

Executive Master
in EU Studies

***Future of European Roads:
Risk and Opportunities***

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Abstract

The European road sector is crucial for the European Union's economy as its network, being part of the Trans-European Transport Network, operates as the backbone of the EU Single Market. Furthermore, the sector's ability to cut its emissions by 90% at the horizon of 2050 as part of the Green Deal's policy objectives will be determinant in the fight against climate change and for the goal to make Europe the first-climate neutral continent. However, the recent crises, first covid, then energy, have heavily impacted the road sector, challenging its capacity to rebound. Looking at the current situation of the sector and the expectations put on it, one can wonder what the perspectives for the future of European roads are. This question can actually be answered by examining three challenges addressed to the road sector: the first one should be its capacity to innovate and remain competitive despite crises and external factors that can have influence over it, the second should be its ability to enhance EU's connectivity and the third should be its commitment to become more sustainable while developing the ability to mitigate the adverse effects of climate change. All three aspects gravitate around the notion of resiliency.

Each aspect shall be examined individually but following the same methodology which focuses on the risk / opportunity relation and begins with a contextualisation and frame of the topic then moves on to the analysis part of either the case or the challenge at hand before ending with the risk / opportunity evaluation. This thesis revealed that the road sector had the ability to remain competitive and innovative, as shown during the covid crisis, and that increased connectivity could be achieved in the Western Balkans region even if it would not result in the immediate development of a strong value chain there. As for sustainability, objectives can be reached as long as governments work hand in hand with the EU to take appropriate action. Overall, the perspectives for the sector are numerous but their outcome will be mostly determined by its resiliency level.

Keywords

Roads – Transport – European – Connectivity – TEN-T – Western Balkans- Economy

Single Market – Value Chains – Innovation – Sustainability – Green Deal – Resiliency

1. Introduction

1.1. Challenges encompassed in the European roads' futures

From 10,000 years ago, when the first human populations began to settle down, to the urbanization phenomenon, that is still spreading worldwide from developed countries to emerging ones, roads have rapidly grown in number, facilitating the development of trade and guiding human migrations.

Recent studies examining the expansion of road networks worldwide, published by the Organization for Economic Cooperation and Development (OECD) over the past three years, show that the first half of this century could see an all-time high number of new road infrastructures with the emerging countries, and Asia in particular, leading the way.¹

In the European Union, this expansion is less marked, but the transport sector still carries a great economic weight by employing directly and indirectly more than 10 million people in total and representing about 5% of the EU Gross Domestic Product (GDP) according to the European Commission figures.²

However, this powerful sector was fragilized by the covid crisis because of the lockdowns' decisions that limited the movements of people and goods across the EU; and it was on its way to recovery when the energy crisis struck as well. Nevertheless, both crises could turn into opportunities for the sector. Indeed, during the covid period, most procedures and administrative requirements had to be moved online to avoid contact which pushed the transport sector to accelerate its digital transition.³

¹ Organization for Economic Cooperation and Development (2020): Transport Bridging Divides, OECD Urban Studies, *OECD Urban Policy Reviews*, 11 December.
Organization for Economic Cooperation and Development (2023): Infrastructure investment, latest data publication in the ITF-Transport Outlook of the 24th of May, *OECD iLibrary*.

² European Commission (2023): Transport sector economic analysis, Analysis published on the EC's EU Science Hub website, regularly updated.

³ International Finance Corporation WB Group (2023): Covid-19's Impact on Infrastructure, Sector Notes published on the Resources section of the IFC Expertise website, regular updates and adding.

As for the opportunity related to the energy crisis, it is related to the adoption of the Green Deal policy presented in 2019 followed by the Fit for 55 measures package in 2021. Indeed, under the frame of the Deal, the transport sector is expected to reduce its emissions by 90% at the horizon of 2050 to participate in the Union's effort to turn Europe into the first climate-neutral continent.⁴ This objective seemed to be a far-reach but because of the crisis, it has become much more feasible as every actor of the sector has realized by now the importance of relying on more than one energy source.

Ultimately, these two crises are occasions to make the transport sector more resilient, which will be highly beneficial in the face of climate change. Indeed, roads infrastructures are vulnerable to adverse climate events, so it is necessary to take climate risks into account for future constructions and to develop maintenance and procedures' techniques that also include it.

Securing the resiliency of the transport sector will also guarantee the smooth functioning of the European road network which is part of the Trans-European Transport Network (TEN-T) and is essential to the Single Market and by extension to the EU's economic growth. Even more so as the TEN-T has been revised to include more European territories into its maps, stretching to the Western Balkans countries in the West and Ukraine and Moldova in the East.⁵

This extension could bring tremendous benefits to the economy of the Western Balkans who are all candidates or potential candidates to EU accession, on the condition that they have the means to implement the TEN-T policy efficiently and know how to proceed.⁶ If they were to succeed in making the most out of this opportunity to increase their trade flows, they would probably become able to create a strong regional value chain that would foster economic growth.

⁴ European Investment Bank (2022): Transport Lending Policy 2022: The Way Forward – Investing in a cleaner and smarter transport system, Policy document released on the EIB website.

⁵ European Commission (2023): TEN-T Revision, Presentation of the revision available on the Transport section of the EC website.

⁶ Ezgeta, Drago and Causevic, Samir and Mehanovic, Mustafa (2022): Challenges of physical and digital integration TEN-T networks in Southeast European countries. In: *Transportation Research Procedia*, Elsevier Editions, Volume 64, pp.270-279.

Besides the Western Balkans have not yet ended their urbanization process which means that among the European countries, they will probably be the ones who will require the highest numbers of new roads infrastructures ⁷, contrarily to more advanced countries which are already highly urbanized and whose population is becoming more aware of ecological issues so, is not in favour of a monopoly of roads over the other less-polluting transportation modes.

Considering all these elements, what are the perspectives for the future of European roads? Can the road sector remain competitive and innovative compared to other transportation sectors?

Will it be able to fulfil its main finality to improve connectivity between European territories, including the ones that have yet to join the European Union?

And finally, can this high-polluting sector become more sustainable and resilient while facing the risks posed by climate change?

The first core chapter of this thesis will provide an overview of the road sector's state of play while presenting the elements, a mix of external influences and necessary evolutions, that challenge its ability to remain competitive and innovative. Then, the TEN-T policy and its objectives will be analysed through a study case of the Western Balkans to assess its potential in improving the European territory's connectivity. A last core chapter will focus on the capacity of the road sector to become sustainable and succeed in mitigating climate risks, in the way required and planned by the Green Deal and Fit for 55 package.

⁷ Eurostat (2021): Demographic developments in the Western Balkans and Turkey, Factsheets 2021 edition. In: *Publications Office of the EU*.

World Bank Group (2023): Western Balkans: Testing Resilience, Regular Economic Report No.23, Spring Update. In: *World Bank Publications*.

1.2. Relevance of the research question and issuing discussion

This thesis could be of interest to policymakers, think tanks and lobbies of the European transport sector and road sector in particular, for bringing together several topics that have been studied independently up to now (competitiveness of the road sector, potential for connectivity with the Balkans or ways of the sector to meet the Green Deal objectives) and proposing some possible perspectives for the future. I also hope to bring new insights on the ability of the sector to move forward with its objectives of competitiveness, connectivity and sustainability while coping with crisis and new challenges. Indeed, very few policies analysis and reports are focusing on the resilience capacity of the sector and try to provide hypothesis on the possible evolutions. Most present instead a state-of-play of the sector then proceed to list and enounce the roadmap elements that the European road sector has committed to follow to align with EU's expectations. While these elements are indeed useful, they don't give insights on the risks and opportunities encompassed in each challenge that the European road sector has to face.

That's why, in addition to balancing several key objectives of the sector, I will, for each, try to underline the risks and opportunities.

Also, this thesis aims to bring more knowledge to the discussion as a way to inform policymakers and help them in their decision-making process. By doing so, I will probably not challenge any sort of theories on the subject, but I may bring additional viewpoints or analyses that had not been examined together before. Indeed, as the scope of my thesis is quite large, this will provide a good overview of existing challenges which may help bring more overall clarity on the topic as it is sometimes difficult to make connexions between various contents and to sort through the extensive existing literature covering it.

2. [Chapter 1] Academic framework: concepts of use and reference

2.1. Economics

2.1.1. Functioning of the EU Single Market

To understand why the Functioning of the EU Single Market is an important part of the conceptual, economic framework of this analysis, it is necessary to recall that the objectives of the EU Single Market are closely linked to transportation. Indeed, it is commonly known that the Single Market is mostly based on the principle of the 4 freedoms defining a common market, as enounced in the Rome Treaty of 1957, which are the free movement of capital, people, goods, and services implying that all these movements are rendered possible by various means including physical transports.

It is thus safe to say that a well-operating, efficient, safe, and reliable transport system is a key factor in the good, smooth functioning of the Single Market.

Among its benefits, the transport sector helps connecting workers, consumers, and service providers alike, ultimately generating more economic growth for territories who benefit from the Single market rules while also promoting cultural diversity and exchange.⁸ Also, it helps creating more equal opportunities for individuals by facilitating abroad studies, job mobility etc. It is also a necessary mean for tourism, which sometimes generates great revenue for the member states thus making them seek to develop the good accessibility of their territory for incoming visitors.⁹

Another role of the transport sector is to encourage regional development by connecting territories¹⁰ with different assets and levels of development which allows for a transfer of competences and for the trade of skills, practices and even knowledge.

⁸ Begg, Iain for EPRS (2021): The European Union and regional economic integration: Creating collective public goods – Past, present and future, European Parliamentary Research Service Briefing.

⁹ European Commission (2023): Transport sector economic analysis, Analysis published on the EC's EU Science Hub website, regularly updated.

¹⁰ European Investment Bank (2016): The Route map to a connected Europe, Document released on the EIB website, June.

Also, the transport sector, and particularly the road sector, is key to the EU supply chain as a lot of goods and materials are carried by lorries across the continent. This is good for consumers, who get to discover and enjoy products from other regions at competitive prices, but also for business competition, as it encourages it, resulting in more production and growth.

Beyond the four freedoms and free trade notion, the Functioning of the EU Single Market is strongly connected to the economic concepts of market competition -as more economic actors are able to take part in the trades- and economic integration thanks to the exchanges and improved mobility as tariffs are eliminated and important trade barriers are removed.

Conversely, a fragmentation of the transport market or diverging national priorities are harmful to the functioning of the EU Single Market as it hinders the growth potential of the states' economies and limit the overall quality of the services provided which should be time-efficient and provided at the most affordable price possible.

To prevent this, the European Union has developed several policies with the aim to gradually develop a Single European transport area ¹¹ guaranteeing safer mobility while keeping the transport sector competitive and innovative, through the development of smart mobility systems, and moving it towards more sustainability with the objective to reduce greenhouse gas (GHG) emissions. This effort to gradually uniformize policies in the sector can be linked to the economic concept of regulatory harmonization which is of great importance for the Union as it regularly tries to harmonize practices and policies across the member states to create an economically stronger Europe and improve the life of the European citizens.

¹¹ European Commission (2023): History of the Trans-European Transport Network (TEN-T) policy, General Information page on the EC website, Transport section, updated regularly.

Conference of European Directors of Roads (2022): Benchmarking Europe's Road Networks: aiming for excellence, Column published on Euractiv web platform, 2nd November.

European Commission (2018): Transport in the European Union: Current Trends and Issues, Report published by the DG MOVE (for Mobility and Transport) on the EC website, April.

European Parliament (1997): Transport policy and EU enlargement, Policy Briefing N°44 published on the old version of the EP's website, 28 July.

2.1.2. Regional value chains

The economic concept of regional value chains is also key for this thesis though it is also very connected to the concept of the European Single Market. Indeed, value chains play a crucial role in the integration and the competitiveness of the Single Market by developing interconnected networks of various economic activities including production processes within different regions of the European Union.¹² Value chains' principle is to bring together countries possessing different skills and production capacities which, put together, allows for the creation of a final product or a service that, in turn, can be distributed across the region and even exported.

In the European Union, the creation of regional value chains was made possible thanks in part to the implementation of the Single Market but also thanks to the development and improvements of transportation means and communication technologies.¹³

It is important to note that regional value chains are not limited to some industries and sectors but on the contrary encompass a wide range of those including automobile or textile which are highly beneficial for the EU economy. Regional value chains have also the advantage to generate and capture investment flows which are also beneficial for the growth and development of businesses. Also, value chains allow for the development of specialized expertise across regions as each participant of the chain must remain competitive and thus must propose a service or a good whose utility and quality is superior. In turn, this boosts innovation, research and skills' development with some countries being more specialized in manufacturing like Germany or Slovakia for cars, and some being at the forefront of innovation like France for IT businesses and public-private services.¹⁴

¹² Casadei, Patricia and Comotti, Sebastiano (2022): Where Global Value Chains go local: EU regions, global value chain creation and local upgrading, Report pulished on the European Commission website, 23 June.

¹³ Kaur, Kiranjot and Kau, Iuliia (2022): Global Value Chain, Chapter 4: Transportation, *Ontario pressbooks*, Ed. By Conestoga College, 11 July.

¹⁴ International Road Federation Research Council (2007): The Socio-Economic Benefits of Roads in Europe, Report published online by the IRF, November.

Apart from the competition aspect, regional value chains call for collaboration and exchanges between participants which has a positive effect on social cohesion across the EU.

Ultimately, the development of the European regional value chains (RVCs) seeks to create a greater European industrial sovereignty, as highlighted by the Interreg Program funded by the EU (Interregional Cooperation 2021-2027).¹⁵ This can be of help during times of crisis. For instance, during the covid pandemic, an improved value chain for the manufacturing of health equipment could have prevented the EU from having to import massively from China (especially covid masks).

Another important aspect of RVCs is that it can be used to create more synergies within a given space and it can also avoid skill dispersion or duplication as every member of the chain has a clearly defined role.

There again, a safe, multi-modal transport network is crucial for the RVCs to operate smoothly and to guarantee the secured and efficient movement of all the elements that compose the chain until the delivery of the final service or good.

2.2. Demographics, Policies, Environmental studies, and Engineering

Several other subjects also intervene in this thesis to provide insights and factual elements.

One of the most important subjects is demographics. To understand why demographics are relevant for my topic, it is interesting to consider the history of demographic studies which amounts back to the Great Recession.¹⁶ Indeed, at the time, Europe was compelled to use new tools of analysis, in addition to economics, to understand how the world's geography was being reshaped. Among those tools were demographic dynamics. Indeed, it was useful to develop projections and to analyze trends.

¹⁵ Platform for Interreg Europe (2020): European Value Chains (EVCs), News article published on the Interreg website, 27 July.

¹⁶ Luxembourg Centre for Contemporary and Digital History (2009): Historical events in the European integration process (1945–2009), education content produced by the University of Luxembourg and published online on CVCE website.

For instance, it was evaluated that by 2050, Asia and Africa combined would be home to 80% of the world's population, while Europe would see a decline in population. Additionally, it was found that general economic predictions were more favorable for Asia than for Europe which is bound to have aftermaths on the global economy and to redraw the world trade patterns. This is also true for transport as it is likely that the population growths experienced in Asia and Africa will require the development of appropriate transportation infrastructures to achieve a smooth and efficient mobility. In turn, this implies that materials and businesses of the road sector will grow more in Asia which could have consequences on the European road sector.¹⁷ Indeed, remaining competitive may prove to be challenging and it is clear that there will be a shift of transport activities towards the Eastern part of Europe.

Conversely, the diminution or stabilization of the European population could be an asset to move toward a more performant, sustainable transport network without having the pressure of producing more transport nodes to accommodate a growing population.

Another important subject is policies as I will be examining many policies relevant to the transport sector and in particular, roads. On a side note, it is worth mentioning that transport policy has been a significant focus of the EU in the past 30 years. Indeed, through the Trans-European Transport Network (TEN-T) project, the Union has sought to liberalize transport markets and improve the connectivity across all the European territories¹⁸, including the states that are not members yet since the revision of TEN-T. In recent years, the protection of the environment has also become a crucial dimension of transport policies as the Union has committed to drastically reduce the GHG emissions produced by the sector; this has called for the design of a more sustainable common transport market.

¹⁷ Luxembourg Centre for Contemporary and Digital History (2009): Historical events in the European integration process (1945–2009), education content produced by the University of Luxembourg and published online on CVCE website.

Heller, Peter (2010): People and places: Can they align to bring growth to Africa? Center for Global Development Publication, November.

Mauro, Paolo (2017): Emerging Economy Consumers Drive Infrastructure Needs, Analysis published on the International Monetary Fund, 4 May.

¹⁸ European Commission (2023): Trans-European Transport Network (TEN-T), General Information page on the EC website, Transport section, updated regularly.

The EU's common transport policy is originally based (legally) on the Treaty of the Functioning of the EU (TFEU), and more precisely on its article 42 however the importance of designing such policy can be traced back to the Rome Treaty. Gradual harmonization of regulations and practice have since followed suite as it was necessary to ensure fair competition between the various modes of transport and within themselves.

From the 2001 White Paper issued by the Commission regarding transport policy to the presentation, in December 2020, of the Sustainable and Smart Mobility Strategy designed by the European Commission, a lot of policies and plans have been issued to move towards a better, more efficient, intermodal and environment-friendly version of the existing European transport network.¹⁹

In addition to those two subjects, there may be some elements appearing in this thesis that may fall under the scope of environmental studies and engineering as these are intricately linked to the transport sector and are also part of my academic background. However, there will be no advanced concepts developed as the chosen elements' sole purpose will be to complement my analysis.

3. [Chapter 2] Methodology

- Selection of the scope and the approach

Soon after I decided to select the topic of the future(s) of the European roads for this Master Thesis, I realized I would have to pick a specific scope and approach, otherwise it would be far too broad.

My first step towards this selection process was to browse through the existing literature on the topic, to identify the trends, the current points of interest for analysts and most importantly, the challenges. Indeed, by choosing to focus on the “future(s)”, I already knew I was going to write about problematic issues or on the contrary, bright perspectives.

¹⁹ European Commission (2018): Transport in the European Union: Current Trends and Issues, Report published by the DG MOVE (for Mobility and Transport) on the EC website, April.

After having reviewed many articles and reports from international and European organizations, I noticed that three aspects of the topics were really emerging.

First, was the ability of the sector to remain competitive in the future. Currently, the sector is undergoing several crucial changes, like the digital transition ²⁰, which will be turning points in its future. In addition, the road sector is sometimes pitted against the rail sector as rail can cover distances faster and is far less-polluting which adds an element of competition. Last, it is well-known that the number of road infrastructures in a certain area is usually correlated to a high density of people. However, demographics studies all pointed at a reduction of the European population in the coming years ²¹ which could potentially result in less economic prospects for industries of the road sector.

The second aspect I identified was related to the role of road networks in the well-functioning of the European Single Market. Indeed, roads are essential to connect territories and make the free movement become a reality. This led me to learn about the TEN-T and its recent project of extension. I realized that the Western Balkans were at the heart of this project which was interesting as they are all potential or current candidates to accession so I thought it would make a good case study to evaluate the potential for improved connectivity in the EU of the road network.

Finally, the third aspect that completed my observations was the relation between the road sector and environmental targets. Indeed, I saw that most technical reports called for a “greenification” of the sector by taking more measures at national level to comply with the objectives set in the Green Deal and the Fit for 55 package. I also found several interesting reports mentioning the disastrous impacts of adverse climate events on road infrastructures which I thought could be included in the need to make the sector more resilient. ²²

²⁰ Valtuena-Ramos, Gabriel and Kirchherr, Julian (2021): Road work ahead: The emerging revolution in the road construction industry, Insights on Public and Social Sector, published on the McKinsey & Company website, 1st March.

²¹ Mauro, Paolo (2017): Emerging Economy Consumers Drive Infrastructure Needs, Analysis published on the International Monetary Fund, 4 May.

Eurostat (2021): Demographic developments in the Western Balkans and Turkey, Factsheets 2021 edition. In: *Publications Office of the EU*.

²² United Nations Economic Commission for Europe (2020): Transport infrastructure at high risk due to climate change in Pan-European region and Canada, Mapping study delivered by UNECE, 25 February.

Those three aspects helped set the guidelines of my scope as I thought them to be quite complementary in the sense that they really give a good overview of the main challenges that will shape the future(s) of the European roads.

As for the approach, I noticed, thanks to some articles talking about how the road sector had to deal with the covid crisis ²³, that there was often the possibility to analyse my topic in terms of risks and opportunities. Indeed, most challenges thrown at the road sector can indeed fragilize it, but they also have the potential to make it evolve into a stronger, more sustainable version. In one word, they can make it more resilient. That's how I decided to select it as my approach.

- Selection of the references, framework, and organization of the analysis

For the references, I tried to collect as many raw information as possible to elaborate my own analysis. Hence, I worked a lot with data from Eurostat, the OECD and the World Bank. I also used a lot of general and technical reports to enrich my knowledge on the topic and give me more back information on it. The web pages of the EC and EP were also quite useful to provide the general facts and timelines of EU policies, projects, or programs.

Keeping in mind that my main subject was Economics, I decided to enrich my analysis with elements taken from the fields of Public Policy, Demographics, Environmental studies, and some Engineering notions from my background as an urban engineer. I must add that I also brought some elements from my own experience spent living or interacting with the locals of the countries I mentioned in this Master Thesis. Indeed, I thought those "cultural" elements could also add some value to my analysis. All those academic or experience-based elements gave me my framework.

Finally, I decided to organize each part of my analysis based on the same model: first, provide context and frame elements then move on to cases and challenges to finish with the part dealing with the risks/ opportunities duo.

²³ Lu, Jason for the Global Infrastructure Facility (2020): The Impact of the COVID-19 Crisis in Emerging Market Infrastructure Finance & PPPs, webinar summary produced for a G20, 22 October.

Reiter, Oliver and Stehrer, Robert (2021): Value Chain Integration of the Western Balkan Countries and Policy Options for the Post-COVID-19 Period, *Policy Notes and Reports 48*, The Vienna Institute for International Economic Studies, March.

4. [Chapter 3] Discussion

4.1. Road sector main challenge: remain competitive and innovative

4.1.1. State-of-play of the road sector

4.1.1.1. Covid crisis recovery

To understand the current state of the road sector it is necessary to consider the aftermaths of the covid crisis. Indeed, in general, the transport sector was one of the most impacted sectors worldwide; enduring huge losses and facing many businesses' bankruptcies.²⁴

In one of its intelligence reports from June 2021, the International Transport Forum²⁵ found that the road sector for goods had lost more than 679 USD billion in 2020 and close to 350 USD billion in 2021. Meanwhile, revenue losses for passengers' transportation amounted to 543 USD billion in 2021, which represented an increase of 43 USD billion compared to 2020. Another warning factor was the fall of the Purchasing Manager's Index (PMI) indicating the huge financial turmoil in which several transport societies had fallen. Indeed, over the months of February and March 2021, the transport sector was among the few which endured a contraction of PMI at the detriment of the activity and development of transport companies. For these reasons, many transport associations worldwide tried to push governments to take action in order to help the companies most impacted.

Compared to ocean or air transport which were also heavily impacted by the pandemic, with reductions big enough to cause issues in deliveries and to lead to increased rates, the road sector had more luck as globally, roads remained operational, except in the countries which decided to apply very strict lockdowns like China.

²⁴ Panteia, Maria Rodrigues and Theo, Tharsis (2021): Relaunching transport and tourism in the EU after Covid-19: Part V Freight transport, Research paper realized for the TRAN Committee of the EC and published on the EP's website, December.

²⁵ Organization for Economic Cooperation and Development Data (2021): ITF Transport Outlook 2021, report from the International Transport Forum published on the OECD iLibrary, 17th of May.

Yet, the impact it suffered should not be minored as the reduction of production and manufacturing activities of the industry led to fewer needs for road freights which in turn made the rates fall, making it more difficult for small companies to keep an economic balance. Indeed, small businesses, especially trucking ones, had to face several issues as they usually do not have many alternative options to their existing business plans and they lack intermittent operation strategies.²⁶ Besides, all the regulations and safety measures in application during the covid period were additional burdens to their response as it complicated processes and required new investments during a time where finances were low.

However, large companies also showed signs of trouble as major and well-established companies like German DHL or CEVA Logistics had to declare Force Majeure on their covid-period contracts which is a strong indicator of the effects of the pandemic. Large companies also suffered from the interruptions of global and regional supply chains even though it is still difficult to assess how great was the impact. However, the ones that had previously developed e-commerce had an advantage as online orders exploded and generated a lot of trade.²⁷ This was even the case for basic and necessary goods as people were either not authorized to go outside or chose to limit their movements by fear of catching the virus. On the other hand, big passenger transport companies were put in a difficult spot as tourism became near impossible outside states' borders.²⁸

Other factors that negatively impacted the road sector were border regulations as many states reinstated such regulations in an attempt to limit the spread of the virus. However, because of these, road freights suffered from many delays and congestions which aggravated the toll taken on delivery schedules and made it even more complicated to deal with for companies, both small and large. These delays also created disruptions in some chains, and that's how several materials or goods began to become more expensive as their presence was lacking.

²⁶ Wagner, Daniel for the Asian Infrastructure Investment Bank (2021): The COVID-19 Pandemic's Impact on Infrastructure, Blog article also published in the Project Finance International magazine, 16 July.

²⁷ Organization for Economic Cooperation and Development Data (2021): ITF Transport Outlook 2021, report from the International Transport Forum published on the OECD iLibrary, 17th of May.

²⁸ Panteia, Maria Rodrigues and Theo, Tharsis (2021): Relaunching transport and tourism in the EU after Covid-19: Part V Freight transport, Research paper realized for the TRAN Committee of the EC and published on the EP's website, December.

In addition, the economic recession caused by the pandemic during the year 2020 increased the difficulties of the businesses working in the road industry and even though the global economy has since gradually recovered, the sector has not managed to compensate its losses fully yet.

In the European Union, a salutary action was the restoration of the free movement of goods within the Union through the “Green Lanes” Initiative. Indeed, as the goods’ movement had been quite disrupted at the beginning of the pandemic, the adoption of the initiative at the end of March 2020 allowed for a renewed flow of goods across the EU with member states committing to let freight in and out of their territories despite individual mobility being restricted at the time. Through the initiative, the crossing time of borders was limited to 15 min for cargos, a network of daily data on traffic was created to keep track of transport congestion and an online portal was also developed to relay and update the various national measures and restrictions related to the pandemic.²⁹ This greatly helped the EU road sector.

As this Green Lanes system proved successful in organizing the road flows, it was later extended to other means of transport and it was also proposed to countries outside the EU like Switzerland or the other members of the European Economic Area, as well as the 6 Balkans countries who are currently candidates to the accession.³⁰ Also, no distinction was made between the different types of cargo and the TEN-T border-crossing points served as a marker of border crossings for the Green Lanes which made it even more efficient and wide. This paved the way for other international initiatives supported by the United Nations Economic Conditions for Europe (UNECE) in cooperation with the International Transport Union.

Overall, the crisis management operated by the European Union was enough to limit too severe aftermaths on the road sector which allowed for a quicker recovery compared with other regions of the globe. This also showed that the EU road sector was quite resilient and could organize itself swiftly to keep functioning.

²⁹ Panteia, Maria Rodrigues and Theo, Tharsis (2021): Relaunching transport and tourism in the EU after Covid-19: Part V Freight transport, Research paper realized for the TRAN Committee of the EC and published on the EP’s website, December.

³⁰ Transport Community Treaty Permanent Secretariat (2021): Development of indicative TEN-T extensions of the Comprehensive and Core Network in Western Balkans, Report published on their website, June.

In light of these elements, it appears that the biggest risks linked to the covid pandemic for the road sector were the bankruptcies, profit losses, as well as the inability to perform efficiently given the restrictions. However, there were also opportunities for the sector, in part linked to the explosion of e-commerce that required the fast development of efficient, local transport networks and in part due to the necessity to achieve “paperless” transport.³¹ Indeed, the road sector’s digital transition was boosted by the pandemic as people were trying to avoid both direct and indirect contacts. This also smoothed the border checking process as it became easy to generate and process electronic documents for freight, loading and moving.

4.1.1.2. Energy crisis

The on-going energy crisis has actually begun during the covid pandemic, because of the delays and restrictions applied on supplies transportation like construction materials. In the spring of 2021, the price of some materials like wood had risen by more than 400% of the original price resulting in the temporary (and sometimes definitive) closing of several construction companies that could no longer afford those materials.³² At the time, the road sector was only mildly impacted compared to the building sector, as it only hindered some infrastructure projects but didn’t paralyze the sector activity.

Unfortunately, just as the situation seemed to be back to normal with China finally beginning to lift most of the restrictions on materials’ transportation, February 2022 came and with it began the war in Ukraine whose consequences were huge for the road sector. Indeed, one of the first consequences of the war was a rise in fossil fuels and gas prices; with gas’ rising by 150% in the EU during the period July 2021-July 2022, as reported by the EC, an absolute record.³³

³¹ Panteia, Maria Rodrigues and Theo, Tharsis (2021): Relaunching transport and tourism in the EU after Covid-19: Part V Freight transport, Research paper realized for the TRAN Committee of the EC and published on the EP’s website, December.

³² Panteia, Maria Rodrigues International Energy Agency (2022): World Energy Outlook 2022, Report published on the IEA website, 27 October.

³³ European Commission (2023): Transport sector economic analysis, Analysis published on the EC’s EU Science Hub website, regularly updated.

Seen as dramatic for its social aftermaths, the energy crisis offers the opportunity to help accelerate the transition to renewables and more ecological, sustainable means of transportation. Indeed, currently the road sector still heavily relies on fossil fuels which exposes citizens and companies to future rises as gas and fuel prices have become very volatile. However, in a power system with an increased share of renewables, the electricity produced could remain at a normal price as gas-fired electricity plants would not work non-stop “on the margin”, that is to say, when the demand is so high that it requires to use of the costliest plant. In turn, it would calm people’s anxiety regarding the transition to electric cars as several owners noted that the rise of electricity prices made it hard on their finances during the peak of the crisis. In France, which is famous for protesting when oil prices are too high, the prices had almost doubled which triggered the anger of citizens who renewed their protests. In the EU, several road transport companies were affected by the rising prices as it resulted in increased unanticipated operating expenses which negatively affected their profitability.³⁴ This issue could have been solutioned if the energy sources were more diversified; that is why it is necessary to accelerate the agenda of the Green Deal and to foster research and development on sustainable alternatives like hydrogen.

Overall, the energy crisis has fragilized the road sector however, it may provide a salutary push to help it transition to more resilient transports that will become part of a diversified mobility offer.

4.1.1.3. Data and shares

To complete the state-of-play of the road sector, this section presents various data taken from either Eurostat (2022 figures)³⁵ or the OECD (2021 figures)³⁶, illustrating the major trends in the EU per types of indicators.

³⁴ European Commission (2023): Transport sector economic analysis, Analysis published on the EC’s EU Science Hub website, regularly updated.

³⁵ Eurostat (2023): Database on transport, Figures until 2022, regularly updated.

³⁶ Organization for Economic Cooperation and Development Data (2023): Infrastructure investment, latest data publication in the ITF-Transport Outlook of the 24th of May, OECD iLibrary.

The first indicator reviewed is the length of the European major roads and motorways network. According to my calculations based on Eurostat figures, in 2021, this network cumulated almost 90,000km of major road sections (about 87,000km to be more precise).³⁷ This is a jump of more than 10,000km compared to the data of 2012. The quasi-totality of those important European roads is part of the Trans-European Transport Network (TEN-T).³⁸ The two figures below show the evolution of countries totaling the longest road portions in the Europe between 2012 and 2020:

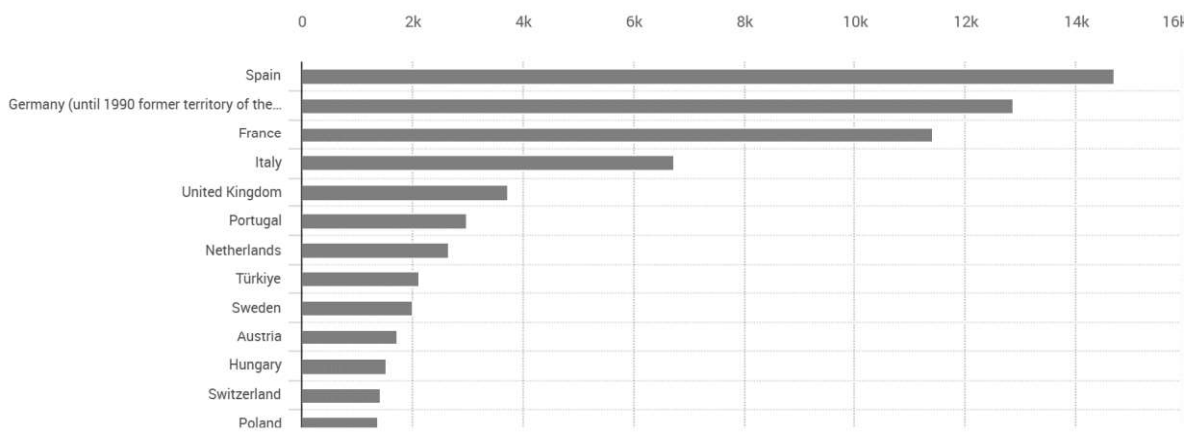


Figure 1: Top Lengths of European major roads and motorways in 2012, Eurostat, 2021

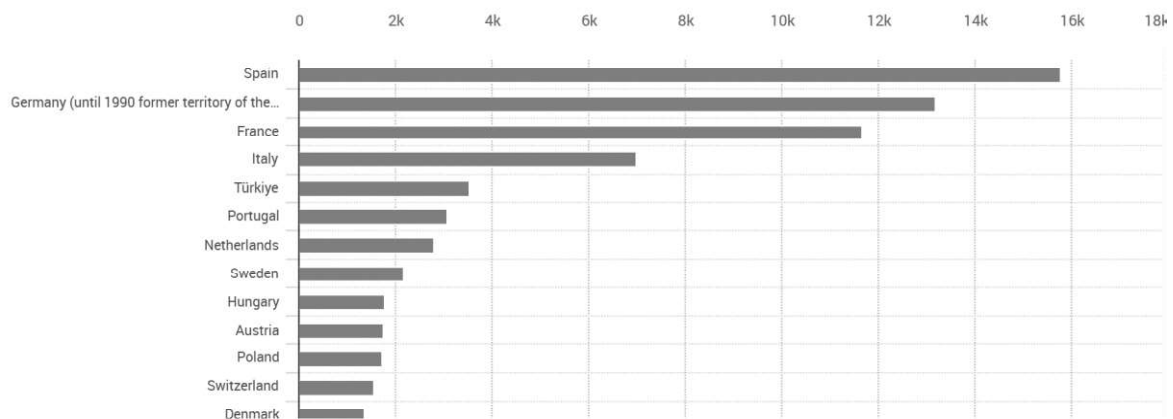


Figure 2: Top Lengths of European major roads and motorways in 2020, Eurostat, 2021

On average the countries that lead the ranking have added 1,500km to their road network.

³⁷ Eurostat (2023): Database on transport, Figures until 2022, regularly updated.

³⁸ Eurostat (2022): Enlargement countries – Transport Statistics, data extracted in April 2022, update planned for June 2023, published on Eurostat website.

Another indicator worth considering is road passenger transport.

Figures from the Eurostat published in 2022, show that in 2020, there were on average 560 passenger cars per 1000 inhabitants in the EU (taking into account the total population). The most important ratio was found in Luxembourg (682 per 1000) and Italy (670 per 1000) while the lowest was in Romania (379 per 1000).³⁹

In the past years, new registrations of passenger cars have oscillated a lot depending on the countries, but 2023 may be topped by Croatia. Interestingly, Croatia's number of new cars registrations have increased a lot after its accession to the EU which might suggest that the country is more integrated and therefore that its population's needs for cars has risen. The following figure shows the repartition of new cars' registrations per countries over the past 3 years:

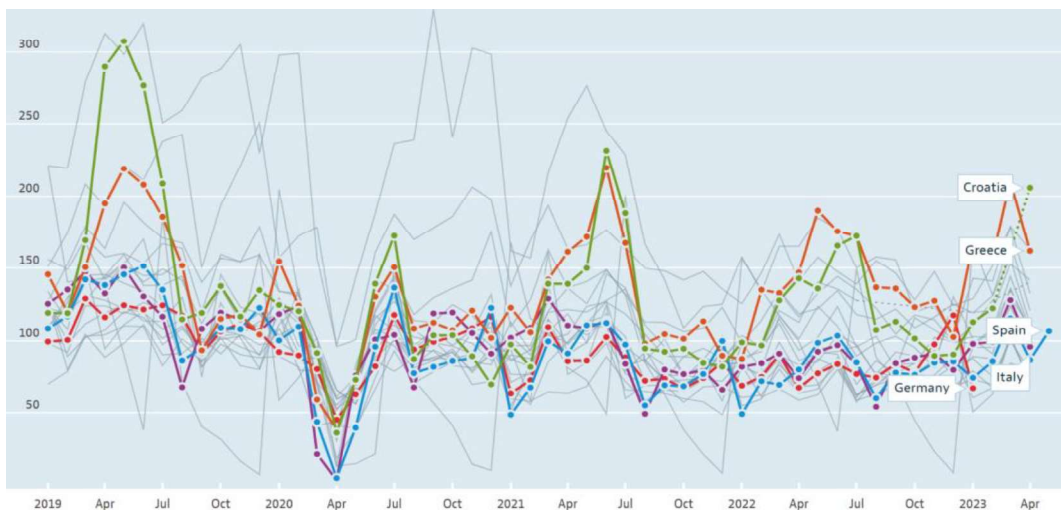


Figure 3: Number of new cars registrations per country (in thousands), OECD, 2022

Another interesting observation is that the most developed and resilient economies in the EU like Germany, Spain or Italy have globally a stable number of new registrations over time while most economically instable countries like Greece or less developed economies like Croatia have a more variable one.

Among those new cars, most of them are still petrol-powered, at the exception of Croatia which possesses more diesel-powered cars, even if the share of electric-powered vehicles has begun to increase in countries like the Netherlands, Germany, France, or Austria.⁴⁰

^{39, 40} Organization for Economic Cooperation and Development Data (2023): Infrastructure investment, latest data publication in the ITF-Transport Outlook of the 24th of May, OECD iLibrary.

When it comes to the quantity of road passengers in the EU, data reveal stark contrasts with Germany, France and Italy cumulating much higher quantities than the other member states as shown on the OECD figure below:

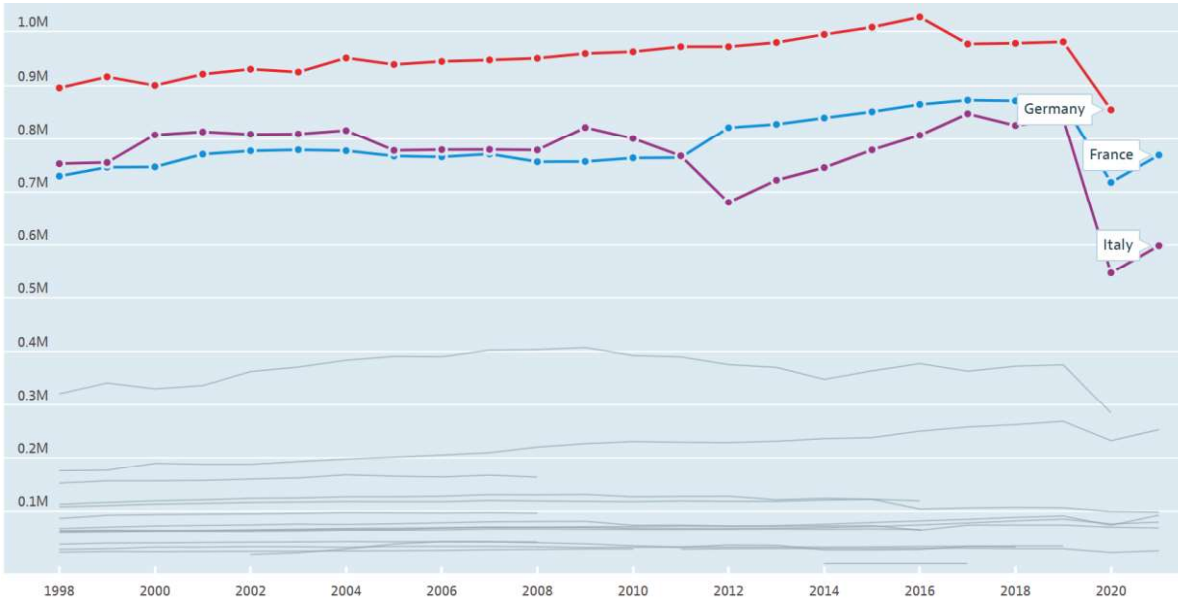


Figure 4: Number of road passengers per country over the years, OECD, 2021

The third indicator is the freight road transport.

Counted in Million tons km, the freight road transport sector is dominated by five countries: France, Germany, Italy, Spain, and Poland who is largely ahead of the others as can be seen on the following figure from the OECD:

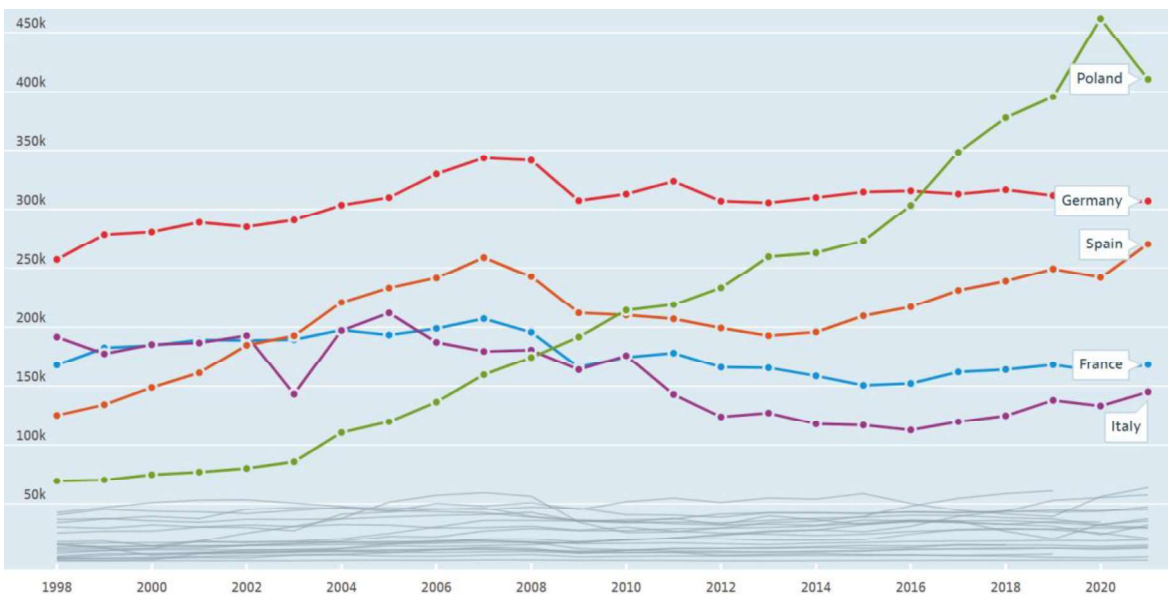


Figure 5: Number of freight road transports in Mn Ton Km per countries, OECD, 2021

If we were to isolate figures of national freight, Germany would take the lead, while if we were to consider exclusively international freight outside of the EU, the fifth top countries would be Romania instead of Italy and Lithuania instead of France, the top 3 would remain Spain, Germany and Poland, in reverse order. ⁴¹

Another good indicator is the share of GDP which, for the whole transport sector, accounts on average to 5% of the EU's GDP share. Hungary is usually one of the EU countries dedicating the highest share of its GDP to the transport sector while Cyprus and Latvia can be found at the other end of the spectrum. ⁴²

The last indicator is the number of employments in the sector which amounted to 6.2 million people in 2021 and close to ten million when including all professions working indirectly for the sector. Out of those 6.2 million, about 90% work for land transports like roads or rails. Only Malta employs more in the aviation and maritime sectors, while Greece has a close 60/40% ratio. The road sector is consequently particularly important for the EU job market. ⁴³

4.1.2. The importance of roads for the EU Single Market

As already stated in the Academic Framework section of this thesis, a well-functioning transport network is key to a healthy European economy as it facilitates trade and gives more job opportunities to EU citizens.

In addition, as the EU Single Market's principle lies with the four freedoms of movements, it is only natural that transport and in particular, roads, are crucial components of the EU Single Market.

Ever since 2007, the International Road Federation's Research Council had identified that roads played a prominent part in the geographic repartition of economic growth as improved connectivity helps increase regional cohesion. ⁴⁴

^{41, 42, 43} Organization for Economic Cooperation and Development Data (2023): Infrastructure investment, latest data publication in the ITF-Transport Outlook of the 24th of May, OECD iLibrary.

⁴⁴ International Road Federation Research Council (2007): The Socio-Economic Benefits of Roads in Europe, Report published online by the IRF, November.

A study carried in the Netherlands by their Directorate for Traffic and Infrastructure ⁴⁵ has even proved that zones with high job densities were always located close to important road arteries. This is understandable as it is easier for companies to be implanted closer to their chains of supplies, delivery etc. while for individuals, the proximity with major roads guarantees a better accessibility to services and activities.

Roads are also a contributing factor to regional development, for instance by boosting the tourism sector. ⁴⁶ Indeed, in the EU, there are still several countries that are easier to visit by car than by train like Slovakia or Romania. Granted, those are not the most touristic destinations in Europe; however, even in the case of France which remains a top touristic destination worldwide, it is often easier to visit the sea and ocean coastal cities by car rather than by train. Besides, the operating French railway company, the SNCF, is infamous for its delays and strikes which make people prefer renting a car over betting on trains. Indeed, road vehicles often offer a flexibility that train do not propose which can be advantageous in some circumstances.

Aside from the aforementioned reasons, as well as the ones already presented in the Academic Framework section, the roads have influenced the shape and frame of the Single Market as trade ways were initially based on the existing roads and the opposite is also true as to gain in efficiency, the development of the Single Market has required the construction of new roads infrastructures. ⁴⁷ This mutual influence can be observed at many levels, whether it's about modernization, modification, or adaptation. Indeed, when the transport sector develops new innovations, it can contribute to fostering growth in the internal market whereas if new orientations are adopted by the Single Market, it will eventually have an impact on the road sector.

More recently, to transition its current economy to a greener and more prosper one, the EU has issued several objectives regarding road transport under the frame of the Green Deal, as developed in a later Chapter of this thesis. Indirectly, reaching these objectives will have an impact on the Single Market as it is a driving force of the Deal.

⁴⁵ Can be found in: European Commission (2018): Transport in the European Union: Current Trends and Issues, Report published by the DG MOVE (for Mobility and Transport) on the EC website, April.

⁴⁶ Begg, Iain for EPRS (2021): The European Union and regional economic integration: Creating collective public goods – Past, present and future, European Parliamentary Research Service Briefing.

⁴⁷ European Commission (2023): Transport sector economic analysis, published on the EC's Science Hub.

For all these reasons, it is safe to say that the efficiency and resiliency of the road sector are indeed of great importance for the good functioning of the Single Market. Conversely, difficulties encountered in implementing or regulating the European road network can have hard consequences on the EU's economy as it can paralyze trade and fragilize territorial cohesion hence hindering the unity project.

4.1.3. Comparison with rails: why should we keep investing on roads?

As part of the Green Deal, the EU wishes to increase the share of rails in the transport modes mix. To that end, the Union is working closely with the national and local administrations on the development of wider, more efficient, and sustainable rail network. The main objective would be to replace 30% of the road freight above 300km by rail freight at the horizon of 2030. ⁴⁸

However, despite this seemingly preference for rails over roads to navigate the future of the EU's land transportation, figures show that the rails currently remain underfunded compared to roads and that their share follows a decreasing trend. ⁴⁹ Indeed, OECD data from 2020 outline that the European rail lines have kept on shrinking since 2008, losing over 3000km. As for fundings, OECD data reveal that from 2000 to 2019, more than 1,340€ billion were invested in road infrastructures while the budget allocated to railway networks was of 843€ billion. This difference of approximately 500€ billion can only be explained by the prioritization of roads over rails' developments in the past decades. ⁵⁰ Among the Member States, only Austria and Belgium chose to invest more in their rail networks; however, in the case of Belgium that can be explained by the fact that its road network is already greatly developed as a result of the fast urbanization of the territory. ⁵¹

⁴⁸ European University Institute (2023): Rail, Robert Schuman Centre, Transport section.

^{49, 50} Organization for Economic Cooperation and Development Data (2023): Infrastructure investment, latest data publication in the ITF-Transport Outlook of the 24th of May, OECD iLibrary.

⁵¹ World Road Statistics (2021): Investing in Road Networks: A European perspective, Analysis paper published on the World Road Statistics website, 30 March.

This prioritization choice is even more debatable after the EU chose to declare 2021 as the “Year of Rail” but failed to initiate a true shift from roads to rails upstream to this declaration ⁵² even if the financing gap has decreased a bit in the past 5 years, compared to the period 2004-2013 when investments going to roads infrastructures were almost double compared to the rails’, as illustrated in the figure below:

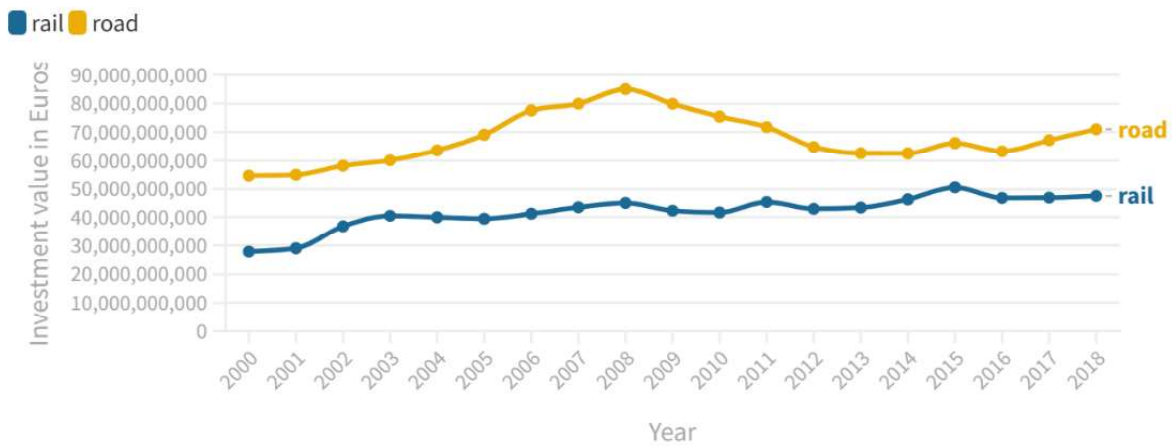


Figure 6: Investments in rail and road transportation in the EU, OECD, 2021

On average, OECD figures show that the share of GDP dedicated to rail infrastructures in European countries ranges from 0.1% (Ireland, Poland, Romania...) to 0.6% (Spain, Austria, Czech Republic...) which is still significantly lower than the range of road infrastructures’ GDP share. This one varies from 0.2% (Austria) to 1.8% (Romania), with an average of 0.8% compared to 0.3% for rails. ⁵³ The high GDP percentage of road infrastructures investments for Romania can be explained by the fact that the country has engaged in a massive program of transport infrastructures improvements to enhance the connectivity of its territory and facilitate commutation for its citizens. Indeed, Romania is still a very rural country, so it is not rare for people to have to commute daily over long distances to reach their workplace or even, school, from home.

⁵² European Investment Bank (2022): Transport Lending Policy 2022: The Way Forward – Investing in a cleaner and smarter transport system, Policy document released on the EIB website.

Curic, Ana and Schmidt, Nico (2021): Data analysis: trains remain under-funded in Europe, Investigation published in the Investigate Europe online newspaper, 19 November.

⁵³ Organization for Economic Cooperation and Development Data (2023): Infrastructure investment, latest data publication in the ITF-Transport Outlook of the 24th of May, OECD iLibrary.

These figures alone are proof that roads have still a bright future in the EU. In addition, it would be unrealistic to believe that rails could completely replace roads. Ultimately, each of these modes of transportation have their specificities that make them more appropriate for certain types of movements. The main advantage of road transport being that it offers more flexibility, especially for short to middle-distances and allows for door-to-door delivery of services and goods.⁵⁴ And while it is apparent that the Union should increase its investments going to rails infrastructures, it does not mean that it should drastically reduce the ones allocated to roads infrastructures. Indeed, for the safety, resiliency, and sustainability of its road network, it is necessary that the EU provides appropriate financial and technical support.

4.1.4. Influences on development: the weight of demographics

Until the Great Recession of 2009, which for some EU countries stretched to 2013, demographics were rarely associated to economics to study the changing geography of the world.⁵⁵ Indeed, economic growth and indicators of development or production like the GDP were long regarded as sufficient to analyze economic trends and flows or to identify economic centers. However, when the Great Recession occurred, severely impacting the economies regarded as advanced, it became clear that economic performances were no longer enough to study and explain the on-going shift of the world economic center from the West to the East.

That is when demographics came into view. Indeed, today, more than 60% of the world's total population lives in Asia while a rising 17% lives in Africa compared to only 10% in Europe, according to figures from the EC.⁵⁶ In the coming decades, projections show that the biggest population growth will happen in Africa while Asia will still gain at least 750 million new inhabitants, despite a reduced growth.⁵⁷ Conversely the European population should keep on decreasing which is bound to have consequences on economic activity but also on several sectors like transport, and by inclusion, road transportation.

⁵⁴ European Commission (2018): Transport in the European Union: Current Trends and Issues, Report published by the DG MOVE (for Mobility and Transport) on the EC website, April.

⁵⁵ Luxembourg Centre for Contemporary and Digital History (2009): Historical events in the European integration process (1945–2009), University of Luxembourg, published online on CVCE website.

^{56,57} Eurostat (2021): Demographic developments in the EU, Factsheets 2021 edition.

Indeed, if the European population is reduced, and considering that most European countries are already urbanized, the need for new road infrastructures will be significantly lower than in areas of the globe where population figures are on the rise. Based on this hypothesis, it is likely that the demand for road transportation services will only happen locally in Europe, in the most populated and dynamic areas which could still experience traffic jams, while the general trend will show a decrease compared to past years.

However, if the need for new road infrastructures is bound to diminish, the ageing of the European population may call for revisions of existing infrastructures. Indeed, older people usually do not have the same needs as the active population, but they require some specific adjustments like accessible public transport options with enough seats, enhanced road safety measures or age-friendly road layouts. Besides, as older people generally prefer to use their own vehicle, the use of intelligent transport systems will become a must in order to offer more security and assistance to the driver. Maybe it will also become an opportunity for the development of autonomous cars despite the public's current distrust of this solution.

Other demographic-related factors that impact the road sector are the changes in work patterns and the raise of environmental awareness among the younger generations.⁵⁸ The first factor is highly correlated to the development of remote working and flexible work rhythm practices, which exploded during the covid crisis and remained after. Therefore, there are less commuting, however, on the other hand, road transport deliveries have exploded. As for the second factor, it could announce a future reduction of fossil-fueled cars' use and production as the younger generations are very concerned about the environment and climate change.

In addition, migration trends have introduced changes in the European demographics which could also impact the road sector. Indeed, depending on their origins, migrant populations may come from countries which follow different transport patterns and may also have their own transport preferences. As a result, the road sector's future will evolve to include these preferences.

⁵⁸ Dr2 Consultants (2021): The future of the EU transport sector (2021-2024) – four trends, Blog on the Consulting Group website, 4 November.

Finally, as mentioned earlier, urbanization is an important factor that can directly impact the road sector. Indeed, according to the World Bank data, there is about 75% of the European Union's population who lives in urban areas compared to 58% in the 60s. Among the least urbanized countries are Croatia (58%), Romania (54%), Slovenia (55%) and the Slovak Republic (54%). On the other end of the spectrum, Belgium (98%), the Netherlands (93%), Luxembourg (92%) and Malta (95%) are the most urbanized countries.⁵⁹ It is interesting to note that the most urbanized countries are among the smallest in size, while the least urbanized are among the last to have joined the EU (with Croatia being the last date). In the future, there are high chances, that the least urbanized countries will catch up to the EU's average which means that there will be a need for road infrastructures there. This can already be observed, as a big bridge was recently completed in Croatia to improve the connectivity of its road network.⁶⁰

In the perspective of the accession of the Western Balkans countries, it can be expected that this region will also require a lot of road infrastructures and will foster a lot of transport investments to accompany its urbanization. Indeed, countries like Bosnia and Herzegovina (49%), Serbia (57%) and North Macedonia (59%)⁶¹ are still very rural despite engaging in several road projects under the frame of the TEN-T policy developed in the next chapter of this thesis.

That's why, despite an ageing and decreasing population, the EU's road sector will still have a lot to adapt to in order to follow with demographic trends.

4.1.5. Evolutions of the sector: fitting into the Digital Single Market

Given the growing importance of digital technologies in daily life and in particular, of the internet, the EC has committed to pilot the EU's Single Market adaptation to the digital age.⁶²

⁵⁹ World Bank Open Data (2021): Urban development, consultable online.

⁶⁰ Botric, Valerija and Sisinacki Jelena (2006): Road Infrastructure and Regional Development: An Evidence from Croatia, Article published on ResearchGate, September.

⁶¹ World Bank Open Data (2021): Urban development, consultable online.

⁶² Watts, Nicola (2016): 3 Pillars Of The EU Digital Single Market Initiative, Article published on the Ogilvy Asia, WPP company, website, Thinking section, 10 June.

This decision resulted in the adoption of the Digital Single Market (DSM) initiative in May 2015, defined as one of the ten political priorities of the Union, which unifies the pace and procedure of the internal market's digital transition instead of creating one more area of "géométrie variable" in the EU.

The main objectives of the DSM are to remove obstacles limiting citizens in their cross-border online activities, like the online purchase of goods sold in another Member State, and to facilitate the transition from paper to screens, especially for administrative tasks. Its policy is based on three pillars: improving access to digital goods and services, creating a favourable environment for the development of digital networks by providing secured and efficient informatic infrastructures, and maximising the economic potential offered by digital technologies to foster growth. ⁶³

As seen in the second section of this chapter, the road sector is of key importance for the EU Single Market hence it is also impacted by its transition to the DSM in several areas.

First, by improving access to digital platforms and removing cross-borders barriers to online trade, the DSM has been facilitating the growth of e-commerce. As a direct consequence, the need for efficient logistics to carry and deliver the online-ordered products across Europe has risen, increasing the number of freight lorries on European motorways and of personal vehicles in urban areas (cars, motorcycles...). Hence the necessity for efficient road transport networks. ⁶⁴

In addition, by promoting the use of Intelligent Transport Systems (ITS), the DMS has enhanced the efficiency and smart management of roads as the ITS provide various indicators that help keep track of key roads' parameters in real time like traffic. Also, ITS are now integrated into most vehicles, equipping them with improved driver assistance systems and helping them stay connected to applications, internet etc. ⁶⁵

⁶³ Valtuena-Ramos, Gabriel and Kirchherr, Julian (2021): Road work ahead: The emerging revolution in the road construction industry, Insights on Public and Social Sector, published on the McKinsey & Company website, 1st March

^{64, 65} Watts, Nicola (2016): 3 Pillars Of The EU Digital Single Market Initiative, Article published on the Ogilvy Asia, WPP company, website, Thinking section, 10 June.

The DSM has also modified road transport practices with the multiplication of peer-to-peer applications dedicated to car-sharing, like Blabla Car, a French app which became the leader of car-sharing worldwide, totalizing over 90 million users. People also began to order Uber Pools instead of traditional taxis even if this tendency has been decreasing in the recent years. And lately, all those applications have started providing environmental information on the vehicles presented in order to promote less polluting means of transformation, which can ultimately influence road users' behaviors and choices.

Finally, the DMS has a big impact on cross-border road transportation as it is gradually removing most paper administrative constraints by replacing it with electronic documents to achieve seamless travel for vehicles across the EU. This impact was amplified by the covid crisis which required a swifter transition to electronic coordination and management to avoid the spread of the virus. ⁶⁶

As a result of the DMS policy, road vehicles' uses, production, and management are being optimized. Besides, as new innovations keep emerging, it broadens the scope for productivity. Among those innovations is the "digital twin" technology which can create an accurate digital representation of a physical asset thanks to multiple data sources. ⁶⁷ This can be useful to study multiple parameters of an asset like a bridge or a road portion, without having to build a physical model. ⁶⁸

However, all those changes introduced by the DSM in the European road sector must be guided by a clearly defined strategy to remain controllable. That's what the Smart and Sustainable Mobility Strategy, issued by the EC in 2021, is for. At national level, the governments must secure their place on the competitive market by introducing new standards for smart transport and work hand in hand with industries to boost innovation and build skills.

⁶⁶ Watts, Nicola (2016): 3 Pillars Of The EU Digital Single Market Initiative, Article published on the Ogilvy Asia, WPP company, website, Thinking section, 10 June.

⁶⁷ McKinsey Global Institute (2017): Reinventing Construction: A Route to Higher Productivity, Research insight elaborated in collaboration with McKinsey's Capital Projects and Infrastructure Practice, February.

⁶⁸ Valtuena-Ramos, Gabriel and Kirchherr, Julian (2021): Road work ahead: The emerging revolution in the road construction industry, Insights on Public and Social Sector, published on the McKinsey & Company website, 1st March.

4.2. Improving connectivity in Europe: TEN-T and the Western Balkans case

4.2.1. The history and objectives of TEN-T

The Trans-European Transport Network (TEN-T) is perhaps the most emblematic policy adopted by the EU in the field of transport. Indeed, with its history tracing back to the beginning of the 1990s, it soon became the “backbone” of the Union’s connectivity, bringing together the member states as one territory and effectively allowing the free movement of goods and people. ⁶⁹

The very first guidelines of the TEN-T policy were issued in 1996 and were accompanied by a Master Plan Study which identified priorities for national infrastructures’ development and their connection together. ⁷⁰ At the time, borders were still an issue to be addressed as there were several restrictions and incompatibilities hindering smooth commuting. The projects (issued through TEN-T) covered not only roads and railways but also waterways.

For several years, no important change was brought to the initial Guidelines of TEN-T, however, in 2004, which also marked the largest enlargement wave so far with the accession of 10 countries to the EU (Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovakia and Slovenia), a thorough revision of the Decision ruling the TEN-T policy (No. 884/200) occurred ⁷¹ in an effort to develop and extend the connectivity between western and eastern Europe and to accelerate the creation of pan-European corridors across the different axis of the continent. This revision identified a total of 30 priority projects which received funding from the EU budget and called for newer, more sustainable transport options. It is interesting to note that out of the 30 identified projects, 18 were focused on rail. This revision also marked the introduction of the Motorways of the Sea (MoS), a project which had been promoted in the 2001 White Paper dedicated to the future of transport. Today, those 30 Priority Projects have been fully incorporated into the Core Network Corridors policy which was adopted later and became the heart of TEN-T.

^{69, 70, 71} European Commission (2023): History of the Trans-European Transport Network (TEN-T) policy, General Information page on the EC website, Transport section, updated regularly.

A few years after this first major revision was carried out, two more countries joined the EU: Romania, and Bulgaria (2007), which called for new road developments. However, these projects, which sometimes overlapped with other existent pan-European corridors, were less significant than past ones. During the same period, the EC and other institutions decided to work on more corridors which were not foreseen in the 30 Priority Projects, like some rail freight ones.⁷² As TEN-T progressively grew, it became imperative to carry an evaluation of the policy to progress in the right direction. Thus, after a careful planning phase carried during the year 2008, the extensive review of TEN-T began in 2009 and stretched until 2013.⁷³

This evaluation helped structure the TEN-T policy into its current organization by defining two multimodal layers of network. The first layer, known as the “comprehensive network”, is formed by the initial TEN-T project with all the existing and future transport infrastructures while the second layer, called the “core network”, which is included in the comprehensive one, gathers all its strategic parts in an attempt to improve and accelerate their development. These strategic parts were identified thanks to a methodology developed over the course of the evaluation which was approved by all member states. The aim of this methodology was to promote a more integrated and project-based approach by choosing to include factors like environment, geography, technology, digitalization etc. and by providing Work Plans for each core network’s component determined. In the end, nine corridors were singled out as a result of applying this methodology.⁷⁴ Together they form the core network and materialize the main routes that ensure the good functioning of the internal market. In addition, two “horizontal priorities” were also identified to structure the TEN-T: the European Rail Traffic Management System and the Motorways of the Sea previously mentioned, which contribute to securing the multimodality aspect of TEN-T. To pilot these eleven projects, the European Commission appointed a European Coordinator to each, who is responsible for the governance and the execution of its Work Plan. Those plans are used to guarantee an efficient and rational management of the corridor’s completion by individualizing its planning and financing while taking into account its technical specificities.

^{72, 73} European Commission (2023): History of the Trans-European Transport Network (TEN-T) policy, General Information page on the EC website, Transport section, updated regularly.

⁷⁴ European Commission (2023): Trans-European Transport Network (TEN-T), General Information page on the EC website, Transport section, updated regularly.

All the aforementioned elements were gathered into the *Regulation (EU) No 1315/2013* which was adopted following the completion of the evaluation.⁷⁵

From 2013 to 2021, when TEN-T was revised, a lot of investments from the EU went to the completion of the nine core corridors as it represents a good 34% of the total TEN-T network. In 2019, already more than 25000 kms of roads had been built with the longest length belonging to the Scandinavian-Mediterranean corridor. Among these core roads, over 85% are motorways, compared to 61% for the total comprehensive network.⁷⁶ However, this overall percentage greatly varies across the European countries as seen on the following figure:

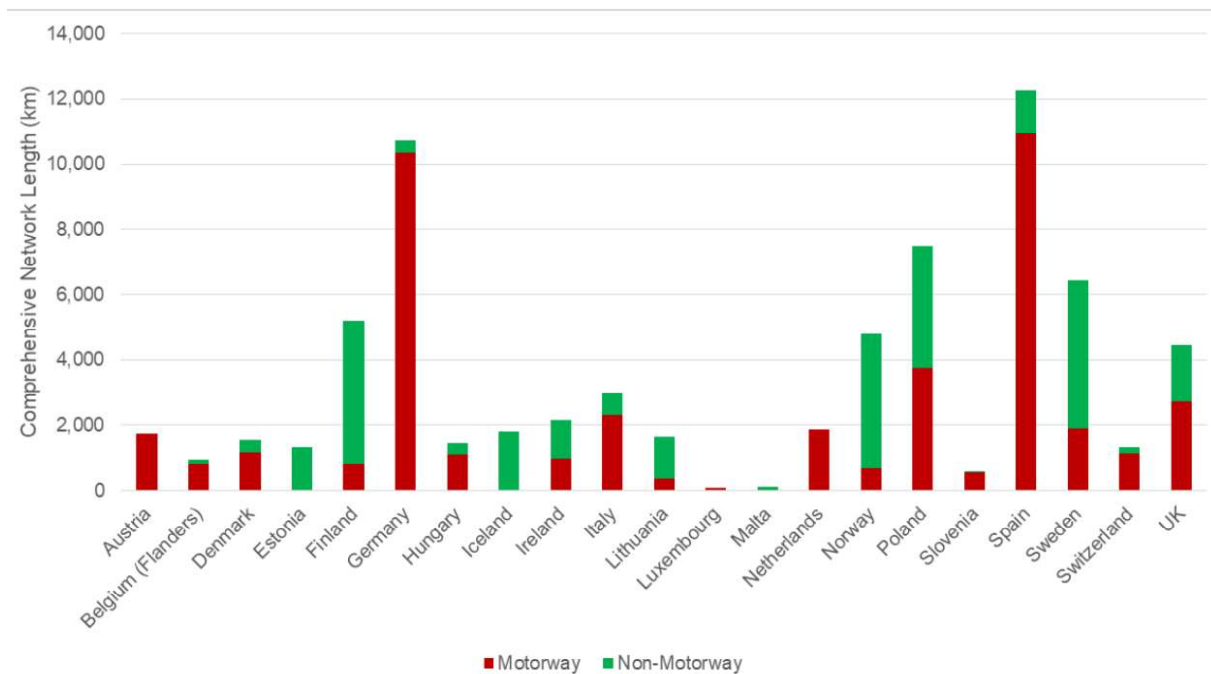


Figure 7: Road types of the TEN-T comprehensive network, CEDR Report, 2019

The same goes for road investments between the period 2013-2019; the sums dedicated to it vary a lot between the European countries with newer member states generally investing more in order to catch up with TEN-T’s developments and objectives. Fortunately, member states benefited from various grants and loans from the EU to help co-finance the road projects carried on their territory.

⁷⁵ European Commission (2023): Trans-European Transport Network (TEN-T), General Information page on the EC website, Transport section, updated regularly.

⁷⁶ Conference of European Directors of Roads (2022): Benchmarking Europe’s Road Networks: aiming for excellence, Column published on Euractiv web platform, 2 nd November.

For instance, the EIB invested more than 27bn€ since 2012 until 2019 for the completion of TEN-T Projects, with a growing percentage of those going to green, sustainable projects.⁷⁷ Indeed, as the EIB has become the EU Climate Bank, it has committed to primarily support projects which are in line with the Green Deal Guidelines and more generally, which are mindful of the environmental impact. Besides, the member states also benefited from the grants delivered by the European Regional Development Fund and the Cohesion Fund which are both co-managed by the EC. Over the period 2007-2013, more than 50bn€ from both funds went to road developments across the EU while, during the period 2013-2020, it still amounted to about 30bn€. Among those, the Court of Auditors found that more than 45% was allocated to the TEN-T for the first period and more than 60% during the second with half of it going exclusively to the core network.⁷⁸

Thanks to the 2013 Regulation, which defined a clear structure and plan for TEN-T, and thanks to the financial support received by both the EU and the member states, the project was able to move forward with its main objective to interconnect the European territory. Stemming from this goal, the TEN-T policy also seeks to facilitate movements of people and goods across Europe through various modes (roads, rails, air, and waters) by providing fast and secured routes and by simplifying cross-borders procedures. By doing so, TEN-T also intends to remain the backbone of the EU internal market, paving ways for more trades and thus, economic growth. Bringing together the different European populations, TEN-T too contributes to the EU social and territorial cohesion while its innovations and improvements help transition towards more sustainable means of transportation and more environmental-friendly construction processes for road infrastructures.⁷⁹

4.2.2. The revision and extension of TEN-T

Initially, after the adoption of the 2013 Regulation, it was decided that both the core and comprehensive networks would be left untouched until 2030, with the exception of a few maritime and air nodes that could be added or removed.

⁷⁷ European Investment Bank (2022): Transport Lending Policy 2022: The Way Forward – Investing in a cleaner and smarter transport system, Policy document released on the EIB website.

⁷⁸ European Court of Auditors (2020): The EU core road network: shorter travel times but network not yet fully functional, Special Report published on the Court website, September.

⁷⁹ European Commission (2023): TEN-T, General Information page on the EC website, Transport section.

It was also foreseen that a revision of the TEN-T policy would eventually happen at the horizon of 2023. However, the covid crisis had the effect of accelerating this agenda. Indeed, during the pandemic, it became evident that an efficient, well-connected, and modern transport network was most needed to keep supplying the EU in essential goods. As the former President of the Council of the EU, Croatian Minister Oleg Butkovic, stated “covid-19 crisis has shown [...] how rail transport can facilitate the supply of [...] goods in exceptional circumstances.”⁸⁰ And the same applied to road freight that were also maintained whereas most air connections were closed.

Another factor indirectly responsible for the anticipated revision of the TEN-T policy was the decision from the EU, supported by the national Ministers for the Environment and the Energy, to have the European Green Deal lead the recovery as a way to guarantee green growth and develop more resiliency.⁸¹ Since the Green Deal encompasses objectives related to transport, like the reduction of emissions, it became necessary to revise the TEN-T policy to ensure that it would have the means to follow and meet the expectations set in the Deal. Following in the footsteps of the Deal, the Fit for 55 package, which was discussed by Transport Ministers in September 2021 and later by the Environment Council in October of the same year, helped better identify the challenges faced by the transport sector in the perspective of climate neutrality. Hence, in 2021, to accompany the transition to greener, smarter, and more resilient modes of transportation envisioned in the Green Deal, the EC decided to revise the 2013 Regulation of TEN-T.⁸²

In line with the objectives set by the Green Deal, the revision, which was legally introduced in December 2021 as Regulation (EU) 1153/2021, proposes guidelines to reduce the transport sector emissions by 90% at the horizon of 2030. It also advocates for the creation of sustainable urban actions plans to support sustainable mobility in the major European cities.⁸³

Furthermore, it seeks to improve connectivity and safety of the overall transport ways and infrastructures by using modern IT systems.

⁸⁰ Conference of European Directors of Roads (2022): Benchmarking Europe’s Road Networks: aiming for excellence, Column published on Euractiv web platform, 2 nd November.

⁸¹ European Commission (2023): TEN-T, General Information page on the EC website, Transport section.

^{82,83} European Commission (2023): TEN-T Revision, Presentation of the revision available on the Transport section of the EC website.

Finally, the revision is behind the extension of the TEN-T network. Indeed, an extended core network has made its apparition alongside the core and comprehensive ones, with a completion horizon set around 2040. In addition, it was decided that the core network corridors would ultimately merge with the rail freight corridors in order to create European Transport Corridors (ETC) and achieve more coordination between the various infrastructures' projects. ⁸⁴

The original version of the extended core network was limited to the inclusion of the Western Balkans countries who are candidates to the accession into the corridors; when it comes to roads, a total of forty-seven projects were identified for a little less than 1000km of length. ⁸⁵ Below is a map of the on-going road projects as examined in 2021:

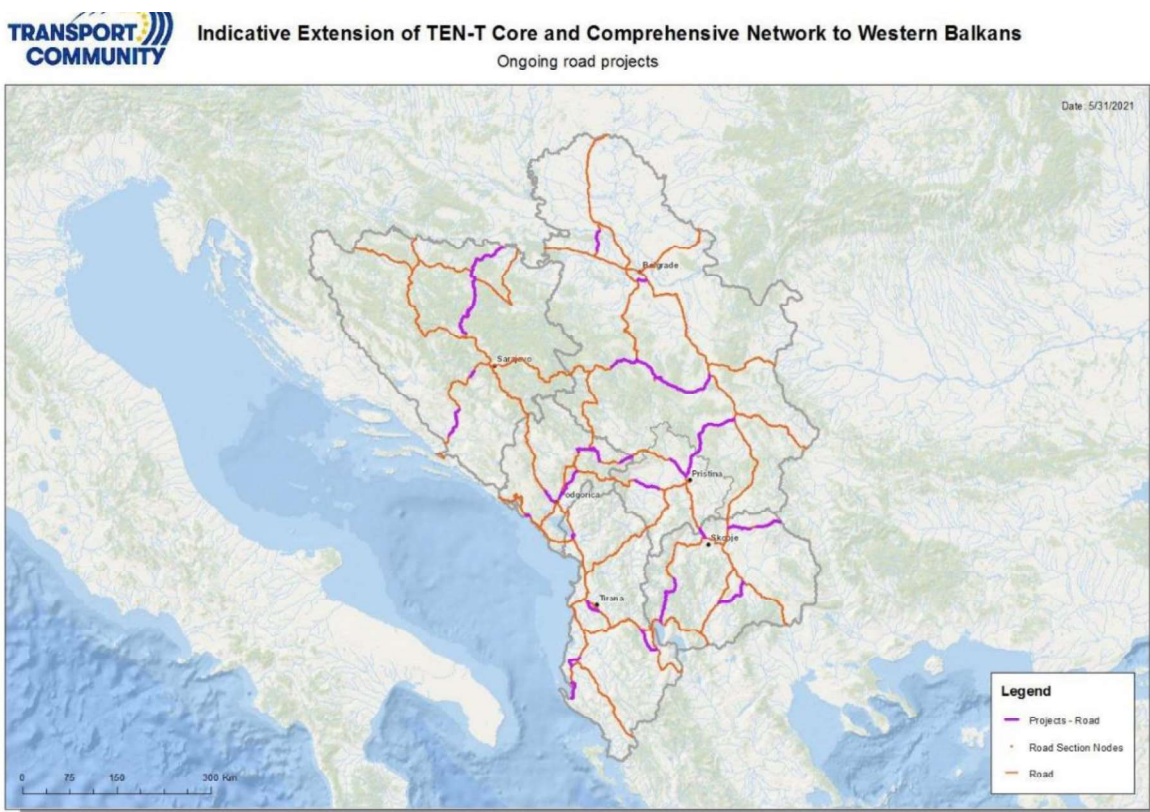


Figure 8: Map of the current road projects in the Balkans, Transport Community, 2021

Cumulating twenty on-going TEN-T projects, Bosnia-Herzegovina is the Western Balkans country which has engaged in the most motorways construction for the coming decades.

^{84, 85} European Commission (2023): TEN-T Revision, Presentation of the revision available on the Transport section of the EC website.

Conversely Albania is more focused on its maritime infrastructures. ⁸⁶ Part of the planned new roads will join the Orient-East-Med core corridor which is part of the nine strategic corridors identified in the core network.

Yet, this extension was furthered following the beginning of the war in Ukraine. Indeed, in May 2022, the EC evaluated that a way to support Ukraine would be to develop and strengthen its communications with the EU by improving the connection of its territory to the neighbor member states. ⁸⁷ Such connection would allow for faster and safer delivery of necessary supplies and would also be of help to evacuate the civil populations who are impacted by the war. A few months later, the TEN-T maps were revised to encompass this extension to the East. ⁸⁸ In total, the extension of 4 out of the nine corridors part of the core network were considered and left to the approval of the EP: the North Sea – Baltic Sea to Marioupol from Lviv and Kyiv, the Baltic Sea - Black Sea-Aegean Sea to Odessa and the Rhine-Danube and Baltic Sea - Adriatic Sea to Lviv. The following maps show the previous version of TEN-T and the current version:

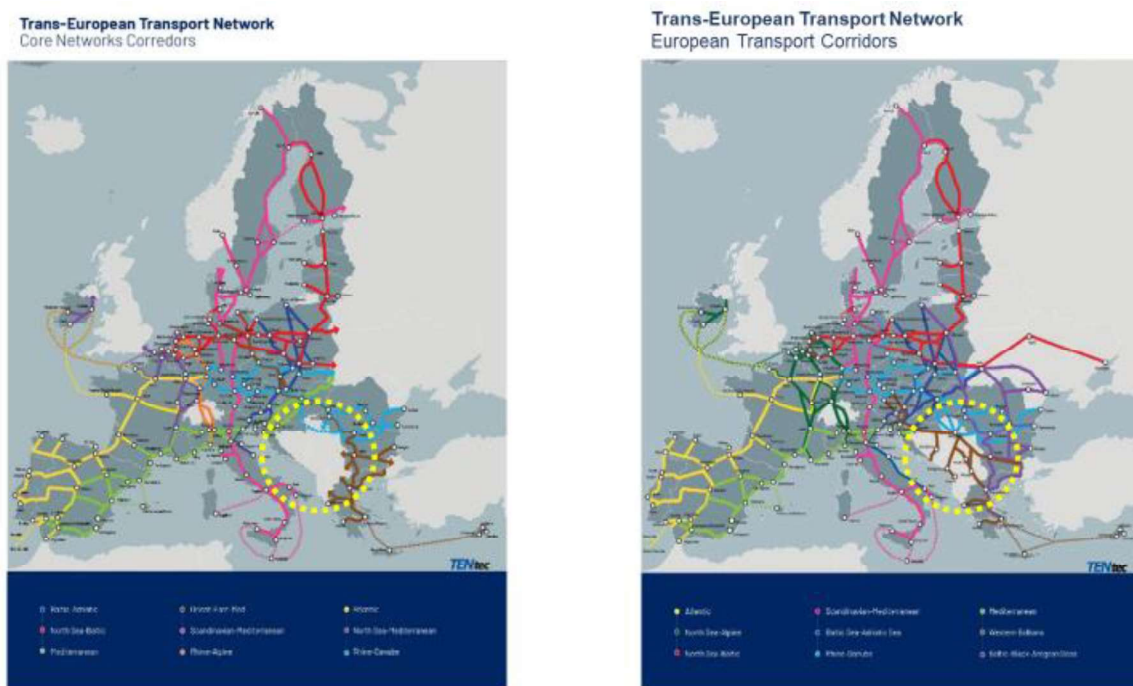


Figure 9: Maps of the previous and new versions of TEN-T core corridors, EC, 2022

⁸⁶ Transport Community Treaty Permanent Secretariat (2021): Development of indicative TEN-T extensions of the Comprehensive and Core Network in Western Balkans, Report published on their website, June.

^{87,88} European Commission (2023): TEN-T Revision, Transport section of the EC website.

Conversely, it was decided to remove the envisioned extensions of TEN-T to Russia and Ukraine from the core network's projects and to relegate them to the comprehensive network instead which means that their possible implementation will be delayed to 2050 instead of 2030. However, if Belarus were to make a democratic turn, some road infrastructures' plans could still be reincorporated into the 2021 Regulation.⁸⁹

Of course, all the extensions planned will require huge investments as a leveling-up of the Ukrainian and Moldovan infrastructures and regulations will be necessary.⁹⁰ As for the Western Balkans countries, the main challenge is their ability to create a Regional Value Chain which is something to be evaluated.

4.2.3. The Western Balkans case: can the objectives be met?

To answer this point's question: "can the objectives fixed by the TEN-T's policy be met by the Balkans countries?", it is necessary to address two sub-questions first. One should be: "do they have the means to meet these objectives?" with means including both financial and technical elements. The other one should be: "if they do have the means, how should they proceed?".

Let's focus on the "means" aspect first.

From a financial perspective, the Balkans countries regularly benefit from generous EU grants. Indeed, as mentioned during the "Western Balkans Road Summit" held in Tirana in June 2022⁹¹, two of the main European investment banks, the European Investment Bank (EIB) and the European Bank for Reconstruction and Development (EBRD) are committed, alongside the EC and the Council of Europe, to help the Western Balkans countries develop safer and more modern transportation infrastructures by providing financial technical support in the form of grants, loans and development programs under the Western Balkans Investment Framework (WBIF) launched in December 2009.

⁸⁹ European Commission (2023): TEN-T Revision, Presentation of the revision available on the Transport section of the EC website.

⁹⁰ Ondrejicka, Dusan for EIB (2022): Moldova: Team Europe - EIB supports faster EU integration of Moldova with €150 million investment in modern highways and improved road safety, Press release on the EIB website, 1 st April.

⁹¹ Kovacevic, Gordana for EIB (2022): Western Balkans Road Summit, "Shaping the future: safe, smart and sustainable roads", Press release on EIB website, 7 June.

This initiative is part of the EU's assistance in preparing the future integration of the Western Balkans countries and was later completed by the Connectivity Agenda for the Western Balkans issued by the EC in 2015.⁹²

Thanks to events like the aforementioned summit, ministers of transport from the region have the chance to discuss the future of their road networks with experts and stakeholders of the EU which can orient them towards more sustainable and resilient approaches. Indeed, most European grants and loans have become conditioned to the commitment to deliver resource-efficient and environmental-friendly projects⁹³ which means that the Western Balkans must elaborate plans that take these aspects into consideration. This includes renovating existing infrastructures to make it less energy-consuming and more lasting, but also to plan the implementation of e-charging stations for electric cars as the region is also expected to take part in the transition from fuel-powered vehicles to electric-powered ones etc. All these with the final goal to facilitate the transportation of goods and people.

Up to now, the EIB has already financed the renovations and improvements of more than hundreds of kilometers of roads while the EBRD has lent more than 2.5€ billion to build or upgrade over forty road portions across the Western Balkans. Out of these forty, about 20 are yet to be completed. It is also likely that, following the revision of the 2012 Regulation of TEN-T which extends the core corridors to the region, two new trade ports will receive funding from the EBRD to foster maritime trade.⁹⁴

Another example of a project financed in the Western Balkans under the WBIF is the Corridor Vc in Bosnia and Herzegovina. Considered to be the backbone of the country's connectivity as it helps connect the north and south and touches more than 1.5 million people, the Corridor Vc is the first major motorway and the biggest infrastructure project ever carried there.

⁹² EU Projects in Serbia (2018): The technical assistance to connectivity in the Western Balkans (Connecta), Programme presentation on the EU Projects in Serbia website.

⁹³ European Investment Bank (2022): Transport Lending Policy 2022: The Way Forward – Investing in a cleaner and smarter transport system, Policy document released on the EIB website.

⁹⁴ Transport Community Treaty Permanent Secretariat (2021): Development of indicative TEN-T extensions of the Comprehensive and Core Network in Western Balkans, Report published on their website, June.

It totalizes 68km of motorway which join a network of over 8000km in length among which 1000km are European routes of interest for the extension of the TEN-T core corridors. The Corridor Vc begins in Budapest and passes through Croatia to reach Bosnia and Herzegovina where it stretches over more than 350km. ⁹⁵

This giant project required a lot of investments from the EU, with first, technical assistance grants to prepare the works, then grants for completion of over 202€ million and loans from both the EBRD and EIB of about 837€ million. Thanks to these sums, the works of the main portions could begin smoothly back in 2014. However, the final project has not yet been delivered as it has accumulated delays due to changes in contractors ⁹⁶, a phenomenon well known by the EIB as most of their projects' contractors usually change 4 or 5 times until the completion. This can be explained by the fact that most projects supported by the EIB are truly massive which can be difficult to manage for local contractors who are usually not used to work on projects of this size and who consequently don't have the necessary means to deliver the whole project. Besides, the construction sector has been heavily impacted by the 2020 covid crisis, which triggered delays in the transportation of supplies and caused the bankruptcy of an important number of construction companies. ⁹⁷ This shows that, even if the financings can be found, it is not enough to guarantee the timely completion of a road project.

In addition to financial support, it is important that the Western Balkans countries' governments engage in various plans and programs that will equip their projects with sufficient technical support. In this regard, the WBIF has the advantage of regularly gathering the ministers for transport of the region. In addition, it will soon provide a vast program for sustainable renovation of the existing Western Balkans Road network supported by the EC and other financing partners. ⁹⁸

⁹⁵ Western Balkans Investment Framework (2020): Corridor Vc in Bosnia and Herzegovina: the road of Europe, Publication on the website, November.

⁹⁶ World Road Statistics (2021): Investing in Road Networks: A European perspective, Analysis paper published on the World Road Statistics website, 30 March.

⁹⁷ International Finance Corporation WB Group (2023): Covid-19's Impact on Infrastructure, Sector Notes published on the Resources section of the IFC Expertise website, regular updates and adding.

⁹⁸ Kovacevic, Gordana for EIB (2022): Western Balkans Road Summit, "Shaping the future: safe, smart and sustainable roads", Press release on EIB website, 7 June.

Another European-supported program worth mentioning is the Technical Assistance to Connectivity in the Western Balkans (CONNECTA) contract.⁹⁹ This facility was developed to boost the region in its transport and energy development in line with the Digital Agenda for the Balkans issued in 2018 and the Connectivity Agenda of 2015. Its role is to provide support in the preparation and implementation of short and middle-term reform measures in the transport sector. Through expertise and administrative assistance, it helps accelerate the elaboration of reform projects while making sure that no element is missing.

All these European programs are highly helpful and efficient; however, they must be complemented by national programs and initiatives just like Greece did back in 2007.¹⁰⁰ At the time, the Greek National Strategic Reference Framework was issued for seven years and included many road transport projects that had to contribute to the development and connectivity of Eastern Macedonia and Greece. This program, which was co-financed by the EU, was successful in completing 87 projects for a total investment of 177€ bn. Such National Frameworks seem to be currently lacking in the Western Balkans even if some countries like Serbia have committed to several plans for safe transport or green transport.

Overall, the Western Balkans countries have probably already the financial means to support the TEN-T projects' cost in their region thanks to EU loans and grants, as well as their own investments. However, when it comes to technical support, governments should be more ambitious in their national plans and initiate more projects for the support of the EU to be truly fruitful and efficient.

Moving on to the question of how the objectives of TEN-T can be met in the Western Balkans, the first answer lies with the 2013 TEN-T Regulation. Indeed, Article 17 of the Regulation, which was not revised in the 2021 version, provides a list of all the infrastructure components which together form a frame of reference that the states should respect.¹⁰¹

⁹⁹ EU Projects in Serbia (2018): The technical assistance to connectivity in the Western Balkans (Connecta), Programme presentation on the EU Projects in Serbia website.

¹⁰⁰ Mavraki, Christina and Arabatzis, Garyfallos (2020): Fostering regional development in eastern Macedonia and Thrace, Greece, through road transport projects. In: Journal of Economic Analysis and Policy, Volume 65, pp.56-67, March.

¹⁰¹ European Commission (2023): TEN-T Revision, Transport section of the EC website.

By following the transport infrastructure requirements formulated in the Regulation, the Western Balkans countries should be able to implement TEN-T in the region without committing mistakes.

An important point mentioned in the Regulation is the quality of roads which should be guaranteed as “high”.¹⁰² This is something that the Western Balkans countries have to work on as out of the 5,287.41 km of roads belonging to TEN-T comprehensive network, of which more than 3,500 km are on the core network, about 1920km are in a medium to very poor state as shown in the figure below:

Road profile	Road condition	Core Network (km)	Comprehensive Network (km)
Motorway	Very Good	750.02	102
	Good	670.12	24
	Medium/Poor/Very Poor	144	0
Expressway	Very Good	28.3	0
	Good	140	69
	Medium/Poor/Very Poor	71.44	0
Conventional road	Very Good	66.9	94
	Good	804.76	617.517
	Medium/Poor/Very Poor	865.01	840.334

Figure 10: TEN-T Road Network infrastructure condition, Transport Community, 2022

In addition, the WB countries are still lacking freight terminals and logistic platforms which is an important drawback to the intensification of trade in the region. The same goes for the development of information systems which is not yet on par with the EU’s.¹⁰³ This last element can partly be explained by the fact that such implementations require a lot of implication from the governments which are responsible for delivering adequate policies while guaranteeing a high level of transparency, something that the WB governments still have to work on.

¹⁰² Transport Community Treaty Permanent Secretariat (2021): Development of indicative TEN-T extensions of the Comprehensive and Core Network in Western Balkans, Report published on their website, June.

¹⁰³ Ezgeta, Drago and Causevic, Samir and Mehanovic, Mustafa (2022): Challenges of physical and digital integration TEN-T networks in Southeast European countries. In: Transportation Research Procedia, Elsevier Editions, Volume 64, pp.270-279.

Last, the WB countries have still a lot to implement to fulfil TEN-T's objective in the field of environment. Currently, the compliance rate of the region to environmental requirements is still lacking as the deployment of alternative fuels and their related infrastructures is at its beginning stage with less than 50 e-charging stations implemented in Serbia and only a few others built in its neighbors.¹⁰⁴ This transition to alternative fuels had already been identified as a priority for the region at the time of the first TEN-T Regulation and on a bright note, it is true that notable improvements were achieved as compared to 2013 when almost nothing had been done yet.

Only by working on the compliance to all these requirements, will the WB countries be able to successfully implement TEN-T.

To conclude this section, the objectives of TEN-T set in the Western Balkans have high chances to be met thanks to all the support given by the EU, both financial and technical, however it may take more time than expected if the governments do not engage in more ambitious actions.

4.2.4. Potential for Regional Value Chains

Thanks to its strategic location as the intersection of several seas and its many resources, the Western Balkans region holds a lot of economic potential. Indeed, market opportunities are numerous and consequently, their regional economic integration is on the rise.

Several elements indicate that the region has the capacity to develop its own value chains. Among them is the improved connectivity between the Western Balkans states. This factor is a direct consequence of their inclusion in the TEN-T policy as many road, rail and maritime infrastructures were built under the scheme of the comprehensive network. The EU's contribution to the region's connectivity was also recently increased by the decision to extend the Orient- East- Med core corridor to the Western Balkans, following the proposal of the 2021 TEN-T revision.¹⁰⁵ In addition, most Western Balkans states have understood that connectivity was necessary to foster trade and economic growth, so they have developed their own plans to facilitate transportation of their people and goods.

¹⁰⁴ Transport Community Treaty Permanent Secretariat (2021): Development of indicative TEN-T extensions of the Comprehensive and Core Network in Western Balkans, Report published on their website, June.

¹⁰⁵ European Commission (2023): TEN-T Revision, Transport section of the EC website.

Furthermore, with the 2013 Belt and Road Initiative launched by China, the region has gained another potential partner for trade who seems to be willing to finance great infrastructures across the Western Balkans countries as seen in the next point of this Chapter. This good connectivity is a great asset in establishing value chains.

As mentioned in the introductory paragraph, the Western Balkans countries also possess diverse resources including agriculture (agri-food industry), textiles and clothing, energy, tourism, information technology and automotive.¹⁰⁶

In respect to the agri-food industry, the Western Balkans countries possess the ability to propose high-quality, biological products that could be competitive in the EU, even at a high price. Indeed, the Western Balkans' land is very fertile and the meteorological conditions there, with a lot of sun, make it easy to grow tasty vegetables, to produce various types of oils and even to grow vines and produce fine wine. However, in the past decades, the industry there had rather focused on the production of cheap products which is not so profitable in the long-run because of the lack of means and financings; with the adoption of the Green Deal which encourages the development of ecological practices for agriculture, this could become an opportunity for the Western Balkans agri-food industry to make a shift and dedicate more investments to high-quality productions. Currently, the crop and animal productions are higher in Albania, Serbia, and North Macedonia while Kosovo and Montenegro have a relatively high share of tobacco production. All the Western Balkans countries also manufacture food products.¹⁰⁷ Among them, all but Albania have a comparative advantage.

As for the textile industry, the Western Balkans countries have vast resources of materials and possess high-skilled workers which means that they have the potential to deliver high-quality final products. However, despite these qualities, most of the local offer is low-cost and low-quality while the high-quality productions remain the privilege of foreign firms who benefit from the lower cost of skilled workers and whose final products are almost all destined to extra-regional exports.¹⁰⁸

¹⁰⁶ Matusiak, Monika and Radovanovic, Nikola (2022): Analysis of Value Chains in the Western Balkan Economies - Enriching the Potential for Regional Cooperation in Priority Areas, EC Publication, 19 April.

^{107, 108} Organization for Economic Cooperation and Development (2019): Unleashing the Transformation Potential for Growth in the Western Balkans, Global South East Europe, Global Relations Policy Insights, OECD Programme.

Therefore, to develop this industry into a competitive one worth integrating in a value chain, it is necessary that the internal trade is developed by improving working conditions, facilitating transport of goods and alleviating tariffs between neighbor countries. On the long run, local firms should be able to produce high-quality goods in their own name instead of lending their skills to foreign brands. However, foreign investments are still necessary to help the Western Balkans countries remain competitive at EU-level.

As for tourism, this industry offers some potential however, the countries should focus on offering a premium and authentic experience instead of following in the footsteps of Greece and turning to mass tourism. To this day, the vast majority of tourist “facilities” are cafes and restaurants with Serbia, being the wealthiest economy among the Western Balkans countries, totalizing a 35% share of their total distribution, closely followed by Albania which, as an important tourist destination, totalize a share of 30%. Montenegro possesses the smallest share of 4% despite being a rising touristic destination because the restaurants operating there are generally of bigger size.¹⁰⁹ A particularity in the Western Balkans is that most of their touristic facilities are generally small-sized, employing four people on average. The biggest facilities are usually sponsored by foreign investments like the Portonovi resort in Montenegro which is worth 700€ million and was financed by the Azerbaijani State Oil Company SOCAR. This resort employs three thousand people, which is probably the highest employment figure for a touristic facility in the whole region.¹¹⁰ By capitalizing on their small but high-quality businesses, the Western Balkans countries should aim at a targeted tourism of people curious about their culture and who wish to experience something unique. Because of their proximity and small size, they could also develop a tourism offer of Western Balkans tours, especially when all the road infrastructures planned under the TEN-T policy will be completed.

In addition to these resources, the Western Balkans countries have the potential to develop a skilled workforce, especially in the fields of textiles, automotive and information technology.¹¹¹

^{109, 111} Organization for Economic Cooperation and Development (2019): Unleashing the Transformation Potential for Growth in the Western Balkans, Global South East Europe, Global Relations Policy Insights, OECD Programme.

¹¹⁰ Ilahi, Nadeem and Khachatryan, Armine (2019): Lifting Growth in the Western Balkans: The Role of Global Value Chains and Services Exports, Volume 2019: Issue 017, IMF Publications, 12 November.

Indeed, they could get inspiration from the strategy developed by one of their neighbors, Romania, who has welcomed foreign investments and companies on its territory for years and who joined the EU back in 2007. Its strategy was to create links between theoretical learning and skills' building. To do that, most universities offer the possibility to start working in an industry in parallel of the academic curriculum as early as during the first years of bachelor studies. This deal is usually a win-win for students and businesses as the firsts acquire a wide range of field knowledge and competences which can advantage them on the job market while the seconds benefit from a highly motivated and dedicated workforce at a very low price. As a result, Romania now possesses heaps of young talents highly skilled in these industrial fields, which could become the Western Balkans countries' reality too if they were to encourage this kind of learning.

However, despite all these advantages, there are still some drawbacks to the development of strong and sustainable value chains in the region because of the political instability of some countries like Serbia as well as the corruption issues that are not completely resolved yet. This has a negative impact on the region's economy and can be a turn-off for companies seeking to invest in the countries there. Besides, the corruption has prevented the governments to invest sufficiently in their countries' infrastructures and industry which implies that future financings will have to be important enough to catch up with the EU market's requirements. Same goes for procedures which lack the transparency and fair treatment to which the EU commits.¹¹² On a bright note, the recent intensification of the negotiations regarding accession to the EU may push governments to take action in order to reach the EU standards at a quicker pace. One can assume that when the Western Balkans countries will be ready to become member states, most of their regional value chains will already be operational.

For now, it is clear that the region has a lot of potential to grow its value chains but there is still a lack of investments, infrastructures, and unified strategy, despite the existence of regional organizations like Western Balkans Six or the Regional Cooperation Council.¹¹³

¹¹² Ilahi, Nadeem and Khachatryan, Armine (2019): Lifting Growth in the Western Balkans: The Role of Global Value Chains and Services Exports, Volume 2019: Issue 017, International Monetary Fund Publications, 12 November.

¹¹³ Ezgeta, Drago and Causevic, Samir and Mehanovic, Mustafa (2022): Challenges of physical and digital integration TEN-T networks in Southeast European countries. In: Transportation Research Procedia, Elsevier Editions, Volume 64, pp.270-279.

4.2.5. China's presence in the region: between competition and cooperation

In the past years, another important actor of the international stage has been interacting with the EU in the Western Balkans region, in the field of transport. This actor is China, whose president Xi Jinping, announced the creation of the “Belt and Road Initiative” (BRI) back in 2013.

This initiative can be viewed as the successor of the Silk Roads developed by China in the past as it partly relies on the same infrastructures and serves the purpose of improving the connection and trade between Asia and Europe by developing an economic belt fostering stronger cooperation. This belt reaches to the Western Balkans region which implies that EU and China are bound to interact in this area, especially as some Western Balkans countries have explicitly stated their interest in participating in both the BRI and TEN-T projects like Serbia, Montenegro or also North Macedonia.¹¹⁴ These interactions prove to be multi-faceted and quite complex as there is scope for cooperation but, inevitably, some competition is also bound to happen as both the EU and China have different values, interests, and ways to proceed.

Regarding cooperation, there have been some road infrastructures' projects that received financing from both China and the EU like the railway project between Belgrade and Budapest which has yet to be completed and might prove to be neither sustainable nor profitable. Indeed, this 350km railway, which is supposed to reach Skopje then Athens to facilitate the carrying of cargo transportation arriving at the Athens port, has proved to possess several drawbacks.¹¹⁵

There was a case of more successful cooperation in Croatia where China and the EU co-financed the Peljesac Bridge project which was built over four years and managed to connect, through the Adriatic Sea, two territories of the EU who were separated by nature. This project, also known as “Reconnecting of Croatia”, was mostly financed by the EU which provided more than 85% of the total sum.¹¹⁶

^{114, 115} Bennett, Vanora (2017): What China's “Belt and Road Initiative” means for the Western Balkans, Article published on the European Bank for Reconstruction and Development website, 11 September.

¹¹⁶ Botric, Valerija and Sisinacki Jelena (2006): Road Infrastructure and Regional Development: An Evidence from Croatia, Article published on ResearchGate, September.

However, the company that carried the works was a Chinese one affiliated to the China Road and Bridge Corporation. After the completion of the work, both co-financers were invited to participate in its inauguration however the EU could not honor the invitation which made people comment in favor of China who had sent a whole delegation to celebrate the event led by the Executive Officer of the Corporation.¹¹⁷

Yet again, this successful cooperation has its negative twin in the form of the motorway project in Montenegro which made the small country indebted by more than 1bn€ to China, pushing it to ask for financial help from the EU. The EC refused as Montenegro had decided to move forward with this project despite the unfavorable opinion given by the EU and being unable to financially commit to it in the first place.

Beyond these opportunities for co-financing, some part of the cooperation between the EU and China can occur regarding the sharing of infrastructures common to both TEN-T and the BRI. This is not so much the case of roads, but it can be true for some maritime or airway nodes. As the Western Balkans can be seen as a bridge region between Middle East (and thus Asia) and Europe, it opens the way for more synergies and connectivity between the two geographical areas.

Nevertheless, this potential for cooperation is accompanied by a risk of competition between the two powers. Indeed, as both try to ascertain their influences and economic cooperation in the region, they are bound to compete for some projects or for political influence over decisions. However, the experts on China working for the European Bank for Reconstruction and Development have stated that, however great the influence of China in the WB could become it could never match the EU's as the region is remaining strongly rooted in its European identity.¹¹⁸ Besides, even if the Western Balkans countries may seek some financings from China, they know that EU grants are a token of quality and transparency, some things that Chinese contracts are sometimes lacking as their standards are usually lower.

¹¹⁷ Botric, Valerija and Sisinacki Jelena (2006): Road Infrastructure and Regional Development: An Evidence from Croatia, Article published on ResearchGate, September.

¹¹⁸ Bennett, Vanora (2017): What China's "Belt and Road Initiative" means for the Western Balkans, Article published on the European Bank for Reconstruction and Development website, 11 September.

In addition, most countries in the Western Balkans are already part of or candidates to the European Union, so their ties are stronger compared to the ones they may develop with China, even if the delaying in the accession process for some countries like Serbia has created some cracks in their relationship with the EU. On the long run, it is likely that China will benefit from the competition on the contracts as it will give their companies a push to level up to the European standards which will make them even more competitive worldwide. However, with TEN-T now covering most of the WB countries if not all, the EU is assured to maintain its leadership over the region in the field of transport, incl. road.

It is only rational to assume that despite the competition for divergent economic interest and ways of influence, a balance will be found between China and the EU, to secure their positions in the region and develop their cooperation while navigating the transport market. Ultimately, the Western Balkans countries will be responsible for choosing what level of cooperation they wish for with each party (EU and China) as they too try to figure out the best deals in order to boost their own developments and growths.

4.3. The difficult road to sustainability

4.3.1. Pollution of the road sector

Among the various transportation sectors, the road beats the others by a fair margin as illustrated in the figure below which presents the shares' repartition of global CO2 emissions between the different types of transport for the year 2018 which totalled 8bn tonnes of CO2:

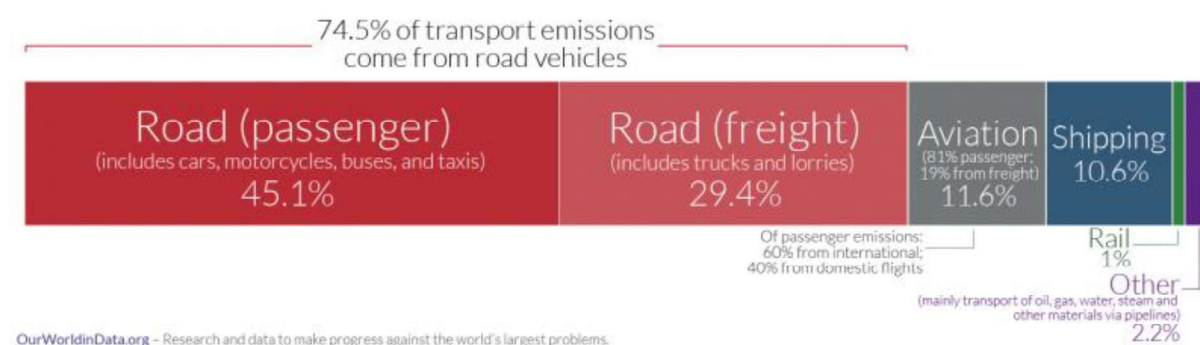


Figure 11: Shares of global CO2 emissions per transports in 2018, OurWorldinData, 2020

This figure shows that, contrarily to popular beliefs, aviation only accounts for less than 12% of the shares of global CO₂ emissions of the transport sector while both passenger road and freight road combined represent almost 75% of it. ¹¹⁹ This explains why governments worldwide, but especially in the EU, are taking measures to develop public transportation and reduce the number of cars used by households while investing in railways infrastructures to reduce the numbers of freight lorries.

In addition to emitting CO₂ most road vehicles also release nefarious pollutants like nitrogen oxides (NO_x), particulate matter (PM) and volatile organic compounds (VOCs). While CO₂ is more harmful to the environment, the other pollutants are particularly dangerous for human health as they can cause respiratory issues, inflammations etc. The combustion of fossil fuels is the main reason for the releasing of greenhouse gas emissions (GHG); that's why governments and the EU have also been advocating for the transition to electric cars that generate less emissions. However, the battery of electric cars' creation process requires a lot of energy and rare materials which cannot be considered ecological. Their end of life is also a debatable issue. This is the reason why it is necessary to invest more in Research and Development to discover more environmental-friendly processes and techniques. Meanwhile, the improvement of road networks can also participate in the reduction of GHG emissions as cars usually emit a lot in traffic jams. ¹²⁰

In the EU, the transport sector has known a steady period of growth of its gas emissions from 2013 to 2019 however, the GHG dropped drastically in 2020 as result of the covid's measures which limited road transport due to the national lockdowns. More precisely, the share of passenger road transport was greatly reduced while the share of freight road transport was only slightly diminished as the EU took measures to authorize it. ¹²¹ This was to preserve the EU's economy through cross-border trade.

¹¹⁹ Ritchie, Hannah (2020): Cars, planes, trains: where do CO₂ emissions from transport come from? Blog post published on the Our World in Data website, 6 October.

¹²⁰ European Environment Agency (2018): Indicator Assessment: Greenhouse gas emissions from transport in Europe, Data and maps published on the EEA website.

¹²¹ Panteia, Maria Rodrigues and Theo, Tharsis (2021): Relaunching transport and tourism in the EU after Covid-19: Part V Freight transport, Research paper realized for the TRAN Committee of the EC and published on the EP's website, December.

The figure below shows the evolution of the quantities of CO₂ emissions in the EU over the years:

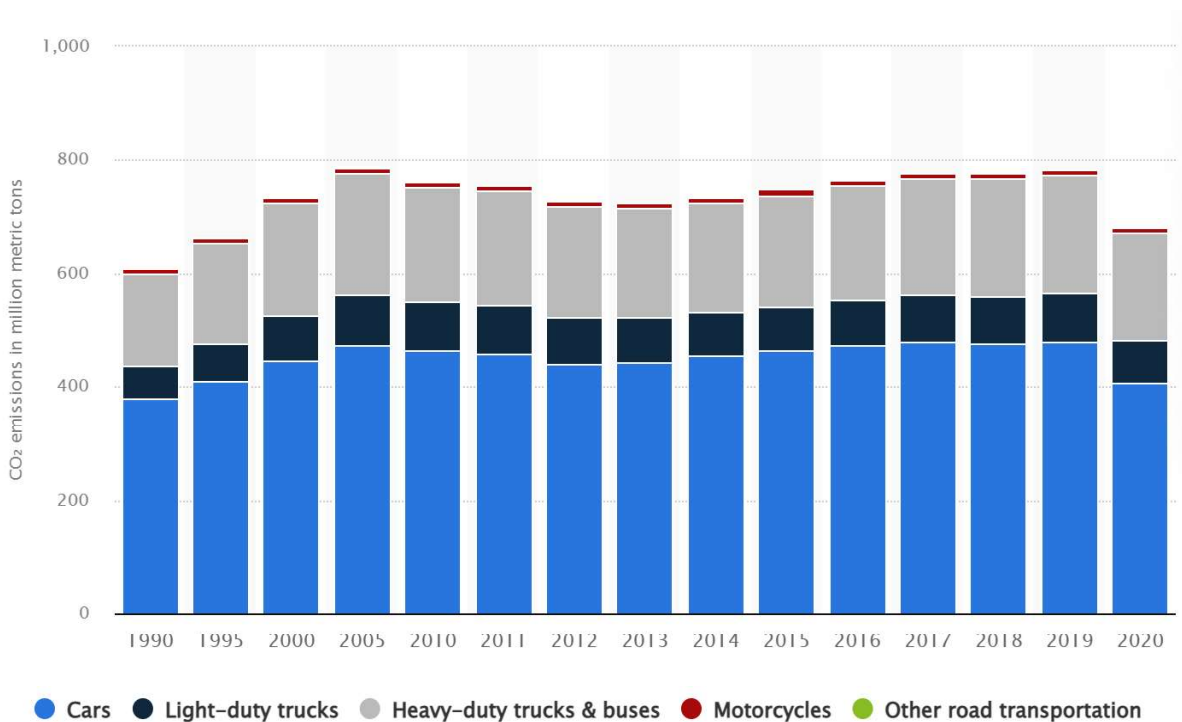


Figure 12: CO₂ emissions for road transportation in the EU over the years, Statista, 2022

Interestingly, the quantities of CO₂ emissions of 2019 were on the same level as those of 2005 which shows that the real turning point occurred during the 1990s when most households began to own two cars and that road trips became even more easy between member states.

In 2021, GHG emissions were almost back to their level of 2019 and projections made by the European Environmental Agency show that the CO₂ emissions quantities will not reach their 90s level before at least 2029. However, the Agency predicts that the road sector will be the only one capable of greatly reducing its emissions in the coming decades among the others means of transportation. Indeed, maritime and air emissions are expected to keep rising while railways' are expected to reduce only a little. ¹²²

¹²² European Environment Agency (2018): Indicator Assessment: Greenhouse gas emissions from transport in Europe, Data and maps published on the EEA website.

The following figure illustrates these predictions (with the road sector in grey):

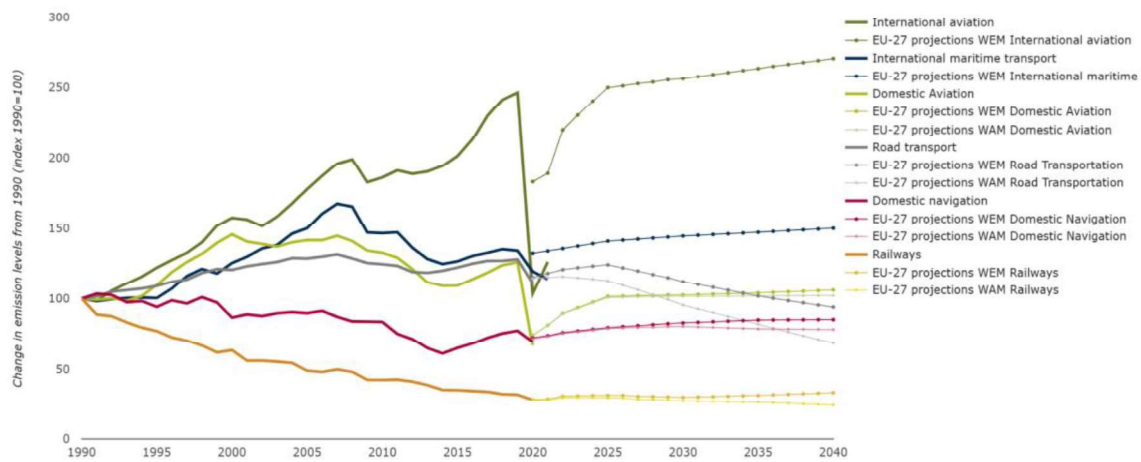


Figure 13: GHG emissions in the EU by transport and scenario, EEA, 2022

Despite this envisioned reduction, the pollution currently produced by the road sector calls for more effective measures. Otherwise, the European roads might fail to fit into the objectives defined in the Green Deal and Fit for 55 package.

4.3.2. Fitting into the Green Deal and Fit for 55 package

First presented in December 2019, the European Green Deal, which is partly financed by the EU’s sever year budget and by the NextGenEU Fund, has become emblematic of the EU’s environmental policy. Indeed, with the objective to turn Europe into the first climate-neutral (emission-neutral may be more appropriate) continent at the horizon 2050, the Green Deal encapsulates several proposals to make the EU transition to a greener, fairer, and more prosperous functioning.¹²³ The Deal was recently completed by the “Fit for 55” package, which is short for “Fit for reducing net greenhouse gas emissions by at least 55% by 2030” and introduces an intermediate milestone to the 2050’s net-zero target.

The areas covered by the Green Deal and Fit for 55 policies are vast including energy, taxation and of course transport. In the EU, transport represents the second highest area of expenditure for households and the sector employs more than 10 million people making it important for the EU’s economy.

¹²³ Rukikaire, Keisha and Loran, Sophie for UNEP (2022): CO2 emissions from buildings and construction hit new high, leaving sector off track to decarbonize by 2050: UN, Press release, 9 November.

Most objectives defined in the Deal for the transport sector and thus, for the road sector, are related to the decarbonization to achieve climate neutrality by 2050. This involves the reduction of GHG by adopting low-carbon technologies like electric cars and the use of renewable fuels. Another key aspect is the development of smart and sustainable infrastructure to accompany the transition to cleaner and more resilient mobility. Those infrastructures are sometimes complementary to the shift to less-polluting vehicles as it includes the creation of e-charging stations for electric vehicles alongside the expansion of public transportation networks.¹²⁴ With the goal to reduce GHG emissions, especially in urban areas, come measures that toughen vehicle emission standards or implement low-emission zones in cities. In Paris, the mayor went even further by openly declaring that her goal was to ban the cars from entering the city in the long-term to improve the air quality.

In addition to the aforementioned objectives, is the development of efficient transport systems. Indeed, the EU road transport can still gain in efficiency and performance, something that can be achieved by using intelligent transport systems and digital technologies.¹²⁵ This involves traffic management initiatives, as well as real-time information systems or smart logistics that can help optimize the vehicles' use. Finally, the Green Deal encourages the application of the principles of the circular economy in the field of road transport. This entails the promotion of reuse, recycling and recovery practices for materials from old vehicles and infrastructures that need to be replaced.

As for the Fit for 55 package, it proposes emission reduction targets at the horizon of 2030, with more expectations for new cars and vans which will have to pollute far less than older ones. These expectations will be translated into the tightening of emission standards set for these new vehicles and the promotion of the uptake of zero-emission vehicles. In addition, the EU member states shall commit to build even more infrastructures dedicated to electric vehicles like e-charging stations as there are still too few on the European territory.¹²⁶ These stations will have to be installed in urban areas and alongside major motorways to gradually encourage people to transition to this type of vehicles. The package also strengthens the CO₂ standards for heavy-duty vehicles like buses or trucks to reduce their emissions and promote the use of cleaner technologies.

^{124, 126} Valtuena-Ramos, Gabriel and Kirchherr, Julian (2021): Road work ahead: The emerging revolution in the road construction industry, Insights on Public and Social Sector, McKinsey & Co website, 1st March.

¹²⁵ Watts, Nicola (2016): 3 Pillars Of The EU Digital Single Market Initiative, Article published on the Ogilvy Asia, WPP company, website, Thinking section, 10 June.

Also, the package promotes the deployment, which means the production and distribution, of alternative fuels such as sustainable biofuels, renewable synthetic fuels, and hydrogen which will help reach the objective of decarbonization faster. Finally, the package insists on the importance of developing sustainable mobility initiatives that support the development of integrated and multimodal transport systems, especially in urban areas which generally accumulate a lot of air pollution from the various emissions of road transports. ¹²⁷

In France, the government has been actively promoting the adoption of electric vehicles by offering financial grants and tax incentives to purchase it. The country is aiming at 100% electric or hydrogen-powered vehicles for public transportation by 2025. To accompany this transition, France has also decided to invest in a large number of charging infrastructures (100,000 across the whole territory) and has implemented regulations to legalize the availability of charging points in both residential and non-residential buildings. France has also strengthened its CO2 standards and can inflict financial penalties on manufacturers that would not comply with the emissions' reductions targets. ¹²⁸

Moreover, several low-emissions zones have been established across the country in big cities like Paris, Lyon or even Grenoble.

Finally, France is investing a lot in Research and Development to discover more about sustainable fuels and processes.

In Germany, the use of electric cars has also been promoted a lot through programs such as the environmental bonus ("Umweltbonus") which delivers financial incentives to help invest in electric vehicles. The country also aims to reach 10million electric cars on its roads by 2030. In addition, Germany has acknowledged the potential of hydrogen as a sustainable fuel for the transport sector and consequently, has launched programs to develop hydrogen infrastructures, including the construction of hydrogen refueling stations. ¹²⁹ Several other measures have been taken that are similar to the French ones like the establishment of low-emissions zones etc.

¹²⁷ Rukikaire, Keisha and Loran, Sophie for UN Environment Programme (2022): CO2 emissions from buildings and construction hit new high, leaving sector off track to decarbonize by 2050: UN, Press release published on the Climate section of the UNEP website, 9 November.

^{128, 129} European Commission (2023): Transport sector economic analysis, Analysis published on the EC's EU Science Hub website, regularly updated.

This gives an overview of all the objectives that the road sector must reach in order to fit into the Green Deal and Fit for 55 policies. Should the sector fail to reach these and to develop its resiliency, it would make it more exposed to climate change and in particular, adverse events.

4.3.3. Managing risks in the face of climate change

Beyond its direct impact on weather events and temperatures, climate change's indirect consequences are multiple: rise of water levels, wildfires, deterioration of land surfaces, forced movements of animals and human populations... All those adverse events can represent risks for the transport sector and in particular the road one. That's why it is important for the road sector to develop its resiliency by becoming able to mitigate those risks.

Before presenting those mitigation possibilities, here are a few of the negative impacts of climate change on the road sector:

- Degradation of road surfaces: this phenomenon is caused by the rising temperatures and changes in precipitations' patterns on the globe surface; indeed, asphalt is sensitive to high temperatures which can soften and deform it creating cracks while important rainfalls can erode the road foundations thus creating instability. As a result of these deteriorations, traffic is slowed which ultimately hinders connectivity.
- Rising sea levels and coastal erosion: coastal highways are particularly exposed to rising sea levels and coastal erosion. Indeed, increased, or violent coastal storms and typhoons can easily destroy big road infrastructures, including bridges which can cause territory fragmentation and once again limit connectivity and accessibility. On a side note, a study financed by the EC found that by 2100, more than 60% of European maritime ports would be under water, which is also bound to have consequences on the land roads leading to these ports.
- Landslides and slope failures: in mountainous areas, climate change can result in landslides as snow masses melt and crumble because of the heat. Besides, heavy rainfalls, which are becoming more frequent as temperatures are not high enough to turn it into snow, can also destabilize slopes which pose some serious safety hazards for alpine roads and the likes.

- Increased extreme weather events: in 2021, several tornadoes occurred in Belgium, which is very rare and had not happened in decades. Climate experts have warned that such extreme and previously rare phenomenon could become recurrent which can have severe consequences on road infrastructures as it can destroy it or cause long interruptions due to evacuations etc. ¹³⁰

All the consequences of those risks, like critical road destructions or limitations of connectivity and accessibility are very costly for governments. Indeed, reparation costs are often very high in the construction sector as road infrastructures usually require a lot of materials and workforce to be completed. Besides, delays and road closures can also have economic repercussions as most industries are dependent on supplies that need to be transported. The EU Joint Research Centre who has been working on these issues for quite some time has even predicted that economic damage caused to critical transport infrastructures in Europe by climate change could multiply sixfold by 2050. ¹³¹

Hence why the risks should be properly mitigated from the design of road infrastructures to their maintenance piloted by monitoring programs. It is equally important to include climate risks at each phase of a road project. This also includes rehabilitation projects and renewal of existing assets. Indeed, even without climate change incidents, delays in replacing aging infrastructures and inadequate maintenance solutions can potentially have dramatic consequences as it makes the road systems more fragile. Also, timely replacement allows for an upgrading and modernizing of old transport assets by preventing their technologies to become obsolete.

However, the multiphase approach is not enough to achieve resiliency in the road sector. Indeed, it must be both comprehensive, including several aspects, and coordinated at a larger scale than states. This is especially true for the EU which, through the TEN-T policy is strongly interconnected, which in turn means that if a road portion is destroyed on a cross-border way, it can have heavy consequences for several countries and not only the one where the incident took place.

¹³⁰ United Nations Economic Commission for Europe (2020): Transport infrastructure at high risk due to climate change in Pan-European region and Canada, Mapping study delivered by UNECE, 25 February.

¹³¹ European Commission (2023): Transport sector economic analysis, Analysis published on the EC's EU Science Hub website, regularly updated.

And of course, it is also true between neighbor countries, even when they are not part of the EU; that's why EIB Global puts so much emphasis on fostering cooperation between partner states on these issues. ¹³²

It is also necessary for engineers and researchers to collaborate in the search for more robust and resilient materials and processes to build stronger infrastructures which can resist extreme climate events. Research must also be carried on information systems to develop new indicators and more accurate predictions.

As an example of climate risks mitigation, Germany has developed a multimodal strategic approach based on several research programs supported by the Federal authorities. ¹³³ By developing scenarios of development, they have managed to gradually develop a methodology for carrying impact assessments of adverse climate events and they also created their own climate indices which give them more leverage to study German-specific phenomenon. Ever since its beginning in 2008, this approach has helped Germany incorporate climate risks in most of its transport projects and has prompted the Deutsche Bahn to request a “climate proofing handbook” for their administrative staff to ensure they would integrate these risks in their work.

5. [Chapter 4] Conclusions

From the first core chapter of my Thesis (Chapter 3, point 4.1), I have found that the European road sector is key for the EU's economy as the road network, alongside the other transport networks part of TEN-T, can be considered as the backbone of the Single Market.

The road sector has had to face two crises over a relatively short period of time: first, the covid crisis, then, the energy crisis that is not completely over yet.

Though the data for the year 2020 clearly showed that the sector had been strongly impacted, it was apparent that it managed to bounce back in 2021, highlighting its ability to evolve rapidly as covid changed many procedures like switching from paper to online.

¹³² European Investment Bank (2022): Transport Lending Policy 2022: The Way Forward – Investing in a cleaner and smarter transport system, Policy document released on the EIB website.

¹³³ European Court of Auditors (2019): Roads connecting European regions, Audit preview published on the Court website, May.

This was a clear sign that the sector has the ability to move forward with new technologies and innovations, even more so in the context of the Digital Single Market that calls for even more use of digital tools.

Meanwhile, the energy crisis proved to have more complex consequences, as on the one hand, it really put the industry in a tough position, with European road associations warning of the gravity of the situation ¹³⁴, but on the other, it gave the road sector a salutary push to accelerate the Green Deal's agenda. With the help from the EU and the commitment of national states to take alleviating measures, the road sector could transform this crisis into a big opportunity to diversify its energy sources and become more competitive on the global market.

Other findings of this chapter included the fact that the rail and road sectors should not be compared as they both serve different purposes even if they can sometimes overlap. Indeed, while it is true that rail should receive more fundings from the EU, it doesn't mean that it should receive more than the road sector. It simply means that the rail should benefit from the same investments that the road sector has benefited from so far. So indeed, believing that the rail could be a competition to the road sector seems not credible, even in the long term, as the benefits of the road sector can't still be matched by rail, like the ability to deliver goods or services directly to the entity that made the order, the time flexibility etc. However, the comparison with rail on a strictly GHG emissions point of view should work as a driving force for the road sector to research less polluting options for fuel. In this respect, research carried in France or Germany on hydrogen-powered cars is an encouraging sign that the sector has the capacity to innovate.

The last finding was related to the evolution of the demographic trends in Europe. Indeed, with an ageing population, the need for road infrastructures is bound to be modified. In addition, as youths are more conscious of environmental issues, the sector will perhaps have to rethink its offer and operation process. However, another demographic effect can counter-balance the first one, at least in the coming decades, which is the urbanization. As the Western Balkans countries have yet to join the EU, they offer a lot of perspectives for further urbanization which means that the road sector may become more active there compared to other regions of the EU.

¹³⁴ Barnard, Lucy (2022): Material concerns: What the global energy crisis means for construction, Article on the International Construction online magazine, 12 April.

Overall, the prospects for the sector are challenging but not alarming. Besides, if member states invest more in Research and Development in the field; the road sector should be able to remain innovative. As for its competitiveness, its performance in this area will be determined by its resiliency which, for now, in the light of the covid crisis, has proved to work, even if it needs to be consolidated.

From the second core chapter (Chapter 3, point 4.2) of my Thesis, I found that the Western Balkans had the potential to further the connectivity of the European space thanks to its resources and strategic geographical situation but that it required an increased support from governments and the realization of adjustments, or shall I say an upgrading, of the countries' procedures and standards that are still lacking compared to the member states.

The Western Balkans offer a lot of possibilities for trade and ultimately, economic growth. By becoming part of the core network of TEN-T, their trade flows should be boosted, and their territorial cohesion should increase which will bring them closer to the EU and eventually, to accession. The correlation between road developments / increased connectivity and integration has not been studied in this Thesis however, it could be the starting point of another analysis as there seem to be some recurring patterns in the way they intertwine.¹³⁵

The gain in connectivity should be achievable provided that the WB countries keep on benefiting from EU grants and loans and try to fulfil the accession's criteria. The presence of China in the region could also influence the development of road networks as the WB are a strategic entry point for the superpower in Europe. WB could consequently have to deal with Chinese companies to realize the works as they have become more implanted in the region over the past decade.

However, even if the connectivity is improved, it is too early to assert that the WB countries will be able to grow a strong regional value chain. Do they have the potential for it? Yes. But they are still lacking in strategic planning and, because of the political instability that is still a real issue there, a lot of decisions are often short termed which, most of the time, is not the best option for building something enduring and sustainable.

¹³⁵ European Parliament (1997): Transport policy and EU enlargement, Policy Briefing N°44 published on the old version of the EP's website, 28 July

Eurostat (2022): Enlargement countries – Transport Statistics, data extracted in April 2022, update planned for June 2023, published on Eurostat website.

Finally, from the third and last core chapter (Chapter 3, point 4.3) of my Thesis, I have found that the pollution figures speak a lot about the challenge that the ecological transition represents for the road sector as it is the biggest polluter among the other transport modes. However, in light of the energy crisis, there is hope that the Green Deal objectives can be achieved in time even if more efforts will need to be done by national governments.

Another important aspect, the mitigation of adverse climate events, highlights the need to include climate risks in all future projects assessments and in all rehabilitation projects as well. On paper, the road sector has the capacity to become sustainable, in practice, the Union coordination may not be enough to achieve this goal and may require the member states to take stronger measures at national level to target the local trends or patterns responsible for high quantities of emissions.

To conclude, to my first question which was: “what are the perspectives for the future of European roads”, I would give the following answer: the perspectives are multiple, challenging, each with their fair share of risks and opportunities, however, if the European road sector chooses to focus on the development of its resiliency skills, it should be able to navigate safely through everything that is awaiting it.

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List of Abbreviations

BRI: Belt and Road Initiative

DSM: Digital Single Market

EBRD: European Bank for Reconstruction and Development

EC: European Commission

EIB: European Investment Bank

EP: European Parliament

ETC: European Transport Corridors

EU: European Union

GDP: Gross Domestic Product

GHG: Greenhouse Gas Emissions

ITS: Intelligent Transport Systems

RVCs: Regional Value Chains

TEN-T: Trans-European Transport Network

TFEU: Treaty of the Functioning of the European Union

UNECE: United Nations Economic Conditions for Europe

WB: Western Balkans

WBIF: Western Balkans Investment Framework

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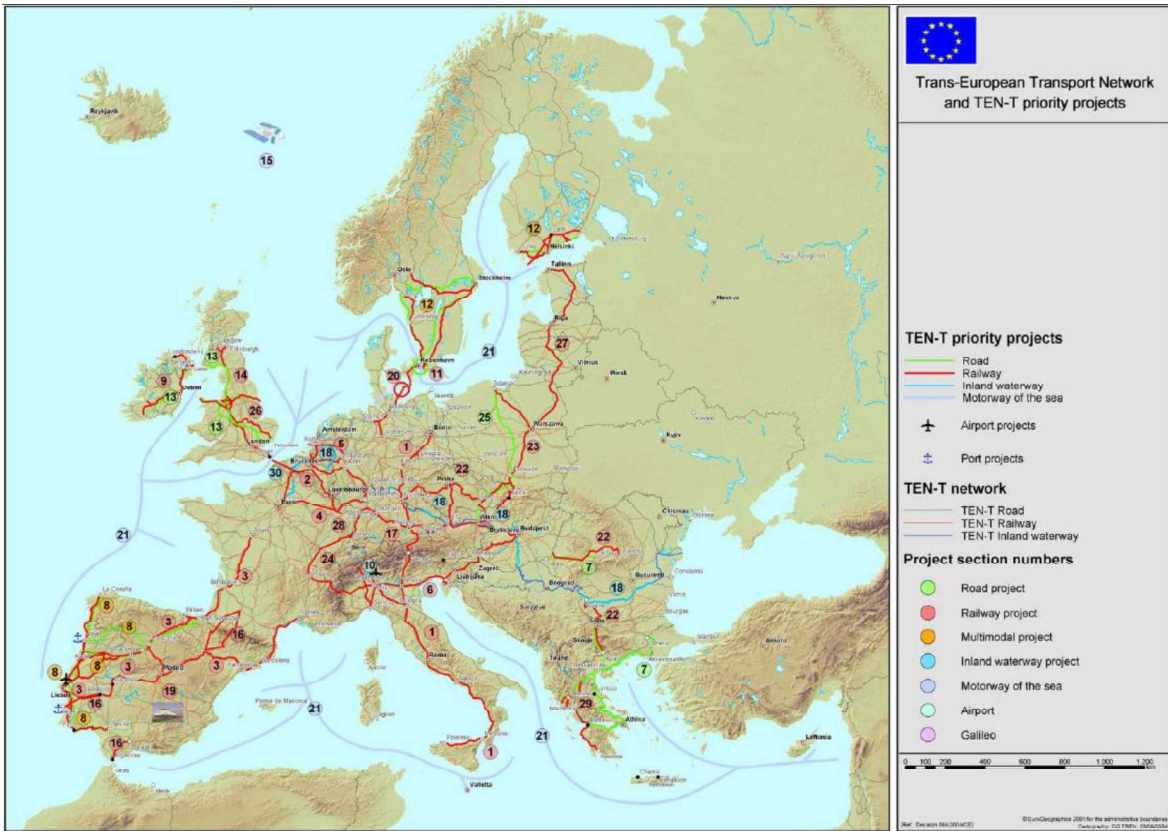
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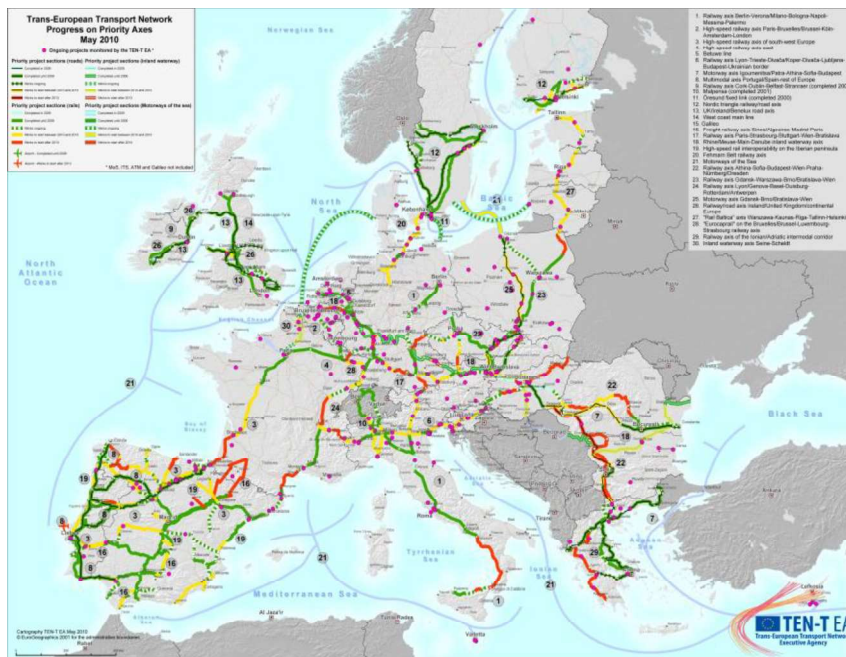
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Annexes

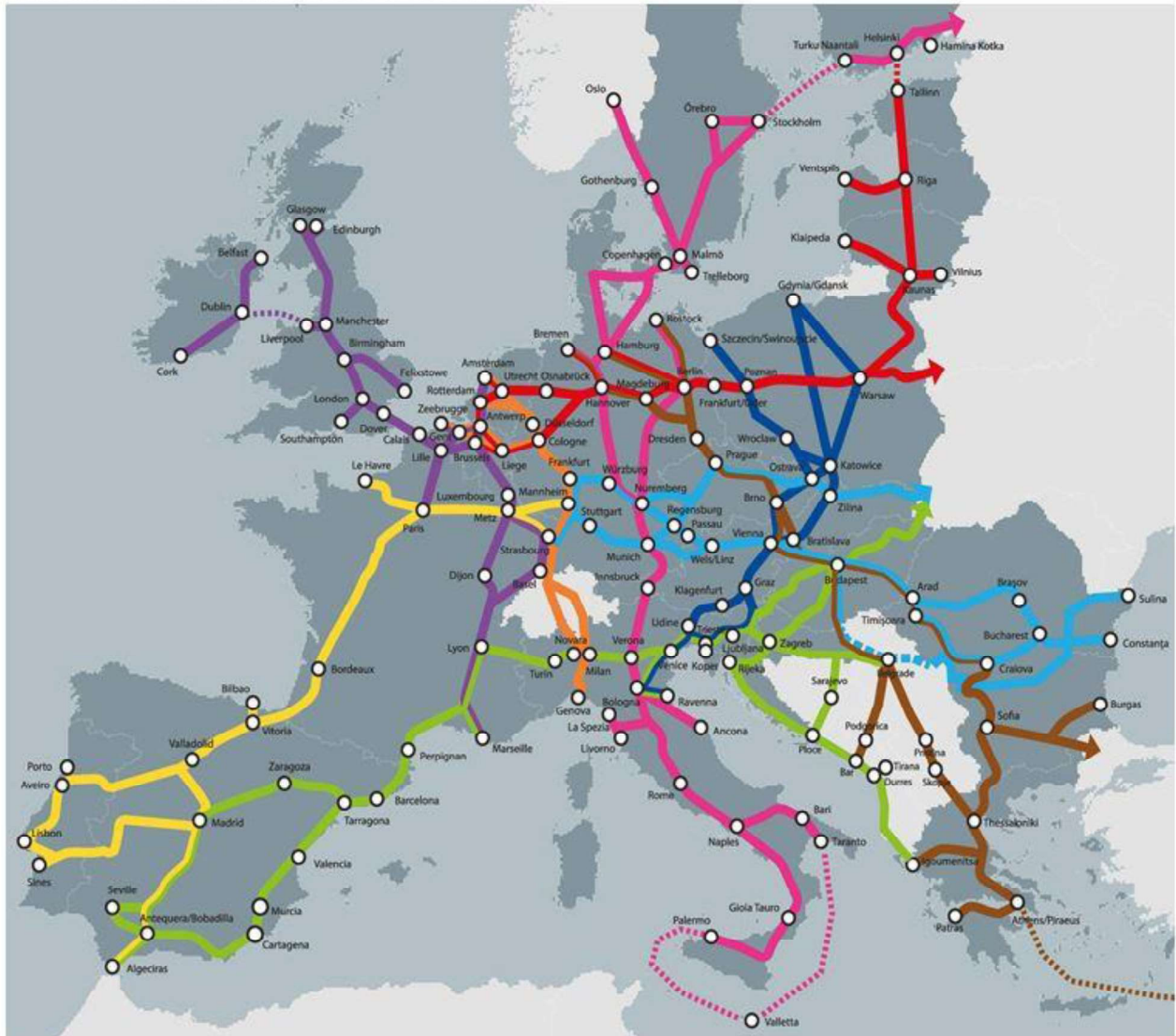


Archive of TEN-T Map, with the 30 Priority Projects, 2009, Eurostat



Archive of TEN-T Map, with the Axis developments, 2010, Eurostat

Map 5: TEN-T Core Network Corridors



- Legend:**
- Atlantic
 - North Sea-Baltic
 - Rhine-Alpine
 - Baltic Adriatic
 - North Sea-Mediterranean
 - Rhine-Danube
 - Mediterranean
 - Orient - East Med
 - Scandinavian-Mediterranean

Source: European Commission (2013)

Map of TEN-T Core Corridors before the 2022 Revision, European Commission