State of Play:

Sustainable Automobility in Europe

April 2024

Foreword

The transition towards sustainable automobility is a cornerstone of Europe's broader environmental and economic ambitions, marking a pivotal moment in our collective journey towards a greener future. "State of Play: Sustainable Automobility," synthesizes comprehensive findings from extensive research across the European Union, spotlighting the nuanced landscape of policy, technological innovation, and infrastructure that underpins this transformative era.

Drawing from the detailed analyses of policies and developments across nations such as Austria, Belgium, Bulgaria, and Croatia, this paper elucidates the multifaceted approach required to navigate the challenges and harness the opportunities within the automotive sector. Austria's dedication to electrifying its public transport network, Belgium's progress in electric vehicle (EV) manufacturing, and Bulgaria's strides in enhancing EV infrastructure exemplify the diverse yet unified efforts towards achieving sustainable mobility.

Central to the discourse on sustainable automobility are the technological advancements that drive the sector forward. Innovations in electric and autonomous vehicles, alongside the expansion of charging infrastructure, are reshaping the mobility landscape. These technological strides, coupled with robust policy frameworks and strategic investments, are crucial for mitigating environmental impact, reducing emissions, and fostering economic growth.

This research also emphasizes the significance of consumer behavior and market trends in steering the direction of sustainable automobility. The increasing acceptance of electric vehicles, the growth in public transport solutions, and the burgeoning demand for green mobility options signal a shift in societal norms and preferences towards more sustainable transportation methods.

"State of Play: Sustainable Automobility" not only captures the current state of sustainable mobility across Europe but also casts a forward-looking perspective on the sector's trajectory. It outlines the potential for future growth, highlighting the importance of collaborative efforts, policy coherence, and innovation in scaling up sustainable mobility solutions. The paper serves as a clarion call for stakeholders across the spectrum—policymakers, industry leaders, technology providers, and consumers—to unite in their efforts towards realizing a sustainable, efficient, and inclusive mobility ecosystem.

As we stand at the cusp of a new era in mobility, the insights from this paper provide a valuable foundation for informed decision-making and strategic planning. By embracing the principles of sustainability, innovation, and collaboration, Europe can lead the way in transforming the automobility sector, setting a global benchmark for environmental stewardship and economic resilience. Let "State of Play: Sustainable Automobility" be a beacon that guides us towards a cleaner, greener, and more sustainable future.

Mario van den Broek (mvdbroek@rsmnl.nl)

Cem Adiyaman (cadiyaman@rsmnl.nl)

Contents

Introduction 4
Methodology 5
Management summary 6
Austria 16
Belgium 19
Bulgaria 22
Croatia 25
Cyprus 28
Czech Republic 32
Denmark 35
Estonia 38
Finland 41
France 45
Germany 49
Greece 53
Hungary 59
Ireland 62
Italy 66
Latvia 70
Lithuania 74
Luxembourg 77
Malta 81
Netherlands 84
Poland 88
Portugal 92
Romania 95
Slovakia 98
Slovenia 101
Spain 105
Sweden 110

Introduction

In recent years, the automotive and mobility sector has undergone a profound transformation, catalysed by an increasing urgency to address environmental concerns and promote sustainable practices. Nowhere is this shift more pronounced than in the European Union (EU), where policymakers, industry leaders, and consumers alike are navigating towards a future of greener mobility solutions. As the global climate crisis intensifies and urban centres grapple with congestion and pollution, the imperative to reframe the automotive industry within a framework of sustainability has never been more pressing. This report, taking a holistic approach, explores the evolution of the sustainable automotive sector and mobility initiatives within the EU, exploring the multifaceted strategies, technologies, and policies driving this transition towards a more environmentally conscious and efficient transportation landscape.
This report aims to offer a detailed sectorial overview for each Member State on the state of play and future strategies of each Member State. Through an in-depth exploration of policies, investments, technological advancements, and international collaborative efforts, this report seeks to illuminate the collective trajectory of the EU-27 countries towards a more sustainable automotive sector and mobility framework. By delineating the specific state of play and future of each Member State, stakeholders, policymakers, and industry leaders can gain a nuanced understanding of the regional nuances and concerted actions driving progress towards shared climate goals. As a result of our research, we were able to not only determine the current state of the automotive and mobility sector but also offer a sustainable development prediction in relation to every Member State. Every state was assigned a colour, red, yellow, or green, based on their relative performance.

The EU-27 countries stand as pivotal players in the global automotive sector, wielding significant influence over industry trends and regulatory standards. However, the path towards achieving ambitious climate goals presents formidable challenges. Balancing the demands of economic growth, industrial competitiveness, and environmental stewardship requires a delicate equilibrium. Nevertheless, the EU has demonstrated a steadfast commitment to fostering innovation and driving systemic change within the automotive industry and broader mobility trends. Through stringent emissions targets, investment in research and development, and the promotion of sustainable mobility solutions, the EU is setting the course towards a more sustainable automotive future. While significant challenges lie ahead, the EU-27 countries possess the collective resources, expertise, and determination necessary to navigate this transformative journey and emerge as global leaders in sustainable mobility.

Many European cities and countries have emerged as pioneers in mobility and public transportation systems, setting a precedent for sustainable urban development and contributing significantly to climate goals. With innovative initiatives such as efficient public transit networks, bicycle-friendly infrastructure, and pedestrian zones, these cities are reducing reliance on individual car ownership while prioritizing low-emission modes of transport. By promoting seamless intermodal connectivity and integrating emerging technologies like electric buses and shared mobility services, they are not only enhancing mobility but also curbing carbon emissions and improving air quality. As other regions look to emulate their strategies and replicate their successes, the collective impact of these efforts will be instrumental in achieving our climate goals on a global scale.

Methodology

For conducting research and developing the content for this report we have identified 9 critical categories:

- **Policy Framework and Regulations;**
- **Technological Advancements;**
- **Infrastructure development;**
- **Market Trends and Consumer Behavior;**
- **Public Transportation Systems;**
- **Environmental Impact and Emissions;**
- **Economic and Social Implications;**
- **Best Practices and Case Studies;**
- **Future Perspectives and Emerging Trends.**

Some categories do not apply to all countries, due to unavailable or insufficient data.
For the collection process we have relied on European Union sources, strategic documents published by national governments, journal published papers and sector specific reports from industry associations. After the collection process, the information was processed and divided into the most relevant categories for a specific country.

Based on the research described above, we have employed the **Semaphore method (green, yellow and red)** to determine the current state of a Member State but also to offer a prediction based on the sustainable development of the automotive and mobility sectors. In evaluating the current state and offering a sustainable development prediction, factors such as the existence of a national long-term strategy, existing EV infrastructure, tax benefits and subsidy availability for buyers of emission-free vehicles, the current state of public transportation, railway electrification, and investment in battery manufacturing plants were used.

Management summary

Member State	Current State	Sustainable development prediction
Austria		
Belgium		
Bulgaria		
Croatia		
Cyprus		
Czech Republic		
Denmark		
Estonia		
Finland		
France		
Germany		
Greece		
Hungary		
Ireland		
Italy		
Latvia		
Lithuania		
Luxembourg		
Malta		
Netherlands		
Poland		
Portugal		
Romania		
Slovakia		
Slovenia		
Spain		
Sweden		

Country Summaries

Austria

For Austria, the country exhibits a strong commitment to sustainable urban mobility, underscored by its Recovery and Resilience Plan with a significant allocation towards zero-emission transport and railway network expansion. Austria offers comprehensive tax exemptions and subsidies for electric vehicles (EVs), aiming for a substantial reduction in transport carbon emissions by 2040. The nation is advancing in autonomous mobility, with substantial investments to support research and development in this area. Infrastructure-wise, Austria has seen remarkable growth in EV charging points, boasting a dense motorway and electrified railway network that underpins its sustainable mobility goals. Market trends indicate a shift towards more sustainable transportation modes, although cars remain the dominant form of passenger transport. The public transportation system focuses on transitioning to electric and hybrid buses, complemented by the innovative "KlimaTicket" to encourage public transport use over private vehicles. Environmental initiatives are in place to limit emissions from taxis and carsharing vehicles, with a significant portion of the automotive industry focusing on exports and the development of e-mobility solutions. Best practices include a wide adoption of mobility-as-a-service (MaaS) platforms, enhancing connected and intelligent transport systems. Future perspectives for Austria are promising, with the government's policies and infrastructure developments positioning it as a leader in the transition to e-mobility.

Belgium

In Belgium, the Recovery and Resilience Plan outlines a robust investment in sustainable mobility, focusing on enhancing railway infrastructure, promoting electric road transport, and improving urban public transport and cycling paths. Belgium encourages the adoption of electric vehicles (EVs) through various tax benefits and subsidies, aiming for a greener transport sector. Technological advancements are significant, with Belgian plants producing a considerable number of electric vehicles and the country investing in battery technology and electric bus and coach manufacturing. Infrastructure development is a priority, with investments aimed at modernizing the rail network and expanding the EV charging infrastructure. The country is also leading in cycling infrastructure, contributing to sustainable urban mobility. Market trends show a positive trajectory towards electric and hybrid vehicle adoption, with electric buses and commercial vehicles expected to see substantial growth. Public transportation in Belgium focuses on reducing carbon emissions, with significant investments in electric buses and trams. However, the environmental impact remains a concern, particularly regarding ozone levels. Economically, Belgium's transport sector is vital, and the shift towards sustainable mobility is expected to create numerous opportunities. Best practices include the development of Mobility as a Service (MaaS) ecosystems, which aim to offer integrated mobility solutions to compete with private car usage. Belgium's future perspectives on sustainable urban mobility are promising, with ongoing reforms and investments indicating a commitment to green and digital transitions in the automotive and mobility sectors.

Bulgaria

Bulgaria's approach to sustainable urban mobility is outlined in its Recovery and Resilience Plan, focusing on decarbonization measures within the transport sector, including investments in electric public transport vehicles and charging infrastructure. However, Bulgaria faces challenges in offering subsidies or tax benefits for EV purchases, relying on environmental tax exemptions for EV owners instead. The country's Integrated Transport Strategy aims for a comprehensive, sustainable development of its transport system,

aligning with European Single Transport Area requirements. Technological advancements in Bulgaria include initiatives like the Sofia Coin mobile app to encourage active transport modes and startups like Ampeco, contributing to the EV charging management software sector. Infrastructure development is bolstered by EU funds for transport, including projects to modernize railway lines, motorways, and sustainable urban transport. Despite the slow construction pace, efforts are underway to complete key motorway projects and enhance railway electrification. Market trends in Bulgaria show a preference for cars, with a significant increase in EV registrations, although EVs represent a small fraction of total vehicles. Public transportation investments aim at introducing zero or low-emission vehicles and developing green transport through EU-backed grant mechanisms. Environmental challenges include reducing transport sector emissions and addressing the high average vehicle age. Economically, Bulgaria's automotive sector, focusing on component and software production, contributes significantly to the GDP. Best practices highlighted include Sofia's Sustainable Urban Mobility Plan (SUMP) aiming for reduced transport development impacts and enhanced urban living standards. Future perspectives for Bulgaria's sustainable urban mobility indicate a transformative path, leveraging European funding and government initiatives to meet national and EU goals, fostering economic growth, and encouraging a faster transition to electric vehicles.

Croatia

Croatia's commitment to sustainable urban mobility is reflected in its extensive Recovery and Resilience Plan, which includes substantial funding towards modernizing the railway infrastructure, deploying autonomous electric taxis, and expanding the network of electric vehicle (EV) charging stations. The plan aims to introduce zero-emission vehicles and vessels as part of a broader effort to reduce environmental impact and promote digital innovation. Croatia offers attractive tax benefits and subsidies for electric vehicles, with the government eliminating excise duties and special environmental taxes for EVs. Additionally, annual incentives are available for purchasing both battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs), supported by the European Investment Bank (EIB) to aid sustainable transport initiatives. Technological advancements in Croatia include initiatives for Smart Cities and the development of EV charging infrastructure. The country is actively seeking investors to bolster its automotive industry, focusing on smart city development, public infrastructure, and increasing the number of bike paths. Infrastructure development emphasizes modernizing the railway network, with substantial investments to enhance connectivity and safety. Cycling infrastructure is being expanded, including projects to build additional bicycle roads alongside major roads. Market trends indicate a lower than EU average number of cars per inhabitant, with a slow growth in the electric vehicle market. Public transportation in Croatia includes buses, trams, and ferries, with a focus on improving efficiency and expanding services. Environmental initiatives aim to reduce greenhouse gas emissions, with a push towards sustainable mobility to address economic challenges and social inequalities in rural areas. Best practices include engaging citizens in the mobility dialogue and investing in R&D innovations. Future perspectives suggest Croatia's sustainable mobility industry depends on financial resources for technological innovations, with recommendations for increased national funding for R&D and investments in Demand Responsive Transport (DRT) to improve connectivity in rural areas. International collaborations, such as involvement in the Rail Baltica project, showcase Croatia's commitment to enhancing rail connectivity and fostering sustainable transportation throughout the region.

Cyprus

Cyprus's approach to sustainable urban mobility, encapsulated in its Recovery and Resilience Plan, emphasizes integrating the island into the EU's electricity network and enhancing renewable energy production. The plan allocates substantial funds to promote sustainable and green mobility, aiming to reduce reliance on private vehicles in favour of public transportation and electric vehicles (EVs). Tax benefits and subsidies in Cyprus support eco-friendly vehicle adoption, offering incentives for electric buses, trucks, and cars, including significant subsidies for scrapping old vehicles and replacing them with new, low-emission models. The Sustainable Urban Mobility Plan (SUMP) focuses on making transportation more efficient, eco-friendly, and accessible, contributing to the reduction of greenhouse gas emissions. Technological advancements are evident in projects like "Smart Nicosia," which aims to leverage technology for improved city management and services, showcasing Cyprus's commitment to harmonizing technological innovation with environmental sustainability. Infrastructure development prioritizes expanding public transportation networks and developing EV charging infrastructure, with the government implementing SUMPs in major cities and investing in cycling infrastructure. Market trends show a growing interest in electric and hybrid vehicles, although they currently represent a small fraction of all vehicle registrations. Public transportation in Cyprus, mainly consisting of buses and taxis, is in the development phase, focusing on enhancing the efficiency of existing services. Environmental considerations include the relatively clean air quality, although challenges with ozone levels persist. The economic and social implications of transitioning towards sustainable mobility include stimulating innovation and creating jobs in the green technology sector, with ongoing efforts to enhance infrastructure connectivity and improve the public transport system's efficiency. Best practices in Cyprus include involving citizens in the mobility dialogue and prioritizing sustainable urban mobility, which is anticipated to yield economic and social benefits by promoting cleaner, more accessible transportation options.

Czech Republic
The Czech Republic's approach to sustainable urban mobility involves comprehensive planning and investment, guided by the country's Recovery and Resilience Plan. The plan focuses on technological advancements, infrastructure development, market trends, and the environmental impact of transportation. The country is making strides in promoting electric vehicles (EVs) through tax benefits and subsidies, aiming to create a more sustainable and efficient transportation landscape. Technological advancements include significant investments in autonomous driving technologies and electric vehicle manufacturing, positioning the Czech Republic as an innovative player in the European automotive industry. Infrastructure development is a key area of focus, with the government investing in the expansion and modernization of the EV charging infrastructure, as well as improving railway and motorway networks. This is part of a broader effort to enhance mobility, reduce emissions, and support the transition to cleaner modes of transportation. Market trends indicate a growing interest in electric and hybrid vehicles, reflecting a shift in consumer behaviour towards more sustainable transportation options. Public transportation systems are being upgraded to include more environmentally friendly vehicles, such as electric buses, contributing to the overall reduction in the sector's carbon footprint. Environmental considerations are at the forefront of the Czech Republic's mobility strategy, with initiatives aimed at reducing emissions and promoting cleaner transportation modes. The country is also focusing on the economic and social implications of these changes, recognizing the potential for job creation and economic growth within the green technology and automotive sectors. Best practices in the Czech Republic include collaboration between government, industry, and research institutions to drive innovation and development in sustainable mobility. Future perspectives highlight the country's commitment to continuing its progress in this area, with ongoing investments in technology, infrastructure, and policies to support a more sustainable and efficient transportation system.

Denmark
Denmark's sustainable urban mobility development is marked by ambitious goals and comprehensive strategies, reflecting its commitment to green and efficient transportation. The country's Recovery and Resilience Plan underlines investments in sustainable mobility, focusing on electric vehicles (EVs), public transportation, and cycling infrastructure. Denmark offers attractive EV tax benefits and subsidies, alongside implementing innovative transportation policies and plans. Technological advancements are evident in Denmark's efforts to promote electric and autonomous vehicles, supported by significant research and development initiatives. The country's infrastructure development includes extensive EV charging networks, and substantial investments are made in modernizing the railway system and expanding cycling paths, enhancing the accessibility and convenience of sustainable transport options. Market trends show a strong inclination towards electric and hybrid vehicles, indicating a shift in consumer behaviour towards more environmentally friendly transportation modes. Public transportation in Denmark is transforming, with a focus on electrification and efficiency improvements aimed at reducing the carbon footprint of the sector. Environmental impact considerations drive Denmark's mobility strategies, aiming for significant reductions in transport-related emissions. Economic and social implications include job creation in the green technology sector and a focus on ensuring equitable access to sustainable transport options. Best practices in Denmark's approach to sustainable urban mobility involve integrating technological innovation with policy and infrastructure development, fostering a collaborative environment between government, industry, and the public. Future perspectives highlight Denmark's continuous efforts to lead by example in the transition towards a more sustainable and efficient transportation system, contributing to the country's broader environmental goals.

Estonia
Estonia's sustainable urban mobility development showcases a targeted approach towards enhancing its transportation infrastructure and promoting eco-friendly transportation options. The country's strategic plans and policies reflect a strong commitment to reducing environmental impact while improving mobility for its citizens. Estonia's Recovery and Resilience Plan highlights investments in sustainable transport, emphasizing the expansion of electric vehicle (EV) charging infrastructure and the adoption of green public transportation solutions. Tax benefits and subsidies are available to encourage the purchase of electric vehicles, demonstrating Estonia's proactive stance in fostering an eco-friendly automotive market. Technological advancements play a pivotal role in Estonia's strategy, with initiatives aimed at integrating smart mobility solutions and enhancing the efficiency and sustainability of transportation systems. The country is making significant strides in infrastructure development, focusing on creating a more interconnected and accessible transport network that supports both urban and rural mobility needs. Market trends in Estonia indicate a growing interest in electric and hybrid vehicles, reflecting a broader shift towards more sustainable transportation modes. Public transportation is also receiving attention, with investments in electrification and the implementation of innovative services designed to improve accessibility and convenience for users. Environmental considerations are at the core of Estonia's mobility policies, aiming to reduce emissions and promote cleaner transport alternatives. The economic and social implications of these initiatives include the potential for job creation in the green technology sector and enhanced quality of life through improved urban environments and reduced pollution levels. Best practices in Estonia's approach to sustainable urban mobility include the integration of

digital technologies in transportation planning and operations, fostering innovation, and collaboration between public and private sectors. Future perspectives for Estonia's transportation sector are optimistic, with ongoing efforts to advance sustainable mobility solutions and achieve environmental objectives while meeting the needs of its population.

Finland

Finland's commitment to economic recovery and resilience within the EU framework is exemplified by its ambitious €1.95 billion allocation. Prioritizing environmental and digital progress, over half of the funds are designated for climate objectives, with nearly a third dedicated to advancing the digital transition. Notably, a portion is earmarked for green transportation initiatives, including the development of EV charging stations and gas charging infrastructure, amounting to €13.6 million. The nation incentivizes zero-emission vehicle adoption through tax benefits and subsidies, aiming to expedite the shift towards greener mobility solutions. Sustainable urban mobility is a focal point, evident in the National Transport System Plan and sustainable mobility plans in cities, aligned with the SUMP model. Technological innovations such as aerial tramways and the European Train Control System pilot bolster transportation efficiency and safety. Infrastructure development prioritizes environmental sustainability and resilience against climate change, particularly in winter maintenance. Finland's EV charging infrastructure is rapidly expanding, supported by EU investments and private enterprises. Market trends show a surge in electric vehicle sales, reflecting a growing preference for sustainable transportation. The country boasts a robust public transportation system, emphasizing sustainability and digitalization. Efforts to integrate transport modes seamlessly and expand electric bus fleets contribute to eco-friendly commuting. Finland aims to halve traffic emissions by 2030 and achieve zero emissions by 2045. It actively participates in global initiatives like the EVI and Rail Baltica, demonstrating its commitment to accelerating electric vehicle uptake and enhancing European transport connectivity. Overall, Finland's holistic approach underscores its dedication to sustainable mobility and environmental stewardship and positions it as a leader in the European Union.

France

France's Recovery and Resilience Plan allocates €40.3 billion to rejuvenate and reform, with a strong emphasis on climate objectives (49.5%) and digital transition (21.6%). Notable investments include €4.4 billion for railway modernization and tax incentives for alternatively-powered vehicles. EV adoption is further encouraged through tax benefits and subsidies, with bonuses of up to €6,000 for eco-friendly vehicle purchases. The Mobility Orientation Law (LOM), enacted in 2019, prioritizes energy transition within the mobility sector, promoting public transport expansion, carpooling, and electric vehicle adoption. France's long-standing Sustainable Urban Mobility Plans (SUMPs) aim to enhance urban transport networks and support eco-friendly transportation solutions. Technological advancements, such as Electreon's wireless Electric Road System, mark France's proactive stance in embracing sustainable mobility solutions. The Grand Paris Express, enhancing cycling infrastructure, and high-speed rail projects contribute to infrastructure development. France aims to install over 400,000 electric vehicle charging points by 2030, positioning itself as a leader in EV infrastructure in Europe. Market trends show a significant increase in electric vehicle sales, supported by government subsidies and policies. Public transportation, particularly buses and subways, plays a vital role in France's transportation ecosystem, despite the prevalent use of personal cars. Initiatives like the New Railway Pact aim to modernize rail services and ensure equitable access to transportation. Addressing environmental concerns, France aims to reduce greenhouse gas emissions from transport by 40% by 2030. Cultural shifts towards sustainable transport preferences are evident, with the growing popularity of bike-sharing programs and carpooling services. France actively participates in international initiatives like the Electric Vehicles Initiative (EVI) and RESIST, collaborating with other nations to accelerate the global adoption of electric vehicles and support sustainable growth projects within the mobility sector.

Germany

Germany's Recovery and Resilience Plan, totalling €28.7 billion, prioritizes climate objectives with 47% of funds dedicated to decarbonizing the industry. Significant investments of €7 billion target greening the transport sector, promoting electric vehicles, clean buses, and rail infrastructure. Tax benefits and subsidies incentivize electric and fuel cell vehicle adoption, with exemptions and reductions in taxes for low-emission vehicles. Sustainable mobility plans in Germany involve collaborations between the Association of German Cities and the Deutsches Institut für Urbanistik, focusing on transportation planning and providing resources for practitioners. Technological advancements, such as smart transport systems and innovations in electric vehicle infrastructure, highlight Germany's commitment to shaping the future of transportation. Infrastructure development includes investments in railways, roads, and projects like the Fehmarnbelt Fixed Link, promoting connectivity and sustainability. Germany aims to expand its electric vehicle charging infrastructure, with plans to increase the network of public charging stations and invest in rapid-charging infrastructure for cars and commercial trucks. Rail network electrification and advancements in sustainable transportation solutions reflect market trends and consumer behaviour, with a growing acceptance of electric vehicles. However, traditional petrol and diesel cars still dominate the market, emphasizing the need for continued efforts to transition towards cleaner alternatives. Germany's public transportation system, characterized by a young bus fleet and a shift towards greener alternatives, plays a crucial role in sustainable mobility. Investments in tram

networks, hydrogen fuel cell-powered trains, and bicycle infrastructure contribute to a holistic and environmentally conscious mobility ecosystem. Despite progress in reducing greenhouse gas emissions, challenges remain in decarbonizing the transport sector. Economic and social implications of strikes affecting rail operations highlight Germany's dependence on rail transport and its impact on neighbouring nations. Best practices and case studies from German cities showcase innovative mobility plans, collaborative research projects, and initiatives like Mobility as a Service (MaaS) to prioritize sustainability and efficiency. Germany actively participates in international initiatives like the Electric Vehicles Initiative (EVI) to promote environmentally friendly transportation practices globally.

Greece

Greece's Recovery and Resilience Plan embodies a comprehensive strategy aimed at revitalizing its economy and fostering sustainable development. With a financial commitment totalling €36.61 billion, including significant contributions from the Recovery and Resilience Facility (RRF), Greece emphasizes environmental sustainability and digital modernization. A substantial portion of the funds, 38.1%, is earmarked for climate objectives, while 22.1% is allocated to digital transformation initiatives. A key focus area of Greece's plan is the advancement of sustainable transportation systems, exemplified by proposals to install over 4,500 electric vehicle charging stations and introduce 220 electric buses for urban public transport in major cities. Additionally, substantial investments are planned for the railway sector to enhance resilience and efficiency, including repair works to address damages inflicted by natural disasters. In alignment with its commitment to environmental sustainability, Greece has adopted ambitious energy and climate policies, aiming for net zero emissions by 2050. The National Climate Law sets targets to reduce greenhouse gas emissions by 55% by 2030, reflecting a proactive approach to combatting climate change. Looking towards the future, Greece's National Transport Plan for 2037 outlines transformative goals for the transport sector, including reductions in road traffic, increases in rail passenger and freight traffic, improvements in road safety, and enhancements in travel time and accessibility. These objectives underscore Greece's dedication to modernizing its transportation infrastructure and promoting sustainable mobility solutions. To incentivize the adoption of electric vehicles, Greece offers extensive tax benefits and purchase incentives, demonstrating a concerted effort to accelerate the transition to cleaner transportation technologies. Moreover, technological advancements, such as battery swapping stations for e-scooters and collaborations with EV manufacturers, further drive innovation in the mobility sector. Infrastructure development remains a priority, with initiatives like the Smart Cities program aimed at revolutionizing urban infrastructure and services through digital transformation. Investments in road and railway infrastructure, coupled with initiatives to expand EV charging infrastructure, are poised to enhance connectivity and accessibility across Greece. Despite facing challenges such as an ageing vehicle fleet and economic constraints, Greece is making significant strides towards sustainable mobility. Collaborative efforts with international organizations and innovative projects like Mobility as a Service (MaaS) on the island of Astypalea showcase Greece's commitment to embracing emerging trends and fostering a greener, more efficient transportation ecosystem.

Hungary

Hungary's commitment to sustainable and intelligent mobility has seen significant strides in recent years, driven by strategic policy decisions and ambitious investment plans. In 2020, the adoption of the National Energy and Climate Strategy marked a pivotal moment, signalling Hungary's determination to transition towards a carbon-neutral economy. Notably, the focus on greening the transportation sector through dedicated legislation in 2019 underscored Hungary's proactive stance on electromobility, with a particular emphasis on promoting electric vehicles and establishing essential charging infrastructure. Hungary's Recovery and Resilience Plan stands as a testament to its dedication to climate objectives and digital transformation. With a substantial investment value totalling €10,430 million, 67.1% of the plan is earmarked for climate objectives, including energy initiatives and sustainable transport. To finance this ambitious agenda, Hungary has secured loans amounting to €3,918 million, supplemented by a REPowerEU grant of €700.5 million. Central to Hungary's green transition is the advancement of sustainable transport systems, as evidenced by plans to modernize significant railway lines and acquire 300 zero-emission buses. Moreover, initiatives to expand tram and trolleybus infrastructures, alongside the purchase of 51 new vehicles, underscore Hungary's commitment to promoting cleaner energy sources in transportation. The government aims to complete these endeavours by August 2026. Incentivizing the adoption of electric vehicles has been a cornerstone of Hungary's strategy, with tax exemptions and purchase incentives provided to stimulate the market. Technological advancements in the autonomous driving sector further showcase Hungary's innovative approach, with investments in startups and enterprises driving cutting-edge solutions. Infrastructure development remains a priority, with investments aimed at enhancing motorways and railways to improve connectivity and accessibility. Efforts to expand EV charging infrastructure are also underway, with plans for significant growth by 2030. Market trends reflect increasing consumer openness to electric vehicle adoption, supported by government expenditure on transport. However, challenges persist, including the need to address emissions from road transport and reduce reliance on fossil fuels. The economic and social implications of Hungary's transition to sustainable mobility are significant, with the automotive sector representing a substantial portion of GDP and employment. The transition to electric vehicles is crucial

to safeguarding jobs and economic output. Best practices, such as the introduction of an e-mobility subsidy package, demonstrate Hungary's commitment to supporting electric vehicle adoption and charging infrastructure development. Looking ahead, Hungary is well-positioned to continue its trajectory towards sustainable mobility, leveraging public-private partnerships and EU funding opportunities to drive economic growth and innovation. Collaborations with international partners further strengthen Hungary's position in the global shift towards greener transportation.

Ireland

Ireland appears to be positioned between the yellow and green categories of the semaphore system for assessing sustainable development and mobility. The country has made significant strides towards a greener and more sustainable future, with the Recovery and Resilience Plan EU allocating substantial funds towards climate objectives and the digital transition, including key investments in sustainable mobility and energy efficiency. The Irish government has implemented comprehensive tax incentives and purchase incentives to boost the electric vehicle (EV) market, indicating a strong commitment to transitioning to green mobility. The establishment of the Future Mobility Campus Ireland and significant investments in technological advancements for autonomous and electric vehicles highlight Ireland's progress in innovation and development of green transportation solutions. However, challenges remain, particularly in infrastructure development where Ireland shows a lower quartile position in motorway and railway infrastructure density. This could hinder the full realization of green mobility initiatives. Market trends show a positive uptake in EV sales, with electric vehicles accounting for 13% of new car sales in early 2023. Public transportation systems are gradually incorporating electric buses, although public transport funding is relatively low. Environmental initiatives are evident with a significant share of battery and hybrid electric cars and efforts to improve the number of electric cars per public charge point. Economic and social implications show a need for increased government expenditure in the transport sector to bolster infrastructure development and employment in the automotive industry. Future perspectives are promising with plans for increased rail capacity and investments in train carriages, infrastructure, and customer services supporting national climate goals. In summary, Ireland demonstrates notable progress towards sustainable mobility with strong policy frameworks, incentives for EV adoption, and technological innovation. However, further investments in infrastructure and public transport are essential to fully transition to green mobility and achieve sustainability targets.

Italy

Italy's approach to sustainable mobility and infrastructure development illustrates a significant commitment towards the transition to green mobility and energy efficiency. Through the Recovery and Resilience Plan EU and REPowerEU measures, Italy is actively reducing its reliance on fossil fuels with a comprehensive €11.178 million investment plan focusing on renewable energy deployment, bio-methane production, and the enhancement of skills necessary for the green transition. This effort is complemented by policies aimed at boosting the electric vehicle (EV) market, including tax and purchase incentives, and the development of smart charging facilities in collaboration with Siemens Smart Infrastructure and Electreon's wireless charging technology. Italy's infrastructure development is robust, with investments in railway and port infrastructures, and the integration of smart transport systems, highlighting a particular focus on improving connections in the southern regions. The public transportation system is undergoing a green transformation with substantial investments in electric vehicles and trains, aimed at revamping local and intercity travel, especially in the southern part of the country. The environmental impact of these measures is significant, with a noticeable shift towards electric vehicles in the automotive market. Italy's efforts in public transport sector reform and sustainable mobility infrastructure, backed by a substantial budget from the NRRP, signal a dedicated move towards decarbonizing the transport sector and aligning with the European Green Deal objectives. Economically, the mobility sector is a vital component of Italy's economy, with significant investments directed towards sustainable mobility. The imposition of retroactive tariffs on Chinese EV brands to protect the Italian automotive industry indicates the government's proactive stance on maintaining competitiveness in the evolving global EV market. Emerging trends and future perspectives highlight Italy's ongoing efforts to enhance its transport infrastructure and international connectivity, though challenges remain in fully integrating sustainable mobility ideologies into local public transport systems. Overall, Italy's multifaceted approach to enhancing green mobility and sustainable infrastructure development positions it towards the green end of the semaphore system, indicating substantial progress and commitment to achieving sustainable transport sector goals.

Latvia

Latvia's efforts in transitioning towards sustainable mobility and green infrastructure are commendable yet face significant challenges. Under the Recovery and Resilience Plan EU, Latvia is investing in the green and digital transition, including greening the Riga transport area and enhancing energy efficiency. They've implemented incentives to boost the electric vehicle (EV) market through tax benefits and subsidies. However, Latvia struggles with technological advancements, especially in digital innovation, but is making efforts towards digitalizing public services and investing in digital infrastructure. The country aims to overhaul the Riga metropolitan transport system and incentivize clean transport with significant investments. Despite these efforts, Latvia faces infrastructural limitations, such as the absence of motorways and an

outdated public transportation system, evidenced by an ageing bus fleet and a decline in bus circulation. The market for EVs remains small, with electric or hybrid vehicles constituting a minor fraction of total vehicles, indicating a low willingness to adapt to EVs among the populace. Latvia's automotive infrastructure lacks development, leading to one of the highest commuting times in the EU. The sustainable mobility program for Riga, including the integration of the Rail Baltica railway, shows promise for improving urban mobility. Future perspectives focus on enhancing infrastructure across levels, with investments aimed at fostering economic growth and contributing to a low-carbon economy. However, the lack of infrastructure for emerging trends like cycling needs addressing to support sustainable mobility fully. In summary, Latvia is on a yellow-to-green path in the semaphore system for sustainable development. The country has made progress with policy frameworks, investments, and incentives towards green mobility. Yet, significant challenges remain in infrastructure development, technological advancement, and public transportation, requiring sustained effort and investment to fully transition to green mobility.

Lithuania

Lithuania is undergoing a comprehensive transformation in its transportation sector, driven by ambitious policy initiatives, technological advancements, and infrastructure investments. The country's Recovery and Resilience Plan, valued at €3.85 billion, focuses on climate goals and digital transformation, with significant funding allocated to sustainable mobility. Tax incentives and purchase bonuses incentivize the adoption of electric vehicles (EVs), while infrastructure developments like Rail Baltica and the expansion of EV charging networks aim to support the shift towards cleaner transportation. Market trends indicate a significant increase in electric vehicle registrations, reflecting growing consumer interest in sustainable transportation options. Lithuania is also focusing on improving public transportation systems and promoting alternative fuels for buses. However, challenges persist in ensuring adequate public transport coverage in rural areas. Lithuania's commitment to sustainable urban mobility is reflected in initiatives such as Sustainable Urban Mobility Plans (SUMPs) and the promotion of public transport, walking, and cycling. Despite challenges such as high emissions from the transportation sector, Lithuania is making progress towards decarbonization and environmental sustainability through collaboration, innovation, and international partnerships. As the country embraces greener mobility solutions, it positions itself to meet the objectives towards a more sustainable and inclusive urban transport landscape, aligning with European Union objectives for climate-neutral cities by 2030.

Luxembourg

Luxembourg's Recovery and Resilience Plan is pivotal in steering the nation towards a more environmentally sustainable and resilient future, while simultaneously preparing it for the opportunities presented by the green and digital transitions. Notably, Luxembourg's strategy places significant emphasis on the green transition, with a staggering 68.8% of its total funding directed towards this end. Among the planned actions is a €30.5 million investment to expand the nation's network of electric vehicle charging stations. Luxembourg incentivizes the adoption of electric vehicles through tax benefits and subsidies, where zero-emission vehicles benefit from reduced administrative taxes and various incentives based on their CO2 emissions and battery capacities. Furthermore, initiatives like the PNM 2035 - National Mobility Plan illustrate Luxembourg's forward-thinking approach to meeting future mobility needs, with a focus on sustainable measures and insights gleaned from extensive surveys and stakeholder engagements. The country's commitment to sustainability is further underscored by its issuance of a Sustainability Bond Framework, making it the first European country to do so. Luxembourg's technological advancements, notably in autonomous mobility technology, position it as a hub for innovation. Infrastructure development is a cornerstone of Luxembourg's mobility strategy, exemplified by ambitious projects like the extension of the tram network and investments in electric vehicle charging infrastructure. Moreover, initiatives to enhance connectivity with neighbouring countries highlight Luxembourg's commitment to international collaboration in developing a robust transport infrastructure. The country's efforts towards sustainable mobility are reflected in market trends, with electric vehicles comprising a significant portion of new car registrations. Despite challenges such as high car ownership and traffic congestion, Luxembourg's initiatives, including free public transportation, aim to encourage a shift towards sustainable mobility solutions and foster economic and social benefits. Collaborative frameworks like the Greater Region initiative facilitate cross-regional commuting solutions and environmental initiatives, showcasing Luxembourg's commitment to regional cooperation and sustainability.

Malta

Malta is undergoing significant development in sustainable transportation, driven by ambitious policy initiatives, technological advancements, and infrastructure investments. The country's Recovery and Resilience Plan, valued at €336 million, prioritizes climate-related objectives and digital innovation, with substantial funding allocated to encourage the widespread adoption of electric vehicles (EVs). Tax incentives and scrappage schemes incentivize the transition to cleaner vehicles, while initiatives like the Sustainable Urban Mobility Plan and the Transport Strategy 2050 aim to promote sustainable mobility across the islands. Investments in EV charging infrastructure, coupled with efforts to enhance public transport, underscore Malta's commitment to reducing emissions and improving air quality. Despite facing challenges such as high carbon emissions and an ageing vehicle fleet, Malta's strategic investments and collaborations with organizations like EIT Urban Mobility signal a promising shift towards a more sustainable transportation landscape. Through continued

investment, regulation, and international collaboration, Malta will achieve significant progress in sustainable transportation practices within the region.

Netherlands

The Netherlands is at the forefront of sustainable transportation, with a comprehensive strategy encompassing policy initiatives, technological advancements, and infrastructure development. Notably, the country's Recovery and Resilience Plan, funded entirely by RRF grants, emphasizes climate and digital advancements, with a significant portion directed towards climate-related goals. The country invests in road maintenance, cycling infrastructure, and public transportation, aiming to enhance connectivity and reduce reliance on cars. With over 120,000 public charging stations, EV adoption is rising, constituting 23% of new car purchases in 2022. The Netherlands maintains a younger and cleaner car fleet compared to the EU average. Sustainable transportation initiatives drive economic growth, create jobs, and improve public health and inclusivity. Investments in ultra-efficient aircraft and electric inland waterway transport underscore the nation's commitment to cleaner transportation modes. Moreover, generous tax benefits and subsidies promote the adoption of zero-emission vehicles, while innovations in smart technologies, including self-driving vehicles and 5G-enabled traffic management, revolutionize transport systems. The Netherlands also leads international collaborations, participating in initiatives like the Electric Vehicles Initiative and collaborating with Scandinavian countries on sustainable transportation projects. With a promising future outlook, the Netherlands continues to drive innovation and progress in sustainable mobility, setting an example for global transportation practices.

Poland

Poland has made significant strides in transportation development, especially in its Recovery and Resilience Plan funded by the EU to combat COVID-19 effects. With a focus on green transition, Poland earmarks funds for green mobility, including electric vehicle (EV) subsidies and infrastructure development. Initiatives like the EV Tax Benefits & Subsidies and various programs encourage EV adoption. Furthermore, technological advancements in Intelligent Transport Systems (ITS) enhance road and railway infrastructure, with notable projects like e-TOLL and the National System of Traffic Management. Infrastructure development includes extensive road networks and plans for railway modernization. Additionally, Poland aims to expand EV charging infrastructure significantly. Despite challenges like limited EV adoption due to higher costs and an underdeveloped second-hand market, micromobility options like electric scooters and bicycles are gaining popularity. While public transportation faces challenges, investments are increasing, and Poland's automotive sector remains a key player in Europe's EV manufacturing. Overall, Poland demonstrates a commitment to sustainable mobility and environmental goals, positioning itself for future growth and innovation.

In addition to its focus on green mobility, Poland's transportation development includes the Solidarity Transport Hub (STH), a strategic initiative aimed at revolutionizing the country's connectivity. The STH project encompasses various components such as transportation hubs, new rail systems, aerotropolis, and strategy development. With plans to connect every major city in Poland to the STH, the project aims for travel times under 2.5 hours, facilitating seamless intercity travel. Furthermore, the STH is designed to integrate with neighbouring countries, enhancing regional connectivity and economic ties. Through its ambitious scope and strategic approach, the STH embodies Poland's commitment to modernizing its transportation infrastructure and fostering sustainable economic growth.

Portugal

Portugal is undergoing a comprehensive transformation in its transportation sector, driven by ambitious policy frameworks, technological innovations, and infrastructure developments. The Recovery and Resilience Plan, with an investment totalling €22.2 billion, prioritizes climate action and digital transition, aiming to modernize transportation infrastructure and promote sustainability. Significant investments in public transportation networks, including metro extensions and bus rapid transit lines, are poised to enhance mobility and reduce emissions nationwide. Moreover, the government's commitment to promoting electric and hybrid vehicles through tax benefits and subsidies, coupled with the expansion of EV charging infrastructure, reflects a strategic focus on sustainable urban mobility. Portugal's ambitious public infrastructure investment plan, including high-speed rail links and clean energy projects, underscores its dedication to modernizing transportation and reducing greenhouse gas emissions. Collaborative initiatives like the RAPTOR competition and #ChallengeMyCity program drive progress in sustainable urban mobility, positioning Portugal as a core country in environmental stewardship and innovative transportation solutions.

Romania

Romania is undergoing a substantial transformation in its transportation and mobility sectors, propelled by ambitious policy frameworks, technological advancements, and infrastructure developments. The National Recovery and Resilience Plan (NRRP), representing 13.1% of GDP, prioritizes green and digital transitions, aiming to modernize infrastructure and mitigate the socio-economic impact of the COVID-19 crisis. With a focus on sustainability, the Ministry of Transport and Infrastructure aims to enhance the efficiency and resilience of the national transport system while aligning with European standards. The country's automotive industry, valued at €27 billion, plays a crucial role in the economy, with significant exports and employment. Romania is also making strides in electric vehicle (EV) adoption, exemplified by the popularity of models like the Dacia Spring, contributing to reduced emissions and air pollution. However, challenges

persist, including the need for expanded EV charging infrastructure and the modernization of railways to promote sustainable transportation. Looking ahead, Romania aims to address these challenges through strategic collaborations and investments, including partnerships with organizations like the European Institute of Innovation and Technology (EIT) Urban Mobility. With concerted efforts, Romania is poised to develop sustainable transportation, fostering economic growth and environmental stewardship in the years to come.

Slovakia

Slovakia is actively pursuing sustainable transportation and mobility solutions through comprehensive policy frameworks, technological innovations, and infrastructure developments. The country's Recovery and Resilience Plan, valued at €6.4 billion, allocates 46% of funds to climate objectives, including sustainable transport initiatives such as the expansion of charging stations and cycling infrastructure. Tax benefits and subsidies for electric vehicles (EVs) further incentivize their adoption, with ongoing efforts to enhance e-mobility through legislative measures like the right to plug legislation. Technological advancements showcase Slovakia's commitment to innovation, with companies like Mobility & Innovation and the development of the AirCar demonstrating pioneering solutions in hydrogen-electric and dual-mode vehicle technologies. Infrastructure improvements, particularly in EV charging networks and railway systems, are underway to accommodate the growing demand for sustainable transportation options. Despite challenges such as ageing railway infrastructure and emissions from road transport, Slovakia's automotive industry remains a cornerstone of its economy, with significant investments in EV production and battery manufacturing anticipated. Collaborations with international partners, like CD Cargo's partnership with Czech Rail, underscore Slovakia's commitment to fostering cross-border cooperation and integrated solutions for sustainable transport. Looking ahead, Slovakia has the potential to emerge as a leader in sustainable automotive and mobility sectors, leveraging its strong industrial base and strategic partnerships to drive green transition and economic growth in the coming years.

Slovenia

Slovenia has made significant strides in sustainable transportation and mobility, driven by robust policy frameworks, technological advancements, and infrastructure developments. The country offers tax benefits and subsidies for eco-friendly vehicles, encouraging their adoption and contributing to a reduction in emissions. Notably, companies like Elaphe and Pipistrel have pioneered innovative electric vehicle technologies, positioning Slovenia as a leader in the field. Infrastructure improvements, including the expansion of EV charging networks and the modernization of railways, are enhancing connectivity and accessibility. Market trends reflect a growing preference for electric vehicles and public transportation, with notable increases in BEV registrations and rail/bus ridership. Ljubljana's success in promoting sustainable mobility through initiatives like shared bike schemes serves as a model for other cities. However, challenges remain, such as high transport emissions and the need for further integration of transportation systems. Looking ahead, Slovenia aims to capitalize on its small size and early adopters to accelerate the transition to EVs. Collaborations with international partners, such as the European Investment Bank, are driving transformative infrastructure projects like the new rail line in Koper, highlighting Slovenia's commitment to economic development and environmental sustainability on a global scale.

Spain

Spain has made substantial strides in promoting sustainable mobility and addressing environmental concerns in the automotive sector. The country's Recovery and Resilience Plan allocates a significant portion of funds to support the green transition, focusing on improving railway infrastructure, creating low-emission zones, and deploying electric charging stations. Legislative measures such as the MOVES III Plan and tax exemptions for electric vehicles demonstrate Spain's commitment to reducing emissions and promoting green transport options. Technological advancements, including the development of electric buses and hydrogen-powered trains, further underscore Spain's dedication to innovation in sustainable mobility. Moreover, initiatives like Sustainable Urban Mobility Plans in cities like Madrid and Barcelona showcase Spain's holistic approach to addressing urban mobility challenges. Despite challenges such as bureaucratic hurdles, Spain's collaboration with international initiatives like the Electric Vehicles Initiative and RESIST reflects its commitment to advancing sustainable transportation solutions globally.

Sweden

Sweden has been a global leader in promoting sustainable development in the automotive and mobility sectors. With ambitious carbon neutrality goals by 2045, the country has implemented stringent policies and invested in technological advancements to reduce emissions. However, recent policy shifts, including increased travel deductions and fuel tax reductions, may hinder progress, potentially leading to an increase in emissions by 2030. Despite these challenges, Sweden's Recovery and Resilience Plan allocates a significant portion towards supporting the green transition, particularly in railway capacity enhancement and transport decarbonization. The country boasts extensive EV charging infrastructure, advanced railway systems, and a well-developed public transportation network. Market trends show a rising demand for electric vehicles, although SUV sales pose challenges due to higher emissions. With ongoing efforts in infrastructure development, environmental impact reduction, and innovative collaborations like the CollERS partnership, Sweden remains at the forefront of sustainable mobility,

poised for transformative growth in EV adoption and technological innovation.

Austria

Policy Review

Austria's Recovery and Resilience Plan

The value of the plan amounts to €4.1 billion. The plan supports the green transition by investing €843 million in sustainable mobility through zero-emission transport. An additional €543 million is allocated to expand the electrified trans-European rail network, including linking it to regional lines.[1]

EV Tax Benefits and Subsidies

All Electric vehicles are registered tax-free, for pollution tax and motor insurance tax. ICE vehicles under certain CO2 emissions are 70% exempted in 2023 and 80% in 2024. EVs are 100% tax-exempt from all relevant federal taxes, except VAT. Businesses also benefit from an exemption from ownership tax for zero-emissions cars. A tax investment incentive of up to 10%, special depreciation rules and exemption from pollution tax apply as well. For employees, the private use of a zero-emission company car, and the electricity to charge it, are exempt from taxation as a benefit in kind. Company EVs up to €40,000 are exempt from VAT. For cars between €40,000 and €80,000, the amount above €40,000 is taxable and for cars above €80,000, there is no deduction available.

Purchase subsidies are available both for private and business entities. For private individuals, it amounts to €5,000, while for businesses it varies between €2,000 - €4,000. It is applicable in cases where the vehicles cost less than €60,000, the subsidy compensates up to 50% of the list price and the budget for the program is €32 million.[2]

Austria's 2030 Mobility Master Plan

The nationwide climate target for transport is a binding directive for action, and strategic planning for all modes of transport must be guided by it. Carbon emissions from transport must be reduced from around 24 million tCO2 (2019 levels) to close to zero by 2040 for Austria to achieve climate neutrality. The plan is focused on two components to achieve this transition: traffic transition and energy transition.

In passenger transport, this will be achieved through expanding public transport, expanding the infrastructure for cycling and foot traffic, and adopting zero-emission vehicle technologies. In freight transport, this will be achieved through increasing cost transparency (rail vs road), increasing efficiency in transport chains and strengthening the focus on regionalism.[3]

Technological Advancements

Autonomous driving will increasingly play a vital role in Austria`s mobility future. The Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) is investing around $80 million between 2019-22 in an "Automated Mobility Action Package". This government's program aims to further strengthen the country`s role as a leading location for research, development and production in the following areas: close government cooperation with the automotive industry and transport companies in the development of a legal framework for autonomous mobility; safer testing and the creation of versatile test tracks; strong funding of research projects and public promotion of autonomous technology.

Most Austrian vehicles are currently classified as Level 0 or Level 1 (max. = Level 5) of autonomous driving. According to a recent study, the first vehicles classified at least as Level 4 could come onto the market in 2022 and reach 17% of EU market share by 2035. Most fully automated cars are anticipated to be used by car sharing providers. Several major Austrian automotive companies are heavily involved in advanced R&D and prototyping of drive trains for autonomous vehicle manufacturers, often working in close collaboration with Austrian universities.[4]

Infrastructure Development

EV charging infrastructure

Austria has registered tremendous growth in terms of the number of charging points available. In March 2023 there were 17.728 charging points, a growth of 44% compared to the same time in 2022 and compared to 2021 the number doubled. The goal for 2030 is that drivers in Austria will have to travel a maximum of 15 km to the next charging station.[5] The Austrian government has taken an important step to improve accessibility to the stations by creating a coalition among the companies building charging points where only one app or card can be used for all of them.[6]

Motorways

Austria already benefits from well-developed motorway infrastructure, currently, the density is at 20km per 1000km^2 of land area.[7] The next steps are to ensure that the existing infrastructure is further developed in order to be able to sustain the transition to EVs. In the last decade as a share of GDP, Austria's total expenditure on transport (use, construction, maintenance, administration) stayed at the same level,

[1] Austria's recovery and resilience plan - European Commission (europa.eu)
[2] Incentives and Legislation | European Alternative Fuels Observatory (europa.eu)
[3] BMK_Mobilitaetsmasterplan2030_EN_UA.pdf
[4] Austria Smart Mobility (trade.gov)
[5] EV charging - Number of charging points in Austria almost doubled in two years (pveurope.eu)
[6] A milestone for e-mobility (bmk.gv.at)
[7] Key figures on European transport – 2023 edition (europa.eu)

3% of GDP.[8] To achieve their targets and complete the transition to an infrastructure that can sustain achieving climate neutrality, it is expected that expenditure levels should go higher.

Railway

Austria's railway network is electrified in a proportion of 90%, this gives Austria an advantage in terms of having a knowledge base regarding expanding and improving on already existing infrastructure. Additionally, Austria has one the densest railway infrastructures in Europe, at 70km per 1000km^2. However, there has been little to no progress in adding new railway lines for the period 2011-2021. The next challenges that need to be tackled are ensuring that the energy sources providing the electricity are also in line with climate neutrality goals.[9]

Market Trends and Consumer Behavior

In 2022 there were 215.050 new car registrations in Austria.[10] Simultaneously, passenger cars are the dominant mode of passenger transportation (70%), followed by aircraft (10%), buses (10%) and trains (10%).[11] This shows that there is still an overreliance on cars as a mode of transportation, considering that 77% of households have at least one car.[12] Subsequently, in order for Austria to achieve their climate goals in the coming years there should be a significant shift from cars to other modes of transportation. Additionally, this should also be followed by a transition to emission free cars. Although, petrol and diesel still represent most new car registrations (86%), EVs already represent 14% of new car registrations.[13] However, as a share of total vehicles on the road, EVs represent only 2.2%.[14]

Public Transportation Systems

In its 2030 Mobility Master Plan and in the context of the Clean Mobility Directive the Austrian government includes the switch to electric buses and fuel cell powered buses central to achieving its climate targets.[15] This will represent a major challenge as in 2022 only 1.9% of the buses were electric, 2.5% hybrid electric and 94.5% Diesel.[16]

In October 2021, Austria introduced a nationwide climate ticket – “KlimaTicket" – offering nearly unlimited public transport use across the country, with a single ticket for a full year. The country aims to reduce private car use by 16% by 2040 and encourages a transition from car-dependent individual transport systems to climate-friendly alternatives. From October 2021 to June 2022, some 170,000 passengers purchased the "KlimaTicket". About two-thirds of customers indicated that they started using public transport more frequently and 85% have already replaced car journeys with public transport.[17]

Environmental Impact and Emissions

Starting with 2025 new registrations of taxis, hired cars and carsharing vehicles will be allowed only for zero-emission vehicles. Starting with 2027 carsharing in public spaces will be available only for zero-emission vehicles.[18] Additionally, Austria is one of the EU countries with the highest share of environmental taxes on energy, transport, and pollution. In 2021 they amounted to 0.83% of the total GDP, while the European average is at 0.42%.

On average Austrian cars are 8.9 years old, putting them below the European average of 12.3 years old. This has direct implications for CO2 emissions as newer cars, in line with more stringent regulatory requirements, emit less CO2.

Economic and Social Implications

The Austrian government expects that the implementation of the 2030 Master Plan should lead to the creation of numerous employment opportunities in all transport sectors, ranging from railway workers to engineers.

About 5.4% of Austria's manufacturing jobs are in the automotive sector, with 107,482 vehicles being produced in 2020. There are 6 automobile assembly, battery, and engine plants in Austria.[19] Over 90% of manufacturing is focused on export.

In general, the conventional drive system, the car body, the interior and the chassis are the most important areas for the Austrian automotive supply industry. Only a small proportion of Austrian suppliers are likely to be able to benefit from the changes towards e-mobility. Large enterprises are more advanced and already active in the areas of e-drives and components (30%) and electrics/electronics (24%). The high share of micro-enterprises with a connection to electrics/electronics indicates that small but specialized companies are particularly in demand for outsourced activities.[20]

Most Austrians’ commuting time is less than 30 minutes (65%), this is a promising statistic as it shows there is potential for further expansion of the public transportation system which in turn should increase the share of commuters spending less than 30 minutes to travel.[21]

Best Practices and Case Studies

Connected mobility in Austria is bolstered by the country's advanced digital infrastructure and innovative industry. There is a wide use of apps and platforms that offer multimodal mobility or "Mobility as a Service" (MaaS), allowing users to seamlessly combine different transportation offerings. Industry leaders in Austria are active both domestically and internationally, contributing

[8] Key figures on European transport – 2023 edition (europa.eu)
[9] BMK_Mobilitaetsmasterplan2030_EN_UA.pdf
[10] ACEA Auto-The Automobile Industry Pocket-Guide-2023-2024.pdf
[11] Key figures on European transport – 2023 edition (europa.eu)
[12] ACEA-Report-Vehicles-on-European-roads-.pdf
[13] Key figures on European transport – 2023 edition (europa.eu)
[14] ACEA-Report-Vehicles-on-European-roads-.pdf
[15] BMK_Mobilitaetsmasterplan2030_EN_UA.pdf
[16] ACEA-Report-Vehicles-on-European-roads-.pdf
[17] Austria’s “KlimaTicket” to promote low-carbon mobility (oecd.org)
[18] BMK_Mobilitaetsmasterplan2030_EN_UA.pdf
[19] ACEA Auto- The Automobile Industry Pocket-Guide-2023-2024.pdf
[20] Internationalization of the Austrian Automotive Supply Industry.pdf
[21] Key figures on European transport – 2023 edition (europa.eu)

to the development of Connected Intelligent Transport Systems (C-ITS).[22]
The AIT Austrian Institute of Technology highlights the challenges and requirements for the broad implementation of e-mobility, including the development of new battery systems, highly optimized electric drives, and ensuring compatibility with lightweight construction concepts. A key focus is also on integrating e-mobility into the electricity grid through charging stations while maintaining supply reliability, grid stability, and voltage quality. [23]

Future Perspectives and Emerging Trends

Austria has the perspective to become one of the European leaders in the transition to e-mobility. The Austrian government has taken comprehensive policy steps to ensure that there is a regulatory framework that targets specific aspects of the transition to e-mobility. Factors such as a well-developed and electrified railway infrastructure, extensive motorway network and economic wealth give Austria an advantageous position. Moreover, socially and culturally, the Austrian populace seems to recognize the importance and need to shift away from ICE and carbon intensive mobility to EVs and e-mobility.

International Comparisons and Collaborations

Austria is actively engaging in international collaborations to enhance e-mobility, demonstrated through partnerships like the one between Austrian SMATRICS and German EnBW, which led to the largest fast-charging network in Austria. Further, Austria's involvement in the Volkswagen Group's Elli division emphasizes the integration of renewable energy sources in e-mobility across Europe. Additionally, Austrian company AVL List GmbH's extensive R&D efforts in e-mobility, supported by collaborations with over 100 universities and various industry partners, underscore Austria's commitment to advancing sustainable transportation through global partnerships and innovation. [24] [25] [26]
Five European clusters from France, Spain, the Czech Republic and Austria have launched the first Eurocluster approved by the European Commission for the mobility, transport and automotive ecosystem.
The Eurocluster RESIST: “REsilience through Sustainable processes and production for the European automotive InduSTry” aims to help SMEs in their green and digital transition process, as well as to increase their level of resilience in the face of upcoming challenges. To do this, it will mobilize more than €1 million in cascading funds through different calls related to five specific areas: networking, innovation, adaptation, training and internationalization. In addition, SMEs will be able to benefit from access to key information and studies focused on analysing future challenges, opportunities, needs, etc., as well as meetings with partners from other ecosystems. In this way, RESIST will function as a One-stop-shop where SMEs from the mobility, transport and automotive ecosystem will be able to access financing and implement projects that guarantee their sustainable growth.[27]

[22] Austria Smart Mobility (trade.gov)
[23] E-Mobility - AIT Austrian Institute Of Technology
[24] EnBW invests in SMATRICS | EnBW
[25] What the future holds for EV charging alliances • EVreporter
[26] Research and Development | AVL
[27] The first Eurocluster of the mobility, transport and automotive ecosystem is launched | European Cluster Collaboration Platform

Belgium

Policy Review

Belgium's Recovery and Resilience Plan

The plan is valued at €5.299 billion, with €5.034 billion allocated from Recovery and Resilience Facility (RRF) Grants and an additional €264 million in RRF loans. It encompasses 119 investment streams and 40 reforms, directing 51% of its resources towards climate objectives and 27% towards advancing the digital transition. Significant investments include €1.2 billion dedicated to sustainable mobility. This funding will enhance railway infrastructure, finance green public buses, support the deployment of electric charging stations, develop urban public transport, and create or refurbish cycling paths. A key reform in the plan aims to promote electric road transport by restricting the preferential tax treatment for company cars exclusively to zero-emission vehicles by the year 2026. [28]

EV Tax Benefits and Subsidies

As of October 2023, Flanders is offering a subsidy of up to 5000 Euro on the purchase of a new EV while the other regions have yet to follow. Furthermore, individuals who purchase an EV can benefit from reduced taxes including a significantly lower value-added tax (VAT) for electricity consumption. In Brussels and Wallonia, purchasers of BEVs and fuel cell EVs (FCEVs) benefit from the minimum tax rates for the associated acquisition and ownership costs. Belgium sees company cars as the 'ideal lever' to achieve its climate ambitions.

For companies, it is possible to apply the maximum deductibility of 100 % of expenses for passenger cars (M1 category) with ≤ 50g CO2/km and battery capacity ≥ 0.5kWh per 100kg of vehicle weight. This deductibility ended June 31, 2023, for PHEVs and will henceforth only be applied to zero emission vehicles. Companies can apply for the minimal annual benefit in kind for BEVs, PHEVs, and FCEVs for passenger cars (M1 category), which is 4% of the list value. Companies also can apply at a federal level for a 35 % deduction of investment in the purchase of BEV and FCEV commercial vehicles (categories N1-N3) as well as for the EV charging infrastructure. In Brussels, micro or small companies can get a €15,000 purchase incentive to buy a maximum of three electric vans per year (N1 category).

National Energy and Climate Plan 2021-2030

The Belgian government has published a national energy and climate plan for 2021-2030, which focuses on reducing emissions, improving energy efficiency, and fostering innovation that directly contributes to the development of sustainable mobility solutions. By creating a more favourable environment for electric and other low-emission vehicles and enhancing the efficiency of the transport infrastructure, the plan supports a shift towards more sustainable transportation methods.[29]

The sales of passenger vehicles with internal combustion engines (ICEs) will be phased out by 2035 and several large cities in Belgium including Brussels, Antwerp, and Ghent are applying increasingly stringent entry restrictions on ICE vehicles. As Belgium is part of the EU, The EU Clean Vehicles Directive requires Member States to purchase between 24–45% alternatively fueled buses between August 2021 and December 2025. The European Commission has proposed that by 2030 only zero-emission city buses can be sold in the EU.[30]

Technological Advancements

The Audi Brussels plant produced almost 44,000 EVs while the Volvo plant in Ghent manufactured almost 25,000 EVs in 2021, with approximately 15% of those cars being fully electric. Volvo plans to significantly increase EV manufacturing capacity to make EV capacity account for around 60% of the plant's total production capacity. Van Hool, a Belgian family-owned coachbuilder and manufacturer of buses, coaches, trolleybuses, and trailers, presented a completely new range of 100% zero-emission buses in 2022 and has initiatives underway to modify existing heavy-duty trucks to fully electric. Netherlands-based VDL Bus & Coach which has manufacturing plants in Roeselare, Belgium has delivered nearly 700 electric buses since 2017, and has plans to modify existing inventories.

Belgium is investing in research and development related to battery technology. Belgian-based Umicore Rechargeable Battery Materials manufactures active cathode materials to enable the transition to electromobility. In 2023, Umicore and U.S. start-up Blue Current, a leading manufacturer of silicon elastic composite solid-state batteries, agreed to strengthen their joint venture collaboration on the development of solid-state battery technology.

Belgium-based Avesta Battery and Energy Engineering (ABEE) announced it will build a €1.4 billion electric car battery cell factory in Galati, Romania to supply batteries mainly for the automotive industry – Renault-Dacia and Ford – and for the stationary storage market. ABEE intends to complete the project's first phase in 2026. In addition, ABEE plans to invest €200 million by the end of the decade in a recycling facility for electric equipment and batteries. ABEE has also signed an

[28] Belgium's recovery and resilience plan - European Commission (europa.eu)

[29] IBJ - IJE - ESG: an introduction to the European framework and recent initiatives in Belgium

[30] Belgium - Electric Vehicles (trade.gov)

agreement to invest in the production of battery management systems in North Macedonia.
Volvo's new battery assembly operation in Ghent opened in May 2022 to supply batteries for the automaker's full-electric heavy commercial vehicles (HCVs). This initiative facilitates the transition from diesel-powered to electric vehicles in the heavy transport sector, a major emitter of greenhouse gases. By localizing battery production, Volvo reduces the environmental impact of manufacturing and transporting these components. It also signals a robust commitment to vehicle electrification, encouraging further investment in electric transport technologies and infrastructure. Consequently, this development plays a crucial role in advancing cleaner, more energy-efficient commercial transportation solutions. [31]

Infrastructure Development

Belgium has been actively investing in its rail infrastructure development, aiming to enhance connectivity, sustainability, and efficiency.[32]
Belgium is set to receive up to €120 million in European funding for six transport infrastructure projects. Over €100 million of this funding is earmarked for investment in Belgium's railways and waterways. Key projects include the further rollout of the European Rail Traffic Management System (ERTMS) by Infrabel and the development of remote-control centres for Flemish waterways to reduce reliance on road transport and lower emissions[33].
The Belgian federal government has signed 10-year contracts with SNCB (Belgian National Railways) and Infrabel (the infrastructure manager) for the period from 2023 to 2032. These contracts outline business plans and investment programs to ensure efficient rail operations and infrastructure maintenance[34].
The European Investment Bank (EIB) has partnered with the Brussels-Capital Region to provide €475 million in financing. This funding will be used to: Acquire new electric buses, metro sets, and trams, renew 63 kilometres of tram and metro tracks. The goal is to improve the quality and sustainability of local public transport in Brussels.[35]

EV Infrastructure

The addition of 13,000 new public charging stations in 2022 brings the total number of public charging stations across Belgium to more than 27,000. According to the industry association EV Belgium, there will be nearly 2 million electric EVs in Belgium by 2030, and the country will require 20,000 to 30,000 new charging points every year.
The Brussels-Capitol regional government now says it is aiming to hit 11,000 points by 2035; however, meeting that demand will be contingent on solving some structural issues including modernizing the city's power network to accommodate faster charging. French company Engie will install and operate 2,800 public EV charging stations in the Flemish provinces of Antwerp, Limburg, and West Flanders. The facilities will total 5,600 charge points since each station can charge two EVs.
Among the regions, Flanders has set the most ambitious target: 100,000 charging points by 2030. At the federal level, Belgium's government recognizes the need to increase the number of charging points, both at home and at work, to support the electrification of the fleet. Accordingly, property owners or tenants who purchase and install a charging point at home between 1 September 2021 and 31 August 2024 will benefit from a reduction in investment tax.[36]

Market Trends and Consumer Behavior

In 2022, passenger EV sales in Belgium increased by 39.7% year-over-year to 98,356 units, representing an EV penetration rate of 26.9% of total new passenger vehicle sales. Battery EV (BEV) sales increased by 72.1% year-over-year to reach 37,815 units. Plug-in hybrid EV (PHEV) sales grew 25% to 60,541 units. According to Fitch Ratings, Belgium's EV sales will grow 18% to 116,000 units in 2023, and its EV penetration rate will increase to 29.3%.
On the commercial vehicle side, at least 60% of new company cars registered in 2022 were EVs. Electric light-commercial vehicle sales increased 153.3% to 1,854 units and electric hybrid commercial vehicle (HCV) sales increased from 31 to 90 units in 2022.
The combination of government-driven fleet electrification (buses) and the electrification of vehicles in logistics networks will drive strong commercial EV sales in the next decade. Given this, electric commercial vehicle sales in Belgium will grow 50% year-over-year to 2,900 units in 2023.[37]
With one of the most extensive cycling networks(14500km) in Europe, Belgium is leading the way in terms of sales of e-bikes. From 2019 to 2022, e-bike sales use increased by 56%.[38]

Public Transportation Systems

Currently, Belgium's buses are majority diesel powered (85.7%), followed by hybrid electric with 11.8%, electric buses represent only 0.9% of the fleet. However, under EIB financing of Belgium's public transportation, which is specifically meant to fund: 94 electric buses, 90 trams and 43 metros, and renew 63 kilometres of tram and metro tracks, there is a clear trend in Belgium to promote sustainable public transport over personal vehicles to reduce traffic jams and lower air pollution.[39]

[31] Belgium - Electric Vehicles (trade.gov)
[32] Belgium's National Recovery and Resilience Plan (europa.eu)
[33] Belgium to receive €120 million from EU for infrastructure projects (brusselstimes.com)
[34] Belgian government signs 10-year contracts with SNCB and Infrabel - International Railway Journal (railjournal.com)
[35] Belgium: EIB supports modernisation of Brussels' sustainable public transport
[36] Belgium - Electric Vehicles (trade.gov)
[37] Belgium - Electric Vehicles (trade.gov)
[38] Sustainable mobility as part of a fair transition (europa.eu)
[39] Belgium: EIB supports modernisation of Brussels' sustainable public transport

Environmental Impact and Emissions

Belgium accounts for 3.3% of the total EU greenhouse gas (GHG) emissions. Since 2005, Belgium has reduced emissions by 17.2%, which is slightly below the EU-wide reduction of 19% during the same period. The carbon intensity of Belgium's economy is slightly lower than the EU average, closely following the decreasing EU trend since 2005.

Notably, emissions from energy industries have decreased by almost 30% between 2005 and 2019. The waste management sector achieved the biggest percentage reduction (55% or 1.7 MtCO2e) in emissions since 2005. However, sectors like transport and agriculture have seen the lowest reduction.[40]

Economic and Social Implications

From 2011 to 2021 the Belgian government spent approx. 2.8% of its GDP on the transport sector. Considering the ambitious goals set for a sustainable transportation system and mobility, the central government in the coming years will have to increase the share of expenditure on transport. A potential avenue to increase funding for the transport sector could be an increase in environmental taxes on transport. Currently, as a share of Belgium's GDP, they represent 0.6%.[41]

In December 2022, Belgium reported 276,554 units of motor vehicle production. This represents an increase from the previous year's production of 261,038 units.[42]

Belgium's commitment to sustainable e-mobility is evident through its investments in green public buses and electric charging stations, aiming to enhance sustainable mobility and reduce urban emissions.[43] The country's focus on integrating social aspects into e-mobility research highlights the importance of public perception and acceptance in the adoption of electric vehicles, essential for achieving decarbonization goals. These initiatives not only address environmental concerns but also aim to improve societal well-being by promoting cleaner, more accessible transportation options.[44]

Best Practices and Case Studies

The MaaS (Mobility as a Service) ecosystem initiative aims to bolster the Brussels Capital Region's mobility offerings by creating an integrated system that competes with private car usage. Focused on establishing a robust MaaS ecosystem, the project seeks to streamline access to various transportation options through a unified digital platform. By simplifying trip planning and booking across multiple modes of transport, MaaS encourages individuals to opt for more efficient and sustainable travel methods. However, implementing such a system presents governance challenges, particularly in coordinating regulatory frameworks and fostering cooperation among different administrative jurisdictions. With nearly half of the employees in the Brussels Capital Region commuting from neighbouring provinces and a significant portion working outside the region, effective collaboration and alignment of regulatory approaches become imperative for a successful MaaS ecosystem.

Funded by the European Union through the Technical Support Instrument and in collaboration with the European Commission's Directorate-General for Structural Reform Support (DG REFORM), this project, titled "Brussels-Capital Region - Adapting Co-operation Mechanisms for the Deployment of Mobility Services on an Interregional Scale," is carried out by the International Transport Forum in partnership with Brussels Mobility. Its primary objective is to map out the desired MaaS ecosystem and identify key competencies, entities, and institutional barriers involved. Through a comprehensive analysis of MaaS governance systems within the European Union, the project aims to benchmark various interregional cooperation frameworks and provide recommendations for effective governance mechanisms to facilitate the deployment and sustainability of mobility services across the Belgian capital and its surrounding regions.[45]

Future Perspectives and Emerging Trends

Belgium is in the process of reforming and creating growth in both EV and public transport sectors. Having a strong internal automotive industry, paired with extensive financial support from European funds and long-term policies created by the government it is encouraging that Belgium is on a path to transform their mobility and automative sectors to meet the needs of the future.

International Comparisons and Collaborations

The Belgian Roads and Traffic Agency (AWV) is in close collaboration with the Rijkswaterstaat (Netherlands). The AWV oversees around 7,000 km of regional roads and motorways, in addition to more than 7,700 km of cycle paths. AWV's partnership with Rijkswaterstaat focuses on exchanging information and ensuring timely communication, preparing balanced and objective programs, effectively managing available knowledge and executing high-quality, innovative work. In 2006, the AWV and Rijkswaterstaat signed a Memorandum of Agreement (MoA). This MoA focused on specific avenues of cooperation, such as the Traffic Management Systems (CHARM Programme), road safety initiatives and big data applications.[46]

[40] Climate action in Belgium (europa.eu)
[41] Key figures on European transport – 2023 edition (europa.eu)
[42] Belgium Motor Vehicle Production, 1997 – 2023 | CEIC Data
[43] Belgium Recovery and Resiliance Plan_en
[44] Social Aspects of Electric Vehicles Research – Trends and Relations to Sustainable Development Goals
[45] MaaS moves Brussels: Interregional, Interoperable and Intermodal | ITF (itf-oecd.org)
[46] Cooperation with neighbouring countries on mobility (rijkswaterstaat.nl)

Bulgaria

Policy Review

Bulgaria's Recovery and Resilience Plan

The total value of the plan will be €6,1 billion, out of which 57.5% is earmarked towards supporting climate objectives. The transport sector will receive €533 million to implement decarbonization measures such as the introduction of new electric rolling stock for sub-urban and inter-regional rail transport; the construction of a new section of the Sofia metro; sustainable urban mobility pilot scheme with the purchase of zero-emission public transport vehicles and charging station infrastructure.[47]

EV Tax Benefits and Subsidies

Among EU countries Bulgaria finds itself in a rather precarious position. It does not offer any type of subsidy when purchasing an EV, nor tax benefits from exemptions or compensations for depreciation. Bulgarian EV owners are exempt only from ownership related taxes when owning an EV.[48]

Integrated Transport Strategy for the period until 2030

The Integrated Transport Strategy for the period until 2030 represents a comprehensive plan for the sustainable development of the transport system of the Republic of Bulgaria and a framework for investments in transport. The document complies with the requirements for the scope, structure and content of a comprehensive transport plan and complies with the applicable thematic prerequisites for ESIF for the period 2014-2020 undertaken as a commitment in the Partnership Agreement with the Republic of Bulgaria. The strategy defines the contribution of the Republic of Bulgaria to the Single European Transport Area in accordance with the general priorities under Article 10 of Regulation (EU) No. 1315/2013 of the European Parliament and the Council, including priorities for investments in primary and extended TEN-T network in secondary connectivity.[49]

Technological Advancements

Bulgaria's capital city, Sofia has also developed a 'Sofia Coin mobile app' to encourage people to switch from cars to active transport modes, such as walking, cycling, or using a scooter. The app measures the distance travelled using active modes and the emissions saved per trip, as well as offering rewards, such as free tickets for public transport, electric scooters or public cycle services, thereby encouraging new behaviour. The app also feeds demand data into mainstream mobility infrastructure planning. Both the on-demand public transport and the Sofia Coin mobile app have been developed as part of the INNOAIR project, supported by the Urban Innovative Actions initiative of the EU.[50] Ampeco is a Bulgarian startup that provides EV charging management software. Ampeco enables energy companies, charge point operators, EV charging and e-mobility providers to swiftly establish operations under their brand and create tailored EV charging stations.[51] Currently, Ampeco has 120 customers across 45 different markets.[52]

Infrastructure Development

As part of the EC's *Transport and transport infrastructure* program, Bulgaria should receive €1.5 billion in funds to develop the Trans European Network for Transport (TEN-T). The funding priorities are Bulgaria's railway, roads, intermodal transport services and sustainable urban transport, traffic management and services & systems and technical assistance. The outcomes should result in the modernization and reconstruction of a 190 km railway line (Sofia – Plovdiv – Burgas), the construction of 62 km of motorway, improved navigational conditions on the Danube, increased transport safety by rail, road, water, and air, an additional 16km of metro lines and 19 metro stations.[53]

Motorways

The total length of highways in operation by 2020 is 806 km. Although about 33% of the newly built highways (265 km) have been built in the last 10 years, the pace of their construction is slow. Of the nearly 1,500 km of highways planned, just over half have been built so far. By 2020, Bulgaria ranks among the lagging countries in the degree of completion of the main road network (TEN-T) by EU member states - a share of less than 55%. The Struma Motorway, connecting Sofia and the

[47] Bulgaria's recovery and resilience plan - European Commission (europa.eu)
[48] Electric-Vehicles-Tax-Benefits-Purchase-Incentives-2022.pdf (acea.auto)
[49] integrated_transport_strategy_2030_eng.pdf (government.bg)
[50] Sofia's SUMP 2019-2035: Addressing Urban Mobility Challenges - European Commission (europa.eu)
[51] About us - AMPECO
[52] The road ahead for AMPECO - growth and expansion after 13M Series A
[53] Inforegio - Operational programme "Transport and transport infrastructure" (europa.eu)

Kulata border checkpoint, is 80% complete. It is expected to be ready by the end of 2025. The Black Sea Motorway, connecting the two largest Black Sea centres – Burgas and Varna, is in the planning stage, as only 8 of the planned 103 km have been completed. Its construction is expected to begin after 2025. Priority for Bulgaria is the completion of the Europe Motorway (A6), which is the connection between Sofia through the Kalotina border checkpoint to Nis via Pirot.[54]

Railway

It is characterized by a high degree of density of the railway infrastructure, as well as a high degree of electrification. In 2020, the total length of railway lines in Bulgaria was 4,029 km, of which 2,871 km were electrified (71%). Some of the problems facing the Bulgarian railway transport are the unsatisfactory technical condition of the railway infrastructure and rolling stock; uneven passenger and freight traffic and insufficient use of the capacity of the existing railway network; low efficiency caused by excess capacity, high freight car turnover, high idle rate, insufficient funding and underfunding of railway transport by the state; low integration of new communication and information technologies; lack or poor integration between rail and other modes of transport in many settlements (remoteness of stations from the settlement, lack of public transport to the station, etc.). Significant shortcomings can also be noted in the weak integration of the national railway network into the European one and the insufficient connections of the national railway network with the seaports.[55]

Cycling infrastructure

In 2019, the total length of the bicycle network was 55.5 km and it lacked uninterrupted safe routes through the city, which resulted in cycling having a less than 2% share of the total number of trips in Sofia. To improve conditions for cycling, the municipality aimed to increase the length of the cycling network by up to 160 km by 2025; five major cycle lanes are currently under construction. One of the flagship projects of Sofia's Sustainable Urban Mobility Plan (SUMP) is the construction of the 'Green Ring' project, which will establish a 30 km-long park and cycling path around the city centre. Once completed, this will be accessible to some 250,000 people, reaching at least 30 neighbourhoods and districts, and will help transform mobility in the city.[56]

Market Trends and Consumer Behavior

Bulgaria, together with Germany, Italy and Poland opposed the ban on ICE vehicles from 2035, citing as the main factor the poor economic state of its citizens. The Bulgarian government stated that one of the most sensitive issues regarding decarbonization in the transport sector remains the relatively high price of electric vehicles against the background of extremely low incomes of the population and lack of charging infrastructure.[57]

In line with European trends, 75% of Bulgarians prefer cars as the main method of transportation, followed by aircraft 15%, 8% coaches and buses, and 2% trains. The smaller number of travellers choosing the train as the main method of travel serves as an indicator of an underdeveloped railway infrastructure.[58]

In 2023 there were over 12000 electric vehicles registered in Bulgaria, compared to 2022 this represents over 50% growth when there were 7800 registered EVs.[59]

Public Transportation Systems

Bulgaria will support investments in the development of green transport through two EU-backed grant mechanisms worth over 126 million Levs (€64.4 million) in 2024. The grants, to be paid under the Transport Connectivity Programme for the 2021-2027 programming period, will give businesses greater access to transport projects through public-private partnerships (PPPs).[60]

The Bulgarian government will provide over 100 million Levs (€51.1 million) of EU-backed project financing to all municipal authorities for the purchase of zero or low-emission public transport and the installation of electric vehicle charging stations, the regional development ministry said. The funds will be disbursed under the EU-approved National Recovery and Resilience Plan, with each region getting an equal share of slightly over 16.6 million levs.[61]

Environmental Impact and Emissions

Bulgaria's transport sector has accounted for 15% of total emissions in 2020. A decrease from 2014 when this number was 4.5% higher at 19.5%. CO2 emissions in Bulgaria's transport sector increased from 8% in 1995 to 19.5 % in 2014, with an annual average growth rate of 5.29%. It is therefore encouraging that emissions from transport have decreased nearly 5% over the past half-decade and show signs of continuing to drop.[62]

[54] *Contemporary State of the Transport System in Bulgaria (ijsmr. in)
[55] *Contemporary State of the Transport System in Bulgaria (ijsmr.in)
[56] Sofia's SUMP 2019-2035: Addressing Urban Mobility Challenges - European Commission (europa.eu)
[57] Bulgaria opposes EU combustion ban citing poverty – Euractiv
[58] Key figures on European transport – 2023 edition (europa.eu)
[59] In 2023: Bulgaria reports over 50% Growth in Sales of Electric Vehicles - Novinite.com - Sofia News Agency
[60] Bulgaria commits 64 million euro for green transport in 2024 (seenews.com)
[61] Bulgaria plans 50 million euro grants for green public transport (seenews.com)
[62] Bulgaria's CO2 Emission - TerGo

The average age of Bulgarian vehicles is 19 years old, way above the European average.[63] The purchase of second-hand cars, mainly imported from Germany and Italy, is also 7 times higher than the purchase of new cars. The Bulgarian government has also raised concerns that the shift of wealthier central and western European countries from ICE to EVs will result in a further increase in second-hand car imports.[64]
According to two recent studies, health and other economic costs of air pollution are equivalent to more than 10% of the city's GDP. The vehicles in use are also old and polluting. One quarter of all vehicles are over 20 years old and 60% are between 10 and 20 years old.[65]

Economic and Social Implications

Sofia is Bulgaria's regional specialization hub for technology & business sectors, with no significant competition. With 43% of the country's GDP and 70% of the economic activity focused in the capital.[66]
Bulgaria finds itself at the bottom of new cars registered per 100 inhabitants. If the European average is currently at 21 new cars per 1000 habitants, then in Bulgaria only 4 new cars are registered for 100 inhabitants.[67] In the long term, this could have a significant impact on Bulgaria's adoption rate of zero-emissions vehicles.
There are no car assembly factories in Bulgaria, however, the automotive sector is relatively well-developed with the production of components, cables and automotive software. The industry's total turnover amounts to €6.5 billion or 8% of the country's GDP.[68]

Best Practices and Case Studies

In 2019, Bulgaria's capital, Sofia adopted its Sustainable Urban and Mobility Plan (SUMP). The city's SUMP strives to achieve five main objectives by 2035: to reduce the negative consequences of transport development for the population and the environment; to enhance the attractiveness of the urban environment and increase the living standards of the population; to implement transport innovations to strengthen local mobility and economic development; to foster the safety of participants in the city's transport system; to build an integrated and accessible-to-all transport network.[69]

Future Perspectives and Emerging Trends

As part of the European Union's drive to reach its sustainability goals, Bulgaria has access to vast funding to compensate for the lack of internal funding. Despite lagging in most mobility and sustainability trends, the Bulgarian government is planning to undertake significant steps to overcome its shortcomings. If implemented successfully, the next 10 years should transform Bulgarian mobility and infrastructure and achieve national and EU goals. The transformation process should also lead to significant positive economic growth which in turn should aid in overcoming the lower wealth levels of the Bulgarian population and encourage a faster transition to EVs.
Sofia, through its SUMP, aims to emerge as a leader in mobility and sustainable development within the European Union. By prioritizing initiatives that integrate various modes of transportation, optimize infrastructure, and enhance accessibility for all citizens, Sofia seeks to create a city where sustainable mobility is the norm. Through innovative strategies such as promoting public transit, cycling infrastructure, and pedestrian-friendly urban spaces, coupled with incentives for electric vehicles and car-sharing programs, Sofia envisions a future where transportation is efficient, eco-friendly, and inclusive. By aligning its SUMP plan with broader sustainability goals and actively engaging stakeholders and citizens in the planning process, Sofia is poised to inspire other cities across the EU and beyond to adopt similar approaches, fostering a greener, more liveable urban environment for generations to come.[70]

International Comparisons and Collaborations

Greece and Bulgaria reviewed bilateral relations and the progress of collaboration in a series of sectors of joint interest, particularly the Greek-Bulgarian connectivity of road and rail networks. It should be noted that issues of joint interest had been also discussed at a high level in October 2023, during the Trilateral Summit of Greece-Bulgaria- Romania and the signing of a joint declaration by the leaders of all three countries.[71]

[63] ACEA Auto- The Automobile Industry Pocket-Guide-2023-2024.pdf
[64] Bulgaria opposes EU combustion ban citing poverty – Euractiv
[65] Health costs of air pollution in European cities and the linkage with transport (cleanair4health.eu)
[66] Sofia's SUMP 2019-2035: Addressing Urban Mobility Challenges - European Commission (europa.eu)
[67] ACEA Auto- The Automobile Industry Pocket-Guide-2023-2024.pdf
[68] Bulgaria opposes EU combustion ban citing poverty – Euractiv
[69] Sofia's SUMP 2019-2035: Addressing Urban Mobility Challenges - European Commission (europa.eu)
[70] Sofia's SUMP 2019-2035: Addressing Urban Mobility Challenges - European Commission (europa.eu)
[71] Greek, Bulgarian prime ministers agree to speed up collaboration in energy and transport (abnase.com)

Croatia

Policy Review

Croatia's Recovery and Resilience Plan

Croatia's strategy encompasses a €10 billion plan, integrating €5.8 billion from Recovery and Resilience Facility (RRF) Grants and €4.2 billion in RRF loans, with national resources also contributing to the total value. The plan outlines 157 investment streams and 78 reforms, dedicating 39% of its funds to climate objectives and 20% to digital advancements. A notable €728 million is allocated for enhancing sustainable mobility. This investment focuses on modernizing railway infrastructure, deploying autonomous electric taxis equipped with accessibility features, expanding the network of electric vehicle charging stations, and introducing zero-emission vehicles and vessels, marking a significant push towards reducing environmental impact and promoting digital innovation.[72]

EV Tax Benefits and Subsidies

Croatia is actively promoting environmental sustainability within its automotive and mobility sectors through various incentives aimed at encouraging the adoption of electric vehicles. Notably, the government has eliminated excise duties and special environmental taxes for electric vehicles. Furthermore, an annual incentive scheme has been established, offering subsidies of €9,333 for battery electric vehicles and €5,333 for plug-in hybrid electric vehicles. This initiative is part of a broader strategy to enhance the appeal of EVs, including the development of infrastructure that allows drivers to charge their vehicles while waiting. As outlined in the Croatian Transport Development Strategy for the period 2017-2030, there is a clear focus on investing in more sustainable modes of transportation. Supporting these efforts, the European Investment Bank has contributed €7.7 billion since 2001 towards the country's development, aiding in the realization of these sustainable transport initiatives. [73] [74] [75] [76] [77]

Technological Advancements

While Croatia may not have a robust automotive industry of its own, it is actively searching for investors as Croatia has multiple available business zones. The country has seen a rise in the availability of EVs and charging infrastructure, with currently more than 140 active automotive companies.[78] Moreover, the country is aiming to implement Smart Cities, where technology and connectivity are used to achieve sustainability throughout the whole city.[79] Even though smart cities have been developing over the past years, research in 2022 has found that smart cities are still lacking development in public infrastructure and that they need to increase the number of bike paths.[80]

Project 3 Mobility, a Croatian company dedicated to revolutionizing urban mobility, has announced a groundbreaking collaboration with Mobileye, a global leader in autonomous driving solutions. The partnership aims to integrate Mobileye's cutting-edge technology, Mobileye Drive, into Project 3 Mobility's innovative urban mobility ecosystem.

Scheduled for a 2026 launch in Zagreb, Croatia, Project 3 Mobility's service seeks to enhance transportation in urban areas significantly. Initial testing of Mobileye's technology on Zagreb's streets is set to commence this year, focusing initially on mapping the city's streets using specially equipped test vehicles.

Following the mapping phase, the collaboration will progress to testing Mobileye's autonomous system solution, utilizing diverse test vehicles equipped with safety drivers. Project 3 Mobility is concurrently developing its autonomous electric vehicle, with a particular emphasis on creating a new vehicle platform optimized for autonomous driving. This vehicle will integrate Mobileye's Drive system for autonomous capabilities.[81]

Infrastructure Development

Infrastructure development in Croatia is essential for supporting sustainable mobility. As of 2020, the World Bank indicated that more investments were needed to improve the infrastructure in Croatia. While its road network is relatively well-developed, Croatia's railway network is highly underdeveloped, as globally it is ranked 90th, a lower ranking compared to other European countries.[82] Croatia is focusing on modernizing its railway network, with approximately 55% of the Croatian railway network relating to lines important for international transport. In 2022, the government was working on 19 large projects, with intensive works on the RH1 corridor, from the Croatian border with Slovenia to the state border with Serbia, and the RH2 corridor,

[72] Croatia's recovery and resilience plan - European Commission (europa.eu)
[73] CEV Technologies and SAP Fuel E-Mobility in Croatia | SAP News
[74] Electric-Vehicles-Tax-Benefits-Purchase-Incentives-2022.pdf (acea.auto)
[75] Transport Development Strategy of the Republic of Croatia 2017-2030 29-10_19.pdf (gov.hr)
[76] EIB to support Croatia in investing in green, sustainable transport projects, digitalisation and the green transition
[77] Electric-Vehicles-Tax-Benefits-Purchase-Incentives-2022.pdf (acea.auto)
[78] Automotive Industry in Croatia (gov.hr)
[79] Croatia's Cities: Boosting the Sustainable Urban Development Through Smart Solutions (worldbank.org)
[80] Assessing-Smart-City-Initiatives-A-Case-Study-of-Croatian-Municipalities.pdf (researchgate.net)
[81] Croatian Company Project 3 Mobility Enters Autonomous Driving World - Total Croatia (total-croatia-news.com)
[82] Croatia's Cities: Boosting the Sustainable Urban Development Through Smart Solutions (worldbank.org)

from Rijeka to the state border with Hungary. Moreover, the government is also focusing on regional and local traffic lines by upgrading and electrifying existing lines and improving safety at level crossings by modernizing 50 crossings and upgrading an additional 95 crossings.[83] In February 2024, the EIB approved a €400 million loan to Croatia to invest in their railway network, complementing Croatia's investment of €2.6 billion.[84]
As of 2023, Croatia has been expanding its cycling infrastructure as part of the Interreg Program "Danube Cycle Plans" partnership. With a total investment of €166.7 million for the period from 2023 to 2027, the strategy sets targets for the construction of over 850 km of additional bicycle roads alongside local, regional, and state roads. Croatia, now the 11th European country with such a strategy, aims to bridge the gap in cycling infrastructure and boost cycle tourism.[85]

EV Charging Infrastructure

Croatia is working to expand its EV charging infrastructure to accommodate the growing number of electric vehicles on its roads. As research described, the problem is not the number of charging possibilities, but rather the efficiency of the charging stations.[86] Currently, Croatia has more than 870 EV chargers, with 34 chargers per 100,000 inhabitants, significantly lower than leading EU markets. GreenWay Network plans to install over 300 ultra-fast chargers, ranging from 100 kW to 400 kW, in urban centres, tourist destinations, and along major highways, with an investment estimated at €30 million.[87]

Market Trends and Consumer Behavior

In 2022, there were 475 cars for every 1000 habitants, which is significantly lower than the EU average of 560 cars. While passenger transport with cars with a percentage of 63.8% is the lowest across the EU, the share of 25.4% of aircraft and 2.7% of seagoing vessels is the highest of all EU countries.[88]
The market for electric vehicles in Croatia is slowly growing but has not received a significant share in the total amount of cars yet. In 2022, less than 3% of new registered cars were electric cars.[89] Moreover, the average age of cars is 13,3 years, which is more than 1 year older than the European average.[90]

Public Transportation

Croatia has a well-established public transportation system, consisting of buses, trams, and ferries, particularly in urban areas. However, with only 0.1% of battery electric and 0.2% of hybrid electric buses, the government needs to make the promised investments in public transportation.[91] In 2017, the total length of the bus lines was 1,363 km, with 2,120 stops, the tram network consisted of 116 km of tracks with 210 stops and 15 daily and 4-night lines, transporting more than 200 million passengers per year.[92]

Environmental Impact

The greenhouse gas emissions related to transport in Croatia in 2021 totalled an amount of 6.26 million tons of CO2 equivalent. This is an increase of 8.62% as opposed to last year, but still below 2019 levels of 6.58 million tons.[93]

Economic and Social Implications

The shift towards sustainable mobility presents both economic opportunities and challenges for Croatia. While it stimulates innovation and creates jobs for 2,350 people in the green technology sector, it also requires significant investment in infrastructure and may disrupt traditional industries.[94] Croatia is comparable to Poland, Germany, and Sweden when looking at the one-way commuting times for employed persons.[95] This is remarkable as the smallest country of those three, Poland with 311.888 km^2, is already six times bigger, than Croatia, with only 56.594 km^2. With tax revenue from fuels at 0.65% of GDP in 2021, Croatia was significantly above the European average of 0.42% of GDP.[96]
The challenges for rural areas are social inequality, a lack of knowledge and information, a lack of full connectivity, and distance from urban centres. Advice for the transport sector would be to establish an OPEN FORUM platform where they can find information on public infrastructure, entrepreneurship, environment protection, digital public services, and sustainable mobility/transport in remote areas.[97]

Best Practices and Case Studies

One example of a case study is the "Citizen voices in the mobility dialogue" from CIVITAS.[98] This case study is based on Zagreb's mobility infrastructure and focuses on involving the citizens actively in the process of decision-making. Using surveys and general meetings, CIVITAS showed that the government should actively engage with the citizens to come up with effective mobility solutions.
Moreover, Croatia can develop overall as a country by investing in R&D innovations. By taking Sweden as an example of effectively investing in businesses and start-ups focused on R&D, Croatia can enjoy economic development and increased competitiveness.

[83] Transforming Croatia's rail in harmony with European standards (globalrailwayreview.com)
[84] Croatia: EIB commits €400 million in green funding to modernise railways
[85] First Croatian national cycling strategy set to boost cycling in the country | ECF
[86] View of Electric Vehicle Charging Infrastructure in Croatia – First-Hand Experiences and Recommendations for Future Development (journalofenergy.com)
[87] GreenWay Network to install 300 ultra-fast chargers in Croatia (balkangreenenergynews.com)
[88] Statistics – Modal split of air, sea, and inland passenger transport | Eurostat (europa.eu)
[89] Key figures on European transport – 2023 edition (europa.eu)
[90] ACEA Report-Vehicles on European roads.pdf
[91] ACEA Report-Vehicles on European roads.pdf
[92] Public Transportation - Croatia | Statista Market Forecast
[93] Croatia: annual greenhouse gas emissions of the transport sector 2021 | Statista
[94] Automotive Industry in Croatia (gov.hr)
[95] Employed persons by commuting time and country, 2019 (%)-Statistics Explained (europa.eu)
[96] Key figures on European transport – 2023 edition (europa.eu)
[97] The Challenges of Rural Areas in Croatia (europa.eu)
[98] Citizen voices in the mobility dialogue – Case study of Civitas

Future Perspectives and Emerging Trends

The future of the automotive and mobility industry in Croatia depends on Croatia's financial resources reserved for technological innovations. With the help of the EIB, Croatia will be able to realize sustainable public transportation. More action is needed to provide new technological advancements. According to the World Bank, an increase in national funding for R&D is needed to increase from the current level of under 1% of GDP to 3% by 2030. Besides an increased investment in railway infrastructure, the World Bank also advises that Croatia invest in Demand Responsive Transport (DRT) which is alternative public transport consisting of smaller buses without fixed schedules. Integrating those services with passenger rail operations will improve connectivity in rural areas.[99]

International Comparisons and Collaborations

Croatia has joined a European Consortium aimed at establishing a European battery value chain. The Croatian company, Rimac Automobile, is set to be the country's partner in this project, which involves 12 EU countries and is co-funded with €2.9 million.

The European Commission has given its approval to the autumn set of applications under the Important Project of Common European Interest (IPCEI) mechanism. This is designed to support research, development, and innovation in the battery value chain. The integrated project's objective is to develop new battery technologies, covering everything from mining and processing raw materials, to the development of new technologies, the production of battery cells and packages, and their recycling. The project involves 42 participants from 12 member countries, who will collaborate to achieve a synergistic effect that will yield positive results for the entire EU and its citizens.

The project, which is expected to run until 2028, was jointly developed by Austria, Belgium, Finland, France, Germany, Greece, Italy, Poland, Slovakia, Spain, and Sweden, in addition to Croatia. Rimac Automobile is Croatia's direct partner in this endeavor. The member states participating in the project have been approved for €2.9 billion in state incentives, which is expected to trigger an additional €9 billion from private investors – more than triple the amount of state incentives. Nataša Tramišak, the Minister of Regional Development and EU Funds, highlighted that the project will not only have a direct impact on the automobile industry and mobility but is also expected to create 1400 new jobs by 2029. Furthermore, it will enhance the knowledge base through collaboration with faculties, including funding for graduate students and the creation of new educational programs. It will also facilitate the entry of relatively new technology firms into the battery ecosystem through the establishment of start-up incubators[100]

[99] Croatia 2030: Roadmap for a Better Future - worldbank.org)

[100] Croatia as part of the European consortium for creating a battery value chain, Rimac among friends - OIE

Cyprus

Policy Review

Cyprus' Recover and Resilience Plan

The plan has a total value of €1,2 billion, including contributions from national resources, with €1,02 billion allocated from Recovery and Resilience Facility (RRF) Grants—incorporating €52.4 million from REPowerEU and €52.1 million from the Brexit Adjustment Reserve—and an additional €200 million in RRF loans. It encompasses 75 investment initiatives and 61 reforms, dedicating 45% of its resources towards climate objectives and 24.6% towards advancing the digital transition. Among its significant commitments to the green transition, the plan allocates €100 million to the EuroAsia Interconnector project, aiming to integrate Cyprus into the EU's electricity network and enhance renewable energy production. Additionally, it earmarked €87 million for promoting sustainable and green mobility, focusing on reducing reliance on private vehicles in favour of public transportation and encouraging the adoption of electric vehicles.[101]

EV Tax Benefits and Subsidies

Cyprus offers tax benefits for eco-friendly vehicles, including exemptions and minimum tax rates for vehicles emitting 120 grams of CO2 per kilometre or less. Incentives for purchasing such vehicles feature a variety of support measures: Up to €12,000 is available for those who scrap an old vehicle and replace it with a new one emitting less than 50 grams of CO2 per kilometre, provided the new vehicle costs €80,000 or less. For the purchase of a Battery Electric Vehicle (BEV) priced at or below €80,000, buyers can receive up to €19,000, with an additional €1,000 offered for scrapping an older car. Electric buses are supported with up to €100,000, and there's a €20,000 incentive for acquiring electric trucks.[102]

Sustainable Mobility Plan

Cyprus has developed a comprehensive sustainable mobility plan aimed at transforming its transportation landscape to be more sustainable, resilient, and inclusive, focusing on both urban and broader national scales. The Sustainable Urban Mobility Plan (SUMP) in Cyprus adheres to several foundational principles, including designing mobility solutions for the functional urban area, cooperation between institutions, citizen participation, and a clear vision with an implementation plan. These principles ensure that the mobility strategies are comprehensive, integrated, and capable of addressing both current and future transportation needs. These plans aim at making transportation more efficient, eco-friendly, and accessible to all citizens, thereby contributing to the reduction of greenhouse gas emissions, improving public health and safety, and enhancing the overall quality of life for the inhabitants.[103]

Technological Advancements

Aligned with the EU's Green Deal and digital transformation objectives, Cyprus is advancing its sustainable development goals impressively. The "Smart Nicosia" project, a collaboration between Cyta and Nokia, has been a standout initiative, clinching first place in a competition among 100 European Green Digital Coalition (EGDC) contestants. This coalition, consisting of 26 ICT company CEOs, is committed to integrating the EU's Green Deal with digital advancements. "Smart Nicosia" aims to leverage technology for enhanced city management and services across various domains. With Nokia's contribution of an Integrated Operations Center (IOC) to the Municipality of Nicosia, the project promises to revolutionize urban living. The IOC will facilitate a slew of new digital services, including improved urban mobility, smart parking solutions, intelligent street lighting, environmental monitoring through sensors, effective waste management, and advanced digital signage and information services. This project exemplifies Cyprus's dedication to harmonizing technological innovation with environmental sustainability, setting a benchmark for smart city developments within the EU framework.[104]

Infrastructure Development

Infrastructure development is crucial for supporting sustainable mobility in Cyprus. Due to its small size, Cyprus does not have a rail network. However, other efforts have been made to expand public transportation networks, improve road conditions to enhance safety, increase biking, and develop EV charging infrastructure. The government has implemented SUMPs in Larnaca, Limassol, and Paphos.[105]

Within the framework of Cyprus's sustainable mobility initiatives, several key projects are being undertaken to enhance the nation's infrastructure, aimed at fostering more eco-friendly and accessible transportation options. One notable endeavour is the development of a comprehensive bicycle network. This project seeks to establish a connected infrastructure linking the universities within the greater Nicosia area directly to the city centre, promoting cycling as a viable and sustainable mode of transport. After investments in

[101] Cyprus' recovery and resilience plan - European Commission (europa.eu)
[102] Electric-Vehicles-Tax-Benefits-Purchase-Incentives-2022.pdf (acea.auto)
[103] Sustainable Mobility – Sustainable Cyprus
[104] Smart Nicosia - SMART NICOSIA - Μια πόλη για έξυπνη και βιώσιμη ανάπτυξη
[105] National Reform Programme 2023 for Cyprus

biking infrastructure, SUMP studies estimated an increased interest in biking among students.[106] Additionally, the implementation of dedicated bus lanes along the TRAM routes in Nicosia, with an investment of €5 million, is another significant step towards improving public transportation efficiency. This initiative aims to reduce traffic congestion and ensure quicker, more reliable bus services. Furthermore, the upgrading of public transport infrastructure extends to the enhancement of bus stops and shelters across the city, improving the overall experience for public transport users by making it more comfortable and accessible. [107]

EV Charging Infrastructure

The Electricity Authority of Cyprus (EAC) provides the e-charge service, enabling EV owners to access reliable public charging stations across 36 locations on the island: 11 charging stations in the Nicosia area, 10 in Limassol, 1 in Platres, 1 in Skarinou, 5 in Larnaca, 3 in Paralimni, 3 in Paphos, and 1 in Polis.

Charge Point and Lidl, along with other entities like the CTO Offices Protaras, Paralimni Amphitheater, and the Strovolos parking area, expand the charging infrastructure. Additionally, Porsche dealerships support EV charging, reflecting a diverse network of options for EV owners in Cyprus, encompassing state, international, and private contributions to sustainable transportation.[108]

Cyprus is working towards enhancing its EV charging infrastructure to accommodate the growing number of electric vehicles. Initiatives such as the Electromobility Platform aim to create a comprehensive network of charging stations to support EV users across the island, with the aim of 460 new charging points by Q2 of 2026.[109]

Market Trends

Between January and July 2023, the Department of Road Transport recorded a total of 26,462 vehicle registrations. Among these new registrations, 2.65% (701 vehicles) were electric, with 502 of them being private saloon cars. Around 22.6% (approximately 6,000 vehicles) were hybrids, including 5,300 private saloons. Combined, electric and hybrid vehicles accounted for 25% of all new registrations during this period, indicating a positive trend toward cleaner transportation options. However, when considering the total number of registered vehicles, the percentage of electric and hybrid vehicles remains low, suggesting room for improvement in the transition to electromobility.

Currently, there are 979,171 vehicles registered with the Department of Road Transport, comprising 2,566 electric vehicles, 16,341 hybrid vehicles, and 612 plug-in hybrids. This means that electric vehicles make up only 0.26% of all vehicles on Cypriot roads. While progress is evident, the Minister highlights the ongoing challenge of affordability in purchasing and maintaining EVs. Nonetheless, there is optimism for future cost reductions post-2025, driven by increased production rates. With 664 cars per 1000 inhabitants of Cyprus in 2022, Cyprus has more cars than the European average of 574 cars per 1000 inhabitants. The market for EVs in Cyprus is still in its early stages, being among the last 6 countries adopting EVs and the overall types of cars being petroleum cars.[110] The distrust towards public transportation is also seen in the modality split of transportation choices, 76.3% of transport modes account for the use of cars, while 11.1% is for buses and trolley-buses.[111] [112]

Public Transportation

Cyprus has a developing public transportation system, primarily consisting of buses and taxis, particularly in urban areas. Efforts to improve and expand public transportation services are underway to reduce congestion, improve accessibility, and promote sustainable travel options. The government has been investing in the newly built Alambra Station interconnecting the Lefkosia-Lemesos Motorway and the Lefkosia-Larnaca Motorway and supporting the surrounding rural area. However, with no electric buses on the road, there's a clear need for greater emphasis on transitioning to eco-friendly modes of transport to address environmental concerns and enhance sustainability initiatives. This shows that Cyprus is still developing its traditional public transport infrastructures before focusing on sustainable public transport alternatives [113] [114]

Environmental Impact

Compared to its European counterparts, Cyprus has a notably small impact on the European Union's overall pollution levels. About 88% of Cypriots have a one-way commute to work of less than 30 minutes, marking one of the lowest rates in Europe. A study revealed that over 90% of transportation in the city is dominated by car use, with approximately 90% of the urban transport infrastructure tailored to support vehicular traffic.[115]

Air quality in Cyprus shows both positive aspects and areas of concern. The country generally does not exceed the limits set by European directives for air pollution, indicating that the air quality is relatively clean. However, there are exceedances in ozone levels, which pose a significant environmental challenge. The exceedance of ozone target values is a concern, mainly due to the absence of public and green transport options, as well as the high number of older cars on the roads. This situation underscores the need for Cyprus to invest in low-carbon public transport and other non-fossil-based means of transport, along with supporting

[106] Εγκαινιάστηκε η β' φάση της ποδηλατικής υποδομής που συνδέει τα Πανεπιστήμια της Λευκωσίας με το κέντρο της Πόλης – Sustainable Mobility
[107] Sustainable Mobility – Sustainable Cyprus
[108] EAC - e-charge
[109] National Reform Programme 2023 for Cyprus
[110] ACEA-Report-Vehicles-on-European-roads-.pdf
[111] Statistics – Modal split of air, se, and inland passenger transport | Eurostat (europa.eu)
[112] ROAD TRANSPORT DEPARTMENT - Announcements (mcw.gov.cy)
[113] National Reform Programme 2023 for Cyprus
[114] ACEA-Report-Vehicles-on-European-roads-.pdf
[115] Key figures on European transport – 2023 edition (europa.eu)

infrastructure for light rail, tramlines, and cycling-friendly amenities. [116]

Economic and Social Implications

The movement towards sustainable mobility in Cyprus opens up economic prospects while also posing certain hurdles. This transition fuels innovation and generates employment opportunities within the green technology field but necessitates considerable investments in new infrastructure, potentially impacting traditional sectors. Given that less than 0.1% of the workforce in Cyprus is employed in the transport sector, any job losses related to shifts in this area are expected to be minimal. Currently, the focus in Cyprus leans towards enhancing existing infrastructure, with gradual steps being taken towards embracing sustainable mobility solutions. Priority is being given to connecting rural regions with other parts of the island and enhancing the public transport system's efficiency. The reliance on personal vehicles is high among the Cypriot population, with EV adoption rates remaining low and the transition to EVs progressing slowly. Addressing other pressing issues first, Cyprus aims to eventually prioritize sustainable urban mobility, which is anticipated to yield economic and social benefits for its citizens.
Furthermore, the tax revenue from the transport sector contributes nearly 0.5% to the nation's GDP, indicating the economic significance of this sector within the broader context of Cyprus's economy. [117] [118]

Best Practices and Case Studies

Cyprus's commitment to sustainable mobility marks a significant stride towards its green transition efforts. Cities such as Limassol, Larnaca, and Nicosia have developed their Sustainable Urban Mobility Plans, showcasing initiatives tailored to transform urban living. These plans encompass a wide range of strategies aimed at making cities more accessible, safe, and environmentally friendly. Key initiatives include transforming cities so that they balance the needs of residents and visitors alike, featuring green, serene neighbourhoods, a vibrant city centre, and expansive public spaces that stand as a model of sustainable and smart mobility. This vision supports a wealth of economic, cultural, and recreational opportunities.

The plans also emphasize reducing motorized traffic in historical centres, enhancing walkability, and overhauling public transportation with new networks, service schedules, and infrastructure changes like dedicated lanes and smaller buses for navigating tight city spaces. An expansion and better integration of bicycle networks, alongside the introduction of sharing systems for cars, e-scooters, and e-bikes, are also central to the strategy. Improvements to traffic management, such as replacing roundabouts with smart traffic light systems, alongside measures to enhance road safety and optimize urban logistics, are integral components of Cyprus's holistic approach to fostering sustainable urban mobility. [119] [120]

Future Perspectives and Emerging Trends

Cyprus is making significant strides in embracing sustainable mobility, with a suite of initiatives aimed at promoting greener, more sustainable transport options. This includes a shift towards reducing the use of private vehicles and encouraging the uptake of electric vehicles (EVs), supported by attractive tax incentives and subsidies. Such strategic measures are part of a broader effort to enhance national connectivity while prioritizing environmental sustainability.
As Cyprus looks to the future, its sustainable mobility strategy is set to reshape the transportation landscape into a more resilient, inclusive, and eco-friendly system. The country is developing SUMPs for key cities such as Nicosia, Limassol, and Larnaca, which, along with tech-driven projects like "Smart Nicosia," highlight Cyprus's commitment to leveraging digital innovation for better urban management and services. With improvements in public transportation, the expansion of EV charging facilities, and incentives for adopting cleaner vehicle technologies, Cyprus is laying a foundational shift towards electromobility. Nevertheless, the success of this transition depends on sustained investment, increasing public awareness—especially crucial as over 90% of current trips are made by private vehicles—and robust policy support to navigate challenges related to affordability and the nascent stage of infrastructure development on the island.

International Comparisons and Collaborations

CIVINETs, as networks of cities and institutions, play a pivotal role in promoting the CIVITAS ethos of enhancing sustainable urban mobility while bolstering local, regional, and national capabilities in this field. The collaboration between CIVINET Greece-Cyprus and Walk21 heralds a promising step forward in fostering more active travel within Greece and Cyprus. Walk21's contribution of expertise aims to propel CIVINET members toward embracing more sustainable, active, and health-focused transportation methods.
Both entities share a common goal of creating environments that are not only safe and healthy but also inviting for daily mobility. This objective is gaining traction across several cities, as evidenced by their SUMPs. The escalating demand for transportation solutions that minimize carbon emissions, bolster public health and ensure fair access to essential amenities and green spaces is hastening the transition toward sustainable mobility. With its extensive network that includes major urban areas as well as smaller island locales, CIVINET Greece-Cyprus has long been a

[116] Low-carbon public transport in Cyprus a must, says EU Environment Commissioner | in-cyprus.com (philenews.com)
[117] Key figures on European transport – 2023 edition (europa.eu)
[118] Key figures on European transport – 2023 edition (europa.eu)
[119] Σχεδίου Βιώσιμης Αστικής Κινητικότητας Λεμεσού – Sustainable Mobility
[120] SUMP Larnaca | MIC-HUB

catalyst for this transformative movement within the societies of Greece and Cyprus. [121]
[122]

[121] CIVINETs | CIVITAS

[122] Bluemed Initiative

Czech Republic

Policy Review

Czech Republic Recovery and Resilience Plan

The Czech Republic is undergoing (2021-2026) a significant National Recovery and Resilience plan under the EU's Recovery and Resilience Facility. EU's contribution amounts to €9.2 billion and the green transition pillar will benefit from 42.9% of the funds. Additionally, the plan furthers the green transition by dedicating €1.2 billion towards sustainable mobility initiatives. This includes the procurement of low-emission vehicles for businesses, upgrades to railway infrastructure, and the enhancement of electric vehicle charging facilities and cycling routes.[123]

EV Tax Benefits and Subsidies

BEVs and FCEVs emitting ≤ 50g CO2/km are exempt from registration charges, while zero-emission cars are entirely exempt from registration tax. For other vehicles, a progressive system is in place, with varying registration tax amounts based on CO2 emissions. Owners of BEVs and HEVs enjoy exemptions from road tax, and vehicles emitting ≤ 50g CO2/km are exempt from road tolls. The depreciation period for charging stations has been reduced from 10 to five years, and accelerated depreciation is applicable for BEVs and PHEVs emitting below 50g CO2/km. Companies benefit from road tax exemptions for alternatively powered vehicles such as BEVs, HEVs, FCEVs, CNG, LPG, and E85. Additionally, there's a tax reduction ranging from 0.5% to 1% for BEVs and PHEVs utilized for private purposes. BEVs, FCEVs, and vehicles with alternative powertrains emitting up to 50g/km CO2 are exempt from motorway tolls. Purchase subsidies are available for low- and zero-emission vehicles, covering the extra costs compared to combustion engine vehicles. In Prague, inhabitants and workers enjoy free parking in blue zones. A subsidy of 30,000 CZK is provided for the installation of a home charger, intended for personal use and not for commercial purposes.[124]

Transport Policy of the Czech Republic (2021-2027)

Additionally, the *Transport Policy of the Czech Republic (2021-2027)* with an outlook to 2050 is meant to implement cross-cutting objectives of the Czech Republic, the European Union and the UN. Upon implementation the transport system will meet the requirements in terms of sustainability, which means that it will be neutral in terms of impact on global (not only climate) changes (in terms of mitigation and adaptation), will have the least possible impact on public health, will have minimal impact on biodiversity, nature and landscape and will make a balanced use of natural resources based on renewables so as not to increase debt to future generations.[96]

The policy has also identified sustainable mobility as a strategic objective for the government. The policy has a holistic approach tackling passenger and freight railway, road transport, transport infrastructure, internalization of externalities in transport, energy savings in transport, bicycle transport, inland waterway transport, pedestrians, etc.

Technological Advancements

In the Czech Republic's National Artificial Intelligence Strategy, one of the goals is the implantation of AI in the transport and mobility sectors. The government has recognized the opportunities available in the cross-section of these industries. Making use of AI should allow for better management of the transportation system, safer roads and better data collection and management.[125]

Infrastructure Development

EV Charging Infrastructure

As elaborated below, EV adoption in the Czech Republic has been significantly below the European average. Along with social and economic factors, the lack of adequate infrastructure is a core contributor to this issue. According to the Czech Ministry of Industry and Trade, in 2022 there were 944 charging stations with a total of 1841 charging points. However, the government is implementing its National Action Plan for Clean Mobility which should see the numbers rise to 19,000 charging stations by 2030.

Railway and Motorway Infrastructure

The Czech Republic enjoys the second most dense railway network in Europe, currently, it stands at 125km of railway lines per 1000km^2 of land area. This goes to show that there is indeed substantial potential to improve mobility and transition to sustainable transportation methods. However, from 2011 to 2021 the density stayed the same, showing that in the past decade, rail transport was not considered a priority for the government.

European Investment Bank (EIB) and the Czech Government will collaborate and explore the possibility of receiving up to €7 billion for the reconstruction of the local rail network in the Czech Republic and attract more funding for multiple rail infrastructure projects The signed Memorandum declares both parties' intention to enter the financing of the pre-selected investments within the period 2023-2027.[126]

In contrast, the highway network has almost doubled in density from 10km per 1000 km^2 in 2011 to 18 km per

[123] Czechia's recovery and resilience plan - European Commission (europa.eu)
[124] Incentives and Legislation | European Alternative Fuels Observatory (europa.eu)
[125] NAIS_eng_web.pdf (mpo.cz)
[126] EIB and Czech Republic to cooperate on modernization of local railway networks

1000 km^2 in 2021. This further demonstrates that political priorities and financial help were aimed at growing and maintaining the vehicle as the main transportation method for both passengers and freight.

Market Trends and Consumer Behavior

Passenger cars are the dominant mode of transportation in the Czech Republic, 77% of the kilometres travelled by passengers are in cars, 5% in aircraft, 9% in coaches, buses and trolleybuses and 9% in trains. Additionally, 600 cars are owned per 1000 inhabitants, putting the Czech Republic above the European average of 560 cars per 1000 inhabitants. In 2022 in the Czech Republic were sold 192,087 cars, 16,908 vans, 8,988 trucks, 1,215 buses, amounting to 219,198 vehicles.

The Czech Republic trails behind the European average when it comes to EV adoption. The current trends show that in the short-term to medium-term, the transition will be slow. If on average in the EU only 50% of newly registered vehicles are ICE vehicles, in Czechia this number is more than 80%, out of which 15% are hybrids.

Despite Skoda, the Czech Republic's national brand, already producing the Skoda Enyaq EV in 2022 it managed to sell only 2646 units, and pure electric cars accounted only for 1.28% of newly registered cars, while the European average is around 8%.[127] The slow adoption can be attributed to the fact that private individuals in the Czech Republic benefit only from tax benefits (e.g. no registration fee, no road tax) which do not provide enough financial motivation to cover the high upfront cost of an EV. At the moment only public entities benefit from subsidies if they purchase an EV. However, through the upcoming government plans to boost adoption and growth of the EV market, it estimates that by 2030 there will be 220,000 electric vehicles, amounting to 3% of the fleet.[128]

Public Transportation Systems

Within the *National Action Plan for Clean Mobility*, the Czech government aims to set objectives for clean mobility in the Czech Republic and measures to strengthen the share of alternative propulsion vehicles. In line with the current priorities, the strategy is shifting from an exclusive focus on individual car transport to public transport.[129]

On average, a Czech rail passenger travels 570 km. This is just above the European average of 560 km. The commuting averages of a Czech national in employment are as follows: 8% (60 minutes or more); 32% (30-59 minutes); 57% (1-29 minutes); 3% (0 minutes). The estimate of the development of the number of electric buses in the Czech fleet in 2030 corresponds to a level of approximately 800 to 1 200 units (without trolleybuses)[130]

Environmental Impact and Emissions

The transportation sector being dominated by fossil fuels (accounts for 93% of energy consumption in the transport sector) leads to the fact that CO2 emissions from transport (in 2021 21 Mt CO/2 year) have exceeded more than twice the CO2 emissions resulting from industry (in 2021 9 Mt CO2/year) and it is constantly growing at 0.6 Mt CO2/year.

As 70% of Czechia's population lives in cities and an additional large number commute daily for business, social or educational purposes the harmful substances (nitrogen oxide, fine dust particles, etc.) emitted by ICE vehicles pose significant health threats to the population. To counteract the negative effects of ICE vehicles the Czech government will launch the *National Emission Reduction Programme of the Czech Republic (2025-2030).*[131]

Economic and Social Implications

The automotive sector is one of the largest sectors in Czechia in terms of output and employment, in turn, the Czech Republic is the 4th biggest automotive producer in the EU. In 2022 it produced 1,2 million vehicles, being surpassed only by France, Spain and Germany. There are 9 automobile assembly, battery and engine plants in the Czech Republic. Consequently, 13.7% (214,000) of the workforce is engaged in the automotive industry.[132]

The Czech Republic has some of the lowest environmental taxes linked to the transport sector. Currently, their value stands at 0.1% of Czechia's GDP, while the European average stands at 0.42%.[133]

In terms of road safety, the Czech Republic is slightly above the European average of 42 deaths per million inhabitants, currently at 48 deaths per million inhabitants.[134]

Rural Mobility

The Czech Republic currently lacks a comprehensive organizational, legal, and financial framework for rural mobility policy. While some infrastructure development projects exist, there is a notable absence of action plans or national policies dedicated to rural mobility. Public transportation operates on separate systems, with only limited integration in terms of traffic, fares, and information across regions. In several areas, integrated transport systems are merely an extension of public transport networks, primarily serving urban and suburban areas rather than connecting all modes of transport across the entire region. Moreover, disagreements persist between regions and core cities regarding the organization of public transport, further complicating efforts to establish fully integrated transportation systems.[135]

Best Practices and Case Studies

The Mobility Innovation Hub (MIH) was established by CzechInvest in 2021 in accordance with the objectives

[127] Electric cars 2022: The price in the Czech Republic is still high. Country Comparison | e15.cz
[128] National Energy and Climate Plan of the Czech Republic
[129] National Energy and Climate Plan of the Czech Republic
[130] Key figures on European transport – 2023 edition (europa.eu)
[131] DTransport Policy of the Czech Republic
[132] ACEA Auto- The Automobile Industry Pocket-Guide-2023-2024.pdf
[133] Key figures on European transport – 2023 edition (europa.eu)
[134] National Road Safety Profile - Czechia (europa.eu)
[135] SMARTA-IP-Czech.pdf (ruralsharedmobility.eu)

of the Innovation Strategy of the Czech Republic: The Country for the Future, with support from the government and the Automotive Industry Association. The Mobility Innovation Hub focuses on connecting key sectors and building the mobility innovation ecosystem. In addition to supporting startups, the purpose of the MIH is also to bring together established companies, scientific and research institutes, innovation centres, secondary schools and universities, sectoral associations and clusters, investors and Czech state and local authorities, as well as international organizations.
Another part of the project is a business incubator that provides a broad range of services for startups, including financial support. The Mobility Innovation Hub is part of CzechInvest's Technology Incubation project. The project is planned to run for five years.[136]

Future Perspectives and Emerging Trends

In the Czech Republic, there is a noticeable shift towards sustainable mobility, driven by initiatives like the National Recovery and Resilience Plan and the transport policy focusing on green objectives. This shift emphasizes promoting eco-friendly transportation modes such as public transit, cycling, and walking, aligning with broader sustainability goals to mitigate environmental impact while improving public health. Additionally, while significant investment has been made in highway infrastructure, attention is also turning towards enhancing railway networks, as evidenced by collaborations with the European Investment Bank for rail network reconstruction, indicating a move towards reducing reliance on road transportation and fostering more sustainable travel options.
Despite its slow internal adoption of EVs and limited focus on mobility, the Czech Republic is in the process of reforming and creating growth in both sectors. Having a strong internal automotive industry, paired with extensive financial support from European funds and long-term policies created by the government it is encouraging that Czechia is on a path to transform their mobility and automative sectors to meet the needs of the future.

International Comparisons and Collaborations

Five European clusters from France, Spain, the Czech Republic and Austria have launched the first Eurocluster approved by the European Commission for the mobility, transport and automotive ecosystem.
The Eurocluster RESIST: "REsilience through Sustainable processes and production for the European automotive InduSTry" aims to help SMEs in their green and digital transition process, as well as to increase their level of resilience in the face of upcoming challenges. To do this, it will mobilize more than €1 million in cascading funds through different calls related to five specific areas: networking, innovation, adaptation, training and internationalization. In addition, SMEs will be able to benefit from access to key information and studies focused on analysing future challenges, opportunities, needs, etc., as well as meetings with partners from other ecosystems. In this way, RESIST will function as a One-stop-shop where SMEs from the mobility, transport and automotive ecosystem will be able to access financing and implement projects that guarantee their sustainable growth.[137]

[136] Mobility Innovation Hub (MIH) - CzechInvest (mobility-hub.cz)

[137] The first Eurocluster of the mobility, transport and automotive ecosystem is launched | European Cluster Collaboration Platform

Denmark

Policy Review

Denmark's Recovery and Resilience Plan

Denmark's approach to sustainable mobility is highlighted by its Recovery and Resilience Plan, which allocates €1.625 billion towards environmental and digital initiatives. Notably, 69% of the funding supports climate goals and green transition, with a significant €27 million dedicated to reducing emissions from domestic ferries, essential for national connectivity.[138]

EV Tax Benefits and Subsidies

The tax benefits for electric and low-emission vehicles are particularly noteworthy, designed to incentivize the adoption of cleaner transport modes. Electric vehicles benefit from paying only 40% of the standard registration tax, along with an additional deduction of DKK 167,500 (€ 22400), and a DKK 1,300 (€155) deduction off the taxable value. Low-emission vehicles emitting less than 50g CO2/km are charged 50% of the full registration tax, with an extra deduction of DKK 48,750 (€6,500) and the same DKK 1,300 (€155) deduction off the taxable value. Furthermore, zero-emission cars are subject to the minimum semi-annual tax rate of DKK 340 (€ 45), underlining the financial advantages of choosing greener vehicles.[139]

Traffic and Mobility Plan for the Capital Region of Denmark

Additionally, the Traffic and Mobility Plan for the Capital Region of Denmark aims to enhance urban mobility. This plan focuses on improving transport infrastructure for citizens and commuters, addressing urbanization challenges and promoting efficiency and environmental sustainability. Together, these measures illustrate Denmark's commitment to leading in sustainable mobility.[140]

Technological Advancements

Clever, a prominent Danish EV charging station operator, offers more than 4,500 public charging stations across Denmark. With the GO TO-U app, accessing these stations and utilizing the charging service is now hassle-free. Users can conveniently locate the nearest Clever A/S station and monitor its availability. The app allows simultaneous monitoring of up to three stations for 12 hours, with the option to activate "Active Monitoring" for real-time notifications regarding connector status changes (free/busy). This feature enables users to plan charging sessions accurately, adjust travel routes, and minimize the chances of encountering a fully occupied charging station.[141]

Infrastructure Development

The Danish parliament has reached a consensus across various political parties to allocate approximately €22 billion for infrastructure development until 2035, marking the largest such plan in Denmark's history. The primary objective is to enhance connectivity between different regions while addressing traffic congestion without compromising environmental sustainability. Funding this year will also go toward refurbishing S-train stations in Copenhagen. Moreover, about €9 billion are allocated for the improvement and expansion of the country's road network, including the construction of nine new motorways, notably one spanning the Limfjord fjord west of Aalborg in North Jutland. Notably, this infrastructure plan prioritizes carbon neutrality, distinguishing it from previous initiatives in Denmark.[142]

Between 2014 and 2029, Banedanmark is undertaking a significant project to electrify the bulk of the Danish regional rail network. By the conclusion of this period, around 1,150 kilometres of track will be prepared to accommodate electric trains, a move away from diesel power. To date, 1,756 kilometres of railway have been successfully electrified, marking a substantial step towards a sustainable and efficient future for Denmark's rail transportation.[143]

EV Charging Infrastructure

In 2023, Denmark's EV charging infrastructure expanded to a total of 23,072 charging points, marking a significant increase from the 10,843 charging points available at the beginning of the year. This represents a remarkable growth rate of approximately 112.5% within the same year. Furthermore, the development of Ultrafast-High power charging stations (≥ 150kW) experienced substantial growth, with their numbers more than tripling, rising from 243 in 2021 to 784 in 2022.[144][145]

Denmark encourages the installation of charging infrastructure by providing financial support to private homeowners, businesses, and municipalities. Additionally, the government has allocated funding to expand public charging infrastructure across the country.[146]

---

[138] Denmark's recovery and resilience plan - European Commission (europa.eu)
[139] Electric-Vehicles-Tax-Benefits-Purchase-Incentives-2022.pdf (acea.auto)
[140] Traffic_and_mobility_plan_for_the_CapitalRegion_UK_Final.pdf (regionh.dk)
[141] Over 4,500 Clever A/S Chargers Available in the GO TO-U App (parking.net)
[142] DSB preselects bidders for their upcoming automated S-trains | RailTech.com
[143] Electrification Programme | UkBane
[144] Denmark | European Alternative Fuels Observatory (europa.eu)
[145] Denmark – EV Adoption per Year (ieahev.org)
[146] Incentives and Legislation | European Alternative Fuels Observatory (europa.eu)

Market Trends and Consumer Behavior

Denmark has one of the highest rates of new car registrations in Europe, with 25 new cars per 1,000 inhabitants. This indicates a strong automotive market in Denmark compared to many other European countries[147]. In 2022, the number of battery electric passenger cars surged, surpassing 100,000 in total, marking a growth rate of 69%. Battery electric vehicles (BEVs) accounted for 20% of new passenger car registrations, indicating a preference for them over internal combustion engine cars. BEVs also surpassed hybrid electric vehicles (HEVs) and plug-in hybrid electric vehicles (PHEVs) in both new registrations and total stock, with PHEV registrations comprising about 18% of total registrations in 2022. Moreover, electric buses dominated new registrations, accounting for 60% compared to 35% in 2021.[148]

Public Transportation Systems

Denmark's public transport system exemplifies sustainable mobility with a well-integrated network of buses (in 2023, 8.2% powered by battery electricity, and 2.1% powered by natural gas as their energy source)[149], trains, and cycling infrastructure, complemented by urban transport solutions like the Copenhagen Metro, operating 24/7 for efficient city navigation. Significant government investment aims to enhance this network further, including the ambitious Cityringen metro expansion and upgrades to the railway signalling system for improved punctuality and capacity. This holistic approach not only promotes green transportation but also aims to increase public transport's market share by 50% before 2030.[150] [151]

Environmental Impact and Emissions

In 2020, the country pledged a 2030 target of a 70% emissions reduction and climate neutrality by 2050. CCPI experts say its climate neutrality goal might be reached a decade early based on current performance.[152] In Denmark, the transport sector is the largest contributor to energy-related greenhouse gas (GHG) emissions, representing 40% of the total emissions, and is the second-largest consumer of total final energy consumption (TFEC), accounting for 30% of the total.[153]

Denmark is actively working to reduce the environmental impact of its transport system while maintaining a high level of mobility. The country has invested in a comprehensive and modern network of public transport, including a state-of-the-art driverless metro in Copenhagen and light railways in other major cities. These initiatives are part of a broader Danish approach promoting green mobility, aiming for a significant reduction in emissions and a transition towards greener transport solutions. Additionally, Denmark is leading in Europe with 78% of new urban buses being electric, showcasing the country's commitment to zero-emission public transportation. This move towards electric and hybrid buses is part of Denmark's efforts to create urban spaces with minimal inconvenience from traffic and to promote the development of new and greener transport technologies . [154] [155]

Economic and Social Implications

In 2021, Denmark distinguished itself in Europe by allocating nearly 1.25% of its GDP to environmental taxes on transport, reflecting its commitment to sustainable mobility. The automotive sector's contribution to direct employment in Denmark remains modest at 1.2%, one of the lowest in Europe. [156]

The Central Denmark Region, with its 1.3 million residents, emerges as Jutland's most populated zone, praised for prioritizing green and active transportation. This region is equipped with an extensive network of high-quality cycling paths that facilitate both daily commutes and leisure activities, enhancing the cycling culture across its 19 municipalities. Municipalities like Halsnæs, Frederiksberg, and Odder report the shortest commute distances, emphasizing the country's efficient mobility solutions. With an average commute of 22.2 kilometres in 2021, Denmark's focus on improving transportation infrastructure and promoting environmentally friendly travel options highlights its leadership in advancing mobility sustainability. [157][158]

Best Practices and Case Studies

Copenhagen's mobility plan aims for 75% of all city trips to be made by walking, biking, or public transport. To achieve this, the plan focuses on reducing car usage, enhancing the metro system, and improving traffic management. These strategic areas are designed to foster a more sustainable, efficient, and accessible urban transportation network, aligning with the city's environmental goals and commitment to promoting active mobility among its residents.[159]

The Danish S-Bahn has transitioned entirely to Communication Based Train Control (CBTC), the latest signalling system for urban railways. In the first two months of 2023, customer punctuality reached a historically high level of 97 percent, as reported by rail infrastructure manager Banedanmark.[160]

Future Perspectives and Emerging Trends

Denmark is currently striving for a 70% reduction in economy-wide greenhouse gas (GHG) emissions by 2030, compared to 1990 levels. The transport sector,

[147] ACEA Auto – The Automobile Industry Pocket-Guide-2023-2024.pdf
[148] Denmark – EV Adoption per Year (ieahev.org)
[149] ACEA-Report-Vehicles-on-European-roads-.pdf
[150] https://lifeindenmark.borger.dk/travel-and-transport/Getting-around
[151] Current-status-of-public-transport-in-Denmark
[152] Transport weighs down Denmark's world-leading energy policy | Sustainability Magazine
[153] Denmark 2023 - Energy Policy Review (windows.net)
[154] Urban_transport_in_Denmark_efficient_and_innovative
[155] Denmar, Luxembourg and Netherlands lead the way on emissions-free buses
[156] ACEA Auto – The Automobile Industry Pocket-Guide-2023-2024.pdf
[157] Here are Denmark's longest commutes (thelocal.dk)
[158] Home to work commuting - Statistics Denmark (dst.dk)
[159] Mobility – how we get around in the city | Urban Development (kk.dk)
[160] Danish S-Bahn runs with record punctuality with help of new signalling | RailTech.com

particularly private road cars, accounts for a significant portion of these emissions, necessitating substantial reductions in the sector's emissions by 2030. Looking ahead to 2030 and 2035, electric vehicles (EVs) are expected to emerge as the primary alternative to internal combustion engine (ICE) drivetrains. While hydrogen-related fuels and drivetrains may have potential, especially in freight and heavy-duty transport, further development is needed to determine which technologies will dominate as ICE drivetrain alternatives across different segments of road transport.
The 2020 Agreement on Green Transport incentivized vehicle adoption through taxation policies. These measures, coupled with a green tax reform, are gradually advancing the decarbonization efforts within Denmark's transport sector. The government intends to reassess the Agreement on Green Road Transport by 2025.[161]

International Comparisons and Collaborations

One prominent example of Denmark's international engagement in green transportation is its participation in the Electric Vehicles Initiative (EVI), a multi-government policy forum under the Clean Energy Ministerial (CEM). This initiative is dedicated to accelerating the introduction and adoption of electric vehicles worldwide. Denmark, along with other member countries, shares best practices, policies, and strategies to promote electric vehicles, demonstrating its commitment to reducing greenhouse gas emissions and enhancing energy security.[162]

[161] Denmark 2023 - Energy Policy Review (windows.net)

[162] Electric Vehicles Initiative – Programmes - IEA

Estonia

Policy Review

Estonia's Recovery and Resilience Plan

Estonia's Recovery and Resilience Plan, valued at €953 million, is a significant step towards addressing the country's economic and environmental challenges. The plan encompasses 28 investment streams and 17 reforms, with a robust focus on sustainability: 59% of the budget is earmarked for supporting climate objectives, and 24.1% for fostering the digital transition. This strategic allocation of funds is particularly crucial as Estonia seeks to decarbonize its economy, a task that includes reducing dependency on oil shale for electricity generation, enhancing the energy efficiency of buildings, and improving the sustainability of its transport sector. [163]

EV Tax Benefits and Subsidies

Despite the lack of tax benefits for electric vehicles (EVs), Estonia has implemented incentives to encourage the adoption of new M1 battery electric vehicles (BEVs) and fuel cell electric vehicles (FCEVs), offering €5,000 per vehicle for individuals and €4,000 for legal entities.[164]

Further advancing its commitment to a greener future, Minister of Economic Affairs and Infrastructure Taavi Aas signed a draft transport and mobility master plan. This ambitious strategy outlines the direction for the next 15 years, aiming to create a more sustainable and safer transport system while prioritizing the strategic development of mobility in Estonia.[165]

Technological Advancements

Elmo, a startup headquartered in Tallinn, has recently obtained €2.6 million in funding. Specializing in deep-tech solutions for remotely controlled cars and offering eco-friendly car-sharing services, the company intends to utilize the funding to expedite the licensing of its advanced remote-control technology in international markets and to bolster its team of experts for the development of next-generation solutions.[166]

Infrastructure Development

The Rail Baltica project aims to construct 53 kilometres of high-speed rail in Estonia, with published tenders estimating a total cost of around US $437 million. This initiative seeks to integrate the Baltic states into the European rail network via an 830-kilometer line stretching from Helsinki, Finland, and Tallinn, Estonia, in the north, to Warsaw, Poland, in the south.[167]

Estonia is actively enhancing its transport and mobility infrastructure with a focus on sustainability and environmental responsibility. The government's 15-year master plan aims to modernize the transport system, making it safer and more eco-friendly, while also prioritizing strategic mobility development. This includes substantial investments in public transport to make it a more attractive alternative to private car use, and the integration of low-carbon fuels across various transport modes to align with Estonia's climate goals for 2050. Moreover, Estonia is committed to improving the accessibility and convenience of public transport through the development of a unified ticketing system and the promotion of cycling and walking. These efforts are part of a broader vision to reduce the transport sector's environmental footprint and contribute to a more sustainable future. [168] [169] [170]

Rail network

Estonia has a railway network spanning around 1,200 kilometres in total, with electrified tracks solely concentrated in the Tallinn region, covering 134 kilometres. Estonia is advancing its rail network towards modernization and sustainability, focusing on expanding the electrification of its tracks through a collaboration between Eesti Raudtee and engineering firms. The Rail Baltica project, a significant component of this initiative, aims to connect the Baltic States with a high-speed, environmentally friendly rail link to the rest of Europe. Additionally, the integration of GIS software by RB Rail AS and Esri will further enhance the planning and management of the rail infrastructure.[171] [172] [173]

EV Charging Infrastructure

Currently, Estonia boasts a network of over 10 companies managing EV charging infrastructure, totalling thousands of chargers. The largest operators, namely Enefit VOLT, Eleport, and Alexela, contribute 560 charging points, distributed across both urban and rural landscapes.[174] Estonia boasts the world's first nationwide EV fast-charging network, with 165 stations ensuring accessibility in every town and major village. This network, characterized by its uniform payment system and strategic placement along highways, was

[163] Estonia's recovery and resilience plan - European Commission (europa.eu)
[164] Electric_cars-Tax_benefits__purchase_incentives_2023.pdf (acea.auto)
[165] Estonia's vision for transport and mobility: A more people-centred, greener and smarter infrastructure | Majandus- ja Kommunikatsiooniministeerium (mkm.ee)
[166] Estonian deeptech startup has raised up to €2.6M to launch eco-sustainable remotely controlled cars and expand globally - ArcticStartup
[167] Tender for development of 53km of high-speed rail in Estonia launched (meconstructionnews.com)
[168] Estonia's vision for transport and mobility: A more people-centred, greener and smarter infrastructure | Majandus- ja Kommunikatsiooniministeerium (mkm.ee)
[169] Estonia: City of Tallinn takes €100 million EIB loan for better urban infrastructure
[170] Space and mobility | Eesti Vabariigi Valitsus
[171] GRK selected to electrify Estonia's railway lines – cost of the project nearly EUR 80 million - GRK
[172] A more modern and sustainable rail network for Estonia - Ayesa
[173] Construction agreement for the initial section of the Rail Baltica mainline in Estonia signed (baltictimes.com)
[174] In Estonia, there's always a charger nearby — Invest in Estonia

financed through CO2 emission quota sales, emphasizing Estonia's commitment to sustainable transportation.[175] [176]
On July 12, 2023, the Management Board of Ignitis Group approved an investment decision by its subsidiary, Ignitis, to invest up to €115 million over a period of 3–5 years. The investment is intended to develop an EV charging network in the Baltics, with Ignitis and its subsidiaries in Latvia and Estonia spearheading the initiative. The primary objective of this investment is to acquire EV charging stations and enhance the charging network infrastructure across the Baltic states. This strategic investment aligns with Ignitis Group's goal of expediting the development of the EV charging network, aiming to establish the largest fast charging network in the Baltics. Ignitis aims to deploy up to 3,000 EV charging points by the conclusion of 2026.[177]

Market Trends and Consumer Behavior

In 2023, Estonia saw EVs make up 6.3% of its new car sales, with a total of 1,445 units sold. However, EVs only constitute 0.7% of the total vehicles on Estonian roads. The country recorded the sale of 16 new cars per 1,000 inhabitants in 2022. Market trends and consumer behaviour in Estonia's mobility and automotive sectors are increasingly reflecting a global shift towards sustainability. Post-COVID-19, a growing environmental consciousness among Estonian consumers is evident, aligning with the global trend where 82% of consumers have reported a heightened sustainability awareness. This shift in priorities is steering Estonian consumers towards more eco-friendly mobility options, including electric vehicles. This trend is further supported by Estonia's leading role in establishing a comprehensive nationwide EV fast-charging network, facilitating a move towards greener transportation options.[178] [179]

Public Transportation Systems

Estonia's public transport system is notably progressive and innovative, particularly in its capital, Tallinn, and has been evolving to meet the needs of its residents and the environment. As of July 1, 2023, the Ministry of Regional Affairs and Agriculture coordinates the development of both county and nationwide public transport, focusing on planning and organizing bus, ferry, and plane transportation according to demand. This initiative is part of a broader strategy to make public transport more accessible and reduce the social and economic costs associated with transport, energy, and infrastructure. [180]
An integral part of Estonia's approach to enhancing its public transport system is its emphasis on sustainability and climate action. The country's transport sector has undergone strategic planning to support the development of a Transport and Mobility Master Plan for 2021-30. This plan includes assessing key aspects of transport policy and proposing reforms aimed at improving infrastructure, integrating technology, and promoting sustainable mobility options.[181]
Since July 1, 2018, fare-free bus transportation has been available for everyone in most Estonian counties. However, on November 8, 2023, Estonia's Regional Ministry announced the cessation of its complimentary bus program, redirecting funds towards the enhancement of its public transportation infrastructure.[182]

Environmental Impact and Emissions

The typical environmental footprint of an Estonian exceeds the planetary boundary by 3.8 times, whereas that of a European surpasses it by 2.9 times. Regarding the environmental impact of transportation facilitating mobility, it accounts for 26%. Despite having one of the oldest car fleets in Europe, Estonia's environmental footprint from mobility is lower than the European average. This distinction is due to lower air travel rates in Estonia; while air transport contributes 27% to the environmental footprint of mobility in Europe, it only constitutes 2% in Estonia.[183]

Economic and Social Implications

Estonia aims for seamless multimodal mobility, envisioning convenient movement for all without car ownership. Efforts are underway to integrate public transportation, micromobility, and other transport modes, providing comfortable and eco-friendly alternatives. Estonia was among the first countries to legalize testing of self-driving vehicles on public roads in 2016, with autonomous buses already operational in city traffic. Plans include implementing Mobility as a Service (Maas) in larger cities and utilizing demand-responsive transportation in rural areas due to sparse populations. Contactless bank cards are widely accepted across Estonia's public transport, simplifying fare payment through mobile devices or directly at validators.[184]

Best Practices and Case Studies

Estonia is actively enhancing its transport infrastructure to support fully autonomous driving, improve traffic flow, and enhance safety. This includes the implementation of smart and digitalized features like smart pedestrian crosswalks, bus stops, and road pavement, aimed at creating a smoother and safer traffic environment. Additionally, Estonia has developed a web-based weather information service, drawing data from various sources to aid in autonomous winter road maintenance and provide real-time updates on weather and road conditions. AI-based technologies are also employed,

[175] Electric charging network growing at lightning pace in the Baltics | News | ERR
[176] Estonia first in the world to open nationwide EV fast-charging network (estonianworld.com)
[177] Ignitis will invest up to EUR 115 million to develop an EV charging network in the Baltic states | Ignitis grupė (ignitisgrupe.lt)
[178] Car dealers: E-vehicle prices still too high to be mass-market product in Estonia | News | ERR
[179] ACEA Auto- The Automobile Industry Pocket-Guide-2023-2024.pdf
[180] Public transport in Estonia | Transpordiamet
[181] The Future of Passenger Mobility and Goods Transport in Estonia | ITF (itf-oecd.org)
[182] Estonia to end free bus travel over lack of funds - Latest News (hurriyetdailynews.com)
[183] The average environmental footprint of residents of Estonia and Europe - Arenguseire Keskus
[184] Seamless Passenger Mobility - e-Estonia

such as Tallinn's use of AI to prevent obstructions at intersections. Moreover, Estonia's comprehensive digital twin coverage facilitates the collection of crucial 3D data for autonomous vehicles, managed through an AI platform and mobile mapping system to streamline data processing efficiently and cost-effectively.[185]
Tallinn has been honoured as the European Green Capital for 2023, a testament to its proactive measures in fostering a sustainable urban environment, advancing green economic growth, and safeguarding natural habitats. The city has embraced several innovative environmental policies, including the transformation of urban landscapes to enhance green spaces, eco-friendly public transportation options for better air quality, and the support of biodiversity through initiatives that engage residents directly. These initiatives enable citizens to contribute to the creation of nature-inspired solutions, like community gardens, showcasing Tallinn's commitment to collaborative and sustainable urban development.[186]

Future Perspectives and Emerging Trends

Emerging trends within the country indicate a shift towards micro-mobility solutions and the development of intelligent, interconnected transportation systems that utilize data analytics and the Internet of Things (IoT) to offer more efficient, user-focused services. Estonia's commitment to green initiatives is further evidenced by investments in upgrading tram networks and the ambitious plan to eliminate diesel and hybrid buses by 2025. These initiatives align with Estonia's broader environmental objectives and its ambition to be recognized as a leader in creating a sustainable future for transportation, enhancing the quality of life for its residents, and contributing to global efforts to combat climate change and promote sustainable development.

International Comparisons and Collaborations

In a pioneering partnership, Elonroad from Sweden and Estonia's Elmo are joining forces to create an innovative stationary charging track for electric vehicles (EVs). This initiative aims to revolutionize the way EVs are charged and foster the adoption of sustainable transportation technologies. Alongside, the Rail Baltica project stands as a testament to Estonia's dedication to sustainable transportation. This ambitious railway infrastructure project aims to connect the Baltic States with Poland, and possibly Finland, by introducing high-speed rail services that promise to lower carbon emissions and improve regional connectivity. With an anticipated completion date in 2030, Rail Baltica is set to make a significant impact on the region's transportation landscape, underscoring Estonia's commitment to environmental sustainability and enhanced mobility .[187][188]

[185] Intelligent Transport Infrastructure - e-Estonia
[186] Tallinn 2023 - European Commission (europa.eu)
[187] Nordic innovators join forces to charge shared EVs on Estonian roads — Invest in Estonia
[188] Rail Baltica Official Website | Rail Baltica

Finland

Policy Review

Finland's recovery and resilience plan

Finland's participation in the EU recovery and resilience plan involves a €1.95 billion allocation, aimed at fostering economic recovery and resilience. The plan comprises 40 investment streams and 19 reforms, with a significant focus on environmental and digital advancements: 52.3% of the funds are dedicated to supporting climate objectives, and 28.9% are allocated to enhance the digital transition. Specifically, €13.6 million is earmarked for green transportation initiatives, including the development of private and public charging stations for electric vehicles, as well as gas charging and refuelling infrastructure.[189]

EV Tax Benefits & Subsidies

Regarding EV incentives in Finland, the country has implemented several measures to encourage the adoption of zero-emission vehicles. Since 1 October 2021, zero-emission passenger cars and vans are exempt from registration tax. Additionally, there are tax deductions of €170 per month from the taxable value for battery electric vehicles (BEVs) from 2021 to 2025, and charging EVs at the workplace is exempt from income tax during the same period. Households can also avail of a purchase incentive of €2,000 for buying or leasing new BEVs, with certain conditions, valid from 2018 to 2023. Furthermore, electric vans and trucks are eligible for purchase incentives ranging from €2,000 to €50,000, depending on the vehicle type and the year of purchase or lease.[190]

The current state of mobility plans in Finland highlights a commitment to sustainable urban mobility and environmental protection. The Finnish government approved the first National Transport System Plan for 2021–2032, following its submission to Parliament in 2021. In addition to the national plan, several Finnish cities have developed sustainable mobility plans, totalling 11 across the country. These plans adhere to the key elements of the Sustainable Urban Mobility Plan model, with a shared goal of promoting sustainable urban mobility, minimizing traffic emissions, and creating a sustainable living environment.[191]

Technological Advancements

Finland could be on the verge of introducing its inaugural aerial tramway following the City of Lahti's signing of a letter of intent with Finnish start-up UDT Technologies. The agreement aims to explore innovative approaches to enhance the city's transportation and logistics. The city is exploring the possibility of installing an aerial tramway on the Lahti campus of LUT University. This system would potentially transport people or goods in capsules, offering a novel solution to transportation challenges.[192]

Siemens Mobility and Pääkaupunkiseudun Junakalusto Oy, a Finnish rolling stock ownership company, have embarked on a significant collaboration to pilot the European Train Control System (ETCS) in Finland. This initiative is a critical step towards modernizing Finland's railway infrastructure and enhancing the safety and efficiency of its rail services. The ETCS is a cornerstone of the European Union's efforts to standardize railway signalling systems across its member states, aiming to create a seamless and interoperable rail network across Europe.[193]

Infrastructure Development

The Finnish Transport Infrastructure Agency (FTIA) is committed to developing a safe, functional, and environmentally sustainable transport system, addressing critical issues like climate change, environmental protection, and resource conservation. Faced with the challenges posed by climate change, particularly the increasing difficulty and cost of winter maintenance for both roads and railways due to harsher weather conditions, FTIA emphasizes the need for adaptive measures. These include enhancing the structural and technical resilience of the transport network and making significant investments in winter maintenance to ensure the uninterrupted and safe flow of traffic. Through these efforts, FTIA aims to maintain the efficiency and reliability of Finland's transport infrastructure amidst evolving environmental challenges.[194]

EV Charging Infrastructure

As of the end of 2022, Finland had a total of 5,514 public EV charging points, with 4,433 being slow chargers (<22kW) and 1,081 being fast chargers (>22kW).[195] Finland is actively expanding its electric vehicle (EV) charging infrastructure, supported by investments from both the European Union and private enterprises. As of the end of 2022, Finland boasted 5,514 public EV charging points, which included a mix of slow and fast chargers. This development reflects Finland's commitment to reducing 'range anxiety' and supporting the growth of its EV fleet.

Additionally, Finnish companies like Plugit Finland are leading the charge in innovative charging solutions, investing significantly in the charging infrastructure and

[189] Finland's recovery and resilience plan - European Commission (europa.eu)
[190] Electric-Vehicles-Tax-Benefits-Purchase-Incentives-2022.pdf (acea.auto)
[191] National Transport System Plan for 2021–2032 (valtioneuvosto.fi) Finland - European Commission (europa.eu)
[192] Lahti mulls Finland's first aerial tramway | Yle News | Yle
[193] Siemens Mobility equips trains in Finland with ATO and ETCS for initial testing | Press | Company | Siemens
[194] Frontpage - Finnish Transport Infrastructure Agency (vayla.fi)
[195] Finland EV Profile: Upbeat Outlook For Shift To E-Mobility Despite Limited Incentives (fitchsolutions.com)

introducing service models like Charging as a Service (CaaS) to facilitate the transition to emission-free traffic. These initiatives are part of a broader strategy to enhance Finland's EV ecosystem and promote sustainable mobility. [196]

Kempower, a Finnish manufacturer of charging hardware, has secured significant funding from the state economic development agency Business Finland for its "Heavy Electric Traffic Ecosystem" development program. The aim is to develop "high-power charging solutions for electric trucks."[197]

Finland is advancing its infrastructure with a dual focus on enhancing its transport system for resilience against climate change and expanding its electric vehicle (EV) charging network, boasting 5,514 public charging points as of the end of 2022. The Finnish Transport Infrastructure Agency (FTIA)'s efforts in winter maintenance and structural adaptations, alongside innovations by companies like Plugit Finland and Kempower in charging technology, underline a comprehensive approach to sustainable mobility. This strategic direction not only addresses environmental challenges but also supports the growth of an emission-free transport ecosystem, demonstrating Finland's commitment to sustainable infrastructure development.

Market Trends and Consumer Behavior

In the first ten months of 2023, Finland experienced a significant surge in battery electric vehicle (BEV) sales, which increased by 126.2% from the previous year to 25,118 units, as highlighted by the ACEA. In contrast, the growth in plug-in hybrid electric vehicles (PHEVs) was more modest, with sales up 10.7% to 15,133 units. BEVs and PHEVs together now account for more than half of all new car sales in the country. Among the popular electric vehicle brands are Tesla, with its Model Y, Skoda's Enyaq, and Volkswagen. However, with new car registrations per 1000 inhabitants at 15, Finland's rate is below the European average. [198][199]

The data reflects a robust upward trend in Finland's electric vehicle market, particularly for BEVs, indicating a strong shift towards greener, more sustainable personal transport options. The considerable difference in growth rates between BEVs and PHEVs suggests a growing consumer preference for fully electric vehicles over hybrids. This shift is supported by the introduction of models from leading EV brands, contributing to the increasing market penetration of electric vehicles in Finland. Despite this positive trend in EV adoption, Finland's overall rate of new car registrations remains below the European average, hinting at potential market growth areas or different mobility preferences within the Finnish population.[200]

Public Transportation Systems

Finland boasts a well-developed transportation infrastructure, including extensive air, rail, road, and water networks, essential for navigating the considerable distances between its cities. The country's rail system spans across its geography, complemented by 20 airports, with Helsinki-Vantaa (HEL) being the largest for both domestic and international travel. Additionally, Finland's bus network, which covers over 90% of public roads, is among the most extensive in Europe. [201]

Finland's public transport system is characterized by a strong commitment to sustainability, digitalization, and innovative mobility solutions. The country is actively working towards creating the world's safest, smoothest, and most environmentally friendly transport system. A key focus is on leveraging digitalization to enhance the transport system's efficiency and to foster the development of new services. This approach includes building a comprehensive real-time situational picture of traffic events and infrastructure across land, sea, and air through the digital platform of traffic data and collaborative efforts among transport operators.[202]

In the realm of sustainable urban mobility, Mobility as a Service (MaaS) plays a crucial role, with public transport serving as its backbone. Finland aims to offer better connections and an integrated system between public transit and other services, thus effectively responding to passenger needs. This effort is supported by public-private partnerships and the promotion of sustainable mobility initiatives, such as those implemented by Helsinki Region Transport (HSL), which covers a significant portion of public transport boardings in Finland. HSL focuses on providing easy, affordable, and efficient mobility through a variety of modes accessible with one ticket, alongside promoting the creation of innovative services through an open data policy.[203]

Currently, electric buses constitute 4.9% of Finland's bus fleet. Nobina, a leading public transport operator in the Nordic region committed to sustainable transport solutions, is set to expand its operations in Finland with 34 new electric buses, aiming to reduce emissions and create a quieter traffic environment.[204]

Environmental Impact and Emissions

Transport contributes to nearly one-fifth of all greenhouse gas emissions, with road transport alone responsible for around 16% when including land use, land-use change, and forestry (LULUCF) emissions, and about 19% when excluding them. In 2020, domestic road transport emitted an estimated 10.4 million tonnes of carbon dioxide. Passenger transport contributed roughly 6.5 million tonnes, while goods transport contributed approximately 3.3 million tonnes.[205] In 2019,

[196] Plugit Finland will invest 100 million euros in Finnish Electric Vehicle (EV) charging infrastructure - Plugit Finland
[197] Finland supports Kempower's initiative for electric truck charging ecosystem | electrive.com
[198] Finland EV Profile: Upbeat Outlook For Shift To E-Mobility Despite Limited Incentives (fitchsolutions.com)
[199] ACEA Auto- The Automobile Industry Pocket-Guide-2023-2024.pdf
[200] Finland EV Profile: Upbeat Outlook For Shift To E-Mobility Despite Limited Incentives (fitchsolutions.com)
[201] Commuting and transport - Work in Finland
[202] Digitalisation boosts the development of Finland's transport system and new services | Fintraffic in English
[203] HSL Helsinki Region Transport – efficient and sustainable public transport in the Helsinki region – Future Mobility Finland
[204] Nobina to develop city transport in Oulu, Finland from June 2024 (intelligenttransport.com)
[205] Roadmap of carbon neutral transport - Autoalan Tiedotuskeskus

Finland's total emissions represented 1.5% of the EU's total emissions, marking a 22% reduction from 2005 to 2019.[206]
Finland's approach to sustainable transport is particularly crucial given its vast geographic area and the resulting longer transport distances for products and individuals compared to other European countries. This unique challenge has spurred Finland to develop and implement innovative and sustainable transportation solutions to minimize environmental impact while accommodating the necessary longer distances.[207][208]

Economic and Social Implications

In urban environments within Finland, residents benefit from a variety of sustainable mobility options, including an extensive public transportation network, and the availability of cycling and walking paths. These methods not only offer an eco-friendly commute but also integrate seamlessly into the daily lives of city dwellers.
Additionally, innovative transportation alternatives such as rideshare services, e-bikes, and electric scooters are increasingly accessible, enhancing urban mobility and contributing to the reduction of carbon emissions.
Despite the slightly longer commute times in metropolitan areas, the average duration of a one-way commute remains quite reasonable at 29 minutes, indicative of the efficient and well-connected urban transport systems.
In contrast, the reliance on personal vehicles is more pronounced in regions where distances between homes and essential services are greater. Finland's road infrastructure is notable for its constant maintenance, ease of navigation, and low congestion levels, facilitating a smoother driving experience. On a national scale, the average one-way commute time by car is 23 minutes, showcasing the effectiveness of Finland's transport infrastructure in accommodating both private and public modes of transport. The prevalence of cars, buses, and trains as the principal means of transportation underscores the country's commitment to providing diverse mobility options, catering to the varied needs and preferences of its population.[209]

Best Practices and Case Studies

Helsinki has emerged as the leading city globally in terms of future-ready urban transport, attributing this success to government investment, widespread adoption of electric vehicles, and robust public transportation. With a dependable rail network, low-emission zones, and extensive cycling infrastructure, Helsinki residents have numerous alternatives to using cars. The city aims to have 30% of all vehicles electric by 2030, and it's steadily advancing toward this target by installing hundreds of additional charging points, supported by a $14 million grant from Finland's central government.[210]
The city of Tampere has been recognized for its Sustainable Urban Mobility Plan, winning the 10th SUMP Award for its multidisciplinary approach that encourages active, safe, and environmentally responsible mobility choices. This award highlights Tampere's commitment to developing a comprehensive strategy that addresses the mobility needs of its residents while promoting sustainable transportation practices[211]
These initiatives collectively showcase Finland's commitment to enhancing sustainable mobility across its cities, aimed at not only improving the quality of urban life but also contributing significantly to the country's environmental sustainability goals.

Future Perspectives

Finland is forging a path towards sustainable mobility with ambitious goals to halve its traffic emissions by 2030 and achieve zero emissions by 2045, supported by advancements in electric vehicle adoption and innovative autonomous transport solutions. Key initiatives include the development of autonomous electric buses, the simplification of the EV charging ecosystem, and the popularization of Mobility as a Service (MaaS) to integrate various transport options seamlessly. Cultural shifts towards sustainable transport preferences among the Finnish population, coupled with the government's commitment to reducing fossil fuel dependency and promoting cycling, lay the groundwork for Finland to emerge as a leader in sustainable mobility in Europe. The nation's holistic approach, blending technological innovation, policy reform, and societal change, positions Finland to become a beacon of sustainable urban mobility on the continent.

International Comparisons and Collaborations

In the realm of international cooperation towards sustainable transportation, Finland showcases its commitment through active participation in two major initiatives. Firstly, Finland is among the sixteen countries engaged in the Electric Vehicles Initiative (EVI), a collaborative policy forum led by the International Energy Agency (IEA). The EVI aims to expedite the global uptake of electric vehicles, fostering a greener future in transportation. This initiative sees countries like Canada, Chile, China, France, Germany, India, Japan, the Netherlands, New Zealand, Norway, Poland, Portugal, Sweden, the United Kingdom, the United States, and Finland working together to share knowledge, strategies, and policies to accelerate the adoption of electric vehicles worldwide.[212]
Secondly, Finland's involvement in the Rail Baltica project underscores its dedication to enhancing European transport connectivity. On 1 February 2019, the Finnish government's Cabinet Committee on Economic Policy resolved to form Oy Suomen Rata AB, a limited liability company created to engage in Rail

[206] Climate action in Finland (europa.eu)
[207] Logistics and transport - Climate 2035
[208] Green transport flourishes in Finland - thisisFINLAND
[209] Commuting and transport - Work in Finland
[210] Why Helsinki is the best city for urban mobility? | World Economic Forum (weforum.org)
[211] Tampere Sustainability and Urban Mobility Plan 2021-2030 (tampere.fi)
[212] Electric Vehicles Initiative – Programmes - IEA

Baltica among other projects. This company, which is planned to include five subsidiaries, one of which will specifically focus on Rail Baltica, signifies Finland's efforts to strengthen its integration into the European rail network. By enhancing the rail connection from Helsinki and beyond, Finland aims to bolster sustainable transportation options across the region, further illustrating its proactive stance in international transport development efforts.[213]

[213] Rail Baltica Official Website | Rail Baltica

France

Policy Review

Farnce's Recovery and Resilience Plan

France's Recovery and Resilience Plan earmarks €40.3 billion for initiatives aimed at rejuvenation and reform, with a substantial focus on climate objectives (49.5%) and the digital transition (21.6%). Key investments in the green transition include €4.4 billion for railway modernization and significant tax incentives for the adoption of alternatively-powered vehicles.

EV Tax Benefits and Subsidies

France promotes electric, hybrid, and other low-emission vehicles through exemptions and bonuses, encouraging both household and corporate uptake. For example, eco-friendly vehicle purchases can attract bonuses up to €6,000, with additional incentives for heavy-duty electric vehicles and a scrappage scheme for low-emission cars and vans.

Mobility Orientation Law (LOM)

The Mobility Orientation Law (LOM), enacted on December 24, 2019, complements these financial incentives by prioritizing the energy transition within the mobility sector. It promotes public transport expansion, carpooling, and electric vehicle adoption, alongside providing local exemptions to the 80 km/h speed limit rule. This law is integral to France's strategy for decarbonizing transportation, a critical component of its climate objectives. [214]

Furthermore, France's commitment to sustainable mobility is underscored by its long-standing development of Sustainable Urban Mobility Plans (SUMPs), known locally as Plans de déplacements urbains (PDUs). Over 32 years, around 160 transport authorities have been engaged in either implementing or developing these plans, aiming to enhance urban transport networks and support eco-friendly transportation solutions, illustrating a comprehensive approach to achieving a greener future.[215] [216] [217]

Technological Advancements

In June 2023, Electreon secured a tender to launch France's first wireless Electric Road System (ERS) on a 2 kilometre stretch of the A10 highway southwest of Paris, incorporating its innovative wireless dynamic charging technology that allows electric vehicles (EVs) to charge while driving. Additionally, the project includes a static wireless charging system for parked vehicles, eliminating the need for cables. This dual charging approach addresses key challenges in EV adoption by extending vehicle range and reducing charging downtime, marking a significant step towards sustainable mobility in France.

The deployment of Electreon's technology signifies France's proactive stance in embracing advanced solutions for a greener transportation network, potentially revolutionizing infrastructure and mobility by reducing reliance on fossil fuels and promoting cleaner urban environments. This initiative is a pivotal move in Europe's transition towards sustainable transport, setting an example for global efforts to integrate electric roads into mainstream transportation infrastructure and achieve ambitious climate goals.[218]

Infrastructure Development

The Grand Paris Express, managed by Société du Grand Paris (SGP), is a metro rail project set to double the size of the Paris Metro network. It entails the construction of 200 kilometres of new fully-automated metro lines (Lines 15–18) extending to the north, south, east, and west of Paris. Services are expected to operate at a frequency of 2–3 minutes (90 seconds during peak hours).[219]

In May 2023, France revealed plans to invest €2 billion in the enhancement of cycling infrastructure nationwide. The French government has now issued its seventh call for cycling development projects as part of the country's 2023-2027 cycling and walking plan, allocating a budget of €125 million. By April 2024, this budget is anticipated to double, facilitating the implementation of additional projects.[220]

In the southwest of France, a significant rail project known as the "Grand Projet Ferroviaire du Sud-Ouest" (GPSO) will expand the high-speed rail network, connecting Paris to Bordeaux via two new lines: Bordeaux-Toulouse and Bordeaux-Dax. SNCF Réseau anticipates an increase of 5 million passengers annually on these routes. Construction on this €14 billion project is set to commence by the end of the year.[221]

EV Charging Infrastructure

By 2030, France aims to install over 400,000 electric vehicle charging points on its road network, including 50,000 fast charging points. Presently, the public network comprises more than 110,000 charging points, positioning France as the second best-equipped country in Europe, trailing the Netherlands and leading Germany. Last year, approximately 3,000 charging points were installed monthly, with 15% being high-power chargers, ten times faster than those installed in 2019, according to Clément Molizon, the general

[214] LOI n° 2019-1428 du 24 décembre 2019 d'orientation des mobilités (legifrance.gouv.fr)
[215] Zooming In On French Transportation | Institut Montaigne
[216] Zooming In On French Transportation | Institut Montaigne
[217] Electric-Vehicles-Tax-Benefits-Purchase-Incentives-2022.pdf (acea.auto)
[218] Charge as you Drive - France | Electreon
[219] Grand Paris Express - Improving Delivery Models (gihub.org)
[220] France: 125 Million Euros Towards Development Of Cycling Infrastructure (insideevs.com)
[221] New 14-billion-euro French high-speed train project taking shape | RailTech.com

delegate of Avere-France, the French association for electric mobility development. To support this endeavour, the government announced new measures, including an additional €200 million allocated for 2024-2027, supplementing the €320 million already earmarked for 2016-2023. Furthermore, the ministry revealed an additional €68 million in assistance for the development of fast and ultra-fast charging stations (exceeding 50 kW) and an increase in the tax credit for home charging points from €300 to €500 per station.[222]

Market Trends and Consumer Behavior

In France, the sustainable mobility market and consumer behaviour trends have been significantly influenced by various factors, including advancements in electric vehicle (EV) infrastructure, governmental policies promoting greener transportation, and a growing consumer preference for sustainable and accessible mobility solutions. The country has seen a notable shift towards electric vehicles, underpinned by improved charging infrastructure and supportive government initiatives, aiming to facilitate a transition to low-emission mobility. France has embraced autonomy level 3 cars and is setting the stage for the adoption of fully autonomous vehicles [223]

2023 was a banner year for electric vehicles (EVs) in France, buoyed by the introduction of more affordable models and substantial government subsidies. Sales of battery electric and plug-in hybrid vehicles soared, capturing 26% of the new car market—a remarkable 47% increase from the previous year. This surge resulted in 1,774,729 new EVs hitting the roads, significantly up from the 17% market share in 2022. Plug-in hybrids alone constituted 9% of these sales, underscoring a growing preference for electrified transport. The density of new car sales per 1000 inhabitants also reached 23, surpassing the European average and highlighting France's leading role in the electric mobility transition.[224] [225]

The Autonomy Paris 2023 conference highlighted several key trends shaping the future of sustainable mobility in France, such as the transformation of cities into smart mobility labs, the pivotal role of public transport in ensuring accessibility and inclusion, and the emergence of shared and micro-mobility solutions. These trends underscore the collaborative efforts of cities, public transport authorities, and private companies in redefining mobility to be more sustainable and user-centric. Additionally, the conference emphasized the urgent need to develop electric mobility infrastructure to support the growing adoption of EVs, alongside the corporate shift towards sustainable vehicle fleets.[226]

Public Transportation Systems

In France, buses hold a prominent position in the realm of public transportation, catering to the needs of both urban dwellers and those residing in rural areas. With an impressive 71% share of public transportation usage nationwide, buses are the backbone of the country's transit system, providing essential connectivity and accessibility to various communities. Meanwhile, in major cities such as Paris, Lyon, Toulouse, Marseille, Lille, and Rennes, the subway emerges as the second most favoured mode of transport, boasting a 49% usage rate. These underground networks efficiently navigate through bustling city centres, offering commuters a swift and reliable means of travel.[227]

Despite the extensive network of approximately 950,000 kilometres of roads and nearly 30,000 kilometres of railways spanning the country, a significant portion of French commuters, approximately 75%, opt for personal cars to commute to work. This reliance on private vehicles highlights a challenge in promoting sustainable mobility practices and reducing carbon emissions. However, public transportation still serves a vital role, accommodating approximately 9.1% of travellers and contributing to the overall transportation ecosystem.[228]

While France's transportation infrastructure is robust, the average commute time varies across regions. While some enjoy relatively short commutes of 1 to 29 minutes, a considerable segment of the population spends between 30 to 59 minutes commuting—a duration notably higher than the European average. This variance in commute times underscores the diverse transportation needs and challenges faced by different regions, highlighting the importance of tailored transportation solutions and infrastructure investments.[229]

In response to the evolving landscape of transportation, France implemented the New Railway Pact in 2018, a legislative initiative aimed at consolidating the nation's fragmented railway entities into a unified group. By streamlining operations and fostering competition within the domestic rail market, this pact sought to enhance efficiency, achieve financial stability, and modernize rail services. Moreover, the New Railway Pact incorporates social reforms, aiming to ensure equitable access to transportation services across various demographics. Through such measures, France demonstrates its commitment to establishing and maintaining a robust, efficient, and socially inclusive public transportation system that meets the diverse needs of its citizens while advancing sustainable mobility goals[230]

Environmental Impact and Emissions

Given France's considerable size, dense population, and significant contribution to greenhouse gas emissions, sustainable mobility plays a crucial role in addressing environmental concerns and mitigating climate change impacts. The transport sector stands out as the largest emitter of greenhouse gases in France, accounting for 30% of total emissions in 2021, with road transport alone responsible for 93.8% of these

[222] France reinvests in EV charging infrastructure to meet EU targets – Euractiv
[223] Mobility in France | Market Research Report | Euromonitor
[224] PFA - Plateforme automobile (pfa-auto.fr)
[225] ACEA-Pocket-Guide-2023-2024.pdf
[226] Autonomy Mobility World Expo 2023
[227] Public transport usage in France, by mode 2021 | Statista
[228] Zooming In On French Transportation | Institut Montaigne
[229] Key figures on European transport – 2023 edition (europa.eu)
[230] SNCF in 2020: New year, new group | SNCF

emissions. With an expanding population and increasing urbanization, the demand for transportation continues to rise, exacerbating environmental pressures. Sustainable mobility practices, such as promoting public transportation, investing in electric and hybrid vehicles, and developing cycling and pedestrian infrastructure, are essential for reducing reliance on fossil fuels and curbing emissions. By prioritizing sustainable mobility initiatives, France can not only combat climate change but also enhance air quality, reduce congestion, and promote healthier and more livable cities for its citizens.[231]

Economic and Social Implications

In rural areas across France, residents often face limited sustainable mobility options, relying heavily on personal vehicles due to inadequate public transportation infrastructure. Unlike urban environments where diverse options like extensive public transport networks, cycling paths, and walking routes are readily available, rural communities may lack such amenities, leading to increased carbon emissions and environmental impact. Furthermore, the geographical spread and dispersed nature of rural settlements contribute to longer commute times, exacerbating the reliance on personal vehicles. This dependence not only strains individual budgets due to fuel costs but also hampers efforts to reduce emissions and combat climate change.

However, the French government's initiatives to support EV adoption, such as the social leasing program for lower-income drivers, hold promise for rural areas as well. By making EVs more accessible and affordable, these measures can potentially alleviate some of the challenges associated with sustainable mobility in rural France. In 2024, the government plans to reduce spending by €200 million compared to 2023 to support EV adoption, which is expected to significantly influence the market this year. Additionally, France has launched a new social leasing initiative enabling lower-income drivers to lease electric cars for as little as €100 ($109) per month, with no down payment and, in some cases, free charging for six months. Initially limited to 20,000 to 25,000 applications, the program is set to expand in the future.[232]

Best Practices and Case Studies

In addition to efforts to address rural mobility challenges, France has also demonstrated a proactive approach to sustainable mobility in its urban centres. One notable example is the city of Montpellier, located in the south of France, which has implemented a free public transport policy inspired by Tallinn, Estonia. This initiative is designed to foster a more inclusive society by removing financial barriers to accessing public transportation, particularly for lower-income groups. By offering free public transport services, Montpellier aims to promote social equity, reduce reliance on private cars, and alleviate traffic congestion and air pollution in the city centre. [233]

Furthermore, France has implemented various urban mobility plans across different cities, including Paris, Lyon, and Bordeaux, to improve accessibility, efficiency, and sustainability in urban transportation systems. These plans often incorporate measures such as expanding public transport networks, promoting active modes of transportation like cycling and walking, implementing car-sharing schemes, and incentivizing the use of electric vehicles.[234] [235] [236]

Future Perspectives and Emerging Trends

France is making significant strides towards sustainable mobility, with ambitious targets aimed at reducing traffic emissions. The country aims to achieve a 40% reduction in greenhouse gas emissions from transport by 2030, aligning with its commitment to the Paris Agreement. This goal is supported by various initiatives, including the widespread adoption of electric vehicles (EVs), the expansion of public transport networks, and the promotion of active modes of transportation such as cycling and walking.

Cultural shifts towards sustainable transport preferences are evident in France, with an increasing number of people opting for greener modes of transportation. Initiatives like bike-sharing programs and carpooling services have gained popularity, reflecting a growing awareness of environmental concerns and a desire to reduce carbon emissions.

France's holistic approach to sustainable mobility, which combines technological innovation, policy reform, and societal change, positions the country as a notable player in the transition towards greener transportation solutions. By embracing sustainable mobility initiatives, France not only aims to reduce its environmental footprint but also to create more livable and resilient cities for its citizens.

International Comparisons and Collaborations

France demonstrates its commitment to sustainable transportation through active engagement in two prominent international initiatives. Firstly, it is one of sixteen nations participating in the Electric Vehicles Initiative (EVI), led by the International Energy Agency (IEA). The EVI aims to accelerate the global adoption of electric vehicles, thus advancing greener transportation practices worldwide. France collaborates with countries such as Canada, Chile, China, Finland, Germany, India, Japan, the Netherlands, New Zealand, Norway, Poland, Portugal, Sweden, the United Kingdom, and the United States within this initiative, sharing knowledge and policies to facilitate the transition to electric vehicles. [237]

Additionally, France is part of RESIST, the first Eurocluster approved by the European Commission, along with Spain, the Czech Republic, and Austria. This initiative serves as a one-stop-shop for SMEs within the

[231] GHG emissions from transport | Climate change observations 2023 (developpement-durable.gouv.fr)
[232] France has record year in EV sales | Electrek
[233] French city adopts free public transport policy 'inspired' by Tallinn | News | ERR
[234] Mobility & Transportation | Choose Paris Region
[235] Urban Mobility Master Plan – Lyon, France | ecosistema urbano
[236] Mobility. Promises of intermodality for sustainable mobility in Bordeaux | Centre Émile Durkheim (centreemiledurkheim.fr)
[237] Electric Vehicles Initiative – Programmes - IEA

mobility, transport, and automotive ecosystem, providing access to financing and support for sustainable growth projects.[238]

[238] European Cluster Collaboration Platform, Resilience Through Sustainable Processes and production for the European Automotive Industry

Germany

Policy Review

Germany's Recovery and Resilience Plan

Germany's recovery plan amounts to €28.7 billion, comprising €28 billion from the RRF grants and loans, with additional contributions from national resources. This comprehensive plan encompasses 26 investment streams and 15 reforms. Notably, 47% of the funds are allocated towards climate objectives, addressing Germany's imperative to decarbonize its industry. Transitioning to a more sustainable transport sector and improving energy efficiency in buildings are key components. Approximately €7 billion will be dedicated to greening the transport sector, supporting the adoption of electric vehicles, clean buses, and rail infrastructure. This initiative aims to facilitate the purchase of around 960,000 zero- or low-emission vehicles, contributing significantly to environmental sustainability.[239]

Tax Benefits and Subsidies

The recent regulatory changes aim to incentivize the adoption of electric and fuel cell vehicles while promoting environmental sustainability. Until December 31, 2025, electric and fuel cell vehicles registered are granted a 10-year exemption from taxes, extendable until December 31, 2030. Additionally, vehicles emitting less than or equal to 95g CO2/km are exempt from annual circulation tax. Furthermore, there's a reduction in the taxable amount for Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (PHEVs), with a further decrease for BEVs priced under €60,000. Until December 31, 2022, an 'innovation bonus' enhances incentives for new and used electric vehicles. Incentives are structured based on the net list price, with varying bonuses for vehicles priced below or above €40,000. Discussions are ongoing to potentially introduce stricter eligibility requirements to ensure the effectiveness of these incentives in achieving long-term environmental goals. Starting from January 1, 2024, the maximum net cost for eligible electric vehicles will be capped at €45,000. The federal subsidy will be reduced to €3,000 from €6,000, with manufacturers providing a matching contribution of €1,500.[240] [241]

Mobility Plans

Regarding sustainable mobility plans, regular meetings are held within the Association of German Cities (Deutscher Städtetag) where transport representatives from major German cities convene in the Fachkommission Verkehrsplanung. Additionally, the Deutsches Institut für Urbanistik, situated in Berlin, aids member cities in transportation planning matters by providing resources and conducting training sessions for practitioners in the field. These institutions serve as valuable networks and sources of information for urban transport planning. Moreover, both entities are members of the "National Task Force SUMP D," an initiative led by Civitas-Prosperity.[242]

Technological Advancements

Germany's role as a leading producer of automobiles has catalyzed numerous innovations in mobility technology. Recently, in Karlsruhe, a conference was convened to explore cutting-edge developments in this field. Researchers are focusing on the advancement of technologies for smart transport systems, aiming to revolutionize traffic management, alleviate congestion, and enhance road safety. By leveraging artificial intelligence and data analytics, they seek to establish an interconnected transport network capable of adapting to real-time conditions seamlessly.

Notable advancements include E.ON's establishment of a state-of-the-art e-mobility test and innovation centre, demonstrating a commitment to accelerating the adoption of electric vehicles and associated infrastructure. Additionally, Siemens Mobility's recent contract win to supply 90 extra-long electric trains underscores the country's dedication to sustainable transportation solutions on a large scale. [243][244]

Furthermore, Germany boasts a vibrant startup ecosystem, with many emerging companies at the forefront of transportation innovation. These startups are pioneering solutions across various domains, including micromobility and even the development of flying cars, indicating a diverse and dynamic landscape for sustainable mobility advancements in the country. As these innovations continue to evolve, Germany is poised to play a pivotal role in shaping the future of transportation worldwide. [245]

Deutsche Bahn, began the tender process for the next generation of ICE trains, according to current plants they should enter service in the early 2030s. The specifications set for the new generation of trains are a maximum length of 400 meters, a minimum speed of 300km/h, approximate capacity of 940 seats.[246]

Infrastructure Development

The nation has reached the midpoint of the Federal Transport Infrastructure Plan 2030, which earmarked €270 billion for investment in transport infrastructure between 2016 and 2030. Most of the funding is

[239] Germany's recovery and resilience plan - European Commission (europa.eu)
[240] BMWK - Regulatory environment and incentives for using electric vehicles and developing a charging infrastructure
[241] Electric-Vehicles-Tax-Benefits-Purchase-Incentives-2022.pdf (acea.auto)
[242] Germany - European Commission (europa.eu)
[243] E.ON opens largest manufacturer-independent test and innovation center for electromobility (eon.com)
[244] Siemens Mobility to Deliver 90 New S-Bahn Trains to Munich | Railway-News
[245] 10 German mobility startups and companies shaping the future of urban transportation | RST Software
[246] Final ICE 4 train leaves Siemens Mobility centre | RailTech.com

allocated to railways and roads, with several autobahn projects underway, alongside the Stuttgart and Hamburg rail initiatives, and an expansion project at Frankfurt airport.[247]
Construction is currently in progress on Europe's longest undersea tunnel (18 km), connecting Germany and Denmark. The Fehmarnbelt Fixed Link, scheduled to be operational by 2029, will feature two double-lane highways and two electrified rail tracks[248]
These infrastructure developments not only aim to improve connectivity and ease congestion but also play a crucial role in promoting sustainable mobility. Investments in railways and electrified rail tracks support the shift towards greener transportation options, reducing carbon emissions and promoting more environmentally friendly travel. Additionally, the emphasis on efficient road networks and the integration of multimodal transport systems contribute to enhancing accessibility while minimizing the environmental impact of transportation infrastructure projects.

EV Charging Infrastructure

Germany now has more than 100,000 public electric car charging points, of which just over 18,000 are fast-charging stations. However, according to an assessment published by the German Association of the Automotive Industry (VDA), 48% of the country's 10,773 communities still do not have a single public charging station.[249]
In 2022, the German government greenlit a plan to inject €6.3 billion over a span of three years aimed at swiftly expanding the network of electric vehicle charging stations across the country. Beginning next summer, an additional €400 million will be earmarked for companies interested in constructing rapid-charging infrastructure tailored for both cars and commercial trucks. Moreover, an emergency program totalling €8 billion was sanctioned in June, which includes a provision of €200 million specifically allocated for the establishment of fast-charging hubs in urban areas, among other initiatives. Another critical concern in the country that demands attention to facilitate the advancement of electromobility is the capacity of the electrical grid, which holds significant importance[250]

Rail network

On average, rail passengers in Germany travel 650km (2021)[251]. 75% of the German rail network is to be electrified by 2030, compared with 62% at present. Looking at the individual German states, regional differences in electrification levels are striking, with the city-states of Bremen (89%) and Berlin (84%) leading the way, closely followed by Saarland (81%) and Hamburg (76%). This is followed by Rheinland-Pfalz (42 %) and Thuringia (34 %). At the bottom of the league in terms of electrified lines is Schleswig-Holstein (27%).[252]

Market Trends and Consumer Behavior

Germany's prominent position as Europe's largest car producer is reflected in the robust performance of its automotive industry, with 3.3 million cars manufactured in 2023, marking a notable 13.2% improvement over the previous year. This surge in production underscores the country's continued dominance in the automotive sector and its significant contribution to the European market. [253]

The rising popularity of EVs is reshaping the German automotive landscape. In 2023, registrations of Battery Electric Vehicles (BEVs) witnessed a remarkable surge, reaching 524,219 units, representing an 11.4% increase compared to the previous year. This surge in BEV registrations signifies a growing acceptance of electric mobility solutions among consumers, with BEVs claiming a substantial market share of 18.4%. However, the decline in registrations of Plug-in Hybrid Electric Vehicles (PHEVs) by 51.5% to 175,724 units highlights potential challenges in the hybrid market segment, indicating a shifting consumer preference towards pure electric vehicles.
Additionally, the segment comprising Full Hybrids (HEVs) and Mild Hybrids (MHEVs) retained a significant market share in 2023, with 664,580 deliveries, accounting for 23.4% of the new-car market.
Furthermore, cars powered by liquefied and natural gas registered 14,474 units, constituting 0.5% of the market, indicating a niche but growing interest in alternative fuel vehicles.
Despite the growing interest in electric and hybrid vehicles, traditional petrol and diesel cars continue to dominate the market. Petrol-powered car registrations surged by 13.3% to 978,660 units, constituting 34.4% of the new-car market, highlighting sustained consumer demand for internal combustion engine vehicles. Similarly, diesel deliveries experienced growth, reaching 486,581 units, up by 3% compared to the previous year. However, despite this increase, the proportion of diesel-powered vehicles in registrations decreased slightly to 17.1%, indicating a gradual shift away from diesel vehicles in favour of alternative powertrains. [254]
Furthermore, the transportation preferences of Germans reflect a strong reliance on passenger cars, with 88% of the population utilizing them as their primary mode of transportation. Trains are the second most popular mode, accounting for 8% of transportation usage, followed by coaches, buses, and trolleybuses at 4%. This preference for passenger cars underscores the importance of addressing sustainability concerns within the automotive industry to mitigate environmental impacts associated with increased car usage. [255]

[247] Federal Ministry of Transport and Digital Infrastructure, The 2030 Federal Transport Infrastructure Plan (bund.de)
[248] World's longest underwater rail and road tunnel will connect Germany and Denmark by 2029 | Euronews
[249] German Association of the Automotive Industry | VDA
[250] Germany to expand electric car charging network – DW
[251] Key figures on European transport – 2023 edition (europa.eu)
[252] Germany: only 100 km rail network newly electrified, Pro-Rail Alliance critises | Latest Railway News (railmarket.com)
[253] Economic-and-Market-Report_Full-year-2022.pdf (acea.auto)
[254] Kraftfahrt-Bundesamt - Pressemitteilungen - Fahrzeugzulassungen im Dezember 2023 - Jahresbilanz (kba.de)
[255] Key figures on European transport – 2023 edition (europa.eu)

Moreover, Germany's significant contribution to EU road freight transport, responsible for 16% of the share of ton-kilometers in 2021, highlights the country's pivotal role in the movement of goods across Europe. As road freight transport represents a substantial portion of carbon emissions, efforts to transition towards cleaner and more sustainable transport solutions are imperative to mitigate environmental impacts and achieve long-term sustainability goals. [256]

Public Transportation Systems

Germany's commitment to sustainable mobility extends beyond private vehicles to encompass public transportation as well. In 2022, the country boasted a fleet of 82,932 buses traversing its roads, with an impressively low average age of just 4.6 years. This figure stands in stark contrast to the European Union average, where buses typically endure for 12.5 years. The comparatively young age of Germany's bus fleet underscores the nation's dedication to modernizing its public transportation infrastructure, enhancing both efficiency and environmental sustainability.

In terms of power sources, German buses exhibit a notable shift towards greener alternatives. While the majority (91%) still rely on diesel, there is a growing adoption of environmentally friendly options. Battery Electric buses account for 2.3% of the fleet, showcasing a commitment to zero-emission transportation. Additionally, Hybrid Electric buses constitute 5.5% of the total, combining conventional and electric propulsion systems to reduce fuel consumption and emissions. A marginal portion (0.1%) of buses run on petrol, reflecting a minimal presence of this less sustainable fuel source in the public transportation sector.

Furthermore, Germany's public transport network continues to evolve to meet the demands of sustainable mobility. Initiatives such as the expansion of tram networks, the introduction of hydrogen fuel cell-powered trains, and investments in bicycle infrastructure are transforming the way people move within urban centres. Moreover, efforts to integrate various modes of transportation, such as seamless connections between buses, trains, and bicycles, contribute to a more holistic and sustainable mobility ecosystem. As Germany progresses towards its sustainability goals, the modernization and greening of its public transport sector play a crucial role in reducing carbon emissions and fostering a more environmentally conscious society[257] [258] [259]

Environmental Impact and Emissions

Since 1990, Germany has made significant strides in reducing greenhouse gas emissions, with emissions dropping from 1,251 million tons of CO2 equivalents to 750 million tonnes by 2022. This remarkable decrease, amounting to precisely 40%, is notable, especially considering the unique factors influencing emissions in 2022. Germany's contribution to one-quarter of the EU's total CO2 emissions from fossil fuel combustion for energy use underscores its importance in regional emissions reduction efforts.

However, despite progress in the Energy Transition (Energiewende), greenhouse gas emissions from the transport sector have been steadily increasing since 2010, casting uncertainty on the transition to green mobility (Verkehrswende). While there are positive developments, such as investments in alternative motorization methods and cities shifting to low-impact transport, a clear trajectory towards decarbonizing the transport sector remains elusive, as highlighted in a recent climate change report. [260] [261] [262]

Economic and Social Implications

Transitioning to sustainable mobility solutions, such as electric vehicles (EVs), which are experiencing increasing adoption rates in Germany, and expanding and electrifying the extensive public transport network, which connects many parts of Germany, offers the potential for economic growth, job creation, and improved social equity. Investments in sustainable transportation infrastructure can enhance accessibility, reduce emissions, and foster community connectivity, ultimately leading to a more inclusive and environmentally responsible transportation system in Germany.

2024 has seen various strikes related to Germany's state-owned rail operator Deutsche Bahn. The economic repercussions of this were high, proving Germany's dependence on rail. It is also affecting other German companies that rely on rail transport for the movement of their raw materials or products.[263] Moreover, the repercussions extend to neighbouring nations as well. Nearly 60% of Deutsche Bahn's freight transport operations span across Europe. As per the Federal Ministry for Digital and Transport, six out of 11 freight transport corridors in Europe pass through Germany.

Best Practices and Case Studies

In addition to national initiatives, German cities are spearheading innovative mobility plans to address urban transportation challenges and promote sustainability. For instance, in Berlin, the city's mobility strategy emphasizes the expansion of cycling infrastructure, the enhancement of public transit networks, and the implementation of smart traffic management systems to reduce congestion and improve air quality. Similarly, Munich is investing in electric mobility solutions, with plans to expand its electric bus fleet and install more charging infrastructure across the city. Furthermore, Hamburg has launched ambitious projects such as the Green Network Plan, which aims to create a connected network of green spaces and pedestrian-friendly

[256] Road freight transport statistics - Statistics Explained (europa.eu)
[257] ACEA-Report-Vehicles-on-European-roads-.pdf
[258] Alstom, About the Coradia iLint
[259] 302 line extension to Bochum in service. With Variobahn (sustainable-bus.com)
[260] Indicator: Greenhouse gas emissions | Umweltbundesamt
[261] CO2 emissions from EU territorial energy use: -2.8% - Eurostat (europa.eu)
[262] Climate Chance, Twists and turns on the road to the Verkehrswende, "green mobility" (climate-chance.org)
[263] German train strike could cost €1 billion – DW – 01/23/2024

pathways to encourage active transportation and combat urban heat island effects. [264] [265] [266]
Moreover, German cities are actively participating in collaborative research and development projects to advance digitalization and automation in transportation. As part of the 'Digital Rail Germany' initiative, Deutsche Bahn, Siemens Mobility, Bosch, and other partners are working together to shape the future of railway transportation through digital innovations. In parallel, under the Automated Train research and development project, these partners are dedicating resources to testing fully automated train services and parking manoeuvres over the next three years. Leveraging sensor technology, these initiatives aim to enable vehicles to autonomously identify their environment and respond to obstacles, paving the way for safer and more efficient rail transportation systems in the future.
Through these concerted efforts, German cities are at the forefront of pioneering mobility solutions that prioritize sustainability, efficiency, and safety for all residents. [267] [268]

Future Perspectives and Emerging Trends

Looking ahead, Germany is poised to continue leading the way in sustainability. One significant trend is the acceleration of electric mobility adoption, driven by advancements in battery technology, infrastructure development, and government incentives. As the cost of electric vehicles (EVs) decreases and their range improves, more consumers are expected to transition away from traditional petrol and diesel vehicles, further reducing carbon emissions and improving air quality. Additionally, the integration of renewable energy sources into EV charging networks will play a crucial role in enhancing the sustainability of electric mobility, aligning with Germany's commitment to renewable energy and carbon neutrality.
Furthermore, the concept of Mobility as a Service (MaaS) is gaining traction in Germany, offering integrated and convenient transportation solutions that prioritize user experience and sustainability. MaaS platforms provide seamless access to various modes of transportation, including public transit, ride-sharing, bike-sharing, and car-sharing, through a single digital interface. This approach promotes the efficient use of resources, reduces congestion, and enhances mobility options for urban residents. Moreover, the emergence of autonomous vehicles and connected mobility solutions presents opportunities to improve safety, efficiency, and accessibility in transportation, paving the way for a future where sustainable mobility is not only environmentally friendly but also technologically advanced and user-centric. [269]

International Comparisons and Collaborations

Germany showcases its dedication to sustainable transportation by actively participating in two significant international initiatives. Firstly, it joins fifteen other nations in the Electric Vehicles Initiative (EVI), overseen by the International Energy Agency (IEA). The EVI strives to expedite the worldwide embrace of electric vehicles, promoting environmentally friendly transportation practices globally. Germany collaborates with countries including Canada, Chile, China, Finland, France, India, Japan, the Netherlands, New Zealand, Norway, Poland, Portugal, Sweden, the United Kingdom, and the United States within this initiative, fostering the exchange of knowledge and policies to facilitate the transition to electric vehicles.[270]

[264] Berlin Mobility Act - Berlin.de
[265] City of Munich - EIT Urban Mobility
[266] Hamburg - City of Mobility - hamburg.com
[267] Deutsche Bahn, Siemens Mobility, and other partners are testing fully automated train operation | Press | Company | Siemens
[268] Deutsche Bahn and Industry Partners Test Fully Automated Driving of Trains - duagon
[269] A MaaS Perspective from Germany | SkedGo | Future Transport-News
[270] Electric Vehicles Initiative – Programmes - IEA

Greece

Policy Review

Greece's Recovery and Resilience Plan

The financial scope of the plan totals €36.61 billion, incorporating national resources in addition to the outlined funds. It outlines a significant commitment of €18.22 billion, with €17.73 billion allocated from the Recovery and Resilience Facility (RRF) as grants and the remainder through RRF loans. The plan features 103 investment avenues alongside 75 reform strategies. Emphasis is placed on environmental sustainability, with 38.1% of the funds directed towards climate objectives, and digital modernization, receiving 22.1% of the funding to enhance the digital transition.

A notable focus of the plan is the advancement of sustainable and multi-modal transportation systems. It proposes the installation of over 4,500 electric vehicle charging stations across Greece, boasting a combined power capacity of 300,000 kW. Additionally, the plan supports the introduction of 220 electric buses for urban public transport in Athens and Thessaloniki. Furthermore, it encompasses a thorough reform and significant investment in the railway sector, including repair of the railway network damages inflicted by severe floods in the Thessaly region, to bolster the resilience and efficiency of public transport. [271]

In Greece, the energy and climate policies are centred around achieving net zero emissions by 2050, while also ensuring energy security, economic competitiveness, and protection for vulnerable consumers. Adopted in 2019, the NECP outlines energy and climate policies through 2030. It includes targets and measures to put Greece on a path toward net zero emissions. The National Climate Law, adopted in May 2022, sets ambitious targets such as reducing total greenhouse gas (GHG) emissions by 55% by 2030 with the end goal of net zero emissions by 2050. [272]

Greece's National Transport Plan – horizon 2037

According to the plan, by 2037 Greece's transport and mobility sector should have experienced a transformative process and gain the ability to better sustain a transition to green transportation and mobility. The key outcomes of the plan should result in: A reduction of approximately 12% in road vehicle-kilometers traveled, indicating a decrease in road traffic. Approximately 20% of total bus traffic (in vehicle-kilometers) diverted from other transport modes, suggesting a shift in travel patterns. A significant increase of around 44% in total rail passenger traffic (in passenger-kilometers), highlighting the growing importance of rail transport. An approximate 35% increase in total rail freight traffic (in ton-kilometers), indicating a boost in rail freight transportation. A reduction of 17.5% in the cost of environmental impacts of transport, reflecting improvements in sustainability. A decrease of 12% in the number of road accidents and 11.6% in the number of fatalities, indicating enhanced road safety. Reductions in journey time, with the travel time between Athens and Thessaloniki reduced to 4 hours by private car and less than 3 hours by rail, leading to economic gains estimated at €750 million per year for the Greek economy. A reduction of approximately 1.5 hours in sea travel time to/from Cyclades due to the use of Lavrio port for coastal maritime trips. Increased accessibility index based on population, with an average increase of almost 90% for rail and 3% for road, indicating improved access to transportation services.[273]

EV Tax Benefits and Subsidies

For tax benefits, there is an acquisition rate of 75% reduction in RT for PHEVs up to 50g/km, a 50% reduction in road tax for HEVs and PHEVs emitting ≥ 50g CO2/km and a road tax exemption for electric trucks. As for their ownership, HEVs with engine capacity ≤ 1,549cc and registered before 31 October 2010 are exempt from circulation tax, and 60% if registered before with a higher engine capacity than 1,550cc. Whereas, cars emitting less than 90g CO2/km (NEDC) or 122g (WLTP) are exempt from the personal income presumption system. For company cars, there's an exemption in kind tax for BEVs and PHEVs emitting ≤ 50g CO2/km (NEDC or WLTP) with net retail price (NRP) ≤ €40,000, and a deductible of €40,000 in the NRP for BEVs and PHEVs up to 50g CO2/km with higher NRP value. [274]

Aside from the exhaustive tax benefits, Greece also has vast purchase incentives for different types of vehicles, where there is a 15-20% cashback on the net retail price (NRP) of BEV cars with a maximum cashback of €5,500- 6,000. The threshold NRP to receive an incentive: is €50,000. An extra €1,000 can be claimed if the car of ≥ 10 years is scrapped. As for BEV taxis, there is a 25% cashback of up to €8,000 (15% for PHEVs with ≤ 50g CO2/km), plus an extra €2,500 when an old taxi is scrapped. And a 15% cashback for vans (up to €5,500 for BEVs; €4,000 for PHEVs), plus €1,000 for scrapping.[275]

The Greek government is attempting to strongly incentivize the consumer market towards the adoption of EVs and shows willingness towards the adoption of electrification in mobility. Greek officials stated that the extensive initiatives were due to Greece lagging behind

[271] Greece's recovery and resilience plan - European Commission (europa.eu)
[272] Executive summary – Greece 2023 – Analysis - IEA
[273] National Transport Plan for Greece 2037 (nationaltransportplan.gr)
[274] Electric-Vehicles-Tax-Benefits-Purchase-Incentives-2022.pdf (acea.auto)
[275] Electric-Vehicles-Tax-Benefits-Purchase-Incentives-2022.pdf (acea.auto)

other European countries with regard to the number of EVs on the road. [276]

Technological Advancements

Evedima is at the forefront of enhancing urban mobility and transport infrastructure, notably through managing the operations of Hopp's e-scooter fleets in Greece, a service originating from Finland. Swobbee stands out by creating the pioneering charging and battery swapping station that distinguishes itself with its compatibility across a diverse range of vehicle batteries in the micromobility sector, irrespective of the manufacturer.
In a collaborative effort, Evedima and Swobbee launched their inaugural project in Vouliagmeni, close to Athens, by establishing a station dedicated to the battery swapping needs of Hopp's e-scooters. This initiative allows for the quick and efficient charging and swapping of batteries, eliminating the need for elaborate charging logistics and storage facilities on the city's fringes. The result is a more cost-effective and environmentally friendly operation for the scooter sharing service. [277] [278]
In 2020, the Greek state investment and trade promotion agency signed a memorandum with the German EV manufacturer Next.e GO Mobile SE. The agreement aims to establish a full-scale manufacturing facility for electric cars in Greece[279]

Infrastructure Development

The Smart Cities program under the EU Recovery and Resilience Facility is a significant initiative aiming to revolutionize urban infrastructure and e-services across Greece through technology and data utilization. It's organized into two phases, focusing on enhancing urban living through digital transformation.
Phase I involves a €90 million budget allocated to 17 municipalities, each with a population exceeding 100,000. These municipalities, including major cities like Athens and Thessaloniki, are encouraged to submit strategic plans for developing new infrastructure, digital platforms, and IT systems. Key areas of interest include transportation, safety, and environmental enhancements. Athens is set to receive the largest portion of funding, €20 million, due to its population size, followed by Thessaloniki. Trikala is notably recognized as Greece's first digital city, having already implemented innovative solutions like driverless buses and a smart pedestrian system.
Phase II expands the initiative with a €230 million budget from the European Regional Development Fund, targeting municipalities with populations up to 100,000. These smaller municipalities had until the end of October 2022 to propose digital transformation projects aligning with their unique priorities. Fund allocations range from €210,000 to €2.77 million, based on the municipality's size. Project categories include sustainable mobility and digital infrastructure enhancements, with possible actions like smart parking systems, smart public transportation stops, and systems to improve accessibility for individuals with mobility challenges.
This structured approach to urban digital transformation emphasizes the EU and the Greek government's commitment to creating more sustainable, efficient, and inclusive cities through the strategic use of technology. [280]

EV Charging Infrastructure

As of December 2023, Greece had a total of 2,120 electric vehicle (EV) charging stations, equipped with 4,890 charging points, as reported by Giorgos Ageridis, the President of the Hellenic Institute of Electric Vehicles (ELINHO). Greece is one of the countries in the EU that has less than one charger per 100 kilometres of road. [281]
To further encourage the use of electric vehicles, Greece has put in place a detailed regulatory framework aimed at facilitating the installation and management of EV charging stations nationwide, with plans to increase the number of charging points to 13,000 by 2025 and to 100,000 by 2030. This initiative is part of the country's ambitious goal to achieve 30% electric vehicle usage by the year 2030. [282] [283]
By 2020, Greece's extensive motorway network reached about 2,320 kilometres, marking it as the largest in Southeastern Europe. However, despite this extensive network, certain national roads are in less than optimal condition, contributing to the country's high rate of traffic violations. These issues are significant contributors to Greece having one of the highest traffic fatality rates in Europe, with 69 deaths per million inhabitants. [284] [285]

Road Infrastructure[286]

The Ministry of Infrastructure and Transport in Greece is currently overseeing the implementation of over 500 kilometres of new roads, including highways and bypasses, as well as significant upgrades and rehabilitations. These infrastructure projects are funded through the Partnership Agreement 2014-2020 between Greece and the EU and/or exclusively by national funds, with completion expected before the year 2027.
One notable project involves the construction of both the southern (Xyniada-Lamia) and northern (Grevena-Trikala) sections of the A3 motorway, also known as Kentriki Odos. These sections, totalling 94 kilometres,

[276] An exploration of electric-car mobility in Greece: A stakeholders' perspective - ScienceDirect (oclc.org)
[277] EVEDIMA - Micromobility Services
[278] Swobbee Battery rental / charging infrastructure for micromobility
[279] E.wave X: The New "Made In Greece" Electric Car (greekcitytimes.com)
[280] Smart Cities, Development of smart city applications in the Municipalities of Cyprus, Crete and North Aegean (smartcities-project.eu)
[281] Electric cars: 6 EU countries have less than 1 charger per 100km of road; 1 charger in 7 is fast - ACEA - European Automobile Manufacturers' Association
[282] Greece's EV charging points 'to increase to 100,000 by 2030' | eKathimerini.com
[283] 2023 Country Report - Greece (europa.eu)
[284] Total length of motorways - Data Europa EU
[285] Preliminary 2021 EU Road Safety Statistics - European Commission (europa.eu)
[286] National Transport Plan for Greece 2037 (nationaltransportplan.gr)

are part of the E65 route, linking the A1 and A2 motorways and enhancing connectivity across the region. Additionally, improvements are being made to the vertical axes of the Egnatia Odos, extending to the Greek borders with neighbouring countries, to facilitate smoother and more efficient transportation routes.
Another significant undertaking is the construction of a new 75 kilometer motorway between Patra and Pyrgos, which includes upgrades to road accesses. This project aims to enhance connectivity and accessibility in the region.
In Crete, the North Crete Road Axis project involves the construction of a 200 kilometer, four-lane motorway from Chania to Agios Nikolaos, passing through Rethymno and Heraklion. This initiative also includes improvements to vertical axes, further enhancing transportation infrastructure on the island. Furthermore, the 'Amvrakia Odos' motorway, spanning 48.5 kilometres, will link the A5 motorway (Ionia Odos) to Aktio airport, Preveza, and Lefkada, improving connectivity in the western region of Greece.
Other projects include the construction of road bypasses for main cities such as Thessaloniki, Katerini, Chalkida, Larissa, and Karditsa, aiming to alleviate traffic congestion and improve accessibility within urban areas. These initiatives collectively contribute to the modernization and expansion of Greece's road infrastructure network, fostering economic development and enhancing mobility for citizens and businesses alike.

Railway Infrastructure

The ongoing upgrade of Greece's railway network maintains a strong focus on the Core Corridors of the Trans-European Network (TEN-T), with projects being financed through various European Funds, including Regional Development Funds and those allocated through the Connecting Europe Facility.
One significant project underway is the reconstruction of the Athens – Patras Railway. This initiative involves the construction of a new double rail line between Kiato and Patra, encompassing sections such as Diakopto - Rododafni, Rododafni - Psathopirgos, Psathopirgos - Rio, and Rio - New Port of Patra. Additionally, investments include the standardization and electrification of the railway link between Isthmos and Loutraki. Another vital project is the Athens – Thessaloniki railway line. This initiative focuses on completing a new double, higher-speed, electrified railway line between Tithorea and Domokos, enhancing connectivity and efficiency along this crucial transport corridor.[287]
Furthermore, efforts are underway to upgrade the Thessaloniki – Idomeni railway line, with the completion of upgrading and electrification works in the Polikastro – Idomeni section. This upgrade aims to improve connectivity and facilitate smoother rail transportation between Thessaloniki and North Macedonia. Lastly, the Thessaloniki – Florina railway line is undergoing reconfiguration, focusing on the existing Thessaloniki-Platy-Edessa-Florina-Neos Kafkasos route. These enhancements aim to modernize and optimize the rail network, supporting improved transportation services and connectivity, particularly towards North Macedonia.[288]

Market trends and Consumer Behavior

Greece has the oldest car and truck fleets in Europe – averaging 16 years. It has 27,662 busses on the road, a 1.3% decrease from 2021.[289] It is estimated that roughly 0.22% of all vehicles in Greece are fully electric.[290]
About 1 in 10 new cars sold in the first five months of 2023 in Greece were either fully electric or plug-in hybrid.[291]. In Greece, personal vehicles have become increasingly favoured for transportation, especially in the aftermath of the 2008 financial crisis. The country sees fewer than 5 million residents, not counting tourists, opting for trains or airplanes for their travel needs. Air travel is mainly concentrated through its three primary airports in Athens, Thessaloniki, and Heraklion, with islands depending predominantly on ferry services for connectivity.
Greece is making strides in electric vehicle (EV) adoption, though it ranked 17th among 22 European countries. The launch of the "I move electrically" program in 2020, which is set to run until 2024, aims to bolster EV and charging infrastructure development through various incentives. Despite facing challenges such as lower average income and a nascent production sector that have historically hindered broader EV uptake, Greece has seen a notable increase in its plug-in hybrid electric vehicle (PHEV) market share, which grew from 0.5% in 2019 to 2.6% in 2020. This growth is supported by the National Energy and Climate Plan, which sets ambitious decarbonization targets for the transport sector, with EV sales experiencing a significant uptick from 479 units in 2019 to 6,971 units in 2021.

The expansion of public charging infrastructure and national coverage is essential for increasing EV penetration in Greece. This approach aims to facilitate easier travel for electric vehicles within and beyond urban centers. Moreover, it's crucial that incentives consider socio-economic disparities to ensure equitable access to EV benefits across different segments of the population. This nuanced approach is necessary to prevent inequalities and align with the diverse preferences of Greek consumers.
Looking forward, the EV market in Greece is projected to reach significant milestones. By 2024, the market revenue is estimated to hit US$361.2 million, with an expected annual growth rate of 10.69% leading up to 2028. This growth will potentially escalate the market volume to US$542.3 million, translating to 15,440 vehicle units sold by 2028. Despite these optimistic

[287] National Transport Plan for Greece 2037 (nationaltransportplan.gr)
[288] National Transport Plan for Greece 2037 (nationaltransportplan.gr)
[289] ACEA-Report-Vehicles-on-European-roads-.pdf
[290] Greek Electric Vehicle Sale Statistics | evstats.gr
[291] Buying a car? Greeks are starting to plug-in! - Greek City Times

projections, the EV market faces hurdles such as limited model availability and an immature market structure. However, the increasing market penetration—from just 0.4% in 2019 to 6.2% in 2021—suggests a growing consumer interest in EVs, driven more by curiosity about new technology than purely environmental consciousness. [292] [293] [294]

Public Transportation Systems

Regarding public transportation, Greece presents a mixed landscape. Athens boasts a diversified transport network, including a metro, tramway, and trolleybus services, with plans for significant metro expansion to reduce car traffic. In contrast, cities like Thessaloniki, Patras, Heraklion, and Volos, along with the Greek islands, rely heavily on buses for public transportation, reflecting a need for broader infrastructure development. The adoption of a modern legal framework for public bus transport is aimed at fostering competition, promoting the use of greener vehicles, and improving the quality and affordability of services, setting the stage for comprehensive enhancements across Greece's public transport system. [295]

Greece's rail sector is undergoing transformative changes aimed at enhancing its efficiency, safety, and innovation. The restructuring of the Hellenic Railway Organisation (OSE) and its construction branch, ERGOSE, is pivotal in this shift, coupled with the implementation of the European Rail Traffic Management System (ERTMS) across the railway's core network. This initiative promises a more efficient and safer railway system, further augmented by legislative reforms that permit private entities to own and manage railway infrastructure, ensuring the development of a state-of-the-art transport network. [296]

Simultaneously, the National Transport Plan for Greece (NTPG) represents a strategic effort to elevate Greece's transport infrastructure and services, supporting sustainable and competitive growth within the transport sector. This plan, developed with insights from the European Investment Bank's Advisory Services, introduces a comprehensive strategy and a national transport model to guide policy, investment, and project development. It also includes establishing a robust management framework to streamline strategic planning and data management within the Ministry, enhancing Greece's transport infrastructure and services for the long term. [297] [298]

Environmental Impact and Emissions

In Greece, road transportation is the principal source of transport emissions, accounting for 85% of the total. This heavy reliance on road for both passenger and freight transport is significant, suggesting a major potential for emissions reduction. Advanced simulations highlight the potential of ambitious policy measures aimed at decreasing road transport emissions and encouraging shifts to alternative modes, like rail. Such strategies could lead to substantial emissions reductions by 2030, with the possibility of cutting up to 74% by 2050 when integrated with broader initiatives in land use and urban planning.

Greek reliance on motor vehicles for transport surpasses that of most other OECD countries, yet Greeks allocate a relatively smaller portion of their income to vehicle purchases. The preference for used cars is notable, with nearly half of all passenger vehicles being second-hand. This indicates unique transport preferences and economic considerations within the country.

The environmental impact of these transport patterns is pronounced, especially in urban centres like Athens, which faces significant air quality challenges, ranking low among European capitals according to GreenPeace. The prevalent use of fossil fuels in cars, trucks, planes, and ferries contributes significantly to carbon dioxide emissions, with the transport sector poised to increase its share of these emissions. Furthermore, tourism, a key economic sector for Greece, exacerbates these environmental pressures, highlighting the urgent need for sustainable transport solutions to mitigate pollution and its negative impacts. [299] [300]

Economic and Social Implications

Shifting to a net-zero emissions transport framework demands substantial revisions in taxation and charging systems, likely causing a significant decrease in revenue from road transport. The transition away from vehicles with internal combustion engines to those emitting low or no emissions, alongside reduced fossil fuel usage, is expected to trigger a financial shift. Research by the OECD and the International Transport Forum (ITF) projects that by 2050, revenue from fuel excise duties, vehicle registration fees, circulation taxes, and tolls could fall by up to 20% with a committed approach to transformation. [301]

In Greece, the development of Sustainable Urban Mobility Plans (SUMPs) has proceeded without a legal mandate, driven by voluntary initiatives despite guidance from the Etis SUMP framework. These strategies, while aimed at comprehensive transportation improvement—from boosting public transport and non-motorized mobility to advancing road safety and supporting electromobility—often fall short of fully embracing all recommended SUMP cycle elements. Goals also include promoting efficient parking management, enhancing urban logistics, and adopting cutting-edge technologies for better mobility. Aligning these SUMPs with existing regulations and investments

[292] Factors and incentives that affect electric vehicle adoption in Greece - ScienceDirect
[293] The future of E-charging infrastructure: Greece - WFW
[294] I move electrically - Gov.gr (www.gov.gr)
[295] Recharge, Electric Mobility in Greece
[296] 2023 Country Report - Greece (europa.eu)
[297] National Transport Plan for Greece – National Transport Plan for Greece
[298] 2023 Country Report - Greece (europa.eu)
[299] Transitioning to a green economy in Greece (oecd.org)
[300] Recharge, Electric Mobility in Greece
[301] Transitioning to a green economy in Greece (oecd.org)

in sustainable mobility is crucial for enhancing Greek urban connectivity and overall mobility. [302]
However, the broader adoption of EVs as part of this sustainable transition faces economic barriers. With one of the oldest car fleets in Europe, Greek consumers' capacity to invest in new, particularly electric, vehicles is limited by disposable income constraints. This economic reality may hinder the pace of EV adoption, emphasizing the need for policies that not only support sustainable transportation infrastructure but also address economic challenges to make new, cleaner vehicle technologies accessible to a wider population.

Best Practices and Case Studies

Through a public-private partnership Mobility as a Service (MaaS) is revolutionizing transportation on the Greek island of Astypalea, serving as a model for other islands and cities worldwide.[303]
In partnership with the Hellenic Republic, Volkswagen Group has introduced two innovative services – AstyGo and AstyBus – providing residents and tourists with flexible options for on-demand and shared mobility. AstyGo offers a multimodal vehicle sharing service, featuring electric bikes, cars, and scooters. Meanwhile, AstyBus replaces traditional bus lines with an on-demand ride-sharing service, deploying minibuses capable of accommodating up to four passengers each. Depending on the time of day, the island operates between three and seven minibuses.[304]
Since its launch, 25% of the island's inhabitants have regularly utilized the AstyBus ridesharing service, covering over 200,000 customer kilometres in just 12 months. Both services are accessible through the AstyMove app. The transition to electric mobility holds significance for both the island and Greece as a whole, given the country's ageing car fleet, with an average age of nearly 17 years. The MaaS project commenced in 2020, benefiting from Astypalea's autonomous energy supply. This transition has also led to the rapid development of the island's charging infrastructure, with a significant increase in the number of electric vehicles and charging stations. Astypalea serves as a testament to how the transition to sustainable mobility can occur rapidly, setting an example for other regions globally.[305]

Future Perspectives and Emerging Trends

Greece is transitioning towards enhanced electric vehicle (EV) and public transportation systems, aiming for growth and modernization with the support of European funding and strategic government policies. This initiative is crucial for adapting Greece's mobility and automotive industries to future demands. Although EV adoption has significantly increased, the scarcity of charging infrastructure presents a major challenge to sustaining this momentum.

To reach its ambitious energy efficiency targets by 2030, Greece recognizes the need to leverage its highly electrified industrial sector's potential. The country is in a prime position to boost its renewable energy use, especially with renewable hydrogen, pending the availability of a secure and economically viable supply. Yet, the widespread adoption of EVs faces financial obstacles, primarily due to Greece having one of the oldest vehicle fleets in Europe and consumers facing disposable income limitations. This economic situation may slow EV uptake, highlighting the importance of developing policies that not only foster a sustainable transportation infrastructure but also address financial barriers, ensuring broader access to newer, cleaner vehicle technologies for all segments of the population.

International Comparisons and Collaborations

EIT Urban Mobility, an initiative of the European Institute of Innovation and Technology (EIT), is collaborating with the city of Heraklion and Civinet, to tackle urban mobility challenges. As part of this partnership, 13 innovative bike stations will be installed across the city. The project's core objective is to promote active mobility, with a specific emphasis on micro-mobility and bike mobility. The initiative entails deploying secure and sustainable infrastructure for bike and scooter parking at selected locations across the city. These hubs, featuring a flexible modular design accommodating 4 to 10 bicycles and e-bikes, cater to both spontaneous parking and charging needs for registered users. These infrastructure upgrades aim to improve the overall quality of life for Heraklion residents, contribute to climate change mitigation efforts, and bolster the urban mobility sector's resilience and efficiency.[306]
In light of the European Union's recent Declaration on Cycling, which emphasizes the promotion of cycling across Europe, the partnership holds significant importance. Heraklion has emerged as a frontrunner among Greek cities in promoting pedestrianization of the city center, encouraging increased pedestrian and bicycle traffic. With the city centre spanning approximately 350m in radius and predominantly pedestrianized, Heraklion aims to incentivize commuters to opt for bicycles or kick scooters over private cars when accessing the city centre. To address urban mobility challenges, Heraklion (4th largest city in Greece and largest in Crete) is launching a strategic initiative to establish micro-mobility hubs throughout the city.[307]
The International Transport Forum, an organization with 66 members, that acts as a think tank for transport policy and organizes the Annual Summit of Transport Ministers is partnering with the Greek government and local authorities to identify actions to boost the use of EVs and development of charging infrastructure. The project is also offering support for the creation of

[302] EU Urban Mobility Observatory - Greece
[303] Greek Island showcases best practice in Mobility as a Service (zagdaily.com)
[304] Greek Island showcases best practice in Mobility as a Service (zagdaily.com)
[305] Greek Island showcases best practice in Mobility as a Service (zagdaily.com)
[306] City of Heraklion, EIT Urban Mobility and Civinet Greece-Cyprus join forces to boost cycling travel. - EIT Urban Mobility
[307] City of Heraklion, EIT Urban Mobility and Civinet Greece-Cyprus join forces to boost cycling travel. - EIT Urban Mobility

Sustainable Urban Mobility Plans for cities across Greece.[308]

[308] Advancing Sustainable Mobility in Greece: Promoting electric vehicle uptake and SUMPs | ITF (itf-oecd.org)

Hungary

Policy Review

In recent years, Hungary has increasingly embraced sustainable and intelligent mobility practices, marking a significant shift in its transportation landscape. A pivotal development came in 2020 with the adoption of the National Energy and Climate Strategy by the Hungarian government, aimed at steering the country towards a carbon-neutral economy. Central to this strategy is the imperative to green the transportation sector. In alignment with this vision, Hungary enacted legislation in 2019 dedicated to electromobility, promoting the adoption of electric cars and vans, alongside the essential infrastructure for charging these vehicles.[309]

Hungary's Recovery and Resilience Plan

From the €10,43 billion investment value, 67.1% of the plan will support climate objectives, partly into energy, and 29.1% of the plan will foster digital transformation, energy and sustainable transport. Hungary's plan includes 13 reforms and 16 investment programs to reduce its reliance on fossil fuels. To finance the programs, Hungary has requested to take up €3.91 billion in loans, in addition to Hungary's REPowerEU grant of €700.5 million [310].

Efforts to advance sustainable transport play a crucial role in the green transition. Key initiatives include the modernization of significant railway lines and their management systems, alongside the acquisition of 300 zero-emission buses. The plan also envisages the expansion and development of tram and trolleybus infrastructures, with the purchase of 51 new vehicles. Furthermore, it supports the acquisition of at least 12,500 electric vehicles and the establishment of charging stations to promote the use of cleaner energy sources in transportation. The Hungarian government plans to complete the plan by August 2026.[311]

EV Tax Benefits and Subsidies

Policies and subsidies have been largely implemented by the government to boost the electric vehicle market. For Hungary, the government has provided tax exemption for BEV and PHEV cars in all aspects – acquisition, ownership and company cars. As of June 2020, purchase incentives were also available for electric cars, starting from €7,350 for a price of up to €32,000 and €1,500 if the price was between €32,000-44,000[312].

Technological Advancements

In recent times, Hungary has risen as a prominent force in the international autonomous driving sector. Propelled by native ingenuity and a proficient workforce, Hungary has witnessed a surge in investments directed towards autonomous driving startups and enterprises. These entities are actively developing cutting-edge technologies and solutions that are pivotal in driving forward the autonomous driving revolution. Leading the charge is a blend of innovative domestic firms like AiMotive and Commsignia, alongside well-established industry giants like Continental Automotive from Germany. The latter operates numerous manufacturing facilities within Hungary, along with a Deep Machine Learning centre situated in Budapest, the capital city.[313] Supported by a combination of private and public partnerships, RECAR (Research Center for Autonomous Road Vehicles) is an all-encompassing entity that bridges the gap between academia and industry. Its core mission is to blend education with research, nurturing highly skilled professionals and laying a strong foundation for future research and development efforts. RECAR spans four distinct levels, each boasting educational and research laboratories dedicated to the study of autonomous vehicles. The centre's infrastructure includes large halls filled with a variety of tools and equipment, as well as nearly 20 smaller labs. Beyond its cutting-edge labs, RECAR provides specialized educational programs aimed at deepening students' knowledge and skills in autonomous vehicle technology. [314]

Infrastructure Development

Hungary boasts one of the largest networks of motorways in Europe, stretching over 1,867.6 kilometres. However, the expansion of this network experienced a slowdown from 2021 to 2022, with only 8 kilometres of motorways added. To ensure the continued development and maintenance of its motorway infrastructure, the Hungarian government initiated an EU open public procurement process. Hungarian Concession Infrastructure Development Plc emerged as the winner of this tender. Starting in September 2024, the company will be responsible for operating, maintaining, and expanding 1,237 kilometres of existing motorways over a 35-year period. Additionally, the contract includes the construction of 272 kilometres of new motorways and the widening of 273 kilometres of the current network within the next decade. Hungary is also notable for its railway network, possessing one of the highest densities of rail lines in Europe, with 80 kilometres of track per 1,000 square

[309] Smart-sustainable-mobility-market-Hungary.pdf (rvo.nl)
[310] Hungary's recovery and resilience plan - European Commission (europa.eu)
[311] Hungary's recovery and resilience plan - European Commission (europa.eu)
[312] Electric-Vehicles-Tax-Benefits-Purchase-Incentives-2022.pdf (acea.auto)
[313] Hungary's Role in Shaping Global Autonomous Transportation (therecursive.com)
[314] Aims | Research Center for Autonomous Road Vehicles (bme.hu)

kilometres of land. This network continues to grow at a steady pace. [315] [316] [317],

EV charging infrastructure

Hungary ranks among the countries with the lowest density of public electric vehicle (EV) charging points, with only 1.5 per 1,000 inhabitants, which is half the deemed necessary rate of three charging points per capita. In an effort to address this shortfall, Hungary is embarking on improvements through a public-private project with OMV. From 2023, Hungary saw a 14% increase in the number of public EV charging stations, rising to 2,147 from an earlier count of 731. OMV has committed to establishing 28 ultra-fast EV charging stations along the nation's major routes. These stations, each with a 150Kw capacity, can charge an EV for up to 200km in just 10-15 minutes, depending on the vehicle's capacity. This endeavour is not solely a Hungarian initiative but also receives support from the European Union, which is contributing €1.05 million towards the project, against total installation costs of €2.1 million. This investment is part of the broader "Development of Ultra-Fast Electric Vehicle Charging in Central and Eastern Europe" project, which aims to set up 400 ultra-fast charging stations across the region, including 7 in Hungary by the end of 2025. The overarching goal is to establish at least 5,900 charging points by 2030, with an estimated funding requirement of €362 million, in conjunction with the Green Bus Programme. [318] [319] [320]

Railway Infrastructure

The improvement of inland railway infrastructure is among the most heavily funded areas, receiving investments exceeding €1 billion. This initiative includes spending on rail vehicles, wagons, and the development of infrastructure that supports park-and-ride (P+R) services and intermodal transport options. The Budapest Suburban Railway Strategy, established in 2021, further backs these efforts. [321]

Market Trends and Consumer Behavior

In 2020, Hungary's government spending on transportation was notably high in comparison to its GDP, at 4.6%. By 2022, the number of vehicles on Hungarian roads reached 4,716,629, marking a 1.8% increase from the previous year. This total included 4,091,975 cars, 510,754 vans, and 96,272 trucks. The country has the third lowest number of cars per 1,000 inhabitants in the EU, with 422 per 1,000 people, which means that Hungarians own fewer cars and could mean a slower adoption of EV vehicles. The projected revenues of Hungary's EV market are expected to hit €680 million, indicating an annual growth rate of 13.15%.

Public Transportation Systems

In Hungary's public transportation system, the number of buses on the roads reached 17,628, experiencing a slight decline of 0.5% from 2021. These buses have an average age of 11.5 years, which is lower than the EU average of 12.5 years. However, in terms of their energy sources, only 0.7% are battery electric and 0.4% are hybrid electric, indicating that investment and spending have been more focused on advancing the automobile industry rather than public transportation.
Hungary has set an ambitious target of operating at least 1,300 electric buses by 2030, with financial backing from the Green Bus Programme. Despite Hungarian manufacturers producing approximately 200 electric buses each year, there is intense competition for this funding. The Green Bus Programme has set aside a total of €100 million for its initiatives. Between 2020 and 2021, €5.6 million plus an additional €6.1 million were allocated for the purchase of electric buses and their charging stations. For the years 2022 to 2029, there is €88.3 million available for the same goal. The funding covers up to 20% of the total investment costs, requiring municipalities (those with populations over 25,000) to cover the remaining 80% of the expenses. [322] [323] [324]

Environmental Impact and Emissions

In Hungary, the transport sector is responsible for nearly 20% of the country's total emissions, with road transport contributing 98% of these emissions. Hungary also has the lowest excise duties on diesel and petrol within the EU, at roughly 0.25%, compared to the EU average of 0.43%, including for unleaded petrol. As the country aims to lead in the electric vehicle (EV) market and achieve decarbonized mobility, and being one of the five countries to legislate climate neutrality by 2050, Hungary is implementing incentives to attract EV manufacturers. This strategy includes a significant 20% increase in fuel prices to encourage a shift towards electric vehicles. [325] [326]

Economic and Social Implications

In 2021, the automotive industry contributed 4-5% to Hungary's total GDP, with a production value of €26.2 billion. Hungary ranks 8th among the top 10 passenger car producers in the EU, manufacturing a total of 453,350 vehicles in 2023, though experiencing a production decrease of 17.5%. Within this sector, 96,805 jobs are directly linked to EU automotive manufacturing employment. Overall, the industry employs 186,000 full-time workers, accounting for 4.1% of Hungary's total employment. The shift towards electric vehicles is critical, given that the automotive sector represents a fifth of Hungary's exports and 8% of its economic output. A significant portion of the automotive workforce could be affected if the transition

[315] Statistics | Eurostat (europa.eu)
[316] Hungarian Concession Infrastructure Development
[317] Key figures on European transport – 2023 edition (europa.eu)
[318] Transport & Environment, How many charge points will Europe and its Member States need in the 2020s.
[319] Smart-sustainable-mobility-market-Hungary.pdf (rvo.nl)
[320] Number of Public EV Charging Stations in Hungary up 14% - BBJ
[321] Smart-sustainable-mobility-market-Hungary.pdf (rvo.nl)
[322] ACEA-Report-Vehicles-on-European-roads-.pdf
[323] Smart-sustainable-mobility-market-Hungary.pdf (rvo.nl)
[324] European Regional Development Fund, Green Bus Programme (interregeurope.eu)
[325] European Regional Development Fund, Green Bus Programme (interregeurope.eu)
[326] Hungary 'Well Placed' to Become an Automotive Innovation Hub - BBJ

to EVs does not maintain or grow the current level of labour demand. [327] [328] [329] [330] [331]

Best Practices and Case Studies

The Hungarian government introduced a new e-mobility subsidy package – which plans to invest €156 million program to support e-mobility which involves fast-charging infrastructure and subsidy for commercial customers. Half of the package will be towards building 170 high-capacity charging stations, located on the busiest roads and the other half will be used towards companies (sole traders, taxi and car-sharing providers) an opportunity to buy electric vehicles at a discounted price.[332]

Future Perspectives and Emerging Trends

Looking ahead, Hungary is poised to continue its trajectory towards sustainable and intelligent mobility, driven by its commitment to the National Energy and Climate Strategy and the ongoing investments outlined in the Recovery and Resilience Plan. With a significant portion of investments earmarked for climate objectives, particularly in the energy and sustainable transport sectors and further development of road and railway infrastructure Hungary is laying the groundwork for a greener transportation landscape. By leveraging public-private partnerships and tapping into EU funding opportunities, Hungary is well-positioned to address its environmental challenges while driving economic growth and fostering innovation in the automotive sector. As the country continues to prioritize sustainable transportation solutions, it is poised to emerge as a frontrunner in the global shift towards greener and smarter mobility.

International Comparisons and Collaborations

Hungary is competing to catch Germany and the US in the electric car batteries industry, following a project with BMW and a Chinese manufacturer from which it amassed €2 billion in investments. The investment is also financed through a loan from China Construction Bank[333].

[327] ACEA-Pocket-Guide-2023-2024.pdf
[328] The electric vehicle boom in a quiet Hungarian town (ft.com)
[329] Hungary 'Well Placed' to Become an Automotive Innovation Hub - BBJ
[330] Economic_and_Market_Report_full-year_2020.pdf (acea.auto)
[331] Hungary 'Well Placed' to Become an Automotive Innovation Hub - BBJ
[332] Hungary introduces new e-mobility subsidy package | electrive.com
[333] The electric vehicle boom in a quiet Hungarian town (ft.com)

Ireland

Policy Review

Ireland's Recovery and Resilience Plan

The plan is worth €923 million, with a funding allocation of €914 million from RRF Grants. It comprises 14 investment avenues and 9 reform initiatives. A significant portion, 42%, is dedicated to meeting climate goals, while 34.2% aims to advance the digital transition. The plan promotes the green transition, notably through a €164 million investment in the electrification and enhancement of the Cork commuter rail system, which is intended to motivate a move from personal vehicle use to railway transportation. [334]

EV Tax Benefits and Subsidies

A grant from the Sustainable Energy Authority Ireland (SEAI) may be available for the purchase of a battery-powered electric vehicle (BEV) that meets certain criteria. From 1 July 2023, a grant of up to €3,500 is available for BEVs, a decrease from the previous €5,000. This grant applies only to new cars with a price range of €14,000 to €60,000. The application for the grant is handled by the car dealer, who then deducts the grant amount from the total car price. The €2,500 grant previously available for plug-in hybrid electric vehicles (PHEV) no longer exists. The annual motor tax for a Battery Electric Vehicle is €120, placing electric vehicles in the lowest tax band for motor tax. Reduced toll fares for electric vehicles ceased on 31 December 2023. Grants for home charging of electric vehicles are also available. The Home Charger Grant Scheme, effective from 1 January 2024, provides up to €300 towards the cost of installing a home charger, down from the previous €600. The EV Apartment Charging Grant caters to residences without driveway access, such as apartments and duplexes. The Electric Vehicle Public Charge Point Grant supports the installation of charging points in public areas, like streets or public car parks, offering overnight parking for residents. More information can be obtained from local authorities.
External charge points for charging electric vehicles away from home are available across the country through the ESB ecars network, along with several private charge point operators.[335]

Sustainable Mobility Policy

The Sustainable Mobility Policy is poised to be a cornerstone in Ireland's strategy to cut its greenhouse gas emissions by half by the year 2030. This policy aims to facilitate a shift in daily transportation choices, encouraging walking, cycling, and the use of public transport as viable, preferable options over the reliance on petrol or diesel vehicles. With an action plan stretching to 2025, the policy outlines several initiatives to broaden the scope of sustainable mobility solutions nationwide. These initiatives are designed to offer safer, environmentally friendly, and easily accessible transportation alternatives. Additionally, the policy incorporates strategies for demand management and encourages behavioural changes to optimize travel demand and minimize reliance on private cars. Through these measures, the Sustainable Mobility Policy seeks to transform Ireland's transportation landscape, making it greener and more efficient. [336]

Technological Advancements

The Future Mobility Campus Ireland (FMCI) is engineered to forge and operate cutting-edge mobility testing grounds within authentic, operational environments. This initiative offers a dynamic, cooperative platform for technology firms, software developers, and researchers to experiment and refine their breakthroughs. Emphasizing a communal and interdisciplinary approach, it gathers a diverse range of expertise and innovative thought to push the boundaries of future mobility, covering areas such as Connected, Autonomous, Shared, and Electric (CASE) vehicles. FMCI is pivotal in driving the electrification of the automotive sector in Ireland, supplying state-of-the-art facilities, services, and knowledge to foster the development and evaluation of pioneering mobility solutions. Currently engaged in the development of Autonomous Connected Electric Shared Vehicles (ACES) and the Connected and Autonomous Vehicles (CAV) sectors, their testbeds serve as a foundational platform for researchers to explore and advance new technologies, offering a glimpse into the prospective mobility landscape of Ireland.[337]

Infrastructure Development

The Revised National Development Plan aims to alter transportation modalities, fostering enhanced community connectivity and facilitating a 50% reduction in greenhouse gas emissions by 2030. An additional half a million journeys each day via walking, cycling, and public transport are projected by 2030, supported by a €360 million annual investment into developing and improving over 1,000 kilometres of pedestrian and cycling infrastructure by 2025, including greenways.

[334] Ireland's recovery and resilience plan - European Commission (europa.eu)
[335] Electric vehicles (citizensinformation.ie)
[336] Ireland's new Sustainable Mobility Policy is a Priority in our Climate and Energy Use Plans For the Future (www.gov.ie)
[337] Future Mobility Campus Ireland (futuremobilityireland.ie)

The implementation of BusConnects (a National Transport Authority's programme to improve bus services), inclusive of segregated cycle paths, is scheduled across Dublin, Cork, Galway, Limerick, and Waterford, with further investments planned for ports and airports to strengthen international links. Enhancements in the inter-urban and regional rail networks are anticipated to offer improved travel times, reliability, and safety. Construction will commence on significant projects such as MetroLink and Dart+ in Dublin. Alongside the preservation and upgrade of an extensive network spanning 100,000 kilometres, critical urban and regional road projects like the M50 Traffic Control Project and bypasses for Moycullen and Listowel, as well as the N20/M20 corridor, are to be advanced. By the end of the decade, it is expected that nearly one million electric vehicles, backed by comprehensive infrastructure, will be operational on the roads, aligning with national sustainability objectives. [338] [339] [340]

EV Charging Infrastructure

Ireland's EV charging network is diverse, with more than 5000 public charging points across the country. Leading providers like Applegreen, EasyGo, ePower, eCars, Circle K, Ionity, and Tesla contribute to this extensive infrastructure. Each offers unique facilities, ranging from DC fast chargers to destination chargers at various locations, including hotels and shops. This network supports the growing adoption of electric vehicles, underlining Ireland's commitment to sustainable transport solutions.[341]

Market Trends and Consumer Behavior

In January 2024, the registration of new plug-in vehicles accounted for 21.2% of the total, split between 4,105 (13.1%) battery electric vehicles (BEVs) and 2,555 (8.1%) plug-in hybrid electric vehicles (PHEVs). This marked a slight increase from January 2023's overall rate of 20.6%, with the number of units growing by over 1,000. The rise was driven by a stronger demand for PHEVs, which grew by 0.9 percentage points, whereas BEVs saw a minor decline of 0.3 percentage points. Interestingly, this period may represent the first January when the proportion of BEVs did not increase compared to the previous year. The Hyundai Kona, Volkswagen ID.4, and BYD Seal emerged as the top three most-registered BEVs in January.

The first quarter of 2023 witnessed a pivotal moment in Ireland, as EV sales surpassed those of petrol and diesel cars for the first time. In 2022, one in every five new passenger vehicles sold was electric, with the EV population on Irish roads surpassing 70,000. By the first quarter of 2023, this ratio approached one in every four new passenger cars.

A survey conducted in collaboration with Done Deal revealed that 70% of participants expressed openness to opting for an electric vehicle (EV) for their next vehicle purchase, showcasing a significant shift in the perception of Irish consumers towards electric mobility. Key considerations for potential EV buyers included price, operating expenses, vehicle range, and reliability. This increasing inclination towards EVs, coupled with the high adoption rates observed in Ireland, illustrates a positive sentiment among the population regarding the transition to electric vehicles. [342] [343]

In terms of vehicle age, Ireland boasts a relatively low average, with one of the EU's lowest at 9.1 years for vehicles. Additionally, the ratio of vehicles per 1,000 inhabitants in Ireland is among the lowest in the EU, standing at 544 per 1,000 inhabitants, ranking fourth lowest. This data indicates that Irish people own fewer cars but tend to replace them more frequently compared to their European neighbours. Such a trend is beneficial for electric vehicle (EV) adoption, as evidenced by current data, suggesting a faster transition to newer, more environmentally friendly EVs as people update their vehicles.[344]

Public Transportation Systems

The Revised National Development Plan earmarks a €35 billion investment for enhancing public transport sustainability. This initiative, part of a broader effort to revamp public transport, also focuses on connecting rural and regional areas, thereby improving accessibility and expanding local bus services to link communities with key towns and growth centres. Under this plan, Iarnród Éireann (Irish Railway system) is set to acquire 90 Alstom train carriages, including 18 modern 5-carriage Battery-Electric Multiple Units (BEMUs), by 2026, complementing the earlier approval of 95 DART carriages for 2025[345] [346]

In Ireland, 2.9% of journeys utilize rail, and 17.2% use bus services, enhanced by expanded inter-city connections. The country is third in the world for electric bus adoption, with 13.1% of its 6727 buses being electric. However, challenges such as high costs impact the bus system's efficiency. Public transport, which includes trains, buses, trams, metros, and cycling infrastructure, is allocated 20% of the transport budget.[347]

Environmental Impact and Emissions

Ireland's sparse population and widespread communities primarily rely on road transport, which

[338] Revised National Development Plan will transform how we travel, with a 35 billion euro package prioritising investment in sustainable, active, accessible public transport (www.gov.ie)
[339] Sustainable transport for a better city | Busconnects
[340] Home page - MetroLinkWeb
[341] Home (irishevassociation.ie)
[342] Home (irishevassociation.ie)
[343] Home - Sustainable Energy Authority Of Ireland | SEAI
[344] ACEA-Report-Vehicles-on-European-roads-.pdf
[345] Revised National Development Plan will transform how we travel, with a 35 billion euro package prioritising investment in sustainable, active, accessible public transport (www.gov.ie)
[346] Minister Ryan announces major expansion of Irish Rail fleet (www.gov.ie)
[347] How does Ireland's public transport compare with other countries? – The Irish Times

significantly contributes to the nation's greenhouse gas (GHG) emissions. In response, Ireland has adopted a CO2- and NOX-based vehicle taxation scheme, along with substantial incentives for electric vehicle (EV) purchases. The government has pledged increased funding for rail, public transport, and active mobility, favouring public transport investment over road infrastructure by a two-to-one margin and planning to repurpose road spaces for more sustainable transportation methods. Efforts to align land use with transport planning aim to support denser development. However, ensuring that new developments facilitate easy access to transport and include safe routes for walking and cycling remains a pressing issue. The challenge of reducing dependence on private vehicles and offering viable transportation alternatives persists, with congestion and its associated costs, particularly around Dublin, projected to rise. Unlike the Dublin Tunnel, Ireland does not widely implement road use charges for traffic management. Furthermore, indirect car use incentives, like free workplace parking, subtly encourage commuting by car, exacerbating reliance on private vehicles.[348]

Economic and Social Implications

Funding sustainable mobility is crucial not just for reducing greenhouse gas emissions but also for spurring economic growth through the development of infrastructure like public transport networks and bike lanes. Challenges such as allocating enough funding for public transport rather than road infrastructure and changing the public's preference from private vehicles to more sustainable options persist. The Irish public has shown a strong interest in electric vehicles (EVs), as indicated by EV registration numbers and surveys. Ireland is addressing these issues through significant investments in rail and active mobility, along with dedicated funding for public transport in the National Development Plan and Sustainable Mobility Policy. These efforts are further supported by policies aimed at enhancing rural connectivity. The success of these endeavours depends on continuous commitment, detailed planning, and strict regulation enforcement to promote sustainable urban mobility, illustrating Ireland's approach to aligning economic growth with environmental and societal health.

Best Practices and Case Studies

The Kilkenny City Sustainable Urban Mobility Plan (SUMP) is a forward-thinking initiative aiming to enhance the quality of life for its residents and visitors by meeting their mobility needs. The strategy encompasses developing a coherent vision, setting clear objectives, and introducing targeted measures to improve urban movement. These measures focus on redesigning street layouts, enhancing public transport systems, and boosting safety for pedestrians and cyclists, fostering a lively, accessible, healthier, and more sustainable urban environment. [349]
Similarly, Dublin's SUMP emphasizes the harmonization of land use with transportation planning, augmenting public transport services, and promoting active travel modes. It addresses congestion and aims to lower transport-related CO2 emissions by enriching the city's public spaces and prioritizing health and placemaking initiatives. Future-oriented, the plan also considers the evolving dynamics of urban mobility, including shared mobility solutions, micro-mobility options, electric vehicles (EVs), and the integration of technology in managing city movement. Together, these plans represent a holistic approach to urban development, acknowledging the critical role of sustainable mobility in shaping thriving, eco-friendly, and inclusive cities. [350]
The Free Travel Scheme facilitates free access to a wide array of public transportation and certain private bus and ferry services for eligible residents of Ireland. Qualification for the scheme extends to individuals aged 66 and above. It also encompasses those under 66 with disabilities and caregivers, subject to specific criteria. Furthermore, the scheme accommodates the provision for a companion, aged 16 or above, to travel at no additional cost, provided the primary beneficiary requires assistance for medical reasons.[351]

Future Perspectives and Emerging Trends

Ireland is embarking on a transformative journey towards sustainable mobility, leveraging a comprehensive strategy that encompasses economic development, environmental sustainability, and enhanced quality of life. Investments in public transport and active mobility infrastructure, such as the Cork commuter rail electrification and extensive cycling paths, aim to shift transportation habits away from personal vehicle reliance towards more sustainable options. The data regarding EV registrations and the sentiment towards EV adoption surveys indicate robust progress in embracing electric vehicles and advanced mobility solutions in Ireland.
However, realizing the vision of a greener, more efficient transport system in Ireland requires overcoming several challenges, including the alignment of investment priorities and cultural shifts in transportation preferences. The National Development Plan's focus on public transport expansion, alongside measures to encourage EV adoption and enhance urban and rural connectivity, sets a promising foundation for sustainable urban mobility. This holistic approach, combining policy support, technological innovation, and infrastructure development, aims to foster a sustainable mobility ecosystem. By persistently addressing these challenges through dedicated planning, policy implementation, and public engagement, Ireland aspires to lead by example in creating a sustainable, inclusive, and vibrant mobility landscape for future generations.

[348] Executive summary | OECD Environmental Performance Reviews: Ireland 2021 | OECD iLibrary (oecd-ilibrary.org)
[349] Kilkenny City Sustainable Urban Mobility Plan | Kilkenny County Council Consultation Portal
[350] Chapter 8: Sustainable movement and transport | Dublin City Council's Planning Consultation Portal
[351] Free travel in Ireland (citizensinformation.ie)

International Comparisons and Collaborations

The Science Foundation Ireland Research Centre for Software is bringing together expert software teams from universities and institutes of technology across Ireland, from diverse expert knowledge in technology advancements, to partner with manufacturing companies within the region. These are bound with the Connected and Autonomous Vehicles (CAV) steering group, which brings together government agencies, research centres and leading automotive companies to strengthen an innovative ecosystem. [352]

With the backing of the European Union-funded International Urban and Regional Cooperation (IURC) program, a three-member team from Dublin City Council embarked on a study visit to Seoul, South Korea. This trip marks the commencement of pilot projects focusing on urban mobility and digital transition. The visit, awarded through a competitive process by the European Union, aims to enhance data-analytic capabilities in both Dublin and Seoul, fostering deeper collaboration between the two cities in these critical areas. In 2004, Seoul introduced the Transport Operation & Information Service (TOPIS) as a strategic initiative to address traffic congestion and offer viable solutions for its residents. Serving as an advanced traffic information system, TOPIS plays a crucial role in improving urban mobility by aiding in policy formulation. It achieves this through the collection, organization, integration, and dissemination of traffic data and insights to the public, thus facilitating informed decision-making regarding transportation. [353]

[352] Collaboration at core of automotive innovation in West of Ireland | Engineering and Technology Magazine (theiet.org)

[353] International Urban and Regional Cooperation – A Program of the European Union (iurc.eu)

Italy

Policy Review

Italy's Recovery and Resilience Plan

The plan's total value is €194.4 billion, which includes both the portion financed with national resources and the Recovery and Resilience Facility (RRF) Grants of €71.8 billion and RRF loans of €122.6 billion. The plan comprises 150 investment streams and 66 reforms. It is designed to support climate objectives (39% of the plan) and foster the digital transition (25.6% of the plan). The transformative impact of Italy's plan stems from a robust combination of reforms and investments that address the country's specific challenges. The reforms aim to eliminate obstacles to lasting and sustainable growth, while the investments are targeted at promoting the digital and green transition and addressing social and territorial disparities.

All measures must be implemented within a strict timeline, as the Regulation establishing the Recovery and Resilience Facility mandates that all milestones and targets within the national plans be completed by August 2026. Italy's recovery and resilience plan supports the green transition with significant investments in sustainable mobility (€34.5 billion). These investments are complemented by crucial reforms aimed at deploying charging points for electric vehicles, increasing competition in the electric market, improving the functioning of concessions in Italian ports, and simplifying various legal frameworks for accelerating energy efficiency interventions and transport infrastructure projects.[354] These investments also strengthen the zero-emission railway and bus fleet initiative, security of electricity and addressing energy poverty.[355]

EV Tax Benefits and Subsidies

Electric vehicles enjoy a five-year exemption from the annual ownership tax from the date of first registration. After this period, they receive a 75% reduction in the tax rate applied to equivalent petrol vehicles in many regions. Purchase subsidies are available for private individuals, with the subsidy amount and additional scrappage bonus varying based on income. These subsidies apply only to brand new vehicles and come with a mandatory holding period. A total budget of €250 million has been allocated for BEVs for the years 2022, 2023, and 2024.

For companies, benefit cars emitting up to 60 g/km CO2 have been taxed at a lower rate (25%) since 2020. The legislation also introduces different rates based on car emissions, with higher percentages for cars emitting more CO2. These percentages were partially revised in 2021.

Some regional governments, especially in northern Italy, have introduced incentives for the purchase of alternative fuel cars and commercial vehicles (up to 7-12 tons). The amount of the incentive usually depends on the type of fuel or power source. A regional subsidy in Lombardy offers a maximum subsidy amount of €4,000 (or €1,000 without vehicle scrapping) for vehicles with a maximum net retail price of €45,000. Lombardy has also adopted an incentive scheme based on the combination of NOx and CO2 values.

A tax credit is granted to taxpayers who install EV charging infrastructures up to 22 kW. It amounts to 50% of the purchase and installation cost up to €3,000, to be split into ten equal annual tranches. Other financial benefits include free access to the limited traffic zone (LTZ) and free parking in many urban centres for hybrid/electric cars.[356]

Technological Advancements

In 2021, the Italian government partnered with Siemens Smart Infrastructure to initialize smart charging facilities in Rome. The project commenced with 23 charging stations that operate on cloud-based charging infrastructure software.

BluBrake, an Italian e-mobility company, has made significant strides in the development of safety technology for electric bicycles. One of their notable innovations is the ABS G2, the second-generation of the e-bike-specific anti-lock braking system1. This system prevents front wheel lock and rear wheel lifting, enhancing the safety of e-bike riders1. The ABS G2 features a single ABS control unit that is small, easy to install, and combined with an artificial intelligence system that adjusts the braking assistance according to the type of terrain1. Compared to its predecessor, the ABS G2 is 65% smaller and 48% lighter, making it easier to integrate into the bike frame.

In addition to the ABS G2, BluBrake has also partnered with Shimano to develop the Shimano ABS by Blubrake2. This system significantly reduces the risk of front wheel lock-up and rear wheel lift-off, even during panic braking, thus improving the riding experience and reducing the number of accidents2. The ABS can be fully integrated into the frame of e-bikes and e-cargo bikes and is compatible with a wide range of Shimano brakes and electric kits. These technological advancements by BluBrake have contributed to making mobility safer and more sustainable.[357]

Infrastructure Development

Road Infrastructure

The complexity of Italy's road infrastructure is largely due to the country's unique morphology and orography.

[354] Italy's recovery and resilience plan - European Commission (europa.eu)
[355] Italy's recovery and resilience plan - European Commission (europa.eu)
[356] Incentives and Legislation | European Alternative Fuels Observatory (europa.eu)
[357] Italian e-mobility scaleup Blubrake lands €5.2 million to expand its innovative safety tech for e-bikes | EU-Startups

This is evidenced by the fact that 60% of the tunnels planned for the TEN-T networks are located in Italy. This geographical feature also results in a lack of intermodal connections and last-mile and penultimate-mile links, particularly in inland and peripheral areas. Many parts of the Italian road network are quite old, with 80% of the motorway network constructed before 1980. Furthermore, the accident rate is high, especially in urban areas.[358]

Crucially, 4 of the 9 European transportation corridors cross Italy - the Baltic-Adriatic Corridor reaches Trieste, the Mediterranean Corridor crosses Italy from Turin to Trieste, the Scandinavian-Mediterranean Corridor crosses the Brenner pass reaching Augusta and the Rhine-Alpine Corridor connects Genoa with the North Sea Ports.[359] Alongside international corridors, the Ministry of Infrastructure and Transport is seeking to develop regional and national infrastructure networks. The National Operational Program on Infrastructures and Networks invested in railway infrastructures, port infrastructures and intelligent transport systems. The focus of these connections is a result of linking the railway to the South of Italy which currently has limited connections.[360] [361]

EV Charging Infrastructure

Ewiva, a joint venture between Enel X Way, a company of the Enel Group dedicated to electric mobility, and the Volkswagen Group, aims to establish a high-power charging (HPC) network of 3,000 charging points across Italy. Each charging point will have up to 350 kW capacity and will be 100% powered by renewable energy, making them accessible to all electric vehicle drivers.

The launch of Ewiva signifies the continuation of the successful collaboration between the Enel Group and Volkswagen to create a comprehensive e-mobility ecosystem in Italy. Currently, Ewiva is deploying the largest ultra-fast charging network in Italy, with 750 points in 233 locations, supplementing the approximately 17,000 charging points operated by Enel X Way. The joint venture plans to expand its network to 500 locations by the end of 2023, with the goal of reaching 3,000 charging points by 2025.

Ewiva's operations will span more than 800 sites, focusing on city centers, suburban areas, and main commuter and tourist routes. The HPC network will be available to drivers of all types of electric vehicles, regardless of the manufacturer.[362]

Rail Infrastructure

Italy's railway infrastructure is among the most electried in Europe (72% of the rail network, compared to the EU average of 56%) and among the safest (0.19 signicant accidents per million kilometres, compared to the EU average of 0.49). However, Italy's rail infrastructure is less extensive than the European average, with less than 300 kilometres of track per million inhabitants, compared to an average of more than 450.[363]

Market Trends and Consumer Behavior

The industry experienced a negative downturn in the registration of new car passengers – with a 9.7% change from 2019 to 2022.[364] On the other hand, in the same year, Italy produced 476,929 cars which is a 6.5% increase from 2019 to 2022. Italy is the 6th biggest vehicle producer in Europe, holding a 1% share of global production and has a fleet age of 14.7 years in the light commercial vehicles category[365], making it one of the oldest in the EU-market. The ageing fleet of vehicles on Italian roads has a direct impact on pollution levels and human health. With 681 cars per 1000 inhabitants, Italy ranks second after Cyprus. With little over 40 million cars on the road, Italy also has the 2nd largest passenger vehicle fleet in the EU, after Germany. [366] The sales of electric cars fell by 26.9% in 2022, falling to 3.7% in comparison to the 12.1% average in the EU,[367] reflecting on the resistance from Italian consumers on the adoption of electrification in the automotive industry.

Despite the recent decrease in sales, the Italian market for electrical vehicles increased from 0.04% in 2012 to 4.6% in 2021 – this margin represented one of the biggest market growths in Europe. In 2018, the Italian Government announced plans to invest €10 billion as an incentive to put a million EVs on the roads of Italy by 2022, in practice it managed to achieve only 244,944 EVs in circulation.[368]

Public Transportation Systems

Italy has been able to make great progress in sustainable mobility due to constructive relationships between central government and territorial institutions, particularly municipal governments.[369] This has enabled the PNRR to allocate €8.4 billion to green local transportation and rapid mass transportation.[370] Through the projects funded it is projected to save an estimated 2.3 million tons of CO2 emissions per year. This includes the development of high-speed and regional lines spanning 700 km, and the introduction of Rapid Mass Transport (RMT) in urban areas with 216 km of new tramlines, metros, and trolleybuses. The plan also involves the purchase of new trains. The renewal of the bus fleet to include electric and hydrogen buses is also part of the plan. This includes 3,200 electric/hydrogen buses for urban areas and 2,000 methane buses for suburban transport. Testing of

[358] CDP, Transport Sector Policy (cdp.it)
[359] Activities and Projects | Ministero delle infrastrutture e dei trasporti (mit.gov.it)
[360] Eurostat, Total Length Motorways
[361] Press Releases - Blubrake
[362] Ewiva: high power charging network in Italy | Enel X Way
[363] Transport Sector Policy (cdp.it)
[364] Economic_and_Market_Report-First_three_quarters_of_2023-1-1.pdf (acea.auto)
[365] ACEA-Report-Vehicles-on-European-roads-.pdf
[366] ACEA-Report-Vehicles-on-European-roads-.pdf
[367] Italy leads revolt against Europe's electric vehicle transition - CBS News
[368] Electric Vehicles in Italy: What You Should Know (hivepower.tech)
[369] The Italian way to new mobility? Restarts from safety - InfraJournal
[370] Ministry of Sustainable Infrastructures and Mobility, Ten years to transform Italy 2021-2027 (governo.it)

hydrogen for un-electrified railways is also planned, with 50 hydrogen trains in the South and Val Camonica. For smoother mobility, 1,800 km of tourist and urban cycle routes are planned to be introduced.[371]
When it comes to the use of public transport, Italy has a usage rate of 11% for daily trips, which is the lowest among major European countries. This is partly because Italy's local public transport is not as developed, with significantly fewer metro services and tramways compared to other European nations. For instance, the national metro services in Italy, which span less than 250 km across seven cities, cover a smaller area than the metro services in Madrid alone, which extend nearly 300 km.
The Ministry of Transportation highlighted the focus of the Ministry of Sustainable Infrastructure and Mobility in investing vast amounts in the extension and planning of metro lines – as the Italian metropolitan system is not as developed as other cities. For instance, the PNRR is funding the Salerno-Reggio Calabria and Brescia-Verona-Padua railway lines[372], as currently only 4 out of the 5 metro lines work which is still minimal for big cities in popular tourist locations.

Environmental Impact and Emissions

In Italy, the transport sector is responsible for 25% of total greenhouse gas emissions and 30% of CO2 emissions, with 92% of the latter directly attributable to road transport.[373]

Economic and Social Implications

The key macroeconomic challenges for the Italian economy include slow productivity and economic growth, high structural unemployment and low labour market participation. [374] The government invested €41.8 billion from the Recovery and Resilience Fund[375] The Italian automotive sector, recorded €18 billion in the export of new vehicles in 2022, including cars and industrial vehicles (+11% vs. 2021) and €23,5 billion in the export of components (+7% vs. 2021).[376] The automotive and mobility industry has a significant influence on the Italian economy, and as Chinese competitors have started importing vehicles on the European market, the Italian government lobbied the European Union to impose retroactive tariffs towards Chinese EV brands to offset the cheaper raw material and manufacturing costs in China[377].
In 2023, Italy counted 280,000 employees in the automotive sector which added to 5.3% of their GDP, the European Association of Automotive Suppliers warned that the EV industry will result in a loss of 60,000 jobs in Italy by 2035 for automobile suppliers alone.[378] However, in a contradictory statement, researchers from the Rome Business schools predict that as a result of the transition to electric power the employment will rise to 296,800 jobs by 2030.[379]

Best Practices and Case Studies

The Italian government established a structure of independent experts – STEMI – aimed to identify opportunities and scenarios for the transport sector which align with the European and National targets[380]. The end goal seeks to formulate policy recommendations for ecological transition in the transport and environmental areas, which looks to assess the feasibility of the European Green Deal and decarbonizing the transport sector.[381] Within the STEMI report, the five main indices seek to enhance sustainable transport, improve energy efficiency and decarbonise transport during infrastructure developments.[382]

Future Perspectives and Emerging Trends

Italy's Recovery and Resilience Plan, with its robust combination of reforms and investments, is poised to significantly transform the country's socio-economic landscape. The plan's emphasis on supporting climate objectives and fostering digital transition indicates a clear shift towards sustainable growth and modernization. Significant investments in sustainable mobility and the deployment of electric vehicle charging points underscore Italy's commitment to the green transition. The plan also highlights the importance of technological advancements, as seen in the partnership with Siemens Smart Infrastructure for smart charging facilities and BluBrake's development of safety technology for electric bicycles.
The rise of electric vehicles (EVs) is a notable trend, supported by tax benefits, subsidies, and the development of EV charging infrastructures. However, the market faces challenges, including a recent decrease in EV sales and resistance from Italian consumers towards electrification in the automotive industry. On the infrastructure front, there is a clear focus on improving road and rail networks, with significant investments planned for the extension and planning of metro lines. The transport sector's environmental impact is also being addressed, with the sector responsible for a significant portion of Italy's greenhouse gas and CO2 emissions. The government's

[371] Ministry of Sustainable Infrastructures and Mobility, Ten years to transform Italy 2021-2027 (governo.it)
[372] The Italian way to new mobility? Restarts from safety - InfraJournal
[373] The evolution of the automotive sector in Italy. (romebusinessschool.com)
[374] Italy's recovery and resilience plan - European Commission (europa.eu)
[375] NRRP: 62 billion euros allocated to MIMS for sustainable mobility, infrastructures and logistics, 56% to the South | Ministero delle infrastrutture e dei trasporti (mit.gov.it)
[376] Italian Trade Agency, Automotive (2022)
[377] EU set to allow possible retroactive tariffs for Chinese EVs | Reuters
[378] Italy leads revolt against Europe's electric vehicle transition - CBS News
[379] The evolution of the automotive sector in Italy. (romebusinessschool.com)
[380] Ministry of Sustainable Infrastructures and Mobility, Decarbonising Transport (2022)
[381] Ministry of Sustainable Infrastructures and Mobility, Decarbonising Transport (2022)
[382] Ministry of Sustainable Infrastructures and Mobility, Decarbonising Transport (2022)

investment in the Recovery and Resilience Fund and the automotive sector's contribution to Italy's GDP highlight the economic implications of these trends. The potential job losses in the automobile supplier sector due to the rise of EVs is a concern, although some predict an increase in employment due to the transition to electric power.

International Comparisons and Collaborations

The first Futurmotive Expo & Talks was launched on November 16, 2023 in Bologna, Italy, attracting significant attention from Italian authorities and a diverse group of over 158 exhibitors and participants from key nations in the automotive industry. The event is designed to be a global stage for promoting innovation in sustainable practices and applications in the automotive field. It was oraganized by Promotec, with backing from the Italian Ministry of Foreign Affairs and International Cooperation (MAECI) and the Italian Trade Agency (ICE).

The event's main objective is to facilitate discussions on energy transition and sustainability-driven innovation in the automotive industry, and to cultivate business opportunities centered on sustainability. The organizers view these subjects as significant trends in the industry with substantial potential for ongoing expansion. Delegations present includes a variety of profiles such as OEMs, startups, associations, clusters, R&D companies in the new mobility sector, importers/distributors, and journalists. The represented countries include Sweden, Norway, the United Kingdom, Spain, the United States, Japan, Korea, Indonesia, Poland, and China.[383]

[383] Automotive Companies Gather at Futurmotive in Italy (mexicobusiness.news)

Latvia

Policy Review

Latvia'sRecovery and Resilience Plan EU

The plan has a total allocation of €1969 million, funded entirely through RRF grants and loans, with no separate RRF grants allocated. It encompasses 63 investment projects and 25 reform initiatives. A significant 42% of the funds are dedicated to achieving climate objectives, while 23% are aimed at advancing the digital transition. Key components include a €295 million investment dedicated to revamping the Riga Metropolitan area's transport system, promoting clean transport, and enhancing sustainable mobility. A major focus is on making rail passenger transport more competitive within Riga's integrated public transport network. The overarching aim is to reduce Latvia's greenhouse gas (GHG) emissions, specifically targeting the transport sector, the nation's largest source of GHG emissions. [384]

EV Tax Benefits and Subsidies

Policies and subsidies have largely been implemented by the government to boost the electric vehicle market. In Latvia, their incentives focused on tax benefits, where one can be exempted from registration costs for BEV vehicles (on the first registration), as for ownership – exemptions for M1 and N1 vehicles emitting ≤ 50g CO2/km apply. As for company cars, there is a minimum rate (€10) for BEVs. [385]

Technological Advancements

The Future Mobility Consortium looks towards promoting Latvia's ability to establish itself in the industry by developing Latvia's national infrastructure. The project, labelled as 'Latvian Energy Reform Plan for Enabling Electromobility in Latvia' - the consortium aims at strengthening Latvia's position in the transport and mobility sector, the development can result in new jobs and products which add high value to socioeconomic factors in Latvia.[386]

Atom Mobility is a Latvian startup that offers an all in one solution for companies looking to launch a car, scooter or bike sharing service. The company offers solutions that can be deployed in approximately 20 days, much faster compared to traditional development which can take between 6-9 months. So far they have managed to integrate their software into 20+ different services and host 20,000+ vehicles on their platform.[387]

Latvia has launched the first cross-border mobility simulation space in Europe, located at the Bikernieki racetrack in the capital city of Riga. Developed as part of the 5G-Routes project[388], an international initiative aimed at ensuring cross-border automated mobility, the testbed utilizes Latvia's LMT and Estonia's Telia 5G networks to emulate fully functioning international connectivity. The testbed recently demonstrated its first use case, conducting a teleoperated vehicle simulation remotely over LMT's 5G network from the town of Cesis, located 80km away. Artūrs Lindenbergs, innovation lead at LMT, expressed confidence in the potential of automated vehicles operating on the 5G network, emphasizing the Baltic corridor's role in enabling a smart, cross-border highway for connected and autonomous vehicles. Addressing the technical challenge of cross-border connectivity, Baltic operators have collaborated to ensure seamless transition between operators on both sides of the border, despite weaker mobile coverage in border areas.[389]

Infrastructure Development

Funds totalling €295 million allocated through REPowerEU seek to overhaul Riga's transport system in order to promote the use of public transportation and sustainable mobility.[390] Regarding highway infrastructure, the Via Baltica Is a critical transport corridor which runs through Latvia, making it one of country's busiest highways and key to connectivity between the Baltic States and the rest of Europe.

In the National Development Plan for 2021-2027, Latvia has outlined a directive focused on the technological landscape and services. This directive emphasizes the development of a cohesive, sustainable transportation system designed to offer high-quality mobility options for both individuals and goods nationwide, enhancing both international and local connectivity. Within this framework, the railway system is envisioned to serve as the backbone of public transport, and compliant with the EU connectivity objectives. [391]

EV Charging infrastructure

Latvia ranks second among the Baltic states in terms of charging infrastructure, with 532 stations, trailing behind Lithuania's 1,018 stations. Despite this, Latvia has the

[384] Latvia's recovery and resilience plan - European Commission (europa.eu)
[385] Electric-Vehicles-Tax-Benefits-Purchase-Incentives-2022.pdf (acea.auto)
[386] Future Mobility | Green-Tech Latvia (greentechlatvia.eu)
[387] ATOM Mobility vs alternatives | Technology for shared mobility
[388] More information under International Comparison and Collaborations
[389] Latvia launches first cross-border mobility simulation space - Smart Cities World
[390] Latvia's recovery and resilience plan - European Commission (europa.eu)
[391] Latvian National Development Plan 2021-2027_final_pdf.pdf (pkc.gov.lv)

fewest fast-charging stations among its neighbours, with only 189. In terms of access to charging stations, Latvia has 9.6 EVs per station, slightly higher than Lithuania's 9.7 and Estonia's 15.6.[392]

In 2023, the Management Board of Ignitis Group approved an investment decision by its subsidiary, Ignitis, to invest up to €115 million over 3–5 years. The investment is intended to develop an electric vehicle (EV) charging network in the Baltics, with Ignitis and its subsidiaries in Latvia and Estonia spearheading the initiative. The primary objective of this investment is to acquire EV charging stations and enhance the charging network infrastructure across the Baltic states. This strategic investment aligns with Ignitis Group's goal of expediting the development of the EV charging network, aiming to establish the largest fast charging network in the Baltics. Ignitis aims to deploy up to 3,000 EV charging points by the conclusion of 2026.[393]

Energy company Enefit plans to invest €5 million this year, with €500,000 sourced from the European Union's Connecting Europe Facility (CEF), to expand its Enefit Volt electric vehicle (EV) charging network from Estonia into Latvia. The company intends to collaborate with Latvian firms to install over 100 public charging stations this year, aiming to establish the largest charging network in the Baltics within the coming years. In 2023, Enefit constructed ten Enefit Volt fast charging stations along the Ventspils, Bauska, and Tallinn motorways, strategically located on the European Transport Network (TEN-T), each with a maximum capacity of 300 kilowatts. These stations, among the most powerful charging solutions available, can recharge an electric car's battery to approximately 80% in just 20 minutes. With two charging points at each station, up to four EVs can be charged simultaneously.[394]

Market Trends and Consumer Behavior

In 2022, Latvia had a total of 870,396 vehicles resulting in a 1.5% increase change to previous years. Which their car circulation stood at 769,345, van circulation at 65,353 and 33,367 trucks on the road.[395] Nevertheless, Latvia has the lowest density of cars per 1000 inhabitants of which 43% of the population does not own a car.[396]

In the first half of 2023, Latvia experienced significant growth in the demand for new electric vehicles, recording a remarkable 119% increase compared to the same period last year, according to data from the EV charging network Eleport. This surge in EV demand places Latvia at the forefront among the Baltics and Poland. The country's swift growth in EV purchases reflects a growing trend towards sustainable transportation options. Furthermore, Latvia boasts the highest EV market share of all new car purchases in the past six months, slightly exceeding 9%. This data underscores Latvia's progress towards embracing electric mobility and reducing carbon emissions in the transportation sector.[397]

The rate of expansion aligns with economic developments and the financial resources accessible to the public. While this is predominantly observed among individual vehicle owners, businesses are also embracing the integration of 100% electric vehicles into their daily fleet operations. Notably, the Latvian branches of multinational corporations, including courier services like DHL and DPD, are prioritizing green initiatives on a global scale. Additionally, local enterprises are weighing the advantages and disadvantages of internal combustion engines versus electric motors and are choosing electric vehicles based on financial assessments.[398]

Riga, Latvia's capital, has also registered a significant increase in the number of cyclists. In 2008, between 8:00 am and 9:00 am 100 cyclists were crossing the Vansu Bridge, by 2018 the number of cyclists increased to 550.[399] Riga also boasts a low car ownership rate at 262 vehicles per 1000 individuals, a feat attributed to several factors. The city administration has diligently pursued improvements in public transportation, committing to continuously upgrade buses, intending to transition the entire fleet to zero-emission buses by 2030.[400]

Public Transportation Systems

In a survey conducted in 2019, the population of 7 municipalities was asked regarding their satisfaction with the public transportation system. The survey concluded that 81% of the respondents evaluated the regional public transport services positively and only 5% stated that public transportation services were not available to them.[401] The high satisfaction rate can be backed up by a 23% growth rate in Riga's ridership in 2023 compared to 2022. Approximately, 83% of residential buildings in the city are situated within 300 meters of a public transit stop, contributing to the efficiency and affordability of public transportation in Riga. Additionally, Riga boasts

[392] 2023: the year of growth for electric vehicles in Latvia - Labs of Latvia
[393] Ignitis will invest up to EUR 115 million to develop an EV charging network in the Baltic states (ignitisgrupe.lt)
[394] Enefit to invest €5 million in establishing EV charging network in Latvia - Labs of Latvia
[395] ACEA-Report-Vehicles-on-European-roads-.pdf
[396] ACEA-Report-Vehicles-on-European-roads-.pdf
[397] 2023: the year of growth for electric vehicles in Latvia - Labs of Latvia
[398] Baltic states' electric charging networks are getting up to speed / Article (lsm.lv)
[399] Commuting Master Plan for Riga Region 2021-2027
[400] Factsheet_Riga (cities-multimodal.eu)
[401] Commuting Master Plan for Riga Region 2021-2027

the second-highest population density among the cities examined, further enhancing the effectiveness of public transit.[402] Despite the average age of buses being 13.3 years, above the EU average of 12.5 years, the public transportation system is enjoying popularity among Latvians. [403]

Environmental Impact and Emissions

To attain the European Union's objective of climate neutrality by 2050, Latvia must significantly decrease transportation emissions. In 2017, the transportation sector accounted for the nation's second-largest portion of final energy usage, comprising 29% of the total. Notably, 94% of these emissions were attributed to road transport.[404]

Latvia's electric and hybrid fleet amounts to 0.1%-1.3% of their total vehicles. With the automotive infrastructure lagging behind Europe, it also has a direct negative effect on the consumers' willingness to adopt EVs.[405] In their National Development Plan, their fourth priority seeks to improve the living environment for balanced regional development, which looks towards the direction of nature and the environment (as part of the Green Deal). The goal is to reach low carbon levels and climate sustainable developments which would allow Latvia to achieve national energy goals, reduce pollution and overall improve the environment. This is aimed to be accomplished through measures such as reducing GHG emissions in climate change mitigation and technological breakthroughs. [406]

Economic and Social Implications

Latvia's deficient infrastructure manifests in the country's high percentage of commuters experiencing travel times exceeding 30 minutes, reaching 52.5%, notably surpassing the EU average of 34.8%.[407]Through regional development, Latvia is aiming to reduce economic disparities. Latvia is implementing measures to promote local mobility by improving infrastructure and micro-mobility solutions. [408]

Best Practices and Case Studies

In October 2020, Riga's mayor joined for the 2nd time the EUROCITIES initiative and urged the European Parliament to commit to higher climate goals by making significant investments in the public transport system, green infrastructure, renovation of buildings, and measures for improving the quality of the air. In line with this commitment, Riga has developed a comprehensive Sustainable Development Strategy until 2030. Under its umbrella the capital has developed action plans for Air Quality Improvement (2021-2025), Sustainable Mobility Action Programme for the transport system (short term: 2019-2025, medium term: 2026-2030; long term 2031-2050), Sustainable Energy and Climate Action Plan 2030. Through these plans, Riga aims that by 2030 they will achieve a -65% reduction of CO2 levels compared to 1990.[409]

The Sustainable Mobility Action Programme for the Transport System in Riga 2019–2025 aims to facilitate the movement of people and businesses while enhancing accessibility and improving the quality of the living environment. Several measures have been outlined in the program:

- Pedestrian Infrastructure:
  - Prioritizing pedestrian convenience and safety in the city centre through street reconstruction designs.
  - Implementing permanent or seasonal restrictions on transit traffic in certain streets to prioritize pedestrian movement.
- Bicycle Infrastructure Improvement:
  - Integrating bicycle infrastructure into street rebuilding projects, including the construction of bicycle paths and lanes, and installing bicycle racks.
  - Placing bicycle racks at educational institutions, public facilities, intersections, and developing bicycle parking at transportation hubs.
- Public Transport Development and Organization:
  - Coordinating and optimizing public transport routes and schedules, ensuring connectivity with regional transit and planned mobility points.
  - Integrating city public transport with railway and regional bus networks.
  - Establishing a management platform for residents' mobility services and implementing infrastructure projects to connect multi-apartment neighbourhoods.
- Private Transport Measures:
  - Encouraging a reduction in private vehicle usage, particularly in city centres and residential areas.
  - Enhancing the traffic control system, including traffic control centres and traffic light systems.
  - Monitoring, regulating, and controlling taxi services, and promoting carpooling.

Regarding electric transport infrastructure, the program specifies that the Riga City Municipality serves as a

[402] Factsheet_Riga (cities-multimodal.eu)
[403] ACEA-Pocket-Guide-2023-2024.pdf
[404] Kempower and Eleport boost EV charging infrastructure in the Baltics with three new fast charging systems in Latvia - Kempower
[405] ACEA-Report-Vehicles-on-European-roads-.pdf
[406] Summary_Latvian National Development Plan 2021-2027_final_pdf.pdf (pkc.gov.lv)
[407] Key figures on European transport – 2023 edition (europa.eu)
[408] Latvian National Development Plan 2021-2027_
[409] Riga Sustainable Energy and Climate Action Plan for 2022- 2030

coordinator, but the installation of electric charging stations for cars or bicycles is primarily financed by developers of public buildings. These charging stations are typically installed in the car parks of these buildings, with no specific construction standards mandated for them.[410]
The program for sustainable mobility of Riga's transport system includes measures for the integration of the Rail Baltica railway into Riga's mobility system. In accordance with the Air Pollution Reduction Action Plan 2020-2030, it was planned to create low-emission zones in Riga where emissions from diesel engines are limited. [411]

Future Perspectives and Emerging Trends

Latvia is focused on improving its infrastructure at all levels, ranging from motorway infrastructure to using REPowerEU budgeting towards upgrading its metropolitan systems. This emerges from incentivizing political agendas to seek development in the mobility industry. Hereby, the goal of Latvia's transport policy is an integrated transport system which ensures safe, efficient, smart and sustainable mobility which in turn, promotes economic growth and contributes to a low-carbon economy. Cycling is one of the fastest growing alternatives to motor vehicles in Riga however, the city lacks the cycling infrastructure necessary to support this long-term. [412]

International Comparisons and Collaborations

The 5G Routes Project aims to conduct advanced field trials of innovative connected and autonomous mobility (CAM) applications within a designated 5G cross-border corridor, known as the 'Via Baltica-North', spanning across the borders of three EU member states: Latvia, Estonia, and Finland. The primary goal is to validate the latest 5G features and 3GPP specifications under realistic conditions, accelerating the widespread deployment of interoperable CAM ecosystems and services in digitized motorways, railways, and shipways throughout Europe.
To accomplish this overarching objective, the project outlines eight key interdisciplinary implementation objectives that are SMART: Specific, Measurable, Attainable, Realistic, and Time-bound.[413]

[410] Riga Sustainable Energy and Climate Action Plan for 2022-2030
[411] Commuting Master Plan for Riga Region 2021-2027
[412] Commuting Master Plan for Riga Region 2021-2027
[413] Objectives - 5g routes project (5g-routes.eu)

Lithuania

Policy Review

Lithuania's Recovery and Resilience Plan

The financial scope of the initiative totals €3.85 billion, segmented into €2.3 billion from the Recovery and Resilience Facility (RRF) in the form of grants, and €1.55 billion as RRF loans. The strategy encompasses 48 actions aimed at both investments and reforms. A significant portion, 37.4%, is dedicated to achieving climate goals, while 23.3% is earmarked to enhance digital transformation.

A substantial investment of €335 million is allocated for the green transition, focusing on sustainable mobility. This includes initiatives to replace polluting vehicles, enhance public transportation, and develop infrastructure for alternative fuel vehicles, alongside the advancement of sectors like biomethane, biofuels, and hydrogen. Electric vehicles (EVs), upon their first registration, are exempt from certain fees.[414]

As of March 2023, Lithuania had developed 20 Sustainable Urban Mobility Plans (SUMPs), following the Ministry of Transport and Communications' adoption of SUMP Guidelines in 2015, with five additional cities either preparing or planning to develop a SUMP soon.[415]

Tax Incentives and Benefits

For vehicles up to six months old, purchase incentives are available as follows: €4,000 for M1 or N1 electric vehicles, €10,000 for M2 or N2 electric vehicles, plus an additional €1,000 for scrapping an old diesel or petrol M1 vehicle owned for at least a year with a valid MOT. Businesses can receive a maximum subsidy of €400,000.

In 2021, individuals were offered purchase bonuses for EVs: €2,500 for used M1 electric vehicles registered after April 2, 2016, or of the 2016 model year or later, and €5,000 for new M1 electric vehicles within six months of first registration. An extra €1,000 bonus was available for scrapping old diesel or petrol M1 vehicles, provided they had been owned for at least 12 months and had a valid MOT for specific dates in 2021.[416]

Technological Advancements

Lithuania is aligning with global trends in the mobility industry, embracing technologies like autonomous driving, electrification, and the Internet of Things (IoT). These innovations are poised to transform the mobility landscape by increasing efficiency, enhancing safety, and reducing environmental impacts. Electrification, in particular, is a critical trend, with startups worldwide developing efficient batteries, charging infrastructure, and manufacturing electric vehicles to facilitate the widespread adoption of electric mobility.[417]

Infrastructure Development

Continuing the development of the European railway track Rail Baltica, procurement announcements for infrastructure structure design are underway at the Kaunas railway junction and the Jiesia section (Kaunas) to the Lithuania-Poland border. The Rail Baltica railway line spans a total of 870 km across the Baltic countries, comprising 392 km in Lithuania, 265 km in Latvia, and 213 km in Estonia.[418] The Lithuanian Government has approved the infrastructure development plan for the Kaunas node, a crucial part of the Rail Baltica line. This plan includes the construction of new railway viaducts, bridges over the Jiesia River, and a railway tunnel near the Palemonas station, among other enhancements. A total of 120.8 km of railway tracks will be installed or reconstructed in this area, all of which will be electrified. The development of the Kaunas node is seen as a vital step for the social and economic growth of the region, improving communication and safety

EV Charging infrastructure

Lithuania is ambitiously expanding its electric vehicle (EV) charging infrastructure to support the growing adoption of electric vehicles. The Lithuanian Government has set a target to build 6,000 new charging stations by 2030, with the first phase aiming to install 1,200 stations by 2025. This initiative, which involves an investment of approximately €90 million, is part of Lithuania's commitment to sustainable transportation and climate neutrality.[419]

In 2022, there were approximately 600 public charging stations for electric vehicles[420]. Lithuania's core electric vehicle charging network was first established in five major cities, resort areas, and along vital trans-European highways like E85 and E67. These strategically placed charging stations, spaced roughly every 50 kilometres, are designed to support electric vehicle journeys. From 2014 to 2020, 26 high-capacity public charging stations were installed along key routes such as the Vilnius-Klaipėda and Vilnius-Panevėžys highways, utilizing EU funding and adhering to EU standards.[421]

Regarding the expansion of Lithuania's EV charging infrastructure, Inbalance Grid, a Vilnius-based company, specializes in crafting intelligent electric vehicle charging solutions tailored for both businesses and grid operators. With ambitious goals, the company aims to

[414] Lithuania's recovery and resilience plan - European Commission (europa.eu)
[415] Lithuania - European Commission (europa.eu)
[416] Electric-Vehicles-Tax-Benefits-Purchase-Incentives-2022.pdf (acea.auto)
[417] Top 10 Mobility Industry Trends in 2024 | StartUs Insights (startus-insights.com)
[418] Procurements for Rail Baltica infrastructure announced in Lithuania (globalrailwayreview.com)
[419] Lithuania to install 6,000 charging stations | electrive.com
[420] Number of electric vehicle charging stations in Lithuania to increase 10-fold by 2030 – minister - LRT
[421] Lithuania is accelerating in the Electric Mobility Development - Expats.lt

integrate 600 new public EV charging points into its network within the next year. Currently, its network spans over 300 charging points, showcasing substantial growth.[422]

Rail network

The Swiss rolling stock manufacturer, Stadler, has secured its initial order for the Fast Light Intercity and Regional Train (FLIRT) in Lithuania. LTG Link, the Lithuanian railway operator, has inked a deal with Stadler for the procurement of 15 FLIRT multiple units**.** This strategic mix of electric and battery-operated trains underlines LTG Link's commitment to modernizing its fleet, enhancing passenger experience, and promoting sustainable transportation solutions. Moreover, the option for additional trains in the contract reflects the potential for further collaboration and expansion of sustainable rail transport in Lithuania [423] The total length of railway lines in Lithuania is 1868.8 km. However, the technical standard of the country's rail sector infrastructure remains below that of Europe.[424]

Market Trends and Consumer Behavior

In Lithuania, the electric vehicle (EV) sector experienced significant growth, with a 33% increase in the EV population last year, followed by a further 25% rise in the first half of this year, bringing the total to over 16,000 vehicles, including both pure electric vehicles and hybrids. The nation has observed a steady upsurge in the adoption of electric cars and plug-in hybrids. Data from the Ministry of Transport and Communications indicate a rapid expansion in the number of EVs, with more than a fourfold increase by the start of 2020 and a doubling by the beginning of 2021. The year 2022 saw the monthly EV registration rate averaging 360, which rose to 500 per month in 2023. As the calendar turned to January 1, 2024, the total registered EV count in Lithuania reached 19,435, with 11,900 being purely electric and the rest plug-in hybrids. However, the rate of new car sales per 1,000 inhabitants in Lithuania is one of the lowest in Europe at 9, indicating a gradual transition toward a predominantly electric vehicle fleet.[425] [426]

Public Transportation Systems

Lithuania is actively transforming its transport sector towards sustainable mobility. Public transport, walking, and cycling are being promoted, with the goal to increase the total number of cycle paths by at least 20% by 2024. By 2030, it aims for at least 60% of urban travel to be via public transport, walking, or cycling, up from the current 45%. [427]

Lithuania is focused on creating an open data platform to monitor real-time public transport movements, enabling better decision-making for future efficiency improvements. Within the context of the green transition, the country aims to connect every citizen, ensuring mobility options are accessible to all. Vilnius, the capital, is spearheading a pilot project for hydrogen buses, reflecting Lithuania's commitment to transitioning from combustion engines to electric and alternative fuels. Maintaining technological neutrality, Lithuania is dedicated to enhancing bus travel by allocating lanes and expanding infrastructure solely for public transport, with the goal of improving efficiency, speed, and comfort for citizens.[428]

Environmental Impact and Emissions

In 2018, the transportation sector emerged as Lithuania's largest greenhouse gas emitter, contributing to 30% of the nation's total emissions. By 2019, the average vehicle age was 15 years, with diesel-powered cars constituting 68% of the fleet. Despite efforts, the cycle path network in the capital region expanded modestly from 140 km in 2015 to only 204 km by 2019.[429]

The transport sector's emissions have been growing and are projected to rise until the end of the decade, posing challenges to the country's decarbonization targets. However, sustainable urban mobility plans (SUMPs) aim to slow the growth of internal combustion engine vehicles and reduce GHG emissions through electrification of railways and the promotion of EVs and cleaner transport technologies.[430]

Economic and Social Implications

Rail transport has been growing in Lithuania, with the Rail Baltica project expected to enhance rail infrastructure and connectivity. These developments are essential for sustaining Lithuania's economic growth and integration into European markets.

Initiatives like the Transport Innovation Forum, organized by EIT Urban Mobility, focus on decarbonizing urban mobility and transport. The forum discusses innovative and efficient logistics, supply chains, and strategies for Baltic cities to become climate-neutral by 2030. Such initiatives highlight the importance of collaboration, innovation, and experience sharing among cities to decarbonize urban mobility and transport systems efficiently. These efforts are crucial for meeting environmental targets and improving the overall quality of urban life, also including rural areas. Regarding rural areas, the recent overhaul of intercity bus services has resulted in many rural municipalities being inadequately served by public transport. Without

[422] Lithuanian electric mobility startup raises €1.3 million for the development of its technology - ArcticStartup
[423] Stadler to roll out FLIRT in Lithuania - Railway Technology (railway-technology.com)
[424] About the Sector - Ministry of Transport and Communications (lrv.lt)
[425] Home - Ministry of Transport and Communications (lrv.lt)
[426] ACEA-Pocket-Guide-2023-2024.pdf
[427] Developing sustainable transport infrastructure is essential for Lithuania to move towards zero-emission transport | Lithuania
[428] Lithuania's roadmap to a greener transport landscape (intelligenttransport.com)
[429] Environmental country reviews - OECD
[430] Chapter 4. Sustainable mobility | OECD Environmental Performance Reviews: Lithuania 2021 | OECD iLibrary (oecd-ilibrary.org)

public subsidies, private carriers focused on profit are unlikely to operate unpopular routes.[431] [432]
These economic and social implications underscore the need for continued investment in sustainable transport solutions, policy interventions to mitigate environmental impacts, and collaborative efforts to foster innovation and resilience in Lithuania's urban mobility landscape.

Best Practices and Case Studies

Vilnius, Lithuania's capital, has been particularly proactive in embracing smart mobility. The city has implemented various ICT solutions to manage traffic flows and reduce congestion. This includes smart traffic lights and traffic management systems that adapt in real time to changing traffic conditions. Vilnius has also been expanding its network of bike lanes and promoting bike-sharing programs to encourage non-motorized transportation, which contributes to reducing air and noise pollution and aligning with sustainable urban mobility objectives.[433]

Future Perspectives

The future perspectives for sustainable mobility in Lithuania point towards a transformative shift, emphasizing the reduction of greenhouse gas emissions, enhancement of urban air quality, and fostering innovation and collaboration. With the increasing importance of decarbonization targets and the adverse environmental impacts of traditional transport modes, Lithuania is poised to embrace sustainable urban mobility plans (SUMPs). These plans aim to slow the growth of internal combustion engine vehicles, promote the electrification of railways, and encourage the adoption of electric vehicles (EVs). This vision for sustainable mobility in Lithuania involves leveraging technological advancements, policy reforms, and international collaboration to create a greener, more efficient, and inclusive urban transport landscape.

International Comparisons and Collaborations

Efforts like the Transport Innovation Forum demonstrate a strong commitment towards greener urban mobility solutions, envisioning a future in which cities across the Baltic region, such as Vilnius among others, lead the way through innovation and shared learnings to realize the goal of becoming climate-neutral by 2030. These cities are integral to the European Union's ambitious Cities Mission, aiming to establish 100 climate-neutral and intelligent cities by 2030. Vilnius, Tauragé, Riga, Liepāja, and Tartu are on a strategic path to achieve this objective, aligning with the broader vision of sustainability and environmental stewardship[434]

[431] Lithuania's rural municipalities left without public transport amid stricter rules for carriers - LRT
[432] Transport Innovation Forum - EIT Urban Mobility
[433] Third place Vilnius (Lithaunia) - European Commission (europa.eu)
[434] Transport Innovation Forum - EIT Urban Mobility

Luxembourg

Policy Review

Luxembourg's Recovery and Resilience Plan
The plan is contributing to making the country more environmentally sustainable and resilient, while also preparing it for the advancements and possibilities brought about by the green and digital transitions. The total value of the plan is €88.4 million, which includes national resources as well. The Recovery and Resilience Facility (RRF) provides €82.7 million in grants, with no loans involved.
The strategy encompasses 12 investment streams and 8 reforms, dedicating 68.8% of its resources to climate objectives and 29.6% to enhancing the digital transition. Luxembourg's strategy places a significant emphasis on the green transition, allocating 68.8% of its total funding of €83 million to this area. Among the specific actions is an investment of €30.5 million to expand the country's network of electric vehicle charging stations.

EV Tax Benefits and Subsidies

Zero-emission vehicles are subject to only 50% of the standard administrative tax, with a minimum yearly rate set at €30. The monthly benefit in kind for these vehicles varies between 0.5% and 1.8%, depending on their CO2 emissions. Battery Electric Vehicles (BEVs) with a battery capacity of 18 kWh or less qualify for a €8,000 incentive, while those with more than 18 kWh are eligible for a €3,000 incentive. Plug-in Hybrid Electric Vehicles (PHEVs) emitting 50g CO2/km or less can receive a €2,500 incentive.[435]

The National Mobility Plan 2035

The National Mobility Plan 2035 (PNM 2035) of Luxembourg represents a forward-thinking strategy to meet the mobility needs of the future. It sets forth the goal to accommodate a 40% increase in travel compared to 2017 and adopt the sustainable mobility measures proposed in the Modu 2.0 strategy. The Modu 2.0 Sustainable Mobility Strategy, crafted by Luxembourg's Department of Transport, is designed to alleviate mobility challenges for both work-related and leisure travels. This strategy draws on insights from the Luxmobil survey, which involved 37,500 local and cross-border workers in 2017. Featuring a "mobility toolbox," the strategy proposes nearly fifty practical actions that can be taken by the four main "mobility stakeholders" — the government, local municipalities, employers, and individuals — to improve the current mobility situation. These measures span a wide array of mobility facets, such as spatial and urban planning, traffic management, infrastructure for walking and biking, peak time control, car travel, parking solutions, multimodal transport options, public transportation enhancements, economic incentives, and the promotion of cleaner vehicular transport. [436]

Sustainability Bond Framework

Luxembourg became the first European country to launch a Sustainability Bond Framework. The framework provides a structured approach for the issuance of green, social, and combined sustainability bonds. It aligns with the International Capital Markets Association (ICMA) principles for Green, Social, and Sustainability Bonds and adheres to the European taxonomy for green financing standards. This framework ensures that funds raised are dedicated to financing or refinancing projects within specified green and social sectors, such as green building construction, energy transition, low-carbon transportation, environmental conservation, water management, climate-related financing and research, essential services access (including health, education, and social inclusion), affordable housing, and employment generation. It is in harmony with Luxembourg's National Plan for Sustainable Development and the Integrated National Energy and Climate Plan, reinforcing the country's commitment to sustainability. Notably, Luxembourg capitalized on this framework shortly after its introduction by issuing the first European sovereign sustainability bond, amassing over €1.5 billion to support sustainable projects.[437]

Technological Advancements

Positioned at the forefront of innovation and technology, Luxembourg offers a prime environment for the company Pony.ai to enhance its autonomous mobility technology within Europe. In collaboration with Luxinnovation and various local entities, Pony.ai plans to establish a regional headquarters in Luxembourg. This hub will focus on advanced research and development in autonomous vehicle technology, positioning Pony.ai as a leader in technological progress and customized solutions for the European sector. Additionally, both the Government of Luxembourg and Pony.ai are dedicated to forming a strong local network to bolster the operational infrastructure in Luxembourg. Pony.ai is eager to forge substantial local alliances to facilitate this initiative, underscoring its commitment to innovation and partnership in the region.[438]

Infrastructure Development

Luxembourg City is planning to extend its tram network by more than 3 kilometres, with an investment of approximately €135 million, sanctioned by the nation's Chamber of Deputies. This extension project

[435] Electric-Vehicles-Tax-Benefits-Purchase-Incentives-2022.pdf (acea.auto)
[436] Luxembourg National mobility plan 2035 - government.lu (gouvernement.lu)
[437] Luxembourg – First European country to launch a Sustainability Bond Framework - government.lu (gouvernement.lu)
[438] Pony.ai

encompasses two key segments: a 1.1 kilometre stretch linking the central station to the Nei Hollerich district, expected to be operational by 2028, and a 2.3 kilometre branch from Rout Bréck-Pafendall station to the newly developing Laangfur district in Kirchberg, slated for completion by 2027. These expansions, including the addition of five new stations, align with Luxembourg's National Mobility Plan 2035. The plan aims to bolster transport capacity by 40% from its inception in 2017, promoting a seamless intermodal network.
Moreover, Luxembourg is keen on enhancing connectivity with neighbouring countries, notably Belgium. This is evidenced by Infrabel, Belgium's rail infrastructure manager, securing a €1 billion loan to advance projects like the Brussels-Luxembourg rail link. These efforts underscore Luxembourg's commitment to developing a robust, efficient transport infrastructure, catering both to domestic mobility needs and international connectivity.[439]

EV charging infrastructure

Luxembourg's Chargy network, a robust infrastructure for charging electric and plug-in hybrid vehicles, currently offers over 700 public charging points nationwide. The network is poised for growth with the planned addition of 88 SuperChargy stations, known for their ultra-fast charging capabilities, along major roads, at motorway service areas, and in select car parks, all equipped with CCS sockets for quick charging. Additionally, a variety of charging points installed by third parties, labelled as Chargy OK, complement the network, enhancing its reach and convenience. The goal is to increase the total number of charging points to 1,600, with significant contributions from Chargy, which receives the most government subsidy, as well as other providers like EVBox, Tesla, and Enovos. [440] [441] [442] [443]

Rail network

On the rail transport front, CFL (Chemins de Fer Luxembourgeois) experienced a record-breaking year in 2023, with nearly 30 million passengers utilizing the service, eclipsing the 2019 record by around 3 million. The most popular route, running between Luxembourg, Esch-sur-Alzette, and Rodange, alone served 9 million passengers. The continued increase in rail passengers is expected to persist until 2035, supported by the addition of extra seating in trains to cater to the growing demand. Luxembourg also shines in terms of railway electrification within the European Union, with 96.7% of its railway lines electrified as of 2021, the second-highest proportion among EU member states, showcasing its commitment to sustainable and efficient rail transport. [444] [445]

Market Trends and Consumer Behavior

In the first eight months of 2023, Luxembourg registered 10,401 new electric vehicles, making up over 30% of all new car registrations and outnumbering new diesel vehicle registrations. Electric vehicles, including both pure and plug-in hybrids, constituted 7.52% of all registered cars in Luxembourg in October 2023. This places Luxembourg among the top EU countries for EV adoption, only behind Sweden and Denmark.[446]
An EIB survey revealed that 51% of car buyers in Luxembourg are open to purchasing hybrid or electric vehicles, showing a slightly lower inclination towards these new technologies compared to their neighbours in the Netherlands (62%), France (61%), and Belgium (63%). However, the interest level in Luxembourg is comparable to that in Germany, where 52% of consumers would consider a hybrid or electric vehicle.[447]
Although Luxembourg does not have an assembly line or a national car brand, the automotive industry in Luxembourg is important. Luxembourg is a prime location for first and second tier suppliers of automotive components. The focus of the industry lies on research and development rather than manufacturing.[448]
As of 2023, there were 539,196 vehicles registered in Luxembourg, including 8,528 electric cars and 25,649 hybrid cars.[449] Despite not producing cars, Luxembourg has recorded the highest motorization rate among the EU Member States for at least 30 years. In 2019, there were 681 passenger cars per thousand inhabitants in the country.[450] This figure may be influenced by cross-border workers using company cars registered in the country. So, while Luxembourg does not produce cars, it plays a significant role in the automotive industry. Additionally, vehicles in Luxembourg tend to have larger engine sizes compared to the EU average, indicating a preference for more powerful cars. The majority of travel within Luxembourg is done by personal car (83.1%), with public transportation making up a smaller portion of travel kilometres. [451] [452]

Public Transportation Systems

In Luxembourg City, the public transport fleet includes 163 AVL (Autobus de la Ville de Luxembourg) buses. As of 2021, electric vehicles, including both fully electric (BEV) and plug-in hybrid (PHEV) models, represent 3 to

[439] Luxembourg approves €135m tram extensions (railway-technology.com)
[440] Electric mobility gathers speed in Luxembourg - Luxembourg (public.lu)
[441] SWIO installs fastest EV charging stations to date in Luxembourg – EVBox Troniq High Power | EVBox Newsroom
[442] Tesla Destination Charging in Luxembourg | Tesla
[443] Electromobility | Le shop en ligne d'Enovos
[444] Nearly 30 million people traveled on CFL trains in 2023 — Luxtoday.lu
[445] Electrified rail network in Europe, by country | Statista
[446] Over 10k New EV Registrations Made in Luxembourg Since 2018 (chronicle.lu)
[447] People in Luxembourg less inclined to buy electric or hybrid cars than their European neighbours - How climate considerations affect the decisions of people in Luxembourg (eib.org)
[448] AUTOMOTIVE - Luxembourg (public.lu)
[449] Luxembourg in figures 2023 now available - Statistics Portal - Luxembourg (public.lu)
[450] Luxembourg leads cars per inhabitant list in the EU - Products Eurostat News - Eurostat (europa.eu)
[451] Europe: car sales engine size | Statista
[452] Luxembourg leads cars per inhabitant list in the EU - Products Eurostat News - Eurostat (europa.eu)

4% of all registered vehicles in Luxembourg. The city has introduced 10 electric buses and aims to transition its entire bus fleet from combustion engines to electric between 2025 and 2030. Despite these initiatives, diesel buses currently dominate the EU, including Luxembourg, making up 94.5% of the fleet, while petrol buses represent a minimal share, deduced by the dominance of diesel and the rise in electric buses. [453] [454] [455]

Since February 29, 2020, Luxembourg has made all its public transportation — including buses, trains, and trams — free for everyone, residents and tourists alike. This initiative makes Luxembourg unique, emphasizing its commitment to sustainable mobility and accessibility. The comprehensive network ensures smooth connectivity across urban and rural areas and is complemented by special services like the CityBus, Night Bus, and services for people with disabilities. Luxembourg also boasts excellent cross-border connections and encourages combining train travel with cycling by providing free bike transport on trains and secure bike parking stations. [456]

Environmental Impact and Emissions

CO2 emissions per person from burning fuel are significantly elevated because historically, road fuels have been taxed minimally. This has attracted cross-border workers and transit vehicle drivers to refuel in Luxembourg. However, when considering CO2 emissions based on demand (footprint), which includes all carbon emissions globally generated to meet Luxembourg's domestic needs, the per capita figures exceed the OECD average. This highlights Luxembourg's reliance on imports to fulfil its domestic demand.[457]

In Luxembourg, passenger cars are relatively newer with an average age of 7.6 years, younger than in many other European nations. Registrations of petrol cars represented 55.4% of new registrations in 2022. Electric vehicles, making up 1.94% of all cars by January 2023, saw 23% of new registrations in September 2022, with expectations of a price decline from 2024 to 2028. Additionally, hybrid vehicles accounted for 28.2% of new car registrations in 2022. [458] [459] [460] [461] [462]

Economic and Social Implications

The automotive sector plays a vital role in Luxembourg's economy, employing a large number of people directly and indirectly. Luxembourg has emerged as a key location for top-tier automotive suppliers and innovators in mobility technology. Companies like BorgWarner, Goodyear, and IEE have chosen Luxembourg for their research and development operations. The country is pursuing ambitious digitalization goals, extending well beyond the automotive industry. [463]

As a major economic force, the automotive industry in Luxembourg reported approximately €1.5 billion in sales turnover in 2017, with over €2.5 billion in additional turnover from Luxembourg-based research and development centres. The industry supports around 10,000 jobs, including 2,500 professionals in research and development, who are distinguished by their multilingual and multicultural capabilities. [464]

Moreover, the members of ILEA (Industrie Luxembourgeoise Equipement pour Automobile), representing Luxembourg's automotive suppliers, achieve a total sales turnover exceeding €1.5 billion annually. [465]

Since 29 February 2020, Luxembourg has made public transport free for all, including residents and tourists, covering trains, trams, and buses. This initiative provides seamless access across the country, enhancing connectivity from urban to rural areas and improving cross-border links with Germany, France, and Belgium. This policy not only boosts social inclusivity by making mobility accessible to everyone but also promotes economic benefits by reducing traffic congestion, lowering pollution, and enhancing the attractiveness of Luxembourg as a tourist destination and a place to live and work.

The country has the highest vehicle density in Europe, with 696 cars per 1,000 people as of 2020. Despite the initiative, Luxembourg continues to face challenges with car use. Low tariffs and taxes have resulted in the cheapest diesel in the EU and the cheapest gas in Western Europe, contributing to high car ownership. Traffic often moves at a crawl, and Luxembourg City is a checkerboard of parking lots. The initiative is expected to increase public transport usage by 20% by 2025. However, it's important to note that many workers commute from neighbouring countries, making the switch to public transportation a complex issue.

While the sustainability impact may be minimal, the social benefits of cost savings are significant. The total cost of running the service is more than €500m, so the government sees the lost fare revenue as relatively small. The initiative is viewed as a social measure that will hit higher taxpayers more than others.[466]

Best Practices and Case Studies

The PNM 2035 is acclaimed for its innovative approach to addressing Luxembourg's future mobility needs, aiming to accommodate a 40% increase in daily trips by

[453] Length of Road Network - Statistics - Public Works Portal - Luxembourg
[454] Luxembourg links EV subsidies to consumption | electrive.com
[455] Report - Vehicles in use, Europe 2021 - ACEA - European Automobile Manufacturers' Association
[456] Public transport - Luxembourg
[457] Environment at a Glance Indicators – Luxembourg (oecd-ilibrary.org)
[458] Average age of the EU vehicle fleet, by country - ACEA - European Automobile Manufacturers' Association
[459] Passenger cars in the EU - Statistics Explained (europa.eu)
[460] Passenger cars in the EU - Statistics Explained (europa.eu)
[461] Average price per unit (PPU) in the electric vehicles market Luxembourg 2016-2028 | Statista
[462] New car registrations in Luxembourg: a difficult year ... - Statistics Portal - Luxembourg (public.lu)
[463] Automotive sector and smart mobility - Luxembourg (public.lu)
[464] 2017 Luxembourg and Global Automotive Market Study (luxinnovation.lu)
[465] ILEA – Luxembourg Automotive Suppliers Industry |
[466] Inside Luxembourg's Experiment With Free Public Transit - Bloomberg

2035 through a shift towards sustainable and multi-modal transportation solutions. This strategic plan, highlighted by sources such as the Luxembourg Government, Delano News, and UITP, is predicated on three transformative shifts: prioritizing the movement of people over vehicles, planning based on future mobility demands, and adopting a comprehensive multi-modal approach. These strategies are designed to significantly reduce individual vehicle use, enhance public transport, cycling, and walking, and incorporate the needs of cross-border commuters, underscoring a holistic vision for a sustainable mobility ecosystem.
PNM 2035 stands out for its collaborative development process involving government entities, transportation companies, and the public, ensuring that the plan addresses a wide range of mobility needs while promoting environmental sustainability and improving quality of life. Its focus on expanding infrastructure, such as railway upgrades and tram extensions, alongside promoting alternative transport modes, positions it as a best practice example in sustainable mobility planning. The plan's ambitious goals for reducing reliance on personal vehicles and enhancing the accessibility and attractiveness of public and alternative transport options reflect a forward-thinking commitment to creating healthier, more livable urban spaces[467]

Future Perspectives and Emerging Trends

Following Luxembourg's introduction of free public transport to encourage a shift away from car ownership and use, it's not immediately clear if this will lead to a significant reduction in car ownership in the near term. Nevertheless, there's a noticeable uptrend in the acquisition of electric and hybrid vehicles, supported by government incentives for these and hydrogen-powered vehicles. This trend, alongside the expansion of electric vehicle (EV) charging infrastructure and growing positive attitudes towards EV adoption, suggests that while the total number of vehicles may not decline rapidly, the composition of Luxembourg's vehicle fleet is set on a path toward greater sustainability.

International Comparisons and Collaborations

Spanning 65,401 km² at the juncture of the Rhine, Saar, Meuse, and Moselle rivers, the Greater Region is a vibrant hub with over 11.6 million residents. This area includes Lorraine in France's Grand Est region, Wallonia and the Federation Wallonia-Brussels in Belgium, Saarland and Rhineland-Palatinate in Germany, and the Grand Duchy of Luxembourg. Originating from a 1969 intergovernmental commission by Germany and France, Luxembourg joined in 1971, followed by additional German and Belgian regions. This collaborative framework, particularly the Transport working group, fosters cross-regional commuting solutions, offering online journey planners for real-time travel information across various transport modes. Environmental initiatives also form a key part of the collaboration, with efforts in agriculture, forestry, and biodiversity, exemplified by GREATER GREEN, Europe's inaugural cross-border environmental technology network.[468][469]

[467] Luxembourg National mobility plan 2035 (gouvernement.lu)
[468] The Greater Region at a Glance — Grande Region
[469] Interreg, greatergreen.eu

Malta

Policy Review

Malta's Recovery and Resilience Plan

The overall valuation of the plan is €336 million, inclusive of portions financed through national resources, while the Recovery and Resilience Facility (RRF) grants amount to €328 million. This figure integrates funds transferred from the Brexit Adjustment Reserve requested by Malta along with the REPowerEU grant allocated to Malta, though no RRF loans are involved.

The plan delineates 16 investment areas and 31 reforms, with a significant 68.8% dedicated to climate-related objectives and 26.2% aimed at advancing digital innovation. Efforts to advance the green transition are evident in the push for widespread adoption of electric vehicles (EVs) across both public and private sectors. An earmarked €60 million is set to encourage the procurement of zero-emission EVs. Additionally, the plan involves a €34 million investment for acquiring 102 electric buses for public transportation and introduces a reform to provide over 100,000 Maltese citizens with free access to public transit, aiming to enhance public transport usage and alleviate congestion issues. [470]

EV Tax Benefits and Subsidies

Malta provides tax incentives for the acquisition of vehicles with emissions of 100g CO2/km or lower. For ownership, the same minimum tax rate applies to vehicles emitting 100g CO2/km or less.[471]

In addition to purchase tax benefits for new electric vehicles, Malta also offers scrappage incentives for old combustion engine vehicles. This encourages the replacement of older, less efficient cars with cleaner alternatives.[472]

To advance the shift towards cleaner and more eco-friendly transport solutions, Transport Malta, together with the Ministry for Transport, Infrastructure and Public Works, unveiled a new financial incentive scheme. This scheme is designed to boost the uptake of zero-emission vehicles, aiming to cut down on emissions from Malta's road transport sector.

In light of the announcement made on October 19, 2023, to halt the operation of rental e-kick scooters, Transport Malta affirms its dedication to eco-friendly transportation alternatives. Despite the prohibition of rental e-kick scooters on the streets, the agency encourages the use of privately owned e-kick scooters, which are still permitted and supported under the current regulations as a viable transport alternative.[473]

Technological Advancements

Transport Malta, in line with the European Union's directives and commitments to sustainable and intelligent transport systems, is also embracing the Intelligent Transport Systems (ITS) directive. This approach improves the accessibility of ITS travel and traffic data, supporting the coordinated and coherent deployment of interoperable and seamless ITS services across all transport modes. [474]

Infrastructure Development

Malta is making strides towards sustainable mobility through comprehensive planning and the adoption of innovative solutions. A key initiative in this effort is the Sustainable Urban Mobility Plan for the Valletta Region, designed to promote sustainable mobility across the Maltese Islands, home to over 40% of the island's population. This plan, published by the Ministry of Transport on December 30, 2022, includes a range of sustainable mobility measures such as peripheral parking schemes to encourage cycling and walking, the establishment of local transport hubs, the development of cycling infrastructure, and the introduction of car-sharing and on-demand transport services. Moreover, the plan focuses on the adoption of electric vehicles and the expansion of charging infrastructure, alongside last-mile and alternative mobility solutions. The full implementation of this reform is anticipated by June 30, 2025. [475]

Malta's Transport Strategy 2050 and its Low-Carbon Development Strategy are geared towards decreasing greenhouse gas emissions, enhancing air quality, and improving the overall quality of life. These strategies are laying out a roadmap for a more sustainable future, emphasizing human-centred approaches. Key initiatives include the development of safe walking and cycling infrastructure, the introduction of dedicated bus lanes for more efficient public transport, seamless integration between bus and ferry services for better connectivity, and the planning of a bus rapid transit system to link major urban centres across Malta and Gozo. Additionally, to boost accessibility and reduce environmental impact, transport-on-demand services powered by electric vehicles have been launched in various localities, contributing to the island's sustainable mobility goals. [476] [477]

EV Charging Infrastructure

Currently, Malta and Gozo boast a network of 372 electric vehicle (EV) charging stations. Specifically,

[470] Malta's recovery and resilience plan - European Commission (europa.eu)
[471] Electric-Vehicles-Tax-Benefits-Purchase-Incentives-2022.pdf (acea.auto)
[472] New Electric Vehicles - Transport Malta (gov.mt)
[473] Transport Malta Launches New Financial Incentive to Promote Sustainable Transport Solutions (gov.mt)
[474] Transport Governance and Policy - Transport Malta
[475] A Sustainable Urban Mobility Plan for the Valletta Region - European Commission (europa.eu)
[476] Sustainable transport is about much more than electrification - The Malta Independent
[477] The future of sustainable transport: Achievements and way forward (timesofmalta.com)

Malta houses 310 stations across 60 different areas, while Gozo features 62 stations in 14 areas. In 2023, efforts to augment this infrastructure saw the addition of 46 new stations in Malta and 12 in Gozo, yet the shift towards electric vehicles proceeds at a gradual pace. A €3 million investment significantly expanded Malta's charging infrastructure, with the number of charging points increasing from 102 to 362 across 70 localities, including 44 fast chargers—a vital development for promoting EV usage. Looking ahead, Malta has set a goal to install an additional 1,200 charging points, a move that underscores its dedication to fostering sustainable transportation and lowering carbon emissions. [478] [479]

Market Trends and Consumer Behavior

By March 2022, the number of electric vehicles (EVs) reached 6,000, a significant increase from 2,000 two years prior. By the end of August 2023, Malta and Gozo collectively registered 3,738 plug-in hybrid cars and 7,362 electric vehicles. While this uptick suggests a positive response to grants promoting sustainable transportation, the prevalence of petrol and diesel vehicles remains remarkably high at 93.9%. Malta's adoption rate lags behind other European countries. The government has earmarked €28.4 million for sustainable transportation endeavours, drawing €13.4 million from national funds and €15 million from the Recovery and Resilience Plan (RRP). Transport Malta emphasized the government's commitment to nurturing sustainable transport alternatives, underscoring a substantial investment of over €27.5 million in incentives in 2022. These initiatives seek to encourage the acquisition of electric and plug-in hybrid cars, fostering reduced emissions and a greener transport infrastructure. [480]

The Electric Vehicles market in Malta is projected to reach a revenue of US$19.7 million by 2024. This market segment is expected to show an annual growth rate (CAGR 2024-2028) of 14.80%, resulting in a projected market volume of US$34.3 million by 2028. The unit sales of Electric Vehicles in Malta are expected to reach 625 vehicles by 2028.[481]
Malta's collaboration with EIT Urban Mobility, through a Memorandum of Understanding (MoU) signed in December 2022, reinforces its commitment to developing and implementing long-term sustainable urban mobility solutions. This partnership aims to leverage the strengths of both organizations to foster innovation in the mobility sector, providing new opportunities for potential partnerships and joint ventures, and promoting active mobility along with public transportation solutions[482]

Public Transportation

Malta has taken significant steps to improve public transport as a key component of its emissions reduction strategy. Initiatives such as offering free public transport for all personalized Travel Card holders and planning for all public transport vehicles to have zero tailpipe emissions by 2030 demonstrate Malta's dedication to enhancing the quality, reliability, and sustainability of its public transport system. [483]
The transport sector is responsible for about a third of national greenhouse gas emissions in Malta. Efforts to reduce emissions are crucial for the island's environmental sustainability.[484]
Malta Public Transport has taken a significant step towards enhancing the efficiency and safety of its services through the implementation of a driver assistant system that leverages advanced technology. This system, which monitors real-time driving patterns to assess factors such as fuel consumption, smooth driving, and accident-avoidance capabilities, was fully adopted in 2020 after a thorough trial phase. It enables drivers to receive monthly personal performance reports, fostering self-improvement through personalized training while also recognizing outstanding performance. The introduction of this technology aligns with the company's commitment to safety and environmental sustainability, evidenced by its operation of one of the youngest bus fleets in Europe and the recent addition of Euro VI vehicles. The initiative has led to notable improvements in driver performance and a decrease in accident rates, underscoring the crucial role of drivers in providing quality service and minimizing the environmental impact of public transportation.[485]

Environmental Impact

In 2018, Malta recorded the second-highest level of carbon emissions within the European Union, largely attributable to the widespread use of petrol and diesel vehicles. Despite strides made by the energy sector in curtailing emissions, the transportation sector experienced a 22% surge in emissions from 2005 to 2019. Notably, the vehicle age distribution on the island reveals a significant portion of the fleet is outdated, with around 45,000 vehicles being over 20 years old, compared to less than 17,000 cars that are no more than two years old. [486] [487] [488]

Economic and Social Implications

Malta's strategic investments and reforms, particularly in sustainable mobility and digital innovation, have significant economic and social implications.

[478] 1,200 new charging points to be installed but Malta still trails Europe in electric vehicle infrastructure - Newsbook
[479] Shaping the island's charging EV infrastructure (maltatoday.com.mt)
[480] Transport Malta (gov.mt)
[481] Electric Vehicles - Malta | Statista Market Forecast
[482] EIT Urban Mobility and Transport Malta reinforce their collaboration with the signature of a Memorandum of Understanding (MoU). - EIT Urban Mobility
[483] Public Transport in Malta - Transport Malta (gov.mt)
[484] Malta Sustainability Forum: Can we change the transport system? - The Malta Independent
[485] Malta Public Transport
[486] Malta registers second-highest carbon emissions in EU in 2018 (maltatoday.com.mt)
[487] Climate action in Malta: Latest state of play | Think Tank | European Parliament (europa.eu)
[488] Malta Number of Registered Vehicles | Economic Indicators | CEIC (ceicdata.com)

Economically, the focus on climate objectives and EV adoption is poised to stimulate growth in green technologies and industries, potentially creating jobs and attracting investment. Socially, improvements in public transport and EV infrastructure aim to enhance quality of life through better air quality and reduced congestion, promoting healthier lifestyles. The push towards digitalization and sustainable transport solutions also signals Malta's commitment to future-proofing its economy and society against environmental challenges.

Future Perspectives and Emerging Trends

Currently, despite its small size, Malta faces significant environmental challenges as a notable polluter. However, there is optimism for a shift towards sustainability, evidenced by the country's recent investments in electric vehicle (EV) infrastructure and sustainable transport initiatives. While Malta's current environmental statistics are concerning, the ongoing efforts and regulations suggest a potential for positive change in the future. The increased awareness of sustainability, coupled with the incentives and legislation supporting EV adoption, indicates a promising trajectory. Nonetheless, Malta still lags behind European averages in EV adoption rates, highlighting the need for further action and improvement.

Key initiatives, such as the implementation of free public transport and the formulation of Malta's Transport Strategy 2050, are pivotal in fostering sustainable urban mobility. These initiatives signal a commitment to transforming Malta's transportation landscape towards a more eco-friendly and efficient system. As awareness grows and infrastructure continues to develop, there are promising opportunities for Malta to enhance its sustainability efforts and align more closely with European standards. Through continued investment, regulation, and public engagement, Malta has the potential to significantly improve its environmental footprint and establish itself as a leader in sustainable transportation practices within the region.

International Comparisons and Collaborations

EIT Urban Mobility and Transport Malta forged a new partnership aimed at fostering the development and execution of sustainable urban mobility solutions within Malta. This agreement signifies a formal acknowledgement of their collaborative efforts and serves to enhance the relationship between the two entities at both strategic and operational levels. This partnership paves the way for Transport Malta to explore new avenues for potential partnerships and joint ventures, thereby promoting business growth within the region. Additionally, it opens doors for active participation and collaborative creation at various events, as well as increased visibility through interactions with prospective clients and members of the EIT Urban Mobility's knowledge and innovation community.[489]

[489] EIT Urban Mobility and Transport Malta reinforce their collaboration with the signature of a Memorandum of Understanding (MoU). - EIT Urban Mobility

Netherlands

Policy Review

EU Recovery and Resilience Plan

The Netherlands has set forth an ambitious Recovery and Resilience Plan with a total budget of €5.4 billion, entirely funded by Recovery and Resilience Facility (RRF) grants, indicating that no part of the plan relies on RRF loans. This comprehensive strategy includes 28 investment initiatives and 22 reforms, with a significant focus on climate and digital advancements. Specifically, 55% of the funding is directed towards climate-related goals, highlighting the country's commitment to environmental sustainability. In addition, 26% of the funds are designated for enhancing the nation's digital transition, underlining the importance of innovation and technology in its developmental agenda.

Within the domain of sustainable mobility, the plan earmarks €29 million for the advancement of ultra-efficient aircraft that utilize hydrogen as an energy source, paving the way for cleaner aviation technologies. Furthermore, an allocation of €56 million is dedicated to supporting the development of fully electric, zero-emission inland waterway transport. This initiative represents a shift towards more environmentally friendly modes of freight and passenger transport along the nation's waterways.

Integral to the plan are reforms aimed at better integrating renewable energy into the national grid, encouraging the sale of self-generated electricity, and enhancing the electric vehicle charging infrastructure. These measures are crucial for facilitating a wider transition to renewable energy sources across the country.

A notable emphasis is placed on the inland waterway energy transition, with a focus on introducing fully electric, zero-emission vessels to the waterway system. This move not only aligns with the nation's environmental goals but also demonstrates its leadership in adopting sustainable energy solutions.[490]

EV Tax Benefits and Subsidies

Zero-emission vehicles (ZEVs) enjoy a full exemption from taxes during both acquisition and ownership phases. For Plug-in Hybrid Electric Vehicles (PHEVs), there's a reduced tax rate of 50%. Zero-emission vehicles benefit from a minimum tax rate of 16%, with a specific focus on Battery Electric Vehicles (BEVs), which have a tax cap on benefits set at €35,000. Notably, hydrogen-powered vehicles are not subject to this cap.

Individuals interested in purchasing or leasing a small or compact BEV, whether new or used, can take advantage of the Subsidy Scheme for Electric Passenger Cars (SEPP).

Entrepreneurs have access to the Subsidy Scheme for Electric Business Vehicles (SEBA), which supports the purchase or lease of new commercial vehicles, specifically those classified as N1 or N2 and weighing up to 4,250kg.

Light commercial vehicles that are either BEVs or Fuel Cell Electric Vehicles (FCEVs), as well as BEV taxis, can benefit from the Environmental Investment Deduction (MIA), a scheme that provides tax deductions for environmentally friendly investments.

Furthermore, the Arbitrary Depreciation of Environmental Investments Scheme (Vamil) allows for favourable depreciation for FCEV cars or taxis and BEV cars equipped with solar panels, facilitating further financial incentives for adopting green vehicle technologies.[491]

Technological Advancements

In recent years, the Netherlands has been pioneering in the field of smart technologies and services aimed at transforming traffic and transport systems into safer, smarter, and more sustainable entities. Among these innovations are self-driving cars and buses, such as the Parkshuttle in Rotterdam and a self-driving minibus in The Hague, signalling a shift towards autonomous public transportation. The deployment of 5G technology in Groningen, known as 5Groningen, is enhancing communication between traffic control systems and drivers, facilitating the efficient exchange of traffic-related information and bolstering the capabilities of self-driving vehicles. Additionally, investments in cycling infrastructure and smart cycling initiatives, like apps for reserving electric shared bikes and chips for locating lost bikes, are making cycling more accessible and enjoyable. The Blue Wave Connecting program also exemplifies the move towards smart navigation by providing real-time data on open bridges and available berths, thus optimizing waterway traffic.

Moreover, the introduction of the Talking Traffic partnership and Connected Transport Corridors is set to revolutionize road use for both individual and freight traffic. Talking Traffic aims to improve road safety and efficiency by offering personalized traffic advice, including alerts on traffic jams and road conditions, thanks to smart traffic lights that communicate with approaching vehicles. For freight traffic, the Connected Transport Corridors program facilitates the exchange of data among road authorities, logistics companies, and trucks over three major logistics routes. This initiative seeks to enhance transport safety, sustainability, and flow by providing centralized information on regulations and offering tailored traffic advice and, where possible, priority at traffic lights. These advancements indicate a significant step towards a fully integrated and intelligent

[490] Netherlands' recovery and resilience plan - European Commission (europa.eu)

[491] Electric-Vehicles-Tax-Benefits-Purchase-Incentives-2022.pdf (acea.auto)

transport system in the Netherlands, promising a future of smoother and more environmentally friendly travel.[492]

Infrastructure Development

The Netherlands is dedicated to ensuring the entire country remains accessible, recognizing the economic significance of the transport and logistics sector. This commitment is underpinned by continuous investment in a robust infrastructure network that includes roads, rail, bridges, viaducts, and waterways. A budget of €1.25 billion is allocated to address maintenance backlogs and future needs, focusing on safety, sustainability, and resilience to climate change. Road safety is a priority, with initiatives to potentially reduce speed limits in urban areas to 30 km/h while maintaining current speeds elsewhere. Discussions are ongoing regarding the A27/Amelisweerd accessibility problem, with options for alternative solutions being explored. The government also plans to support the construction of the Lely line with regional and European funds, aiming to bolster the northern economy, improve housing access, and enhance international rail connections.

Investments are being made to enhance public transport, cycling, driving, and waterborne travel infrastructure to ensure faster connections and address major bottlenecks identified in the Integrated Mobility Analysis 2021. An additional €7.5 billion will be injected into the Mobility Fund over the next decade to improve access to new housing areas. Efforts are also underway to improve international rail connections and encourage the shift of freight transport from roads to rail and water. The development of multimodal hubs, increased accessibility of public transport for disabled individuals, and enhanced bicycle parking at transit hubs are part of these efforts. Furthermore, the government is looking to sustain Schiphol Airport's pivotal role in global connectivity while addressing environmental concerns and promoting the use of sustainable aviation fuels to reduce CO_2 emissions. [493]

EV Charging Infrastructure

As of September 2023, the landscape of electric vehicle charging infrastructure has seen significant growth, with 142,297 regular charging stations and 5,043 fast charging points now in operation. This surge in the number of charging stations, particularly noticeable in the private sector which more than doubled over the last three years, has been propelled not only by technological advancements leading to increased charging power but also by the introduction of new regulations and policies. Initiatives such as the Recovery and Resilience Plan, alongside various allocated funds, have played a crucial role in enhancing the charging network. These measures aim to ensure a more robust and efficient charging infrastructure, further facilitating the transition to electric mobility[494].

Market Trends

In 2022, the Netherlands witnessed a ratio of 525 cars per 1,000 citizens. EVs made up 23% of all new car purchases in the year, alongside a notable decrease in the acquisition of diesel vehicles. This positions the Netherlands as the fourth leading country in the European Union for EV adoption. Such trends highlight the critical need to foster sustainable mobility solutions, aligning with changing consumer demands and broader environmental objectives.

Following this momentum into September 2023, the electric vehicle sector showed remarkable progress across different categories. The BEV passenger car fleet expanded to 416,028, an increase of 11,190 vehicles or 2.8% from the previous month, with new BEV sales numbering 10,292 and capturing 29.9% of the monthly market share. Leading the sales were the Tesla Model Y, Volvo XC40, and Kia Niro. On the FCEV front, the count nudged up to 616, marking a slight rise of 3 vehicles or 0.5%. The PHEV category also saw growth, with its fleet reaching 244,611, up by 6,664 vehicles or 2.8%. New PHEV passenger car sales were reported at 3,594, accounting for a 13.4% share of the total vehicle sales for the month. [495] [496] [497]

Public Transportation

The Dutch government is taking bold steps toward a greener future with its goal to cut greenhouse gas emissions by 49% by 2030, using 1990 levels as a baseline. Public transportation is at the forefront of this mission, with the government, local authorities, and transit operators pushing for its use as a sustainable alternative to cars. As trains, buses, trams, and metros become increasingly eco-friendly, accommodating many passengers at once, the public transport system is becoming an even more attractive option. Notably, as of 2022, 15.9% of all buses in the Netherlands were fully battery electric, and 2.4% were hybrid electric, indicating progress towards the 2025 target of a fully electrified bus fleet, though more efforts are required to achieve this goal. Investments are being channelled into public transport to increase train services and improve bike parking at stations, making it simpler for commuters to switch from biking to public transport.

The Dutch public transport system stands out for its commitment to sustainability. All electric passenger trains have been powered by green electricity since 2017, and a mandate requires all new buses from 2025 to run on 100% renewable energy or fuel, with the ambition for all buses to be emission-free by 2030 as part of the Zero Emission Bus Transport agreement. Research into hydrogen-powered trains is underway, and the rail sector has pledged to reduce energy use by 2% annually. ProRail is also focusing on sustainability in station construction and maintenance, employing solar panels and environmentally conscious materials under

[492] Nederland als toepassingsland voor slimme mobiliteit | Mobiliteit nu en in de toekomst | Rijksoverheid.nl
[493] Infrastructuur | Regering | Rijksoverheid.nl
[494] Netherlands Enterprise Agency, Electric Vehicles Statistics in the Netherlands (2023) (rvo.nl)
[495] ACEA-Report-Vehicles-on-European-roads-.pdf
[496] Trendrapport Nederlandse markt personenauto's Feiten, cijfers en ontwikkelingen Editie 202 | Rapport | Rijksoverheid.nl
[497] Netherlands Enterprise Agency, Electric Vehicles Statistics in the Netherlands (2023) (rvo.nl)

the guidance of the national government, reinforcing the Netherlands' position as a leader in sustainable public transportation. [498] [499]

Environmental Impact

In the Netherlands, the average age of cars stands at 11.4 years, vans at 9.9 years, and trucks at 10.5 years, all of which fall below the EU average. Beginning in 2008, Dutch policies started incentivizing the purchase of efficient and cleaner vehicles through fiscal benefits, positioning the country as a leader in reducing CO2 emissions from new cars within the EU. Despite the removal of these incentives leading to a dip in its leading status, the Netherlands still boasts an impressive average of 87g CO2/km for new cars, which is 20% lower than the European average. Concerns have been raised about the potential environmental impact of importing used cars; however, studies indicate that these imported vehicles are comparatively young and efficient. Moreover, there's an increasing trend towards importing cars that meet the Euro 6 standards according to European Emission Standards, suggesting that the Netherlands continues to progress towards a more sustainable vehicle fleet.[500]

Further supporting this shift towards cleaner transportation, the implementation of low emission zones (LEZs) in various Dutch cities limits access to only those vehicles that comply with certain emission criteria. Furthermore, there are plans to establish zero-emission zones specifically for trucks and vans starting in 2025. These initiatives are geared towards lowering emissions, enhancing air quality, and fostering the transition towards greener transport solutions. [501]

Economic and Social Implications

By investing in sustainable transportation solutions, the Netherlands creates job opportunities in manufacturing, research, development, and service sectors. Additionally, it fosters economic growth through innovation and export of sustainable technologies and expertise. Moreover, sustainable mobility initiatives promote inclusivity by providing accessible transportation options for all demographics, improving public health by reducing air pollution and encouraging active transportation, and enhancing overall quality of life by reducing traffic congestion and promoting community connectivity[502]

The pressure on the waterway and road network in the Netherlands is increasing. Smart techniques are being utilized to prevent further congestion. This collaborative effort involves various stakeholders including knowledge institutions, the market, and other waterway and road authorities.

Efforts extend beyond national borders, acknowledging the interconnected nature of road systems. Collaboration with both domestic and international partners is integral to this endeavour. Collectively, a journey towards smarter transportation solutions is underway, with a commitment to ongoing progress and innovation. [503]

Best Practices and Case Studies

The Netherlands has earned acclaim for its extensive cycling infrastructure and promotion of electric vehicles. Approximately 17% of licensed drivers in the country factor in environmental concerns when choosing their mode of transportation, leading to a notable increase in the use of public transport and bicycles. Additionally, the government offers free public transport for students during their studies and provides discounts for the elderly. There is ongoing debate among governmental parties regarding the possibility of making public transport entirely free.

Numerous cities across the Netherlands have implemented initiatives to promote sustainable urban mobility. Amsterdam, Rotterdam, The Hague (Den Haag), Utrecht, Eindhoven, Groningen, Delft, Haarlem, Leiden, and Nijmegen have all invested in cycling infrastructure, expanded public transportation networks, established low-emission zones, encouraged car-sharing programs, and prioritized pedestrian-friendly urban design. While the specifics of their plans may vary, the overarching objective remains consistent: to create more livable, accessible, and environmentally friendly urban environments.

Innovations in technology have led to new case studies, such as EVBox's advancements in EV charging technology. Furthermore, initiatives like Mobility as a Service (MaaS) platforms and shared mobility services such as Greenwheels and Swapfiets showcase effective strategies for optimizing transportation resources and reducing carbon emissions. [504] [505] [506] [507] [508] [509] [510]

Future Perspectives and Emerging Trends

In the Netherlands, the future of sustainable mobility appears promising, driven by ambitious policies and innovative technological advancements. Moreover, the Netherlands continues to incentivize the adoption of electric vehicles (EVs) through tax benefits and subsidies, ensuring a supportive environment for zero-emission vehicles. Technological advancements, such as self-driving vehicles and 5G-enabled traffic management systems, are revolutionizing transportation systems, making them safer, smarter, and more sustainable. Additionally, investments in cycling infrastructure and smart mobility initiatives are

[498] Duurzaam openbaar vervoer | Openbaar vervoer (ov) | Rijksoverheid.nl
[499] ACEA-Report-Vehicles-on-European-roads-.pdf
[500] Trendrapport Nederlandse markt personenauto's Feiten, cijfers en ontwikkelingen Editie 202 | Rapport | Rijksoverheid.nl
[501] Milieuzones in Nederland | Milieuzones in Nederland
[502] Duurzaam openbaar vervoer | Openbaar vervoer (ov) | Rijksoverheid.nl
[503] Smart mobility (rijkswaterstaat.nl)
[504] Duurzame mobiliteit - Klimaatverandering en energietransitie | CBS
[505] Moet het openbaar vervoer in Nederland gratis worden? - BNNVARA
[506] Slimme laadpalen en software voor elektrische auto's | EVBox
[507] Deelauto's van Greenwheels | Autodelen vanaf € 2,30/u
[508] Your own bike or electric bike for a fixed monthly fee | Swapfiets
[509] Mobility as a Service (MaaS): multimodaal reisadvies op maat | Mobiliteit nu en in de toekomst | Rijksoverheid.nl
[510] SUMPs-UP | Home

enhancing accessibility and promoting eco-friendly transportation options.
Looking ahead, future trends in sustainable mobility are expected to focus on further electrification of vehicles, advancements in autonomous driving technology, integration of renewable energy sources, and the expansion of smart mobility solutions. Research into innovative technologies like 3D-printed vehicles and wireless EV charging signifies a dynamic landscape that promises to shape the future of transportation in the Netherlands for years to come. [511] [512]

International Comparisons and Collaborations

The Netherlands demonstrates its commitment to sustainable transportation through active engagement in two prominent international initiatives. Firstly, it is one of sixteen nations participating in the Electric Vehicles Initiative (EVI), led by the International Energy Agency (IEA). The EVI aims to accelerate the global adoption of electric vehicles, thus advancing greener transportation practices worldwide. The Netherlands collaborates with countries such as Canada, Chile, China, Finland, Germany, India, Japan, France, New Zealand, Norway, Poland, Portugal, Sweden, the United Kingdom, and the United States within this initiative, sharing knowledge and policies to facilitate the transition to electric vehicles. [513]
The Netherlands is part of the Independent Regulators Group (IRG) – Rail, as over 80% of Dutch freight rail transport accounts for cross-border transport. Dutch rail regulators collaborate with European counterparts on freight corridors, focusing on corridor-related developments and addressing complaints from transport undertakings.[514]
Moreover, The Netherlands collaborates with Scandinavian countries on initiatives related to sustainable transportation, including electric mobility, cycling infrastructure, and intelligent transport systems.[515]

[511] Samenwerken en kennis delen (rvo.nl)
[512] The Dutch hydrogen balance, and the current and future representation of hydrogen in the energy statistics (2020) pdf (overheid.nl)
[513] Electric Vehicles Initiative – Programmes - IEA
[514] International cooperation – transport | ACM.nl
[515] Sweden and the Netherlands: innovating together | Weblogs | Government.nl

Poland

Policy Review

Poland's Recovery and Resilience Plan

European funds play an important role in co-funding transport projects, Poland is set to receive a total of €59.8 billion in loans and grants for its Recovery and Resilience plan to combat the effects of Covid-19. Out of the total 46.6% are set towards supporting the green transition and € 7.5 billion are earmarked for green and smart mobility. In order to make use of the full funds all measures divided under the plan have to be implemented by August 2026.[516]

EV Tax Benefits & Subsidies

Consumers benefit from registration tax exemption until 2029 for all new electric vehicles and PHEVs (up to 2000 cc). Additionally, the government provides ownership tax benefits to counter depreciation, up to €52200 for BEV and FCEVs up to €34600 for vehicles emitting 0-50g CO2/km and up to €23300 for vehicles emitting > 50g CO2 /km.[517]

The Green Car program offers private individuals the possibility to receive co-financing of up to €4100 for new car purchases when it does not exceed 15% of the car value and the purchase price does not exceed €27500. The Koliber program is addressed to business owners and it includes a one-off surcharge for the company may amount to 20% of the value of the vehicle and not more than €5500 in the case of a subsidy or loan up to 100% of eligible costs. The eVAN program aimed at people interested in purchasing an electric delivery vehicle. The co-financing of up to 30% of costs but not more than €16200.[518]

Technological Advancements

The rapid development of Intelligent Transport Systems (ITS) in Poland over recent years has been a notable aspect of the country's transportation infrastructure. ITS solutions have become integral to highways and road networks, supported by significant investments. Under the current EU funding scheme from 2014 to 2023 (with potential extension until 2025), the government plans to invest $17.5 billion in railway infrastructure and $36.6 billion in road infrastructure. Among successful implementations is e-TOLL, facilitating toll collection on motorways, expressways, and national roads, alongside CANARD, which connects all photoradars. Notably, the manual toll collection system was phased out in December 2021. In May 2020, the General Directorate of National Roads and Motorways (GDDKiA) entered a contract for a National System of Traffic Management valued at over $52 million, co-financed by the EU. This project aims to provide real-time monitoring of highways and express roads, enhancing dynamic traffic management services, providing traffic condition information, supporting road infrastructure maintenance processes, and asset management.[519]

In a state-led venture, Poland is also aiming to develop its own home-grown electric car, known as Izera. In November, the firm signed a license agreement with Chinese company Geely – owner of the Volvo and Lotus brands, among others – to supply the platform for the vehicle.[520]

Infrastructure Development

Road Infrastructure development

Poland boasts an expansive road network, spanning approximately 2,092 kilometres of highways and 6,120 kilometres of express roads. The Ministry of Infrastructure has drafted a new road program outlining government-planned investments in national roads throughout the third decade of the 21st century, totalling approximately €54.5 billion. This allocation encompasses new projects valued at around €35 billion and ongoing initiatives totalling about €19.5 billion. The program focuses on enhancing the Trans-European Transport Networks (TEN-T) road network and complementary road connections, facilitating investments in new road infrastructure and upgrades.[521]

In 2022, Poland constructed 322 kilometres of new roads, with ongoing construction covering over 1,241 kilometres and an additional 267 kilometres in the tender process. The 2023 plan targets the completion of 259 kilometres of new roads, including nearly 48 kilometres of highways and over 191 kilometres of express roads. Notably, the government has allocated over €5.9 billion for construction on the Polish segment of the Via Carpatia, an international route linking Lithuania with Greece, alongside funding for new ring roads in various cities. Additionally, a resolution adopted in April 2021 outlines the construction of 100 ring roads during the period of 2020-2030, with an investment exceeding €5.9 billion.[522]

Another significant endeavour is the Polish segment of the Via Baltica, an 870 kilometer expressway connecting Tallinn, Estonia to Warsaw, Poland via Latvia and Lithuania, promoting vital road connections among Baltic countries. The final opening of Via Baltica

[516] Poland's recovery and resilience plan - European Commission (europa.eu)
[517] Incentives and Legislation | European Alternative Fuels Observatory (europa.eu)
[518] Incentives and Legislation | European Alternative Fuels Observatory (europa.eu)
[519] Poland - Infrastructure & Intelligent Transportation Systems (trade.gov)
[520] The number of electric cars in Poland grows 63% in a year but remains well below government target | Notes From Poland
[521] Poland - Infrastructure & Intelligent Transportation Systems (trade.gov)
[522] Poland - Infrastructure & Intelligent Transportation Systems (trade.gov)

is slated for mid-2024. Furthermore, the General Directorate for National Roads and Highways (GDDKiA) initiated "The Safe Road Infrastructure Program 2021-2024," earmarking over €544 million from the National Road Fund to enhance road safety infrastructure on a large scale. Additionally, the National Traffic System, supported by a €120 million subvention from the European Commission, aims to provide real-time information to drivers regarding traffic, accidents, and road conditions. Moreover, the "Bridges for Regions" program, with an estimated cost of €532 million, commenced in 2020, encompassing the construction of 21 bridges over major Polish rivers, with 23 new investments currently underway.[523]

EV charging infrastructure

Poland is gearing up for a substantial expansion of its public charging infrastructure network, with plans to boost the current number of charging points from around 5,000 to nearly 100,000 by 2030. Within the next three years, the annual installation rate of new chargers could surpass ten times the rate observed in 2022. The year 2022 saw a remarkable 30% increase in the total number of public charging stations in Poland, driven by the installation of 633 new chargers. Notably, the percentage of fast charging stations, with a capacity exceeding 50 kW, has been steadily rising, comprising 11% of the Polish network in 2022, up from 8% in 2021. This expansion has led to a significant overall increase in the total capacity of operational infrastructure, which surged by 44% in 2022 alone, reaching approximately 98 MW. Moreover, the concentration of infrastructure among 13 prominent operators is on the rise, with these operators now accounting for almost 70% of all public chargers in Poland. GreenWay Polska holds the highest market share, followed by Orlen Charge, Tauron, Noxo, and EV+. Despite these advancements, the distribution of charging infrastructure remains uneven, with over half of all stations concentrated in cities with populations exceeding 100,000. The future development of infrastructure hinges largely on measures taken by public administration, and the industry is hopeful that the implementation of optimization measures could lead to a more than tenfold increase in newly installed charging points by 2025, reaching over 17,000, and culminating in a network of over 99,700 public charging points in Poland by 2030.[524]

Railway network

With substantive EU funding, Poland is undergoing an overhaul of its railway network. If planned investments are implemented and necessary funding is provided by mid 2030s Poland should have one of the most advanced railway networks in the EU.

PKP S.A. stands as the leading entity in Poland's railway market, overseeing the extensive railway infrastructure spanning approximately 19,312 kilometres today. The majority of these projects received funding through the EU Program Infrastructure and Environment between 2014 and 2020, with the EU investing over €8.6 billion for the modernization of Poland's railway system. Within this framework, plans are in place to create or enhance 14,484 kilometres of railway tracks and upgrade 500 trains.[525]

Looking ahead to the period of 2021-2030, the Polish railway sector is slated to receive approximately €63.6 billion for further development. Through the National Railway Program (KPK), a pivotal railway investment initiative in Poland, PKP PLK has outlined over 370 infrastructure projects valued at €15.3 billion, aiming to modernize more than 9,000 kilometres of railway tracks. Presently, projects totalling €2.2 billion have been finalized, with an additional €8.4 billion underway. Priority is placed on cargo routes, particularly those connecting the southern region to the northern seaport and those within major urban centres. Notable projects include the modernization of the southern cargo route Chorzow-Zdunska Wola (€840 million) and the enhancement of railway infrastructure linking seaports in Gdansk, Swinoujscie, and Gdynia (€1.3 billion). The program's objective is to increase average train speeds on 8,500 kilometres of rail tracks, as current speeds lag behind the EU average.[526]

The future of Polish railroads lies in intermodal transportation, yet hindered by slow cargo train speeds, which are double the EU average, and insufficient intermodal terminals. A significant investment endeavour in Poland is the Solidarity Transport Hub (STH), envisioning the construction of 1,800 kilometres of new railway lines by 2034. These routes, including 10 spokes leading to Warsaw and the STH, will be modernized and extended by PKP S.A. The STH Railway Program comprises 12 railway routes, forming part of 30 investment projects. Commencement of the first construction works started in 2023.[527] Upon completion, every major city in Poland will be directly connected to STH, with a target travel time under 2.5 hours.[528]

Market Trends and Consumer Behavior

Buying a new vehicle remains a privilege for Polish households, Poland is far below the European average in terms of new passenger car registrations. Buying a new vehicle is a privilege and a luxury purchase.[529] This in turn has implications for the transition to EVs, PHEVs and Hybrids as on average they are still more expensive than ICE cars, additionally, limited availability on the 2nd hand market, coupled with underdeveloped charging infrastructure and cultural and social aspects will make adoption more difficult. In 2022, Poland found itself at the bottom of European rankings in terms of newly

[523] Poland - Infrastructure & Intelligent Transportation Systems (trade.gov)
[524] How many charging stations will be built in Poland by 2030? - PSPA - Polish Alternative Fuels Association
[525] Poland - Infrastructure & Intelligent Transportation Systems (trade.gov)
[526] Poland - Infrastructure & Intelligent Transportation Systems (trade.gov)
[527] Poland - Infrastructure & Intelligent Transportation Systems (trade.gov)
[528] Solidarity Transport Hub Poland (2020)
[529] The future of the European automobile industry Poland and Romania - Darteyre & Guga.pdf (etui.org)

registered EVs, only 2.9% (11,177) of the total number of newly registered passenger cars.
Micromobility and multimodality are becoming increasingly popular among Poles. In cities such as Warsaw, Krakow, Poznan, Gdansk, Lodz or Wroclaw, it is becoming more and more common to see various types of personal transportation. One of the most popular choices is the electric scooter. Rentals, which offer short-term rental of these vehicles, have become a common sight in the centres of most cities (they are currently available in about 90). Using e-scooters is not only an environmentally friendly alternative to conventional cars and taxis but also a way to avoid traffic jams and save time when travelling around the city.
Bicycle rentals are also part of the micromobility development in Poland. By-the-minute rental systems are already in place in about 80 cities, encouraging residents and tourists to use this ecological, cheap and healthy form of transportation. In addition, electric scooters or small electric cars, which are ideal for commuting, are available on the Polish market – as part of carsharing platforms. As of the end of March 2023, almost 90,000 vehicles were registered in the Polish shared mobility market – in the self-service category. These figures include both two-wheelers and cars, which can be rented via mobile apps or directly from vehicle owners.[530]

Public Transportation Systems

Despite funds being dedicated towards the expansion of Poland's national bus network, since 2016 the service coverage decreased by 40%. However, in the context of more investment aimed at improving mobility, starting 2024 funding will be increased to €224.77 million for further improvements.[531] Polish commuters are close to the European average in terms of time spent. Roughly 5% of commuters work and live in the same space, 60% spend between 1-29 minutes commuting, 25% spend between 30-59 minutes and 10% spend 60 minutes or more.

In rural areas, public transport is typically facilitated through bus services that connect various towns. However, there was a notable shift in the early 1990s in Poland, characterized by a partial liberalization of the market and widespread motorization. This led to the fragmentation of the bus transport system, particularly with the division of the largest national bus company, PKS (Przedsiębiorstwo Komunikacji Samochodowej - Motor Transport Company), into numerous smaller companies.[532]

Environmental Impact and Emissions

Poland finds itself among the top CO2 emitters for newly registered passenger cars. While the European average was around 107.8g CO2/km, in Poland it reaches as high as 125g CO2/km. This is a direct result of the strong second market dominated by ICE and one of the oldest car populations in the EU with an average of 14.3 years.

Economic and Social Implications

Poland finds itself below the European average when it comes to the environmental taxes on transport as a share of its GDP (EU average 0.42%), in 2021 it represented 0.23% of GDP.[533]
The transport sector operates **19 factories and employs 397 thousand people**, making Poland's automotive sector 3rd largest in Europe.[534] Poland has had success in becoming a hub for the manufacture of electric vehicles and their components. In 2020, it became **the EU's largest exporter of electric buses**, with Solaris – a Spanish-owned Polish manufacturer – Europe's largest producer of such buses. In July 2022, SK Nexilis, a South Korean manufacturer of copper foil used in electric car batteries, inaugurated the construction of a factory in the southeastern Polish city of Stalowa Wola.

Best Practices and Case Studies

The Solidarity Transport Hub (STH), based on four key pillars — connectivity, infrastructure, real estate, and modernization, comprises the following components: **Transportation Hub -** Serving as the primary hub airport for Central and Eastern Europe (CEE) and the principal transfer railway station for Poland. **New Rail System** - Rail Component: Implementing a new traffic organization, introducing novel railway connections (including high-speed rail), and deploying new trains. **Aerotropolis** - Real Estate Component: Establishing unparalleled conditions for residential, commercial, and recreational infrastructure in the vicinity of the airport. **Flywheel:** Strategy and Development Component: Serving as a catalyst for economic growth, sustainable development, and innovation, fostering collaboration with various stakeholders.[535]
The New Rail system stemming from STH should emerge as a staple of European Railway infrastructure. Each major city in Poland will enjoy direct connectivity to STH, with the aim of achieving travel times under 2.5 hours. STH is set to become a pivotal hub within the long-distance train network. Furthermore, the new system will enhance connections to Poland's remote regions, which are presently isolated and heavily reliant on road transport. STH will also integrate with neighbouring countries, facilitating links to the primary economic hubs in Central and Eastern Europe, such as Vienna, Prague, Bratislava, and Budapest. We anticipate that the new railway system will cater to diverse travel needs and demand categories, offering a range of train categories including fast InterCity connections, as well as InterRegio and RegioExpress trains.[536]

[530] EIT Urban Mobility joins the New Mobility Congress 2023, Poland, where European leaders will discuss how to accelerate multimodality and zero emission transport in cities. - EIT Urban Mobility
[531] Local bus service coverage in Poland falls by more than 40% since 2016 | Notes From Poland
[532] SMARTA-IP-Poland.pdf (ruralsharedmobility.eu)
[533] Key figures on European transport – 2023 edition (europa.eu)
[534] Poland drives e-mobility (sitearchief.nl)
[535] Solidarity Transport Hub Poland (2020)
[536] Solidarity Transport Hub Poland (2020)

Through the Smart Airports Horizon consortium, which includes STH, the project secured €12 million in funding to implement environmentally friendly solutions for Smart Airport design. Emphasizing electromobility, STH aims to mitigate greenhouse gas emissions from the aviation sector by integrating green infrastructure planning tools and electromobility applications into the Solidarity hub design. Leveraging state-of-the-art technologies, the goal is to minimize the carbon footprint to its lowest possible extent.[537]

Future Perspectives and Emerging Trends

Poland's transportation sector is undergoing significant transformations, driven by ambitious initiatives and substantial investments. With support from the EU's Recovery and Resilience Plan, the country is directing significant funds towards green and smart mobility projects. These efforts include promoting electric vehicles through tax exemptions and subsidy programs, alongside investments in infrastructure development and technological advancements. Plans to expand the EV charging network, modernize railway systems, and improve road networks signal a commitment to enhancing connectivity, efficiency, and sustainability in transportation across the country.

Furthermore, Poland's focus on micromobility solutions and public transit improvements reflects a broader shift towards sustainable urban transportation modes. Investments in EV charging infrastructure, coupled with initiatives to reduce CO2 emissions from passenger cars, underscore the country's commitment to mitigating environmental impact while fostering economic growth. Continued efforts to integrate technological innovations, improve public transportation networks, and promote cleaner transportation options will play a crucial role in shaping the future of Poland's transportation landscape.

International Comparisons and Collaborations

Poland hosted the New Mobility Congress (KNM) 2023. KNM is the largest e-mobility and zero emission transport sector event in Central & Eastern Europe which will bring together industry leaders, researchers, government and administration representatives and all those interested in the future of mobility. One of the topics at this year's Congress will include micromobility and multimodality as an integral part of the future transportation system in cities. Among other things, the KNM 2023 will present a "Strategy for the New Mobility Development" diagnosing 8 key challenges and containing a total of 15 recommendations for action, the introduction of which will allow the development of new forms of mobility in Polish local governments. During the conference, the "National Bicycle Strategy" project will also be launched. In addition, leading stakeholders and industry representatives will discuss the necessary regulatory changes to stimulate the development of the micromobility sector in Poland, as well as best practices in this area implemented in European cities. PSPA is proud that all those topics and other significant city transport issues will be addressed with the support of EIT Urban Mobility.[538]

Poland hosts an early Intelligent Transport System Congress (ITS), the largest and most significant gathering in Poland for the exchange of expertise and insights on ITS solutions. A key objective of the Congress is to foster collaboration within the intelligent transport solutions environment. Alongside substantive discussions, manufacturers and suppliers will deliver presentations showcasing devices and comprehensive ITS solutions. Representatives from leading companies in the ITS market will be available to explore the capabilities of these devices and discuss their integration with existing systems. This facilitates the development of systems from inception and the expansion of functionalities. Importantly, these solutions can be tailored to meet the specific needs and capabilities of implementing entities. The topics discussed at the congress encompass: protecting roads and road users from overloaded vehicles, addressing threats to infrastructure, road safety, and fair competition, Mobility as a Service (MaaS), projects within the SmartCity Lab initiative by the ITS POLSKA Association, innovations in traffic management, use of artificial intelligence in transport solution, etc.[539]

[537] Solidarity Transport Hub Poland (2020)

[538] EIT Urban Mobility joins the New Mobility Congress 2023, Poland, where European leaders will discuss how to accelerate multimodality and zero emission transport in cities. - EIT Urban Mobility

[539] Foreword - Polski Kongres ITS (pkits.pl)

Portugal

Policy Review

Portugal's Recovery and Resilience Plan

Portugal's strategy involves a substantial investment totalling €22.2 billion, with the plan's worth set at €16.3 billion. This includes €5.9 billion in grants and loans from the Recovery and Resilience Facility (RRF), spread across 117 investment initiatives and 44 reforms. A significant portion of the plan, 41%, is dedicated to achieving climate goals, while 21% aims to advance the digital transition. The strategy includes major improvements to the public transportation network, such as extending the metro systems in Lisbon and Porto with an investment exceeding €700 million to enhance sustainability. Additionally, a new Bus Rapid Transit Line in Braga, along with other sustainable transport projects, will be developed across Portugal. A key feature of the plan is the involvement of the private sector in establishing 15,000 electric vehicle charging stations by 2025, marking a significant step towards sustainable transport nationwide.[540]

EV Tax Benefits and Subsidies

The government is implementing several incentives and exemptions aimed at promoting the adoption of electric and hybrid vehicles. These incentives include financial benefits for both individuals and companies. For electric passenger vehicles, there is a €6,000 subsidy for acquisition or leasing, limited to a certain number of vehicles and a specific budget through the Environment Fund. Additionally, there are exemptions from vehicle taxes such as ISV and IUC. Hybrid vehicles also receive reductions in ISV based on their emissions and autonomy in electric mode, along with VAT deductions for associated expenses. Furthermore, companies enjoy exemptions from Autonomous Taxation and various vehicle taxes, as well as full VAT deductions on related expenses within certain cost limits.

Technological Advancements

Portugal is utilizing a dynamic model known as SERA (Scenario Evaluation and Regionalization Analysis) to explore the potential for Fuel Cell Electric Vehicles (FCEVs) and to pinpoint specific regions where developing hydrogen fuel infrastructure could yield the most advantage. The preliminary outcomes of this analysis highlight Lisbon, Porto, and Aveiro as the leading candidates for the introduction and expansion of fuel cell technology. This strategic approach aims to facilitate the targeted deployment of hydrogen fueling stations in areas most likely to embrace and benefit from FCEV adoption. [541]

Infrastructure Development

The expansion of the metro networks in Lisbon and Porto, with investments surpassing €700 million, aims to elevate sustainable transportation. Furthermore, the initiative encompasses a Bus Rapid Transit Line in Braga and additional investments in eco-friendly transport throughout Portugal. In Porto, a new Bus Rapid Transit system will stretch from Boavista to Império, featuring a 3.8km route with seven stations. The city has also seen investments in a comprehensive network of bike lanes and pedestrian pathways, boosting the popularity of cycling and walking. Porto, Braga, and Cascais have been at the forefront of enhancing public transport infrastructure with significant investments. [542] [543]

Portugal's Prime Minister Antonio Costa announced a massive €43 billion investment in public infrastructure, focusing on the transportation and energy sectors. A key project includes the development of a high-speed rail link that will connect Lisbon and Porto by 2030, with a budget of €4.5 billion. The plan also dedicates €21.7 billion to various transportation initiatives and €13 billion to clean energy projects, with a special emphasis on hydrogen production. Additionally, €2 billion will support the expansion of deepwater ports in Sines, Leixoes, and Lisbon, aiming to improve the country's maritime infrastructure[544]

Portugal's highway network is ranked by the World Economic Forum among the top 5 in Europe, boasting the most extensive network per capita on the continent. This infrastructure serves as one of Portugal's key strengths in its efforts to foster sustainable urban mobility, adapt to evolving transportation needs, and pursue environmental goals, further solidifying its status as a key player in regional and global connectivity.[545]

EV Charging Infrastructure

The electric vehicle (EV) charging infrastructure in Portugal has been rapidly expanding. As of the end of 2022, Portugal had a total of 6,533 EV charging points. This included 4,024 regular chargers, which operate at less than 22kW, and 2,509 chargers which are classified as fast (22-99kW) and ultra-fast (over 100kW). The country witnessed a substantial increase in the number of public and semi-public charging points in 2022, with 2,857 new installations. This growth supports the larger EV fleet in Portugal, which reached 113,218 units by the end of 2022, marking an 11.0% year-over-year expansion. This growth trend in EV adoption and

[540] Portugal's recovery and resilience plan - European Commission (europa.eu)
[541] Electric Mobility in Portugal: Current Situation and Forecasts for Fuel Cell Vehicles (researchgate.net)
[542] EIT Urban Mobility commitment with Portugal's sustainable objectives | EIT (europa.eu)
[543] Portugal's recovery and resilience plan - European Commission (europa.eu)
[544] Portugal to invest €43 billion in large infrastructure by 2030 – Euractiv
[545] Roads quality in Europe | TheGlobalEconomy.com

charging infrastructure development is crucial for supporting Portugal's environmental objectives. [546] Portugal has implemented a universal payment method across its network of public charging points, spanning all 308 municipalities. Additionally, there are 900 charging points located within buildings or businesses that participate in the MOBI.E system.[547] MOBI.E, a public company under the Ministry of the Environment, spearheaded this initiative with the goal of providing the best possible service to electric vehicle users. To utilize these charging points, users simply need to have a contract with an electric mobility energy provider and either a card or a mobile app. Despite the presence of 94 charging operators and various applications, the administration has successfully created a unified market, ensuring seamless access to the public charging network managed by private operators. This approach prevents fragmentation and ensures a cohesive user experience.[548]

Market Trends and Consumer Behavior

In 2023, electric vehicle sales surged by 101.9% compared to the previous year. A total of 36,390 light passenger vehicles were sold throughout the year. Within the electric, hybrid, and plug-in hybrid car categories, 92,395 units were registered, marking a significant increase of 58.5% compared to the corresponding period in 2022, as reported by NM.[549] Overall, Portugal's market trends and consumer behaviour towards sustainable urban mobility reflect a strong movement towards EV adoption, supported by a comprehensive range of incentives and a growing charging infrastructure. This aligns with the broader European commitment to sustainable mobility and the reduction of greenhouse gas emissions, positioning Portugal as a notable player in the transition to cleaner, more sustainable transportation solutions.

Public Transportation Systems

Portugal's national rail network, managed by Comboios de Portugal, links major cities and offers international connections via Spain. With 2,791 kilometres of tracks, primarily wide-gauge to accommodate shipments from Spain and 1,430 kilometres electrified, the network supports efficient transportation. High-speed services, covering over 900 kilometres, operate at speeds exceeding 120 kilometres per hour. Lisbon and Porto feature subway systems—Lisbon Metro, Metro Sul do Tejo, and Porto Metro—with each encompassing over 35 kilometres of lines. Additionally, tram networks exist in both cities, with Lisbon's being more extensive. All major cities and towns have local urban transport networks, however, accessing some of the smaller towns and villages can be a bit more challenging, with fewer services available, making taxis a necessary alternative in some cases.

Environmental Impact and Emissions

The rate of vehicle ownership in Portugal stands at 537 vehicles for every 1,000 residents, which is slightly below the European average of 574. In terms of environmental impact, Portugal's contribution to the European Union's total greenhouse gas emissions was under 2% for the year 2020. As a significant step towards environmental sustainability, Portugal's National Energy and Climate Plan sets a goal that, by 2030, 40% of urban journeys will be undertaken via walking, cycling, or using public transport. This commitment is in line with the nation's broader objective to cut greenhouse gas emissions by 55% by 2030. According to the OECD, Portugal is on a promising path towards achieving its climate goals for 2030. [550] [551] [552]

Economic and Social Implications

Since 2021, Portugal has implemented 39 projects aimed at advancing innovation and fostering collaboration in urban mobility. Notably, the RAPTOR competition in Cascais swiftly tackles urban mobility challenges, yielding successful results in 2022 by addressing three identified city challenges. Similarly, the #ChallengeMyCity program, set to launch in Braga in 2023, seeks to address four urban challenges by piloting innovative mobility solutions over six months with a total investment of €240,000. These initiatives align with Portugal's commitment to sustainable mobility, exemplified by its significant investment in over 16 projects in Lisbon alone, supported by EIT Urban Mobility with a total investment exceeding €1.5 million since 2021. Through collaborative efforts, Portugal aims to advance sustainable urban mobility, with programs like RAPTOR and #ChallengeMyCity driving progress and fostering cooperation.

Best Practices and Case Studies

Iberdrola and bp pulse have officially launched their joint venture in Spain and Portugal, with plans to invest €1 billion to establish the most extensive fast and ultra-fast public charging network in Iberia by 2030, aiming for 11,700 charging points. Starting with over 300 operational public charging points, the company targets nearly 5,000 by 2025, aiming to provide reliable, high-speed charging infrastructure to promote widespread access and accelerate electric vehicle adoption.[553] Portuguese TSO Redes Energéticas Nacionais (REN) is set to implement its Speed-E high voltage electric vehicle charging solution at five locations across Portugal. Partnering with Italian EV charging infrastructure provider Atlante Energy through a Memorandum of Understanding, REN aims to develop

[546] Portugal EV Profile: Enhanced Charging Infrastructure And Continuity Of Incentives To Sustain Shift To E-Mobility (fitchsolutions.com)
[547] MOBI.E - Mobi.e (mobie.pt)
[548] El coche eléctrico triunfa en Portugal empujado por un sistema de pago universal en los puntos de recarga | Clima y Medio Ambiente | EL PAÍS (elpais.com)
[549] Electric car sales up by over 100% - The Portugal News
[550] Highlights - OECD Environmental Performance Reviews: Portugal 2023 by OECD - Issuu
[551] EIT Urban Mobility commitment with Portugal's sustainable objectives | EIT (europa.eu)
[552] Highlights - OECD Environmental Performance Reviews: Portugal 2023 by OECD - Issuu
[553] Iberdrola and bp pulse launch their fast and ultrafast charging joint venture in Spain and Portugal | REVE News of the wind sector in Spain and in the world (evwind.es)

five projects utilizing the Speed-E grid connection solution. This patented solution, developed by REN, facilitates EV charging directly through the electricity transmission network, offering significant power levels for multiple fast and ultra-fast chargers simultaneously. This initiative expands charging infrastructure to areas where the transmission network is available, potentially extending by about 9,000 km across Portugal.[554]

Future Perspectives and Emerging Trends

Portugal's future outlook in terms of transportation and environmental sustainability looks promising. The government's implementation of various incentives and exemptions to promote electric and hybrid vehicles, alongside substantial investments in infrastructure and technological advancements, indicates a commitment to reducing greenhouse gas emissions and fostering innovation. The significant surge in electric vehicle sales and the expansion of EV charging infrastructure also highlight a growing shift towards sustainable transportation. Moreover, Portugal's ambitious public infrastructure investment plan, including initiatives such as high-speed rail links and clean energy projects, further emphasizes its dedication to modernizing and greening its transportation sector. With continued efforts to meet climate targets and advance sustainable urban mobility, Portugal is poised to emerge as a leader in environmental stewardship and innovative transportation solutions in the years to come.

International Cooperation

Portugal is actively participating in significant partnerships to boost its EV charging network, notably through an investment of €1 billion by Iberdrola and BP. This investment aims to install up to 11,000 fast EV charging points across Spain and Portugal, significantly advancing the charging infrastructure and facilitating the transition to electric mobility. [555]

Additionally, the Electric Vehicles Initiative (EVI), a collaborative policy forum involving sixteen countries, including Portugal, aims to expedite the global adoption of electric vehicles. Coordinated by the International Energy Agency, EVI supports its member countries through shared knowledge and initiatives, with participants including nations like Canada, Chile, China, Finland, France, Germany, India, Japan, the Netherlands, New Zealand, Norway, Poland, Sweden, the United Kingdom, and the United States. This collective effort underscores a global commitment to embracing electric vehicles as part of a broader strategy for sustainable transportation.[556]

[554] Portugal's REN to pioneer transmission connected EV charging (smart-energy.com)

[555] Charging and Portugal - EV Driven

[556] Electric Vehicles Initiative – Programmes - IEA

Romania

Policy Review

Romania's Recovery and Resilience Plan

Romania's National Recovery and Resilience Plan (NRRP): Currently Romania is undergoing an unprecedented number of reforms and investments aimed at bolstering infrastructure and mitigating the socio-economic effects of the Covid-19 crisis. The total cost of the plan amounts to €29.2 billion or 13.1% of the country's GDP. The plan runs from 2021-2026 and 52% of the funds are aimed to facilitate the country's green and digital transition.[557]

Institutional Strategic Plan 2021-2024 for the Ministry of Transport and Infrastructure

The plan aims to achieve three strategic objectives: A national transport system with high economic efficiency and environmentally sustainable, which supports the competitiveness of the national economy; A national transport system integrated into the Single European Transport Area; A high level of performance of the Ministry of Transport and Infrastructure to provide better services to the public.[558]

The transport sector currently faces several significant challenges. Firstly, there is a pressing need to mitigate the impact of transportation on climate change by prioritizing sustainable and environmentally friendly modes of transport. Additionally, efforts are underway to enhance the economic efficiency of the national transport system while reducing the overall cost burden on the national economy. Another key challenge involves the restructuring and strengthening of major national networks, including roads, railways, and waterways, to ensure their resilience and effectiveness. Furthermore, there is a focus on reorganizing transport services to better align with the needs of both citizens and businesses. Ensuring the development of a safe and secure transport system, including accessible public transportation for all, remains a priority. Lastly, there is an emphasis on improving the organizational capacity of the Ministry and the corporate governance of State-owned Enterprises to enhance service delivery to the public.[559]

EV Tax Benefits and Subsidies

The Romanian Government has an extensive program of subsidies named *Rabla Clasic* and *Rabla Plus* to encourage owners of old cars/motorcycles to scrap their vehicles and buy new cars/motorcycles. The programs include ICE, hybrids and EVs. *Rabla Plus* subsidy applies to EVs not more expensive than €70,000 and for the vehicle to qualify for scrapping 6 or more years need to pass from first registration. Although in 2023 the subsidy amounted to €10,000 for EVs and €5200 for hybrid vehicles, in 2024 it was halved to €5200 for EVs and €2600 for hybrid vehicles.[560]

Technological Advancements

Dacia produces the Dacia Spring, the only pure EV in its line-up, with a claimed range of 220km. It enjoys wide popularity in Europe, in 2023 it was the 5th most sold EV with 140,000 units sold since its launch in 2022. In contrast to its competitors, it starts at around €20,000, while the average price for an EV in Europe is around €50,000. In February 2024, Dacia announced a facelift for Dacia Spring that will align with the brand's new design language.[561]

Infrastructure Development

EV Charging Infrastructure

The number of charging locations in Romania continues to increase by approx. 300 units each year, totalling approx. 1350. However, only 25% have more than one station. Through government-funded programs, it is expected that by 2026 the number will climb to 6500 stations.

Motorways

Romania as the 8th biggest EU country by size is one of the EU countries with the least developed motorway network. From 2017 (763 km) to 2023 (1002 km) it has built less than 350 km of motorways. Although there is a major development campaign at the moment to add another 715km by 2027, the network will remain underdeveloped compared to neighbouring countries and Romania's own needs.[562] The lack of adequate infrastructure has also been linked to a high mortality rate in car accidents. Out of the 27 EU countries, Romania has the highest number of fatalities per million inhabitants. In 2021, the average was 93 deaths per million inhabitants. Compared to the rest of the EU, this rate has decreased at a significantly slower pace since 2001.[563]

Rail network

On average, rail passengers in Romania travel 200km (2021)[6]. Despite inheriting an expansive rail network, the Romanian government did not take the appropriate steps to adequately maintain and modernize the infrastructure. Currently, Romania has the lowest percentage of electrified railways in the EU – 20.06%. The average speed of passenger trains is currently

[557] Romania's recovery and resilience plan - European Commission (europa.eu)
[558] Institutional Strategic Plan 2021-2024 for the Ministry of Transport and Infrastructure (gov.ro)
[559] Institutional Strategic Plan 2021-2024 for the Ministry of Transport and Infrastructure (gov.ro)
[560] ADMINISTRATIA FONDULUI PENTRU MEDIU - VEHICULE ELECTRICE (afm.ro)
[561] Sales results: Dacia grew by 16.7% over the first 9 months of 2023 - Site media global de Dacia
[562] Calendarul finalizarii proiectelor de autostrazi in Romania (130km.ro)
[563] European Comission, Romania Road Safety Profile (europa.eu)

68.86km/h, while for freight trains in 2019 was 44km/h.[564]

Funds from Romania's Recovery and Resilience plan are expected to significantly boost the state of the railway infrastructure. Numerous tenders have been awarded or are in the preparation phase to electrify, upgrade and repair railway infrastructure across Romania. [565]Investments are also focused on renewing the rolling stock. CFR Passenger began the initial phase of modernizing locomotives and wagons under the National Recovery and Resilience Plan with the release of the first five tenders in May 2023. In total, the project entails launching 11 tenders aimed at enhancing the rail infrastructure, including the modernization of 55 electric locomotives for passenger train operations, the conversion of 20 hydraulic diesel shunting locomotives into battery electric locomotives, and the modernization of 139 passenger wagons.[566]

Market Trends and Consumer behavior

Romania is the 6th biggest passenger car producer in the EU. In 2022, it produced 507,269 vehicles. This represents a 20% increase compared to 2021.[567] In 2022, in Romania were sold 129328 cars, 13583 vans, 6870 trucks and 860 buses. Totalling 150641 vehicles. As a result of generous government subsidies, the years between 2018-2022 registered a large increase in the share of EV registrations. In 2018 only 604 EVs were registered by 2022 that number increased to 11638 EVs.[568]

Looking at engine size: Petrol- Romanians prefer small petrol engines (≤ 1399 cm^3) the most, with 29.4% of cars; medium-sized 16.7% (1400 cm^3 – 1999 cm^3); and large-sized 1.1% (≥ 2000 cm^3). Diesel - small diesel engines 1.7% (≤ 1399 cm^3), medium sized 41.3% (1400 cm^3 – 1999 cm^3); and large sized 7.2% (≥ 2000 cm^3).[569] Using passenger cars as a transportation method is most popular among Romanians, 80% do so. Followed by coaches, buses and trolleybuses at 15% and trains at 5%. (2020). Based on ton-kilometers Romania is responsible for 3.5% of the share of EU road freight transport. (2021)[570]

Public Transportation Systems

In 2022 there were 54713 buses on Romania's roads. The average age of a bus is 17.1 years old. Second oldest population after Greece (18.8 years) and significantly above the European Union average (12.5 years). By power source, they are distributed by Diesel (98.2%), Battery Electric (0.8%), Hybrid Electric (0.6%) and Petrol (0.2%).

Urban public transport in Romania is increasingly structured around two key strategic elements: Sustainable Urban Mobility Plans (SUMPs) and Contractual Service Plans (CSPs). SUMPs have been adopted by all major cities since 2015, serving as vital strategic tools guiding investment decisions in both public and individual transportation sectors. These documents, legally binding, typically outline plans up to 2030 and include comprehensive investment master plans. CSPs, on the other hand, are a newer instrument that is still in the implementation phase in some Romanian cities. While these plans generally cover periods of 5 to 6 years, certain municipalities and inter-community development associations (IDAs), such as Bucharest, Cluj Napoca, and Timisoara, are extending their planning horizons to 10 to 15 years. However, it's notable that Romanian cities have yet to fully develop expertise in risk sharing between public authorities and selected public transport operators within these CSPs.[571]

In inter-urban transport, a significant imbalance persists, characterized by the overwhelming dominance of road transport, particularly minibuses, which command nearly 80% of the modal share. This stands in stark contrast to the growing European trend favouring rail transport, where the modal share in intercity public transport on inland routes is steadily approaching or exceeding 50%. A key factor contributing to this modal imbalance is the prolonged underinvestment in new rolling stock. This has resulted in a drastic reduction of the national operator's rolling stock, plummeting from approximately 11,000 passenger wagons/cars in 1990 to a mere 2,290 wagons by 2016, with only about 1,500 still operational. Consequently, this severe depletion severely limits transport capacity and the availability of public transport services. Moreover, with CFR-Călători operating around 1,300 trains daily with the existing fleet, the dwindling wagon fleet has led to significant financial inefficiencies in operating costs for passenger trains.[572]

Environmental Impact and Emissions

The fastest growing sector is transport with a 17% share in 2016, having increased emissions by 35% since 1990. The ageing fleet of vehicles on Romania's roads has a direct impact on pollution levels and in turn on human health. In 2021 a study measuring NO2 levels has put 4 Romanian cities in the top 10 most polluted. The average age of a Romanian car is 14.9 years. By power source, the fleet is divided as follows: Petrol – 54.9%; Diesel – 42.2%; Hybrid electric – 0.8%; Battery electric – 0.3%; Plug-in Hybrid – 0.1%. Romania also has the 2nd highest share of passenger cars older than 20 years(after Estonia), namely 31%. The average age of a Romanian van is 15.8 years. Second oldest van population after Greece. [573]

[564] Key figures on European transport – 2022 edition - Eurostat (europa.eu)
[565] CFR Infrastructura Archives - Pagina 2 din 10 - Mobilitate.eu
[566] Sumar - CFR Călători a lansat primele 5 licitații din cele 11 pentru proiectele de modernizare prin PNRR - Mobilitate.eu
[567] Economic-and-Market-Report_Full-year-2022.pdf (acea.auto)
[568] Romanian E-Mobility Index: Demand surges thanks to generous incentives | Roland Berger
[569] Key figures on European transport – 2022 edition - Eurostat (europa.eu)
[570] Key figures on European transport – 2022 edition - Eurostat (europa.eu)
[571] Asociatia Pentru Mobilitate Uraban, Studiu privind analiza situatiei existente a transportului public local si metropolitan la nivelul a 20 de poli de dezvolatare urbana (2019) (fzmaur.ro)
[572] Institutional Strategic Plan 2021-2024 for the Ministry of Transport and Infrastructure (gov.ro)
[573] Key figures on European transport – 2022 edition - Eurostat (europa.eu)

In light of the old car population, Romania has also missed the deadline to submit a National Alternative fuel strategy, putting them three years behind most other European nations. This will have an additional negative impact on Romania's capacity to lower transport sector emissions in accordance with EU set deadlines. Romania's ageing vehicle fleet significantly contributes to poor air quality in its cities. Bucharest, for instance, ranks 57th among European cities for the average number of days exceeding the EU limit for particulate concentration, with 69 days surpassing the threshold. Additionally, it holds the second position among the most congested cities in Europe (and fifth globally), resulting in an average loss of 218 hours per year due to traffic congestion. [574]

Economic and Social Implications

The automotive industry in Romania is valued at €27 billion or 12% GDP. The industry is also responsible for 30% of Romania's exports, which also represents the highest share of all exports. Over 90% of the cars produced in Romania are exported, the overwhelming majority to Europe. Dacia (51% Owned by the Renault Group) is currently the largest company in Romania.[575]
The transaction value of the automotive industry in 2022 amounted to 7% (€6.9 billion) of the total mergers and acquisitions in Romania. This makes it the third most valuable industry in Romania. Approximately, 15.2% (163,988 jobs) of jobs in Romanian manufacturing are in the automotive industry. This represents the 2nd highest share of workers in the EU.[576]
In 2022, Romania had 413 cars per 1000 inhabitants, whereas the European average stood at 574. Additionally, vans, trucks, and buses per 1000 inhabitants in Romania were 69, compared to the European average of 85.[577] The majority of Romanians spend between 1-29 minutes (65%) and 30-59 minutes(30%) to commute to work (2019).[578]

Best Practices and Case Studies

Romania has an extensive railway travel subsidy program for students and retirees. Retirees and students benefit from substantive discounts on train tickets, additionally, students benefit from free travel to/from their educational institution to/from home.[579]

Future Perspectives and Emerging Trends

Romanian trends correspond broadly to general European trends. EVs enjoy a similar share of the newly registered cars in Romania as in other Member States. However, there are also potential limitations. Namely, the lack of motorways and limited charging infrastructure will confine the use of EVs to short trips in cities and close by towns. This could prove a serious limitation for wide adoption in the country.
On average, Romanian infrastructure significantly trails behind the European average. Despite the sizeable influx of investments, large infrastructure projects take time. Assuming that projects will be finished and delivered under the current timeline, significant improvements should be observed in 2027-2030. Through its already strong automotive industry, Romania has demonstrated that it can successfully absorb large investments and has an attractive and skilled workforce for employers.

International Comparisons and Collaborations

Romania participated in the signature of three grant agreements under the Connecting Europe Facility for Transport worth almost €45 million to improve transport connections between Moldova and Romania along the trans-European transport network (TEN-T). The projects will modernize transport infrastructure at the road border crossing points Ungheni, Albița-Leușeni, and Reni-Giurgiulești-Galați. These investments will strengthen the EU-Ukraine Solidarity Lanes – the routes used since Russia's blockade of Ukraine's Black Sea ports to transport Ukraine's and Moldova's exports and imports.[580]
European Institute of Innovation and Technology (EIT) Urban Mobility and Romania's Regional Development Agency of Centru (Centre) Region have signed a Memorandum of Understanding (MoU). The memorandum marks a significant milestone in collaborative efforts and establishes strategic cooperation to promote innovation in transportation and mobility in Romanian cities. The document defines the overall common objectives, areas of collaboration and the establishment of a monitoring committee to oversee the partnership. This partnership will strengthen the innovation ecosystem in areas relevant to mobility, in line with the priorities of the Smart Specialisation Strategy of the Centru Region.
Belgium-based Avesta Battery and Energy Engineering (ABEE) announced it will build a €1.4 billion electric car battery cell factory in Galati, Romania to supply batteries mainly for the automotive industry – Renault-Dacia and Ford – and for the stationary storage market. ABEE intends to complete the project's first phase in 2026. In addition, ABEE plans to invest €200 million by the end of the decade in a recycling facility for electric equipment and batteries. ABEE has also signed an agreement to invest in the production of battery management systems in North Macedonia.

[574] EUKI Project, Emission reduction strategies for the transport sector in Romania (transportenvironment.org)
[575] Romania : an emerging automotive hub in Europe (blue-europe.eu)
[576] ACEA-Pocket-Guide-2023-2024.pdf
[577] ACEA-Report-Vehicles-on-European-roads-.pdf
[578] Key figures on European transport – 2022 edition - Eurostat (europa.eu)
[579] Elevii vor călători gratuit cu trenul în România, din data de 3 septembrie (wall-street.ro)
[580] EU signs grant agreements for transport infrastructure to better connect Moldova with EU - European Commission (europa.eu)

Slovakia

Policy Review

Slovakia's Recovery and Resilience Plan

The total value of the plan is at €6.4 billion with 46% of the plan supporting climate objectives. Furthermore, €759.3 million will be invested into sustainable transport to support the roll-out of more than 3000 charging stations for alternative fuels, the modernization of the railways and 162 km of new cycling infrastructure. Additionally, funds will be invested in creating integrated public transport systems in six regions.[581]

EV Tax benefits and subsidies

BEVs pay the lowest rate of tax on motor vehicles. Additionally, the annual tax rate for BEVs is zero. Hybrid motor vehicles and electric motor vehicles have a reduced tax rate of up to 50%.

The last subsidy program ended in 2020, it was fairly limited as it supported only the sale of 785 EVs (€6 million) and PHEVs. According to the government, there is a new program in the works, however, there are no clear indications of the budget or when it will start.[582]

Slovak e-mobility action plan (2022) [583]

Published in 2022, building upon the plan published in 2019 and aiming to implement by 2026. It takes a holistic approach to e-mobility. The Slovak government intends to focus on continuing direct support for the use of low-emissions vehicles, long-term support for the development of charging infrastructure, support for research, development and production of batteries, improving the business environment for undertakings looking to improve electromobility, applicating principles of green public procurement in the purchase of new government vehicles, creation of low-emission vehicles, etc.

The Slovak government intends to pass right to plug legislation, that should simplify the procedures for installing and operating charging points in apartment buildings and workplaces. Additionally, the polluter pays principle will be transcribed into legislation as well, this action should provide further incentives for end users to switch from ICE to EVs and PHEVs.

Technological Advancements:

Slovakian based company Mobility & Innovation launched an 8-metre hydrogen-electric minibus in Bratislava to demonstrate the viability of hydrogen fuel cell technology in transit vehicles and market its future product line. The H2Bus bus with seating for 21 passengers offers a zero-emissions solution to urban transit and is powered by a Loop Energy S300 Series hydrogen fuel cell system as well as an electric motor. The company chose Loop Energy's 30 kilowatts (kW) fuel cell system after its technology outperformed competitors' products in fuel efficiency tests. Now that Mobility & Innovation can offer the H2Bus for fleet deployment, Loop Energy intends to advance to the scale-up phase in commercial mobility.[584]

The Slovak-made AirCar, a groundbreaking dual-mode vehicle capable of both driving on roads and flying in the sky, has recently received official certification from the Slovak Transport Authority. This certification comes after the successful completion of 70 hours of rigorous flight testing, conducted in accordance with European Aviation Safety Agency (EASA) standards. Impressively, the AirCar prototype demonstrated its stability and reliability by performing over 200 take-offs and landings in fully automatic mode, showcasing its ability to navigate challenging flight manoeuvres, including 45-degree turns, without any intervention from the pilot.[585]

Infrastructure Development:

EV Charging Infrastructure

At the end of 2021, there were approximately 1020 publicly accessible charging points in 430 locations across Slovakia.[586] With funds from the Recovery and Resilience Plan and in line with the E-mobility action plan, Slovakia is allocating € 30 million for Motorways and Expressways, €10 million for cities and €6 million for companies. In the case of motorways, 60 charging hubs with 230 points will be built. This should support long long-distance travel within the TEN-T framework. For companies, the program will provide up to 50% of the funding.[587] With an outlook for 2026, the target is to add 3000 new units by 2026.[588]

Motorway Infrastructure

Slovakia went through a significant infrastructure project to develop its motorway infrastructure in the last decade. If in 2011, the motorway density was at 10km

[581] Slovakia's recovery and resilience plan - European Commission (europa.eu)
[582] SEVA: "The Slovak government's support for the purchase of EVs needs to be more robust" - Mobility Portal
[583] Slovakia E-mobility action plan (2022) https://shorturl.at/qsFO2
[584] Slovakia's Mobility and Innovation launches hydrogen-electric bus in Europe - CEENERGYNEWS
[585] In Slovakia, a flying car is cleared for take-off and mass production (emerging-europe.com)
[586] Slovakia E-mobility action plan (2022) https://shorturl.at/qsFO2
[587] Slovakia's Action Plan and € 50 mil Investments into EV Charging Infrastructure - SEVA
[588] SEVA: "The Slovak government's support for the purchase of EVs needs to be more robust" - Mobility Portal

per 1000 km^2 land area, by 2021 it reached 18km per 1000 km^2 land area.[589]As part of Slovakia's e-mobility action plan, within the next 5 years, the infrastructure will be further upgraded to accommodate the increasing demand for EVs related infrastructure.

Railway infrastructure

Slovakia has one of the densest railway infrastructures in the EU, with a total length of 3626 km, out of which 1585 km are electrified (43.7%). As it is crossed by three critical trans-European corridors, the Baltic-Adriatic Corridor, Orient/East – Mediterranean Corridor and Rhine – Danube Corridor it is well positioned to sustain an increase in reliance on railway as a way to transport passengers and goods.[590]

However, similar to other Member States, years of under-investment have led to the slow decay of the infrastructure, as such many sections have speed and weight limits and would require new and constant funding to be maintained and upgraded. The railway transport sector in Slovakia currently relies heavily on human labour, leading to significant labour costs, which account for 60% of the expenses of Slovakia's National Railway company. However, this reliance on manual labour poses risks to the sustainability of operations, particularly considering the ageing population and the impending retirement of a large portion of employees in the coming years. Addressing this challenge is essential for improving throughput, enhancing safety, and reducing the unsustainable financial burden associated with operating railway lines. [591]

In the Slovakian Transport Masterplan 2030, the Slovakian government understands and acknowledges the shortcomings of its railway infrastructure. According to the objectives set, the responsible bodies should prepare operational passengers and freight railways concepts and implementation plans up to 2030 with an outlook to 2050.[592]

Market Trends and Consumer Behavior:

The Slovak government estimates that the rate of growth for the number of BEVs is expected to accelerate from the current 1.7% to 10% in 2025. By the end of 2030, the government expects 183,000 BEVs in the country and the share of new registrations to grow to 39%.[593]

In line with the European trend, passenger cars make the largest share of passenger transport with approx. 75%. Followed by air and buses at roughly 10% each and trains at 5%.[594] This indicates that if Slovakia is looking to diminish its reliance on personal vehicles it should also focus on developing a robust bus and railway network for the entire country.

Public Transportation Systems

In contrast to the European average Slovakians enjoy slightly shorter commuting times. The majority of the population, approximately 70% enjoy commuting times less than 30 minutes, 20% travel between 30 minutes and one hour, and 10% travel more than one hour.[595] The rather short commute times can be an indicator of a robust public transport system that can efficiently and timely deliver commuters to their workplaces.

In 2022, Slovakia's fleet of electric buses amounted to 47, which represents 0.7% of the total fleet. On average, Slovak buses are 11.3 years old, which situates them above the European average of 12.5 years old.[596] However, the fleet being dominated by diesel buses results in a negative impact on the environment and the health of passengers. Despite, Slovakia's mobility plan stating that the modernization of the public transportation system is one of the priorities there is a lack of concrete steps to achieve modernization and implicitly electrification of the fleet. Simultaneously the share of public transport increased to 26.2%, well above the EU average of 17.2%.[597]

To stimulate the use of the passenger railway network the Slovak government introduced free travel for students up to the age of 26 and for seniors aged 62 and above.[598]

Environmental Impact and Emissions:

In 2022, there were 3.1 million vehicles on the road, an increase of 15% compared to 2018. On average Slovakian vehicles were 14.7 years old, putting them higher than the European average of 12.3 years old. Slovakia enjoys a fairly even distribution among petrol engine cars(50%) and diesel cars (43.8%), while only 0.2% are EVs, 0.2% PHEVs and 2% hybrid.[599]

Compared to 1990, emissions in road transport in the Slovak Republic increased by approx. 38% (CO2). While in 1990 CO2 emissions from road transport accounted for only 67% of total transport emissions, in 2016 the share of CO2 emissions equiv. from road

[589] Key figures on European transport – 2023 edition (europa.eu)
[590] Rail | European Alternative Fuels Observatory (europa.eu)
[591] Innovative Trends in the Field of Railway Transport and Infrastructure in the Conditions of Railways of the Slovak Republic (sciencedirectassets.com)
[592] Strategic Transport Development Plan of the Slovak Republic up to 2030 – Phase II (gov.sk)
[593] Slovakia E-mobility action plan (2022) https://shorturl.at/qsFO2
[594] Key figures on European transport – 2023 edition (europa.eu)
[595] Key figures on European transport – 2023 edition (europa.eu)
[596] ACEA-Report-Vehicles-on-European-roads-.pdf
[597] European Commission, 2023 National Reform Programme of Slovakia and delivering a Council opinion on the 2023 Stability Programme of Slovakia (europa.eu)
[598] Electrification and Modernisation of Lines Are Among the Important Goals of Progressive Slovakia, Says Transport Team Leader Martin Pekár | RAILTARGET
[599] ACEA-Report-Vehicles-on-European-roads-.pdf

transport rose to 94% of total transport emissions. The biggest increase was recorded in the emissions of the categories of passenger cars (30%) and light commercial vehicles (almost 340%).

Economic and Social Implications:

With an annual production of more than a million manufactured vehicles, Slovakia currently ranks 15th in the number of total manufactured vehicles in the world. The automotive industry in Slovakia contributes up to 50% of total industrial production, 42% of industrial exports and 11% of total GDP. The automotive industry directly employs 176,000 people and indirectly 261,000.[600] The Slovak Republic provides a stable background for four global producers and a number of companies that together form a complete subcontractor chain. In 2022, a mega-investment of a fifth car company in eastern Slovakia was announced. The new car company should produce 250,000 electric cars a year in Slovakia from 2026.a[601] Battery production for EVs is expected to start in 2026.[602]

There are 13 BEV & PHEVs (4 BEV & 9 PHEV) models being produced in Slovakia.[603] Chinese company Gotion High Tech and its Slovak partner InoBat signed a memorandum to build a plant in Slovakia. Battery production for EVs is expected to begin in 2026. One of the most significant announced investments is Volvo's plant in the east of the country, which will exclusively produce EVs upon its launch in 2026. Furthermore, other Original Equipment Manufacturers (OEMs) are already investing in new models.

Similarly, Volkswagen is preparing its facility for the launch of an electric Porsche model. Another Porsche-owned factory is investing €1 billion in the production of battery modules.[604]

Best Practices and Case Studies:

Tramway extension to the borough of Petržalka - Bratislava's largest district and home to more than 100,000 people. By Slovakian standards, it is often described as a city within the city. For many years, the transport system in Bratislava and the surrounding region has suffered from a lack of strategic planning, with the sole focus on road development.

Investments in the public transport sector were primarily focused on upgrading the bus fleet, neglecting the modernization of trolleybuses and trams, which consequently had a limited supply of low-floor vehicles. Moreover, the infrastructure associated with these modes of transportation required extensive renovation. The sole means of traveling from Petržalka to the northern part of the city and the city centre via public transport was by taking a bus across one of the four bridges. The project consisted of the construction of 2.4 kilometres of new tramline connecting the city centre of Bratislava, located on the north bank of the Danube River, with Petržalka, situated on the south bank of the Danube. One tram stop was reconstructed and three new ones were built along the tram route. Vehicle access to the bridge is restricted to trams and emergency vehicles.[605]

Future Perspectives and Emerging Trends:

Slovakia has all the prerequisites to become one of the European leaders in achieving a sustainable automative and mobility sector. The central government has a range of strategies to promote adoption and spur growth, additionally a very strong automotive sector gives Slovakia the possibility to become a test bed for new technologies and investment, it is encouraging that industry players have already committed to precise development plans that should be completed in the next 3-5 years. The next 5 years should serve as a transformative period both for Slovakian society and economy and with the right circumstances the green transition should come with strong development and economic growth for the country.

International Comparisons and Collaborations:

CD Cargo, the largest Czech Rail carrier specialising in freight cargo, has a close partnership with the Slovak railways. In 2022 it transported over 15 million tonnes of goods through the main border crossings. CD Cargo has leveraged the almost identical railway infrastructure shared between Czech Republic and Slovakia to offer unique routes and integrated solutions to their customers.[606]

---

[600] Slovak Investment and Trade Development Agency, Automotive Sector in Slovakia (2023)
[601] Slovakia E-mobility action plan (2022) https://shorturl.at/qsFO2
[602] SEVA: "The Slovak government's support for the purchase of EVs needs to be more robust" - Mobility Portal
[603] Slovak Investment and Trade Development Agency, Automotive Sector in Slovakia (2023)
[604] SEVA: "The Slovak government's support for the purchase of EVs needs to be more robust" - Mobility Portal
[605] Joint Assistance to Support Projects in the European Region, A neighbourhood story (eib.org)
[606] Rail freight transport and Czecho-Slovak cooperation The Business Soirée (thebusinesssoiree.com)

Slovenia

Policy Review

Tax benefits and Subsidies

Owners of vehicles emitting less than 110 g/km CO2 pay the minimum rate motor vehicle tax of (0.5%). Additionally, the Slovenian government offers subsidies for purchases of vehicles without CO2 emissions ranging from €200 to €4500. The maximum value of the vehicle, including VAT must be below €65000 to qualify for the subsidy.

The government has also established an Eco Fund offers long-term loans for the purchase of electric cars at a subsidized rate set by the Bank of Slovenia. Loans with up to a 10-year repayment period with an interest rate of EURIBOR + 1.3 % are available. The conditions are different for personal and business purchases.[607]

Slovenia Recovery and Resilience Fund

Slovenia's plan is valued at €2.7 billion, out of which 49% will be dedicated towards green transition. In the transport sector, Slovenia faces several challenges due to its dependency on the road transport. In order to achieve significant progress, Slovenia will dedicate €708 million towards a plan that will support sustainable mobility.[608]

Slovenia's Transport Development Strategy Until 2030

The strategy set out to achieve several core objectives: improve transport connections and harmonization with neighbouring countries; improve national and regional connections within Slovenia; Improve the passenger's accessibility to the main urban agglomerations and within them; improve the organizational and operational structure of the transport system to ensure system efficiency and sustainability; obtain the economic benefits associated with robust transport and mobility infrastructure.[609]

Technological Advancements:

Elaphe Propulsion Technologies, a Slovenian based company, was among the first to develop a in-wheel electric motor. Slovenian agency SPIRIT, acknowledged Elaphe as an Ambassador for the Slovenian economy, which was now followed by a Slovenian government grant of 7 million EUR for 2021-2024.[610] Elaphe positions itself as a world leader in multiple wheel drive electronics and electric in-wheel technology, the company claims that it's in-wheel motors achieve energy efficiency levels of 97%. The motors are already used in some EV start-ups, the Lordstown Endurance e-pick up, the Lightyear O and in the future by Aptera as well. Currently Elpahe is also partnering with McLaren to further improve and develop their technology.[611]

Slovenia-based Pipistrel, with its Velis Electro was the first certification (2020) of a world-wide of a fully electric aircraft. Achieving certification in less than three years was made possible by the close collaboration between Pipistrel and EASA, both sharing the common objective of ensuring the aircraft met stringent safety standards. This project also yielded valuable insights that will facilitate future certifications of electrically powered engines and aircraft.[612]

Infrastructure Development:

EV Charging Infrastructure

At the end of 2022, there were only 1600 charging points across Slovenia. However, in May 2023 the Slovenian parliament passed a law dedicating over €230 million (while hydrogen and other types of alternative fuels are mentioned, the focus is on electric mobility as currently the most mature technology) for the expansion of the charging infrastructure. [613]

Motorways

Slovenia has a network of motorways spanning 643 km and is one of the most dense in the EU-27 with 30km per 1000 km^2, however, its quality is perceived as relatively low compared to other EU countries. Slovenia is 12th out of 27 EU countries in terms of the lowest numbers of fatalities per million inhabitants. Prior to 2009, the mortality rate in Slovenia was still much higher than the EU average. Compared to the EU average, the distribution of fatalities in Slovenia shows a relatively high proportion of powered two-wheelers and fatalities that occur on motorways. Over the past ten years, there has been a considerable decrease in the number of fatalities on urban roads.

Railways

[607] Incentives and Legislation | European Alternative Fuels Observatory (europa.eu)
[608] Slovenia's recovery and resilience plan - European Commission (europa.eu)
[609] Transport Development Strategy of the Republic of Slovenia Until 2030
[610] 7 million € for Elaphe Propulsion Technologies as support from the Slovenian government - Elaphe (in-wheel.com)
[611] Elaphe & McLaren team up on powertrain development | electrive.com
[612] Slovenian electric plane "world's first" to receive official certification (smart-energy.com)
[613] Euractiv, Slovenia passes law to accelerate e-mobility

Slovenia has 1209 km of railways, out of which 610 km (50,5%) are electrified.[614] In September 2022, 52 new sets of trains were added to the fleet, and 20 new trains were ordered last June, and are expected to arrive in 2025. Moreover, four engines and 20 railroad cars are to arrive in 2026 in what will significantly expand the international transport options provided by the operator. In the future, Slovenian Railways would like to see additional high-speed tilting trains as well as more investment, upgrades, double-tracking, and electrification of regional lines. The company also has high hopes for the new passenger terminal in Ljubljana, whose completion is slated for 2026. The terminal should allow for a one-third increase in throughput on commuter routes linking the capital and other towns.[615]

Market Trends and Consumer Behavior:

In 2023 there were 11,874 BEVs registered in Slovenia, compared to 2022 when there were 7674 BEVs this represents a 50% increase in the total number. Similarly, to other European countries Slovenia is showing strong year on year growth.[616]

Ridership on Slovenian trains has been growing since 2021, hitting over 15 million last year. The Slovenian train operator aims to achieve 25 million rides by 2028. The number of rail passengers increased more than 20% in 2022, exceeding the pre-pandemic figure recorded in 2019.[617]

Bus ridership went up as well, as the number of passengers went up 24% in 2023. In 2022 ridership also exceeded the figure recorded in the pre-Covid year of 2019, and bus rides in the capital are expected to attract even more passengers once the LPP fleet receives new hydrogen and electric buses. Not counting city buses, over 26 million passengers passed through the station in 2023. At the monthly level, an estimated 20% of foreign tourists visiting Ljubljana used bus services to get to the city.[618]

Ljubljana, Slovenia's capital, car sharing system is very popular and increasingly recognisable, namely, the number of rentals in 2019 went up by 200% in comparison to the previous year. The car sharing network in Ljubljana includes over 200 vehicles at 34 public and 51 private locations. Car sharing services can have a sizeable impact on traffic flow and vehicle ownership as it is estimated that one shared car replaces up to 10 privately owned cars.[619]

Public Transportation Systems:

Public transport services in Slovenia are categorized into three main types: inter-city public transport, which is overseen by the state; urban public transport, managed by municipalities; and public railway transport, operated jointly by the state and the Slovenian Railroad company. In 2013, there were a total of 1,777 inter-city public transport lines spanning 61,524 kilometers, along with 128 urban public transport lines covering 1,385 kilometers. In the same year, only 32 municipalities, representing 15% of the total, contributed to the financing of inter-city public transport, indicating challenges in rural mobility. Urban public transport services were available in 17 municipalities, accounting for 8% of the total.[620]

Slovenia's public transport accessibility is relatively adequate in terms of the 1,000 m radius, but less so in terms of the 500 m radius, where it is adequate only in most urban areas. Vast areas across the country, including in some city municipalities, do not have adequate public transport accessibility, which is the consequence of low population density in the countryside, and larger gaps in provision were identified in suburban areas that have formed outside public transport corridors.[621]

As of 2023, Ljubljana, Slovenia's capital only relied on its relatively outdated system of city buses. Additionally, it lacked integration with the regional bus system, resulting in extra planning and travel time for passengers. [622] However, Ljubljana has introduced a rentable city bike service that to a large degree enjoys success among commuters and is touted as among one of the most successful in the region. Such positive developments are encouraging for the further development of mobility in Ljubljana, but also in Slovenia's other cities.[623] The maintain and spur further growth the central government and local authorities must also ensure that commuters' willingness to shift away from traditional means of transportation is backed up by investments in cycling and overall mobility infrastructure.

Environmental Impact and Emissions:

Transport emissions accounted for 42.7% of Slovenia's total CO2 emissions in 2018, which is above the EU average (32.6%), and continue to rise in absolute terms.[624] In line with other European countries Slovenia

[614] Rail | European Alternative Fuels Observatory (europa.eu)
[615] The Slovenia Times, Public transport gaining popularity (2024)
[616] Vehicles and fleet | European Alternative Fuels Observatory (europa.eu)
[617] The Slovenia Times, Public transport gaining popularity (2024)
[618] The Slovenia Times, Public transport gaining popularity (2024)
[619] Ljubljana – second most car sharing friendly city » City of Ljubljana
[620] Smart Rural Transport Areas, Slovenia.pdf (ruralsharedmobility.eu)
[621] Jernej Tiran, et al, A spatial analysis of public transport accessibility in Slovenia (urbaniizziv.si)
[622] Gašper Pirc, The Future of Slovenian Public Transport and the state of City Services and Local Development in Slovenia (2023) (china-cee.eu)
[623] Gašper Pirc, The Future of Slovenian Public Transport and the state of City Services and Local Development in Slovenia (2023) (china-cee.eu)
[624] Sustainable Mobility | GOV.SI

enjoys a rather equal distribution among petrol (46.2%) and diesel (50.7%) cars, followed by hybrid (1.7%), PHEV (0.2%), and BEV (0.6%).[625] If EV adoption will continue at current rates, the CO2 emissions resulting from the transport sector should start decreasing in the coming years.

Economic and Social Implications:

Slovenia's transport sector employs only 26,000 thousand people[626], a small portion of Slovenia's 982,000 workforce.[627] Roughly 98% of it being employed in the land transport sector, with the rest taken by water and air. Costs associated with purchasing vehicles, their operation and other services, such as transport tickets are below the European average and unlike in other European countries have remained stable in the past few years.[628]

In the past decade (2012-2022) Slovenia registered the highest growth of the share of household consumption expenditure on transport, rising from 15% to 17,5% and situating it above the European average of 12.5% (2022).[629]

Best Practices and Case Studies:

Between 2002 and 2012, there was a 52% rise in car usage in Ljubljana, accompanied by a 23% reduction in public transportation usage. By 2011, public transport accounted for only 13% of the modal share, whereas cars dominated with 67%. In response to this trend, Ljubljana implemented a new Sustainable Mobility Plan (SUMP) in 2012. The objective of the plan was to curtail private motor vehicle traffic and instead prioritize pedestrians, cyclists, and public transportation. Through the implementation of its Sustainable Urban Mobility Plan (SUMP), Ljubljana experienced a significant increase in the use of public transport and active mobility options. In terms of public transport, the city witnessed an 18.5% rise in usage between 2010 and 2014, along with a 17% increase in city bus ridership since 2011 and a 34% surge in journeys on regional buses between 2013 and 2014. Furthermore, 98% of city residents view the shared bike scheme positively, with close to three million journeys recorded in its first four years.[630]

Ljubljana has successfully transitioned from a city focused on cars to one that prioritizes pedestrians, leading to a reduction in pollution levels. Thanks to the SUMP, pedestrian areas were expanded by 620% through the closure of the city centre (100,000 m2) to motorized vehicles. The city centre is now utilized for various cultural, social, and sporting events year-round. Renovation efforts on Slovenska Street resulted in a 70% decrease in black carbon levels and a 58% reduction in PM 2.5 levels, with no increase in concentrations on surrounding streets. These changes have also positively impacted residents' well-being. According to the 2015 European Quality of Life Survey (Eurobarometer), 92% of Ljubljana residents expressed satisfaction with the city's quality of life.[631]

Ljubljana is internationally recognized as a best practice in sustainable mobility. In 2016 it was recognized as the European Green Capital, in 2012 it received the Urban Public Space Award, and in 2013 it received the European Mobility Week award, in 2020 in the category up to 750000 residents it was recognized as the second most car sharing friendly city.[632][633]

The Trata 2.1 project in Škofja Loka, Slovenia, aims to revolutionize employee mobility habits in the Trata industrial zone, where the vast majority currently rely on cars for daily commuting. Spearheaded by a collaborative partnership of eight organizations, including municipalities, development agencies, and private companies, the initiative seeks to promote sustainable transportation options such as walking, biking, public transit, and carpooling. Through a multi-phase approach encompassing surveys, infrastructure enhancements, and policy advocacy, the project endeavours to achieve a 4% increase in the adoption of clean mobility habits among employees.[634]

Led by the Development Agency Sora and supported by international partners, the project addresses not only transportation challenges but also policy gaps that hinder the transition to cleaner modes of travel. By fostering a culture of sustainable mobility within the industrial zone, Trata 2.1 aims to set a precedent for similar initiatives across Slovenia and beyond, offering a replicable model for enhancing urban mobility and combating climate change.[635]

Future Perspectives and Emerging Trends:

Unlike neighboring countries, Slovenia does not have the advantage of a strong automotive sector. However, the transition to EVs and e-mobility will require new battery manufacturing plants and new vehicle manufacturing plants. This could bring opportunities that could help spur growth, provide more funds and ease Slovenia's goals of achieving its climate targets.

Slovenia has already started working on the modernization and electrification of it’s railways and based on the EV's market development Slovenians seem to have enough early adopters in order to kickstart the adoption program. In this sense, Slovenia's small size should aid this transition due to the smaller distances that need to be travelled and the smaller

[625] Key figures on European transport – 2023 edition (europa.eu)
[626] Key figures on European transport – 2023 edition (europa.eu)
[627] Labour force survey results, 4th quarter 2022 (stat.si)
[628] Key figures on European transport – 2023 edition (europa.eu)
[629] Key figures on European transport – 2023 edition (europa.eu)
[630] Pedestrianisation and car-free zones: Ljubljana, Slovenia – EBRD (ebrdgreencities.com)
[631] Pedestrianisation and car-free zones: Ljubljana, Slovenia – EBRD (ebrdgreencities.com)
[632] Award-Winning Ljubljana » City of Ljubljana
[633] Sustainable Mobility in Ljubljana - Pedestrian Space
[634] Cleaning up the commute in Alpine Slovenia | EEA Grants
[635] Cleaning up the commute in Alpine Slovenia | EEA Grants

infrastructure costs associated with that. However, the central government should ensure that it establishes long-term development plans for mass adoption of EVs as well.

International Comparisons and Collaborations:

The Slovenian city of Koper, a vital hub in the Baltic-Adriatic Corridor, faces infrastructural challenges with its outdated single railway track, hindering its capacity to meet current and future demands. To address this issue, 2TDK, a Slovenian project development company, is spearheading the construction of a second rail line with the support of a €250 million loan from the European Investment Bank (EIB). This ambitious project aims to enhance trade, reduce carbon emissions, and alleviate road congestion by providing a modern and sustainable inland connection. The partnership between Slovenia and the EIB underscores a commitment to fostering economic development and environmental sustainability through strategic infrastructure investments.[636]

The new railway line, spanning 27 kilometers from Divača to the port of Koper, promises significant benefits for Slovenia's economy and environment. By increasing rail capacity and reducing reliance on road freight, the project is expected to create employment opportunities, boost trade efficiency, and mitigate CO2 emissions. Moreover, the project's careful consideration of environmental preservation, including the protection of natural and cultural landmarks, exemplifies a holistic approach to sustainable development. As the project progresses, it serves as a testament to the fruitful collaboration between Slovenia and the EIB in driving forward transformative infrastructure initiatives with lasting socio-economic and environmental impacts.[637]

[636] New Slovenia rail line cuts emissions, congestion (eib.org)

[637] New Slovenia rail line cuts emissions, congestion (eib.org)

Spain

Policy Review

Spain's Recovery and Resilience Plan
The total value of the plan represents €163 billion, out of which 40% of the plan will support the green transition. Improving sustainable mobility in urban and long-distance will be achieved through investing €13.2 billion in improving railway infrastructure, creating low-emission zones in urban areas, financing green public buses, deploying electric charging stations and developing urban public transport.[638]
Spain has put in motion different legislation in accordance with European Union directives. The most recent legislative development about sustainable mobility is MOVES III Plan, consisting of different plans of action, goals and targets, as well as a monetary investment of €1200 million to be distributed among the autonomous communities of Spain. Some of the developments include the mandatory creation of a sustainable mobility plan for large companies (more than 500 employees), subsidies to electric vehicles of up to €7,000, increased allowances for corporate electric vehicle fleets, subsidies to public transportation and infrastructure, further developing of low emission zones in big cities and other.

EV Tax Exemptions and Subsidies

Vehicles emitting ≤ 120g CO2/km are exempt from 'special tax.' Moreover, in the Canary Islands, there's a VAT exemption for alternatively-powered vehicles emitting ≤ 110g CO2/km, including BEVs, FCEVs, PHEVs, EREVs, and HEVs. Signifiicant incentives are provided for BEV owners in major cities like Madrid, Barcelona, Zaragoza, and Valencia, with a substantial 75% reduction in ownership tax. The use of company cars for private purposes is treated as a payment-in-kind and is factored into personal income tax calculations. This includes a 30% reduction for BEVs and plug-in hybrid (PH)EVs costing ≤ € 40,000, and a 20% reduction for HEVs costing ≤ € 35,000.
Under the MOVES III scheme (2021- July 2024), private individuals are eligible for various subsidies. For cars, BEVs and FCEVs can receive €4,500-7,000, and PHEVs can receive €2,500-5,000, depending on vehicle scrappage. For vans, private individuals can receive €7,000-9,000, depending on scrappage. Different incentives are available for SMEs and large companies under the MOVES FLOTAS program.

Spain's Mobility Strategy 2030

Spain's "Estrategia de Movilidad Segura, Sostenible y Conectada 2030" (Safe, Sustainable, and Connected Mobility Strategy 2030) outlines the future of transport and mobility over the next decade under the guidance of the Ministry of Transport, Mobility, and Urban Agenda (MITMA). It is structured around nine strategic axes encompassing over 40 action lines and more than 150 specific measures aimed at transforming the mobility ecosystem. Key focus areas include enhancing safety, sustainability, and connectivity within the mobility framework, supported by the Sustainable Mobility Law and financial backing from the Recovery, Transformation, and Resilience Plan. This initiative emphasizes inter-administrative cooperation, coordination, integration, and was developed following an ambitious public participation process, including the "Open Mobility Dialogue" and various public consultations and territorial workshops throughout 2020 and 2021.
Moreover, the strategy aims to address Spain's mobility challenges by decarbonizing and digitalizing transport, introducing new technologies, and alleviating congestion in major cities. It emphasizes both passenger and freight transport, reflecting a comprehensive approach to mobility that recognizes the importance of sustainable and efficient logistics. The government has committed to a significant transformation aligned with broader European objectives, with the strategy expected to substantially influence the country's economic and social landscape by 2030[639]

Technological Advancements

Siemens Mobility, a leader in intelligent transport solutions, is showcasing several innovative developments for urban rail mobility, which were presented at the UITP Global Public Transport Summit in Barcelona. The company highlighted its commitment to transforming urban mobility for a better tomorrow through technological areas integrated into the Siemens Xcelerator. These include Train2Cloud, Digital Station, RailXplore, CoreShield OSA, Railigent X Application Suite, and MoBase, aimed at providing sustainable, comfortable, and cost-efficient rail transportation. Additionally, Siemens Mobility's involvement in creating Mobility-as-a-Service (MaaS) solutions like the MaaS app dōcō, which is available throughout Spain, reflects an effort to provide seamless travel experiences for passengers.[640]
Filling batteries solely with green energy is one of the main missions of H2PLT, a young Spanish startup that has just inaugurated its second charging station in the province of Cuenca. The entire installation is covered by a vast array of solar panels, which in turn constitute the primary source of electricity supplied through the chargers themselves. This ensures that we will be using

[638] Spain's recovery and resilience plan - European Commission (europa.eu)
[639] Spain's Mobility Strategy 2030 (mitma.gob.es)
[640] 2023 UITP: Siemens Mobility to present innovative developments for urban rail mobility | Press | Company | Siemens

truly renewable energy in practically all of our recharges.[641]
Hympulso, a collaboration among ten Spanish companies, has united to spearhead the integration of hydrogen propulsion into a high-speed train. The project is a component of the Strategic Projects for Renewable Energies, Renewable Hydrogen, and Storage (PERTE) program. The objective is to innovate and create a novel technical car powered by hydrogen and batteries for a Talgo 250 train. The project received an additional €6.5 mln investment to further develop the in conjunction with different transportation companies in Spain.[642]

Infrastructure Development

Across Spain, cities like Valencia, Seville, Bilbao, Malaga, and Granada are leading the charge towards sustainable urban mobility, embracing initiatives that reduce reliance on cars and promote environmentally friendly transport options. Valencia's Sustainable Urban Mobility Plan aims to bolster public transport and cycling, while Seville has significantly increased its cycling population through extensive bike lane networks. Bilbao's urban regeneration integrates green spaces with pedestrian-friendly zones, and Malaga leverages smart technologies for traffic management and public transport improvements. Additionally, Granada's light rail system exemplifies efforts to enhance public transportation infrastructure. These initiatives collectively showcase Spain's commitment to creating more livable, sustainable urban environments through innovative mobility solutions. [643] [644] [645] [646] [647]

EV Charging Infrastructure

In Spain, there are a total of 25,180 public electric charging stations. Slow chargers, totalling 17,767, with a maximum power of 22 kW represent 78% of the country's charging points. As of June 30, 2023, there were 6,704 installed charging points but out of service (Anfac). This represents 23% of the charging infrastructure.[648]
Under the Moves III Plan, installation of charging points is subsidized by the Spanish government in proportion of up to 80%. With the installation of charging points, the % of the subsidy depends on the type of the beneficiary and the number of inhabitants in the municipality or city where the project is carried out. The subsidy percentages for different entities are as follows:
For self-employed individuals, homeowners' associations, and public administrations:

- In municipalities with more than 5,000 inhabitants, there's a subsidy covering 70% of the total cost.
- In municipalities with fewer than 5,000 inhabitants, the subsidy covers 80% of the total cost.

For companies installing public access charging points with a power of less than 50 kW, categorized as fast charging installations:

- In municipalities with more than 5,000 inhabitants, large companies receive a 35% subsidy, medium-sized companies receive 45%, and small companies receive 55%.
- In municipalities with fewer than 5,000 inhabitants, large companies receive a 40% subsidy, medium-sized companies receive 50%, and small companies receive 60%.

For companies installing public access charging points with a power of more than 50 kW:

- In municipalities with more than 5,000 inhabitants, there's a 30% subsidy.
- In municipalities with fewer than 5,000 inhabitants, there's a 40% subsidy.[649]

Railway Infrastructure

The Spanish railway network boasts over 15,500 kilometres of tracks, with more than 3,000 dedicated to the high-speed train system (AVE), which is continuously expanding. This high-speed network is the longest in Europe and one of the most extensive globally. In operation since 1992, these AVE trains can travel at speeds of up to 310 kilometers per hour, significantly reducing travel time. For instance, the journey from Madrid to Barcelona takes around three hours, covering a distance of approximately 504 kilometers. Alongside having one the most extensive networks in Europe, Spain has managed to achieve the lowest average construction cost in the Eurozone.[650]
Stadler, a manufacturer of railway rolling stock, has secured agreements with nearly every railway operator in the country to supply 'Euro6000' electric freight locomotives, with plans to deliver them within the next two years. Among the companies that have purchased these new locomotives from Stadler are Renfe, Captrain, Medway, and AlphaTrains.[651]

Market Trends and Consumer Behavior

The last month of the year 2023 has brought more positive news in the electric car market. For the second consecutive month, there has been a steady increase in the registration of 100% electric cars, surpassing the 6,000 mark: 6,061 units were registered in December, representing a 69% increase compared to the previous year. As for plug-in hybrids, their sales have grown by

[641] La estación de carga para eléctricos más verde ya está en España (caranddriver.com)
[642] Spanish consortium Hympulso tackles hydrogen-power for high-speed rail | RailTech.com
[643] Movilidad Sostenible - Generalitat Valenciana (gva.es)
[644] Plan de Movilidad Urbana Sostenible — Movilidad (sevilla.org)
[645] Plan de Transporte Metropolitano del Área de Granada. Plan de Movilidad Sostenible - Junta de Andalucía (juntadeandalucia.es)
[646] Líneas de trabajo (malaga.eu)
[647] Sustainable Urban Mobility Plan BILBAO
[648] ANFAC | Barómetro de electro-movilidad
[649] MOVES III Plan: What the subsidy is for and who can benefit from it? – LRP Energy
[650] Spain has Europe's most efficient high-speed rail network, says report | RailTech.com
[651] Stadler to produce 130 electric freight locomotives for Spanish operators | RailFreight.com

43%, reaching 6,645 units in December. Currently, electric vehicles account for about 6% of all vehicles, while hybrid electric vehicles represent 31%.[652] The Spanish Association of Automobile and Truck Manufacturers predicts that with the support offered under the Moves III plan, registration of EVs in Spain will grow by 75%, which would represent an increase of 70000 sold. [653] Despite the encouraging trends, there are still serious limitation in terms of high EV prices, only 4% of newly purchased electric vehicles cost less than €25,000. Chinese brands are offering the lowest prices. The implementation of electric vehicles is costly and entails a lot of bureaucracy for tax breaks.
Spain's bicycle usage ranks lower compared to other European countries, particularly those in the Mediterranean region, which affects its sustainable mobility efforts. The Netherlands and Nordic countries lead in cycling frequency, highlighting a stark contrast with Mediterranean countries, including Spain, where a significant portion of the population rarely or never cycles.[654]

However, in recent years, the Spanish bicycle market underwent significant growth. The overall value of the market increased by 45,1% from 2020 to 2023, on average registering 1.5 million bikes sold every year. The electric bike segment stood out as the leader in sales, overtaking the mounting biking segment. This growth also had a positive effect on the local manufacturing of bicycles, from 2019 to 2022 the sector registered a 50% growth. In a nation where cycling is predominantly associated with sports, both conventional and electric city bikes have emerged as notable choices. In 2022, there was a notable increase of 22.5% in the sales of city bikes, reflecting the escalating interest in cycling among urban residents.[655]
Spain's first National Cycling Strategy, adopted on 8 June 2021, marks a significant commitment to promoting cycling as a key solution for urban mobility. With a €5 million budget, the strategy aims to enhance sustainable mobility, healthy living, cycle tourism, leisure, and sport cycling, alongside coordinating state action to support cycling. This initiative represents a collaborative effort to transform societal attitudes towards cycling, enabling investments in cycling infrastructure and encouraging active mobility across the nation.[656]

Public Transportation Systems

In Spain, public transport services are categorized into three types: conventional, discretionary, and special. Conventional services, also known as "transportes regulares," adhere to fixed frequencies, itineraries, and stops. Discretionary services, or "transportes discrecionales," operate without fixed itineraries or schedules. Special services, labeled as "transportes especiales," are specifically dedicated to transporting sick or injured individuals. Within the conventional category, there are further distinctions. "Transportes públicos regulares de uso general" refer to services designed to meet general demand, accessible to any interested party. Conversely, "transportes públicos regulares de uso especial" exclusively cater to specific groups such as students, workers, military personnel, or similar homogeneous groups.[657]
Endesa X is leading the shift to electric buses in Spain. Just between January and June 2023, registrations of electric and hybrid buses increased by 641.5%.[658] The state has invested in more than 1000 projects across the country to improve mobility: they are buying 1024 zero emission buses and constructing/improving 1200 kilometers of bike lanes. Several Autonomous Communities already have several urban transport lines operating with hydrogen buses. Others are in the bidding phase and will soon receive the first units.[659]
In Spain, the rural population tends to rely heavily on private vehicles. This dependency largely stems from the limited availability and coverage of public transport services, which in many cases are either infrequent or nonexistent. Typically, public transport in rural areas is provided through conventional fixed-route services, although there are instances of Flexible or On-Demand Transport services being implemented. It's important to note that transport services in rural areas are often integrated into the broader provision for nearby towns.[660]

Environmental Impact and Emissions

The transportation sector accounts for 26% of greenhouse gas emissions in Spain, according to data from the Ministry for Ecological Transition and the Demographic Challenge.[661] The average emissions of new passenger cars have been below the 2015 EU-wide target of 130g CO2/km since 2012. However, the observed increasing trend since 2016 is distancing Spain from the EU-wide target of 95g/km by 2021.[662]

Economic and Social Implications

Spain is making significant strides towards sustainable urban mobility, with many cities leading the way in implementing comprehensive plans aimed at transforming mobility habits and enhancing the overall quality of life. These initiatives underscore Spain's commitment to addressing the economic and social implications of urban mobility, alongside its environmental impact.
As for rural Spain, the need for improved transportation routes is a significant concern, with many political

[652] Ventas de coches eléctricos en España: diciembre 2023 (forococheselectricos.com)
[653] MOVES III Plan: What the subsidy is for and who can benefit from it? – LRP Energy
[654] Cycling in Europe: Which countries and cities are the most and least bicycle-friendly? | Euronews
[655] The Spanish bicycle market in 2023: challenges and perspectives (velco.tech)
[656] Estrategia Estatal por la bicicleta | Estrategia de Movilidad Segura, Sostenible y Conectada 2030 (mitma.es)
[657] Smart Rural Transport Areas, Spain (2019) (ruralsharedmobility.eu)
[658] Home - AEDIVE
[659] El autobus de hidrógeno está en toda España - eshidrogeno
[660] Smart Rural Transport Areas, Spain (2019) (ruralsharedmobility.eu)
[661] Ministerio para la Transición Ecológica y el Reto Demográfico (miteco.gob.es)
[662] Climate action in Spain (europa.eu)

parties proposing changes to enhance connectivity and mobility in these areas. Improving rural mobility is crucial for economic development, social inclusion, and access to services and opportunities. While specific proposals vary, the overall goal is to ensure that rural communities are not left behind in Spain's transition to a more sustainable and equitable mobility system. [663]

Best Practices and Case Studies

Madrid's Sustainable and Accessible Mobility Plan, Madrid 360, focuses on promoting public transport and multimodality as central elements of its strategy. The plan aims to facilitate comfortable and safe transfers, enhancing the potential of collective transportation modes. It recognizes the importance of integrating infrastructures planned by various administrations, such as the expansion of the Metro network, improvement of commuter trains, and development of bus lanes, to bolster the role of public transport in city mobility. Moreover, the plan includes modernizing the bus fleet and expanding the bus lane network to improve service efficiency. Initiatives to increase pedestrianization and improve cycling infrastructure highlight the plan's commitment to sustainable and active forms of transport. Additionally, the plan addresses parking management and promotes lower emission vehicles through subsidies and access restrictions for more polluting vehicles. [664]

Barcelona, on the other hand, has set ambitious targets to ensure that more than 80% of all journeys in the city are made on foot, on public transport, or by bike. This goal is part of Barcelona's Urban Mobility Plan, which outlines measures to promote healthy and sustainable transportation options. The city's focus on citizen engagement, environmental quality, and comprehensive planning reflects a holistic approach to urban mobility, aiming to create a more livable, sustainable, and inclusive urban environment. [665]

In 2023, Spain implemented measures to make public transport more accessible and affordable in response to the economic challenges and rising costs of living. The government introduced free and discounted public transport options, including extending its free train travel scheme that covered special multi-journey tickets for Renfe-operated Cercanías, Rodalies, and Media Distancia trains. This initiative required a small deposit and was aimed at supporting commuters and promoting the use of public transport.[666]

Heading into 2024, Spain plans to continue offering free and discounted public transport to select groups within the population. Some autonomous communities have already finalized their plans, with other soon to follow. These efforts are part of Spain's broader strategy to enhance sustainable urban mobility, reduce the reliance on private vehicles, and improve environmental and economic outcomes by making public transport more accessible to all residents.[667]

Future Perspectives and Emerging Trends

Spain is actively shaping its urban mobility landscape to address current challenges and meet future needs, with a significant emphasis on sustainability and citizen participation. The development and implementation of Sustainable Urban Mobility Plans (SUMP) across various Spanish cities highlight the country's dedication to fostering more sustainable travel within municipal environments. These SUMPs are designed to tackle issues stemming from the expansion of metropolitan areas, reliance on private vehicles, and previous decades of urban planning. By assessing the current mobility situation, setting clear objectives, designing targeted measures, and establishing indicators for progress monitoring, Spain is making strides toward improving the quality of life for its citizens through enhanced urban mobility solutions.

Furthermore, Spain's engagement in initiatives like the Urban Mobility Days conference in Seville emphasizes its role in fostering dialogue and knowledge exchange on emerging transport trends, technologies, and sustainable urban mobility planning. [668]

However, the adoption of electric vehicles (EVs) in Spain faces challenges due to significant bureaucracy and a lack of adequate infrastructure. These obstacles slow down the pace at which EVs are embraced by the public, despite the government's efforts to promote cleaner transport options. Additionally, the usage of bicycles remains low, indicating a need for better cycling infrastructure and incentives to encourage more people to consider biking as a viable daily transport option. Moreover, rural areas are in particular need of effective and sustainable transportation modes to ensure accessibility and connectivity for all residents. Addressing these issues is crucial for Spain to continue progressing in sustainable urban mobility.

International Comparisons and Collaborations

Spain showcases its dedication to sustainable transportation by actively participating in two significant international efforts. Firstly, it joins forces as one of sixteen countries in the Electric Vehicles Initiative (EVI), spearheaded by the International Energy Agency (IEA). The aim of the EVI is to expedite the worldwide uptake of electric vehicles, promoting more environmentally friendly transport methods globally. In this initiative, Spain works alongside nations such as Canada, Chile, China, Finland, France, Germany, India, Japan, the Netherlands, New Zealand, Norway, Poland, Portugal, Sweden, the United Kingdom, and the United States, exchanging insights and strategies to ease the shift towards electric vehicles. [669]

Moreover, Spain is engaged in RESIST, the inaugural Eurocluster endorsed by the European Commission, collaborating with France, the Czech Republic, and Austria. This initiative acts as a comprehensive resource for SMEs within the mobility, transport, and automotive

[663] Desconexión Forzada: El calvario del transporte público en la España Vacia(da) – Guadared
[664] Madrid 360
[665] BCNROC. Repositori Obert de Coneixement de l'Ajuntament de Barcelona: Pla de mobilitat urbana 2024
[666] Descuento joven para viajar en verano 2023 | Renfe
[667] Metrovalencia, Abono Temporal Jove gratuito, condiciones
[668] Urban Mobility Days 2023 - European Commission (europa.eu)
[669] Electric Vehicles Initiative – Programmes - IEA

sectors, offering them access to funding and support for sustainable development projects. This involvement underscores Spain's commitment to advancing sustainable mobility and transportation solutions on both a national and international level.[670]

[670] European Cluster Collaboration Platform, Resilience Through Sustainable Processes and production for the European Automotive Industry

Sweden

Policy Review

Until 2021, Sweden has been at the forefront of promoting sustainability in the automotive and mobility sector through stringent policies and regulations.[671]Sweden's ambitious goal to become carbon neutral by 2045 has catalyzed the former government to implement various initiatives to reduce emissions from vehicles. However, the policies recently announced by the current government are the first policies in the last two decades that will not decrease emissions related to transport, and may even increase emissions in the short term.[672] Plans to increase the travel deduction for trips to work from €1.8 per 10 km to €2.1 and the fuel deduction using a company car from €0.50 per 10 km to €1 will decrease the number of people using public transport. Also, the government reduced the fuel tax on petrol and diesel by €0.069 per litre from 1 January 2023. Lastly, incentives for buying emissions-free and energy-efficient vehicles will be stopped. Maintaining these regulations up to 2030 can increase emissions of up to 1 million tons of CO2.[673]

Sweden Recovery and Resilience Plan

The total value of the plan amounts to € 3.5 billion, out of which 44% will go towards supporting the green transition. Sweden has set an ambitious target to attain carbon neutrality by 2045, necessitating significant reforms and investments across various sectors, notably energy, housing, transport, and industry. In the realm of green transportation, a substantial €148 million investment is earmarked to bolster railway capacity enhancement efforts. Moreover, a reform initiative is underway to incentivize transport decarbonization, involving the elimination of energy tax reductions on fuel and adjustments to taxable benefit rates for company cars. Notably, the revised plan maintains a robust emphasis on advancing the green transition, with 43.6% of available funds allocated to measures supporting climate objectives, exceeding the targeted objective of 37%.[674]

Tax exemptions and subsidies

There are a range of tax exemptions and subsidies available in order to promote the transition to sustainable transport among car owners. Ownership Tax Benefits: Electric vehicles (BEVs) enjoy the lowest ownership tax, approximately €32 annually, while conventional vehicles incur higher taxes, totalling €355 per year. Circulation Tax: BEVs are exempt from circulation tax for five years, providing a benefit of €170 per year. Company Tax Benefits: For company cars, the private use is subject to taxation on benefits. Green cars may receive a permanent tax reduction on the benefit value. BiK taxation grants an average benefit of €270 for a C-segment car, with BEVs receiving a 50% discount on the tax base calculation, resulting in a maximum reduction of €30,550. Purchase Subsidies: No subsidies are available for cars registered after November 8, 2022. BEVs registered before this date receive reduced bonus amounts, with a maximum of €4,365 for stock models. From 2023, cars emitting a maximum of 30g CO2/km are eligible for subsidies. Other Financial Benefits: Electric and plug-in hybrid electric vehicles (PHEVs) benefit from reduced company car taxation. The taxable value of these vehicles for calculating the benefit-in-kind under personal income tax is reduced to that of a comparable petrol or diesel car, with an additional 40% reduction (up to €10,000) valid until 2020, subject to political decisions for extension.

Technological Advancements

The automotive industry in Sweden has seen significant advancements in electric and autonomous vehicle technologies. Leading companies like Volvo and Scania have invested heavily in developing electric and hybrid vehicles, along with autonomous driving features. Additionally, Sweden is a hub for innovation in battery technology, with companies like Northvolt leading the way in sustainable battery production.[675] For example, in 2022, Volvo and Northvolt joined their powers by opening an R&D centre in Gothenbourg to focus on battery development[676].

Sweden is making strides in sustainable transportation with the construction of the world's inaugural permanent electric road, designed to charge electric vehicles while they're in motion. Having already experimented with temporary electrified roads in cities like Lund, Southern Sweden, the country is now embarking on a 21 km (13-mile) stretch of roadway that will serve as a lasting solution. Led by the Swedish transport administration Trafikverket, the project is currently in the process of selecting the specific charging technology, options include overhead power lines akin to tram systems, ground-level electric rails embedded in the road, or road-embedded inductive coils that transfer power to vehicles. Situated on the E20 motorway between Hallsberg and Örebro, the chosen location is a bustling traffic corridor for commercial goods transport, spanning from Stockholm to Malmö. Scheduled for completion by 2025, the electrified highway is poised to play a pivotal

[671] Accelerating Sweden's climate action in transportation | SEI
[672] Swedish Climate Policy Counsel, Report of the Swedish Climate Policy Counsel 2023 (klimatpolitiskaradet.se)
[673] Accelerating Sweden's climate action in transportation | SEI
[674] Sweden's recovery and resilience plan - European Commission (europa.eu)
[675] Swedish Climate Policy Counsel, Report of the Swedish Climate Policy Counsel 2023 (klimatpolitiskaradet.se)
[676] Volvo Cars and Northvolt to open Gothenburg R&D centre as part of SEK 30bn investment in battery development and manufacturing - Volvo Cars Global Media Newsroom

role in Sweden's transition to EVs, potentially leading to smaller battery sizes and enhanced sustainability.[677]

Infrastructure Development

The Swedish government has prioritized infrastructure development to support sustainable mobility. In 2023, the government set aside €78.04 million and for 2024, the government has planned to invest €867 million. Investments have been made in expanding public transportation networks, building bike lanes, and developing charging infrastructure for EVs. In stride with this, the current government transferred €650 million in the state budget for railway maintenance to road maintenance.[678] Efforts are also underway to integrate smart technology into infrastructure to improve traffic flow and reduce congestion.

EV Charging Infrastructure

Sweden boasts an extensive EV charging network, with both public and private entities investing in charging stations. The investment plans stated in the previous paragraph also include quick charging stations. Moreover, the government offers subsidies for installing charging infrastructure, home chargers are subsidized for 50% up to €960.[679] Initiatives like the Swedish Charging Infrastructure Council work to standardize charging protocols and improve accessibility[680].
Research has shown that Sweden is among the top four countries regarding EV adoption and EV charging infrastructure, with 265 available EV charging station for every 100,000 people.[681]

Railway Infrastructure

Sweden's railway system is undergoing significant upgrades, with a 25% increase in funding allocated for the maintenance of state-owned railways, amounting to approximately €3.9 billion during the planning period. This surge in resources aims to minimize long-term maintenance costs and enhance service reliability by prioritizing timely maintenance activities. Investments are focused on four designated transport corridors, including the Western Mainline, Southern Mainline, northern rail freight corridor, and the Iron Ore Line, to improve infrastructure robustness and reduce maintenance backlog.[682]
Over 80 percent of the allocated funds are directed towards railway network improvements, with substantial investments in new high-speed rail mainlines and railway engineering systems, including the adoption of the digital ERTMS signal system, within a 2040-2045 timline. However, due to challenges in the ongoing planning process for certain sections, adjustments are proposed, with approximately €10.2 billion allocated for new mainlines during the planning period. Efforts are also intensified to reduce investment costs, aiming to lower system-wide expenses by approximately €6.4 billion compared to current estimates. Additionally, loan-financed measures are proposed to increase capacity on the Iron Ore Line, alongside plans to enhance speeds on key routes and modernize station infrastructure to accommodate longer and heavier trains.[683]

Market Trends and Consumer Behavior

The demand for electric vehicles in Sweden has been steadily increasing, driven by government incentives, environmental awareness, and technological advancements.[684] Sales of EVs have outpaced traditional vehicles in recent years, making Sweden the runner-up of electric car share in European countries.[685] As seen in the technological advancements, automakers are responding by expanding their electric vehicle offerings.
However, the demand for SUVs has seen a spike in 2022, accounting for more than 25% of all cars produced after 2020.[686] Due to their weight, SUVs are related to higher emissions. Even though electric SUVs would seem the solution, the need for critical minerals in the production process hurts the overall supply chain.

Public Transportation

Sweden has a well-developed public transportation system, with trains, buses, trams, and ferries connecting urban centres and remote regions. Investments in infrastructure and technology have improved the efficiency and sustainability of public transit, making it an attractive option for commuters. In 2022, 6.4% of the buses were fully electric buses.[687] The government is still planning on investing in public transportation and increasing incentives for bicycle and pedestrian modes of transport.[688]
Sweden aims for public transport to make up 40% of all transport modes by 2030. However, from 2019, with 32%, Sweden has seen a decrease in public transportation use of 20% in 2021 and 28% in 2022. So, the use of public transportation is slowly rising again, but not at the pre-pandemic level yet.[689]
In Sweden, public transportation encompasses various levels, including local and regional, interregional, and international services. Governed by the Public Transportation Act, local and regional public transport is regulated to meet the daily travel needs of commuters and residents within a county or across multiple counties. It aims to provide accessible and efficient services for work commutes and other routine travel requirements. The utilization of local and regional public

[677] Sweden is building the world's first permanent electric road that charges moving EVs (electrek.co)
[678] Swedish Climate Policy Counsel, Report of the Swedish Climate Policy Counsel 2023 (klimatpolitiskaradet.se)
[679] Incentives and Legislation | European Alternative Fuels Observatory (europa.eu)
[680] Swedish environmental Protection Agency, Car Charging (2024) (naturvardsverket.se)
[681] gridX, EV Charging Infrastructure Report 2023
[682] Proposal national plan for transport infrastructure 2022-2033 (diva-portal.org)
[683] Proposal national plan for transport infrastructure 2022-2033 (diva-portal.org)
[684] EV and EV Charging Incentives in Sweden: A Complete Guide (wallbox.com)
[685] Europe-Vehicle-Market-Monitor-Q1-23.pdf (theicct.org)
[686] Accelerating Sweden's climate action in transportation | SEI
[687] ACEA-Report-Vehicles-on-European-roads-.pdf
[688] Swedish Climate Policy Counsel, Report of the Swedish Climate Policy Counsel 2023 (klimatpolitiskaradet.se)
[689] Stockholm Environment Institute, Accelerating Sweden's climate action in transportation (2023)

transport in Sweden has been on a consistent rise. Since 2014, there has been a notable increase in national usage, a 28% growth over a decade, indicating a growing reliance on public transportation for everyday travel needs.[690]

Environmental Impact

The shift towards sustainable mobility, like more EVs and increased public transportation use, has had a positive environmental impact, reducing greenhouse gas emissions and air pollution. Efforts to promote a modal shift towards public transportation and active modes of transport further contribute to reducing the carbon footprint of the transportation sector.[691] In 2021, 15.44 million tons of CO2 equivalent came from transportation. The last couple of years show a slow but steady decrease in those emissions, from 19.57 million tons in 2012 to 15.44 million tons in 2021.[692]

Economic and Social Implications

In 2021, 13.8% of manufacturing jobs in Sweden are related to the automotive industry in Europe.[693] Moreover, while most Swedish citizens have to commute between 1 and 29 minutes to work, there is also a significant amount of citizens who have to travel between 30 and 59 minutes. [694]

Best Practices and Case Studies

Sweden's approach to sustainable mobility serves as a model for other countries. The integration of public transportation, cycling infrastructure, and EV incentives has led to tangible reductions in emissions and congestion. Case studies like Stockholm's traffic congestion fees demonstrate the effectiveness of innovative policies in promoting sustainable transportation.[695] However, when implementing traffic congestion fees, countries should account for and act upon the increased demand for public transportation and biking possibilities.

Also, to cope with the increasing demand for SUVs, the government should implement a weight-based tax on SUVs, like France.[696]

Future Perspectives and Emerging Trends

Sweden's automotive and mobility industry is poised for transformative growth with a push towards electric vehicles (EVs) and autonomous driving technologies. The country's commitment to sustainability is evident in its ambitious 2025 goals, including the launch of electric road pilots and advanced hydrogen refuelling stations. Emerging trends include shared mobility services, electric aviation, and sustainable logistics solutions. Despite challenges like raw material scarcity for EV batteries, Sweden's innovative approach and robust infrastructure for EV charging continue to drive the market forward. This momentum is underpinned by the Swedish population's environmental awareness and the government's strategic initiatives to enhance sustainable mobility. [697] [698]

International Comparisons and Collaborations

Sweden's collaboration within the CollERS partnership, which involves Germany and France, underscores a shared commitment to the electrification of roads. This innovative alliance aims to spearhead the development and deployment of electric road systems, potentially setting a new standard for sustainable transportation in Europe. By pooling resources, expertise, and technological advancements, the countries involved hope to accelerate the transition to greener mobility solutions, demonstrating a united front in the fight against climate change and dependence on fossil fuels.[699]

[690] SMARTA, Sweden Insight Paper (2020) (ruralsharedmobility.eu)
[691] Swedish Climate Policy Counsel, Report of the Swedish Climate Policy Counsel 2023 (klimatpolitiskaradet.se)
[692] Sweden: annual greenhouse gas emissions of the transport sector 2021 | Statista
[693] ACEA, The Automobile Industry Pocket Guide 2023-2024
[694] Key figures on European transport – 2023 edition (europa.eu)
[695] Traffic Congestion Fees: The Stockholm Success Story (gov1.com)
[696] Stockholm Environment Institute, Accelerating Sweden's climate action in transportation (2023)
[697] Nordic Investment Bank , The future of mobility (2023) (nib.int)
[698] Trafikverket, Electrafication of the state road network trafikverket.se)
[699] International Research Collaboration on Electric Road Systems II (CollERS 2)

THE POWER OF BEING UNDERSTOOD
ASSURANCE | TAX | CONSULTING

RSM Netherlands Business Consulting Services B.V.
Mercuriusplein 9
Postbus 30
2130 AA Hoofddorp
T 023 530 0400
rsmnl.com