active modes, such as cycling and walking, might in the future contribute more than today to a more sustainable urban mobility.

As far as the goal of achieving essentially CO_2-free city logistics in major urban centres by 2030 is concerned, the responses obtained from interviews with stakeholders and survey of national authorities organised in the context of the support study show that a vast majority of respondents expect to have made some progress towards the goal, but not to achieve it by 2030.

The Alternative scenario further shows that, with current policies and measures in place, the goal of a 40% share of low-carbon sustainable fuels in aviation by 2050 will not be reached. The share of low-carbon sustainable fuels in aviation is projected to be below 3% of the fuel mix by 2050. In addition, the role of the White Paper initiatives in reducing the emissions from international maritime bunkers is expected to be minimal (1% reduction in 2030 and 2050 relative to the Baseline scenario).

Road transport is projected to maintain its dominant role in passenger and freight transport in the EU-27 in the Alternative scenario. However, the share of passenger rail is projected to increase by 1.6 percentage points in 2030 relative to the Baseline and by 2.3 percentage points in 2050. For rail freight the impact would be more significant showing an increase in its modal share by 3.1 percentage points in 2030 relative to the Baseline and by 5.6 percentage points in 2050. Inland waterways and national maritime is also project to gain 1.2 percentage points in terms of modal share in 2030 relative to the Baseline and 1 percentage point in 2050.

The goal of tripling the number of kilometres of high-speed rail lines by 2030 is unlikely to be reached. Approximately 8 840 km of high-speed lines are currently in use in EU-27 and around 1 460 km of lines were under construction in 2017. Achieving the goal set by the White Paper means reaching a length of about 19 000 km of high-speed railways by 2030. Considering that, on average, it takes around 16 years for new high-speed lines to proceed from the start of works to the beginning of operations, to achieve this goal would require significant efforts by Member States.

However, a significant increase in the passenger transport activity of high-speed rail in the EU-27 is projected in the Alternative scenario. The share of high-speed rail in total rail passenger transport activity would increase to around 38% by 2030 and 43% by 2050[93], 6 percentage points higher in 2030 and 9 percentage points higher in 2050 relative to the Baseline.

The Alternative scenario projects that the number of fatalities in the EU-27 would be decreasing by about 26% by 2030, and 30% by 2050 relative to 2010. The goal of

[93] An increase of 8 p.p. by 2030 and 13 p.p. by 2050 compared to 2010 levels.

moving close to zero fatalities in road transport by 2050 is thus not expected to be achieved.

5.1.3. Evaluation question #3: To what extent have the 40 action points, which are broadly covered by all the policy options in the impact assessment of the White Paper, contributed to reaching the objectives and headline goals of the White Paper?

The White Paper is a long-term strategy composed by 132 initiatives and 40 action points specifically designed to exert synergies between them and to deliver the results of the overall strategy. In most of the cases action points contribute to more than one objective and/or headline goal and this makes it not possible to isolate the contribution of a specific action from the contribution of the other actions in the achievement of the White Paper goals.

Therefore, the evaluation looks at the potential maximum overall impact of the White Paper as a whole (i.e. all 40 action points together) by means of quantitative results from the model used in the external support study. Since the quantitative impacts of the White Paper have been discussed in the replies to the previous evaluation questions, they are not replicated here. In a second step, a qualitative discussion on the contribution (direct and indirect) that action points may have in delivering the objectives and goals of the White Paper, highlights which actions are expected to play a more significant role.

As far as action points contribute more to reaching the objectives and headlines goals, it is not possible to perform a quantitative assessment of the impact of each action point by modelling it individually. Past modelling experience has indeed shown that assessing the impact of each action individually (i.e. out of a bundle of actions composing the strategy) is not methodologically sound. It would lead to an overestimation of the impacts of the actions, if their impacts would be simply added up (and the synergies of the policies and the potential overlapping effects would not be accounted for).

A qualitative analysis on the contribution (direct and indirect) that the 40 action points may have in delivering the objectives and goals of the White Paper, allows to conclude that, although they are conceived to deliver the EU transport strategy, not all of them are expected to contribute to achieving each of the specific objectives. Similarly, not all of them are expected to contribute meeting each of the headline goals.

Moreover, the policy measures in the White Paper are quite different in nature, objective and complexity. Some require physical investments; others are mainly a matter of setting (and enforcing) different rules; others are preparatory measures (i.e. guidelines or definition of standards) mainly intended to pave the way for subsequent actions, etc.

Therefore, according to the objective or goal, certain action points are expected to be more effective than others and it is not possible to conclude on the absolute importance of the actions irrespective of the goals to be achieved.

5.1.4. Evaluation question #4: Which factors and developments (e.g. digitalisation, mobility as a service, technology cost, etc.) have, negatively or positively, contributed to the achievement of the objectives and headline goals?

This evaluation question examines which and how external factors and developments have positively or negatively contributed to the achievements of the objectives and goals so far.

Whereas external factors and developments have been identified in preliminary desk research and to some extent have already been discussed in the implementation report of 2016 on the White Paper, the analysis of their positive or negative contribution is based on evidence collected from the targeted stakeholder consultation (i.e. surveys and interviews). In general, many of the trends and factors that have been identified are considered by stakeholders as still quite young for having significantly influenced the achievements of the White Paper so far. They may all have had an impact, but it is difficult to measure it at this stage. They are seen to play a major role in the future.

5.1.4.1. Digitalisation and new business models

Digitalisation appears as a two-sided trend, like automation. It can be considered one of the most important developments in the European transport landscape over the past years, as it is able to address many of the challenges faced by the transport sector such as emissions and congestion. However, at the same time, it could also prevent the shift towards collective modes of transport and lead to a negative impact on working conditions (since the expansion of online ride-hailing platforms). The need for a proper enforcement of existing EU and national labour regulations has been raised by respondents.

5.1.4.2. New technological trends

New business models in the sector, especially for mobility as a service (MaaS) and ride-sharing, are also considered relevant though no concrete development has been noted yet. The challenge they often bring lies in balancing the interests of service providers with those of operators and ensuring that the end product is financially viable and still attractive for the consumer.

5.1.4.3. Evolution in technology costs

As regards technology costs, many respondents believe that these will continue to decrease in the future (e.g. battery costs). This evolution should boost the uptake of new technological trends, such as automation, which however is seen to come at a risk of a new rise of car use in cities. This could go against the modal shift efforts.

5.1.4.4. New mobility patterns

While new mobility patterns such as MaaS and micro-mobility are growing in cities, the uptake is not as big as expected yet. One stakeholder argues it could be worthwhile

looking at the economic context, in particular at how the distribution of wealth within European societies affects the choice of transport (modes), affordability and access to sustainable transport modes.

5.1.4.5. Changes to consumer behaviour

Behavioural changes towards more sustainable modes of transport are still at the early stages. To be enhanced, more regulation should be considered, say surveyed stakeholders. The new challenges brought by COVID-19 may lead to long-lasting changes in consumer and transport user behaviour, but it is too early to tell. According to a representative of the national and regional authorities, crises induced by security threats and COVID-19 made it clear that the resilience of transport system needs to be established, and it is an aspect not sufficiently addressed by the White Paper initiatives.

5.1.4.6. Evolution of e-commerce

The evolution of e-commerce is the development that has received the most controversial assessment from interviewed stakeholders in relation to the achievements of the White Paper: 17 out of 40 respondents believe e-commerce expansion has led to negative effects. 8 respondents opposed this position and, on the contrary, considered e-commerce evolution as beneficial. 4 respondents identified no impact and 11 did not have an opinion on this. New business opportunities through e-commerce are highlighted as benefits, whereas criticism focusses on negative environmental impacts (emissions, congestion), negative impacts on working conditions and an overall strain on the transport system. A railway stakeholder fears that with customers getting used to fast home deliveries, the competitiveness of railways as a means of freight transport might suffer.

5.1.4.7. Climate change

As regards climate change, it is considered having enhanced the need for White Paper actions to be timely implemented, leading to one step further with the recent adoption of the European Green Deal. Climate change will continue to strongly influence the transport sector and related policies, not only through the European Green Deal, but also through many local actions (e.g. climate-friendly cities).

5.1.5. Evaluation question #5: Which unintended positive and negative economic, social and environmental effects, if any, have been produced?

This evaluation question discusses the unintended or unexpected (both positive and negative) effects perceived by stakeholders as a result of the actions taken in the context of the White Paper. The analysis is based on evidence collected by the external consultant from targeted interviews with stakeholders representing international organisations and business associations in the transport sector.

In general, respondents find it difficult to clearly identify the unintended effects coming from the actions of the White Paper due to a lack of reliable evidence on the causal links.

Indeed, some unintended effects coming from key drivers like technology and digitalisation in transport would probably have occurred irrespective of the promotions of related measures in the White Paper. However, they are perceived by some stakeholders as having a relation with the White Paper's actions.

The White Paper, with its key objectives, might have contributed to an increased awareness of consumers about climate change impacts and vehicles emissions. This has contributed to boost the change of market transport supplies with new propulsion methods coming onto the market (e.g. electric and hydrogen vehicles).

Technology and digitalisation promoted by the White Paper are seen as having unexpectedly indirectly contributed to creating favourable conditions for the uptake of disruptive services, such as ride-hailing and delivery-on-demand services, which have determined new features for the end users. Some of them are seen as creating even more dependency on fossil fuels by increasing transport demand. They are also often linked to business models where trade unions denounce that workers in these segments of the transport sector are not sufficiently covered by social protection or shielded against wage dumping.

Cyber risks and threats are unintended consequences of the process of digitalisation promoted by the White Paper. The 2019 cyber-attack to Maersk Lines is considered one example.

The International Association of Public Transport (UITP) points out that when the revision of the Clean Vehicles Directive has been adopted in 2019,[94] it has been wary of the fact that it created new obligations for the public transport sector, a sector that was already providing sustainable mobility, without providing financial compensation. The purchase of the newest bus technologies will require financial resources that cannot be spent on other priorities, such as expanding the public transport offer or providing better passenger information.

5.1.6. Evaluation question #6: To what extent have the 40 action points of the White Paper been implemented by the Commission, by the Member States, by regional and/or local authorities (where relevant), or by other actors (e.g. transport operators)?

The review of implementation by the Commission and Member States is based on the information from Commission services and complemented by desk research. Interviews with other stakeholders are used to complement the assessment on the level of implementation of actions in charge to other actors.

[94] Directive (EU) 2019/1161 of the European Parliament and of the Council of 20 June 2019 amending Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles, OJ L 188, 12.7.2019, p. 116–130.

5.1.6.1. Implementation by the Commission

Since its adoption in 2011 the Commission made a considerable work on the implementation of the White Paper programme. Currently 15 out of the 40 action points of the White Paper have been fully implemented by the Commission and another 7 can be considered in an advanced state of implementation. All other actions are in progress.

Table 2: Status of implementation on initiatives by the Commission at end of 2019

ACTION POINTS		Status		
		Completed	Advanced	In progress
1	A true internal market for rail services	√		
2	Completion of the Single European Sky			√
3	Capacity and quality of airports	√		
4	A maritime "blue belt" and market access to ports	√		
5	A suitable framework for inland navigation		√	
6	Road freight			√
7	Multimodal transport of goods: e-Freight	√		
8	Social code for mobile road transport workers			√
9	A social agenda for maritime transport		√	
10	A socially responsible aviation sector			√
11	An evaluation of the EU approach to jobs and working conditions	√		
12	Cargo security	√		
13	High level of passenger security with minimum hassle		√	
14	Land transport security	√		
15	End-to-end security			√
16	Towards a "zero vision" on road safety	√		
17	A European strategy for civil aviation safety		√	
18	Safer shipping	√		
19	Rail safety			√
20	Transport of dangerous goods	√		
21	Passengers' rights			√
22	Seamless door-to-door mobility			√
23	Mobility continuity plans	√		
24	A technology roadmap		√	
25	An innovation and deployment strategy			√
26	A regulatory framework for innovative transport			√
27	Travel information			√
28	Vehicle labelling for CO2 emissions and fuel efficiency			√
29	Carbon footprint calculators			√
30	Eco-driving and speed limits	√		

ACTION POINTS		Status		
		Completed	Advanced	In progress
31	Urban mobility plans			√
32	An EU framework for urban road user charging	√		
33	A strategy for near "zero-emission urban logistics" 2030		√	
34	A core network of strategic European infrastructure			√
35	Multimodal freight corridors for sustainable transport networks			√
36	Ex-ante project evaluation criteria		√	
37	A new funding framework for transport infrastructure	√		
38	Private sector engagement	√		
39	Smart pricing and taxation			√
40	Transport in the world: the external dimension			√
""	Urban Mobility Package			√

5.1.6.2. Implementation by the Member States (or by regional and/or local authorities where relevant) or by other actors (e.g. transport operators)

As far as the initiatives already completed by the Commission are concerned, in most of the cases they are addressed by more than one intervention (e.g. revision of existing Directives/Regulations, adoption of new pieces of legislation etc.). It is often the case that only some of these interventions have completed their formal process at European Institutions' level, while others are still to be finalised. Therefore, also in this case the implementation of the initiative (and of the related action point) can only be partial and related to the specific intervention (and not to the full initiative/action point).

In other cases, the initiatives have been fully delivered by the European Institutions, but it often applies that they require a contribution or follow-up from Member States at national or sub-national level.

In Table 3, those actions fully delivered by the Commission but not yet fully delivered by Member States are classified as 'in progress'. The actions not yet fully delivered by the Commission and where action by Member States can only be partial are classified as 'partially in progress'. Those actions that do not imply formal obligations for Member States (e.g. those related to urban dimension which, according to the subsidiarity principle, falls under national, regional or local responsibility) but showing implementation progress at local/regional/national level are clearly identified.

The initiatives included in the White Paper programme are quite different in nature, scope and therefore their implementation entails challenges of different magnitude. As an example, measures concerning smart pricing and taxation face major obstacles in being accepted by Member States as clearly witnessed by the long-lasting process of the revision of the Eurovignette Directive and by the withdrawal of the Energy Taxation Directive.

Table 4 shows the action points that required implementation efforts by other stakeholders. Most of them entail on-going activity within dedicated working groups or similar involvements and therefore are ‘continuously on-going’.

Table 3: Summary of implementation of the 40 action points by Member States

ACTION POINTS	
Completed (Total: 4)	
5	A suitable framework for inland navigation
12	Cargo security
18	Safer shipping
20	Transport of dangerous goods
In progress (Total: 5)	
1	A true internal market for rail services
4	A maritime "blue belt" and market access to ports
16	Towards a "zero vision" on road safety
30	Eco-driving and speed limits
1	A true internal market for rail services
Partially in progress (Total: 17)	
2	Completion of the Single European Sky
6	Road freight
8	Social code for mobile road transport workers
9	A social agenda for maritime transport
13	High level of passenger security with minimum hassle
15	End-to-end security
17	A European strategy for civil aviation safety
19	Rail safety
21	Passengers' rights
22	Seamless door-to-door mobility
24	A technology roadmap
25	An innovation and deployment strategy
26	A regulatory framework for innovative transport
27	Travel information
28	Vehicle labelling for CO2 emissions and fuel efficiency
35	Multimodal freight corridors for sustainable transport networks
39	Smart pricing and taxation
No formal obligations / in progress: (Total 4+1)	
31	Urban mobility plans
32	An EU framework for urban road user charging
33	A strategy for near "zero-emission urban logistics" 2030
34	A core network of strategic European infrastructure
""	Urban Mobility Package
Deadlines yet to come (Total: 1)	
7	Multimodal transport of goods: e-Freight

Table 4: Summary of implementation of the 40 action points by other actors

ACTION POINTS	
Completed (Total: 2)	
14	Land transport security
19	Rail safety
Continuously on-going (Total: 5)	
10	A socially responsible aviation sector
12	Cargo security
17	A European strategy for civil aviation safety
26	A regulatory framework for innovative transport

5.2. Efficiency

5.2.1. Evaluation question #7: To what extent have the costs of the 40 action points in the White Paper been proportionate to the overall benefits achieved? & Evaluation question #8: To what extent have the initiatives under the White Paper been cost effective? Which benefits have been achieved for the different stakeholder groups? What costs have resulted for the different stakeholder groups?

The evaluation questions on efficiency aim to examine the cost-effectiveness of the White Paper. To contribute to that analysis, evaluation question #7 discusses the costs of implementing the 40 action points and the related 132 initiatives in relation to the benefits derived from its implementation and evaluation question #8 seeks to highlight costs and benefits for different stakeholder groups.

5.2.1.1. Limitations to the analysis

The main source of quantitative information are evaluation studies, of which only around 20 are available with information about the White Paper initiatives. Even among those evaluations available, sometimes they only cover a specific aspect of an initiative, not the overall initiative and extrapolation is not possible. Furthermore, when assessing costs and "cost-efficiency", the level of detail provided and the methodology used in these evaluations vary considerably. This makes comparisons between initiatives and between action points to assess the overall cost-efficiency of the White Paper complicated. Furthermore, the information on costs in evaluations tends to diminish as we move from the EU institutions (where some data might be available), to Member States (where data might be available in some Member States and then is perhaps extrapolated to the entire EU) to industry, where only a small number of data points might be available.

In the case of EU funding programmes (including TEN-T programme, CEF Transport, Horizon 2020 and Cohesion Funds), more detailed information is available. However, it is not always possible to attribute costs of a funding programme to a specific initiative. It is also difficult to estimate the benefits of expenditures in research and innovation.

Data provided by stakeholders on efficiency is overall scarce and mostly qualitative. A number of stakeholders that have contributed to the external support study have pointed to the difficulties in providing relevant quantitative information.

Because of these issues, the analysis of efficiency of the White Paper is limited in its scope (as information is lacking for some areas of action) and conclusions (as this limits that types of overall analyses that are possible; e.g. in most instances it is not possible to assess what costs can be directly attributed to the White Paper and what costs would have been incurred nonetheless).

5.2.1.2. Costs related to implementation of initiatives

Given the high number of initiatives covered by the 40 actions points and the absence of a dataset with information on the relative costs, there has been a need to prioritise the analysis towards those initiatives with more significant costs. Thus, the focus of the analysis is on action points and initiatives that include regulatory measures and financial instruments

These costs have been disaggregated in the following categories:

- Adoption/implementation of EU legislation (includes costs on both human resources and capital expenditures).
- Financial instruments, public-private partnerships (PPPs) and research and development funding.
- Studies and development of EU policy.
- All other EU measures (e.g. standards and social dialogue promotion activities).

Adoption and implementation costs are costs incurred by the Commission that has been responsible for the initial development and implementation. Member State's authorities at different level, industry, social partners and civil society organisations can incur costs related to the implementation of EU legislation, be it to participate in the policy process (a role where trade associations play an important role, although individual companies can also, and do, participate), or to implement the various provisions related to specific EU legislation. Individual industry stakeholders throughout the EU can also incur costs.

There are certain difficulties in identifying specific costs and associating these costs with the White Paper action points. However, where this is possible, costs do not appear to be significant.

EU financial instruments are a crucial form of funding infrastructure across the EU. The TEN-T funding programme and the subsequent Connecting Europe Facility (CEF) (since 2014, aggregating investment on TEN-T) have been the major EU programmes funding transport infrastructure across the EU, covering all modes. Each of them has supported infrastructure investment of over 20 billion euro of total investment, which a significant portion being sponsored by the EU. From the remaining costs, it is not possible to determine who was responsible for the investment (e.g. Member States or private sector).

In both programmes, rail has represented the majority of investment (around two-thirds in each case), with other modes representing much smaller portions.

The different funds of the European Structural and Investment Funds (ESIF) programme are another way through which EU has supported investment in transport in the EU. In the 2007-2013 period the category called "transport infrastructure" has received 66.4 billion euro of funding. For the more recent 2014-2020 programmes more discrete categories are available, and in the 2016-2019 period, actual (i.e. not planned) expenditures in categories related to investment in the TEN-T network have 47.8 billion euro, with an EU contribution of 40.1 billion euro (84%). For all other non-TEN-T transport investments, actual expenditures have 26.7 billion euro, with an EU contribution of 21.9 billion euro (82%).

The White Paper also aims to promote the use of Public Private Partnerships (PPPs) in transport. A database of the European Investment Bank shows that the number of transport PPP[95] projects finished across Europe (defined as EU-28 plus Turkey and the Western Balkans) reached a high of 20 in 2014, and it has been since then in a steady decline towards seven in 2018 and 10 in 2019. Overall, during the 2011-2019 period, across Europe (as defined above) 118 transport PPPs were finished, representing a total investment of 74.7 billion euro.

Finally, the White Paper introduces measures to support EU level research and technology development (R&D) covering all aspects of the transport system. One of the main ways to support those developments is via the Horizon 2020 programme, which has a total budget of 77 billion euro for the 2014-2020 period. Transport is covered in several categories, with a total budget (2014-2020) of 6.3 billion euro.

EU action very often starts with the development of a strategy or communication and the publication of a study on the status of the market and to support adoption of policy measures. However, compared to the actual cost of implementing EU legislation or building infrastructure these policy-related costs are relatively modest. These studies typically run from the tens of thousands to the hundreds of thousands of euro.

Other measures outlined in the White Paper include the creation of technical standards, support to social dialogue and cooperation with third countries. Quantitative data on these topics is non-existent, but some qualitative information was gathered for the support study. The findings of the support study suggest that the costs associated to these other measures were largely insignificant.

5.2.1.3. Costs and benefits as perceived by different stakeholder groups

The costs for national, regional and local authorities vary considerable, with some initiatives corresponding to tens of thousands of euro of ongoing costs per Member State related to monitoring, enforcement and administrative costs.

[95] These are not disaggregated by mode.

The limited data available makes it difficult to extrapolate all costs incurred by Member States for all initiatives of the White Paper. However, given that most cost data collected refers to ongoing costs for Member States it is possible to make some estimates regarding these ongoing costs (usually administrative, enforcement and monitoring costs):

The White Paper includes a total 44 regulatory measures. These are the measures more likely to incur these types of costs.

Ongoing costs, for administrative, enforcement and monitoring, are usually below €1 million per Member State per year.

For the 44 initiatives stipulating regulatory measures that would be a cost, per Member State, of 4.4 to 44 million euro per year, or a total of 0.12 to 1.2 billion euro/year across all 27 Member States.

Data on the costs for other initiatives for Member States are not available but it is reasonable to expect that they will usually represent less significant costs, if at all.

Industry representatives report that they incur costs for participating in the policy process and for compliance (e.g. with emission standards for vehicles, provisions of the 4th Railway Package). However, they are not able to quantify these costs.

Existing evaluations indicate a number of quantifiable benefits to society as a result of White Paper actions:

- The full implementation of the Single Market for rail transport: benefits of 1 to 2.7 billion euro per year. Further integration with the road sector would bring additional benefits of 2.5 to 4.5 billion euro per year.
- 17.5 billion euro reduction in statistical costs for fatalities and serious road injuries, compared to an investment of 4.3 billion euro by Member States.
- The directive on cross-border exchange of information on road safety related traffic offences is deemed to be cost effective, with costs insignificant compared to benefits.
- Regulation 996/2010 on the investigation and prevention of accidents and incidents in civil aviation:[96] costs of 1.1 million euro per year, compared with a combined value of saved accidents of 202 million euro.

13 out of 21 authorities participating in the targeted survey say that the benefits outweighed the costs to society fully or to a significant extent. 4 out of 21 authorities say the benefits outweighed the costs by to a limited or to some extent.

Industry representatives make a more negative assessment on the cost-effectiveness of the White Paper initiatives. They point at delays in the implementation of initiatives and highlight that, whereas the administrative burden of individual initiatives might not be high, all initiatives combined might have more costs than benefits, namely for smaller

[96] Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC, OJ L 295, 12.11.2010, p. 35–50.

businesses. Yet, cost items related to TEN-T and climate change mitigation are acknowledged by the industry as having significant benefits in the long run.

Trade unions appear to have difficulties quantifying social impacts (both positive and negative) of any specific initiatives and therefore declare they cannot provide a detailed assessment.

5.2.2. Evaluation question #9: Is there room to streamline or simplify the various initiatives under the White Paper?

This efficiency question examines whether there are potential improvements in efficiency that could be achieved because of potential duplication of activities amongst the different action points of the White Paper and because of potential improvements that could be achieved within each initiative.

For the first aspect, the level of information gathered from data requests and field research revealed only a small number of potential duplication of activities found. This could be an indication that the number of duplications is small and that possible duplication between action points is not a concern for the different stakeholders.

For the second aspect, the analysis of input from different sources (data requests and desk and field research) suggests a number of areas where simplification could be achieved within each initiative. Proposed simplification includes aspects such as revising reporting requirements, reducing the scope of legislation, and changing the way that specific legislative acts are implemented across the EU. Given the unavailability of information of potential efficiency gains for each of these proposed simplifications, it is not possible to estimate potential combined savings for the entire White Paper.

5.3. Relevance

5.3.1. Evaluation question #10: Are the problems/needs identified in the White Paper still valid?

Both from the modelling results of the support study and the consultation of stakeholders, it appears that the needs identified in the White Paper at the time of its adoption in 2011 are still largely relevant today. Despite undeniable progress, key challenges of 2011, such as the need of greater use of more sustainable transport modes, oil dependency, congestion, or GHG emissions from transport are still on the agenda for EU transport policy in 2020.

At the time of White Paper adoption, the lack of improvement in the environmental performance of the transport sector has been linked to the dominant role of road transport in both the freight and passenger sectors. The modal split has not significantly changed since then and the majority of stakeholders, business organisations, civil society organisation as well as representatives of the public administration, consider it an ongoing need that the dominance of road transport be addressed.

At the time of White Paper adoption, the transport sector has been the only sector to report almost continuous growth in greenhouse gas emissions since 1990.[97] In 2011, the total CO_2 emissions associated with the transport sector (excluding international maritime shipping) have been 900 million tonnes of CO_2. By 2018, the total emissions have increased to 946 million tonnes of CO_2. While emissions associated with the rail sector, inland waterways and maritime sector have fallen since 2011, emissions associated with the road and aviation sectors have increased over this period.

In the case of air pollution, the transport sector has been a major contributor towards overall local air pollution from different sources at the time of the adoption of the White Paper, which exceeded legal limits (not only because of transport activities) in a number of urban and non-urban areas.[98] Air pollution (associated among other factors with transport) remains as significant problem, and road transport a significant contributor to air pollution by particulate matter and by nitrogen dioxide (NO_2), especially in the proximity to busy roads.

Thus, in both cases, the available data already point to the ongoing need for further policy action, a conclusion that is also supported by the majority of stakeholders across all categories. In total, 57 out of 70 stakeholders indicate that they 'fully agree' that there is still a need for policy action to address the level of CO_2 emissions and air pollutants from the transport sector.

By 2018, fossil fuel products has represented the lion share of energy consumption in the transport sector with limited change since 2011. Despite continued fossil fuel dependency in the transport sector, alternative fuel technologies and active travel and micro-mobility modes are making inroads. Most stakeholders support the ongoing need for further policy action to reduce oil dependency, with no significant difference in responses between different stakeholder categories. The same picture emerges when stakeholders are consulted on the need to keep encouraging the uptake of new technologies in vehicles and in the transport system, such as e-mobility.

According to the external support study, in the Alternative scenario, by 2050 hours spent in congestion are projected to increase to 43.5 on average per driver and per year.

The need to address congestion is bolstered by the majority of stakeholders across all stakeholder categories, with 52 out of 69 stakeholders in the interviews conducted by the contractor for the support study expressing that they 'fully agree' that there is still a need for policy action to address the level of congestion.

A majority of consulted stakeholders, all except for 3 out of 24 national and regional authorities, consider road safety still a relevant need to be addressed by EU transport policy.

Between 2011 and 2017, the R&D intensity in Europe[99] has declined by 5%. Over the same time period, investment in transport infrastructure also has declined by

[97] SEC(2011) 391 final.
[98] SEC(2011) 391 final.
[99] Eurostat data is only available for select Member States (BE, CZ, HR, FR, IT, MT, PL, PT, RO, SK, FI, SE, UK).

approximately 20%.[100] This indicates a general trend of declining investment in the transport sector, which suggests that the need to maintain competitiveness of the EU transport sector is still a need which requires policy action. It will be important for the EU transport sector to remain competitive, in regard to the emergence of alternative fuel technologies and the automation of the transport sector, which are both becoming central tenets of future of mobility systems.

Similarly, stakeholders also agree, although to a slightly lesser extent than for other needs, that removing market access barriers for transport service providers, completing the Single European Transport Area and improving the quality of service are still relevant needs. Again, there is no significant difference in the responses between different stakeholder groups.

At the time of White Paper adoption, around one in six people in the EU have had a disability. With this in mind, the White Paper acknowledges the need to provide reliable, safe, and quality services for individuals with reduced mobility.[101]

Between 2011 and 2018, the number of older people living in the EU has increased steadily, by an average annual growth rate of 1.9%.[102] In addition to this, the ageing population is projected to increase from 20% of the total population in 2018 to 29% by 2050, equivalent to 149 million people. Therefore, not only is the issue of accessibility a current need, but it is likely to remain a need which requires addressing well into the future. As an increasing share of the population will face mobility concerns, facing difficulties driving and becoming more reliant upon public transport services, it will be essential for improvements in public transport services to be made.

5.3.2. Evaluation question #11: Have there been any changes in the EU transport or climate change policy objectives making the White Paper objectives less relevant? To what extent are the objectives of the White paper still relevant in relation to current broader EU policy objectives?

Since the adoption of the White Paper in 2011, several EU-level policies and strategies have been implemented which aim to transform the transport system, through providing new strategic visions, implementing new targets, and advocating new policy measures. Four key policy documents have been identified, which are considered to reflect overarching EU policy objectives, in relation to transport and climate change policy:

- The European Green Deal (2019) and the Communication to step up Europe's 2030 climate ambition (2020);[103]
- 'A Clean Planet for all – A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy'? (2018);
- European Strategy for Low-Emission Mobility (2016);
- The 2030 Climate & Energy Framework (2014).

[100] CE Delft (2019) Overview of transport infrastructure and costs.
[101] COM(2011) 144 final.
[102] Eurostat (2019): Ageing Europe. Looking at the lives of older people in the EU.
[103] COM(2020) 562 final.

Through interviews and desk research conducted as part of the external support study, the release of the European Green Deal appears to be the most significant change to transport and climate policy objectives since 2011. The European Green Deal introduces a goal to reduce GHG emissions in the transport sector by 90% by 2050, highlights a zero pollution ambition and the need to ramp-up the production and deployment of sustainable alternative transport fuels and calls for the price of transport to reflect the impact it has on the environment and on health.

The Green Deal notes the need to implement public recharging and refueling stations, to support the transition away from oil dependency. Therefore, to align with the European Green Deal, the White Paper would need to enhance the ambition of reducing the oil dependency for the transport sector to achieving a 'drastic decrease' in oil dependency by 2050.

Beyond enhancing ambition in relation to environmental and climate change response, a growing focus on digitalisation and automation of transport is apparent from recent strategic and policy documents. Other key objectives for EU transport policy highlighted in recent policy documents include multimodality, road safety and congestion.

Whereas the GHG emission reductions of the White Paper are less ambitious than the climate neutrality target under the Green Deal, other objectives of the White Paper are still relevant. Initiatives to promote digitalisation and automation (e.g. through ITS, ERTMS, RIS) have already been introduced by the White Paper and remain high on the agenda, as well as the "Vision Zero" for road safety and the shift towards more sustainable mobility, that would better combine different modes of transport and thereby reduce congestion.

5.3.3. Evaluation question #12: How well do the original objectives and 10 headline goals of the White Paper still correspond to the current transport and climate policy needs? & Evaluation question #13: Are the proposed 10 headline goals still adequate benchmarks for achieving an integrated, sustainable and efficient transport system in the EU?

Since the adoption of the White Paper in 2011, a series of new needs have emerged, or have become more pressing. These needs relate to climate change, employment and working conditions, skills, accessibility, safety, and support for the uptake of new technologies in transport systems.

Despite the emergence of these needs, the objectives of the White Paper still largely remain relevant in terms of topic area. However, regarding the headline goals, there is greater disparity in the continued relevance in light of the new needs identified.

For the third headline goal on modal shift and the tenth headline goal on the "polluter pays" and "user pays" principles, it is important to reflect on the practicalities of evaluating these shifts/applications in the context of the current evaluation. Both of these headline goals require transformation of the transport system in different areas, where progress has been limited to date. Therefore, not only do further measures need to be

introduced, but also their impact would still need to be assessed. Nevertheless, the goals of moving towards more sustainable modes of transport and to better internalise external costs of transport activities remain relevant policy priorities in the context of the European Green Deal and the 2030 Climate Target Plan of the Commission.

In addition to reflecting upon the existing headline goals, the new needs have also resulted in the desire to consider the potential to implement new goals in the areas of accessibility, charging and refuelling infrastructure and new transport services (i.e. micro-mobility, mobility as a service, connected and automated vehicles).

National and regional authorities and EU institutions contributing to the evaluation are satisfied with the clarity of the goals and the alignment of the goals with the objectives of the White Paper. However, there is more variation in perceptions in relation to the realistic nature of the headline goals from the national and regional authorities.

In contrast, among industry associations and civil society (including a trade union organisation) and research organisations a relatively low proportion indicate that the headline goals have been clearly defined, realistic or aligned with the objectives of the White Paper. In regard to the use of the headline goals to facilitate assessment of EU, national and regional transport systems, the majority of stakeholders indicates that the goals are useful for assessing the environmental impacts of the transport systems. A lower level of support is indicated for the ability of the headline goals to assess the energy efficiency of the transport systems or the level of integration of modes.

5.4. Coherence

5.4.1. Evaluation question #14: Are the White Paper objectives coherent with the 2018 European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy[104] and the 2016 Low-Emission Mobility strategy?[105]

The analysis is expanded to include coherence with the European Green Deal Communication of 2019[106] and the 2030 Climate Target Plan.[107] In addition to a review of the White Paper and the other Communications, their respective supporting documents have also been reviewed where relevant, i.e. the 'In depth analysis' that the Commission has presented in support of the 'Clean Planet for All' Communication[108] and the respective SWDs containing the impact assessments for the White Paper and the Low-Emission Mobility Strategy.[109]

It is important to note that the White Paper has been published five years earlier than the next of these documents, which is also the other document that focuses on transport, i.e.

[104] COM(2018) 773 final.
[105] COM(2016) 501 final.
[106] COM(2019) 640 final.
[107] COM(2020) 562 final and the accompanying impact assessment SWD(2020) 176 final.
[108] European Commission (2018): In-Depth Analysis in Support of the Commission Communication COM(2018) 773 final.
[109] SWD(2016) 244 final.

the Low-Emission Mobility Strategy. The other two strategies, which have been published another two and three years later, both focus on environmental issues (the earlier of these, 'A Clean Planet for All', focuses only on climate change) and what might be done in different sectors, including transport, in order to address these issues. Hence, it might be expected that there would be an evolution in terms of what is covered in the respective documents and how.

Such an evolution can be seen in relation to the context of the different documents. At the time of the adoption of the White Paper, the Intergovernmental Panel on Climate Change (IPCC) has called for developed countries to reduce their GHG emissions by at least 80% by 2050 compared to 1990 levels in order to keep the global temperature rise to 2°C above pre-industrial levels. In its 2011 'Roadmap to a Low Carbon Economy by 2050',[110] the Commission has translated this into a reduction of between 54% and 67% from transport, the mid-point of which has been used in the White Paper as one of the document's core elements. The Low-Emission Mobility Strategy has reiterated the need to reduce transport's GHG emissions by at least 60% compared to 1990 levels by 2050 and for these to be "firmly on the path to zero" by then, while emissions of air pollutants from transport that harm our health are to be drastically reduced without delay. The Strategy refers to the need for reducing air pollution by fostering several initiatives from the White Paper programme, including for example the revision of the revision of the Clean Vehicles Directive[111] or further deployment of intelligent transport systems.

In between the publication of the Low-Emission Mobility Strategy and the 'Clean Planet for All' Communication, the IPCC has published its analysis[112] of the implications of the Paris Agreement, which had reiterated the Parties' desire to pursue efforts to limit the global temperature increase to 1.5°C. The IPCC's analysis has demonstrated that, in order to limit global warming to 1.5°C, there needs to be net zero GHG emissions by around 2050.

The 'Clean Planet for All' Communication has been a response to the UNFCCC's Paris Agreement. The scenarios presented in the Communication include ways of delivering net zero emissions in the EU by 2050. The European Green Deal and the 2030 Climate Target Plan have effectively translated the findings of this Communication, specifically how to deliver a net zero GHG emissions economy by 2050, into a political commitment. In this respect, these two documents translate the net zero aspiration to mean a 90% reduction in GHG emissions from transport by 2050, which is clearly greater than the GHG emissions reductions that underlay the White Paper. The 2030 Climate Target Plan introduces the ambition of reducing greenhouse gas emissions to at least 55% below 1990 levels by 2030. The White Paper intermediate goal for 2030 has been a 20% reduction of GHG emissions below 2008 levels.

[110] COM(2011) 112 final.
[111] Directive (EU) 2019/1161 of the European Parliament and of the Council of 20 June 2019 amending Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles, OJ L 188, 12.7.2019, p. 116–130.
[112] https://www.ipcc.ch/sr15/

Other than the underlying assumptions regarding CO_2 emissions, the documents also vary in terms of the detail in which they set out the measures that are needed in the transport sector, which is partially due to the different nature of the respective documents, as described above. In spite of the differences in the nature of the documents, it is possible to see some evolution of the measures mentioned. The most obvious example is in relation to connected and automated mobility. The White Paper makes only one reference to 'cooperative systems' in relation to safety, and makes no mention of connected and automated mobility, while the Low-Emission Mobility Strategy mentions the latter in an annex. However, the two more recent publications give a much higher profile to automated mobility, even though transport is only one of a number of sectors that each of them covers. This probably reflects the increasing attention given to the potential for, and the technological developments relating to connected and automated mobility in the second half of the past decade.

5.4.2. Evaluation question #15: How does the White Paper interact with other EU/ national/ international initiatives which have similar objectives?

5.4.2.1. Consistency with initiatives at international level

The obvious discrepancy between the White Paper and the initiatives of international organisations is in relation to the Paris Agreement, which has committed the Parties to limit global warming to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C. The GHG reductions that have been core to the White Paper have been based on the aim of keeping this temperature increase to no more than 2°C.

The high-level transport themes covered by the United Nations' Sustainable Development Goals (SDGs) are similar to those addressed by the White Paper. The one exception worth noting is the former's emphasis on the affordability of transport, whereas none of the initiatives of the White Paper explicitly cover either the affordability of transport or the particular concerns of low income groups.

The White Paper underlines the need for international action in the aviation and maritime fields. The work of ICAO, IMO and ILO (on maritime labour), in particular, appear to be coherent to the White Paper. Indeed, the White Paper explicitly notes the need to update some EU legislation in response to changes in the respective IMO Convention (on the training and certification of seafarers), while both the work of the ICAO and the White Paper note the importance of safety information exchange.

5.4.2.2. Consistency with initiatives at EU level

For the other EU-level initiatives, the focus is on the Europe 2020 Strategy and its Flagship Initiatives, as well as on high-level initiatives in climate action, employment, taxation, digitalisation and sustainable development that have not been covered elsewhere.

The initiatives that have been published after the White Paper address many of the latter's main themes, or at least issues that are covered by the White Paper. Common themes include the importance of clean, efficient and integrated transport and resilient infrastructure.

In relation to the Europe 2020 Strategy, almost all stakeholders believe that its objectives are consistent with those of the White Paper, but some criticise inconsistent implementation of (parts of) the strategies.

Similarly to the Sustainable Development Goals, transport is recognised as an essential service in the European Pillar of Social Rights for fulfilling a basic need in enabling people to integrate into society and the labour market, but also as representing a significant part of household expenditure.

The treatment of modal shift in different policies is raised by different stakeholders contributing to the evaluation, although from different perspectives. Some argue that other initiatives, including the United Nations' SDGs and the Sustainable Urban Mobility Plans (SUMPs) promoted by the Commission's Urban Mobility Strategy, put more emphasis on modal shift than the White Paper. On the other hand, others argue that the White Paper – and some other EU polices – focus too much on modal shift, which undermines the positive role that the road transport can play, both in terms of the economy and in improving the environmental performance of transport.

5.4.2.3. Consistency with initiatives at national level

Overall, the findings from the external support study suggest that in a majority of cases national and regional transport strategies focus on similar problems and have similar objectives as the White Paper. In a minority of cases, there is no clear match between the national and regional strategies and the White Paper, whereas strategies are contradictory only in a very small number of cases. Interviews with national and regional authorities suggest that the White Paper's objectives have often fully, or to a significant extent, informed the objectives set in national and regional strategies.

This suggests that the White Paper is generally consistent with national and regional initiatives. To some extent, this is not surprising, as EU Member States are facing similar challenges in terms of transport and its associated adverse impacts, although these my differ in their extent and coverage between different countries.

5.4.3. Evaluation question #16: To what extent are the White Paper initiatives complementary to each other, mutually supportive and non-contradictory? Are there any synergies, overlaps and/or inconsistencies between them?

The support study suggests that the action points of the White Paper generally provide a coherent framework to deliver the objectives of the White Paper, which themselves are considered to be an appropriate framework for developing and implementing sustainable transport.

Of the three priority objectives, two (reducing GHG emissions and oil dependency) are closely linked. While the second of these also has an energy security aspect, reducing oil dependency will have the impact of reducing GHG emissions, as long as the alternatives to oil are not as carbon intensive. The third main objective, i.e. reducing congestion, can be interpreted as being both an environmental and economic objective. Hence, none of the three priority objectives themselves address any social considerations, which is one of the three pillars of a sustainable development and so of a sustainable transport policy. However, the White Paper's additional objectives address this gap, as they cover access and mobility needs (which also have an economic dimension), affordability, as well as safety and security. These additional objectives also expand economic considerations to include efficiency and high quality services, as well as the environmental impacts covered to include air pollution, noise, biodiversity loss and increased land use. Hence, together, the priority and additional objectives, although not the priority objectives on their own, can be seen to provide a coherent set of objectives to support the development and implementation of sustainable transport.

The action points appear to provide a coherent framework for addressing the White Paper's objectives. Annex 7 provides an overview of the relation between the action points and the objectives. Whereas all action points are meant to contribute directly to certain objectives, they often indirectly also support the attainment of other objectives.

An important gap seems to be that biodiversity loss is not explicitly mentioned in the White Paper action points, although there is a recognition in the text of the White Paper that transport infrastructure needs to reduce its negative impacts on natural assets, including land and ecosystems. Yet, one infrastructure-related action point refers to the need to take account of environmental issues in the early stages of planning procedures.

A vast majority of national authorities participating in the stakeholder consultation activities of the study, as well as a majority of business organisations believe that the White Paper's initiatives provide a coherent framework for the development and implementation of a sustainable transport policy. Representatives of civil society and research tend to be more critical in their views on this question. Some call for more progress to be made on the internalisation of external costs, automated and connected driving and modal shift. The European Conference of Transport Research Institutes (ECTRI) notes that the White Paper may emphasise competition too much at the expense of collaboration that it underestimates the challenges posed by some of its more radical objectives and that it does not take sufficient account of the needs of the end user or focus sufficiently on passenger rights.

A common theme to emerge from the stakeholder engagement is that the ambitious objectives of the White Paper is not matched by the initiatives, because important initiatives have been delayed, whereas in other cases they are unrealistically ambitious.

5.4.3.1. Potential synergies between initiatives of the White Paper

The majority of the action points potentially contribute to the delivery of more than one objective, while the delivery of each objective can count on the contribution of at least

five action points (Annex 7). This underlines how, at least at a high level, the action points have the potential to work together to potentially deliver the objectives.

A number of industry organisations identifies various synergies, e.g. between the TEN-T, Connecting Europe Facility and NAIADES, between multimodality and e-mobility and potentially between road pricing and financing. CEN CENELEC notes that there are synergies between EU Directives and Regulations and the standardisation requests that it receives. From the perspective of civil society and research organisations, there are synergies between road safety and urban mobility, while ECTRI notes the links between the White Paper and EU transport research.

5.4.3.2. Overlaps or inconsistencies

Of the stakeholders that have expressed a view, 11 out of 29 believe that there are some inconsistencies or overlaps between the specific individual initiatives set out in the White Paper. From the perspective of public authorities, the Association of German Cities feels that the approach to competition and regulation is not balanced. Business stakeholders note that the alternative fuels promoted by the Alternative Fuels Infrastructure Directive and the revised Renewable Energy Directive are not reflected in, or complemented by, the CO_2 emissions regulations for vehicles.

5.5. EU added value

5.5.1. Evaluation question #17: What is the added value resulting from the EU level intervention of the White Paper compared to the results brought by the actions which could have been achieved by Member States at national and/or regional level?

From a legal perspective, EU action taken in the context of the White Paper has been based on several articles of the Treaty on the Functioning of the European Union, including Articles 91 and 100(2) that make provisions for the Common Transport Policy, and Article 192 which provides a legal basis for addressing the environmental sustainability of the transport system.

According to the impact assessment for the White Paper 2011, EU intervention has been justified in view of the high level of complexity of transport system, the interaction between multiple actors and the global relevance of transport and of its effect on the economy, society and the environment. EU action has been seen as justified to reach the objectives and complement the action of stakeholders and Member States.

Stakeholders highlight that EU actions associated with the White Paper have helped avoid fragmentation of the transport market, for example through the 4th Railway Package. All civil society and research organisations agree (5 out of 8), along with 14 out of 23 industry organisations and 12 out of 24 national and regional authorities. Only 3 respondents disagree with this (one regional authority and two industry organisations.

A large proportion of stakeholders agrees or strongly agrees that EU level actions associated with the White Paper have increased the effectiveness of measures, specifically because they have been agreed at EU level. Five out of eight civil society and research organisations and 14 out of 25 national and regional authorities agree, along with a further 4 regional authorities who strongly agree . Whilst 10 out of 23 industry associations also agree with this, 3 disagree.

Similarly, a large proportion of stakeholders agree that EU level actions associated with the White Paper have led to increased efficiencies (for authorities, industry and/or consumers) through ensuring common objectives, through better coordinating efforts among Member States and by creating synergies and avoiding duplication. 5 out of 8 civil society and research organisations and nine out of 24 national and regional authorities agree, along with a further 3 national and regional authority strongly agreeing. However, whilst 11 industry representatives agree, a further 9 appear more critical and express a negative view.

A majority of stakeholders (mainly industry associations) also considers that EU level actions associated with the White Paper have stimulated research and innovation at a greater scale and have increased cooperation and information exchange.

The analysis of the stakeholder reactions points at a clear added value of the specific EU level actions under the White Paper. The majority of efforts taken towards the action points of the White Paper programme would either not have been possible without EU level intervention or could have taken place but would have been less effective and efficient. Some progress towards them could have been expected in some Member States, but in most cases, this would be fragmented and uncoordinated, meaning effectiveness would be limited.

On the question, whether specific initiatives under the White Paper would have also been taken at national or sub-national level without the EU strategy, the replies from stakeholders are split. Many believe that EU action has been necessary, but almost half of the respondents representing public authorities can think of initiatives that might have also been implemented without the White Paper, mainly in the areas of road safety, sustainable urban transport and road usage charging.

5.5.2. Evaluation question #18: To what extent do the issues addressed in the White Paper continue to require intervention at the EU level?

The answers to the evaluation questions on effectiveness have shown that the expected progress towards reaching the main objectives of the White Paper (GHG emission reduction by 60% by 2050, reducing oil dependency, limiting the growth of congestion) will be insufficient to achieve the White Paper's vision for 2050. At the same time, the answers to the question on the relevance of the White Paper show that at least its three key objectives (and to a lesser extent the ten headline goals) continue to be relevant. In fact, recent Commission initiatives, such as the European Green Deal, the 2030 Climate

Target Plan[113] and the Hydrogen Strategy[114] demonstrate that the Commission intends to upkeep, modernise and strengthen the objectives and the underlying philosophy from the 2011 White Paper on transport. This includes not only the decarbonisation objective for transport, but also key measures to make the EU mobility system more sustainable: multimodality, digitalisation, deployment of alternative fuels, concepts for sustainable urban mobility, social issues etc.

Hence, the question is not whether the issues addressed in the White Paper continue to require intervention, but whether it is justified to pursue this intervention at EU level.

Climate change is a trans-boundary problem. For trans-boundary problems, individual action is unlikely to lead to optimal outcomes. Instead, coordinated EU action can effectively supplement and reinforce national and local action. Coordination of the reduction of GHG emissions across the European Union benefits from coordination at the EU level given the EU's single market. Action at the EU level is therefore indispensable and coordinated EU policies have a much bigger chance of leading to a true transformation towards a climate neutral economy by 2050.[115] This finding from the impact assessment accompanying the 2030 Climate Target Plan essentially also applies to the ongoing quest for decarbonisation and reducing the environmental footprint of the transport sector in the EU.

The EU single market moreover acts as a strong driver for cost-efficient change. This is particularly important for wide-spread acceptance of technological change and to foster public and private investments therein. Examples include the incentives for cleaner road vehicles and the development distribution of alternative fuels.

Connectivity in the single market, mainly pursued through initiatives in the framework of TEN-T and supported by the CEF, is key for more sustainable freight distribution, multimodality and reducing congestion, while promoting accessibility and affordability of transport. This is a cross-border challenge by its very nature and can only be efficiently addressed with initiatives at EU level.

One can argue that the promotion of sustainable urban mobility and in particular achieving CO_2 free city logistics would be better achieved at national or local level, in line with the subsidiarity principle. It is true that the White Paper and its initiatives address urban mobility mainly through initiatives that aim at raising awareness or promote the exchange of best practice.

Yet, essential preconditions for a more sustainable urban passenger and freight mobility have to be created at EU level, be it emission standards for vans and trucks sold on the single market, investment in research and development for smart and connected mobility solutions, fostering the roll-out of critical mass of alternative fuel infrastructure or

[113] COM(2020) 562 final.
[114] COM(2020) 301 final.
[115] SWD(2020) 176 final.

creating a functioning framework for competition among providers of new mobility solutions, such as MaaS, ride-sharing or ride-hailing.

5.5.3. Evaluation question #19: What would be the progress made in the EU to date and by 2050 in reducing GHG emissions, fossil fuel dependency and congestion without the actions put forward in the White Paper?

This evaluation question considers what would have been the situation in the absence of the EU intervention under the White Paper.

Thus, in many respects it reflects the expected progress under the hypothetical Baseline scenario where Member States would not strategically follow the guiding principles and framework for action to be taken as set out in the White Paper.

At the time of the adoption of the White Paper, the supporting impact assessment has concluded that the transport system has provided Europe with a high degree of mobility with an ever-increasing performance in terms of speed, comfort, safety and convenience. However, despite the progress made in certain areas there had been no structural change in the way the system operated. It has been considered unsustainable, characterised by an ever-increasing level of CO_2 emissions, persistent oil dependency and high levels of congestion. Four root causes that would prevent the EU transport system from developing in a sustainable system have been identified as consisting in inefficient pricing, inadequate research investment, inefficient transport services and a lack of integrated transport planning. Based on this, the impact assessment has developed a projection of the expected evolution of the problem and its expected impacts under the 'no-policy change' scenario, where it has been assumed that there would be no additional policy interventions besides those already in place. These have included all transport-specific policies adopted by March 2010 as well as the 2008 Climate and Energy Package.[116]

According to the impact assessment accompanying the White Paper, under the no policy change scenario, the transport system would be expected to not become sufficiently resource efficient so as to promote sustainable growth in the meaning of the Europe 2020 strategy. As a result:

- Transport would remain dependent on oil whereas CO_2 emissions from transport-related activities account would still grow.
- Congestion would continue growing.
- The transport system would not keep pace with the mobility needs and aspirations of people and businesses.

The Baseline scenario developed in the context of this evaluation shows that despite reductions in technology costs and the revised macro-economic and fuel price

[116] The list of policy interventions considered under the baseline scenario included policies adopted up to 2010 covering a broad range of areas. The complete list of 24 such measures included in the baseline is provided in Appendix 4 of the IA assessment report.

framework, CO_2 emissions from transport[117] would stabilise by 2030 and increase by 4% by 2050 relative to 2010, in absence of additional policies beyond 2011. Compared to 1990, the reference year for the White Paper target, CO_2 emissions from transport would still be 29% higher in 2050.

No significant progress would take place in the oil dependency ratio by 2050 relative to 2010. The oil dependency ratio would only decrease by about 2 percentage points between 2010 and 2050.

High congestion levels are still projected by 2050 in the Baseline scenario, with delay costs expected to increase by 34% between 2010 and 2050. More details on the assumptions underpinning the Baseline scenario and its results are provided in Annex 5.

6. CONCLUSIONS

Since its adoption in 2011 the Commission has made considerable progress on the implementation of the White Paper programme. Currently 15 out of the 40 action points of the White Paper have been fully implemented by the Commission and another 7 can be considered in an advanced state of implementation. All other actions are in progress. On the basis of quantitative desk and field research and various stakeholder activities, certain conclusions can be drawn on the effectiveness, efficiency, relevance, coherence and EU added value of the White Paper and its initiatives.

The analysis shows that in many cases the White Paper's measures have not yet delivered their expected impacts as their implementation by Member States is yet to come or it is too recent in time. However, this appears quite in line with the medium- to long-term timeline of the strategy which has been designed to deliver results by 2030 and 2050.

The findings of the evaluation indicate that there is a need for an integrated and focused approach that includes all relevant EU policies that can contribute to achieve a sustainable and smart transport system. Therefore, together with this evaluation, the Commission puts forward a Sustainable and Smart Mobility Strategy[118] to prepare European transport for the future. The staff working document accompanying that strategy highlights remaining challenges and draws conclusions on the lessons learnt from the policy developments until today.

6.1. Effectiveness

Evidences collected from available statistical sources show that limited progress has been achieved by 2018 towards the three specific objectives. This is also due to the long-term time horizon of the strategy (until 2050). The White Paper does not assume a linear

[117] Excluding international maritime, in line with the 2011 White Paper target for 2050.
[118] COM(2020) 789 final.

trajectory of emission reductions, but expects increased decarbonisation efforts after 2030, with cleaner and more efficient technology becoming gradually more widespread.

The progress towards the GHG emissions reduction goal in 2050 of the White Paper is projected to be limited, although significant progress is expected take place towards achieving the 2030 milestone.[119] Results from the modelling exercise show that for the EU-27, thanks to the White Paper overall CO_2 emissions from transport (including international aviation, excluding international maritime shipping) would be 16% lower relative to the Baseline in 2030 and 39% lower in 2050. In particular, emissions from road transport are projected to be 19% below the Baseline levels in 2030 and 46% lower in 2050. Policies adopted after 2011 would contribute significantly towards the White Paper milestone for 2030 but fall short in delivering the 60% emissions reductions by 2050, showing around 40 percentage points gap relative to the target.[120]

The oil dependency of the EU transport sector is still high, but clearly decreasing. The increase in the use of electricity and biofuels in transport, mainly in road transport, has been a main determinant of the decrease in oil dependency in recent years. The initiatives adopted by the end of 2018 are projected to result in reductions in oil dependency, but the transport sector is projected to still be dependent on oil and petroleum products for 77% of its energy needs by 2050.

The problem of road congestion persists in many European cities and urban areas. Based on projections in the context of this evaluation, congestion will still increase over time although at slightly slower pace than without the White Paper.

Progress towards the ten headline goals has been mixed so far. Some goals are projected to be achieved, others not or are too early to assess.

Since 2011, only very limited progress is visible in the statistics measuring the fulfilment of the three key objectives and the ten headline goals. This is explained by the fact that it takes time for the initiatives under the White Paper to be developed, implemented and have an effect.

For instance, the current transport policies and measures would be sufficient to reach the objective of halving the use of 'conventionally-fuelled' cars in urban transport in the EU-27 by 2030, as defined at the time of the adoption of the 2011 White Paper, but not to phase them out by 2050.

Whereas the modal split for freight and passenger transport appears to be very stable, it is nevertheless noteworthy that both rail freight and rail passenger transport have increased their transport performance (in terms of tonne-kilometres/passenger-kilometres) considerably since 2011, as compared to other modes, and are projected to continue to do so until 2050.

[119] It is important to note that the impact assessment accompanying the 2011 White Paper assumed further intensification of policies after 2030, whereas this evaluation only takes into account policies adopted by the end of 2018.

[120] It is important to note that the impact assessment accompanying the 2011 White Paper assumed further intensification of policies after 2030, whereas this evaluation only takes into account policies adopted by the end of 2018.

The Commission has made proposals to move towards full application of "user pays" and "polluter pays" principles in EU transport, but significant efforts remain to be made.

Two achievements, which are also highlighted by surveyed stakeholders as being particularly cost effective, are the progress made on the Single European Transport Area, namely the market opening in the railway sector, and various successful initiatives to improve the safety of transport activities.

Good progress can be reported on accessibility of transport services. Eurobarometer surveys indicate a high level of satisfaction with the quality of transport services and the application of passenger rights provisions. Several initiatives in the context of the White Paper have improved the social protection of transport workers, in particular in road haulage. This is also confirmed by stakeholders. Yet, mainly civil society and research organisations fear that developments like automation and digitalisation could negatively impact future working conditions in transport.

6.2. Efficiency

While significant data gaps exist, it can be concluded that policy-related (Commission internal work and third-party studies) and administrative costs are a very small share of the overall implementation costs of the White Paper initiatives. Capital costs, including investments in technology or infrastructure, form the majority of implementation costs, and total at least tens of billions of euro across the EU since the White Paper has been published in 2011. These costs are spread across many stakeholders, including the EU institutions and bodies themselves, Member States, industry and civil society stakeholders.

Quantifiable benefits have been mentioned by stakeholders with reference to the initiatives completing the Single European Transport Area, in particular in the area of rail transport (4th Railway Package). Transport safety legislation in the context of the White Paper has also quantifiable benefits according to stakeholders.

The total transport system costs are projected to decrease further, mainly due to a reduction in the fuel costs which takes place as a result of the market uptake of electro-mobility, increased use of public transport and the expected shift towards more fuel-efficient transport modes such as rail.

The reduction of CO_2 emissions, which is a major benefit to society, is the result of the policies targeting the penetration of less carbon intensive technologies in the market, the support of alternative fuels and the gradual shift towards more sustainable transport modes.

Due to the data limitations (data was very disperse and often non-comparable), it has not been possible to reach conclusions on the overall costs and benefits resulting from the White Paper for the stakeholder groups under analysis. It has also not been possible to

identify groups of stakeholders that, overall, were subject to any undue burdens, or that experienced significant benefits. Nonetheless, from the society perspective, only looking at a few initiatives, namely those related to road and air safety, the benefits to society seem to already vastly outnumber the costs incurred with specific initiatives.

6.3. Relevance

The needs that have been identified for EU transport policy at the time of the adoption of the White Paper in 2011 are to a very large extent still relevant today. This is particularly the case for the environmental performance and need to modernise the EU transport sector. Similarly, the needs to increase competitiveness and deepen the single market for transport services are still valid. Despite some progress in terms of improved safety, for stakeholders the issue is rightly still high on the agenda.

6.4. Coherence

The analysis of the coherence criterion has identified two issues in relation to the coherence of the 2011 White Paper with the 2016 Low-Emission Mobility Strategy, the 2018 'Clean Planet for All' Communication, the 2019 European Green Deal and the 2030 Climate Target Plan of 2020.

The first of these relates to the way in which the understanding of the need to reduce GHG emissions more generally, and from the transport sector in particular, has evolved in the last decade. The White Paper (and also the Low-Emission Mobility Strategy) set the objective to cut transport's GHG emissions by 60% in order to reduce GHG emissions by at least 80% by 2050. This goal was set in 2011 and it is not in line with climate neutrality by 2050. The European Green Deal and the 2030 Climate Target Plan introduce the ambition of reducing greenhouse gas emissions to at least 55% below 1990 levels by 2030 (White Paper intermediate goal for 2030: 20% reduction of GHG emissions below 2008 levels) and highlight that, to achieve climate neutrality, a 90% reduction in transport emissions is needed by 2050.

The second issue that has been identified is the increasing attention given to connected and automated mobility, even in the European Green Deal, which has a relatively brief section on transport, in particular compared to the White Paper and the Low-Emission Mobility Strategy.

The main issue that has been identified in relation to the coherence of the White Paper and the initiatives of international organisations, as well as in relation to some other EU policy initiatives, is the lack of coherence between the GHG reductions that underlay the Transport White Paper with those that are necessary to meet the aspirations of the subsequent Paris Agreement (and recently revised EU climate targets).

The White Paper is generally consistent with national and regional initiatives.

In terms of internal coherence, the action points of the White Paper generally provide a coherent framework to deliver the objectives of the White Paper, which themselves are considered to be an appropriate framework for developing and implementing sustainable transport.

6.5. EU Added Value

For trans-boundary problems, such as climate change mitigation, individual action is unlikely to lead to optimal outcomes. Instead, coordinated EU action can effectively supplement and reinforce national and local action. Action at EU level is therefore indispensable and coordinated EU policies have a much bigger chance of leading to a true transformation towards a climate neutral economy by 2050.[121] This finding from the impact assessment accompanying the 2030 Climate Target Plan essentially also applies to the ongoing quest for decarbonisation and reducing the environmental footprint of the EU transport sector.

The EU single market acts as a strong driver for cost-efficient change. This is particularly important for wide-spread acceptance of technological change and to foster public and private investments therein. Examples include the incentives for taking up cleaner road vehicles and the development and distribution of alternative fuels.

There appears to be a clear added value of the specific EU level actions under the White Paper. The majority of efforts taken towards implementing the action points of the White Paper would either not have been possible without EU level intervention or could have taken place but would have been less effective and efficient. Some progress towards them could have been expected in some Member States, but in most cases, this would be fragmented and uncoordinated, meaning effectiveness would be limited.

[121] SWD(2020) 176 final.

Annex 1: Procedural information

1. LEAD DG, DECIDE PLANNING/CWP REFERENCES

DG Mobility and Transport is the lead DG on this evaluation. The evaluation has been validated in Decide under the reference PLAN/2019/4992.

2. ORGANISATION AND TIMING

The evaluation has been launched on 4 December with the first meeting of the interservice steering group, consisting of the following DGs: CLIMA, COMP, ECFIN, EMPL, ENER, ENV, ESTAT, GROW, HOME, JRC, JUST, MARE, MOVE, RTD, SG, SJ, TAXUD, REGIO.

The roadmap for the evaluation has been published on the Better Regulation Portal on 7 February 2019.

The Commission has contracted an external consultant to carry out the study to support the evaluation. The study has been kicked-off on 6 September 2019.

The inception report of the support study has been received on 27 September 2019. After written consultation of the ISG, a revised version was accepted on 29 October 2019.

The ISG has met on 29 January 2020 to discuss the first interim report of the support study and on 29 June 2020 to discuss the second interim report.

The Commission has conducted an open public consultation (OPC) on the evaluation from 1 July 2020 to 23 September 2020. The OPC had initially been planned for spring 2020. Its start had been delayed to the Covid-19 pandemic.

The ISG has met on 11 November 2020 to discuss the draft final report of the support study.

3. EXCEPTIONS TO THE BETTER REGULATION GUIDELINES

The evaluation has been carried out in line with the Better Regulation Guidelines. Exceptionally, no dedicated consultation strategy has been published for this evaluation, because the consultation activities had been merged with the consultation for the Strategy on Sustainable and Smart Mobility of the Commission. Due to the Covid-19 pandemic, a planned stakeholder conference and workshops with stakeholders could not be held.

4. EVIDENCE, SOURCES AND QUALITY

The evaluation relies mostly on the support study on the ex-post evaluation conducted by the external consultant. In the framework of the support study, experts from the Commission have provided data and information on the state of play of the implementation of the various initiatives under the 2011 White Paper. The external consultant has carried out targeted interviews with stakeholders and national and regional authorities. The external consultant has also drawn on the results of the OPC to answer the evaluation questions.

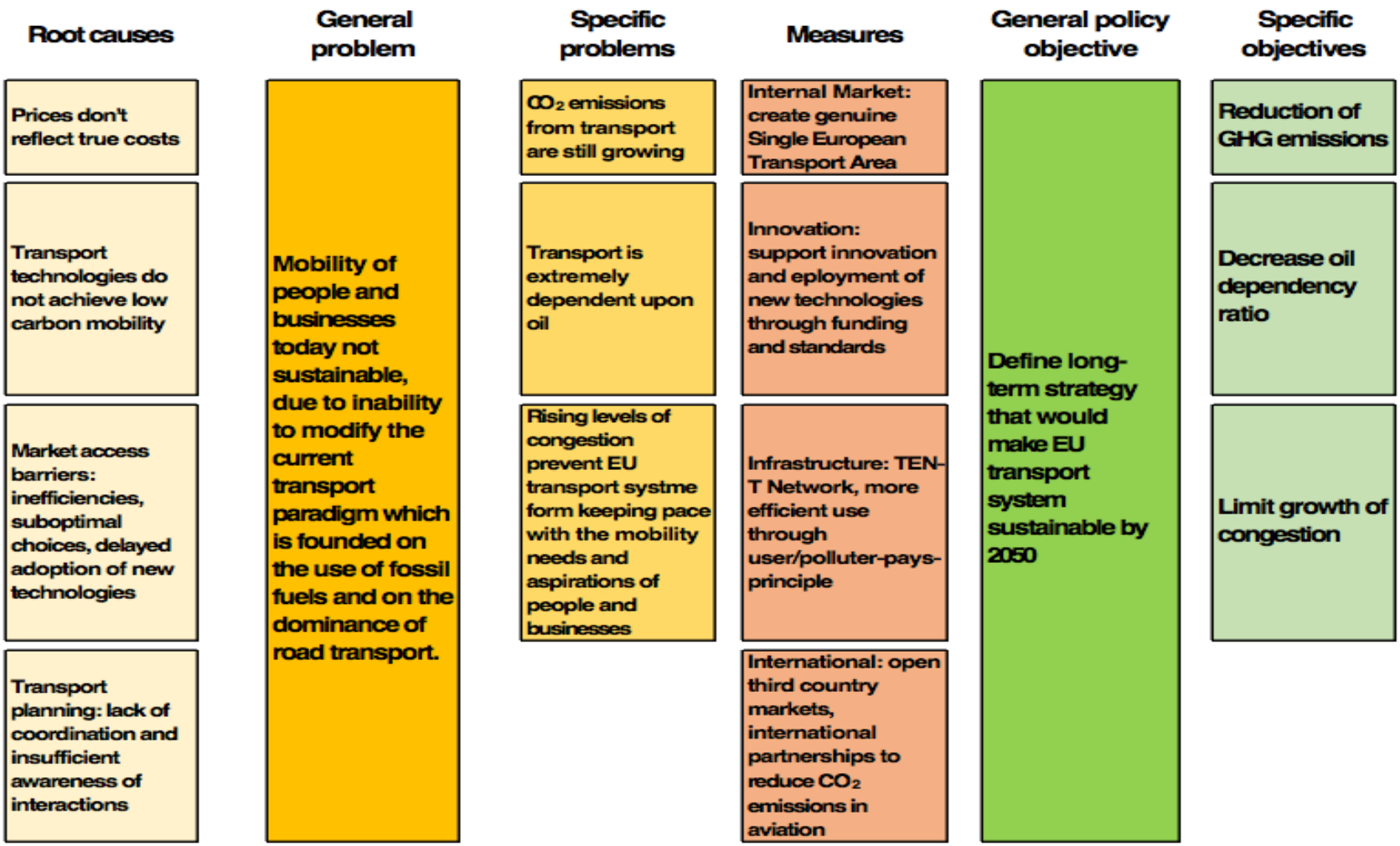
Annex 2: The ten headline goals of the White Paper

The White Paper identifies ten goals for a competitive and resource efficient transport system that serve as benchmarks an integrated, sustainable and efficient transport system in the EU and accompany the 40 action points of the White Paper strategy:

1. Halve the use of conventionally fuelled cars in urban transport by 2030, phase them out in cities by 2050, and achieve essentially CO2-free city logistics in major urban centres by 2030.
2. 40% low-carbon sustainable fuels in aviation by 2050; reduce EU CO2 emissions from maritime bunker fuels by 40% by 2050, (if feasible by 50%)[122].
3. Shift 30% of road freight above 300 km to rail and waterborne by 2030 and more than 50% by 2050, facilitated by efficient and green freight corridors.
4. Triple the length of the existing high-speed rail network by 2030, and by 2050 have a complete European high-speed rail network, and maintain a dense railway network in all Member States. The majority of medium-distance passenger transport should go by rail by 2050.
5. Fully functional and EU-wide multi-modal TEN-T 'Core Network' completed by 2030, with a high quality and capacity network by 2050 and corresponding information services.
6. Multimodal connections between all Core Network airports and rail, between Core Network seaports and rail and, where possible, seaports and inland waterways by 2050.
7. Deployment of traffic management systems in the various modes, including air traffic (SESAR) by 2020. Deployment of the European Global Navigation Satellite System (Galileo).
8. By 2020, establish the framework for a European multimodal transport information, management and payment system.
9. Halve road casualties by 2020, move close to zero fatalities by 2050.
10. Move towards full application of 'user pays' and 'polluter pays' principles and private sector engagement to eliminate distortions and harmful subsidies, and to generate revenues and ensure financing for future transport investments.

[122] Cf. Commission Communication "A Roadmap for moving to a competitive low carbon economy in 2050", COM (2011) 112 final.

Annex 3: Intervention logic of the White Paper 2011



Annex 4: Stakeholder consultation

The stakeholder consultation activities in the context of this evaluation were as follows:

- **A survey of national and regional authorities** was launched on 13 December 2019 and remained open until 31 March 2020;
- **An interview programme** was launched on 17 December 2019 and remained open until 4 May 2020;
- **An OPC** was launched on 1 July 2020 and remained open until 23 September 2020.

I. Consultation strategy

Overall approach

The stakeholder consultation for this evaluation support study aimed to gather the views of relevant stakeholders on the following issues:

- The effectiveness of the overall White Paper strategy and its 40 action points;
- The extent to which the costs of the White Paper initiatives are proportionate to the benefits achieved;
- The relevance of the White Paper needs and objectives in view of current and future developments in the transport sector, and policy changes (i.e. European Green Deal);
- The coherence of the objectives of the White Paper with targets set out in other relevant policy areas;
- The EU added value of the strategy.

The consultation activities were tailored to the relevant stakeholder groups, according to their involvement in the White Paper.

Survey of national and regional authorities

Two online surveys were developed, which were aimed at national authorities and regional authorities, respectively. The surveys were launched on 13 December 2019 and remained open until 31 March 2020.

Both of the surveys were structured around the evaluation questions, and the 12 thematic areas (pillars) of the White Paper. The surveys included a range of closed response questions, based on a 5-point Likert scale, to assess the degree of agreement with a statement or the perceived strength of a specific White Paper contribution. A few open response questions were also included, to allow respondents to elaborate upon their

response. The complete catalogue of questions was presented in the first interim progress report.

The survey for regional, local and city authorities was disseminated by five organisations representing cities, regions and metropolitan areas (i.e. Council of European Municipalities and Regions (CEMR), International Council for Local Environmental Initiatives (ICLEI), POLIS, Eurocities and Emerging Markets Trade Association (EMTA)). Their members were alerted to the survey through direct emails, newsletters and social media posts. The regional survey was available in 14 languages[123], via the EU Survey Tool.

The survey aimed at national authorities was distributed to contacts identified for each EU Member State by the study team. Where possible, national contacts were asked to disseminate the regional survey to any relevant regional contacts within their Member State. The national survey was available in English, via the EU Survey Tool.

From January 2020 to survey closure, sent regular email reminders were sent to the contacts circulating the regional authority survey, and to the national authority contacts, to maximise the response rate. In total, 17 responses were received to the national authority survey and eight responses to the regional authority survey. For the national authority survey, Estonia and Sweden provided two responses, on behalf of different ministries within their respective Member States. As the responses were not coordinated, and offered differing insights, both sets of responses were included in the analysis.

Targeted interviews

The interviews followed a similar structure to the survey of authorities and were structured around the evaluation criteria and 12 pillars of the White Paper. Between 17 December 2019 and 4 May 2020, 66 interviews were conducted, with an additional three stakeholders submitting written responses to the interview questionnaire, which brought the total number of contributions to 69. An additional five stakeholders submitted position papers, which were also included in the analysis. The interview programme covered a wide range of organisations, including EU institutions (i.e. European Commission Directorates-General, EU agencies, etc.), representatives of industry organisations, labour and passenger organisations, research organisation organisations, and non-governmental organisations (NGOs).

For the majority of stakeholder groups, the planned number of interviews was reached, or missed by one stakeholder. However, for city networks, only half the interviews initially predicted were conducted (3 out of 6). Given that the survey of regional authorities also took place, this was not seen as problematic, as the survey was also used to gather the views of this stakeholder group.

[123] English, German, French, Italian, Spanish, Polish, Romanian, Estonian, Hungarian, Portuguese, Greek, Czech, Bulgarian and Lithuanian.

Open Public Consultation (OPC)

The Commission launched a 12-week OPC on 1 July 2020, which closed on 23 September 2020. The OPC invited all citizens and organisations to provide input on the White Paper, and on the future Sustainable and Smart Mobility Strategy. The OPC covered the transport needs identified in the White Paper, the objectives and goals that were set, the proposed initiatives and the outcomes that were achieved, as well as the overall impact of the strategy since its release. In total, 684 responses were received.

II. Consultation analysis methodology

Survey and interview analysis

Following the closure of the two online surveys and the interview programme, the raw data was cleaned to allow analysis to take place. For all of the closed response questions, charts were developed.

The survey questions were mapped against the interview questions. Where the same questions were presented in the surveys and interviews, the following stakeholder groups were used:

1. National and regional authorities;
2. Industry organisations;
3. Civil society and research organisations.

National and regional authorities include ministries within Member States and regions, as well as organisations which represent city and regional networks. **Industry organisations** include organisations which represent transport operators, manufacturers, managers of transport infrastructure, and trade associations representing business sectors related to transport. **Civil society and research organisations** include NGOs, trade unions, research organisations, campaign groups, organisations which represent transport users/consumers, and organisations which represent transport employees.

In some cases, where the questions were tailored to specific stakeholder groups, questions were only included in the interviews, or in the surveys. Charts have also been produced for these questions and the stakeholder consultation method has been indicated for these charts (i.e. *Source: Survey of authorities*).

OPC analysis

Following the OPC closure, the responses were analysed. The analysis involved developing charts to display the responses to closed questions. The responses to open questions were also analysed, split by respondent type, issue and, where relevant, by the particular interest of the respondent.

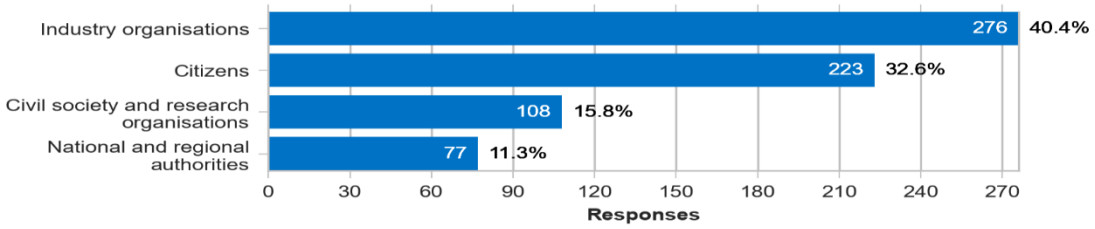
III. Identified campaigns and ad-hoc contributions

No identified campaigns or ad-hoc contributions were received through the targeted consultation of surveys and interviews. Under the OPC, identified campaigns for public consultations (where organisations have called their members to participate with coordinated responses) were analysed separately, and their share of the total contributions was reported. In addition, ad-hoc contributions that were submitted outside of the formal consultation process were reviewed and presented, noting the origin of the contribution and the stakeholder group. In total, 116 ad-hoc contributions were received as part of the OPC analysis.

IV. Respondents to the OPC

There were 684 responses to the questionnaire. Responses from industry representatives made up the largest share of responses, followed by citizens, who contributed nearly one third of the responses.

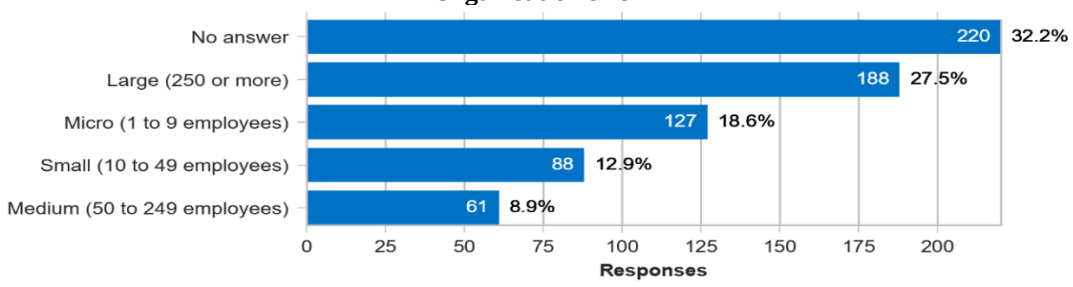
Organisation type

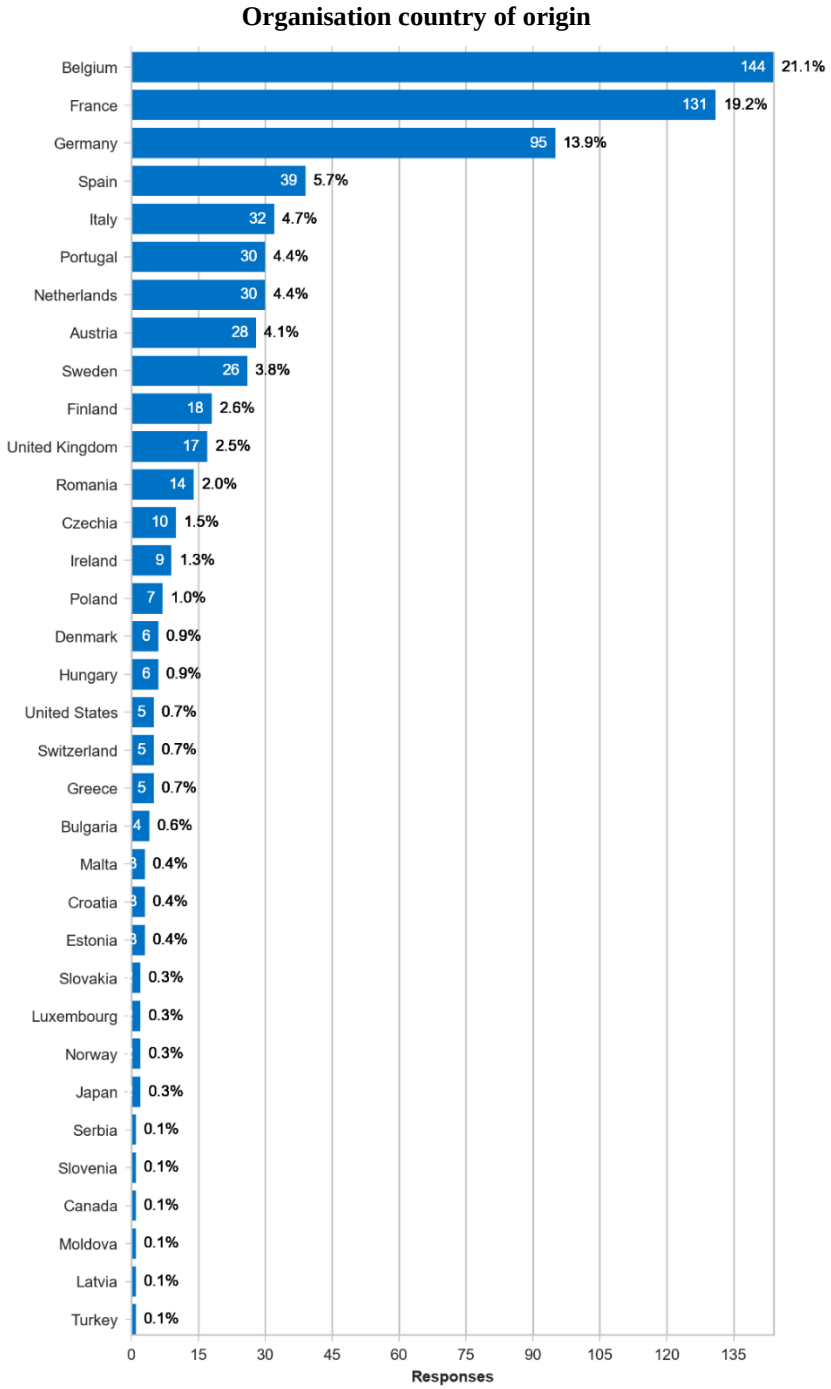


There were more responses from large organisations, than organisations of other sizes, although there were a fair number of responses from organisations of all sizes.

Responses were received from respondents residing in, or organisations based in 25 EU Member States, with only Cyprus and Lithuania not being represented. In addition, there were responses from Canada, Japan, Moldova, Norway, Serbia, Switzerland, Turkey, the United Kingdom and the United States. Over half of the respondents were based in either Belgium (21%), France (19%) or Germany (14%), with the high concentration in the former linked to the number of pan-European trade associations and other representative bodies that are based in the country.

Organisation size





V. Results of the stakeholder consultation activities

Effectiveness

Stakeholder perceptions relating to progress made against the White Paper objectives vary significantly, depending on the White Paper objective.

In relation to the first White Paper objective, on reducing greenhouse gas (GHG) emissions from transport by 60% by 2050 compared to 1990 levels, the majority of

respondents either noted ‘no change’ or an improvement in the level of GHG emissions since 2011. Similarly, a large proportion of respondents suggested that ‘no change’ had occurred in relation to the second White Paper objective, on decreasing the oil dependency of transport-related activities over the past decade. Of the three specific objectives, progress against the third White Paper objective, on limiting the growth of congestion, was perceived least favourably by stakeholders.

The targeted consultation also covered progress made towards the general objectives of the White Paper, in terms of accessibility, provision and quality of transport services, and the minimisation of external costs to society. A large majority of respondents considered that at least a ‘slight improvement’ had occurred in relation to the accessibility of transport services for individuals and companies. With regard to the accessibility of peripheral regions, views were also largely positive. For people with special needs, slight to significant improvements in the accessibility of transport services were identified by the majority of respondents (38 out of 58). The perspectives of the OPC respondents reflected the positive view on the role of the White Paper in improving accessibility to transport services for individuals (262 out of 435) and companies (172 out of 338).

Views regarding the progress made in relation to the affordability of transport services since 2011 were more mixed. Out of 64 respondents, 22 respondents stated that there was at least a ‘slight improvement’, 15 respondents stated that ‘no change’ had occurred and 9 respondents indicated at least a ‘slight deterioration’. Stakeholders generally displayed a positive response in relation to the progress made on the overall quality of transport services since 2011, although civil society and research organisations shared more mixed views on this topic area.

In regard to the quality of transport services, the majority of respondents (42 out of 70) indicated that at least a ‘slight improvement’ had been made. With regard to progress made on the safety and security of transport services, the majority of respondents (45 out of 65) indicated that at least a ‘slight improvement’ has been made since 2011. The OPC respondents similarly displayed support for the role of the White Paper in improving the safety (322 out of 449) and security (253 out of 402) of transport services. In contrast, stakeholders displayed a more mixed opinion on progress relating to the minimisation of external costs from transport, with only 23 out of 67 indicating that at least a ‘slight improvement’ had been made.

Efficiency

In the targeted consultation, stakeholders were asked to provide input on the cost-effectiveness of the initiatives for society, and for their organisation.

In relation to the cost-effectiveness for society, 13 out of 21 national and regional authorities stated that the benefits outweighed the costs to society ‘fully’ or to ‘a significant extent’. Similarly, in the OPC, there was a general consensus from authorities that the benefits derived from the White Paper initiatives outweighed their costs (206 out of 302). No further details were provided in regard to the initiatives which these authorities were referring to.

In terms of the cost-effectiveness for authorities, stakeholders indicated that, in most cases, the costs of the initiatives were justified by the benefits. In total, 10 out of 21 national and regional authorities considered that the benefits of the White Paper outweighed the costs to their administration, 'fully' or to 'a significant extent'. A further four authorities stated that the benefits outweighed the costs 'to some extent', and only one authority indicated that the benefits did not outweigh the costs.

Although industry stakeholders were more sceptical, with only 8 out of 22 industry stakeholders indicating that, at best, the costs were justified by the benefits 'to some extent', the largest proportion of stakeholders indicated that they 'did not know' if the costs were justified by the benefits (10 out of 22). Of those that did not believe the costs were justified, two main justifications emerged: (i) a lack of progress made in regard to implementation, leading to a delay in the materialisation of benefits; (ii) significant burden imposed on industry by the requirements emerging from multiple pieces of legislation, which has been particularly burdensome for small businesses. For civil society and research organisations, the largest proportion of stakeholders (4 out of 8) indicated that they 'did not know' if the costs were justified, and the remaining stakeholders indicated that the costs of the White Paper were justified by the benefits, at least 'to some extent'.

Relevance

Stakeholders were asked to indicate if they saw a continued relevance today to address the needs identified in the White Paper. Overall, the stakeholders that engaged in the targeted consultation suggested that there is still interest in addressing all of the needs identified in the White Paper.

The continued need to address the dependence of the transport sector on fossil fuels was supported by the greatest majority of stakeholders (67 out of 69 in the targeted consultation). Stakeholders indicated that the decarbonisation of the transport sector remains a key policy objective and that it will be integral to reaching the EU's climate policy objectives. The need to address GHG and air pollutant emissions from the EU transport sector was also supported by the vast majority of stakeholders (67 out of 70 in the targeted consultation). Stakeholders noted the continued need to address the dependence on oil, with some stakeholders suggesting that a substantial shift to rail could help to reduce the reliance on fossil fuels, whilst also relieving road congestion.

The ongoing need to support the development and integration of new technologies in the transport sector was also supported by a large majority of stakeholders that contributed to the evaluation, with 64 out of 69 stakeholders in the targeted consultation expressing that there is still a need for policy action in this area. Of those that elaborated upon their position, the continued importance of the development and deployment of new technologies across several policy areas was noted, including technologies relating to climate mitigation and traffic management.

Overall, the continued need to address the dominance of road transport was supported by the smallest majority of stakeholders (47 out of 64 in the targeted consultation) that

contributed to the evaluation. Of those that disagreed with the need to address the dominance of road transport, the need to encourage multimodality, rather than to entirely neglect the importance of road transport, was raised. In addition, the potential to shift towards less-polluting road vehicles was also noted.

In regard to the environmental needs (i.e. dominant role of road transport, level of GHG emissions and air pollutants, dependency on fossil fuels), civil society and research organisations displayed the greatest support for the continued need for policy action in these areas, relative to the other stakeholder groups. In regard to economic needs (i.e. competitiveness of the EU transport sector, completion of the single internal market), industry organisations displayed the greatest support for the continued need for policy action in these areas.

Coherence

Stakeholders generally indicated that the objectives of other EU policy areas and transport strategies were consistent with the objectives of the White Paper. For each of the other EU policy areas, a majority of stakeholders in the targeted consultation indicated that the White Paper was consistent with initiatives in other policy areas, including environmental policy (27 out of 50), climate change policy (26 out of 39), taxation policy (14 out of 23), employment policy (9 out of 14), and in wider transport policy (27 out of 42).

Of those that suggested that there were inconsistencies between the White Paper and other EU environmental and climate change policies, few stakeholders provided a justification. However, a couple of civil society organisations suggested that the inclusion of natural gas as an alternative transport fuel was not consistent with EU climate change policy, particularly in relation to the need to decarbonise transport. Three other stakeholders suggested that the White Paper, or at least elements of it, were not consistent with the ambition of EU climate change policy.

Several industry organisations provided an explanation for their belief that the objectives of the White Paper were not consistent with EU taxation policy. A perceived lack of support in EU taxation policy for alternative fuels, along with continued support for some diesel applications, was identified as one inconsistency by industry organisations. The Commission has evaluated the current Energy Taxation Directive. The evaluation concludes that overlaps, gaps and inconsistencies significantly hamper EU objectives in the field of energy, environment, climate change and transport.[124] In addition, other industry organisations suggested that the Eurovignette Directive did not yet sufficiently apply the ‘user pays’ and ‘polluter pays’ principles.

[124] SWD(2019) 329 final.

EU added value

In terms of the role of EU-level action in driving effective policymaking, the input provided by the majority of stakeholders was positive. Stakeholders indicated that achieving results more effectively is linked to setting harmonised EU-level objectives, which limit the fragmentation of measures and increase the potential for border-free transport.

In terms of the cross-border dimension, the majority of stakeholders supported the notion that EU-level action has had a positive impact. Stakeholders highlighted the success of cross-border legislative measures and packages, such as the Cross-Border Enforcement Directive on traffic offences relating to road safety, and the 4th Railway Package.

For the EU's role in avoiding fragmentation, stakeholders acknowledged success in relation to the 4th Railway Package, vehicle safety and minimum standards for consumers. However, it was noted that the varying capacities of Member States to implement certain provisions under the White Paper has resulted in the uneven implementation of measures across the EU. Finally, it was noted that, although the Mobility Package has improved fragmentation issues, it has also led to enforcement challenges.

In relation to the efficiencies gained through coordination of effort, the input provided by the majority of stakeholders was positive. Stakeholders suggested that efficiencies were derived through the use of common procedures, increased coordination and the avoidance of effort duplication. It was noted that the White Paper has helped to align efforts, and has allowed organisations to benefit from information exchange. However, it was suggested that new EU frameworks have the potential to result in additional administrative burdens.

In terms of the role of EU-level action in creating synergies, a large proportion of stakeholders indicated that EU-level action has had a positive impact. Stakeholders noted the benefits of EU expertise, such as improving skills development at the regional level (e.g. pilot projects helping regional stakeholders to prepare SUMPs with the support of experts during workshops).

EU-level action was also considered to have stimulated research and innovation at a greater scale, with stakeholders acknowledging that a number of relevant research projects for transport have been developed under the Horizon 2020 funding framework. However, it was noted that the administrative application procedures for EU R&D funding can be quite burdensome, and some questioned how significantly the research projects would contribute towards achieving the White Paper objectives.

Annex 5: Methods and analytical models

1. Overview

The analysis was based on an evaluation matrix (see Annex 6) that was used to identify operational questions, potential indicators, success criteria and relevant data sources for each evaluation question.

Desk research was used to identify qualitative and quantitative evidence that would support the analysis of the evaluation questions. An important element of the desk research was the analysis of impact assessments and evaluation of initiatives that the Commission has launched in the context of the White Paper since 2011. Moreover, Commission experts and national and regional authorities were requested to provide updated information on the status of the implementation of the EU initiatives so far adopted under the White Paper.

To solicit the views of stakeholders, the analysis included three different stakeholder consultation activities:

- A survey for public authorities, including national, regional and local government levels. As this aimed to cover public authorities across Member States and government levels, a survey was considered the most appropriate tool to gather the required inputs in a cost-effective and consistent way.
- Phone interviews to obtain relevant input from representatives of industry, the civil society (NGOs, consumer groups) and transport experts. These were targeted interviews on the basis of an interview checklist developed to help the evaluation questions.
- The Commission organised a web-based open public consultation covering all evaluation questions.

The quantitative analysis built on a counterfactual scenario logic comparing the actual and expected future impacts of the already adopted policies in comparison to a no policy scenario. More specifically, E3Modelling used the PRIMES-TREMOVE transport model to quantify two scenarios - the Baseline and the Alternative scenario in order to assess the effectiveness and the efficiency of the White Paper strategy:

- Baseline scenario: this scenario projects what would happen if the policies and measures adopted following the White Paper were not in place.
- Alternative scenario: included recently adopted and proposed EU initiatives. It is not possible to assess with certainty which initiatives have been adopted following the 2011 White Paper and which initiatives would have been adopted even in its absence. Therefore, the comparison between the "Baseline" and the "Alternative" scenario provides insights in the expected maximum impacts up to 2050 as a result of the White Paper.

2. Description of the Baseline scenario and Alternative scenario

The Baseline scenario projects the developments under the assumption that the policies and measures adopted following the White Paper are not in place. In addition, as explained above, an Alternative scenario has been developed to assess the expected maximum impacts as a result of the White Paper intervention.

This section presents the methodology for developing the Baseline scenario and the Alternative scenario, using the PRIMES-TREMOVE transport model by E3Modelling. Key results of the Baseline scenario and Alternative scenario are provided in the following sections at an aggregate level for the EU27.

PRIMES-TREMOVE model

The PRIMES-TREMOVE transport model projects the evolution of demand for passengers and freight transport, by transport mode, and transport vehicle/technology, following a formulation based on microeconomic foundation of decisions of multiple actors. Operation, investment and emission costs, various policy measures, utility factors and congestion are among the drivers that influence the projections of the model. The projections of activity, equipment (fleet), usage of equipment, energy consumption and emissions (and other externalities) constitute the set of model outputs.

The PRIMES-TREMOVE transport model can therefore provide the quantitative analysis for the transport sector in the EU, candidate and neighbouring countries covering activity, equipment, energy and emissions. The model accounts for each country separately which means that the detailed long-term outlooks are available both for each country and in aggregate forms (e.g. EU level).

In the transport field, PRIMES-TREMOVE is suitable for modelling *soft measures* (e.g. eco-driving, labelling); *economic measures* (e.g. subsidies and taxes on fuels, vehicles, emissions; ETS for transport when linked with PRIMES; pricing of congestion and other externalities such as air pollution; accidents and noise; measures supporting R&D); *regulatory measures* (e.g. CO_2 emission performance standards for new passenger and heavy duty vehicles; EURO standards on road transport vehicles; technology standards for non-road transport technologies, deployment of Intelligent Transport Systems) and *infrastructure policies for alternative fuels* (e.g. deployment of refuelling/recharging infrastructure for electricity, hydrogen, LNG, CNG). Used as a module that contributes to the PRIMES model energy system model, PRIMES-TREMOVE can show how policies and trends in the field of transport contribute to economy-wide trends in energy use and emissions. Using data disaggregated per Member State, the model can show differentiated trends across Member States.

The PRIMES-TREMOVE has been developed and is maintained by E3Modelling, based on, but extending features of, the open source TREMOVE model developed by the TREMOVE[125] modelling community. Part of the model (e.g. the utility nested tree) was built following the

[125] Source: https://www.tmleuven.be/en/navigation/TREMOVE

TREMOVE model.[126] Other parts, like the component on fuel consumption and emissions, follow the COPERT model.

Data inputs

The main data sources for inputs to the PRIMES-TREMOVE model, such as for activity and energy consumption, comes from EUROSTAT database and from the Statistical Pocketbook "EU transport in figures".[127] Excise taxes are derived from DG TAXUD excise duty tables. Other data comes from different sources such as research projects (e.g. TRACCS project) and reports. In the context of this exercise, the PRIMES-TREMOVE transport model is calibrated to 2005, 2010 and 2015 historical data.

Methodology for developing the Baseline and Alternative scenarios

The Baseline scenario builds on the baseline developed in the context of the Impact Assessment accompanying the 2011 White Paper but accounts for updated macro-economic, fuel price and technology costs assumptions[128]. These assumptions are common with those used in the context of the 2017-2018 Mobility Packages[129] and also in the in-depth analysis accompanying the Clean Planet for all long term strategy[130]. No further policies at EU or MS level are assumed to be implemented beyond 2011 in the Baseline scenario, in line with the baseline of the Impact Assessment accompanying the 2011 White Paper.

The Alternative scenario builds on the Baseline scenario developed in the context of this evaluation but additionally includes the measures in Table 1, adopted following the White Paper. It is not possible to assess with certainty which initiatives have been adopted following the 2011 White Paper and which initiatives would have been adopted even in its absence. Therefore, the comparison between the "Baseline" and the "Alternative" scenario provides insights in the expected maximum impacts up to 2050 as a result of the White Paper.

Table 5: List of policies covered by the PRIMES-TREMOVE model that are included in the Alternative scenario and not in the Baseline scenario

Act or subject matter	Reference
Amendment on ILUC of the Directive on the promotion of the use of energy from renewable sources ("RES Directive") and Fuel Quality Directive	Directive (EU) 2015/1513 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources

[126] Several model enhancements were made compared to the standard TREMOVE model, as for example: for the number of vintages (allowing representation of the choice of second-hand cars); for the technology categories which include vehicle types using electricity from the grid and fuel cells. The model also incorporates additional fuel types, such as biofuels (when they differ from standard fossil fuel technologies), LPG, LNG, hydrogen and e-fuels. In addition, representation of infrastructure for refuelling and recharging are among the model refinements, influencing fuel choices. A major model enhancement concerns the inclusion of heterogeneity in the distance of stylised trips; the model considers that the trip distances follow a distribution function with different distances and frequencies. The inclusion of heterogeneity was found to be of significant influence in the choice of vehicle-fuels especially for vehicles-fuels with range limitations.

[127] Source: European Commission (2020) EU Transport in Figures. Statistical Pocketbook 2020.

[128] The scenario analysis does not account for the Covid-19 impact on the economy and the transport sector.

[129] https://ec.europa.eu/transport/modes/road/road-initiatives_en

[130] https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf

Act or subject matter	Reference
Eurovignette Directive on road infrastructure charging	Directive 2011/76/EU amending Directive 1999/62/EC; proposals for Directives amending Directive 1999/62/EC, COM(2017) 275 and COM(2017)276,
Directive establishing a single European railway area (Recast)	Directive 2012/34/EU
Regulation on noise-related operating restrictions at Union airports	Regulation (EU) No 598/2014
Directive on the Sulphur content of marine fuels	Directive 2012/33/EU
Roadworthiness Package	Directive 2014/45/EU, Directive 2014/46/EU amending Directive 1999/37/EC, Directive 2014/47/EU
Regulation on the sound level of motor vehicles	Regulation (EU) No 540/2014
Regulations governing the performance and charging schemes in as well as the network functions of the Single European Sky	Commission Implementing Regulations (EU) No 390/2013, 391/2013 and 677/2011; later replaced by Regulations (EU) 2019/317 and 2019/123
Directive on the deployment of alternative fuels infrastructure	Directive 2014/94/EU
TEN-T guidelines	Regulation (EU) No 1315/2013 supported by the Connecting Europe Facility (Regulation (EU) No 1316/2013)
The recast Renewable Energy Directive	Directive (EU) 2018/ 2001
Regulation on setting post-2020 CO_2 emission standards on new cars and light commercial vehicles and the replacement of the New European Driving Cycle (NEDC) test cycle by the new Worldwide harmonized Light-vehicles Test Procedure (WLTP)	Regulation (EU) 2019/631
Improving testing procedures - real driving conditions ('Real Driving Emissions' – RDE) and improved laboratory test ('World Harmonised Light Vehicle Test Procedure' – WLTP)	Commission Regulation (EU) 2018/1832 Commission Regulation (EU) 2017/1151 Commission Regulation (EU) 2017/1154 Commission Regulation (EU) 2016/646 Commission Regulation (EU) 2016/427
Regulation on setting post-2020 CO_2 emission standards on new heavy-duty vehicles	Regulation (EU) 2019/1242
Clean Vehicle Directive	Directive (EU) 2019/1161
Regulation on electronic freight transport information	Proposal for Regulation on electronic freight transport information[131]
European Maritime Single Window	Regulation (EU) 2019/1239

[131] https://data.consilium.europa.eu/doc/document/ST-5142-2020-REV-1/en/pdf. This proposal has meanwhile given rise to Regulation (EU) 2020/1056.

Act or subject matter	Reference
Inland waterways and port services	Directive 2016/1629/EU on technical requirements for inland waterway vessels and the Regulation on non-road mobile machinery (NRMM) Regulation (EU) 2017/352 establishing a framework for the provision of port services
Directive on weights & dimensions	Directive 2015/719/EU amending Directive Directive 96/53/EC
Road infrastructure safety management Directive and General Safety Regulation	Directive (EU) 2019/1936 amending Directive 2008/96/EC; Regulation (EU) 2019/2144
4th Railways package	Directives (EU) 2016/798 on railway safety, Directive (EU) 2016/797 on railway interoperability and the Directive 2016/2370/EU regarding the opening of the market for domestic passenger transport services by rail and the governance of the railway infrastructure
Single European Sky 2+	Proposal COM(2013) 409 final; amended proposal COM(2020)579, complemented through proposal COM(2020)577.

3. Baseline scenario and Alternative scenario results

This section presents the key results of the Baseline and the Alternative scenarios quantified with the PRIMES-TREMOVE transport model, drawing on the evaluation support study. The results are presented at EU-27 level.[132]

Transport activity and modal shares

Road passenger transport is projected to continue holding the largest modal share in passenger transport activity throughout the period until 2050 in both the Baseline and the Alternative scenario. Nevertheless, the projections show that the modal share of road passenger transport follows a decreasing trend. By 2050 it would represent around 78% of the passenger transport activity in the Baseline scenario and 76% in the Alternative scenario.

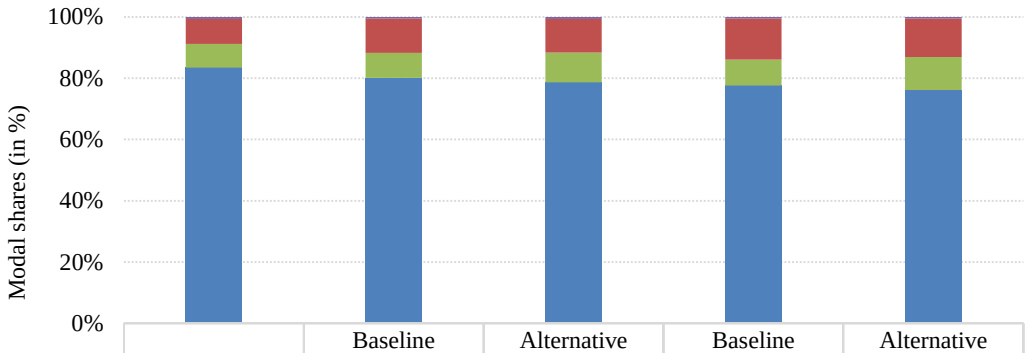
Rail transport is projected to show a relatively stable modal share by 2030 and 2050 in the Baseline scenario, in lack of specific policies adopted beyond 2011. In the Alternative scenario however, the share of passenger rail is projected to increase by 1.6 percentage points in 2030 and by 2.3 percentage points in 2050 relative to the Baseline. This is mainly driven by the implementation of the TEN-T core and comprehensive network, supported by CEF funding, as well as of the 4th Railways package.

[132] Selected results are presented also at the EU28 level in the evaluation support study to show that the impact of the White Paper implementation in the Alternative scenario compared to the Baseline scenario does not change between the two geographical scopes (i.e. EU-28 versus EU-27).

In the Baseline scenario, air passenger transport activity is projected to show significant growth by 2050 and increase its modal share by about 5 percentage points relative to 2010. In the Alternative scenario the modal share of air transport is projected to be slightly lower (0.8 percentage points lower in 2050) relative to the Baseline due to some shift of passenger traffic for medium-distance trips from aviation to high-speed rail.

A significant increase in the passenger transport activity of high-speed rail in the EU-27 is projected in the Alternative scenario, driven by the assumed completion of TEN-T core and comprehensive network. The share of high-speed rail in total rail passenger transport activity would increase to around 38% by 2030 and 43% by 2050[133], 6 percentage points higher in 2030 and 9 percentage points higher in 2050 relative to the Baseline. By contrast, the share of high-speed rail is projected to remain relatively stable in the Baseline scenario in the absence of initiatives driving an increase in the competitiveness of the sector.

Figure 6: Modal split of the EU-27 passenger transport activity in the Baseline and the Alternative scenario



	2010	2030 Baseline	2030 Alternative	2050 Baseline	2050 Alternative
Inland navigation	0.6%	0.6%	0.6%	0.5%	0.6%
Aviation	8.1%	11.2%	11.0%	13.4%	12.5%
Rail	7.7%	8.1%	9.7%	8.5%	10.7%
Road	83.5%	80.1%	78.7%	77.6%	76.1%

Source: PRIMES-TREMOVE, E3Modelling

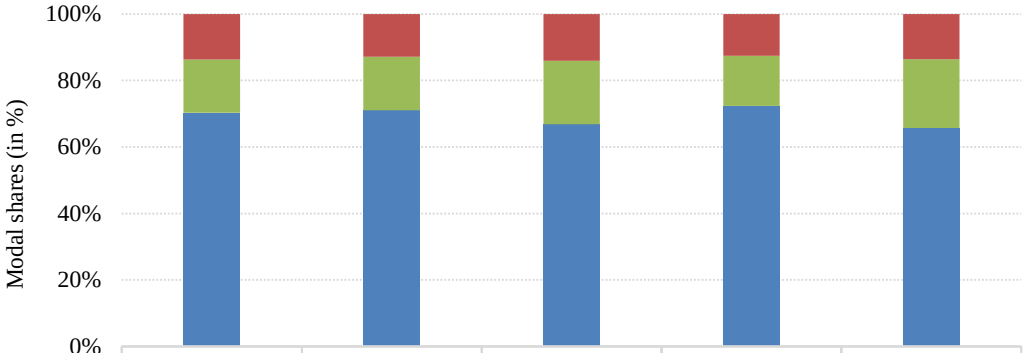
Total freight transport activity is projected to grow, driven by GDP growth, in both scenarios. Road freight transport sector would continue to hold the largest share in the total freight transport activity by 2050. In the Baseline scenario, in lack of specific policies adopted beyond 2011, the modal share of road freight transport is projected to increase by close to one percentage point by 2030 and an additional percentage point by 2050, relative to 2010. This would come to the detriment of rail freight and inland navigation transport (covering inland waterways and national maritime) that display declining modal shares over time.

The Alternative scenario shows a reduction in the modal share of road freight transport over time and also relative to the Baseline. Rail freight is projected to increase its modal share by 3.1 percentage points in 2030 relative to the Baseline and by 5.6 percentage points in 2050. Inland waterways and national maritime is also project to gain 1.2 percentage points in terms

[133] An increase of 8 p.p. by 2030 and 13 p.p. by 2050 compared to 2010 levels.

of modal share in 2030 relative to the Baseline and 1 percentage point in 2050. The changes in modal shares are mainly driven by the implementation of the TEN-T core and comprehensive network and the proposed revision of the Eurovignette Directive, but also by policies promoting inland waterways and port services and other policies driving improvements in the efficiency of the transport system.

Figure 7: Modal split of the EU-27 freight transport activity in the Baseline and the Alternative scenario



	2010	2030 Baseline	2030 Alternative	2050 Baseline	2050 Alternative
Inland navigation	13.7%	12.9%	14.1%	12.6%	13.6%
Rail	16.0%	16.0%	19.1%	15.1%	20.7%
Road	70.3%	71.1%	66.8%	72.3%	65.7%

Source: PRIMES-TREMOVE, E3Modelling

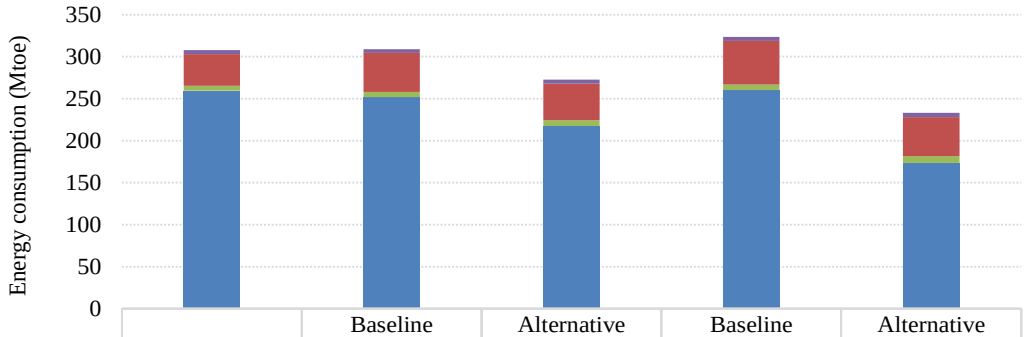
High congestion levels are still projected by 2050 in the Baseline scenario, with delay costs expected to increase by 34% between 2010 and 2050. The Alternative scenario, accounting for policies adopted by the end of 2018, shows only limited decrease in the external costs of congestion relative to the Baseline (1.1% reduction in 2030 and 0.4% in 2050), driven mainly by greater use of more sustainable transport modes.

Energy consumption in transport

In the Baseline scenario, energy consumption in the transport sector[134] is projected to remain relatively stable between 2010 and 2030 and increase by 5% during 2030-2050. The highest share of energy demand originates from road transport. The energy consumption of passenger cars is projected to slightly reduce over the projection period as a result of some autonomous progress in energy efficiency, in the absence of more ambitious policy measures post 2020. On the other hand, road freight energy demand would increase driven by the growth in transport activity, in lack of specific measures driving improvements in energy efficiency. As a result, road transport energy demand is projected to remain relatively stable between 2010 and 2050 in the Baseline scenario. Energy consumption in air transport is projected to increase by almost 40% by 2050, relative to 2010, and drives the overall increase in the transport sector energy demand between 2030 and 2050. Energy use in rail and inland navigation would be relatively stable by 2050 relative to its 2010 levels.

[134] Excluding international maritime.

Figure 8: Energy consumption in the transport sector in the Baseline and the Alternative scenario



	2010	2030 Baseline	2030 Alternative	2050 Baseline	2050 Alternative
Inland navigation	5	4	5	5	5
Aviation	38	46	43	52	47
Rail	6	6	7	6	8
Road	259	252	217	260	174

Source: PRIMES-TREMOVE, E3Modelling

The picture changes in the Alternative scenario which projects a gradual reduction in the energy demand in the transport sector. Energy consumption would be 12% lower relative to the Baseline scenario by 2030 and 28% lower by 2050, mostly driven by the reduced energy consumption in the road transport sector and the shift towards more sustainable transport modes like rail, including high-speed rail, and inland navigation.

The implementation of the CO_2 emission standards on cars, vans and trucks manufacturers, supported by the deployment of the recharging and refuelling infrastructure, is among the key drivers for the decrease in the road transport energy demand. The implementation of the post-2020 CO_2 emission standards is projected to drive low and zero-emission vehicles in the market, which are also more fuel efficient. The effects of the regulations are also extending in the period after 2030 with the replacement of older vehicles with new vehicle technologies that comply with the standards. In addition, by varying road charges based on CO_2 emissions the proposed revision of the Eurovignette Directive would provide further incentives to the faster uptake of more fuel-efficient vehicles. The impacts on energy use in road transport are further reinforced by the penetration of low and zero emission vehicle technologies in the public transport, driven by the Clean Vehicles Directive.

The modal shift from road transport towards rail and inland navigation, supported by policies, is also contributing to the reduced energy demand in road transport in the Alternative scenario compared to the Baseline scenario. In addition, the aviation sector is also projected to record some reductions in the energy use in 2030 and 2050 relative to the Baseline scenario. This is partly attributed to the lower activity growth in the Alternative scenario compared to Baseline and some further fuel efficiency improvements as a result of the initiatives assumed in the Alternative scenario, like for example the Single European Sky 2+.

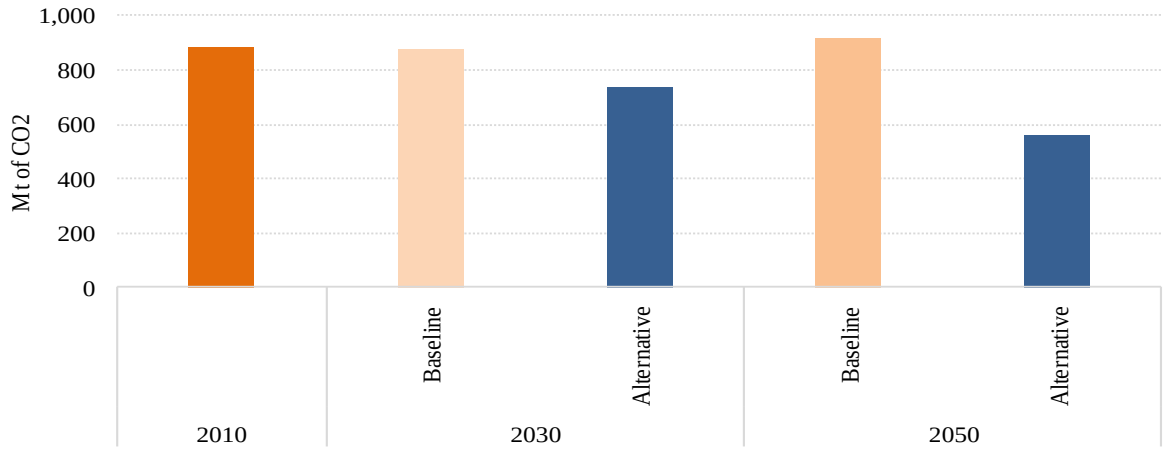
In the Baseline scenario, no significant progress would take place in the oil dependency ratio by 2050 relative to 2010. The oil dependency ratio would only decrease by about 2 percentage points between 2010 and 2050. The Alternative scenario however projects substantial progress in reducing the oil dependency by 2050. Relative to the Baseline scenario, oil

dependency would be about 17 percentage points lower by 2050 driven by the projected progress on electromobility, further electrification of rail and further uptake of renewable and low carbon fuels. However, the transport sector is projected to still be dependent on oil and petroleum products for about 87% of its energy needs in 2030 and 77% in 2050.[135] In addition, the Alternative scenario also shows that, with current policies and measures in place, the goal of a 40% share of low-carbon sustainable fuels in aviation by 2050 will not be reached. The share of low-carbon sustainable fuels in aviation would be below 3% of the fuel mix by 2050.

CO_2 emissions from transport

The Baseline scenario shows that despite reductions in technology costs and the revised macro-economic and fuel price framework, CO_2 emissions from transport[136] would stabilise by 2030 and increase by 4% by 2050 relative to 2010, in absence of additional policies beyond 2011. Compared to 1990, the reference year for the White Paper objectives, CO_2 emissions from transport would still be 29% higher in 2050.

Figure 9: CO_2 emissions from transport in the Baseline and the Alternative scenario



Source: PRIMES-TREMOVE, E3Modelling

The Alternative scenario projects that for the EU-27 overall CO_2 emissions from transport (including international aviation, excluding international maritime shipping) would be 16% lower relative to the Baseline in 2030 and 39% lower in 2050. In particular, emissions from road transport in the Alternative scenario are projected to be 19% below the Baseline levels in 2030 and 46% lower in 2050. This is due to the CO_2 standards for new light duty vehicles and heavy duty vehicles post-2020, supported by the deployment of recharging and refuelling infrastructure, but also due to policies driving greater use of sustainable transport modes, such as for example the implementation of the TEN-T Core and Comprehensive Networks, and the 4th Railway Package. At the same time, the Alternative scenario shows limited reduction in

[135] Oil dependency is calculated including international shipping.
[136] Excluding international maritime, in line with the 2011 White Paper target for 2050.

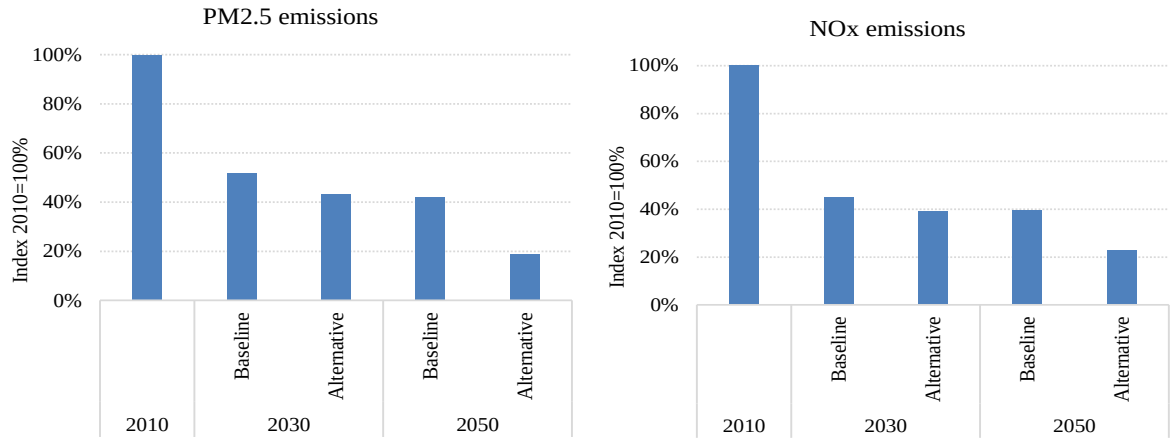
the emissions from international maritime bunkers (1% reduction in 2030 and 2050 relative to the Baseline scenario).

Policies adopted after 2011 would contribute significantly towards the White Paper milestone for 2030 but fall short in delivering the 60% emissions reductions by 2050, showing around 40 percentage points gap relative to the target. In this context, it is important to note that the impact assessment accompanying the 2011 White Paper had assumed further intensification of policies after 2030, whereas the Alternative scenario only takes into account policies adopted by the end of 2018. The adopted policies would deliver additional emissions reductions after 2030 due to, for example, the turnover of the vehicle fleet and larger penetration of new vehicles which are subject to CO_2 standards, as well as the implementation of the Core TEN-T Network by 2030. However, their impacts would remain limited by 2050 in lack of additional policies or further intensification of existing policies.

Air pollution emissions

In the Baseline scenario, transport NOx and PM2.5 emissions are projected to decrease during 2010-2030, mainly driven by the reductions in the road transport sector, as a result of the Euro standards Regulations. NOx and PM2.5 emissions would however remain relatively stable between 2030 and 2050, as the vehicles would continue to operate on petroleum products and no additional environmental policies to limit emissions are assumed in the Baseline scenario. Road transport sector is responsible for the largest share of PM2.5 emissions throughout the projection period. On the other hand, aviation would provide a significant share of the transport NOx emissions from 2030 onwards in the Baseline scenario.

Figure 10: PM2.5 and NOx emissions from transport in the Baseline and the Alternative scenario (index 2010= 100%)



Source: PRIMES-TREMOVE, E3Modelling

The Alternative scenario shows a significant reduction in the air pollutant emissions from transport relative to the Baseline. PM2.5 emissions are projected to decrease by about 16% in 2030 and 55% in 2050, respectively to the Baseline scenario. Similarly, NOx emissions would decrease by about 13% in 2030 and 42% in 2050 compared to the Baseline. The reduction in

the air pollutants emissions is mainly driven by the penetration of low and zero emission vehicles and in particular electric vehicles, but also due to improvements in the testing procedures and roadworthiness tests. Reductions take place also in other transport modes, albeit at a lesser extent compared to road transport.

Annex 6: Evaluation matrix

I. Effectiveness

	Evaluation sub-questions	Indicators	Analytical tools and initial success criteria	Data sources
EQ1	**What progress has been made towards the objectives (both general and specific) and the headline goals of the White Paper?**			
	What progress has been made towards the specific objective of reducing the **GHG emissions** from transport by 60% by 2050 compared to 1990? What progress has been made towards the specific objective of **decreasing the oil dependency** ratio of transport-related activities by 2050? What progress has been made towards the specific objective of **limiting the growth of congestion**? What progress has been made towards the **headline goals** of the WP? What progress has been made towards the **general objective** of the WP in terms of: • **Accessibility** (i.e. Satisfaction of mobility needs for passengers and freights); • **Equity** (i.e. Promoting high quality employment and equity within and between successive generation); • **Provision and quality of services** (i.e. Offering affordable, reliable, safe	Quantitative indicators on the evolution of key issues at EU level from 2012 to 2018, including: **Covering specific objectives** 1. Greenhouse gas emissions from transport; 2. Consumption of oil and petroleum products in transport (share of total); 3. External costs from congestion (congestion measured in monetary terms) as share of GDP; 4. Number of EU cities in the list of 100 most congested cities in the world; 5. Hours spent in road congestion annually. **Covering headline goals** 6. Urban areas final energy consumption of diesel, gasoline and other petroleum products; 7. Share of AFVs in total new passenger cars registrations; 8. Share of electric vehicles in total new passenger cars registrations; 9. Number of electric vehicles charging points per 100'000 urban inhabitants; 10. Final energy demand of kerosene, biokerosene, synthetic kerosene in aviation; 11. % share of low carbon fuels in aviation; 12. CO_2 emissions from international maritime bunkers; 13. GHG emissions from international	Analysis of the overall observed progress in the period 2012 to 2018 towards the objectives and the headline goals set by the White Paper. The analysis of the quantitative and qualitative indicators shows the progress made (e.g. either that the problem is increasing, or not decreasing fast enough) due to the White Paper in combination with other EU policies in other sectors (e.g. environmental and energy policies). Quantitative indicators are derived as much as possible from official EU data sources and complemented (where needed) by findings from desk research. Qualitative discussions are based on the findings of desk research and field research (surveys and interviews with key stakeholders). Initial success criteria: Positive progress towards the achievements of the objectives and of the headline goals of the White Paper are observed in the period 2012 to 2018.	Including data from: EEA EUROSTAT and European Transport Scoreboard; European Alternative Fuels Observatory Eurobarometer Reports; Desk research on key literature (including TEN-T CNCs Reports; ERTMS Deployment Plan; studies on the internalization of the external cost; INRIX and Tom-Tom data on urban congestion; data from Consumer Markets Scoreboard (Consumer Market Monitoring Survey)); Supplementary input from national and local/regional authorities (survey) and interviews with EU level stakeholders (industry, civil society and transport experts)

	Evaluation sub-questions	Indicators	Analytical tools and initial success criteria	Data sources
	and secure transport services); • **Minimising the external costs to society due to transport operations** (i.e. Accidents, noise and air pollution).	aviation 14. Modal split of freight transport (share of road freight); 15. Modal shift potential of long-distance road freight in containers; 16. Length of lines of high-speed rail network; 17. % of total rail passenger transport activity performed with high speed train; 18. Modal split of trips between 300 and 1,000 km; 19. Length of the TEN-T networks by Core and Non-Core Networks; 20. Completion of TEN-T Conventional Rail Core Network; 21. Completion of TEN-T High Speed Rail Core Network; 22. Completion of TEN-T Inland Waterways Core Network; 23. Completion of TEN-T Road Core Network; 24. Number of core network airports connected to the rail network; 25. Number of core seaports connected to rail and inland waterways; 26. Deployment of ETCS and GSM-R on Core Network Corridors 27. Number of 'SESAR solutions' deployed in the operational environment; 28. Level of use of EGNOS across transport modes; 29. Level of development of land and waterborne transport management systems (ERTMS, ITS, SSN and LRIT, RIS); 30. Total external costs from accidents; 31. Number of road accidents per year (fatalities, injuries); 32. Total external costs of transport by mode, 2016 33. Total external and infrastructure costs vs.		

	Evaluation sub-questions	Indicators	Analytical tools and initial success criteria	Data sources
		total taxes and charges; cost coverage ratio. **Covering other specific objectives** 34. Level of accessibility of public transport in the EU-28; 35. Consumer satisfaction with urban transport; 36. Intergenerational equity: Share of renewable energy used in transport; 37. Intra-generational equity: Level of public transport accessibility; 38. Marker Performance Indicator for the transport services sector; 39. Consumer satisfaction with rail transport; 40. Consumer satisfaction with air transport; 41. Road fatalities per million inhabitants.		
EQ2	**What is the expected progress by 2030 and 2050? How does this compare to what was initially expected in the impact assessment?**			
	What is the expected progress by 2030 and 2050 on **GHG emissions** from transport? What is the expected progress by 2030 and 2050 on **decreasing the oil dependency** of transport-related activities? What is the expected progress by 2030 and 2050 on **limiting the growth of congestion**? What is the expected progress by 2030 and 2050 towards the **headline goals** of the WP? What progress can be expected by 2030 and 2050 towards the **general objective** of the WP in terms of: • **Accessibility** (i.e. Satisfaction of mobility needs for passengers and	This evaluation question is based as much as possible on the same quantitative and qualitative indicators of EQ1. However, it is limited to those indicators that are covered by PRIMES-TR EMOVE model, namely: 1. Greenhouse gas emissions from transport; 2. Consumption of oil and petroleum products in transport (share of total) 3. External costs from congestion (congestion measured in monetary terms) as share of GDP; 4. Urban areas final energy consumption of diesel, gasoline and other petroleum products; 5. Share of AFVs in total new passenger cars registrations; 6. Share of electric vehicles in total new passenger cars registrations; 7. Energy demand of kerosene,	Analysis of the qualitative and quantitative indicators shows the expected progress towards the objectives and the 10 headline goals by 2030 and by 2050. Indicators, from PRIMES–TREMOVE model 'Alternative scenario' show the expected impact at 2030 and 2050 due to the White Paper in combination with other recently adopted EU policies (e.g. energy and climate targets). The comparison between the 'Baseline' and the 'Alternative' scenario shows the expected progress due to the White Paper at 2030 and 2050. The findings are compared with analogous findings of the impact assessment of the	Projections from PRIMES-TREMOVE Alternative scenario; Projections from PRIMES-TREMOVE Baseline scenario; Available projections from desk research; Field research (surveys and stakeholders' interviews).

	Evaluation sub-questions	Indicators	Analytical tools and initial success criteria	Data sources
	freights); • **Equity** (i.e. Promoting high quality employment and equity within and between successive generation); • **Provision and quality of services** (i.e. Offering affordable, reliable, safe and secure transport services); • **Minimising the external costs to society due to transport operations** (i.e. Accidents, noise and air pollution). • How does this compare to what was initially expected in the impact assessment SEC(2011)358?	biokerosene, synthetic kerosene in aviation; 8. % share of low carbon fuels in aviation; 9. CO_2 emissions from international maritime bunkers; 10. Modal split of freight transport (share of road freight); 11. Modal shift potential of long-distance road freight in containers; 12. % of total rail passenger transport activity performed with high speed train; 13. Total external costs from accidents; 14. Number of road accidents per year (fatalities, heavy and light injuries); 15. Intergenerational equity: Share of renewable energy used in transport.	White Paper. For those indicators not covered by the model, the analysis is based on available projections (e.g. completion of the TEN-T core network by 2030; status of ERTMS implementation at 2030 etc.) where **available.** The analysis is complemented with input from stakeholders (surveys and interviews with key stakeholders) on the expected developments. <u>Initial success criteria</u>: Positive progress towards the achievements of the specific objectives and of the headline goals of the White Paper are expected by 2030 and 2050. The White Paper will strongly contribute in reaching the objectives and headline goals by 2020 and 2050. The comparison with what was initially expected in the impact assessment is positive (i.e. progress in the transport sector are in line with previous projections or are faster than expected).	
EQ3	**To what extent have the 40 action points, which are broadly covered by all the policy options in the impact assessment of the White Paper, contributed to reaching the objectives and headline goals of the White Paper?**			
	To what extent has the White Paper contributed to reaching its objectives and headlines goals? Which action points **contribute more** in	For sake of comparability, this evaluation question is based as much as possible on the same quantitative and qualitative indicators as EQ1 and EQ2.	Comparative analysis of quantitative indicators of PRIMES-TREMOVE model at 2018 in the 'Baseline' and in the 'Alternative' scenario	Data from PRIMES-TREMOVE Alternative scenario; Data from PRIMES-TREMOVE

	Evaluation sub-questions	Indicators	Analytical tools and initial success criteria	Data sources
	reaching the objectives and headlines targets?		**Qualitative discussion** on the **contribution** of **the** action points in reaching the objectives and headline goals. Initial success criteria: The White Paper has strongly contributed in reaching the objectives and headline goals. Some action points **are** more effective than others towards certain objectives and goals.	Baseline scenario; Desk research on key literature.
EQ4	**Which factors and developments (e.g. digitalisation, mobility as a service, technology cost, etc.) have, negatively or positively, contributed to the achievement of the objectives and headline goals?**			
	Which factors and developments have, negatively or positively, contributed to the achievement of the objectives and headline goals? In what way? What will be their expected influence in the future?	Qualitative indicators on the observed and/or expected impact (positive or negative) of selected key factors and developments on the objectives and headline goals of the White paper.	The answer to this question is based on input from interviews with stakeholders **on** factors and developments that have positively or negatively contributed to the achievement of the objectives and headline goals of the White Paper or are expected to have an influence in the future. The investigation focuses on the following developments: • digitalisation and new business models; • new technological trends; • evolution in technology costs; • new mobility patterns (e.g. micro-mobility); • changes to consumer behaviours; • evolution of e-commerce; • new security and safety issues; • climate change • extreme weather events.	Input from interviews with EU level stakeholders (industry, civil society and transport experts, EU institutions interviews), national and local/regional authorities (surveys).

	Evaluation sub-questions	Indicators	Analytical tools and initial success criteria	Data sources
			Initial success criteria: No indication of negative role of factors or developments (e.g. technological developments, digitalisation etc.) in achievement of objectives and goals.	
EQ5	**Which unintended positive and negative economic, social and environmental effects, if any, have been produced?**			
	Have there been any unintended (positive or negative) effects in the economic, social and environmental domains? How significant were they? And why did they occur?	Qualitative indicator: Unintended positive or negative effects derived from the White Paper.	The answer to this question is based on input from stakeholders to identify unintended (positive and negative) effects of the White Paper and of their impact on its objectives. Initial success criteria: No unintended effects have been produced so far by the implementation of the White Paper.	Input from interviews with EU level stakeholders (industry, civil society and transport experts)
EQ6	**To what extent have the 40 action points of the White Paper been implemented by the Commission, by the Member States, by regional and/or local authorities (where relevant), or by other actors (e.g. transport operators)?**			
	To what extent have the 40 action points of the White Paper been implemented by the Commission? To what extent have the 40 action points of the White Paper been implemented by the Member States, by regional and/or local authorities (where relevant), or by other actors (e.g. transport operators)? Is there any delay in the implementation? And what are the reasons for these delays?	Quantitative indicators: • Number (and %) of EC initiatives completed; • Number (and %) of EC initiatives completed on-going; • Number (and %) of EC initiatives in advanced status; • Number (and %) of EC initiatives cancelled Qualitative indicators: • Level of implementation of White Paper actions at Member State level; • Level of implementation of White	The review of implementation by the Commission takes stock of the progress made in the implementation based on the Commission Staff Working Document SWD(2016) 226 final which maps the progress in the implementation of the 40 action points until July 2016. Input from EC experts to update the situation up to now as well as to assess the level of implementation by Member States or other actors of initiatives is used. Interviews with stakeholders are used to complement the assessment on the level of	Input form EC experts Desk research Interviews with stakeholders

	Evaluation sub-questions	Indicators	Analytical tools and initial success criteria	Data sources
		Paper actions at regional and local level (only where relevant); • Level of implementation of White Paper actions by other actors. • Reasons for delay	implementation. Initial success criteria: The implementation of the 40 actions points is progressing without delays.	

II. Efficiency

	Evaluation question/sub-question	Indicators	Analytical tools and initial success criteria	Data sources
EQ7	To what extent have the cost of the 40 action points in the White Paper been proportionate to the overall benefits achieved?			
	What have been the overall costs for the preparation and implementation of the 40 action points? How do the costs compare with the benefits resulting from the implementation of the 40 actions? How do they compare against the progress made towards achieving the specific objectives and headline goals? Are they justified? How do the total costs of transport from the White Paper intervention compare with the expected benefits?	Costs (in EUR or qualitatively) associated with the preparation and implementation of the 40 action points and respective initiatives, including: • Costs for EC for implementation of EU level actions (one-off and ongoing); • Costs for national and regional authorities for the implementation of the action points (one-off and ongoing); • Costs for other actors (e.g. transport operators) involved in the implementation of the action points. Costs presented by action point/initiative and by type of cost (studies; implementation; financial instruments/R&D funding)	Data on the costs for implementation of the important/costly initiatives under the 40 actions points and respective initiatives of the White Paper at EU and national level. Priority is given to regulatory measures and financial instruments. Other types of measures are analysed when data is available. Costs are compiled using information from the desk research (i.e. evaluation or IA studies for specific measures), input of EC experts, results from field research and targeted data requests. Results of the analysis under effectiveness (EQ1-3) in terms of the achievement of the 10 headline goals and the progress made in terms of the achievement of the specific and general objectives Results of the PRIMES-TREMOVE analysis comparing the Alternative with the Baseline scenario to calculate net the mitigation costs of achieving the CO2 emissions reduction and the	Data collected as part of the desk research (evaluations, IAs and other support studies) Input from EU desk officers for costs at EU level (Task 2) Surveys of national authorities Interviews with industry and civil society representatives (NGOs/social partners) (Task 3) Input on benefits from the effectiveness questions (EQ1-3), including outputs of the PRIMES-TREMOVE model on the costs and benefits Targeted data requests

	Evaluation question/sub-question	Indicators	Analytical tools and initial success criteria	Data sources
		PRIMES-TREMOVE model: • Total transport system costs • External costs of congestion, air pollution, noise and accidents	respective co-benefits. Success criteria: The costs of implementation of the White Paper are justified in view of the benefits achieved/expected.	
EQ8	To what extent have the initiatives under the White Paper been cost effective? Which benefits have been achieved for the different stakeholder groups? What costs have resulted for the different stakeholder groups?			
	What have been the costs of the initiatives under the 40 action points for different categories of stakeholders? How do the costs of the initiatives compare with the resulting total benefits/cost-savings of the initiatives? Which initiatives have been cost-effective and which ones have not?	Costs (in EUR or qualitatively) associated with individual initiatives (at EU/national/regional level), including: • Costs for EC (administrative, monitoring) • Costs for national authorities, (administrative, monitoring, enforcement); • Cost for different groups of stakeholders (charges/fees, compliance, administrative costs). Costs presented by action point/initiative and by stakeholder group affected. Overall assessment of cost-effectiveness either on qualitative or quantitative terms.	Data and analysis of EQ7 to extract costs and benefits for different categories of stakeholders. In those cases where information is not available quantitatively, a qualitative assessment as to whether the costs of specific initiatives were justified by the benefits is made (where such information is available). Success criteria: The costs for the different categories of stakeholders are proportionate to the derived benefits. No category of stakeholder experienced disproportionate costs.	Data extracted as part of the desk research (evaluations, IAs and other support studies) Input from EU desk officers for costs at EU level Surveys of national authorities Interviews with industry and civil society representatives (NGOs/social partners)
EQ9	Is there room to streamline or simplify the various initiatives under the White Paper?			
	Are there action points or initiatives that could be merged to avoid duplications of activities (procedures; requirements) and resulting costs?	Logical analysis based on input from stakeholders on initiatives that are considered unnecessary and could be	Analysis of the costs from EQ7 and EQ8 and the input from EC experts and stakeholders to identify areas within initiatives where savings could be	Data extracted as part of the desk research (evaluations, IAs and other support studies)

	Evaluation question/sub-question	Indicators	Analytical tools and initial success criteria	Data sources
	Are there procedures and requirements under the various initiatives that could be eliminated or simplified to reduce the respective costs without affecting the level of the (expected) benefits?	eliminated.	made. Analysis of cases where merging of these initiatives with other initiatives could be theoretically possible**.** The analysis is based on qualitative input from EC experts responsible for the specific actions to help assess the possibility of revising specific initiatives or merging it with another initiative. Relevant qualitative input from national/regional authorities and stakeholders in their respective areas of interest, via field research. Success criteria: There is no room to streamline or simplify the initiatives of the White Paper.	Input from EU desk officers for costs at EU level Surveys of national authorities Interviews with industry and civil society representatives (NGOs/social partners)

III. Relevance

	Evaluation question/sub-question	Indicators	Analytical tools and initial success criteria	Data sources
EQ10	Are the problems/needs identified in the White Paper still valid?			
	To what extent are the needs identified at the time of the adoption of the White Paper still valid today? Is there still need for policy action to address the above needs? Namely, are there still problems (and respective needs) related to: • Dominant role of road transport (passenger and freight); • Level of CO_2 emissions and air pollutants	Quantitative indicators are referenced to capture the evolution of key issues at the EU level since 2011. These include: • Consumption of oil and petroleum products in transport; • Penetration of alternatively fuelled and zero-emissions vehicles; • Greenhouse gas and air pollutant emissions from EU transport (CO_2, PM, etc.);	Analysis of the quantitative indicators show the overall trends in the key problem areas, and thus helped to assess whether they represent an ongoing need (e.g. if the indicators show either that the problem is increasing, or not decreasing fast enough). This is achieved, through comparing the current situation to the situation at the time of adoption, to see what the changes have been. The quantitative indicators are used to	Data sources used to build and update the PRIMES-TREMOVE model. This is supplemented by Eurostat data and the other relevant EU sources (i.e. Eurostat, DG MOVE Statistical Pocketbook, European Environment Agency, European Transport Safety Council).

	Evaluation question/sub-question	Indicators	Analytical tools and initial success criteria	Data sources
	from EU transport sector; • Dependency of the transport sector on the use of fossil fuels; • Level of congestion and accessibility for peripheral areas; • Road safety levels in specific parts of the EU; • Service quality/consumer protection; • Accessibility for people with disabilities; • Effective development and integration of new technologies in vehicles and transport systems; • Competitiveness of the EU transport sector; • Single internal market for transport.	• External costs of pollution resulting from transport (in € billions); • Modal split of passenger and freight transport; • Investment in transport infrastructure; • Length and completion of the TEN-T network (across the EU and at Member State level); • Congestion levels (including congestion-related costs); • Accessibility indicator; • Safety (e.g. serious road injuries and fatalities, external costs from accidents); • R&D intensity in the transport sector; • Market Performance Index for transport services sector. Qualitative indicators are also used. Stakeholders were asked to consider whether the needs identified at the time of the adoption of the White Paper (indicated in the previous column) are still valid today. Stakeholder inputs are used to display: • The level of agreement among stakeholders that identified the needs/problems as still relevant. • The identification of the needs/problems in national and regional strategies reviewed as part of the case study.	demonstrate the overall trends. They are supplemented by qualitative analysis based on desk research (EU documents and other studies), relevant input from the case studies (problems/needs identified in recent national/regional strategies) and stakeholder inputs, to reflect the extent that they are considered as important ongoing needs. Initial success criteria: • The needs identified in the White Paper are still relevant to the current needs of society.	These indicators are the primary source used to inform analysis of developments in the major trends since 2011, and relevant needs. Where possible, Alternative scenario projections to 2050 are also referenced to provide an indication as to the longevity of the need/problem. Input from stakeholders from surveys (authorities) and interviews (industry, civil society, transport experts, EU institutions) are used to cover qualitative indicators and to complement the quantitative analysis.

	Evaluation question/sub-question	Indicators	Analytical tools and initial success criteria	Data sources
EQ11	Have there been any changes in the EU transport or climate change policy objectives making the White Paper objectives less relevant? To what extent are the objectives of the White Paper still relevant in relation to current broader EU policy objectives?			

	How, if at all, have the EU transport and climate policy objectives – as reflected in the recently adopted EU policy documents – changed/revised in relation to:
	
	• Climate change objectives and targets and the expected role of the transport sector;
	• Transport policy objectives, including:
	  ○ Decarbonisation;
	  ○ Environmental impacts (e.g. pollutant emissions, noise);
	  ○ Congestion targets;
	  ○ Safety and security aspects;
	  ○ Modal split;
	  ○ Accessibility, equity, quality of services, provision of services and external costs.
	
	In view of the above changes, are the objectives of the White Paper still (equally) relevant (ambitious enough and/or of sufficient scope)? More specifically:
	
	1. Are the three main objectives still relevant:
	
	• Reduce transport-related emissions of CO_2 by around 60% by 2050 compared to 1990;
	• Achieve drastic decrease in the oil dependency ratio of transport-related activities by 2050;
	• Limit the growth of congestion.
	
	2. Are the remaining specific objectives still relevant:
		Combination of qualitative (mainly) indicators to inform the analysis, including:
		
		• Level of difference/deviation between White Paper objectives and objectives in other EU policies;
		• Level of agreement among stakeholders that the identified objectives of the White Paper are relevant (i.e. ambitious and with appropriate scope).
			This question focuses on examining the extent to which changes to EU policies have made the objectives and goals of the White Paper less relevant (i.e. in terms of ambition and scope). EQ14 focuses on the presence of inconsistencies between the White Paper and other EU policies. Nonetheless, the input from the analysis in EQ14 also feeds into the analysis here.
			
			Policy documents are reviewed that reflect EU policy in relation to climate change and transport policy to identify changes to the EU policy objectives in comparison to the time of the adoption of the White Paper. These documents include comprehensive EU-level climate and transport strategies, such as:
			
			• 2030 Climate Target Plan (2020)
			• The European Green Deal (2019);
			• European Strategy for Low-Emission Mobility (2016);
			• 'A Clean Planet for all – A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy'? (2018);
			• 2030 climate and energy policy framework.
			
			Mode-specific strategies have also been reviewed, due to their relevance, which include:
			
			• On the road to automated mobility: An EU strategy for mobility of the future (2018);
				Desk research based on policy documents and relevant studies to identify changes/developments in policy objectives.
				
				Interviews with representatives of EU institutions/bodies and additional input from interviews (i.e. industry, civil society, transport experts, EU institutions), and inputs from national and regional authorities where relevant.

	Evaluation question/sub-question	Indicators	Analytical tools and initial success criteria	Data sources
	• Allow the basic access and the development of mobility needs of individuals and companies? • Promote equity within and between successive generations? • Offer safe, secure and reliable transport services of high quality? • Ensure provision of services that are affordable, operating fairly and efficiently, offering a choice of transport mode and promoting high quality employment? • Minimise the external costs of accidents, noise and air pollution, biodiversity loss and increased land use? To what extent are the objectives of the White Paper still relevant in view of other broader EU policy objectives and priorities, including in relation to: • Research, innovation and competitiveness of EU industry; • Development of a deeper and fairer single market; • The global role of Europe.		• The Mobility Packages (2017 – 2018); • Fourth Railway Package (2016); • Aviation strategy for Europe (2015). Developments in relation to the broader EU policy objectives were also identified with reference to the 10 Commission priorities (2014-2019), the recently-released 6 priorities (2019-2024), the Digital Single Market and the Energy Union. Logical analysis and input from Commission officers, EU institutions and other relevant industry and transport sector stakeholders to assess the relevance of the White Paper goals. Initial success criteria: • The White Paper objectives are still relevant to the current EU climate, transport and broader policy objectives.	
EQ12	How well do the original objectives and 10 headline goals of the White Paper still correspond to the current transport and climate policy needs?			
	What transport and climate policy needs have emerged (or are expected to emerge) as a result of technological, societal and environmental developments that were not considered at the time of the adoption of White Paper? The trends identified include: • Ageing population; • Urbanisation; • Collaborative economy (i.e. vehicle-	Quantitative indicators of trends that have emerged or evolved since 2011 include: • Level of use of new services (mobility as a service (MaaS), ride-sharing); • Active travel uptake; • Alternative fuel vehicle registrations; • E-commerce penetration.	An assessment of the development of key trends (based on analysis of indicators) since 2011, and the associated emergence of new needs is presented. The analysis presents the key trends (i.e. ageing population) and corresponding new needs (i.e. improvements in accessibility for VRUs), with a focus on the emission reduction, decarbonisation, efficiency and integration of the transport system and accessibility.	Relevant data is used to describe the emerging trends. The following sources offer examples: • **E-commerce penetration**: Eurostat's E-commerce statistics; Ecommerce Europe's report. • **Collaborative economy and digitalisation**:

	Evaluation question/sub-question	Indicators	Analytical tools and initial success criteria	Data sources
	sharing); • Connected and autonomous vehicles; • Digitalisation; • Further changes in supply chains; • Alternative fuels; • Increasing role of active modes and micro-mobility; • Increasing security threats. Are the specific objectives of the White Paper relevant in view of the new needs identified? Are the 10 headline goals still relevant and ambitious enough in view of the new transport and climate policy needs? Have any gaps arisen due to existing headline goals not properly reflecting the emerging needs?	This is complemented by: • The extent to which existing objectives of the White Paper are relevant for the new needs arising; • The level of agreement among stakeholders that objectives are relevant to the new needs.	This is complemented by desk research (e.g. studies analysing the current trends and future of mobility) and input from stakeholders, to identify how/whether the new trends have introduced new problems/needs. Analysis is done how the specific objectives and the current headline goals correspond to the identified needs (whether they are still appropriate and/or ambitious enough) based on logical analysis and input from relevant stakeholders. Initial success criteria: • The objectives of the White Paper correspond to the new transport and climate policy needs; • The 10 headline goals of the White Paper correspond to the new transport and climate policy needs.	Deloitte's Car Sharing in Europe report; ING's car-sharing unlocked report; UITP's digitalisation in transport report. • **Electrification:** EAFO's alternative fuel vehicle registrations; BNEF's Electric Vehicle Outlook. Input from the surveys (i.e. national/local authorities) and interviews (i.e. industry, NGOs, transport experts) is used to assess the development of new trends and their implications, and to qualitatively complement the quantitative data, or cover any data gaps.
EQ13	Are the proposed 10 headline goals still adequate benchmarks for achieving an integrated, sustainable and efficient transport system in the EU?			
	Are the 10 headline goals: • Clearly defined; • Realistic (too ambitious or not ambitious enough in view of developments); • Complete (properly reflect the objectives of the White Paper). Are the 10 headline goals useful to guide policy actions and to help assess the performance of the EU and national transport system in terms of: • Environmental impacts (decarbonisation, reduce air pollution and noise);	Better Regulation S.M.A.R.T. criteria to help assess the clarity of the headline goals, and how realistic and measurable they are. Not all headline goals set specific quantifiable targets. In this case, a more qualitative assessment of the ongoing relevance of the target was needed. The following high-level indicators are presented to help assess the relevance of the headline goals: • Number of headline indicators whose targets have already been met or are not ambitious enough;	Analysis whether the headline goals are still appropriate goals in view of progress already made and the changes to the policy priorities, drawing upon the S.M.A.R.T. criteria. Input from stakeholders concerning the clarity, completeness and level of ambition of the headline goals, and determine whether they consider there to be a need for changes/revisions. Input from the case studies (review of national transport policy documents) to examine whether the headline goals are reflected in the targets set by the national strategies.	Surveys with national and regional/local authorities and interviews with stakeholders (i.e. industry, civil society). Desk research (i.e. national/regional transport policy plans). Case study analysis.

	Evaluation question/sub-question	Indicators	Analytical tools and initial success criteria	Data sources
	• Energy and resource efficiency; • Level of integration of transport services within and across modes. Is there need for any of the 10 headline goals to be: • Revised? (e.g. become more demanding, change their scope) to provide appropriate benchmarks; • Dropped? (as they no longer properly serve the role of benchmarks for performance).	• Number of headline indicators whose goals are still relevant (ambitious enough) in view of the new needs and objectives; • Number of headline goals used in national transport policy documents. Qualitative input from stakeholders is used to assess the relevance of the goals. Level of agreement among stakeholders that each of the headline goals: • Is clearly defined, relevant and ambitious; • Represented useful benchmarks in guiding policy (at EU/national level).	Initial success criteria: • The 10 headline goals are still adequate benchmarks (there is no need for revisions).	

IV. Coherence

	Evaluation question/sub-question	Indicators	Analytical tools and initial success criteria	Data sources
EQ14	Are the White Paper objectives coherent with the 2018 European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy and the 2016 Low-emission mobility strategy?			
	Is the strategic approach defined by the general and specific objectives, including the overall level of ambition, of the White Paper consistent with: • Vision and objectives of the 'A Clean Planet for All' Communication (COM(2018) 773)?	Qualitative indicators: Presence and importance of overlaps or contradictions between the three Communications in relation to their: • Scope • Timescales • Objectives • Assumptions relating to GHG	Desk-based mapping of these elements of the White Paper and other three Communications. The coherence of the White Paper with these other Communications is explored through logical analysis of these different elements and also in the engagement with Member States (survey) and EU level stakeholders.	The White Paper (COM(2011) 21) and the other three Commission Communications (COM(2016) 501, COM(2018) 773 and COM(2019) 640), along with the 'In depth analysis' that accompanied COM(2018) 773 and the Impact Assessments that accompanied the White Paper and the Low Emission Mobility Strategy (SEC(2011) 258 and SWD(2016) 244).

	Evaluation question/sub-question	Indicators	Analytical tools and initial success criteria	Data sources
	• Objectives of the 'A European Strategy for Low-Emission Mobility' Communication (COM(2016) 501)? • Objectives set in the Green Deal Communication (COM(2019) 640)	emissions • Assumptions relating to transport's GHG emissions • Goals/indicators of progress • Overview of the content relating to transport • Actions relating to transport split by the themes of the White Paper	Success criteria: The various elements of the White Paper were/were not aligned and consistent with those of these other Communications.	Input from EU institutions, national authorities (survey) and interviews with EU level stakeholders (industry, civil society and transport experts)
EQ15	How does the White Paper interact with other EU/national/international initiatives which have similar objectives (e.g. actions in the field of mobility, climate, employment, taxation and sustainable development)?			
	Is the approach set out in the White Paper consistent with other initiatives at the: • International level, including the UNFCCC's Paris Agreement, the UN's Sustainable Development Goals and relevant work of ICAO, IMO, ILO, OTIF, OSJD, UNECE and the ITF. • EU level, including the Europe 2020 strategy (COM(2010) 2020), its flagship initiatives to implement its seven priority issues and other relevant strategic policy documents; • National level.	Qualitative indicators: Presence and importance of interactions between the White Paper and these other initiatives.	Desk-based mapping is undertaken of the broad aims and objectives of the relevant international and EU level initiatives and their coherence with those of the White Paper. For the national initiatives, the findings of the case study work are assessed. Success criteria: The White Paper's objectives are (or are not) fully aligned and consistent with those of these other initiatives.	For the international initiatives, the main data sources are the relevant policy documents and information on their respective websites about relevant initiatives. For the EU level initiatives, the focus is on the 'Europe 2020' strategy (COM(2010) 2020), along with its relevant Flagship Initiatives (i.e. those on resource efficiency (COM(2011) 21), innovation (COM(2010) 546), industrial policy (COM(2010) 614) and jobs (COM(2010) 682), as well as other relevant strategic documents. The latter include: • European action for sustainability (COM(2016 739) • Roadmap for moving to a competitive low carbon economy in 2050, COM(2011) 112 • Policy framework for climate and energy in the period from 2020 to 2030, COM(2014) 15 • EU adaptation strategy to climate change, COM(2013) 216 • Clean air programme for Europe, COM(2013) 918 • Europe that protects: clean air for all,

	Evaluation question/sub-question	Indicators	Analytical tools and initial success criteria	Data sources
				COM(2018) 330 • Living well, within the limits of our planet, Decision No 1386/2013/EU • Digital Single Market Strategy (COM(2015) 192) For the national level, the work is based on an analysis of national transport strategies.
EQ16	To what extent are the White Paper initiatives complementary to each other, mutually supportive and non-contradictory? Are there any synergies, overlaps and/or inconsistencies between them?			
	Do the White Paper's initiatives provide a coherent framework to guide the development and implementation of sustainable transport policy in the EU? Are there potentially important synergies between any of the White Paper's initiatives? Are there significant overlaps or inconsistencies between any of the White Paper's initiatives?	Qualitative indicators: Extent to which the action points provided a framework for an appropriate level of action for all of the modes against the relevant specific objectives. Extent to which the action points complement or contradict each other in terms of their contribution to meeting the specific objectives.	A desk-based logical mapping of the scope and aims of action points and individual initiatives is undertaken to assess their coherence. Relevant questions are also asked in the course of the engagement with Member States and EU level stakeholders, as well as with relevant Commission desk officers. Success criteria: The initiatives provide a coherent and synergistic framework, with no significant areas of overlap or inconsistency.	The White Paper, specifically its objectives and action points. Input from EU institutions, national authorities (survey) and interviews with EU level stakeholders (industry, civil society and transport experts).

V. EU Added Value

	Evaluation question/sub-question	Indicators	Analytical tools and initial success criteria	Data sources
EQ17	What is the added value resulting from the EU level intervention of the White Paper compared to the results brought by the actions which could have been achieved by Member States at national and/or regional level?			
	Are there actions of the White Paper which would (could) have been implemented by Member States	Quantitative indicators:	Logical analysis is used to characterise the 40 action points in terms of their EU added value potential (in	Desk research, namely the analysis of evaluations and

	Evaluation question/sub-question	Indicators	Analytical tools and initial success criteria	Data sources
	at national and/or regional without an EU intervention? Are there actions that would not (or could not) have taken place without the EU level intervention? Compared with action only at national level, how do the each of the actions of the White Paper perform (or is expected to lead) in relation to the following criteria: • Increased effectiveness. • Increased efficiency. • Creation of synergies. To what extent did the actions associated with the White Paper contribute towards the following: • Ensuring that that cross-border dimension of the transport sector and transnational aspects are addressed. • Avoid fragmentation of the transport market/contribute to the development of the common transport market. • Increased the effectiveness of measures as they were agreed at EU level • Led to increased efficiencies (for authorities, industry and/or consumers) by aligning strategies and objectives among Member States and coordinating effort among authorities, avoiding duplication of effort and resources. • Support the development of skills and capacity building at national level and easier access to expertise. • Stimulated research and innovation at a greater scale. • Increased cooperation and information exchange.	• Number and share of actions that would not have been possible without EU level intervention. • Number of actions that would be expected to be less effective only based on action at Member State level. • Number of actions that would be expected to be less efficient only based on action at Member State level. • Number of actions that created synergies that would not be possible on the basis of action at Member State level. Qualitative indicators: • Level of evidence available indicating that EU actions brought specific additional benefits to what national action could achieve in each of the areas of intervention. • Extent that stakeholders agree that the EU intervention as a result of the White Paper increased the effectiveness of each action.	relation to effectiveness, efficiency and synergies). Input from the desk research is used (where available) to inform the analysis of the specific (or expected) contribution of EU action in comparison to action at national level. Stakeholders feedback (interviews with industry, transport expert and civic society representatives and the survey of authorities) is used to complement this analysis by obtaining input on the specific benefits brought by the presence of EU action either in terms of implementation or in terms of results and contribution to effectiveness, efficiency or synergies. The case study analysis of national transport strategies and their comparison also points to areas where the White Paper contributed to an alignment of objectives and measures. <u>Success criteria</u>: • The majority of actions taken would not have been possible without EU level intervention (or would have been less effective)/ • The EU level intervention has had distinct and significant value in comparison to action achieved at national/regional level.	impacts assessments (see Task 2.2.3). Input from EU institutions (data requests), authorities (survey) and interviews with EU level stakeholders (industry, civil society and transport experts) Case study analysing national transport strategies.

	Evaluation question/sub-question	Indicators	Analytical tools and initial success criteria	Data sources
EQ18	To what extent do the issues addressed in the White Paper continue to require intervention at the EU level?			
	Is there still need for action at EU level in order to address the following issues addressed in the White Paper: • Level of CO_2 emissions from transport. • Oil dependency of transport. • Congestion and overall efficiency of the transport system. Is there still need for action at EU level in order to address the following additional aspects addressed in the White Paper: • Accessibility: allow the basic access and the development of mobility needs of individuals and companies, • Equity: promote equity within and between successive generations. • Quality of services: offer safe, secure and reliable transport services of high quality. • Provision of services: be affordable, operate fairly and efficiently, offer a choice of transport mode, promote high quality employment. • External costs to society: minimise the external costs of accidents, noise and air pollution, biodiversity loss and increased land use. For each of these issues, what would happen if EU level action were to stop?	Qualitative assessment of the ongoing need for EU level action for each of the issues/problem areas based on input from analysis of evidence from EQ17, logical analysis and input from stakeholders through surveys and interviews.	Qualitative approach to answer this question including an assessment of the ongoing need for EU level action for each of the issues/problem areas based on input from analysis of evidence from EQ17 in combination with the review of the progress made in the implementation of the White Paper (EQ3, effectiveness) and the continuous relevance of the needs (EQ10 and EQ11, relevance). The analysis also draws on the survey of authorities, the data requests to EC experts and interviews with transport experts, industry and civic society representatives and international organisations to develop a qualitative picture of the ongoing need for action at EU level. Success criteria: EU level action is still required to address the issues addressed in the White Paper.	Input from EU institutions (data requests), authorities (survey) and interviews with EU level stakeholders (industry, civil society and transport experts) Input from analysis in EQ3, EQ10, EQ11 and EQ17.
EQ19	What would be the progress made in the EU to date and by 2050 in reducing GHG emissions, oil dependency and congestion without the actions put forward in the White Paper?			
	Assuming that none of the actions put forward in the White Paper was adopted, what should be expected to be to date and by 2050 the progress	Quantitative indicators on the basis of the	Analysis using the PRIMES-TREMOVE model to derive a scenario of non-White Paper policies that accounts for changes in the framework conditions	PRIMES-TREMOVE model outcomes and input from

	Evaluation question/sub-question	Indicators	Analytical tools and initial success criteria	Data sources
	made in the following areas, solely on the basis of national action: • The level of reduction of transport-related GHG emissions compared to 1990. • Reduction on the level of dependence on fossil fuel of transport-related activities. • Progress made in reducing the level of congestion. How could national action alone contribute towards reducing GHG emissions, oil dependency and congestion to date and by 2050	PRIMES-TREMOVE model: • Level of GHG emissions from transport. • Energy demand (fossil/ non-fossil) in transport. • External cost of congestion.	since 2010 (e.g. demographic trends, GDP projections, fuel price projection, technological developments) without the White Paper policies. This represents the Baseline (no-policy change) scenario which includes policies adopted at national level up to 2011 and other policies not related to the White paper. Success criteria: Progress made without the White Paper in relation to the three specific objectives would have been less than in comparison situation with the White Paper.	analysis in EQ17

Annex 7: Direct and indirect relevance of action points to the White Paper objective

	Priority objectives			Additional objectives				
Action Points	**60% GHG reduction**	**Reduce oil dependency**	**Limit growth of congestion**	**Allow basic access and development of mobility needs**	**Promote equity within and between generations**	**Safe, secure, reliable, high quality transport services**	**Affordable, fair and efficient service that offer a choice of mode/high quality employment**	**Minimise external costs of accidents, noise, air pollution, biodiversity loss and increased land use**
1. AN EFFICIENT AND INTEGRATED MOBILITY SYSTEM								
1.1. A single European transport area								
1. A true internal market for rail services	indirect	indirect	indirect	Direct	indirect	direct	direct	
2. Completion of the single European sky	indirect	indirect	direct	Direct	indirect	direct	direct	
3. Capacity and quality of airports			direct			direct	direct	
4. A maritime 'blue belt' and market access to ports	indirect			Direct	indirect		direct	
5. A suitable framework for inland navigation	direct			Direct	indirect		direct	direct
6. Road freight	direct	direct			indirect		direct	
7. Multimodal transport of goods: e-Freight	indirect				indirect		direct	
1.2. Promoting quality jobs and working conditions								
8. Social code for mobile road transport workers					direct		direct	
9. A social agenda for maritime transport					direct		direct	
10. A socially responsible aviation sector					direct	direct	direct	
11. An evaluation of the EU approach to jobs and working conditions across transport modes					direct		direct	
1.3. Secure transport								

	Priority objectives			Additional objectives				
Action Points	60% GHG reduction	Reduce oil dependency	Limit growth of congestion	Allow basic access and development of mobility needs	Promote equity within and between generations	Safe, secure, reliable, high quality transport services	Affordable, fair and efficient service that offer a choice of mode/high quality employment	Minimise external costs of accidents, noise, air pollution, biodiversity loss and increased land use
12. Cargo security						direct		
13. High levels of passenger security with minimum hassle						direct		
14. Land transport security						direct		
15. 'End-to-end' security						direct		
1.4. Acting on transport safety: saving thousands of lives								
16. Towards a 'zero-vision' on road safety						direct		direct
17. A European strategy for civil aviation safety						direct		direct
18. Safer shipping						direct		direct
19. Rail safety						direct		direct
20. Transport of dangerous goods						direct		direct
1.5. Service quality and reliability								
21. Passengers' rights				indirect	direct	direct	direct	
22. Seamless door-to-door mobility				Direct		direct	direct	
23. Mobility continuity plans				Direct		direct	direct	
2. INNOVATING FOR THE FUTURE: TECHNOLOGY AND BEHAVIOUR								
2.1. A European transport research and innovation policy								
24. A technology roadmap	indirect	indirect	indirect		indirect	indirect		
25. An innovation and deployment strategy	indirect	indirect			indirect			
26. A regulatory framework for innovative transport	direct	direct	indirect		indirect	indirect		direct
2.2. Promoting more sustainable behaviour								

	Priority objectives			Additional objectives				
Action Points	**60% GHG reduction**	**Reduce oil dependency**	**Limit growth of congestion**	**Allow basic access and development of mobility needs**	**Promote equity within and between generations**	**Safe, secure, reliable, high quality transport services**	**Affordable, fair and efficient service that offer a choice of mode/high quality employment**	**Minimise external costs of accidents, noise, air pollution, biodiversity loss and increased land use**
27. Travel information	indirect	indirect	indirect	indirect			indirect	
28. Vehicle labelling for CO2 emissions and fuel efficiency	direct	direct			indirect			direct
29. Carbon footprint calculators	indirect	indirect			indirect			indirect
30. Eco-driving and speed limits	direct	direct			indirect	indirect		direct
2.3. Integrated urban mobility								
31. Urban mobility plans	direct	direct	direct	direct	indirect	indirect	indirect	
32. An EU framework for urban road user charging	direct	direct	direct		indirect			direct
33. A strategy for near-'zero-emission urban logistics' 2030	direct	direct	direct		indirect			direct
3. MODERN INFRASTRUCTURE AND SMART FUNDING								
3.1. Transport infrastructure: territorial cohesion and economic growth								
34. A core network of strategic European infrastructure — A European mobility network	direct	direct			indirect		indirect	
35. Multimodal freight corridors for sustainable transport networks	direct	direct			indirect		direct	direct
36. Ex ante project evaluation criteria								indirect
3.2. A coherent funding framework								
37. A new funding framework for transport infrastructure	indirect	indirect	indirect		indirect			indirect
38. Private sector engagement					indirect			
3.3. Getting prices right and avoiding distortions								
39. Smart pricing and taxation	direct	direct	direct		direct			direct
4. THE EXTERNAL DIMENSION								
40. Transport in the world: the external dimension	indirect					indirect		