

Transport Policy of the Czech Republic

period of 2021 - 2027, with an outlook
until 2050



Ministerstvo dopravy



RESOLUTION
OF THE GOVERNMENT OF THE CZECH REPUBLIC

of 8 March 2021, No. 259

on the Transport Policy of the Czech Republic for 2021 – 2027 with the Prospect of 2050

The Government

I. Approves the Transport Policy of the Czech Republic for 2021– 2027 with the Prospect of 2050 included in the part III of the material File No.205/21 (hereinafter only „Transport Policy“) as a starting strategic document of the transport sector for the next period, this document to be specified on an ongoing basis depending on the evaluation of the Transport Policy and on the public resources;

II. Request

1. the Members of the Government and heads of other State administration central bodies to ensure the objectives and principles of the Transport Policy,

2. the Deputy Prime Minister , the Minister for Industry and Trade and the Minister for Transport to submit to the Government:

- a) by 31 December 2021, an assessment of the impact of the COVID 19 pandemic crisis on the funding of the Transport Policy,
- b) by 31 December 2025, an evaluation of efficiency of the Transport policy,
- c) by 31 December 2027, for approval, the Transport Policy for the period from 2028 onwards;

III. **Recommends** to the regional administrators, the Mayor of the capital city of Prague and mayors of statutory cities and mayors of municipalities to base own transport policies on the Transport Policy principles.

To be executed by:

Members of the Government,
Heads of State administration central bodies
Chairman of the Technology Agency

For information of:

Regional administrators,
Mayors of the statutory cities

JUDr. Alena Schillerová, Ph.D.
Deputy Prime Minister and Minister of Finance

Transport Policy of the Czech Republic for the period of 2021 - 2027, with an outlook until 2050

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Proposal part

Background

One of the goals of territorial development of the state is to involve the entire area of the territory in a common system of value creation and consumption. This is done by creating a healthy polycentric settlement structure. This is the opposite of a monocentric settlement structure, with the dominant role of the central region and the poverty of remote regions. Communication is a tool for involving the whole area into the territory of active economic life. It has two forms - the transfer of information and the transport of people and things. The first form of communication, the dissemination of information, has made significant progress in recent years. This has happened thanks to the electronization and digitization of information technology. Data communication is already used not only by people but also by things. Technical devices communicate with each other, the Internet of Things is a basic tool of Industry 4.0. The second form of communication, the transport of people and things, is still mostly based on the technologies of the twentieth century, the continuation of its extensive development is already unsustainable in the coming years:

- the dominant role of very energy-intensive cars powered by low-efficiency internal combustion engines is the cause of high energy consumption in transport. In 2016, the final energy consumption in transport in the Czech Republic of 269 PJ/year exceeded the final energy consumption in industry (268 PJ/year) and is steadily increasing by another 9.2 PJ/year every year. This is in sharp contrast to the commitment of the Czech Republic, which was accepted by the Czech government in its Resolution 31 approving the National Energy and Climate Plan on 13 January 2020. It contains a binding task to reduce final energy consumption by 8.4 PJ/year annually through new energy savings (increasing energy efficiency),
- inadequate energy structure for transport with a predominant role of fossil fuels (which account for 93% of total final energy consumption in transport) leads to the fact that carbon dioxide production in transport (currently 21 Mt CO₂/year) has exceeded more than twice the carbon dioxide production in industry (approx. 9 Mt CO₂/year) and also exceeds the production of carbon dioxide in households (approx. 14 Mt CO₂/year) and is constantly growing by 0.6 Mt CO₂/year. This is in contrast to the commitment of the Czech Republic, which was accepted by the Czech government in its Resolution 31 approving the National Energy and Climate Plan on 13 January 2020. It includes the task of reducing carbon dioxide production by 1.2 Mt CO₂/year each year,
- inadequate energy structure for transport with a predominant role of hydrocarbon fuels (which account for 98% of total final energy consumption in transport) leads to strong emissions of harmful substances (nitrogen oxides, fine dust particles, polyaromatic hydrocarbons and others). More than 70% of the population of the Czech Republic lives in cities, other inhabitants commute to cities every day for work, education and other activities. At the same time, in most cities in the Czech Republic, transport is the dominant (up to 90%) air pollutant, as emissions produced by transport occur in the streets in close proximity to human dwellings. According to analyses by the Ministry of the Environment of the Czech Republic, air pollution causes approximately ten times more premature deaths than traffic accidents,



- the predominant individual ownership of means of transport leads to a very low use of the capital invested in them¹ and results in high demands on parking spaces², which occupy valuable land in cities that has the potential for much more efficient use.

The main topic is therefore the decarbonization of transport, i.e. the elimination of the dependence of transport on the consumption of hydrocarbon fuels, its conversion to zero-emission and low-emission. At present, scientific evidence shows that global climate change is already taking place, even at a faster pace than predicted by the relevant models. Global climate change is closely linked to global changes in planetary chemistry, hydrology and food production capabilities. The most important areas affected by the changes are the availability of energy, food and quality drinking water. At first glance, these may seem to be areas that concern the transport sector only marginally, but the opposite is true. In the new situation, it is therefore necessary to set up the transport system so that it does not contribute to the deepening of these changes (mitigation), but to allow further development of the economy in a sustainable mode and to adapt it to the new conditions, which are unavoidable (adaptation), with regard to the inertia of the Earth's system.

It is therefore important for the transport system that the conditions for the use of all modes of transport are consistently created so that their economic and ecological pre-conditions are utilized and their shortcomings are reduced. A necessary prerequisite for the functioning of the transport system and its efficient operation is the sufficiency and quality of information for traffic management or for the organization of the movement of people or things. The future form of transport is not based on competition (mere ability to overcome others), but on cooperation (ability to cooperate) and complementarity (ability to complement each other) of individual modes of transport, while maintaining a competitive environment between business entities. Sustainable multimodal mobility is the future. This requires a specific approach in each transport segment. Therefore, the transport policy is addressed by two interconnected lines: on the one hand by monitoring and applying the principles of long-term sustainable development, and on the other hand by achieving these principles through a specific approach according to the conditions of individual types of regions. These regional specifics are addressed for type areas as defined by the Strategy of Regional Development of the Czech Republic 2021+, i.e. with special approach to metropolises, agglomerations, regional centres and their rural hinterland, economically and socially vulnerable areas (e.g. peripheral areas), ecologically sensitive areas and separately also for interregional and long-distance links.

The main starting points of the Transport Policy are the following European and national cross-cutting strategic documents, including related concepts:

European Green Deal

The European Green Deal constitutes the European Commission's new strategic plan to ensure the sustainability of the EU economy. The aim is to transform the EU into a modern, competitive, resource-efficient economy, where no net greenhouse gas emissions will be produced by 2050 and where economic growth will be decoupled from resource use. From the point of view of the transport sector, the most important goal can be con-

¹ The average car in the Czech Republic is used only 24 minutes a day, that is only 1.7% of the time, the remaining 23 hours and 36 minutes it is idle.

² Of the 5.748 million passenger cars registered in the Czech Republic, an average of 5.652 million are parked.

sidered to be to reduce greenhouse gas emissions from transport in the EU by 90% by 2050. The document also includes a target to transfer 75% of the inland freight transport currently provided by the road network in EU countries to rail and waterways by the same year. The fulfilment of these goals so far seems difficult in the conditions of the Czech Republic, but it can be expected that legislative steps aimed at fulfilling these goals will be gradually implemented at the EU level. However, the energy savings of about 9 TWh per year associated with the transfer of 75% of road transport to rail are very significant. These energy savings amount to the annual electricity production in the intended new 1.2 GW nuclear power plant in Dukovany.

Strategic Framework Czech Republic 2030

Strategic Framework Czech Republic 2030 is a key strategic document of the Czech Republic, which responds to international developments in the field of sustainable development and takes into account all 17 goals of sustainable development approved at the UN summit in New York in September 2015. It is the responsibility of each country to perceive the world in context and to reflect the 17 goals in its national policies. In recent years, the prospect of sustainable development has become a mainstream of political debate in Europe and the world in connection with the need to address today's world challenges, such as climate change, demographic change, loss of fertile land and deepening inequalities.

The Strategic Framework Czech Republic 2030 is the result of a joint effort for the sustainable development of the European Union and at the same time the Czech Republic's contribution to the fulfilment of all 17 global sustainable development goals, which are applied in the context of the Czech Republic. Czech Republic 2030 is based on two main approaches - quality of life and sustainability. Progress in society cannot be assessed only by economic indicators, but it is also necessary to take into account individuals, families and communities and various aspects of their interactions, including the specific needs of different groups of the population. The Strategic Framework Czech Republic 2030 formulates its objectives in a total of six key areas: People and society, Economic model, Resilient ecosystems, Municipalities and regions, Global development and Good governance.

State Energy Concept

The vision of the State Energy Concept (SEC) is a reliable, affordable and long-term sustainable supply of households and the economy with energy, which represents the three top strategic goals of the Czech energy sector, which are safety - competitiveness - sustainability. The main mission of the SEC is to ensure a reliable, safe and environmentally friendly supply of energy for the needs of the population and economy of the Czech Republic, at competitive and affordable prices under standard conditions. At the same time, to ensure an uninterrupted supply of energy in crisis situations. Last but not least, its goal is to ensure a stable and predictable business environment, efficient state administration and sufficient and secure energy infrastructure.

In the area of transport, the State Energy Concept has stipulated a substantial reduction in the consumption of hydrocarbon fuels, especially petroleum products, and a higher use of electricity. At the same time, this replacement is associated with significant savings - the decrease in fuel consumption for internal combustion engines is many times higher than the increase in electricity consumption. These savings are physically due to the higher efficiency of the electric traction drive compared to the internal combustion engine drive and to the preferential application of electric carriage in less energy-intensive rail transport.

State Raw Materials Policy

The State Raw Materials Policy is a strategic document expressing the state's goals in the field of minerals in accordance with the needs of economic and social development, including environmental protection. It is based on the principle of sustainable development, as a general overarching factor. The subject is to provide for the raw material needs of the state, to ensure a stable, safe and economically advantageous access to mineral resources for the sustainable development of the whole society, which are necessary for the functioning of the Czech economy. Mineral resources come from three basic sources, namely from domestic sources, minerals imported to the Czech Republic and obtained from secondary sources by their recycling or reworking.

The State Raw Materials Policy is formulated in such a way as to help secure the necessary minerals for the Czech economy and at the same time to enable the necessary development of the raw materials industry. Mineral resources ensure the functioning of the economy of the given state because they form basic and irreplaceable inputs for the country's economy. Using them effectively promotes prosperity and can help overcome crises. The broad consensual and social acceptance of the use of domestic minerals obviously requires the fulfilment of strict environmental protection criteria and the maximum use of modern mining and processing methods with minimal impact on the environment.

Achieving a climate-neutral circular economy requires the full mobilization of the industry. It takes 25 years, i.e. one generation, to transform a particular industrial sector and all value chains. A decision needs to be taken and action launched by 2025 to prepare the transport sector. The action plan for the circular economy will have to be guided by transformation in all sectors, but action will have to focus in particular on those that are the most resource-intensive - i.e. also in transport construction, which is one of the major branches of construction.

State Environmental Policy

The State Environmental Policy (SEP) is a long-term top strategic document at the national level ensuring the protection of the environment in the Czech Republic. The main goal of the SEP is to provide the citizens of the Czech Republic with a safe, healthy and resilient environment that will enable a quality life for future generations. The SEP strives to minimize the negative impacts of human activity on the environment, the best possible preparation of society and the economy for climate change, and to ensure the efficient use of all resources with priority given to secondary raw materials and emission-free energy sources. It is also essential to use the landscape in a sustainable way and to promote biodiversity. The SEP emphasizes the protection of the environment and resources not only on a local but also on a global scale, because the Czech Republic's economy influences international events, the extraction of raw materials and global biodiversity.

The issue of transport is relevant for the SEP in all three thematic areas - Environment and Health, Low Carbon and Circular Economy, and Nature and Landscape. The adoption and implementation of adequate measures in the field of transport are absolutely essential for meeting the objectives of improving air quality and reducing noise pollution in settlements, but also reducing greenhouse gas emissions. The growing density of the transport network is the cause of seizure of often very fertile agricultural land. The transport network and especially the high intensity of traffic on roads causes fragmentation of the landscape and ecosystems, so mobility is also addressed in terms of biodiversity protection, migration permeability for animals and land use.

Climate Protection Policy

The Czech Republic's approach to climate change can be divided into a policy aimed at reducing anthropogenic greenhouse gas emissions (mitigation) and a policy of adapting to the negative effects of climate change (adaptation). The Climate Protection Policy primarily focuses on the analysis and proposal of possibilities for sufficient and cost-effective reduction of greenhouse gas emissions in the conditions of the Czech Republic. It presents a concept that determines the basic and indicative goals of the Czech Republic in the field of climate protection in the horizon until 2050 and thus constitutes a long-term strategy of low-carbon development of the Czech Republic. The Policy is designed to be proactive and therefore defines specific measures and instruments for gradually reducing greenhouse gas emissions with respect to the economically usable potential in the areas concerned, i.e. in particular in energy, final energy consumption, industry, transport, agriculture and forestry, waste management, science and research and voluntary instruments. At the Czech Republic's level, the Climate Protection Policy takes into account the existing commitments of the European Union, which stipulate that greenhouse gas emissions should be reduced by at least 40% by 2030 compared to the base year 1990. These targets were adopted at the level of the European Council as part of the 2009 Climate and Energy package, or the Climate and Energy framework of 2014, together with the targets for renewable energy sources and energy savings. In the longer term, the EU plans to achieve carbon neutrality, which corresponds to the goal of reducing greenhouse gas emissions by 80-95% by 2050 compared to 1990, when a similar contribution is expected from all economically developed countries and an adequate involvement of all other global emitters.

The newly created strategic management document is the Czech Republic's National Plan for Energy and Climate until 2030, approved by the government and notified to the EU authorities, in which the Czech Republic has set an effectively guaranteed (sanctioned) commitment to reduce final energy consumption by 8% between 2020 and 2030 (i.e. by about 0.8% a year) and reduce carbon dioxide production by 10% (i.e. by about 1% a year). These are very serious commitments for transport, as the trend in the Czech Republic has been quite the opposite in recent years: energy consumption in transport is growing annually by an average of 3.5% and carbon dioxide production in transport by 4%. Therefore, in addition to the required decrease in energy consumption and carbon dioxide production, it will be necessary to stop their growth in transport in the first place.

In the programming period 2014 to 2020, the Ministry of Industry and Trade of the Czech Republic and the Ministry of the Environment of the Czech Republic effectively managed the reduction of final energy consumption in the areas of industry and households with the use of subsidy programmes. Thanks to this, significant energy and emission savings were achieved in industry and households. Transport was not included in these activities (with the exception of some projects under the Operational Programme Enterprise and Innovation for Competitiveness) and logically, therefore, energy and emission savings in transport did not occur spontaneously. Without using the potential for energy and emission savings in transport, the Czech Republic is not able to meet its goals and commitments in this area. Therefore, it is important that in the forthcoming programming period 2021 to 2030, transport should also be significantly included in the relevant subsidy programmes aimed at reducing final energy consumption by increasing energy efficiency and reducing carbon dioxide emissions.

The potential for energy savings in transport is considerable. Both by intramodal savings (i.e. energy savings achieved in one mode of transport, typically replacement of internal combustion engines with electric traction drives, the indicative value of the decrease in

final energy consumption to 40%) and especially by extramodal savings (i.e. motivation of passengers and carriers to switch to more energy and emission efficient modes of transport, typically from road to rail, the indicative value of the decrease in final energy consumption to 13%). By combining both of these steps, the final energy consumption in transport can be reduced in the Czech Republic until 2050 from the current 300 PJ/year (98% hydrocarbon fuels and 2% electricity, production 21 Mt CO₂/year) with the same carriage volume to the target value of 100 PJ/year (production 0 Mt CO₂/year), thus saving 200 PJ/year of final energy consumption and 21 Mt CO₂/year.

The National Plan of the Czech Republic for Energy and Climate was created on the basis of the climate and energy commitments to the EU and European legislation; it basically connects the scope of the State Energy Concept and the Climate Protection Policy, or with concepts for improving air quality, thus constituting a plan for an integrated approach in energy and climate and environmental policy. The main goals of the National Climate and Energy Plan are to increase the ambitions of the share of renewable energy sources and energy efficiency by 2030 and to further reduce greenhouse gas emissions and interconnectivity.

Strategy for Adaptation to Climate Change in the Conditions of the Czech Republic

Climate change is currently seen as a major global factor that can have a major negative impact on human society. The basic conceptual approach is prevention and preparedness for possible impacts. Timely and effective adaptation leads to a reduction in vulnerability and an increase in resilience to the effects of climate change, and thus to a reduction in economic losses caused by its negative impact.

Transport, together with energy, is the main integrating sector of the whole economy and the functioning of society. The negative effects of climate change can have cumulative and synergistic effects, even with a relatively smaller impact on transport itself. Therefore, due attention needs to be paid to climate change in the transport sector.

In accordance with the Strategy for Adaptation to Climate change in the Conditions of the Czech Republic, the main goal for the transport sector is to increase the ability to adapt to the negative effects of climate change, increase resilience to the negative impacts of climate change and support low-emission development in transport without jeopardizing the quality of the environment and the economic and social potential of development.

National Emission Reduction Programme of the Czech Republic

The National Emission Reduction Programme of the Czech Republic is a strategic document that determines the country's progress in reducing the amount of selected pollutants released into the air. These include sulphur dioxide, nitrogen oxides, ammonia, volatile organic compounds and dust particles. The current update of the National Emission Reduction Programme of the Czech Republic is mainly related to the need to ensure compliance with national emission reduction commitments set for 2025 and 2030. The forecast of the development of the amount of pollutant emissions does not show that the Czech Republic's commitments could be met without the introduction of further measures after 2020. The proposal of such additional measures is the main goal of updating the National Emission Reduction Programme of the Czech Republic. Reducing the amount of pollutants released into the air will improve air quality in the Czech Republic.

Regional Development Strategy

The Regional Development Strategy of the Czech Republic 2021+ defines the main goals of the country's regional policy after 2021. The country's regional policy is a policy that should guide other sectoral policies to take into account the specifics of individual types of territory, namely metropolitan areas, agglomerations, regional centres and their rural background, structurally disadvantaged regions, economically and socially vulnerable areas, while creating their own tools that influence the development of specific areas. The Regional Development Strategy of the Czech Republic 21+ (RDS 21+) identifies thematic areas in which a territorially specific approach is needed or desirable, and at the same time defines which interventions should be implemented in different territorial contexts so as to promote competitiveness and reduce regional disparity using the principle of sustainable territorial development.

National Plan for the Promotion of Equal Opportunities for Persons with Disabilities

Roughly one third of the population of the Czech Republic has certain (physical, sensory, mental, age, etc.) restrictions on their movement, orientation and communication. This one third of the population (pregnant women, children in prams, small children, the elderly, the sick, the disabled, etc.) also face obstacles to using individual transport due to their physical and economic situation. However, even these persons have the right to enjoy all civil liberties (work, education, gathering, culturally enjoying themselves, visiting doctors, acquaintances, religious and sports events, public meetings and more). However, the fulfilment of their civil liberties is contingent upon the freedom of movement, which allows them to participate in public and family life. Therefore, public transport must be functional in the country, providing basic transport service, and it must be accessible to persons with reduced mobility, orientation and communication, both on the part of infrastructure and on the part of vehicles and the relevant information services. As regards the standardization of requirements for the transport of passengers with reduced mobility, orientation and communication, the railway has the Technical Specification for Interoperability for Persons with Reduced Mobility and Orientation, TSI PRM, at EU level; it is binding on both building projects on railway infrastructure and on new vehicles.

Implementation and development of 5G networks in the Czech Republic - the path to a digital economy

The document defines the approach of the Czech Republic to the introduction and use of 5G networks. The aim of the material is to define the strategic approach of the Czech Republic to the introduction and use of 5G networks and to the new electronic communications services provided. It is expected that the commissioning of 5G networks will offer new opportunities and possibilities for the Czech industry, the Smart Cities, Smart Regions and Smart Village concepts will be raised to a new, quantitatively higher level, and other areas for e-health and e-agriculture will be provided. The document also emphasizes the potential of using 5G technologies for the purposes of security and rescue services, crisis management and other specific needs of the public sector in the implementation of its agendas.

It also defines implementation milestones for implementation as such, while in many key topics it builds on other strategic materials, especially the Innovation Strategy 2019-2030, the concept of Digital Czechia, Action Plan 2.0 and others.

Vision and main objective

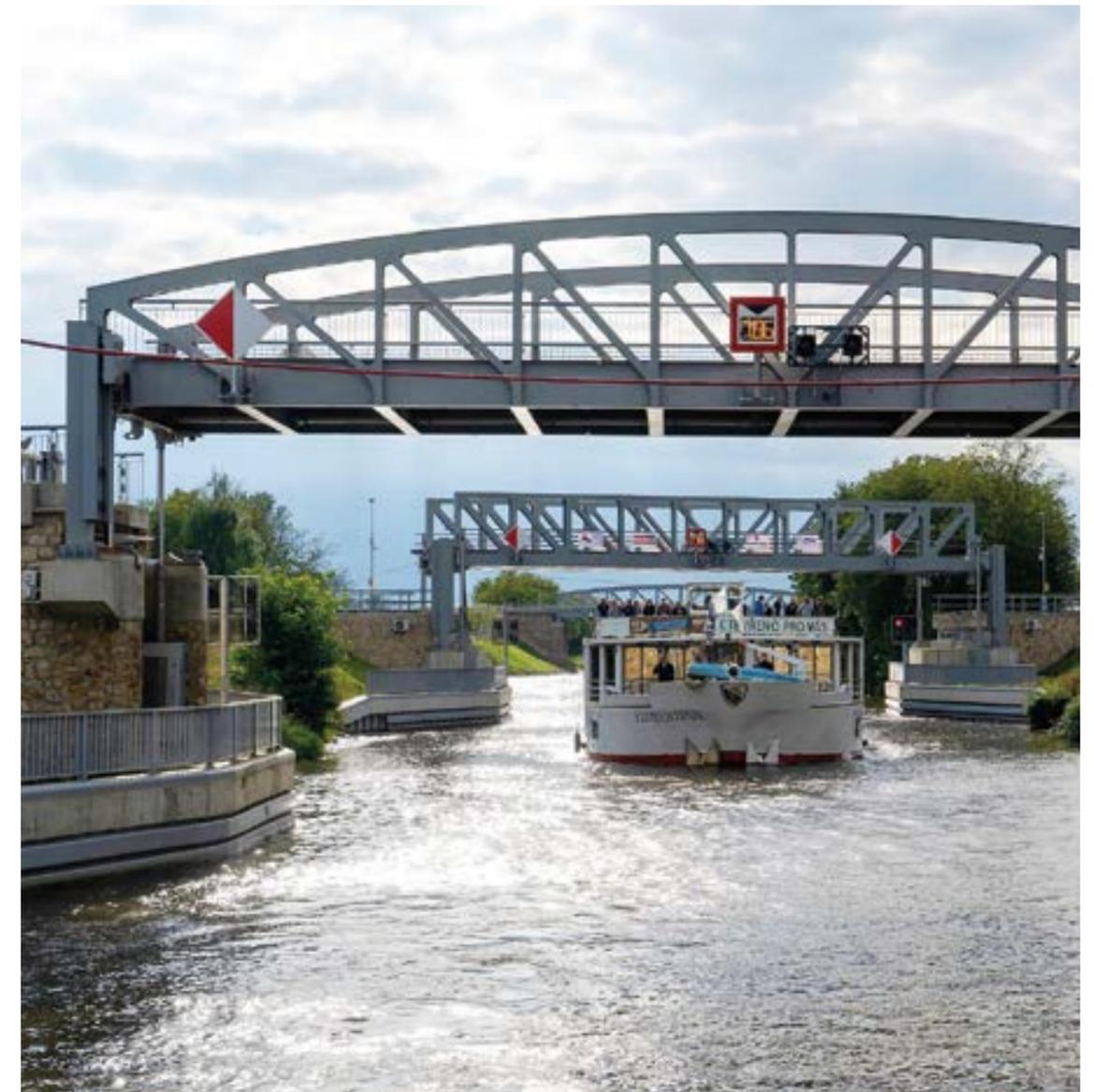
The Transport Policy of the Czech Republic for the period of 2021 - 2027 with an outlook until 2050 follows up on the main cross-cutting objectives of the Czech Republic, the European Union and the UN (see the background) and the scenarios and SWOT analysis from the Analytical Part of the Transport Policy. The vision of the Czech Republic's transport system in the long run assumes that the Czech Republic and its individual regions will be provided with a transport system that meets the requirements of transport needs in both passenger and freight transport, supports sustainable economic development and inclusive policy aimed at structurally disadvantaged regions and their inhabitants. At the same time, this 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. It will therefore be necessary to meet the need for the mobility of people and things, the way in which these needs are provided must be influenced in such a way as to ensure sustainability in relation to further economic development. The aim is not to restrict transport, but to develop it. However, not in its current extensive form with a strong dependence on high energy consumption, especially fossil fuels, but in an energy-efficient and environmentally friendly form. The social challenge is therefore to increase the energy efficiency of transport. This means ensuring a reduction in specific energy consumption (share of energy consumption and carriage work performed).

This vision will be achieved through the following three consecutive steps:

1. Measures will be sought to enable savings on the transport of passengers and goods so that transport needs are generated as little as possible, without affecting economic development (optimization of transport needs). To this end, the results of applied research will be put into practice and modern technologies will be used, spatial planning will be improved, especially in cities, and the restructuring of the economy towards the creation of higher added value will be supported. This first step will therefore be the subject of a broader state policy in accordance with the adopted Strategic Framework Czech Republic 2030.
2. A transport system fulfilling the above vision must be based on a multimodal approach, which consists in reaping the benefits of individual modes of transport and must be based on interdisciplinary cooperation. In the case of concentrated (strong and regular) traffic flows, it is necessary to make better use of more energy efficient modes of transport, supported by high-quality transport infrastructure built for this purpose, including energy and information facilities, as they achieve the lowest energy intensity (kWh/pkm, kWh/tkm) as well as the lowest carbon dioxide production (kg/pkm, kg/tkm).
3. Individual modes of transport need to be developed with regard to the necessary accessibility of individual regions, taking into account the transport needs and the reduction of environmental impacts. The prerequisite is a high-quality transport infrastructure equipped with modern technologies as well as means of transport for sharing information and data on transport; the conditions for energy efficiency and minimization of emissions within individual modes of transport must be met. It is necessary to closely link the transport system with the energy system; energy in transport must be considered as a whole, the use of fossil fuels must be minimized, both for reasons of climate protection and for reasons of environmental protection and public health.

The main objective therefore continues to be based on the main objective of the transport policy for the previous period:

The main objective of the transport policy is to ensure the development of a high-quality, functional and reliable transport system based on the use of technical, economic and technological characteristics of individual modes of transport, on the principles of competition with regard to its economic and social effects and impacts on the population (social cohesion, public health, standard of living), security and defence of the state and all components of the environment, on the principle of sustainable use of natural resources.



Strategic and specific objectives concerned

1 Strategic objective: Sustainable mobility

1.1 Specific objective: Influencing mobility

- *Responsibility for fulfilling the specific goal: Ministry of Transport, Ministry of Industry and Trade, Ministry of Regional Development, Ministry of the Environment, Ministry of Finance in cooperation with local governments*
- *Follow-up documents and background: Strategic Framework Czech Republic 2030, Concept of Urban and Active Mobility, sustainable urban mobility plans of individual cities, urban development plans.*
- *Projection of transport policy measures to ensure the defence and security of the state by central administrative authorities into state defence plans*

It is necessary to distinguish between the different levels of relationships that need to be ensured in order to support the sustainable development of the economy, as the satisfaction of relationships between entities may not always be ensured by transport. These relationships can be provided as connectivity, accessibility or mobility:

- Connectivity refers to the links between a physical (using transport) or virtual (information technology) environment. Thus, to ensure connectivity, transport may or may not be a means to achieve participation elsewhere. The second option is the use of ICT (information and communication) services.
- Accessibility is a concept that relates to capacities to achieve opportunities and is closely related to the concept of economic utility. Even in this case, transport may or may not be a means to achieve a service. Some services can be provided directly on site, so it is not necessary to travel for them. The question is therefore whether it is more efficient to provide transport services to achieve the service or to provide the service on site.
- Mobility is the implementation of links through physical movement between places, the needs for mobility are important. Even in this case, it is possible to influence the needs for mobility so that it is as small as possible. It can be influenced, for example, by appropriate tools for urban development planning. An example is the humanization of public space, which will reduce the need to travel to reach a favourable environment for reasons of relaxation. The line between mobility and accessibility is not sharp and the two concepts overlap to a large extent.

When dealing with transport issues, it is necessary to start with mobility because this is a need after relocation. The need for mobility is influenced by many factors, such as the relationship between the global and local economy. Therefore, the need for mobility must be addressed in processes that are above transport policy. This need is met through transport. Satisfying mobility is important for the sustainable development of the economy. On the other hand, transport will always be associated with a negative impact on public health, the environment and the global impact on climate and other physicochemical characteristics of global importance. From this point of view, it is important to minimize these effects, while optimizing the need for mobility (not to waste on traffic).

Accessibility to activities does not always depend only on whether we are mobile or not, so mobility must be taken into account both in transport planning and in spatial planning. It is important to focus on the role of accessibility measures in transport planning and modelling, reducing travel needs and shifting the modal split between modes of transport through policies that shift the focus from mobility to accessibility. New transport projects maximize accessibility without the need to increase mobility.

On the other hand, it is necessary to perceive a change in the ratio of rationally (professionally, compulsorily) motivated travel and emotionally (experientially, optionally) motivated travel. As part of the growth of labour productivity and the reduction of costs, companies are increasingly using information technology to minimize the loss of working time and overhead costs associated with travel, despite the growth of territorial integration. At the same time, they reduce daily commuting (home office). Paradoxically, citizens use the growing wages associated with higher labour productivity to travel to relatives, acquaintances, sports, culture or learning on weekends and holidays. This is very clearly demonstrated by statistical reports. While until 2013, for example, the carriage volume of the 3rd quarter on Czech railways was lower than the carriage volume of the 2nd and 4th quarters, in recent years the carriage volume of the 3rd quarter has been higher than the carriage volume of the 2nd and 4th quarters - summer travel has grown significantly.

Addressing mobility needs has its specificities in the case of passenger and freight transport and they must therefore be addressed separately.

A specific characteristic is also the requirement for mobility for the transport of persons, ammunition, explosives and military equipment in order to create the necessary conditions in the country to meet the tasks of the armed forces and to provide for the needs of the population. For this purpose it will be necessary to adopt measures to ensure, for example, the establishment of transfer posts of military columns at the national borders, the use of contingent airports, the construction of large-capacity rest facilities when providing HNS (Host Nation Support), the building and maintenance of independent traction capacity in the event of crisis situations and, last but not least, sufficient fleet and the building and maintenance of transport capacity of the national carrier for the transport of passengers and property.

1.1.1 Influencing mobility in passenger transport

In the case of passenger transport, based on the analyses from the previous section, it is clear that as GDP grows, so does the standard of living of the population, which is also reflected in higher mobility, especially in leisure time. With regard to regular commuting, it is appropriate, from the point of view of transport policy, to support the possibilities offered by the Society 4.0 concept. This makes it possible to work in a mode other than just the conventional mode, using modern technology, starting with home office (in transport, for example, also rail office) and the possibility of holding meetings and conferences at a distance without having to travel, as well as using time spent travelling for active work with the support of modern information technologies (Internet in public transport vehicles).

Measures in this area are not fully under the responsibility of the transport policy and concern the broader economic policy of the state. They should focus on promoting the use of new forms of work with minimal commuting (video conferencing, home offices, etc.). Another area is urban development planning so that new projects generate a lower need for mobility (jobs in the place of residence, schools enabling safe attendance of pupils, etc.). The issue will be addressed in more detail in the case of urban settlement

within the framework of sustainable urban mobility plans. There is a great potential in the management of territorial urbanization through mobility conditions.

Measures:

1.1.1.1 Create conditions for preventing the emergence of mobility needs.

1.1.2 Influencing mobility in freight transport

In freight transport this involves, among other things, the relationship between the price of transport and the price of other links in the logistics chain. Due to the fact that externalities in transport, which are significant, are not fully internalized (transferring external costs back to their originators), this leads to increased demand for transport and related services, including a preference for just-in-time transport modes with high external costs, which has negative societal impacts. At the same time, this leads to a shift of production to areas with cheaper labour. The result is a steady increase in demand, especially for road transport, including long-distance reverse transport. The problem is therefore largely the internalization of externalities in transport, not addressed in the long term. It is necessary to take advantage of the growing sensitivity of the social perception of the quality of the environment and gradually put into practice the "user pays" and "polluter pays" principles as defined by the EU transport policy in the Roadmap to a Single European Transport Area (White Paper on Transport)³. Furthermore, this problem must be addressed in cross-cutting strategies beyond the framework of the transport sector (e.g. in the Strategic Framework Czech Republic 2030). The second important area is the support of the local economy as a counterweight to the global economy and also as a tool for the application of economic self-sufficiency in areas of interest to the state, such as population protection, security and defence.

A specific problem is the reduction of transport volume in the supply of cities and households. Urban logistics plans, which are part of sustainable urban mobility plans, will address the issue. A major topic is the growth of e-commerce, which replaces the traditional joint transport of people and consumer goods ("shopping on the way from work") with separate transport of people and of consumer goods (mail order service). On the other hand, it can replace part of the shopping trips by car. The newly created distribution transport of consumer goods needs to be streamlined from an energy and environmental point of view for the following reasons:

- the ratio of carriage work (net tkm) to transport work (gross tkm) is very low, often below 1% (a car weighing tons transports goods weighing units of kg, while in long-distance transport it is around 50%),
- unlike public transport, which is organized and optimized in cities (lines, timetables, transfers, information systems, connection search engines, etc.), it is a disorganized and non-optimized, basically chaotic system with a number of reverse transport links and empty rides,
- unlike public passenger transport, which is largely emission-free and low-emission (Metro, trams, trolleybuses, electric buses), emission vehicles are generally used to transport goods, so it will be necessary to set up an appropriate regulatory framework.

³ EU COM (2011) 144

The rationalization and optimization of these transports, combined with their decarbonization, is a very current topic of urban mobility that needs to be addressed immediately.

Measures:

1.1.2.1 Internalize externalities in line with European trends.

1.1.2.2 Prevent the emergence of mobility needs within logistics and urban logistics.

1.1.2.3 Create conditions for ensuring the defence and security of the state and to reflect them in the Plan for the Operational Preparation of the State Territory of the Czech Republic for the given four-year period.

1.2 Specific objective: Multimodal approach

The multimodal approach is a key tool for sustainable mobility. The Czech Republic must meet its obligations in the area of air pollution by harmful substances (National Emission Reduction Programme), reduction of greenhouse gas emissions (see the Paris Agreement on Climate Change), while the common denominator being energy savings (National Plan of the Czech Republic for Energy and Climate).

It is necessary to start from the fact that internal combustion engines in transport have a low efficiency compared to electric motors and are a source of emissions of harmful substances and noise. Lower rolling resistance and lower resistance of the rail transport environment are also important. In the case of regular and strong traffic flows, it is therefore necessary to ensure, first and foremost, the use of rail transport with electric vehicles, both in passenger and freight transport. The use of inland waterway transport is similarly advantageous. The multimodal approach must be beneficial not only from the point of view of the environment, sustainable development and public health, but also as an economically advantageous alternative. Therefore, emphasis must be placed on interdisciplinary cooperation as well as on the suppression of interdisciplinary externalities⁴.

1.2.1 Passenger transport

- *Responsibility for fulfilling the specific goal: Ministry of Transport, cooperation with local governments*
- *Follow-up strategies: Public Transport Concept, Concept of Urban and Active Mobility, plans for transport service of the state and regions, sustainable urban mobility plans of individual cities, ITS Strategic Plan.*

A multimodal approach in passenger transport is key to reducing the energy intensity of transport. It is provided mainly through a high-quality public transport network built on the basis of an alternative to individual transport. In the case of shorter journeys, non-motorized (active) transport (pedestrian, cycling) is also a very important alternative. In current practice, four levels of public transport can be distinguished:

1. *Public transport as a social service.* It only provides for the basic needs of a specific group of people with different types of disadvantages. Such services are characterized by a small range of services. These are, for example, urban mass transport

⁴ A certain mode of transport - especially in cities - restricts other modes of transport, for example due to delays.

lines in smaller cities on the basis of a long interval (60 minutes and more) serving the entire city and characterized by long travel times. This also includes special school connections. The service is focused on satisfying the defined needs of the population (commuting to schools, for health care or to offices). In this case, the basic transport service system is individual car transport, while public transport is just a supplement.

2. *Public transport as a supplement to the system of transport service without the definition of social services.* In this case, public transport provides for a wide range of population needs, but for economic reasons is unable to provide sufficient standards in terms of quantity of services, with the result that the basic transport service system is still individual car transport, while public transport is only a supplement. This mostly involves transport service by regular bus transport in sparsely populated areas. Inadequate transport service has the greatest impact on disadvantaged groups, especially women, children and the elderly, who mostly do not own a car and are dependent on public transport. Poor accessibility of public transport and insufficient interconnection of transport lines ultimately contribute to the outflow of population from peripheral areas to larger agglomerations and have a significant negative impact on demographic development in these areas.
3. *Public transport as an alternative to individual transport.* In this case, public transport provides for all the needs of the population, throughout the day and the week. The quantity of services provided and their quality is at such a level that for all groups of the population, including disadvantaged groups, it provides such services thanks to which it is not necessary to depend on a car. A car is then only necessary in special cases, for which it is also possible to use shared cars. In this case, public transport within the transport service system is comparable in importance to individual car transport. These systems operate in more densely populated areas.
4. *Public transport as the basis of the transport service system.* In this case, public transport caters to all the needs of the population throughout the day and the week, while providing greater flexibility than individual transport, which faces the problem of insufficient space (congestions, insufficient parking spaces and the price of parking). In this case, public transport is dominant within the transport service system and individual car transport is only a supplement. These systems operate in a large part of large cities, especially in their historic centres.

Each of these levels may be appropriate in specific justified cases; however, developments should gradually lead to a reduction in level 1 (it is suitable e.g. in smaller cities with short distances where active mobility should play a major role), level 2 should be achieved as a minimum standard in sparsely populated areas. Level 3 should predominate in most areas and level 4 should mainly concern larger cities.

As part of the development of communication technologies, the concept of Mobility as a Service (MaaS) is evolving. The basic idea is to improve the relationship between individual and public passenger transport. According to the results of the statistical survey of the Transport Yearbook, a passenger car is used on average only 24 minutes a day and is occupied by only 1.3 people in the Czech Republic. Today, mobile phones and activity on social networks have taken over the social function and the role of a social status indicator. The intention of the concept is to make sure that in the future people will buy the service of a certain mobility operator, similarly to a mobile operator today. The concept of Mobility as a Service (MaaS) therefore represents a ground-breaking transport concept that could at least disrupt current transport delivery models, especially in cities. Therefore, it will be

crucial to define the individual roles and ensure fair conditions for all participants in the concept. MaaS should offer a “package” of personal mobility that best suits the lifestyle and needs of the individual and is provided by models prepared on the basis of the data provided. This service will enable integrated travel and payment planning on a one-stop-shop basis. MaaS will include different modes of public transport and/or shared vehicles and bicycles, information for passengers on different modes of transport and an integrated reservation and payment system. The system will work in such a way that users, after entering the starting point and the destination of their journey, will be able to visualize the best variant in the application according to their preference - fastest, cheapest, most ecological, etc. - and make all the necessary reservations, etc., either directly or through access to the applications of the respective service providers.

Long-distance transport, public services and their supplementation with commercial services

The quality of long-distance rail transport is improving, which is reflected in the very fast-growing carriage volume of long-distance rail transport (see the Analytical Part in the Annex). Given that the capacity of the railway infrastructure on the main lines is already exhausted and the construction of new capacities is a medium-term issue, more and more emphasis will be placed on the distribution of available capacity among individual transport segments. The free market in rail transport (market competition) must therefore be dealt with judiciously, taking into account the capacity of suburban and freight railways. Given the capacity of the railway infrastructure and the need to ensure transport services in the public interest, while maintaining free capacity for freight, it proves problematic to operate more long-distance trains in the same low-capacity section during peak periods, with infrastructure capacity for other trains (regional, freight) missing. The environmental friendliness of rail transport is reflected mainly in the larger number of transported persons or goods in one train. Two trains within an hour at peak times in express long-distance sections over 200 km can be considered sufficient and, from the point of view of optimal use of the potential of railway transport, even more advantageous, while the quality of service is not significantly deteriorated. At the same time, two different operators can be secured in a half-hour intervals (two lines in an hourly interval) as part of market competition. In any case, for the further development of long-distance transport, it is necessary to ensure a further increase in the capacity of the railway infrastructure (measures on existing lines, construction of pilot sections of high-speed connections and the adjacent integrated sections of high-speed connections).

In this situation, it will be necessary to support on the main lines, by setting the price for the transport route, especially longer trains, which will perform more carriage work within their slot. This means removing the weight category from the transport route price calculation, for both passenger and freight transport, as the current cost structure, almost directly proportional to the weight of the train, does not motivate the carrier to create fewer longer trains. Similarly, it is necessary to encourage carriers not to use slow or low-performance vehicles that waste track capacity and delay other trains on very busy lines using adequate pricing for the use of the railway infrastructure or by prescribing minimum specific power values.

Private services in long-distance transport (open access) brought a positive effect on the quality of the services provided. However, this is a model conditioned by sufficient capacity of the railway infrastructure. Especially in case of insufficient capacity of transport infrastructure and in cases where this model is not supplemented by an order under a public service obligation, the quality of services may gradually deteriorate in terms of their flexibility, including the impact on other transport segments (freight transport, regional

transport). If the service is to be based on the commercial principle, it cannot sufficiently respond to an uneven demand during peak periods, both because of the directional asymmetry of those peaks, which means that the trains are not sufficiently occupied on return, and because during off-peak periods it is not possible to use the vehicle fleet designed to cover peaks effectively. Both are associated with additional costs that are not offset by revenues, leading to a loss. Commercial carriers address this problem by connections with obligatory seat reservations, which allows them to cut “uncomfortable” demand at peak times. For the passenger, this means buying a seat ticket early enough, which results in a loss of service flexibility and, ultimately, an outflow of some potential customers. Ultimately, this means that the potential of the service cannot even be determined. For the above reasons and due to the need to address the necessary capacity of railway infrastructure for other transport segments (freight transport, suburban passenger transport), it will be necessary to address the supplementation of the existing public transport model within the follow-up Public Transport Concept. The introduction of a concession model seems to be a possible solution. The concession model does not aim at a situation where its introduction would lead to market foreclosure and the passenger would lose the benefits offered by the choice of carrier. Another option for optimizing the capacity of the railway infrastructure on the main lines (especially in places of concurrence of the main TEN-T network for passenger and freight transport) is the introduction of the TTR principle⁵, for which it will be necessary to adopt the relevant legal provisions at European level.

Connection of agglomerations to catchment metropolises⁶ (according to the definition of the Regional Development Strategy of the Czech Republic 2021+) as well as the interconnection of metropolises by public transport work in most cases quantitatively and qualitatively in accordance with the Western European benchmark. Exceptions are sections where high-quality railway infrastructure is not available, for example:

- Prague - Liberec
- Prague - Karlovy Vary
- Prague - Jihlava
- Brno - Zlín
- Prague - Most

Long-distance bus transport is operated commercially in these directions and with frequent large fluctuations due to the emergence/cessation of competition on these commercially attractive routes. In the event of market failure, the regions have only a minimal opportunity to regulate these fluctuations and the state does not intervene in this regard, as it also lacks appropriate tools for regulation; this is a long-lasting situation, as pointed out by the previous Transport Policy for 2014-2020. At the same time, in connection with the new rules given in particular by European Regulation No. 1370/2007, the state's share in the economy of these lines has already been established in the form of compensation for losses incurred due to state-imposed discounts, which significantly improved their profitability. As part of the update of the Public Transport Concept, the Ministry of Transport will

⁵ The aim of the project is to propose a new principle of capacity allocation that better takes into account the needs of individual segments of railway transport.

⁶ Metropolises with which most contacts are associated, i.e. the main centres of agglomerations in Bohemia connect to Prague, agglomerations in Moravia mostly connect to Brno; Jihlava and Olomouc to both metropolises.

therefore examine the possibilities for setting new decision-making competencies, which would bring the possibility of regulating these lines in the event of market failure⁷, and especially their more effective involvement in the system of long-distance and interregional transport, so far guaranteed by the state only in railway transport. In these sections, it is crucial to guarantee the quality of the connection by a fast bus connection, which would precede a long-term solution - a sufficiently fast railway connection. The goal is to achieve a high-quality and operative service (possibility to decide to use the service immediately without the need to purchase a seat a few days in advance). This solution would only apply to the operation of exceptional sections, the actual list of which is given in the text above, on the basis of a long-distance transport order pursuant to Section 4 of the Public Services Act, which must be covered by legislation within the amendment to this Act. Subsequently, it is necessary to justify the exceptional order of long-distance bus transport in these sections in the transport service plan of the area.

Building high-quality and high-capacity railway infrastructure for fast and energy-efficient interconnection of these cities is an important priority, which is gradually met (see the reconstruction of the Brno - Přerov line to a double-track line with a speed of 200 km/h). However, the situation in northern Bohemia is very poor. The population of the sparsely populated southern Bohemia can take advantage of modern railways (speed 160 km/h, high-quality modernized double-track electrified lines, express trains in regular short intervals, international connections), but the population in the industrially oriented north of the Czech Republic has only unsatisfactory single-track non-electrified lines with speed around 80 km/h. These are practically unusable for long-distance and interregional transport. These facts are increasingly perceived by the population and regional politicians as territorial discrimination.

Integrated transport systems

The aim of the transport policy is to achieve higher levels of public transport services (see the four levels of service defined above); however, meeting these requirements requires a different approach for different types of regions. While in metropolises, agglomerations and suburban areas this requirement is being met by integrated transport systems, some regions are failing to meet it, especially in peripheral areas and in areas with low population density in general. There is usually only the first (social) level of services and the inclusion of these areas in integrated transport systems is usually not completed. This is reflected in the decline of interest in regular bus transport in rural areas. In terms of the types of areas served, the issue is elaborated in more detail in section 3.2.

The updated Regulation 1370/2007/EU imposes an obligation on all customers of public passenger transport services to carry out transport planning. For this reason, the amendment to Act No. 194/2010 Coll., on public passenger transport services and on the amendment of other acts, as amended, envisages a more detailed definition for the planning of transport service. Within the framework of these provisions, there must also be an obligation to mutually discuss transport service plans of neighbouring regions so as to improve the interconnection of lines, especially in regular bus transport at regional bor-

⁷ In particular, if only one carrier operates in the relevant section and this carrier tends to limit operation during marginal periods of the day or week, or when, on the contrary, it does not offer sufficient capacity during peak periods, which it restricts by connections with obligatory seat reservations. Regular bus transport in these important sections does not offer other important services - for example, when transporting children under three years of age, the passenger is required to take a child seat with them, also the transport of live animals without a crate is not allowed and the transport of bicycles, children's strollers and persons with reduced mobility, orientation and communication is very limited.

ders, which in most cases show signs of peripheral areas precisely because of insufficient accessibility.

In connection with transport planning, it is also necessary to address the issue of quantitative and qualitative standards. These must be set in such a way that, on the one hand, they lead to the improvement of public services, while on the other hand, they must not be counterproductive in that they would be too restrictive for customers in their proposals.

Another question concerns the professional component of transport service in the regions. With regard to the need of all customers to plan transport service, it is appropriate that this professional unit, if established by the region, professionally represents all customers in the region. These units should also play an active role in sustainable urban mobility plans, in cities of all categories. In the case of smaller cities, where it is economically difficult to introduce an urban mass transport system as an alternative to individual transport, it is necessary to seek solutions for the purposes of public transport within the city in close cooperation with the regional customer and its professional unit. An alternative in small towns and in the countryside also concerns demand systems for public transport which are more or less "smart", i.e. on the phone, in the form of a mobile application, such as a public taxi service, etc.

The issue of competencies of individual levels of public administration for regional railway transport will be addressed in detail within the follow-up Public Transport Concept.

Market opening

Tenders for the operation of public passenger transport services tend to be quite complicated, as these tenders tend to include follow-up tenders, such as for the acquisition of vehicles. For this reason, a sufficiently long deadline has been set from which it will be necessary to carry out these tenders. However, many regional customers are delayed in preparing tenders without realizing the complications that need to be expected in connection with these tenders. The role of the state administration is therefore to draw attention to this risk and to provide expert consultations and, where appropriate, guidelines for managing this process.

Vehicle renewal

Both in long-distance rail transport and in regional and urban transport, the vehicle fleet has not been properly renewed for many years. This has very serious consequences:

- simple reproduction is neglected, which requires 3.3% of the inventory of vehicles to be replaced every year by purchasing new vehicles, subject to a rolling stock life of 30 years. The result is an obsolete fleet of vehicles (with an average age of over 30 years, i.e. beyond the manufacturer's guaranteed service life), with low attractiveness for passengers, high maintenance costs, high energy consumption, not meeting the current normative and safety requirements and technologically obsolete,
- the transport supply lags behind the growth in transport demand, with numerous trains running overcrowded or rejecting passengers, who then have to choose energy-intensive and environmentally demanding car transport against their will. Between 2010 and 2018, the total carriage volume of passenger rail transport on Czech railways increased by 56%, which is on average by 7% per year compared to the base year 2010. Thus, in addition to ensuring simple reproduction by changing

3.3% of the vehicle fleet per year, it is also necessary to ensure extended reproduction by purchasing on average another 7% of the vehicle fleet per year. In long-distance transport, the average growth of transport demand is 10% per year; on the lines connecting Prague with large cities on modernized corridors, the number of passengers grows by 20 to 25% per year.

- the functionality of railway is formed by the interaction of its four structural subsystems:
 - infrastructure (INF),
 - energy (ENE),
 - control-command and signalling (CCS),
 - rolling stock (RST).

The development of vehicles significantly lags behind the development of infrastructure. It has not only the already mentioned age and quantity (capacity) dimensions, but also a qualitative dimension. The investments planned in the development of railway infrastructure are as follows:

- increasing speeds on conventional lines to up to 200 km/h,
- electrification of other railway lines,
- conversion of DC power supply 3 kV to a single AC system 25 kV, 50 Hz,
- implementation of the European ERTMS system,
- construction of long tunnels,
- start of construction of pilot sections of high-speed lines,
- ensuring compliance with the requirements of the TSI.

All these investments into the infrastructure only make sense if the vehicles are able to use them. It is necessary to acquire new railway vehicles not only due to old age (simple reproduction) and due to the growth of transport demand (extended reproduction), but also due to the appreciation of investments in the development of the railway infrastructure (vehicles for speed up to 200 km/h instead of the current 120 to 160 km/h, electric vehicles instead of diesel vehicles, AC traction vehicles or multi-system vehicles instead of electric DC vehicles, vehicles with ETCS on-board units, pressure-tight and safe vehicles for tunnel operation and interoperable vehicles).

The last topic, interoperability, is crucial for safety. This is one of their five objectives (safety, reliability, health protection, environmental protection and technical compatibility). All new structures are consistently designed in accordance with the requirements of the TSI, they cannot be handed over for use without a certificate of conformity with the TSI. It is necessary to proceed in a similar way with vehicles. New vehicles meet this requirement, interoperability is a legal obligation for them. However, retrofits of older vehicles and imports of vehicles decommissioned abroad are not covered by the requirements of the TSI. Instead of the natural disappearance of vehicles not compliant with TSI requirements due to their expired life, the obsolete rolling stock is thus preserved for years to come and expands in numbers. This has serious negative effects both on the environment (unnecessarily high noise and emissions of harmful substances) and especially on safety (low

strength, low impact resistance - missing deformation elements, low level of fire safety, weak brakes, etc.). Not only to reduce operating costs, to achieve energy savings and to make public transport accessible to people with reduced mobility, orientation and communication, but also to ensure transport safety and minimize its impact on the environment, public transport customers must consistently require the carriers to use TSI compliant vehicles and also to allow them their financial coverage.

Vehicle renewal using only European co-financing does not appear to be a systemic solution and, according to experience, rather hinders a standard solution, which must be based on linking the issue of vehicle renewal with tenders for public passenger transport operators. In addition, linking the tender process to service providers and the supply of vehicles is in itself very demanding and burdening this process with additional requirements arising from European co-financing already significantly increases the risk that the tender will not be successful. A significant disadvantage is also the non-inclusion of investment subsidies in depreciation, which leads to the system not being sustainable - the operation of public transport does not generate resources for the future replacement of the vehicle fleet by the carrier. In the interest of sustainability of the public transport system, it is therefore necessary to ensure that from 2021 public transport customers (state, regions and cities, or municipalities) are obliged to require carriers to renew the rolling stock at least to the extent of simple reproduction increased by the increase in transport capacity corresponding to the increase of transport supply or demand, in order to pay the proportional depreciation to the carriers in the price of the ordered service. The use of European co-financing is particularly useful in cases where it is necessary to ensure that new vehicles can make full use of the railway infrastructure enhanced through investments higher by orders of magnitude (line electrification, train protection through ETCS, higher line speed, tunnels requiring pressure tightness and greater fire safety). Furthermore, it is necessary in this way to support the investments of carriers in vehicles using alternative fuels and thus to achieve a compensation of the price difference between a conventional vehicle and a vehicle using alternative energy. To this end, it is necessary to create effective financial instruments that meet the objectives of the EU in the field of transport decarbonization, in cooperation with the Ministry of Transport, the Ministry of Industry and Trade, the Ministry of the Environment and the Ministry of Finance of the Czech Republic.

Obsolete vehicles (both of domestic origin and used vehicles from abroad) as well as new vehicles acquired with support from EU funds do not generate appropriate depreciation. As a result, the cost price charged by the carriers to the customers (state and regions) does not include the cost of properly renewing the vehicle fleet. Between 2010 and 2020, the vehicles aged by 10 years and the trains became fuller. The 56% growth of the carriage volume of passenger rail transport in the Czech Republic (in passenger km) between 2010 and 2018 was accompanied by a decrease in seat km by 1%, i.e. vehicles are used by 57% more. From the point of view of economic efficiency, there was a positive development, an increase in productivity, but at the cost of exhausting internal reserves in both capacity and age of vehicles. However, this trend can no longer be continued; in the next period, the public transport order must also include a component ensuring the renewal of the rolling stock (corresponding to depreciation), which must be included in the payment of the transport order under the public service obligation. This will help meet not only the goals in the transport sector, but also the goals in the field of energy savings, or increase of energy efficiency, and goals in the field of reducing emissions.

The connection of financial resources from public sources (EU and the Czech Republic) with commercial bank loans (see the Juncker plan) proves to be a very suitable solution, with the aim of multiplying public resources through resources from commercial banks

and administratively simplifying their utilization and making it stable in the long run. In cooperation with the Ministry of Transport, the Ministry of the Environment (Modernization Fund), the Ministry of Industry and Trade (see the energy efficiency improvement programme) and the Ministry of Regional Development (Integrated Regional Operational Programme), these methods need to be introduced especially to support the purchase of energy-efficient vehicles. It is crucial that the solution allows the inclusion of depreciation in the costs of the carrier paid by the customer, so that they get rid of the repeated need for investment subsidies.

Single ticket

In connection with the opening of the market, public transport is operated by several carriers, even within individual sections. This causes complications for passengers, as they have to plan the company whose services they would use long time before the start of the journey. The introduction of a single ticket will help solve this problem. The single railway ticket system in the Czech Republic is based on negotiations with carriers operating services on a commercial basis to join this system. Connection to the system will be mandatory for the ordered services. The single ticket will have three stages; the issue of implementation will be addressed in more detail within the follow-up Public Transport Concept.

Passenger rights

Further extension of passenger rights in the event of major delays in land transport must be considered in the light of the costs involved, so as not to make basic services more expensive. However, this process has long been regulated at EU level. An amendment to the current regulation on passenger rights is currently being discussed at EU level, which will bring about significant changes that railway carriers will have to make.

Ensuring stable financing of public services

Stable financing until 2030 is supported by supporting financing of regional railway transport through targeted subsidies from the state budget, but the volume of available financial resources needed to provide passenger rail transport under the public service obligation is provided only on the basis of the current government's programme statement and further is set within the current state budget and budget outlook. It must also include funds for the renewal of the vehicle fleet at the level of simple and extended reproduction in proportion to the growth of transport demand and with regard to the development of all subsystems of the railway infrastructure. In the near future, therefore, it will be necessary to provide and prepare documents for negotiations for the next period, and thus ensure the basic financial framework for medium-term financing of passenger rail transport under the public service obligation in accordance with the needs arising from the State Transport Policy.

The financing of the public transport system under the public service obligation of the state is also linked to the issue of competencies of individual levels of public administration, especially in the section of regional railway transport. The individual possible variants, including the draft legislative regulation, will be the subject of the follow-up Public Transport Concept.

Tax policy in passenger transport and in energy for passenger transport, taking into account externalities

In passenger transport, similar principles apply as in the case of freight transport (see in

section 1.2.2 below). In the case of a public order, the money saved will make it possible to expand the order, thus increasing the competitiveness of public transport. The end result of exempting electricity in passenger transport from taxes and payments would then be the final savings on energy in transport, especially energy from fossil fuels.

A current topic is the payment for the support of renewable energy sources (SRES), which currently acts significantly against clean mobility:

- electricity for traction is burdened by SRES payment in the amount of CZK 0.50 per kWh,
- diesel fuel and motor gasoline with an energy content of 10 kWh/litre are not charged with the SRES payment (in the corresponding amount of CZK 5 per litre).

Discrimination of electric traction against vehicles with internal combustion engines goes completely against the goals of the transport, emission and energy policy of the Czech Republic. This asymmetry needs to be removed, similarly to other EU countries, by exempting electricity for traction from the SRES payment.

The situation is similar with emission allowances, where the inconsistency of the current EU ETS system also counteracts clean mobility:

- electricity for traction is burdened by the costs of power plants for the purchase of emission allowances, which currently (at the emission allowance price of EUR 25 per t of CO₂) increases the price of electricity by approximately CZK 0.30 per kWh,
- diesel fuel with a carbon footprint of 2.65 kg CO₂/litre, or motor gasoline with a carbon footprint of 2.45 kg CO₂/litre, are not burdened by the costs of purchasing emission allowances (in the corresponding amount of CZK 1.70 and CZK 1.60 per litre, respectively), as the EU ETS only applies to large consumers of hydrocarbon fuels.

Discrimination of electric traction against vehicles with internal combustion engines goes completely against the goals of the transport, emission and energy policy of the Czech Republic. This asymmetry needs to be removed by including fossil fuel distributors in the EU ETS regulated area.

In this context, it is necessary to recall that the current revenue from excise duty on mineral oils, for passenger cars in the amount of approximately CZK 0.40 per passenger km, is significantly lower than the external costs caused by the operation of internal combustion engines (local and global exhausts) of road vehicles.

Individual transport as part of the multimodal chain

Some areas, especially peripheral ones, are difficult to serve by public transport in the mode of alternative to individual transport. Also in long-distance transport, where the popularity of railways is growing, the car is increasingly used for transport to the railway station. For this reason, it is important to support terminals with park and ride (P+R) car parks that also fulfil functions for bicycle transport (B+R), while there are two forms of combination of individual and mass transport:

4. The primary use of individual transport, with mass transport being used only in places where there is an obstacle to the use of a car, especially in the form of par-

king restrictions or in the case of regular congestions in the city. P+R car parks on the outskirts of large cities, with links to public transport, are used for this purpose.

5. On the contrary, the use of mass transport is primary and the car is used to overcome a section with poor public transport offer (last mile). This is achieved by P+R car parks at railway stations in the suburbs of large cities, and in the case of interregional transport by passenger transport terminals at long-distance train stations.

From the point of view of the transport policy, the support of the second type of passenger transport terminals and P+R car parks has a higher priority; however, support must be given to both types, taking into account local conditions, capacity of public transport lines and capacity of roads. The issue will be addressed in individual sustainable urban mobility plans and especially in regional transport service plans. Following the development in the field of cars (replacement of internal combustion engines with electric drives, vehicle sharing, automatic vehicle steering), it is necessary to equip car parks with charging points for slow charging.

In the next step, individually owned cars manually steered by amateurs will be gradually replaced with autonomous vehicles (ownership of vehicles will be replaced by a service, MaaS). The car parks for individually owned vehicles will be gradually transformed into autonomous vehicle terminals. A great benefit of this service is the offer of individual transport at both ends of the journey (first and last miles) and also a significant reduction in the necessary parking spaces (shared vehicles are used much more).

Provision of information services on road traffic and on travel using public passenger transport within EU countries

This area means ensuring the same quality and volume of information without language barriers and regardless of the country in which the user of the service is currently located. Pan-European technically harmonized development of ITS systems under which this information service falls is gradually implemented on the basis of the issued EU specifications referred to in Section 39a of Act No. 13/1997 Coll., on roads, as amended, specifically the Commission Delegated Regulation (EU) 2017/1926 with regard to the provision of EU-wide multimodal travel information services.

Measures:

- 1.2.1.1 Set up the optimization of the use of capacity backbone railway lines using appropriate organizational measures and pricing policy (reducing the importance of train weight categories in the calculation of the infrastructure price) and by examining the gradual introduction of a concession model for the operation of commercial lines of public transport and/or implementation of the TTR model.
- 1.2.1.2 To create conditions for ensuring transport services at level 3 or 4 under the Transport Policy, in exceptional cases at least at level 2, ensuring active methodological assistance for regional customers to achieve such a level.
- 1.2.1.3 Ensure high-quality interregional transport service for all regions of comparable importance, regardless of their transport infrastructure.
- 1.2.1.4 Ensure a uniform transfer tariff for rail transport, gradually usable for other types of passenger transport, with the involvement of connections that are not ordered as part of public services being voluntary.

- 1.2.1.5 Set quantitative and qualitative standards in the planning of transport services.
- 1.2.1.6 Create a sustainable economic framework for the operation of high-speed trains on high-speed connections and other backbone railway lines.
- 1.2.1.7 Link the process of vehicle renewal in public transport and the tender for public service operators, with an emphasis on emission-free mobility.
- 1.2.1.8 Link the process of vehicle renewal in railway public transport with the intentions of railway infrastructure development and with regard to the forecasted carriage volumes.
- 1.2.1.9 Examine the possibilities for reducing the price of electricity by an appropriate pricing policy compensating for the payment for supported energy sources (SRES).
- 1.2.1.10 From 2025, introduce a penalty surcharge for the operation of a diesel vehicle on an electrified line as part of the price for the use of railway infrastructure and provide justified exemptions from this surcharge, and refrain from using the financial resources of the state to contribute to regions or carriers to pay for public transport if it is provided on electrified lines using vehicles powered by internal combustion engines, or for the purchase or modernization of such vehicles.
- 1.2.1.11 Address the connection of regions with different density and nature of settlement by improving the offer of public transport and its links to long-distance transport and by building passenger transport terminals and park-and-ride facilities for individual and bicycle transport.
- 1.2.1.12 Build P+R car parks on the basis of sustainable urban mobility plans, primarily outside large cities in locations where there are no traffic jams, while ensuring sufficient follow-up public transport from these locations.
- 1.2.1.13 Address the issue of competencies and financing of the order of public regional services in rail transport.
- 1.2.1.14 Address the issue of the scope and capacity of public services on backbone connections to agglomerations equipped with insufficient railway infrastructure.
- 1.2.1.15 Provide data owned by the state and local governments for the development of MaaS and other mobile services.

1.2.2 Freight transport

- *Responsibility for fulfilling the specific goal: Ministry of Transport, cooperation with local governments*
- *Elaboration in a follow-up strategy: Freight Transport Concept, Concept of Urban and Active Mobility, sustainable urban mobility plans of individual cities.*

The dominant type of freight transport is road transport, which is due to the fact that this type of transport is irreplaceable in the general service of the territory and in the supply of the regions. Short-distance transport is predominant in terms of transport volumes; in addition, there is a tendency to transport smaller consignments in a shorter interval. In

terms of transit, the Czech Republic is rather a secondary transit country because the main long-distance flows are directed from the centre of the EU towards Russia through the Polish lowlands and towards the Balkans along the Danube. In the case of long-distance transport, it is necessary to focus on interdisciplinary cooperation with other modes of transport, especially in the case of strong and regular traffic flows. The transit flows in road transport from the south-east to Western Europe, which cross the Czech Republic, are relatively important.

The use of rail transport as an alternative to direct road transport is absolutely essential from an energy point of view, a truck transported by electrified railway consumes only about 12 - 17% of energy compared to driving on the road using an internal combustion engine. This is absolutely essential for mitigation measures as well as for reducing pollutant emissions. The aim is not to take orders away from road carriers, thus disrupting the market environment in freight transport, but on the contrary to help road freight transport, which suffers from a chronic shortage of drivers: in the course of three years, 2015 to 2018, the interstate carriage volume of carriers registered in the Czech Republic decreased to only 47%, among other causes due to the missing drivers (a freight train driver transports 30 to 50 times more goods than a long-distance truck driver). The aim is therefore to provide a service to road carriers and other transport operators, while reducing the negative environmental impact of freight transport and making a significant contribution to energy savings. Measures aimed at multimodality in freight transport are set out in the follow-up Freight Transport Concept. However, it is necessary to draw attention to the fact that only a small part of long-distance transport in multimodal freight transport takes place in the Czech Republic, and that the competitiveness of these services is determined by the reliability of the system, including foreign sections of the route, which the Czech transport policy cannot influence in any way, The European target of shifting 30% of road freight transport over 300 km to rail transport and waterways by 2030 must also be seen in the context of the EU-wide European target, with offshore maritime transport playing an important role. The EU's strategy is gradually evolving and following trends towards emission-free transport, which is also the focus of the EC Communication European Green Deal.

A major shortcoming in rail freight transport is the need to order capacity under the train schedule 8 - 20 months before it is actually needed, in a situation where only 20 - 25% of freight train routes are stable in the long run and 75 - 80% of trains are in an as-needed mode. Therefore, a TTR project is being prepared at European level, with the aim of proposing a new principle of capacity allocation that better takes into account the needs of individual transport segments.

Competitiveness of continental combined transport

Continental combined transport (CCT) is an example of interdisciplinary cooperation between freight carriers / road carriers and railways, which provides services subject to mutually beneficial cooperation. However, it is necessary to ensure the "cooperation capability" of railway services, which are subject to the same requirements as when ensuring competitiveness.

One of the problems of continental combined transport is the high price of transshipment services in Czech terminals. Experience shows that in the current situation, combined transport is in most cases not able to compete on price with direct road transport, even in the case of longer transport routes. In terms of the possibility of reducing the price, the possibilities on the part of carriers are largely exhausted. Compared to other segments of freight transport, combined transport is more or less on the verge of profita-

bility. The main possibility for influencing it is therefore by increasing the parameters of infrastructure - the length and weight of trains. These parameters need to be increased primarily, and specific transshipment projects can only be supported in connection with this. An important factor in promoting combined transport is the internalization of externalities ("user pays" and "polluter pays" principles) set out in the Roadmap to a Single European Transport Area⁸. Under non-harmonized conditions, the transport market is distorted, users choose seemingly cheaper modes of transport for them, which, however, indirectly burden them with a high tax levy to cover the damage caused by transport. Possible operational support for terminals would then help level up the prices of the services provided, making continental combined transport more attractive, which would help reduce the cost of externalities from freight transport.

There are a sufficient number of combined transport terminals in the Czech Republic, but they are not optimally distributed throughout the Czech Republic. A bigger problem than the absolute number of 17 combined transport terminals is their limited area capacity and limited ability to provide services to customers. While the advantage of storing containers is the possibility of stacking them into at least four levels, intermodal trailers are much more space-consuming. In some terminals, the expansion of areas is not feasible even with the possibility of using subsidies. The barrier to the development of combined transport is also the minimum number of truly neutral terminals⁹ and subsequently combined transport lines offering neutral and non-discriminatory access to all carriers. In the Czech Republic, these are basically only terminals that were supported from public funds: Lovosice, Černá za Bory, Kolín, Mělník, Ústí nad Labem, Mošnov and partly Paskov. Currently, only one company offers public lines. These terminals provide services on a non-discriminatory basis for the duration of the project's sustainability for 5 years, when prices and operating hours are published and available to customers. All domestic terminals are owned by private entities and terminal operators are usually also carriers (rail, road, water) who rather use their terminals for their own purposes.

A significant limit of combined transport concerns failures in the reliability of railway transport, very strongly criticized by customers; from the point of view of many road transport customers and due to the negative media coverage, this is a fundamental argument for many road carriers not to join combined transport. Train delays of several hours are not an insurmountable problem for customers, but unexpected delays of days or omissions of connections are already major problems that most often discourage customers from further use of combined transport. Longer train delays on arrival at destination terminals tend to have a significant impact on the economy of semi-trailer circulation. To ensure re-import, carriers abroad have pre-contracted re-transport, which they cannot carry out due to missing semi-trailers, even though they have both drivers and tractors in place.

The future support of combined transport is also related to the long-discussed amendment of Council Directive 92/106/EEC on the establishment of common rules for certain

⁸ EU COM (2011) 144

⁹ In general, if the conditions pursuant to Section 2(9) of Act No. 266/1994 Coll., on railways, as amended, are met, combined transport terminals are service facilities and their operators are therefore obliged to provide to carriers, through that facility, services directly related to the operation of track transport in a non-discriminatory manner at a price agreed in accordance with price regulations (see Section 23d). However, not all combined transport terminals in the Czech Republic meet this legal definition. Non-discriminatory access must also be allowed if public funds are invested in the terminal. Non-discriminatory access to such a terminal must be allowed for the period of sustainability, in the case of the Czech Republic for a period of 5 years from the commissioning of the terminal.

types of combined transport of goods between Member States¹⁰ and Commission Implementing Regulation (EU) 2017/2177 on access to service facilities and rail-related services, effective from 1 June 2019. The European Commission also pays attention to multimodal transport and draws attention to the need to revitalize this area of transport through the "European Green Deal".

Tax policy in freight transport and in energy for freight transport, taking into account externalities

One of the factors influencing the competitiveness of rail freight transport is the price of energy. Electricity generation is burdened by the payment for support for renewable energy sources (SRES). The setting of this payment policy is correct in the context of households, industry and services, because in these sectors electricity is not in a competitive position with other energy sources, such as oil, petrol or natural gas, which are not burdened by the payment for support for renewable energy sources (SRES). However, such a competitive relationship exists in transport and, given that competing forms of energy are not burdened with similar payments, paradoxically, the state burdens the mode of transport that saves energy most efficiently while reducing dependence on fossil fuels. At the same time, SRES represents up to a 10% increase in costs. It does not only concern the competitiveness of railways (in passenger and freight transport, as well as in urban mass transport) compared to road and individual transport, but diesel locomotives are often used on electrified lines for these reasons, too. Although this was certainly not the intention of the legislators, the state discriminates against carriers who use electric drives against carriers that use fossil fuels in two ways:

- the price of electricity pays a contribution for supported energy sources of CZK 0.50 per kWh, while diesel with a heat content of 10 kWh/litre is not charged with a similar payment of CZK 5 per litre,
- the price of electricity includes emission allowances at the level of approx. CZK 0.35 per kWh for the production of 0.5 kg CO₂/kWh in the production of electricity, while diesel fuel with a production of 2.65 kg CO₂/litre is not burdened with a similar payment of CZK 1.80 per litre.

These price distortions must be eliminated, as they work against the fulfilment of strategic goals set by the Czech Republic both in the field of energy savings and in the field of climate protection and in the field of public health protection (clean air) in connection with the EC position.

Measures:

- 1.2.2.1 Ensure the availability and reliability of continental combined transport, in the short term by supporting the optimal adaptation of railway users and, in the medium to long term by eliminating bottlenecks through investments. Prepare conditions for the introduction of the TTR mode when allocating train routes to transport infrastructure.

¹⁰ No compromise could be found between the Council and the European Parliament. Even with a view to the publication of the Green Deal, the EC has withdrawn the proposal and is preparing a new directive (to be published probably in 2021), which should be more elaborate and ambitious in terms of objectives.

- 1.2.2.2 Examine the possibilities for reducing the price of electricity by means of an appropriate pricing policy compensating for the payment for supported energy sources (SRES) and the price for emission allowances.
- 1.2.2.3 Establish a programme to support the development of combined and multimodal transport terminals, focusing on the technical, technological and operational aspects of support for combined transport, on supporting transshipment points and loading posts on the railway network and on supporting the development and maintenance of railway sidings.
- 1.2.2.4 From 2025, introduce a penalty surcharge for the operation of a diesel vehicle on an electrified line as part of the price for the use of the railway infrastructure and provide for justified exemptions from this surcharge.
- 1.2.2.5 Following the example of the Support and Guarantee Fund for Farmers and Forestry, which compensates farmers for natural disasters not caused by them, examine the possibilities of insurance by the state for entities operating in continental combined transport¹¹ against compensation for damage claimed by carriers when penalized for late delivery of goods in the event of a railway malfunction on or outside the territory of the Czech Republic. The measure will include an examination of the financial complexity of this step.

1.2.3 Principles of development, maintenance and operation of transport infrastructure

- Responsibility for fulfilling the specific goal: Ministry of Transport, cooperation with the Ministry of Regional Development and local governments
- Elaboration in a follow-up strategy: Transport sector strategies.

Development of transport infrastructure

The development of transport infrastructure must ensure that the commitments under the trans-European transport network policy¹² are met; however, it is not possible to ignore the needs of individual regions. It is therefore necessary to look at the development of transport infrastructure at the following levels:

- connection of the Czech Republic to the European transport network (TEN-T network),
- interregional links within the Czech Republic (routes that are not also included in the TEN-T network),
- intraregional links,
- general service of the territory.

¹¹ Transport of road semi-trailers or swap bodies

¹² Regulation No. 1315/2013/EU

The basis for the evaluation of transport infrastructure projects is an economic evaluation based on departmental guidelines for evaluating the efficiency of transport infrastructure. This guideline is a public standard for assessing whether potentially spent public funds are beneficial from a societal perspective.

Especially in the case of development of the road and motorway network, it is necessary to take into account the fact that the efficiency of these structures can be assessed not only from an economic point of view but also from the point of view that excessive land seizures lead to a reduced retention capacity of the landscape with negative impacts on water supply to the population, with an impact on soil moisture in agriculture and forestry and, last but not least, with increasing risks of flood events. At the same time, naturally valuable areas can also be seized. The development of ITS and C-ITS technologies on the road and motorway network, which make it possible to optimize capacity, is still lacking, and therefore there is often an effort to prioritize the construction of additional capacities, either new parallel roads or expanding existing ones, both with an impact on further land seizures.

The valid departmental guideline for evaluating the economic efficiency of transport structures arises from some principles based on older prepared documents¹³, which were created before fundamental agreements and commitments were made, at the UN and EU level, by which the Czech Republic is bound. In addition, this guideline does not take sufficient account of new global, European and national targets for global climate change and local pollution due to the use of outdated values for some externalities¹⁴. It also does not take into account the effects of the possible use of time when travelling, which has been made possible in particular by the development of information technology. The result is that the feasibility studies of a number of transport construction projects, which were successful in the CBA assessment pursuant to the original guideline¹⁵, report an internal rate of return (EIRR) lower by orders of magnitude when assessed under the new¹⁶ guideline, which makes the project in question ineligible for funding. This fact can have serious consequences in the form of postponement of significant and much-needed transport structures necessary to meet the Czech Republic's goals in the field of energy, climate protection and health protection. These are, in particular, the National Emission Reduction Plan, the State Energy Concept of the Czech Republic and the National Plan of the Czech Republic for Energy and Climate. From the experience gained so far, it can be concluded that many much-needed projects enabling higher energy efficiency of transport will not meet the criteria of the new guideline. In this situation, it is appropriate to update the guideline to reflect current societal interests and needs. The issue is presented in more detail in the analytical part.

The development of transport infrastructure must also meet the parameters of transport infrastructure to ensure the defence and security of the country (transport of troops).

The construction of new transport infrastructure must be coordinated with the construction of high-speed electronic communications networks and possibly also with energy networks, which will have a positive effect in reducing the construction costs of these networks and speeding up their implementation.

¹³ HEATCO, 2007; DELFT 2011

¹⁴ DELFT 2011, a jump increase in the prices of emission allowances from 2018

¹⁵ Transition guideline

¹⁶ Departmental guideline for evaluating the economic efficiency of transport construction projects, State Fund for Transport Infrastructure, 2018

The analytical part of the Transport Policy also identified threats to the continuation of transport construction in the horizon of approximately ten years due to the lack of sources of building materials. It will therefore be necessary to pay increased attention to the possibilities of recycling building materials.

Acceleration of the process of construction of transport infrastructure

The act which governs, in contrast to generally valid legal regulations, the specifics of procedures for the preparation, siting and permitting of structures of transport, water and energy infrastructure as well as electronic communications infrastructure and whose purpose is primarily to accelerate the construction of selected types of structures is Act No. 416/2009 Coll., on accelerating the construction of transport, water, energy and electronic communications infrastructure, as amended. This Act was last amended in 2018 by Act No. 169/2018 Coll., on accelerating the construction of transport, water, energy and electronic communications infrastructure, as amended, and other related acts. This amendment brought fundamental improvements in the area of property-law preparation of structures (introduction of the institute of interim decision when deciding on the expropriation related to key structures of transport infrastructure) and other changes in the area of performance of state administration under delegated competence, when the jurisdiction to conduct territorial proceedings and expropriation proceedings for transport infrastructure projects changes from 1 August 2019 so that in the first instance the regional authority will be competent to decide, and the appeal will then be resolved by the Ministry of Transport or the Ministry of Regional Development depending to the type of structure. The Act also contains partial changes removing serious obstacles in the preparation of transport infrastructure projects. Another amendment was prepared in 2019, which should primarily enable the permitting of transport structures on the basis of documentation of lower detail than the building permit documentation (BPD)

Process of awarding public contracts and quality of construction of transport infrastructure

The process of awarding public contracts is very important also with regard to the resulting quality of the structures. The quality parameters must be the subject of a tender, competing only for the lowest price is very risky in terms of the resulting quality. The introduction of uniform FIDIC contractual conditions simplifies the process of awarding public contracts in the transport construction industry.

One of the impulses for the emergence of uniform contractual conditions is the impact of globalization, which also penetrates the construction industry. Construction companies often operate on a transnational basis, major construction projects are increasingly financed by multinational institutions. An extension of the sample contractual conditions was further associated with the accession of the Czech Republic to the European Union and the associated utilization of subsidies from European Union funds, which is, among other things, conditional on the use of verified standardized sample contracts. The use of FIDIC contract samples means greater certainty of a well-built contract for construction projects. The use of these contract samples is advantageous not only for financial institutions, but also for clients, construction supervisors and contractors. The sample contracts contain a summary of good and predictable contractual practice in the construction industry.

FIDIC contractual conditions are used mainly in large transport infrastructure projects financed by the State Fund for Transport Infrastructure, but their application encounters the limitation of change processes in public contracts, where from the point of view of

European law and Czech public procurement law it is not possible to make substantial changes after the contract is concluded. The long-term experience of experts from all over the world is incorporated into the contractual conditions. Another problem in putting the FIDIC contractual conditions into practice is their complexity in terms of understanding.

The relationship of FIDIC contractual conditions to Czech legislation has not yet been sufficiently defined. Given that the application of the FIDIC contractual conditions is not possible without the addition of special business conditions to describe this relationship, it is unfortunately sometimes necessary to make additional changes to the special conditions based on the experience gained with their application.

An important step forward is the digitization of technical documents for BIM structures. The implementation sponsor is the Ministry of Industry and Trade, which deals with the implementation of the BIM method at the top in the field of construction. The Ministry of Transport approves conceptual materials related to the BIM method. These are, for example, guidelines and technical regulations for BIM to verify their use in pilot projects, etc. It thus fulfils the role of a top decision-making body in the transport sector. In parallel with the processes on the part of investor organizations, the Ministry of Transport decided to implement BIM for the PPP D4 project, especially with regard to its long-term nature, where benefits are sought not only in the design and implementation phase, but especially at the level of mutual communication and during the operation phase.

Maintenance of transport infrastructure

Ensuring operability, high-quality maintenance and repairs of the transport infrastructure are key and must be financially secured as a matter of priority. Without meeting this requirement, investments in transport infrastructure already made will be gradually depreciated. The financing of repairs and maintenance must be such that there is no further increase in hidden debt. Funding in this area must be as dependent as possible on subsidies from public budgets and must be derived as far as possible from operating charges. The maintenance of transport infrastructure cannot be replaced by investments.

Repairs and maintenance of the transport infrastructure must be carried out with a view to minimizing disruption to traffic. When assessing alternative solutions, it is therefore necessary to include the losses of carriers, passengers, transporters and other relevant entities in the costs. The system of motivating investors to reduce the exemption condition as much as possible will be addressed.

Measures:

- 1.2.3.1 Ensure the connection of all types of regions to the transport infrastructure corresponding to the importance of the specific region.
- 1.2.3.2 Update the Guideline for the economic evaluation of transport infrastructure projects.
- 1.2.3.3 Optimize the process of preparation of transport infrastructure projects (including urban mass transport infrastructure in electric traction) with regard to shortening the preparation time and increasing quality.
- 1.2.3.4 Introduce process digitization using BIM and digital spatial data.

- 1.2.3.5 Ensure sufficient financial resources for the maintenance and repair of transport infrastructure, including their smooth allocation throughout the year, including waste management.
- 1.2.3.6 Create conditions for greater recycling of building materials (for example, pursuant to the European Green Deal).
- 1.2.3.7 Plan lockouts and closures for maintenance of transport infrastructure with a view to minimizing impacts on traffic and coordinate their concurrence (including coordination of concurrence of railway/road closures and lockouts, use of valley periods and night periods).
- 1.2.3.8 When building transport infrastructure, pay attention to reducing the negative impact of climate change on transport itself by setting appropriate adaptation measures.
- 1.2.3.9 Ensure the parameters of the transport infrastructure needed to ensure the defence and security of the country (transport of troops).

1.2.4 Internalization of externalities in transport

- Responsibility for fulfilling the specific goal: Ministry of Finance and Ministry of Transport in cooperation with the Ministry of Industry and Trade
- Elaboration in a follow-up strategy: National Action Plan for Clean Mobility

In May 2019, the EC published a study¹⁷ which shows that all external transport costs across the EU amount to EUR 1 trillion a year, i.e. 7% of the GDP. The study also provides an estimate of how individual Member States are doing in this area. In the case of the Czech Republic, the study states that the external costs of road, rail and inland waterway transport amount to EUR 14 billion per year, which corresponds to 5.2% of the Czech Republic's GDP. 97% of all these external costs in the Czech Republic are external costs from road transport. Regarding the shares of individual types of external costs, the highest in the Czech Republic, as in the whole EU, is the share of environmental external costs (43%), the share of external costs caused by congestion is slightly lower in the Czech Republic than the European average (25%), while by contrast, the share of external costs associated with traffic accidents is slightly higher than the EU average (32%).

The output of the study is also important; it assesses the extent to which users in road and rail transport operating in the Czech Republic participate, in the form of various prices, taxes and payments, in the payment of external costs. It implies that users in road passenger and freight transport pay less of these costs (47% and 48%, respectively) than users in rail passenger and freight transport (53% and 51%, respectively). According to the study, inland waterway users pay easily the highest external costs (134%). When comparing within the EU, most road transport users in the Czech Republic pay a lower percentage than the same users within the European average. In the case of individual car transport, the EU average is 63%, and in the case of light commercial vehicles it is 53%.

The above conclusion of the EC study fully corresponds with some of the findings of the study *Analysis of Vehicle Taxation and Charging*, which is prepared by the Transport Research Centre. This is mainly due to the fact that the vast majority of EU countries (including Central and Eastern European countries such as Slovakia, Hungary and Romania) use,

¹⁷ *Sustainable Transport Infrastructure Charging and Internalization of Transport Externalities, May 2019*

unlike the Czech Republic, certain tax instruments whose rates take into account the environmental parameters of individual road vehicles. There are basically two types of taxes: vehicle acquisition tax (sometimes referred to as registration tax) and vehicle ownership tax. The latter of these taxes basically corresponds in the conditions of the Czech Republic to the road tax, whose payers, however, are only legal and natural persons using their vehicles for business purposes.

Phase 2 of that study should be completed by the end of 2020, to assess possible additional taxation of road vehicles in order to encourage a more massive introduction of vehicles using alternative fuels. However, the conclusions of this analysis cannot be predicted at this time.

It is also essential to further develop the "user pays" and "polluter pays" principles within the toll system, in line with European legislation in this area (see the forthcoming amendment to the Eurovignette Directive). It is expected that it will be possible to include external costs related to air pollution and noise in the amount of tolls under this Directive. Following the currently discussed amendment to this directive, it should be possible to differentiate the level of tolls according to the CO₂ emissions of individual vehicles, which should have a positive impact on the gradual renewal of the vehicle fleet towards low-emission and zero-emission vehicles.

Measures:

- 1.2.4.1 Gradually internalize external costs in connection with pan-European developments and based on the conclusions of the study *Analysis of Vehicle Taxation and Charging*.
- 1.2.4.2 In connection with the currently discussed amendment to the Eurovignette Directive, introduce a differentiation of toll rates according to CO₂ emissions.

1.2.5 Energy savings in transport

- Responsibility for fulfilling the specific goal: Ministry of Industry and Trade in cooperation with the Ministry of Transport,
- Elaboration in a follow-up strategy: National Action Plan for Clean Mobility, Public Transport Concept, Freight Transport Concept.

The largest consumers of energy in the Czech Republic and the EU are industry, households and transport. While in the first two areas, cost-saving measures are being applied, and energy savings must also be achieved in the case of, for example, dispatch buildings, in the case of transport the absolute energy consumption is still rising. Cost-saving measures are being introduced even in transport, such as more fuel-efficient car engines, but as the popularity of large cars, especially SUVs, increases, energy consumption eventually continues to rise, not least in absolute terms. Even in transport, the Jevons paradox may apply in certain cases; it says that increasing energy efficiency may not lead to savings, but to even greater consumption, due to cheaper traffic, which implies greater use. In any case, the introduction of electromobility in road transport will mean significant energy savings, as internal combustion engines have very low efficiency (2/3 of the energy is converted into waste heat).

Due to the fact that transport has a growth tendency, according to forecasts and from a long-term perspective, the possibility to ensure energy savings will be considerably com-

plicated. However, the potential for savings is different for different transport systems. Rail transport using electric drive has about eight times lower energy intensity than road transport provided by vehicles powered by internal combustion engines. Therefore, there is a significant potential for savings (around 88%) in the use of mass transport, especially rail transport with electric traction, as a substitute for individual transport using conventional cars. The advantage of the Czech Republic is that citizens are used to using mass transport; in the case of urban transport, the Czech Republic is a European leader in this respect. However, in order to exploit the significant potential for energy and emission savings from the transition from individual car transport to public rail transport with electric drive, two basic conditions must be met:

- the system of public rail transport with electric drive (lines, vehicles as well as the timetable and tariff) must be of sufficient quality to motivate the population to prefer it over more energy-intensive individual transport,
- the capacity of the system of public transport, especially rail transport, with electric drive must be large enough to meet the transport demand. Because quantity is also part of quality, the rejection of a passenger (seat reservation system) or travelling in crowded connections (open system) has a very negative effect.

Recently, the popularity of long-distance rail transport on modernized lines and suburban transport has also been growing. It is necessary to build on this fact in the future, provided that the support of the use of energy efficient modes of transport requires a specific approach based on individual types of regions, so it is further addressed in Part 2.

In the case of freight transport, there is a potential, especially in continental combined transport, which is gradually evolving in the light of the situation on the transport market. According to the operators, the biggest obstacle is the capacity of the railway network and its reliability; unlike energy, the railway works without backup. Therefore, operational failures (not only in the Czech Republic, but also abroad) are usually addressed by stopping the operation on a broader part of the network and restarting the operation, which is time consuming. In this case, it is necessary to prepare adaptation measures for the rail network for climate change throughout Europe, as a result of the growing energy in the atmosphere, which is manifested by increasingly frequent episodes of extreme weather.

Measures:

- 1.2.5.1 Reduce the dependence of transport on fossil resources.
- 1.2.5.2 Create conditions for a transport system based on interdisciplinary cooperation.
- 1.2.5.3 Improve the energy balance of dispatch and other operating buildings on the railway.

1.3 Specific objective: Optimization of individual modes of transport

1.3.1 Mitigation measures and energy savings, alternative energy in individual modes of transport

- *Responsibility for fulfilling the specific goal: Ministry of Industry and Trade in cooperation with the Ministry of Transport, Ministry of Regional Development*
- *Elaboration in a follow-up strategy: National Action Plan for Clean Mobility, Public Transport Concept, Freight Transport Concept.*

The combustion process for use in transportation is not very advantageous because the efficiency of the heat engine is limited for physical reasons by the production of waste heat. It is therefore more advantageous to use electric motors, which have about 2.5 times higher efficiency compared to internal combustion engines. In this case, it depends on the source of electricity. Another energy disadvantage of internal combustion engines is the inability to use the kinetic or potential energy of vehicles during regenerative braking. The combustion process is therefore more advantageous to use for heating, because in that case all the thermal energy of the combustion process can be used. Although the production of electricity in thermal power plants also generates waste heat, this can be used for water heating and domestic heating. Therefore, the trend of electrification of transport is important in the future, in all transport modes depending on the development of technologies.

Road transport

The issue of alternative fuels in transport is addressed in the follow-up document, the National Action Plan for Clean Mobility. It addresses the creation of favourable conditions for the introduction of the following alternative drive methods:

- Use of methane, initially based on natural gas, which will be gradually replaced by its non-fossil sources (biomethane, or later synthetic methane). These are versions of compressed natural gas (CNG) and liquefied natural gas (LNG). The efficiency of this drive is even lower than the efficiency of diesel engines. The ignition temperature of methane is higher than the ignition temperature of diesel. Therefore, methane cannot be used in Diesel-type diesel engines, but can be used in Otto-type petrol engines, which have lower efficiency. Additional energy must be expended on liquefaction or compression of the gas. Nevertheless, this drive has certain benefits in terms of pollutant emissions and greenhouse gas emissions. However, if we look at this problem from the point of view of the entire emission cycle, then the gradual replacement of fossil CNG/LNG with biomethane injected into the gas network can ensure a large saving of these emissions. In this case, the biomethane source plays a crucial role.
- Use of second- and higher-generation synthetic fuels / biofuels to reduce CO₂ emissions from road transport
- Use of electricity in variants:
 - Direct power supply from the trolley (especially battery/partial trolleybuses, electrification of motorways for road freight and possibly also bus transport is also tested),
 - Battery vehicles. The battery charging time is relatively long, so this type of

vehicle is suitable for use in households or corporate fleets of cars and light commercial vehicles, as these vehicles are used on average less than half an hour a day according to statistical transport yearbooks, so there is enough time for slow charging, which can take place mainly in energy valleys, whereby this type of electromobility will make it possible to contribute to solving the problem of uneven electricity consumption. On the other hand, fast charging in the case of longer journeys places demands on the energy network, and at the same time this type of charging shortens the life of the batteries. In the case of batteries, certain problems are their price, the availability of resources for production and their subsequent ecological disposal. On the other hand, new types of batteries with a larger capacity and service life are gradually being developed. The advantage of electromobility is also the possibility of energy recovery during braking. Overall, the replacement of internal combustion engines by electric vehicles with batteries reduces energy consumption to about 30 to 40%.

- Use of hydrogen in combination with a battery. It is a fuel cell that supplies electricity to the battery. Hydrogen sources can be different, but currently most hydrogen is produced from fossil fuels. However, in order to meet the climate protection goals, it is necessary to focus exclusively on hydrogen produced from renewable energy sources, especially by electrolysis. It also meets the strict purity requirements for application in fuel cells pursuant to ISO 14 687-2, namely 99.97% (hydrogen produced from oil or natural gas has about 30 to 50 times more impurities). The efficiency of the electrolysis - fuel cell cycle is about 40% and the energy consumption for compression and transport further reduces the resulting efficiency to a value below 30%. Compared to line or battery powered vehicles, therefore, the electricity consumption for hydrogen vehicles is about three times higher. For these reasons, therefore, the introduction of hydrogen technology in transport is associated with the transition of energy to renewable sources. Excess electricity from wind or solar power plants is used to produce hydrogen by electrolysis. Thus, it is a question of solving energy problems (the use of randomly occurring surpluses of instantaneous power in the electricity system) rather than of solving transport problems, for which the direct use of electricity is simpler and more efficient.

For all types of alternative energy, it is necessary to create support programmes for the development of a network of charging/recharging stations (OPT), because in the initial period there are not enough vehicles using alternative energy in operation, so it is not possible to start market processes at this initial stage. The plan of other programmes is to support: IROP - public transport, OP TAC - purchase of an electric car or acquisition of a charging station for businesses; CEF (support for charging stations and hydrogen filling stations on the TEN-T network), National Programme of the Ministry of the Environment (purchase of alternative drive vehicles for regions and municipalities), Fund for Fair Transformation and Modernization Fund.

Measures:

- 1.3.1.1 Support the development of a network of filling and charging stations and charging infrastructure for alternative energy in road transport.
- 1.3.1.2 Encourage the purchase of alternative fuel vehicles (price difference between a conventional vehicle and an alternative fuel vehicle).

Rail transport

Electromobility in rail transport has been gradually introduced since the 1950s. Electrification initially took place in a DC system with a voltage of DC 3 kV, which electrified the northern half of the republic. Only then did the electrification of the lines in the southern part of the republic take place with the more advantageous AC system 25 kV, 50 Hz. The main railway lines are mainly in the northern part, while the DC system no longer meets the requirements of current traffic. It was therefore necessary to decide whether to strengthen the power in the 3 kV DC system with the construction of additional substations, or whether to proceed with the gradual conversion of the traction system. The conversion to a single AC system 25 kV, 50 Hz proved to be more economically advantageous, as it will increase the energy efficiency of electric traction on these lines from about 80% to 95%. Another advantage of this variant is the possibility of efficient electrification of other lines in the northern part of Bohemia and Moravia, where so far only a few lines are electrified because of the higher costs of electrification in direct current traction. The extension of line electrification (already with a unified AC 25 kV, 50 Hz system) to all heavily congested lines is an important investment priority of the Ministry of Transport of the Czech Republic and the Railway Administration. Gradually, individual electrification projects are being prepared. In this context, it is necessary to address the sufficient performance of connection points from the distribution network.

There is a pan-European trend on the railways, which will gradually lead to the disappearance of diesel traction. Gradually, in combination with the advancing electrification, battery trolley vehicles will be introduced (bimodal vehicles can also be used temporarily), which will serve non-electrified end sections and which will be continuously dynamically charged when driving on electrified sections, or statically charged when standing in electrified stations. Battery trolley vehicles are not a substitute for line electrification, but a complement to it. They increase the efficiency of line electrification by enabling the replacement of diesel with electricity not only on newly electrified lines, but also on lines in their vicinity. The growth of the size of the electrified network creates additional opportunities for charging battery trolley vehicles. At the same time, it shortens the length of lines without electrification and thus the necessary range of battery trolley vehicles.

Hydrogen technology will also be used on a temporary basis, in areas where backbone lines have not yet been electrified. In this case, hydrogen filling stations will also be used for bus and individual transport, these stations will then be used for road transport even after the electrification of the backbone railway lines.

Vehicle renewal must also respect the requirements for alternative types of drive, taking into account the gradual process of electrifying other lines. The spread of these types of drive will most likely be associated with a significant increase in compensation to carriers, paid by customers.

Measures:

- 1.3.1.3 Complete the intended target scope of electrification of railway lines with a view to reducing externalities and achieving further energy savings, and accelerate the electrification of backbone lines to regions with missing electrified lines, so that battery trolley (or temporarily bimodal) vehicles can be used in these regions as well and vehicles in diesel traction can be gradually replaced with electric and battery trolley vehicles for the service of end sections with less traffic, which will not be electrified.

- 1.3.1.4 Accelerate the implementation of projects for the conversion of the traction power supply system from DC 3 kV to AC 25 kV, 50 Hz in connection with the results of feasibility studies for individual areas.
- 1.3.1.5 Create a background for the operation of battery vehicles in areas without line electrification, by building supply points for both overnight stays (tempering) and for charging vehicles in turning stations.
- 1.3.1.6 Coordinate the plans of the Ministry of Transport of the Czech Republic and the Railway Administration for the electrification of other lines with the plans of carriers for the development of the vehicle fleet so as not to harm investments. In practice, this means no longer buying vehicles powered by internal combustion engines and concentrating financial resources exclusively on the purchase of electric vehicles (trolley or battery).
- 1.3.1.7 Coordinate the plans of the Ministry of Transport of the Czech Republic and the Railway Administration for the electrification of other lines with the plans of the Ministry of Transport of the Czech Republic and the Railway Administration for equipping lines and vehicles with the single European train control system ETCS. The aim is for lines not yet electrified to be electrified at the same time as they are equipped with the single European train control system ETCS. This will prevent inefficient investment in equipping non-prospective diesel vehicles with the mobile parts of the ETCS train control system, as these will be eliminated in the foreseeable future.
- 1.3.1.8 Coordinate the plans of the Ministry of Transport of the Czech Republic and the Railway Administration for the electrification of other lines with the plans of public transport customers to address the lines and vehicle requirements. Not allow transport provided by diesel-powered vehicles to be ordered on electrified lines and not allow customers of public transport (state and regions) to demand new diesel-powered vehicles from carriers to ensure carriage.

Inland waterway transport

In the case of freight transport, inland waterway transport can also make a significant contribution to energy savings as well as to reducing the environmental impact of freight transport. The volume of waterway freight transport is very low, which is due to the unreliability of the Elbe waterway below Ústí nad Labem and the unfinished navigability to Pardubice (part of the TEN-T network). At the same time, waterway transport is very difficult to replace in the case of oversized transport, which is very important for the Czech Republic, as an industrially developed country.

Also in the case of waterway transport, it will be necessary to address the replacement of fossil fuels with alternative energy, this issue is elaborated in the National Action Plan for Clean Mobility. Alternative energies will also be important in the area of recreational navigation, e.g. in the central part of Prague, recreational navigation has contributed significantly to air pollution. Passenger waterway transport in Prague is now undergoing extensive remotorization, which is to contribute to better air in the city centre. The problem of older engines must also be addressed in freight transport by modernizing vessels, which is relatively slow in view of the long life of vessels.

Measures:

- 1.3.1.9 Introduce alternative fuels in inland navigation (e.g. support for the introduction of filling and recharging stations).
- 1.3.1.10 Support the modernization of vessels with an appropriate programme .

Non-motorized transport

Non-motorized transport is an important part of the transport service system, the importance of which will grow in the future. It is necessary to distinguish:

- bicycle transport, including the use of all new types of vehicles moving with at least an active human contribution; on the contrary, vehicles that move without an active human contribution cannot be counted in bicycle transport,
- pedestrians,
- carts (wheelchairs) for people with reduced mobility that operate without active human participation.

For other carts it is necessary to define the rules of use.

Bicycle transport

The conditions for the development of bicycle transport within transport services began to develop systematically in the 1990s, and it took some time before bicycle transport began to be perceived as a full-fledged part of transport. Unfortunately, even today there are still voices that the marking of cycle paths on city roads limits the development of individual transport. At the same time, bicycle transport has the main advantage not only as an emission-free mode of transport, but also in saving public space.

The potential for bicycle transport is considerable, as evidenced by the experience of Western European cities. On the other hand, it is necessary to take into account that in the conditions of the Czech Republic, it is to a large extent a seasonal mode of transport, which is evidenced, for example, by the Transport Yearbook of the Technical Road Administration. This is mainly due to climatic conditions, when occasional winter frost episodes and snow showers and summer heat waves prevent year-round cycling to a greater extent. Therefore, even in sustainable urban mobility plans, it is necessary to differentiate cities according to geomorphology, because in mountainous areas the climatic conditions are considerably more difficult in terms of year-round cycling.

In the past, sections were built especially where they were less investment-intensive, so very often isolated and mutually unconnected sections were created. In suburban and rural areas, continuous cycle paths are difficult to build due to the considerable fragmentation of the municipal structure in the Czech Republic. Therefore, it is necessary to prepare analyses and start a discussion on whether to transfer cycle paths passing through several municipalities from the category of local roads to a new category which would correspond in nature to the category of class III roads in terms of administration, maintenance and development. In addition, in many municipalities, in the event of any crossing of a cycle path with a road, often at entrances to adjacent land, the cycle path is automatically interrupted and the cyclist must give priority to cars. This creates cycle paths with a large number of signs marking the beginning and the end of the cycle path.

Measures:

- 1.3.1.11 Complete the network of cycle paths.
- 1.3.1.12 Address the issue of entry of motor vehicles on cycle paths, or under what conditions and for which vehicles it is possible to allow entry to pavements.
- 1.3.1.13 Extend bikesharing, with a distinction of vehicle types.
- 1.3.1.14 Develop standards for parking spaces for bicycles and scooters, especially in passenger terminals.
- 1.3.1.15 Improve the conditions for regular commuting to work and schools, including as part of corporate and school mobility plans.
- 1.3.1.16 Ensure the development of ITS to increase the safety of cyclists in road traffic.
- 1.3.1.17 Submit to the government a legislative proposal regulating the operation of e-bikes and other types of carts and the method of their monitoring in operation.

Pedestrians

Pedestrian “transport” has always taken an important place, it is a basic way of moving. Unfortunately, the development of individual car transport has significantly reduced this type of transport, which has, among other things, very negative consequences for the health and fitness of the population. This is especially evident in smaller towns and villages. This is often due to the fact that individual car transport causes pedestrians considerable discomfort, whether caused by noise, exhaust gases or impact on safety, as well as frequent delays or lengthening of trips (need to bypass intersections to the nearest crossing, controlled intersections are primarily adjusted with respect to passage of cars, etc.). At the same time, cities should primarily belong to pedestrians and not to individual car transport. This is important both for human health and for the economic development of cities (prosperity of business activities in the streets). The statistical data of the Transport Yearbooks show that in the case of the number of trips made in the capital, individual car transport and pedestrians have the same share of 29% (at different average distances). It is therefore necessary to include losses from interdisciplinary externalities, i.e. time losses that individual car transport causes to pedestrians and public transport users, in the calculation of the economic evaluation of infrastructure projects for individual car transport.

Measures:

- 1.3.1.18 As part of optimization of the functioning of ITS systems in urban traffic, take sufficient account of preference for pedestrian transport.
- 1.3.1.19 Prepare master plans for pedestrian transport in cities with a population of over 15 thousand as the basis for spatial planning authorities.

Carts (wheelchairs) for people with reduced mobility

It is a mode of transport for citizens who are already less mobile, and the society should create a level playing field for them. It is therefore necessary to address the rules of movement of persons on these carts, mostly electric. The aim is to remove barriers as much as possible. Therefore, these carts should also be tolerated on pavements, in shopping malls and other public spaces.

Measures:

- 1.3.1.20 Establish rules for the use of carts for people with reduced mobility.

Urban public transport in electric traction

Urban public transport is an important segment of public transport and, especially in larger cities, shows the largest share in the number of transported persons. Energy savings and the reduction of emissions, especially of pollutants in cities, are absolutely essential, because emissions occur in places with a high concentration of inhabitants. It is therefore necessary to pay a lot of attention to the electrification of urban mass transport.

Measures:

- 1.3.1.21 For the period of 2021 to 2027, provide a subsidy programme to support urban mass transport infrastructure in electric traction and a subsidy programme to support urban mass transport vehicles in electric traction.

1.3.2 Air pollution, technical condition of vehicles

- Responsibility for fulfilling the specific goal: Ministry of Transport

The biggest air pollutants from transport are mainly vehicles with an older production date. The focus in this area is mainly on diesel engines, which have a higher combustion temperature. The new diesel engines have low emissions, but they require regular and relatively expensive maintenance, which is why many cars already show deteriorating parameters after a year of operation. Recently, a number of measures have been taken to ensure better work of testing centres and to introduce inspections of vehicles in normal operation.

Measures:

- 1.3.2.1 Ensure sufficient capacity to carry out in-service inspections of vehicles with internal combustion engines for pollutant emissions.

1.3.3 Other environmental impacts

- Responsibility for fulfilling the specific goal: in the case of new buildings Ministry of Transport, in the case of existing transport infrastructure Ministry of the Environment, in the case of noise Ministry of Health

Landscape fragmentation and permeability

There are two interconnected phenomena arising from the same cause. This is the creation of barriers in the landscape that make it difficult or even impossible for animals to

move freely. Landscape fragmentation is a process in which, due to the increase in the number and extent of impermeable barriers, the landscape breaks down into smaller and smaller units that are no longer able to provide for their ecological functions. Landscape permeability is a description of the same phenomenon, but from the point of view of specific species of animals, their movement in the landscape, interruption of migration routes and increasing the isolation of individual populations.

When characterizing landscape fragmentation, it is necessary to focus on 4 basic areas: (i) objects of fragmentation - for which species of animals it is evaluated, (ii) fragmentation as one of the effects on the biota, (iii) sources of fragmentation, (iv) components of fragmentation barriers. It should be borne in mind that the above-mentioned areas act simultaneously and interact with one another.

The basic barriers in the landscape in relation to animals and humans are residential infrastructure and transport infrastructure. Both of these sources of fragmentation are closely interconnected. The construction of new settlements, especially outside urban areas, generates new transport requirements, which leads to increased pressure on the construction of new roads. These roads, run mainly for the protection of the health of the population in the open countryside, make new locations accessible for the potential construction of new settlements. The spiral spun by positive feedback between the two main sources of fragmentation is the main cause of the ever-increasing landscape fragmentation.

Migration barriers generally consist of two components: static and dynamic. The static component is represented by buildings, the dynamic one by the activities that take place there. Of the transport structures, the static component is a road or a railway body, the dynamic component the traffic that takes place there. The same applies to the barrier effect of the settlement infrastructure (industrial and settlement areas + transport and other activities taking place there). The overall barrier effect is given by the mutual combination of static and dynamic components. This is important in terms of reducing and optimizing the barrier effect. Landscape fragmentation is not only increased by the construction of new roads and railways, but also by an increase in transport volume on the new and existing networks. From the point of view of landscape fragmentation, there is a lot of room for optimizing the mutual relationship between the construction of new sections and the solution of the traffic situation of the wider area, for example by means of landscaping.

The issue of landscape permeability and its fragmentation is often narrowed to the construction of special overpasses for animals across highways (ecoducts). Although these are important objects in some places, they represent only a small fraction of the measures needed to ensure sufficient permeability of the landscape and its protection from growing fragmentation. Without the implementation of systemic steps to reduce the primary sources of fragmentation at the level of development of residential and transport infrastructure, partial technical measures cannot bring the necessary effect. The conceptual approach must cover not only all sources of fragmentation, but also all groups of animals that are negatively affected by fragmentation. And it is necessary to assign a person to them in the first place (for example, to ensure the accessibility of land so as to create conditions for the rational management of landowners and to increase the permeability of the landscape for pedestrian and bicycle transport). Therefore, the systemic problem requires the cooperation of the Ministry of Transport, the Ministry of Regional Development, the Ministry of the Environment, the Ministry of Agriculture and the Ministry of Health to be addressed.

Measures:

- 1.3.3.1 As part of the human health impact assessment, pay more attention to the negative factors resulting from landscape fragmentation by transport, especially in relation to the risk of accumulation with other negative effects (noise, light pollution from transport, air pollution).
- 1.3.3.2 To the maximum extent possible, use the existing instruments of spatial planning and nature protection to optimize the construction of the transport network in accordance with strategic planning.
- 1.3.3.3 Use landscaping as much as possible in the preparation and construction of new motorways and railways and in the removal of railway crossings.
- 1.3.3.4 Ensure spatially and financially adequate passage of wildlife and the population through transport infrastructure.

Noise

Noise is one of the most widespread environmental pollutants today and causes serious diseases of civilization in the long term. Road transport represents more than 90% of the total noise load from traffic. As noise generated by tire-road contact is currently the predominant source of noise in passenger cars from speeds of around 40 km/h, the application of low-noise abrasive layers ("low-noise surfaces") is a very effective anti-noise measure and it is desirable to focus on assessing this way of reducing noise to a greater extent¹⁸. In recent years, research activities within the transport sector have also focused in this direction. Since about 2014, selected parts of the road network have been monitored by measuring the noise of abrasive layers using the CPX method, both in the case of standard abrasive layers and low-noise abrasive layers, as part of various research projects or projects commissioned within the transport sector (especially with the participation of the Transport Research Centre). Partial conclusions from research activities obtained during these several years of measurements summarize information on changes in the acoustic parameters of roads during their use on the road network. The conclusions of the performed road noise measurements led to the elaboration of the Technical Conditions TP 259 Asphalt Mixtures for Low-Noise Abrasive Layers, approved by the Ministry of Transport and effective from 1 December 2017, These Conditions define the acoustic characteristics of roads so that they can be classified as low-noise roads. Information on the noise of individual types of road surfaces and their changes are in high demand both from ministries and road administrators, as well as from health supervision, regional health centres, the Ombudsman, etc., precisely for decision-making purposes. At present, however, it is still not possible to give clear data for the long-term acoustic characteristics of the road technologies used, whether standard or low-noise. Many technologies are innovated and measurements do not take long enough to obtain a statistically significant data set, such as anti-skid properties. Under the Ministry of Transport, it is planned in the near future to expand the practical use of measuring the acoustic parameters of roads both for internal

¹⁸ Low-noise/smooth surfaces have a reduced rate of friction and prolong the braking distance in rain or snow or leaves, affecting safety; especially on motorways at higher speeds, there is a risk of chain accidents. Sometimes the most effective solution is to reduce the maximum speed limit, although it is the least popular solution among traffic users.

use (road management system) and inter-ministerial cooperation (acoustic characteristics of typical surfaces used in the Czech Republic for use to prepare the Strategic Noise Mapping pursuant to the newly required European calculation methodology).

Noise reduction also applies to rail transport, where a major effect can be achieved by eliminating brakes with cast iron brake blocks. New passenger cars with disc brakes and air suspension generate 32 times less acoustic noise (-15 dB) than older, obsolescent passenger cars with old chassis and cast iron block brakes. In freight transport, the renewal of the truck fleet is accelerating. Wagons with composite brake blocks compliant with the interoperability requirements (NOI TSI) achieve approximately 8 times lower acoustic noise output (-9 dB) than wagons with cast iron block brakes. However, a condition for the overall noise reduction is also an adequate condition of the rail infrastructure. By grinding the surface of the rails, the acoustic power of the noise can be reduced by another up to 9 dB.

In terms of environmental protection and sustainable development of transport, it is necessary to maintain, expand, update detailed acoustic characteristics of applicable road surface construction technologies and know the changes in their acoustic characteristics in the long term. The aim of the Ministry is to further update data on the life cycle of road surfaces, especially in the context of acoustic characteristics.

For the Ministry of Transport, the elimination of noise is relevant, especially in the outdoor environment; only in exceptional cases can it eliminate noise in interiors. In the long term, the Ministry of Transport is developing and discussing Action Plans to reduce traffic noise from main roads, major railway lines and the Václav Havel Airport (Prague-Ruzyně Airport). This year, the completely discussed 3rd round already took place on the basis of European Directive 2002/49/EC relating to the assessment and management of environmental noise.

Legislatively, noise is incorporated into Act No. 258/2000 Coll., on the protection of public health, as amended. However, this is a complex issue that should be addressed comprehensively by a separate law.

Based on the issued ruling of the Constitutional Court on the amendment to Government Decree No. 272/2011 Coll. on the protection of health against adverse effects of noise and vibration and the Guideline for measuring noise in the non-working environment, there are no binding noise limits from the point of view of international or European law and their determination is left to the competence of individual countries. The Czech concept of enforcing noise limits in the outdoor environment is unique in Europe and provides a higher level of protection against noise than in other countries. In addition, in every country enforcing the limits, they are always allowed not to be enforceable if it is based on an economic balance of unprofitability - similar to the "as low as reasonably achievable" concept, which is legally enshrined in our legislation only in connection with the granting of a time-limited permit. The Constitutional Court has reminded that the Czech legal system contains several means of protection, which make it possible to defend against noise even outside the noise limits.

The most important task is the legislative change of noise limits, so as to enable the reduction of the number of people in an area affected by above-limit noise values. This refers to traffic noise. How exactly, it will depend on the final text of the Noise Act, which should arise under the competence of the Ministry of Health. The current state of legislation based on unsurpassable noise limits is unsustainable in the long run, as it cannot solve the problems that have already arisen and cannot be solved in the long run. The decision of

the Constitutional Court draws attention to this situation. The Ministry of Health plans to submit specific legislative amendments to Act No. 258/2000 Coll., on the protection of public health and on the amendment of certain related acts, and Government Regulation No. 272/2011 Coll., on the protection of health against the adverse effects of noise and vibration, in 2021, aiming to optimize approach to traffic noise in the sense of a broader application of the "as low as reasonably achievable" concept, including adjustments to certain health limits. Changes to these legislative regulations can achieve rapid and very effective rationalization, i.e. streamlining the preparation and implementation of transport networks and ensuring the protection of public health from noise. Based on these legislative changes, or after their evaluation, the optimization process can be further developed, among others by the substantive intent of the Noise Act, for example.

Light pollution

The issue of light pollution has many aspects, in the case of transport it has an impact on road safety. The Transport Policy, as well as the National Road Safety Strategy, must also address this aspect.

Measures:

- 1.3.3.5 Prepare proposals for changes in Act No. 258/2000 Coll. and Government Regulation No. 272/2011 Coll.
- 1.3.3.6 Fulfil the obligations specified in the Action Plans for individual modes of transport pursuant to Directive 2002/49 EC - 3rd round.
- 1.3.3.7 Implement Commission Regulation (EU) 2019/774 as regards application of the technical specification for interoperability relating to the subsystem 'rolling stock — noise',
- 1.3.3.8 Continue research into all road surfaces, including low-noise roads.
- 1.3.3.9 Continue to monitor the development of noise barriers, including ensuring their effectiveness.
- 1.3.3.10 Support the development of low-noise tires.
- 1.3.3.11 Support the reduction of external noise of rail vehicles.
- 1.3.3.12 Support noise reduction of railway superstructures.

1.3.4 Principles of development, maintenance and operation of transport infrastructure

- Responsibility for fulfilling the specific goal: in the case of new buildings Ministry of Transport, in the case of existing transport infrastructure Ministry of the Environment, in the case of noise Ministry of Health
- Elaboration in a follow-up strategy: Transport sector strategies

The measures below constitute the main set of principles for the development of transport infrastructure. The database of projects and their prioritization is the subject of the follow-up document Transport Sector Strategy. The measures respond to operational needs arising from other chapters of the Transport Policy.

Railway infrastructure measures

- 1.3.4.1 Completion of transit railway corridors including railway junctions by 2025 (with the exception of junctions in Prague and Brno and sections with long tunnels, for which separate schedules will be proposed in the Transport Sector Strategies).
- 1.3.4.2 Modernization of lines on the main TEN-T network for passenger and freight transport and lines included in rail freight corridors pursuant to Regulation (EU) No. 913/2010 by 2030.
- 1.3.4.3 Modernization of railway lines on the global TEN-T network by 2050 at the latest.
- 1.3.4.4 Connection of all regional cities to a high-quality railway network in the direction of the main economic centres of the country (in Bohemia to Prague, in Moravia to Prague and to Brno) by 2040.
- 1.3.4.5 Ensuring sufficient freight transport capacity to connect industrial zones of strategic importance by 2030.
- 1.3.4.6 Ensuring sufficient capacity and speed parameters of lines for suburban transport, especially in cities with a population approximately over 40 thousand, and for urban transport, especially in cities with a population of over 250 thousand (pursuant to the schedule in the Transport Sector Strategies).
- 1.3.4.7 Continue preparation of high-speed rail projects by completing feasibility studies of individual branches and starting their preparation and implementation in accordance with the outputs of the High-Speed Connection Development Programme, so that pilot sections and sections included in the TEN-T core network are operational by 2030 at the latest and sections of the global TEN-T network by 2050 at the latest. Give priority to the implementation of sections starting from the main railway junctions (Prague, Brno, Ostrava) in order to strengthen the insufficient capacity of lines for suburban, long-distance and freight transport and to address the capacity of the Prague railway junction.
- 1.3.4.8 In terms of technical standards, in case of interest of the municipality, prepare space for possible projects of tram-train systems.
- 1.3.4.9 Gradually optimize other railway lines important for transport service or freight transport pursuant to the schedules set out in the Transport Sector Strategy document.
- 1.3.4.10 The new sections will be electrified with regard to the necessary management of public transport and freight transport lines and with regard to meeting the objectives in the area of transition to sustainable forms of energy (pursuant to the schedule set in the Transport Sector Strategy document). Prepare for a situation where diesel-powered vehicles will gradually cease to be produced.
- 1.3.4.11 Electrification of other lines with the potential to increase carriage volume so that it will be possible to gradually replace diesel vehicles with electric vehicles and accu-trolley vehicles for the service of end sections with less traffic, which will not be electrified; in this regard, pay special attention to regions where not even the backbone lines are electrified so far (especially northeastern Bohemia).
- 1.3.4.12 Conversion of the traction power supply system to AC 25 kV, 50 Hz and increase of the performance of existing fixed equipment.
- 1.3.4.13 With regard to the necessary routing of public transport lines, implement measures on small-scale railway infrastructure (e.g. extension of platforms, installation of rail links and streamlining of train running by making better use of the traction properties of modern traction rail vehicles).
- 1.3.4.14 Removal of bottlenecks on the railway infrastructure according to operational experience, justified requirements of carriers and customers ordering transport and construction, or maintaining the necessary parking capacity for decommissioning trains during outages at carriers, for decommissioning trains during changing or rest of engine drivers.
- 1.3.4.15 Equip the defined railway network and vehicles with the ETCS system in accordance with the obligations arising from European legislation.
- 1.3.4.16 Gradually ensure the possibility of operating 740 m long trains on the main TEN-T network by 2030.
- 1.3.4.17 In railway infrastructure development projects within the economic evaluation, take into account the influence of the project on the regularity, stability and reliability of traffic.
- 1.3.4.18 Implement traffic rationalization for selected regional railways in the regions in connection with the binding order for regional transport, without limiting the accessibility of specific locations by public transport, which would have a negative impact on their social and demographic development.
- 1.3.4.19 Support the development of cross-border rail transport projects (long-distance and regional).
- 1.3.4.20 Develop and maintain the rail network in accordance with the TSI.
- 1.3.4.21 Based on an economic assessment of the importance of reducing the railway network by removing lines that are not usable for regular transport service (to be assessed on the basis of transport service plans of the country and regions and on the basis of an assessment of importance for freight transport). Offer unnecessary lines for sale without the right to future state subsidies. In the case of lines to be eliminated, the transport function will not be taken away - they will be used for the needs of non-motorized transport or other transport activities as part of tourism (continuously).
- 1.3.4.22 Reduce railway crossings, which can be cancelled without compensation, or in economically justified cases with compensation addressed by means of a compensatory measure (e.g. by means of forest and field roads, in a larger area created by land improvements). When addressing, take into account the possible negative impact of the removed crossing due to the increased traffic of heavy agricultural and forestry equipment through municipalities.
- 1.3.4.23 When preparing the modernization of the road and motorway network, prepare the related modernization of parallel railway lines so that there is no significant shift of transport to a less energy-efficient mode of transport.

- 1.3.4.24 Continue to raise the standard of safety and accessibility of rail transport infrastructure in line with the TSI.
- 1.3.4.25 Implementation and inspection of a system of cyclic repairs.
- 1.3.4.26 Optimize railway line permeability in terms of use for passenger and reliable freight transport.
- 1.3.4.27 In areas outside line electrification, systematically build power points for battery vehicles.

Road infrastructure measures

- 1.3.4.28 Construction of missing sections on the main TEN-T network by 2030 with parameters corresponding to the forecasted traffic intensities (forecasts from the transport model in the Transport Sector Strategy document).
- 1.3.4.29 Construction of missing sections on the global TEN-T network by 2050 with parameters corresponding to the forecasted traffic intensities (forecasts from the transport model in the Transport Sector Strategy document).
- 1.3.4.30 Improving the connection of all regional cities to the backbone high-capacity road network in the direction of the main economic centres of the country (Prague, in Moravia also Brno) by 2030.
- 1.3.4.31 Ensuring adequate transport connections of industrial zones to road infrastructure in accordance with the relevant government resolutions.
- 1.3.4.32 Ensure the connection of significant development investments to road infrastructure at the level of at least class I roads.
- 1.3.4.33 Install intelligent transport systems on the main motorway routes to control and regulate traffic, increase safety and efficiency of transport and to ensure infomobility (ITS application will enable, among other things, better use of road infrastructure capacity) and increase the safety of traffic users. When further strengthening capacity through capital construction, it is necessary to take into account the possibilities of better use of existing capacities using ITS and C-ITS applications.
- 1.3.4.34 Replenish the capacity and improve social standards for road freight rest areas so that drivers can meet safety break requirements under applicable laws. It is necessary to build an information system that draws attention to the free capacity around the vehicle, which will allow to optimize the use of rest area capacity. As part of the concept of rest areas, it is necessary to build a security system for crime prevention. Gradually adapt the rest for autonomous vehicles running in "train" mode.
- 1.3.4.35 Addressing through roads in municipalities on routes with high traffic intensities, especially the construction of bypasses (this also applies to accompanying roads to motorway-type roads), based on the schedule set out in the Transport Sector Strategy document.

- 1.3.4.36 Use low-speed weighing of vehicles and increase the number of high-speed weighings of vehicles at places selected by the Police of the Czech Republic to eliminate the number of overloaded trucks which disproportionately damage the road infrastructure.
- 1.3.4.37 Implementation of a system of cyclic repairs.

Measures for inland waterway infrastructure

Waterways also perform functions other than transport. Therefore, the planning of their development is closely related (including financing) to other concepts that are under the responsibility of the Ministry of Agriculture¹⁹ (water management).

- 1.3.4.38 Address issues of navigability and reliability on transport-significant and used waterways and other waterways, the development and modernization of which is effective (in accordance with the Waterway Transport Concept and based on the schedule in the Transport Sector Strategy document).
- 1.3.4.39 Continue to implement the objectives of the NAIADES, NAIADES II and related programmes of this type.
- 1.3.4.40 Continue to develop River Information Services.
- 1.3.4.41 Prepare projects for the completion of infrastructure for recreational navigation on transport-important waterways in accordance with Act No. 114/95 Coll., on inland navigation (based on the schedule in the Transport Sector Strategy document).
- 1.3.4.42 Complete the equipping of waterways and ports with flood protection elements.
- 1.3.4.43 Address capacity problems on the waterway in Prague.
- 1.3.4.44 Following the completed Feasibility Study of the Danube - Odra - Elbe Water Corridor, ensure an evaluation of the environmental feasibility of the Danube - Odra - Elbe project by 2023. Continue international cooperation with Poland and Germany (connection of the Ostrava agglomeration to the Odra Waterway) and Slovakia.

Measures for airport infrastructure and air traffic

The potential of regional airports in the Czech Republic is evaluated in a document following up on the Transport Policy of the Air Transport Concept for the period of 2014 - 2020. This document also introduced three categories of international airports.

Main principles of aviation infrastructure development:

- 1.3.4.45 Create conditions for the modernization of technical airport infrastructure aimed at increasing the capacity and quality and increasing air traffic safety.

¹⁹ For example, the Concept for Protection against the Consequences of Drought for the Territory of the Czech Republic

- 1.3.4.46 Create conditions for a functioning system of protection, maintenance, development and modernization of existing airport infrastructure in the public interest for the provision of services to air carriers and other airport users.
- 1.3.4.47 Address the development of regional airports in such a way as to prevent the creation of unused or inefficiently used existing airport infrastructures, which could thus become an economic burden (recommendations for regions, further elaborated in the Air Transport Concept).
- 1.3.4.48 Support the gradual transition from conventional navigation to navigation using global navigation satellite systems (GNSS).
- 1.3.4.49 With regard to meeting the requirements of the EIA process, continue preparations for the construction of a parallel runway at the Václav Havel Prague Airport. Along with the continuation of preparations for the construction of the parallel runway, further implement the airport development plan (especially the strengthening of terminal capacities) in order to satisfy the growing demand for air transport in accordance with long-term forecasts of the development of air transport demand. In the event of non-implementation of development plans, the growing demand for air transport from the catchment area would have to be served using airports in neighbouring countries (further elaborated in the update of the Air Transport Concept).
- 1.3.4.50 Connect the Václav Havel Prague Airport to railway transport, especially for direct connection to the centre of Prague, but refrain from making it impossible in the future to connect direct long-distance transport or direct connection with Kladno. As part of the Prague Railway Junction Feasibility Study, including High-speed Connections, assess the effectiveness of the connection of the Václav Havel Airport to the Prague - Dresden high-speed railway line.
- 1.3.4.51 Implement adequate capacity strengthening of the airport's road connection to the Czech transport network.
- 1.3.4.52 Address the issue of no-barrier accessibility within the operating rules of public airports.

Measures for non-motorized transport infrastructure

- 1.3.4.53 Accelerate the gradual construction of cycling infrastructure, including charging points, with a view to increasing the involvement of cycling in the short-distance passenger transport system.
- 1.3.4.54 Achieve a reduction in the number of accidents involving cyclists by separating cycling traffic from other modes of transport on heavily congested roads in urban areas. In densely populated areas, a suitable solution according to local conditions is to set aside a separate lane for cyclists in conjunction with the implementation of traffic calming elements.
- 1.3.4.55 In the case of the construction of cycle paths passing through several municipalities, start a discussion on the possible ownership of the region.

- 1.3.4.56 Support the development of pedestrian transport by introducing measures for separation and safety of pedestrian traffic (barrier-free, wider pavements for carers with children and prams, lighting of stops and underpasses, luminaries with effective optical elements, proper lighting of crossings, etc.) and measures to speed up pedestrian transport by reducing the time pedestrians have to wait on traffic lights.
- 1.3.4.57 Application of traffic calming elements and additional safety elements with regard to pedestrians (children in traffic, humanization of street space).
- 1.3.4.58 Modification of public transport stops to facilitate passengers getting on and off, with improved conditions for the elderly, carers with prams and children under 3 years of age and people with reduced mobility, orientation and communication.
- 1.3.4.59 Provide financial support for personal navigation systems for people with reduced mobility, orientation and communication for the implementation of measures for people with reduced mobility (barrier-free access for people with disabilities, carers with prams and children aged under 3 years, pregnant women and the elderly).

Measures for the infrastructure of multimodal transport terminals

Multimodal transport terminals in passenger and freight transport are an integral part of the transport infrastructure and a separate layer in the TEN-T network is defined for them.

- 1.3.4.60 Support the establishment of public terminals with a possible connection to logistics centres in locations designated for the TEN-T network, as well as in other locations where it is economically justifiable. Terminals with public access must not compete with each other (application of the regional principle), competition must take place between service providers, in the form of direct competition in the market or competition for the market.
- 1.3.4.61 Support the equipping of combined transport terminals with progressive transshipment technologies with the aim of connecting the Czech Republic to the regular network of combined transport lines in Europe.
- 1.3.4.62 Enable financing of multimodal freight terminals with possible ownership of the infrastructure manager.
- 1.3.4.63 Support regions and municipalities in the construction of multimodal terminals for passenger transport, including their equipment with information and check-in systems.
- 1.3.4.64 On high-speed railways, consider not only fast passenger transport, but also fast transport of goods (packages, EU pallets, etc.) in the sense of the Euro Carex system. For this purpose, address multimodal terminals on high-speed lines not only for the purpose of passenger transport, but also for the purpose of transporting goods (logistics chain).

Measures for rail infrastructure of urban public transport in electric traction

1.3.4.65 Support the development of infrastructure for urban public transport in electric traction through European co-financing through the Operational Programme Transport.

1.3.5 Traffic safety

- *Responsibility for fulfilling the specific goal: in the case of new buildings Ministry of Transport, in cooperation with the Ministry of the Interior*
- *Elaboration in a follow-up strategy: National Road Safety Strategy and National ERTMS Implementation Plan*

The issue of road safety has long been conceptually addressed and regularly evaluated. A Road Safety Strategy until 2030 is currently being prepared. The main goal will be to reduce the number of road accident victims and serious injuries by 50% by 2030. The main focus will be on the human factor and law enforcement.

Measures:

- 1.3.5.1 Implement ITS and C-ITS applications as an element of accident prevention.
- 1.3.5.2 Create targeted campaigns for drivers' behaviour near railways - at level crossings, but also in the case of tram lines, as fatal accidents are not declining and ITS and C-ITS deployment and level crossing investments are taking into account the availability of technology and investment.
- 1.3.5.3 Gradually reduce the number of railway crossings on busy lines and in confusing sections, increase the level of security of existing crossings.
- 1.3.5.4 Submit a legislative proposal governing the binding opinion of the Police of the Czech Republic on the determination of traffic signs by road administrative authorities to the Government of the Czech Republic
- 1.3.5.5 a) Increase visible police oversight, in particular over speed limits.
- 1.3.5.6 b) Increase the number of automated technical means without operators to document and deal with serious violations of road traffic rules on motorways and class I roads outside the municipality.
- 1.3.5.7 Increase the enforceability of arrears of final fines for traffic offences
- 1.3.5.8 Revision of the strict liability of the vehicle operator, including increasing the enforceability of a specified amount.
- 1.3.5.9 Support campaigns targeted at the specific needs of individual groups of the population; avoid gender stereotypes about transport behaviour.
- 1.3.5.10 As part of the sustainable development and support of pedestrian transport, introduce measures to protect pedestrian safety (a well-marked and well-arranged transport environment) - especially for the most vulnerable groups, such as children, the elderly, women and carers.

1.3.5.11 Increase the safety of passengers, also at night with regard to the prevention of sexual harassment and the safety of passengers in trains (e.g. carrier staff) and in public spaces (installation of high-quality and gentle lighting at railway stations, in underpasses, etc.).

1.3.5.12 In the case of rail transport, introduce projects to implement ETCS as an interoperability element and increase railway safety.

1.3.5.13 Implement a system for the identification and registration of accident sites and ensure the financing of their systemic elimination.

1.3.6 Adaptation to climate change

Transport, together with energy, is the main integrating sector of the whole economy and the functioning of society. The negative effects of climate change can have cumulative and synergistic effects, even with a relatively smaller impact on transport itself. Therefore, due attention needs to be paid to climate change in the transport sector in line with the Climate Protection Policy.

Transport in the Czech Republic currently operates in a certain range of climatic factors. To assess the practical risk of climate change, it is crucial to what extent this range will be extended, not only in terms of absolute values achieved, but above all in terms of their frequency of occurrence. Some parameters may move significantly in an undesirable direction in the next 20-30 years. The current practice with partial modification will be sufficient and at the same time there will be time for gradual adaptation. Therefore, primary attention will be paid to measures that are already obvious and commonly implemented today, such as improving the resilience of the transport network to floods, the implementation of bypasses, strengthening the possibilities of alternative traffic management, application of information systems, etc. The implementation of these measures is effective regardless of climate change. Czechia lies at the crossroads of two climate trends: (a) north-south direction, in Europe represented by the transition from the Arctic climate (northern Norway), through a temperate climate (Czech Republic) to the subtropical climate of the Mediterranean, (b) west-east direction, the transition from oceanic to continental climate. The current forecasts of climate change for the Czech Republic in the vast majority of factors do not exceed the extent of the climate in Europe. As part of preventive measures, it is appropriate to study practical experience from selected countries with different climates, compare them with our standards and possibly incorporate them into them (e.g. Italy - hot climate model, Sweden - cold climate model, Ireland - high precipitation model, Austria - model of snow calamities).

Meteorological parameters are in their essence very variable in time and place, and in order to determine the overall trend, it is necessary to introduce a system of long-term monitoring of representative indicators. To assess the impact on traffic, it is not enough to monitor only the input climatic data (temperature, precipitation, etc.), but indicators directly related to transport (an example is the use of data from meteorological stations on the road network and evaluation of conditions directly on the roads). For a selected set of priority indicators, it is necessary to prepare separate pilot studies, which will be put into practical implementation.

This implies that climate change will affect transport, but dramatic change is not expected. Due to the importance of transport in society, due attention will be paid to this topic.

Measures:

- 1.3.6.1 Ensure higher permeability, safety and operability of the transport network (implementation necessary even regardless of the expected climate change).
- 1.3.6.2 Take into account the risks of the impact of extreme climatic events in the protection of existing and new transport infrastructure, including ensuring safety and basic mobility during extreme climatic events.



2 Strategic objective: Territorial cohesion

Satisfying the needs for mobility is a basic function of transport within the state economy, with sustainable development being an important aspect. It is necessary to approach the issue of satisfying the needs for mobility in a specific way within the individual types of territories defined in the Regional Development Strategy of the Czech Republic 2021+. Satisfaction of mobility needs must be ensured, but in some cases it turns out that it does not have to be about meeting needs in any way. This is due to the fact that especially individual car transport is very space-consuming and in densely populated areas not all requirements can be satisfied for this reason.

2.1 Specific objective: Balanced provision of transport infrastructure in regions

- *Responsibility for fulfilling the specific goal: Ministry of Transport and organizations responsible for the management and development of transport infrastructure*
- *Elaboration in a follow-up strategy: Transport sector strategies*

An important task of the Transport Policy is to ensure a comparable quality of transport infrastructure in individual regions in order to create conditions for their balanced development. Regions intersected by higher-order roads very often benefit from this. Good transport connections to economic centres are one of the conditions for business development, labour mobility and improving the living standards of the inhabitants of the regions. In particular, it is necessary to focus on areas where the absence in the density and permeability of roads or the quality of the railway network directly limits the development of economic activities. At the same time, it will be necessary to take into account the conclusions of the Regional Development Strategy of the Czech Republic 2021+, the important output of which is the identification of regions on which it will be necessary to focus state aid in order to ensure regional cohesion.

There are variously large deficiencies in the quality of transport infrastructure in all regions of the Czech Republic. The following overview shows regions that are not yet connected to the higher-tier network of road or rail infrastructure²⁰:

- South Bohemian Region - the basic connection in the railway and road infrastructure in the direction of Prague - České Budějovice - Linz has not been completed, the railway infrastructure is in an advanced stage of implementation.

²⁰ This is not a complete overview of all shortcomings in the transport network, but a rough identification of regions that lack the most basic connection to the trans-European transport network. The main principles of transport infrastructure development are set out in the Transport Infrastructure priority and a detailed schedule for the implementation of projects is set out in the Transport Sector Strategies. The infrastructure of waterways is not listed here, because the road and railway infrastructure must be assessed in terms of regional interconnection, since they serve attraction districts at the level of individual micro-regions (railways) and local parts of municipalities (roads). For waterways, we monitor the connection at the level of the Czech Republic (we cannot guarantee the connection of all regions). Therefore, water infrastructure is monitored only at the national level.

- Karlovy Vary Region and the western part of the Ústí nad Labem Region - the basic road and railway connection in the direction of Prague - Karlovy Vary - Markvartowitz and Prague - Chomutov / Most has not been completed, the new railway connection is currently being assessed within the Prague - Dresden high-speed railway line project.
- Liberec Region - there is a complete lack of high-quality railway connections for passenger and freight transport (including the adjacent industrial area of Mladá Boleslav), currently the technical solution for the Lysá nad Labem - Mladá Boleslav section has been approved, the Mladá Boleslav - Liberec section will be further tested.
- Plzeň Region - modernization of the railway connection on the Prague - Plzeň - Schwandorf - München / Nürnberg axis, which is noticeably lacking in passenger and freight transport not only to the Plzeň Region, but also to the entire Czech Republic and the EU, has not been completed.

The following are the main shortcomings of the trans-European transport network:

- The Capital City of Prague and the Central Bohemian Region - the road connection enabling the diversion of transit traffic from the capital city has not been completed.
- There is no alternative high-capacity route for the D1 motorway ensuring direct connection of the primary nodes of the TEN-T network in Prague and Ostrava (Opatovice - Mohelnice section).
- There is no high-capacity backbone railway axis of Moravia (Brno - Přerov), including the Brno railway junction.
- There is a lack of direct and high-quality railway connections between the Václav Havel Airport and the centre of Prague and using long-distance railway transport with regional centres.
- Unreliable navigability of the Elbe - Vltava waterway in the cross-border section of the Elbe.

Major shortcomings of the connection of large cities within the regions in the direction of the regional centre:

- Capital City of Prague and the Central Bohemian Region - it is necessary to increase the capacity of the Prague railway junction and there is no high-quality railway connection for regional transport from Prague to the three largest cities in the Central Bohemian Region (Kladno, Mladá Boleslav, Příbram).
- Liberec Region - lacks high-quality transport infrastructure connecting important centres of the region (Česká Lípa, Jablonec nad Nisou, Semily). Vysočina Region - lacks high-quality infrastructure connecting important centres of the region (especially Třebíč and Žďár nad Sázavou).
- South Moravian Region - lacks high-quality railway infrastructure connecting important centres of the region (especially Znojmo, Vyškov), the current condition of the Brno railway junction is a chronic deficiency.
- Zlín Region - lacks high-quality infrastructure connecting important centres of the region (Vsetín, Valašské Meziříčí).

- Moravian-Silesian Region - a road connecting the Ostrava agglomeration and Slovakia is gradually being built, modernization of the Ostrava railway junction has not been finalized.

Measures:

- 2.1.1.1 Ensure a comparable connection of individual regions to the higher-tier transport infrastructure network.

2.2 Specific objective: National level, connection of the Czech Republic to neighbouring countries

- Responsibility for fulfilling the specific goal: Ministry of Transport and organizations responsible for the management and development of transport infrastructure
- Elaboration in a follow-up strategy: Transport Sector Strategies, Freight Transport Concept, Public Transport Concept

The main principles of transport infrastructure development for long-distance and inter-regional transport are addressed in section 3.1.3.4.

Passenger transport

In passenger transport, the main flows show a positive trend of increasing the share of rail transport, including international transport, and at the same time a slight decrease in the daily volumes of individual car transport. It is thus necessary to continue to strengthen the use of rail transport in combination with individual transport through passenger terminals. It is therefore necessary to continue with the preparation of high-speed lines in the future, as the capacity of the railway corridors is gradually being exhausted. Thus, high-speed lines should gradually take over not only individual transport, but also some short flights.

There is also a need to further improve interconnections between regions, including border regions with neighbouring countries.

Freight transport

Long-distance transport is a segment where it is possible to reap the benefits of rail transport on the basis of cooperation with road carriers. Transport to the main seaports is developing satisfactorily; on the contrary, the vast majority of intra-continental transport connections are so far performed primarily by road transport, although these are often strong traffic flows. Continental combined transport has significant room for improvement for the following reasons:

- insufficient capacity of railway transport infrastructure,
- insufficient reliability (closures, traffic restrictions due to poor condition of railway infrastructure, low stability of allocated routes, insufficient adaptation of railway infrastructure to weather fluctuations, not only in the Czech Republic), in road infrastructure an acceptable time of lane traffic exclusion in a given section is important, congestion of the motorway and road network, acceptable time for the resumption of smooth road traffic in the event of emergencies from detecting or reporting to securing the section or place concerned (e.g. accidents) and to the resumption of smooth traffic, etc.

- interoperability (slow implementation of ETCS, language barriers, persistent differences in national regulations and infrastructure parameters, lack of information for carriers on the status of ETCS implementation),
- insufficient infrastructure parameters for freight trains (slow adaptation for trains of at least 740 m in length, local constraints on structural clearances and track load classes),
- the issue of public access to business in combined transport terminals and the price for handling in the Czech Republic, with the possibility of public sector involvement,
- insufficient equipment of road carriers with transport units suitable for combined transport,
- other reserves on the part of carriers (parameters of locomotives, speed, costs, etc.).

To increase the use of combined transport, a partial solution would be to be able to insure transports against damage due to late delivery caused by operational failures on the railways.

In the case of waterway transport, it is necessary to ensure the connection of the Czech Republic to the network of European waterways, waterway transport is difficult to replace especially in the transport of oversized goods.

Measures:

- 2.2.1.1 In long-distance and interregional transport, on the basis of creating suitable conditions, ensure effective interdisciplinary cooperation with the aim of achieving a greater share of more energy-efficient modes of transport.
- 2.2.1.2 Address interregional relationships (connection of transport services between regions and to neighbouring regions abroad, permeability of borders by completing transport infrastructure).

2.3 Specific objective: Transport in metropolises and agglomerations, SUMP

- *Responsibility for fulfilling the specific goal: Ministry of Transport in cooperation with regional and municipal governments*
- *Elaboration in a follow-up strategy: Sustainable urban mobility plans and regional transport service plans*

Problems in cities associated with transport arise due to the high concentration of people and economic activities, which in turn creates a high demand for mobility. Therefore, it is necessary to influence this demand in the sense of preventing the need for mobility, so as to reduce redundant transport and carriage volumes. The transport system must meet transport needs so that it does not hamper economic development and at the same time has the least possible impact on the environment, public health and global climate change. Transport needs must therefore be met, but in the case of large cities and their agglomerations, the transport mode that is preferred in terms of meeting needs for various reasons does not always have to be applied; society-wide needs and interests must

be taken into account. The goal of sustainable urban mobility plans is to achieve the lowest possible share of individual car transport, mainly due to space requirements or limited capacity of public space. The increase in individual car transport has a negative impact not only on suburban municipalities, but also on the city itself, where a large part of people commute for work and services. Strong traffic flows can be effectively replaced by individual modes of transport that meet the need for mobility using alternative modes of transport, in particular public transport, but also pedestrian and bicycle transport.

Public transport is the main alternative to individual car transport in cities under the conditions of the Czech Republic. The introduction and use of various alternatives of public transport has a positive impact on both the quality of public life and the environment. The importance of public transport increases in proportion to the size of the city, offering greater opportunities to achieve a favourable modal split. Metropolitan areas have a great potential and opportunities for the use of public transport, including urban rail.

In cities and their agglomerations, it is therefore necessary to address mobility comprehensively within the framework of sustainable urban mobility plans (SUMP), within which it is necessary to follow the following procedure:

- Preventing mobility needs,
- Promoting the use of alternative modes of transport (public transport, active mobility),
- Reducing the negative effects of individual modes of transport in the city on public health, as well as global change,
- Humanization of street space so that the streets become a multifunctional space and not just a single-purpose high-capacity transport and parking infrastructure.

These principles apply to both the transport of passengers and the transport of goods. In connection with the deepening of the social division of labour and the growth of internet sales, the scope of carriage volumes in freight transport in cities is significantly increasing and its productivity is decreasing (ratio of carriage and transport work, net tkm / gross tkm). Prevention of mobility needs must be taken into account at the level of the urban master plan or development strategy. The urban development plan or strategy must, within the framework of development planning, evaluate the impacts of all urban development activities on the transport system, therefore the mutual coordination of strategic and spatial planning is essential.

A metropolitan area is an area containing the core city and its hinterland - the suburban area ("metropolitan countryside"). Agglomerations, the centres of which are usually regional cities and their hinterlands are internally heterogeneous, act in many cases as metropolitan areas. Therefore, the problems of these cities are largely identical to the problems of metropolitan areas, especially problems related to the environmental and social component and the quality of life of people in cities. Among other things, traffic pollution is a serious problem. It is absolutely essential to ensure relationships between the city and the suburban area. Suburban areas play a significant role in the enormous population growth, especially in metropolitan areas. The solution lies in an adequate compensation of the development of capacity of class II and III road infrastructure because a significant part of the suburban population commutes to work in the core of the metropolis/agglomeration. The result is a number of traffic jams, both within the entire suburban area and within the metropolis/agglomeration. A partial solution is offered by

park-and-ride facilities (P+R, P+G), taking into account that it is necessary to maintain a reasonable walking distance to a public transport station, but also the construction of dedicated bus lanes at the entrances to the core city and the development of electric traction in urban mass transport beyond the city limits.

Sustainable urban mobility plans must also address urban freight transport thoroughly for the following segments:

- supply of the sales network,
- logistics of industrial companies,
- e-commerce and package machines,
- waste collection,
- construction logistics²¹,
- provision of services.

Building infrastructure for urban logistics must be addressed at the level of transport (line structures, terminals), energy (line and spot power supply) and information (management of transport processes in order to minimize transport volumes to ensure the necessary carriage volume). The Capital City of Prague is working on a city logistics project in a separate process due to its complexity; in the case of regional cities, it is necessary that city logistics be addressed as part of SUMP.

Measures:

- 2.3.1.1 Based on the implementation of sustainable urban mobility plans, transform public space in cities into a multifunctional space with suitable parameters for public life.
- 2.3.1.2 Reduce the degree of motorization in large cities and their suburban areas and increase the share of use of public transport and active transport.
- 2.3.1.3 Develop services related to the mobility of people and things focused on a range of mobility options that will be an alternative to individual transport (also taking into account the specific needs of different population groups such as children, the elderly, carers, people with reduced mobility, orientation and communication).

2.4 Specific objective: Transport in rural areas

- *Responsibility for fulfilling the specific goal: Ministry of Transport in cooperation with regional and municipal governments*
- *Elaboration in a follow-up strategy: Sustainable urban mobility plans and regional transport service plans*

²¹ In cities where a waterway passes through the city centre, the use of waterway transport will also be tested as part of construction logistics. The issue is elaborated in more detail in the Freight Transport Concept.

In terms of transport issues, rural space can be understood as an area in the middle of which there is a centre of regional importance (usually cities with a size of 5 - 25 thousand inhabitants), which is not part of an agglomeration or metropolitan area or regional type city. This rural area includes municipalities that have gravitate to a regional centre and usually have maintained a certain minimum level of services. This area is served by regular transport mostly within the 1st level of services (i.e. social services in line with the definition of basic transport service). However, this space has some potential for the introduction of services that can be at least partially an alternative to individual transport.

In the regional centres as such, the strength of traffic flows is decreasing. Urban mass transport focuses mainly on providing the first level of services - basic transport service. The service must be addressed by a close connection between the ordering of regular transport to the suburban area and the needs of service of the city itself; to ensure a high-quality integrated transport system, mutual cooperation of cities with the regional customer ordering public transport is important. Even for smaller cities, sustainable urban mobility planning is a suitable tool for solving transport problems, although the content of these plans will differ from the SUMP prepared for large cities. High-quality planning of transport services on the basis of the Act on Public Services in Passenger Transport is then necessary for the entire rural area.

A lower level of transport service has the greatest impact on the population who do not own a car and are dependent on public transport. The interconnection of transport and the promotion of public transport, taking into account sensitive and sustainable urban infrastructure planning, will help balance the opportunities of different groups in society and activate their rational economic behaviour.

Measures:

- 2.4.1.1 Based on the implementation of sustainable urban mobility plans, transform public space in cities into a multifunctional space with suitable parameters for public life in medium-sized and smaller cities.
- 2.4.1.2 Reduce the degree of motorization in medium-sized and smaller cities and in their rural hinterland and increase the share of use of public transport and active transport.
- 2.4.1.3 Develop mobility-related services focusing on a range of mobility options that will be an alternative to individual transport.

2.5 Specific objective: Transport in peripheral areas

- *Responsibility for fulfilling the specific goal: Ministry of Transport in cooperation with regional and municipal governments*
- *Elaboration in a follow-up strategy: regional transport service plans*

Peripheral areas are characterized by poor access to public services, overall weak economic performance, natural growth negative in the long term. Peripheries have largely formed on the borders of some regions ("inner peripheries"), but they are also taking other forms (e.g. border areas - outer peripheries, areas at a great distance from regional centres, etc.). The level of transport service tends to be low and focused mainly on social services, while on weekends many municipalities are not served by public transport at all. Quantitatively limited transport service reduces the attractiveness of public transport,

which is why it is a transport segment whose use has been declining for a long time.

As a rule, the younger, economically productive and more educated part of the population leaves peripheral areas. This tendency is due to low living standards, low transport accessibility, high unemployment, poorer availability of public services and, more broadly, civic amenities and commercial services. An important characteristic of many peripheries is the need to travel longer distances, both for services and job opportunities. An insufficient number of public transport connections often contributes to poor accessibility, especially on weekends. It is therefore necessary to decide in the following period of time how to approach these areas, taking into account the consequences for the catchment cities:

- Option 1: keep the current condition, i.e. provision of only social services of public transport (transport to schools, to the doctor, to the authorities, to a limited extent to work), which means maintaining the current situation in terms of funding.
- Option 2: at least rough approximation to the mode of the alternative to individual transport, which would mean serving municipalities throughout the citizen day at the peaks of working days in a 60-minute interval and in other periods, including weekends, at least 120 minutes. This would be served by small buses, which will be connected to the backbone lines of the regional transport service system. This option would make public transport more attractive, but would mean greater funding requirements. Rail transport is definitely not suitable for service of this nature. Interval bus transport can be provided by low-capacity vehicles (vans with a capacity of up to 9 people, driven by a person with a type B driving license - a car up to 3.5 tonnes).
- Option 3 (applicable in the medium to long term): introduction of 2nd generation public individual transport, providing an alternative public service to private individual car transport, based on an autonomous electric vehicle.
- Option 4 (applicable in less accessible and sparsely populated areas with a dispersed settlement structure, i.e. without linear dominant traffic flows): introduction of alternative demand-oriented public or semi-public, possibly also private transport services with a modern concept (municipal taxi service, shared mobility, carpooling on voluntary or commercial basis using a smart application, flexible timetable for minibus transport in option No. 2).

Peripheral areas also need a high-quality network of lower class roads, not only in terms of quality, but also in terms of technical condition.

Measures:

- 2.5.1.1 Create an integrated transport service system to help improve the lives of citizens in peripheral areas in order to help stabilize the settlement of these areas.

2.6 Specific objective: Transport in sensitive areas and tourism

- Responsibility for fulfilling the specific goal: Ministry of Transport in cooperation with the Ministry of the Environment, regional and municipal governments
- Elaboration in a follow-up strategy: regional transport service plans and transport service plans of sensitive areas

Sensitive areas are defined as areas with a lower population density which have a high ecological value and serve as core areas in terms of ecological stability of the area, and are also highly attractive for tourism, which in certain periods generates strong traffic, especially due to individual car transport, which is a threat for the ecological and landscape value of these areas. These are mainly specially protected areas, such as national parks, segments of the 1st and 2nd zones of protected landscape areas and national nature reserves.

Measures:

- 2.6.1.1 Look for an alternative way of addressing recreational transport in ecologically sensitive areas.

2.7 Specific objective: Equal conditions and opportunities for accessibility in transport

- Responsibility for fulfilling the specific goal: Ministry of Transport
- Elaboration in a follow-up strategy: taken into account in all processes related to the Transport Policy

In many European cities, a trend based on the principles of sustainable development - gender planning in transport services, infrastructure and in spatial and transport planning - is a matter of course. Vienna, for example, has been involved in gender planning since the 1990s, when it focused on collecting gender-separated data, which revealed differences in the patterns of transport behaviour. Since then, gender mainstreaming in Vienna has been taken into account in more than 60 pilot projects focusing on public space and urban planning. Thanks to such targeted planning, it is possible to remove barriers that discriminate against entire groups of the population and, as a result, improve transport service, increase the economic activity of the population, rationally distribute resources and improve the overall living conditions of the city.

The importance of using different modes of transport and their interconnections (multimodality and intermodality) is growing, such as increasing the interconnection of rail, bus and urban transport, building multimodal transport hubs for passengers with good connections or interconnecting individual and public transport by building parking systems at public transport stations. The principle of multimodality can be assessed as beneficial for women because it is women who use public transport more often and take multiple, shorter journeys during the day, often combining different modes of transport. Likewise, this principle is beneficial for children and the elderly who use public transport more often. On the other hand, it is also important to motivate men to make greater use of alternative modes of transport instead of individual transport, which is very important in terms of meeting the targets for energy savings and reducing greenhouse gas emissions and pollutants.

The policy of equal conditions and opportunities as a cross-cutting principle of transport policy is supported by the setting of equal conditions, opportunities and accessibility and the free movement for all groups of the population. The aim is to ensure an approach targeted at all groups of transport users in order to achieve the highest possible level of accessibility of all modes of transport.

The freedom of movement of an individual is not only given by building modifications of structures that would physically impede free movement, but is also closely connected

with easy orientation within the transport infrastructure and accompanying infrastructure. Ensuring free movement for employment, family care, services for people's everyday life (e.g. health facilities, post office, trade, cultural facilities, transport services, development of public spaces, etc.) consists in the maximum possible accessibility of buildings of authorities and other institutions.

In relation to the transport system, this mainly involves the accessibility of transport structures and technologies related to them. Accessibility generally means ensuring the independent and full involvement of people with disabilities in all areas of society, by removing obstacles and barriers to the accessibility to buildings, transport and information and information technology.

Not only people in wheelchairs need to move without barriers. The removal of barriers on the structures of transport infrastructure and accompanying transport infrastructure is therefore important for all groups of citizens, such as people with reduced mobility, orientation and communication, pregnant women, carers, parents with prams, elderly people with reduced mobility or people with temporary mobility restrictions, and therefore environmental accessibility should become a common standard.

Obligations in terms of accessibility of transport infrastructure accessible to all groups of the population are linked, in cooperation with the Ministry of Regional Development, to Decree 398/2009 Coll., which ensures uniformity of adjustments across individual sectors. The Building Act and the implementing decree are supplemented by technical standards, which further ensure technical parameters (for example, ČSN 73 6425-1 Bus, trolleybus and tramway lines halts, interchanges and stations - Part 1: Designing halts).

Measures:

- 2.7.1.1 Increase the number of stations equipped with an orientation and information system in accordance with Commission Regulation (EU) No. 1300/2014 through the gradual modernization of lines and repair of station buildings.
- 2.7.1.2 Systematically remove barriers on the structures of transport infrastructure (e.g. railway platforms, underpasses, staircases, entrances to buildings or sanitary facilities), including supervision over compliance and correct application of regulations in the implementation of new buildings or in the reconstruction of existing buildings. For these reasons, investment projects will be preferred to non-investment projects to address the poor condition of buildings.
- 2.7.1.3 Ensure functional, barrier-free, safe and reliable public transport for all groups of the population.
- 2.7.1.4 Make buildings providing transport services accessible.
- 2.7.1.5 Promote the use and introduction of innovative technologies accessible to people with reduced mobility, orientation or communication and to vulnerable road users.
- 2.7.1.6 Address the discrepancy between the speed of development of new services and the ability of selected groups of the population to use them.

2.8 Specific objective: Ensuring qualified labour force in transport

Forecasts of societal development, increased use of modern technologies, robots and autonomous systems, but also the new social challenges, such as sustainable development, clearly imply that education is becoming an inevitable requirement for individuals as part of the society throughout their life, and this trend will become even more important. The Ministry of Education, Youth and Sports is responding to these requirements by preparing, with the Education Policy Strategy of the Czech Republic until 2020 coming to an end, a new follow-up document, the Education Policy Strategy of the Czech Republic until 2030+, which will define the priorities, goals and measures of the education policy and the education system in the future. The Czech economy is production-oriented and will therefore be significantly affected by technological changes. Technologies are transforming all sectors of the economy. New categories of employment are being created that change or completely replace the traditional ones. The skill sets that are needed for both traditional and new occupations are also changing. Although technological developments will lead to greater automation and are expected to reduce the number of employees or slow the growth of demand for them in some areas, these developments will at the same time create many new job opportunities. The potential for new job opportunities will be mainly in the fields of mechanical engineering, materials research, electronics and electrical engineering, transport and energy. Ignoring the potential of women in these fields can be a brake on our country's global competitiveness. Modern societies are aware that the presence of people from different social groups allows them to use their different experience, perspectives and ideas. The reasons for the different choice of occupation between men and women, but also for work in different job positions, include an education system that reproduces and strengthens inequalities between men and women, in addition to cultural and social factors.

The opportunity of employees to adapt to these changes by increasing their qualifications, especially in the field of digital skills, or by changing them will be crucial. The education system must reflect this development by supporting the development of technical thinking and looking for tools that connect the fields of study with the needs of the economy. Cooperation among educational institutions and employers, research institutions or non-profit organizations seems to be effective. In countries where cooperation among schools, businesses and social partners is applied and supported, schools can teach theoretical subjects based on the needs of individual employers (dual system).

However, education cannot become a mere mirror reflection of the short-term needs of the market and the interests of its individual, competing stakeholders. The concept of an innovative industry must be supported by strategic and long-term planning, combined with the use of high-quality education and its critical potential for the progressive development of society as a whole, or all of its various parts. The success of "Society 4.0" depends not only on technological progress, but also on the ability to harness the potential of social diversity, the specific skills and experience of different social groups, which will be reflected in the success of the whole economy, able to meet and serve their diverse needs. Therefore, it is necessary to strive to achieve the most open education system possible, removing barriers based on social class, age, gender, ethnicity, health, sexual orientation, etc.

In addition to cooperation in the development of the offer of further education, it is also a challenge for formal education institutions to become more and more providers of informal education. Whether in the form of modular education, professional courses or accredited retraining. The education system should be able to offer sufficient opportunities, i.e. educational programmes aimed at the deeper development of skills needed in

civic, professional and personal life, as well as for adults who are already outside initial education.

The transport sector has long been facing labour shortages, in particular drivers, engine drivers, skippers and ship crews. The analytical part shows that the problem also concerns the future, because in addition to the decline in the number of active people in the economy, the share of university-educated population is rising, and therefore the workforce for professions with secondary education will be increasingly scarce. It is also essential to implement positive changes in schools, especially in the manner of education (not only secondary, tertiary education, but also in professional accreditations) and in career guidance. Another prerequisite for improving the representation of the workforce in the transport industry is the promotion of job offers and recruitment campaigns, and not least the adaptation of working conditions to women.

Measures:

2.8.1.1 *Cooperation with the Ministry of Education, Youth and Sports on the innovation of the professional system of secondary vocational education and the reorganization of higher technical education:*

- Involvement of private companies from ACRI, railway carriers, private ship-owners and other entities operating in the relevant transport fields in the education system in the form of practical training, or the establishment of their own secondary schools with fields of education with an apprenticeship certificate, and cooperate on revisions of the Framework Educational Programmes of relevant fields of education.
- Establishment or possible modification of individual educational/training plans focused on individual professions in transport and the transport industry and making these fields of study more attractive to women.
- Support for modern education centres - driver simulators, traffic management, navigation, etc., which take into account the rule of equal opportunities for men and women and the benefits of socially diversified teams.

2.8.1.2 *In accordance with the draft of the Long-term Plan for Education and Development of the Education System of the Czech Republic 2019-2023, initiate systemic involvement of relevant ministries in the support of relevant schools or fields and involve employers' associations in direct and indirect support of schools.*

2.8.1.3 *Promote more the National Register of Qualifications (NRQ), a register of professional qualifications existing on the labour market in the Czech Republic. The NRQ enables applicants to obtain a nationally recognized certificate of their professional qualification also on the basis of recognition of the results of informal education and informal learning.*

2.8.1.4 *Complete the implementation of the Digital Education Strategy for 2014-2020 in the area of transport and set new strategic goals in the area of digital education.*

2.8.1.5 *Create a programme for a greater interconnection of schools with transport areas (participation of external teachers from practice in teaching, assignment of student projects by experts from practice, excursions, brigades, internships, weekend seminars, etc.)*



3 Strategic objective: Society 4.0 in transport - Link to the document Industry 4.0 and Society 4.0

In connection with the development of automation (especially in transport, for example), routine human activities are being replaced, which reduces human workload, corrects incorrect human interventions, eliminates errors and increases the performance of systems. On the other hand, there is a loss of human habits and operability, especially in cases where the automatic system does not provide the required activities or it is necessary to address non-standard or emergency situations quickly. Continuous training must be provided to persons operating or using automatic electronic systems to manage both traffic situations in terms of control and cooperation with automatic electronic systems, as well as situations involving non-standard emergency and critical situations which the automatic system does not deal with. Progressive automation could cause a situation in which people will just use the equipment, rely entirely on it, and will not recognize, because of the lacking experience with systems without automatic evaluation and decision-making, that there has been a system failure or even a critical situation that they need to understand and handle. The management of such critical and dangerous situations can be trained in facilities that most realistically reproduce emergency situations arising in actual operation. This approach avoids a decline in the ability to handle critical situations due to lack of practice.

Another important issue is the factor of the human psyche, which affects adaptability to technological innovation. The public should be informed and educated about the benefits of using and properly using ITS and C-ITS systems in real life. However, informing and educating the public must be ensured in such a way that citizens' expectations of these new, and especially breakthrough, technologies are realistic and citizens are aware not only of the benefits but also of certain risks associated with these technologies, which are constantly evolving. This education should be provided not only through lifelong learning, but also through thematically focused training courses and awareness campaigns, including the possibility of testing these technologies in practice in order to better acquire habits and skills. Such an approach will help create the necessary awareness and at the same time help remove psychological barriers to the use of these new breakthrough technologies, as well as motivate users to use them correctly.

3.1 Specific objective: Telematics in transport

- *Responsibility for fulfilling the specific goal: Ministry of Transport*
- *Elaboration in a follow-up strategy: Strategic Plan for the Development of Intelligent Transport Systems (ITS) in the Czech Republic 2021 - 2027 (with an outlook to 2050)*

Intelligent transport systems - main trends for the future

The interconnection of the transport system and the related information through intelligent transport systems (ITS) improves the safety and smoothness of traffic, increases the efficiency of the transport process and makes it more environmentally friendly. Thanks to equipment that collects and creates data, it is possible to create new information sources and provide new information services. The main challenge for ITS is to be a tool for providing high-quality transport services whose conditions of provision and information on the traffic situation are predictable by and understandable to users, making it easier for users to use multiple modes of transport without the multimodal access constituting

a significant barrier for them. Technological development supports the strategic shift from the simple construction of transport infrastructure to the operation of transport networks and to the organization and management of the process of relocation of people and things on these networks. Increasingly, the management of traffic and related operations is being replaced by technology and is automated. It is a never-ending and repetitive process, due to the availability of technological solutions not only from a technical point of view, but especially economically. This is also related to acquisition and operating costs.

Transport must be operated in a safe way, i.e. its operation should be ensured in such a way that there are no collisions of means of transport, collision situations that can be foreseen and resolved in advance, and that the transport infrastructure is in a standard state that does not damage the means of transport (e.g. derailment). Furthermore, transport (both traffic and infrastructure, etc.) must be designed and secured against emergencies (e.g. floods, terrorist attacks, etc.).

New technologies in the past have already provided and will continue to provide additional opportunities for the deployment of active elements of traffic safety, for the reliable and safe operation of ITS systems, which the end users perceive as ITS systems credible for them. At present, the issue of self-driving vehicles resonates very strongly. Fully automated road vehicles are not yet normally put into live operation, so far these vehicles equipped with various degrees of automation of vehicle steering are still in trial operation. But the deployment of cooperative ITS systems (C-ITS) is very current and becoming a reality now. C-ITS systems are based on communication (two-way data exchange) concerning the current situation in road traffic²², both among the vehicles themselves and among vehicles and equipment on the road infrastructure. C-ITS systems do not directly interfere with the vehicle's steering systems, the appropriate response is up to the (pre-warned) driver's decision. Thanks to the warning message received, the driver can be informed in advance so that they can react as quickly as possible (according to their abilities) to an unexpected situation in road traffic. Even with reduced visibility when, for example, they would otherwise react correctly and on time under better conditions.

On the railways, the process of transition to intelligent control began with the construction of ERTMS, i.e. the EIRENE digital radio link (initially using GSM-R technology, then using FRMCS technology) and the single European train control system ETCS. This is now taking place intensively on the tracks and on vehicles in the Czech Republic. From 1 January 2025, the exclusive operation of all trains under ETCS supervision will be introduced on selected railway lines and its installation on other lines and vehicles will continue. The provision of safely-relevant train control functions by the ERTMS system creates a basic precondition for the introduction of higher degrees of automation of railway traffic control, namely ATO (automatic train operation) and ATS (automatic train supervision). This is an example of the application of the principles of the Internet of Things in transport.

Further development of ITS will also concern waterway transport (River Information System RIS, Maritime Information System).

The emerging and rapidly evolving technologies of ITS and C-ITS are putting great pressure to make products and services using these systems work safely, reliably and predictably. In this sense, the current legal situation for ITS and C-ITS systems needs to be assessed and, taking into account the complexity of the emerging technologies, careful consideration should be given to whether or not existing legislation needs to be amen-

²² in particular those which may endanger another road user or cause an accident

ded for these systems and the respective conclusions duly substantiated. In this regard, particular attention should be paid to the following areas:

- construction, modernization, repair, maintenance or operation of an intelligent transport system²³, cooperative intelligent transport systems (C-ITS), geographic information systems, global navigation satellite systems and Earth observation systems,
- security solutions for cooperative ITS systems (C-ITS) in order to ensure the credibility of the entire C-ITS system and the integrity of transmitted data so as to eliminate the risks associated with affecting the data content or with the deployment of invalid data.

The principle of cooperative ITS systems is the dissemination of information and warning messages among the C-ITS units of different manufacturers (vehicle and infrastructure) located in the given location, so it is necessary to ensure mutual credibility of this equipment and at the same time to eliminate from the system messages from units that are not considered as credible by the common certification authority. Building a certification authority is not only about the technical solution, but also about setting up procedures so that the entire system is safe and credible in the long run.

Benefits of ITS in the following areas:

- **Sustainability**
ITS make it possible to organize the process of relocating people and things and to further influence traffic in such a way that the existing transport network can be better used, i.e. it is possible to organize traffic flows in such a way as to minimize the need for seizures of agricultural and forest land on which new parts of the transport network would otherwise be built. ITS technologies can provide data that can be used to reduce the costs of operating and maintaining transport infrastructure, as well as data on the availability of filling and charging stations, thus improving the comfort of users of alternative fuel vehicles.
- **Energy efficiency**
ITS makes it possible to optimize traffic flows in such a way that vehicles run smoothly without sudden stops and subsequent starts, thus eliminating excessive energy consumption. Energy savings will also be applied in the future by reducing the aerodynamic drag of platooning vehicles.
- **Optimization of the use of modes of transport**
A large amount of data is currently available. An important issue is the availability of data and their accessibility for different groups of users with specific needs. It is important to provide the end users (transport participants) with data relevant for them, which will increase their real-time awareness. Data sharing mechanisms and work on interoperability and standardization issues need to be further developed.
- **Specific approach by types of territory/region**
Currently, the massive development of large cities is evident. In addition to construction projects related to transport infrastructure, it is necessary to invest in ITS systems for influencing and managing urban car traffic, urban mass

transport and city logistics. It is also possible to adapt the ITS function to rural areas. ITS systems can be used in cases of certain restrictions on the use of the road network (restrictions on the operation of vehicles using traffic signs).

3.2 Specific objective: Autonomous steering in all modes of transport

- *Responsibility for fulfilling the specific goal: Ministry of Transport in cooperation with the Ministry of Industry and Trade*
- *Elaboration in a follow-up strategy: Autonomous Mobility Development Vision, Autonomous Steering Action Plan*

Automated and autonomous steering

The area of automated and autonomous transport represents a dynamically developing area, which is an opportunity for the Czech Republic with a traditionally strong automotive industry (9% of Czech GDP, 25% of exports, about 170 thousand directly employed people, and another 400 thousand in the related industries) to strengthen its competitiveness and to ensure further development of transport as a whole. The mobility services sector (mobility-as-a-service concept), smart cities and regions and newly developed logistics solutions such as autonomous consignment transport are closely related to the development of automated and autonomous transport. Automated and autonomous transport is generally a global trend with an overlap in fields such as artificial intelligence, Internet of Things and digitization. Its gradual proliferation into the transport system can be expected to bring benefits in terms of increased safety, improved accessibility of transport and services, as well as reduced emissions with a positive impact on the environment, as well as reduced personnel costs. This is a highly innovative area, the development of which will be supported, among other things, by strengthening the innovation environment in the Czech Republic and focusing on the knowledge economy. Similar objectives apply to urban rail transport, with track transport generally having better initial preconditions for full automation where solutions usable in practice are already available.

It is therefore necessary in the coming period to actively support the development of automated and autonomous transport, which can be considered as one of the main trends determining the shape of the transport sector with a significant impact on users. It is a set of measures related to the transport and technical area, which will enable the advent of automated and autonomous transport. Creating an appropriate legal environment in the Czech Republic for trial and normal operation, social acceptance, ethical issues or support for education and awareness are other areas that need to be intensively addressed in connection with automated and autonomous transport. Equally important is the support of related research and testing and the continuous strengthening of international cooperation, sharing of good practice, coordination of activities, etc.

Measures:

- 3.2.1.1 Actively support the development of automated and autonomous transport in road, rail, urban public transport and inland waterway transport.

²³ Section 39a(1) of Act No. 13/1997 Coll., on roads, as amended

3.3 Specific objective: Support for the development of research, development and innovation in transport

Research, development and innovation

- *Responsibility for fulfilling the specific goal: Ministry of Transport in cooperation with the Technology Agency of the Czech Republic*
- *Elaboration in a follow-up strategy: Concept of Research, Development and Innovation in the Transport Sector until 2030*

Research, development and innovation in transport (hereinafter referred to as “Transport R&D&I”) is an integral part of transport development with a major impact on the competitiveness of the Czech Republic, the efficiency of its economy with a dynamic impact on the market with goods, services and labour, and also increasing the quality of life in the Czech Republic. Support for the development of Transport R&D&I and the provision of sufficient funding leads to the strengthening of an effectively interconnected innovation ecosystem, the development of services and, as a result, to an increase in the quality of life. At the same time, it is necessary to develop Transport R&D&I with regard to other cross-cutting areas - the environment, energy and optimization of the use of modes of transport. Synergies between individual areas contribute, among other things, to meeting societal challenges, such as increasing operational safety, mitigating negative environmental impacts, reducing economic demands and strengthening sustainability. Innovation in transport, such as data-linked, cooperative and automated mobility, electromobility and drones, and their interconnection with the broader areas of digitization, artificial intelligence, the Internet of Things are also an integral part of Transport R&D&I. It is necessary to build a sufficiently robust system, but at the same time to respond flexibly to these and other new trends.

Transport R&D&I are significantly related to the topics of innovation and new technologies for the construction and maintenance of transport routes, technologies supporting the safety and economy of vehicle operation, technological solutions for transport management processes, as well as procedures, principles and solutions in the field of organization of transport and carriage processes. Ensuring sufficient funding through a specific national financial instrument and supporting the involvement of Czech entities in the EU framework programmes for research and innovation are preconditions for the development of Transport R&D&I in the context of support for an innovative environment. At the same time, it is necessary to support the development of a mutually influencing and well-cooperating system of Transport R&D&I, to strengthen cooperation among research organizations and the private sector and to support the applicability of results in practice through appropriate measures. The priorities of Transport R&D&I reflect the main objectives of the Transport Policy, thus contributing to its fulfilment.

To strengthen the knowledge base, it is appropriate to provide long-term financial support to a departmental research institution (Transport Research Centres), which forms a significant research and knowledge base in the entire transport research system and its research focus covers the key needs of transport development in the Czech Republic. The Ministry of Transport uses the scientific capacities of the departmental research institution mainly as a source of expert and research information and knowledge, and therefore it is necessary to work purposefully to create conditions for the ongoing support of these activities.

R&D&I priorities are based on strategic documents - National Policy for Research, Deve-

lopment and Innovation of the Czech Republic 21+, Innovation Strategy of the Czech Republic 2019-2030 and other documents defining specific areas of support such as the Memorandum on the Future of the Automotive Industry in the Czech Republic, and they are further elaborated in a follow-up document, i.e. the Concept of Research, Development and Innovation in the Transport Sector until 2030.

Within the development of Transport R&D&I, emphasis will be placed on the observance and strengthening of the principles of equal opportunities and non-discrimination and the fulfilment of all social needs, including the needs of disadvantaged persons. This approach will continue to be supported and will, inter alia, become the starting point for transport research, development and innovation policies and strategies.

Measures:

- 3.3.1.1 Strengthen a stable system of support and development of Transport R&D&I, which is a prerequisite for the development of efficient, sustainable, safe and inclusive transport based on innovative approaches and new solutions.
- 3.3.1.2 Implement a departmental programme aimed at supporting applied research in transport and ensure its long-term financial security.
- 3.3.1.3 Support international cooperation in the field of R&D&I.
- 3.3.1.4 Take into account a non-discriminatory approach in the development of policies and strategies for research, development and innovation in the field of transport, which will be based, inter alia, on the principles of equal opportunities and diversity.

3.4 Specific objective: Activities in outer space

- *Responsibility for fulfilling the specific goal: Ministry of Transport*
- *Elaboration in a follow-up strategy: National Space Plan*

Activities in outer space are an important factor in the development of transport, especially as a result of satellite navigation systems, Earth observation (satellite imagery) and satellite telecommunications. These are critical operating systems with a major impact on the industry as a whole:

- Satellite navigation: streamlining in car transport and aviation (navigation in the phase of taxiing for take-off, flight and approach, drones), preparation of new solutions for rail transport and public transport, important in ITS, condition for autonomous mobility (vehicles, drones), condition for door to door mobility, etc.
- Earth observation: weather forecast (traffic control, maintenance and construction of infrastructure), planning of line structures, monitoring of the condition of transport infrastructure, safety of transport infrastructure, monitoring of transport impacts on the environment, etc.
- Satellite telecommunications: logistics, IoT networks associated with ITS, waterway and air transport, new way of air traffic control, back-up communication solutions in transport.

Transport in outer space is becoming a new mode of transport: rocket launches and launching satellites into orbit are becoming more frequent, mainly due to massive private sector investments. With regard to international law, it is necessary to address the issue of authorizing the launch of new satellites in relation to the state's liability for possible damage caused by a satellite made in the Czech Republic (2 Czech satellites have been launched into orbit in the last 2 years, another 4 are planned in the coming years, it is a growing trend). In addition to ensuring the operation of satellites or entire satellite systems, the issue of monitoring and controlling traffic in orbit, as well as the emerging trend of suborbital flights, etc., need to be addressed more and more intensively in this context. This will be mainly about regulatory adjustments, which will be addressed mainly internationally.

Measures:

- 3.4.1.1 Apply satellite data in transport where they bring added value to transport users, transport operators and transport infrastructure managers (e.g. logistics, long-distance freight transport, etc.) or higher safety.
- 3.4.1.2 Standardize the use of satellite systems in transport and ensure their further integration into the dispatching and control systems of means of transport of all modes of transport, development of services for drivers (e.g. meteorological data).
- 3.4.1.3 Use data from remote sensing of the Earth to monitor the stability and safety of transport infrastructure and evaluate the condition of transport infrastructure.

3.5 Specific objective: Spatial data and information in transport

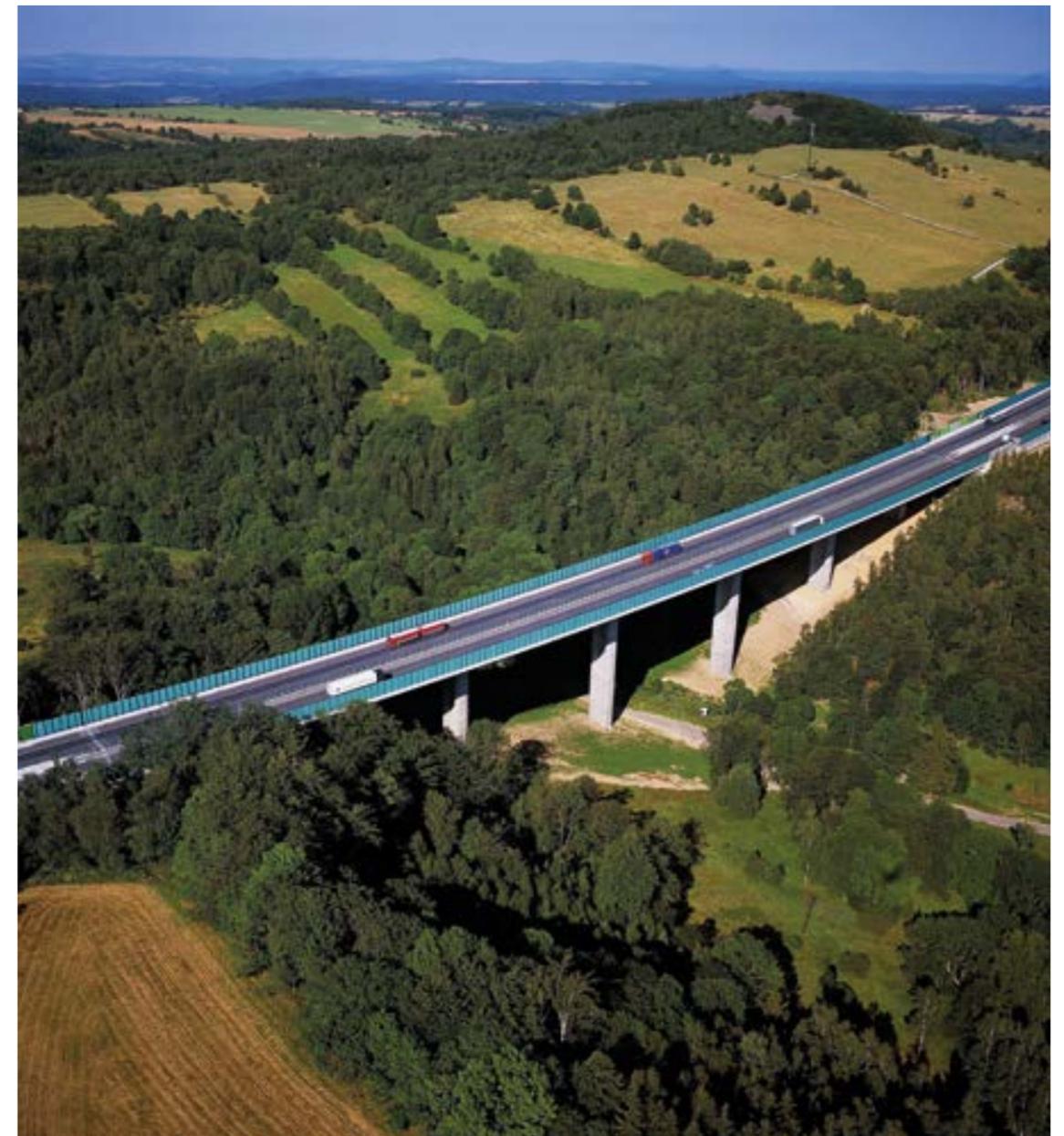
- *Responsibility for fulfilling the specific goal: Ministry of Transport*
- *Elaboration in a follow-up strategy: Strategic Plan for the Development of ITS in the Czech Republic until 2027 with an outlook until 2050 and the related Strategy for the Development of Infrastructure for Spatial Information in the Czech Republic until 2020*

Digital maps

Spatial data sets (digital maps) are a basic information base for the needs of planning, construction and maintenance of transport infrastructure and for the organization and management of transport. The efficiency and, in part, the safety of transport depend on the level of coverage, quality and detail of the description of physical infrastructure in the terrain, i.e. roads, railways, air infrastructure and waterway infrastructures, and on the description of phenomena on transport infrastructure. Existing spatial data sources and services based on these data do not fully reflect the needs of transport and are far from using their potential for optimization in transport. The territorial context for the analysis of the origin and development of negative phenomena in transport is the basis for the prevention of occurrence of these phenomena and also the key to their solution. High-quality spatial data sets are also the basis for further digitization in transport, development and implementation of new mobility schemes and one of the factors in the implementation of autonomous transport (HD maps), in all of their types.

Measures:

- 3.5.1.1 Reinforcement of existing and construction of new spatial data sets, data handling systems (GIS) and spatial data services.
- 3.5.1.2 Implement spatial data and services into the entire life cycle of transport infrastructure and into the organization and management of transport.
- 3.5.1.3 Determination of autonomous mobility requirements for HD map materials, including pilot verification of the collection and updating of these data and verification of their deployment in a simulated environment, including research into alternative positioning methods.



Long-term outlook

Within the outlook until 2050, the following trends and development directions can be expected:

Outlook in the field of transport infrastructure development

- The primary goal is to involve the entire area of the Czech Republic in a common European system of value creation and consumption with the help of high-quality and generally available transport of people and goods.
- This transport must be sustainable, i.e. independent of fossil fuels, with minimal energy intensity and with minimal negative effects on nature and the environment.
- Due to the minimization of energy intensity and externalities, the priority is to use emission-free and low-emission public transport.
- An optimal solution of transport tasks is based on the principle of mutual cooperation and complementarity of individual transport systems, on sustainable multimodal mobility.
- The structure of transport must reflect not historical, but current and future settlements, i.e. it must meet the needs of urban, regional and interurban transport, both in passenger transport and in the transport of goods.
- The tool for addressing the differences between the current and future state of transport networks is the implementation of transport structures. It will be necessary to complete the basic network of transport infrastructure of all modes of transport. The planned high-speed rail network should be completed by around 2050.
- Other needs for the development of transport networks will be monitored on an ongoing basis, to be focused mainly on capacity bottlenecks. The development of this network must respect the network of large-scale protected areas in the Czech Republic, including development plans in this area.
- In addition to the transport network itself, it is necessary to build the relevant energy and information networks in parallel.
- In addition to the development of the transport infrastructure (line structures and multimodal terminals), it is also necessary to ensure the harmonious development of means of transport and, in the case of transport of people or goods in the public interest, the harmonious development of ordered services in the public interest.
- In the case of inland waterway transport, the possibility of building a Danube - Odra - Elbe canal connection will be monitored, based on the final form of a government resolution based on the prepared Feasibility Study of the Danube - Odra - Elbe Canal Connection (the Elbe branch was not recommended by the Ministry of Transport for further monitoring due to high investment costs and based on the economic results). Further project preparation will only continue if feasibility is demonstrated in terms of the environmental impacts in the follow-up stage. This canal connection could be completed around 2050.
- The implementation of all the above topics is contingent upon the availability of adequate investment funds after 2030.

- Promote dual requirements (parameters of transport infrastructure in terms of the use of civilian and military equipment) for transport infrastructure in terms of promoting the goals and ambitions of the EU Military Mobility Action Plan.

Outlook for ITS development until 2050

- ITS will face the following main challenges, which will need to be addressed gradually:
 - operational safety, security of ITS systems against misuse or deliberate attack, and protection of privacy,
 - method of management of data generated by the public and private sectors and their sharing and use, a common vision needs to be achieved between public and private stakeholders,
 - building a new digital layer of transport infrastructure,
 - integration of new ITS and C-ITS solutions with existing systems and ensuring national and international interoperability.
- In the transport system, breakthrough innovation and knowledge from research and development activities will be transformed into new products, processes and services that will help transport become safer, more efficient and more environmentally friendly.
- Although new technologies play an important role in the innovation and transformation process, they only constitute one of the components of the whole process. It is not possible to expect that "a miracle technology will come" that will solve all traffic problems.
- The transformation of the transport system requires a comprehensive strategy and its implementation must be ensured in such a way that all stakeholders, including the public, who will be affected by the technological change are already included in the strategic planning.
- People are the basic building block for introducing innovation. It is necessary to support cooperation with the academic sphere and the corporate research sphere, especially to support young talented scientists who can make Czechia more attractive for emerging technologies.

Transport safety

- Autonomous intelligent means of transport with and without operator, safe operation, control by a system based on artificial intelligence.
- Total automation providing confidence in system safety.
- Robust modular units and infrastructure tools, easy to maintain and repair using a robotic automated system, ensuring reliability and operational safety.
- Real-time monitoring of the condition of assets through a wide range of diagnostic tools, interconnected in an Internet of Things environment, providing the basis for a predictive-maintenance decision-making process.

Traffic safety

- Robust and resilient information and communication technology infrastructure.
- Digital systems fully protected by advanced cybersecurity technologies.
- Integrated risk management approach focused on the whole transport sector.
- Non-invasive safety measures that do not affect passengers.
- Goods tracking and tracing systems supporting safety aspects.
- Technologies and solutions that meet the highest privacy requirements.

Autonomous and automatic systems

- Vehicles, infrastructure, security and control systems fully digitized.
- Networking of elements through the Internet of Things.
- Use of artificial intelligence, with a high degree of autonomy.
- Autonomous, intelligent vehicles responsive to the traffic situation, ensuring safety and reliability at higher traffic densities.
- Adaptive and reliable system management models adapted to transport demand.

Digitization

- Application of digitized technologies for modelling and process control.
- Technologies relying on fully digital 1:1 models (digital twins) in real time, collaboration models that involve both customers and suppliers.

Effective use of assets

- Intelligent asset management based on the entire life cycle - systematic and coordinated activity that leads to optimal asset management, associated activities, risks and expenses throughout the life cycle.
- Assets that automatically communicate with all stakeholders, optimized robotic maintenance management, automated adjustment of services offered to match the appropriate state of resources.
- Infrastructure and vehicle management is effectively managed through the flow of information from diagnostic tools to ensure appropriate real-time intervention, self-diagnostic and self-repairing infrastructure capabilities, limiting necessary operational disruptions.

Outlook for the use of alternative fuels in transport

- Application of alternative energies in railway transport:

- a crucial part of passenger and freight transport services will be implemented in the electric traction of the AC system 25 kV, 50 Hz,
- the peripheral parts of the network will be served by accu-trolley vehicles or other alternative drives.
- The application of alternative energies in waterway transport will first be based on liquefied natural gas, LNG, and with further technical progress then on electricity or hydrogen technology.
- Application of alternative energies in road transport:
 - Cars used mainly for shorter distances will be powered by batteries, which will be recharged during parking, especially at night and in other periods of energy valleys. If these cars are used over longer distances, two-track traction lines will be available on the backbone lines to power vehicles as well as to ensure dynamic charging while driving, as well as fast-charging and ultra-fast charging stations (with a power of up to 350 kW),
 - cars with a larger share of trips over 500 km will be equipped with hydrogen fuel cells or fuel cells using synthetic methane. However, with regard to significantly faster and more convenient high-speed rail travel and the transfer of 75% of the carriage volume of freight transport from road to rail, the use of long-distance cars will be minimal, the focus will be on the first and last miles.
- In the case of larger cities, urban mass transport systems will increase the share of rail system performance in electric traction and develop partial trolleybus networks complemented by a network of electric buses. In the case of medium-sized cities, it will involve the development of a network of partial trolleybuses and electric buses.
- Road freight transport, intercity road transport and waterway transport will use mainly CNG or LNG into which biomethane will be mixed. In the next stage, natural gas will be replaced by synthetic methane or hydrogen. For all these transports, the electric drive is also tested at the same time.



Implementation part

Follow-up processes

The Transport Policy is the top document for the transport sector, the objectives of which are further elaborated in follow-up plans, concepts, strategies and processes, which will be assessed in terms of creating conditions, inputs and measures for ensuring the defence and security of the Czech Republic.

Transport sector strategies

The transport sector strategies updated in 2018 constitute the main plan focused on the financing and development of rail, road and waterway transport infrastructure. The main objectives of the transport sector strategies are:

- create a database of all known plans in the field of development of transport infrastructure of all modes of transport owned by the state; determine the extent of financial needs for regional infrastructure,
- using the forecast (for 2025, 2035 and 2050) compiled with the use of the national multimodal transport model, determine the importance of the plans by means of multi-criteria evaluation and simplified evaluation of benefits and costs; plans are divided into projects and topics (the boundary between the two types of plans is not sharp, both categories differ in the state of preparation and the amount of information available),
- forecast of financial possibilities,
- distribution of funds for the purposes of repairs, maintenance and operation of infrastructure and for development plans,
- setting a schedule for the preparation and implementation of projects and ideas based on the order of importance and the availability of financial resources.

Strategy update: approved by Resolution of the Government of the Czech Republic No. 136 of 27 February 2018

Sponsor: Ministry of Transport

Monitoring: evaluation of effectiveness and updating in 2023 at the latest

Strategy information: www.dopravnistrategie.cz

Public Transport Concept

The area of transport service is currently being addressed through the Act on Public Services in Passenger Transport and national and regional transport plans. Further direction of the public transport system, including the selection of the system organization option, is set out in the White Paper - Public Transport Concept, which selected an option of the public transport organization structure, the necessary legislative modifications and a proposal for financing the system. The concept will be updated.

Date of completion of the update of the Public Transport Concept: 31 December 2020

Sponsor: Ministry of Transport in cooperation with the local government

Strategy information: <https://www.mdcz.cz/Dokumenty/Verejna-doprava/Pravni-predpisy/Zelena-a-bila-kniha-koncepcie-verejne-dopravy>

Follow-up steps: Transport service plans with a medium-term perspective of 5 years prepared by each customer ordering public transport

Freight Transport Concept

The Freight Transport Concept focuses on improving conditions in all types of freight transport; in accordance with the goal of increasing energy efficiency in transport, special attention is paid to the cooperation of road and rail carriers within continental combined transport.

Strategy completion date: approved document of the Resolution of the Government of the Czech Republic No. 57 of 25 January 2017

Sponsor: Ministry of Transport

Monitoring: evaluation of effectiveness no later than in 2020, updating in 2021 at the latest

Strategy information: <https://www.mdcz.cz/Dokumenty/Strategie/Koncepcie-nakladni-dopravy-pro-obdobi-2017-2023-s-v>

Concept of Urban and Active Mobility for the period of 2021-2030

The process of planning sustainable urban mobility falls under the independent competence of the municipal government. The original intention to draw up these plans only for large cities proved to be inappropriate because smaller cities also have transport problems. If this process is to be properly handled, cooperation of municipal and regional governments and methodological guidance by the state are necessary. The first generation of the elaborated plans is currently being evaluated, and on the basis of this analysis a conceptual document of a methodological nature will be prepared, focusing on the various categories of cities that will elaborate the plans. The concept will have a recommendatory nature for the local government and its implementation part will include a set of methodologies and procedures that cities can use. The document will be submitted to the government for approval in order to support the issue within the transport sector (but also energy, environment) as an important process.

Concept completion date: 31 December 2020

Sponsor: Ministry of Transport

Strategy information: in preparation

Strategic Plan for the Development of ITS in the Czech Republic until 2027 with an outlook until 2050

For the area of intelligent transport systems in the field of road transport and for interfaces with other modes of transport, the Strategic Plan for the Development of Intelligent Transport Systems (ITS) in the Czech Republic until 2027 (with an outlook until 2050) has been prepared, including its elaboration in the Action Plan (determination of the time schedule of follow-up steps and the method of financing). The document does not only deal with road transport, but also with urban transport, public passenger transport and rail transport.

Update date:	2020
Sponsor:	Ministry of Transport in cooperation with regions, statutory cities, traffic police, rescue services, transport and logistics companies and relevant professional organizations
Monitoring:	continuous evaluation of effectiveness no later than in 2018, updating in 2020 at the latest
Strategy information:	https://www.mdcrcz/Dokumenty/Strategie/ITS/Akcni-plan-rozvoje-intelignentnich-dopravnich-systemu

National Action Plan for Clean Mobility

The aim of the document National Action Plan for Clean Mobility is to create a strategy of the Czech Republic in this area, to evaluate the current development of the vehicle fleet in the Czech Republic (summary of projects or support for the use of alternative propulsion vehicles) and the impact of transport on the environment. It will set objectives for clean mobility in the Czech Republic and measures to strengthen the share of alternative propulsion vehicles. In line with the urgency of social need, the document is gradually shifting from an exclusive focus on individual car transport to public transport.

Strategy update completion date: approved document, Government Resolution No. 469 of 27 April 2020

Sponsor: Ministry of Industry and Trade in cooperation with the Ministry of Transport and the Ministry of the Environment

National Road Safety Strategy

The forthcoming National Road Safety Strategy 2021-2030 will aim to reduce the number of people killed and seriously injured in road traffic by 50% by 2030.

Strategy completion date: 31 December 2020

Sponsor: Ministry of Transport

Monitoring: evaluation of effectiveness takes place annually

Strategy information: <https://www.ibesip.cz/Pro-odborniky/Narodni-strategie-BESIP/Aktualni-strategie>

Tax Policy in Transport Taking into Account Externalities

The aim of the project is the implementation of selected tasks and measures resulting from the National Action Plan for Clean Mobility and the Action Plan for the Development of the Automotive Industry. The aim of this document is to assess possible options in the field of taxation and charging of road vehicles in terms of the wider introduction of alternative fuel vehicles. With regard to the Ministry of Industry and Trade's document Proposal of measures to improve the structure of the vehicle fleet in the Czech Republic, the benefits of these measures in terms of improving the structure of the fleet will also be assessed. Within the 1st phase of the project, suitable options of taxation/charging were selected (e.g. introduction of a flat road tax or registration tax), which were modelled within the 2nd phase of the project. Based on the outputs of this simulation, an evaluation and interpretation of the calculations will be performed (especially with regard to the impact of individual measures on the state budget) and specific recommendations will be formulated.

Project completion date: 31 December 2020

Sponsor: Ministry of Transport

Monitoring: evaluation of effectiveness takes place annually

Programme for the Development of High-speed Railway Connections in the Czech Republic

The document High-speed Connection Programme was approved by Government Resolution No. 389 of 22 May 2017. Based on this document, the government confirmed the need to prepare the High-speed Connections system (a network of high-speed lines and conventional lines of higher parameters such as the system of transport infrastructure, security, vehicles, energy and operational concept). Furthermore, the Technical and operational study enabling the design of high-speed lines was approved and contacts were established with foreign railway administrations operating high-speed railway systems. The next step will be the completion of feasibility studies for the individual branches of the high-speed connection, including the key railway junctions into which the system will open.

Study completion date: approved, one-off process for starting the preparation of the High-speed Connections concept, evaluation will be completed after the completion of feasibility studies of the individual projects.

Sponsor: Ministry of Transport in cooperation with the Ministry of Regional Development and the Ministry of Industry and Trade

National Space Plan 2020-2025

The development of the Czech space sector is closely linked to the European space policy and the strategies of the European Space Agency (ESA) and the European Union (EU). The document National Space Plan is intended for bodies that will decide on the further direction of the Czech Republic in the field of space activities. The document sets out the context for the space sector and space activities and proposes ways and measures to maximize the return on public investment.

Strategy completion date: approved document
Sponsor: Ministry of Transport
Monitoring: update in 2025
Strategy information: <http://www.czechspaceportal.cz/2-sekce/kosmicke-aktivity-cr/narodni-kosmicky-plan/>

Autonomous Mobility Development Vision and Autonomous Mobility Action Plan

The Autonomous Mobility Development Vision defines the basic concepts in the field of autonomous mobility and also contains specific topics in testing, development of cooperative systems or requirements for the transport and communication infrastructure, and defines priority areas to support the development of autonomous mobility and future steps, including the elaboration of the Autonomous Steering Action Plan, support for testing and operation of autonomous vehicles, elaboration of a feasibility study for the testing of the technological solution of autonomous vehicles at the test site and development of cooperation with neighbouring countries in the field of cross-border testing of autonomous vehicles. The Autonomous Steering Action Plan, which follows up on the Autonomous Mobility Development Vision and is also in line with the Memorandum on the Future of the Automotive Industry in the Czech Republic, contains specific measures in the in the areas of transport and technical infrastructure, legislation and standardization, ethics, research and development and the promotion of education and awareness. The Memorandum on the Future of the Automotive Industry in the Czech Republic also defines specific activities and in their framework the topics for the direction of support in the field of research, development and innovation are continuously updated; they include autonomous mobility, smart infrastructure or mobility as a service.

Strategy completion date: approved document (Autonomous Mobility Development Vision)
Sponsor: Ministry of Transport
Monitoring: continuously
Strategy information: https://www.czechspaceportal.cz/files/files/ITS_new/Ostatní/Vize%20rozvoje%20autonomní%20mobility.pdf

Air Transport Concept

Air transport is the only transport sector whose transport infrastructure is financed on the basis of financial efficiency and return. The airport infrastructure is decentralized (only the Václav Havel Prague Airport is under state administration). The concept therefore categorizes the airport as an input for spatial planning documents.

Strategy completion date: Approved document
Sponsor: Ministry of Transport
Monitoring: evaluation of efficiency no later than 2021, update in 2022 at the latest

Waterway Transport Concept

A separate concept will be developed for the area of waterway transport due to its specifics - in addition to transport functions, waterways also perform a number of other functions and it is therefore an intersectoral area.

Strategy completion date: The concept was completed in 2018; it was necessary to determine the prevailing public interest and compensatory measures due to the significant negative impact on selected objects of protection of the Natura 2000 system. The Government of the Czech Republic identified inland navigation as the predominant public interest over the protection of selected Natura 2000 objects. The document has so far only been noted by the Government of the Czech Republic, but has not been approved because pursuant to the expert opinion of the Bohemian Switzerland National Park Administration from November 2018, prepared for the SEA process, it is not possible to compensate for negative environmental effects due to the construction of weirs near Děčín and Přebouč.

Sponsor: Ministry of Transport in cooperation with the Ministry of Agriculture, Ministry of the Environment, Ministry of Industry and Trade and Ministry of Regional Development
Monitoring: evaluation of efficiency no later than 2022, update in 2023 at the latest

Legislative instruments

Between 2021 - 2027, the following legislative process will take place (selection of amendments to the most important acts):

- **Draft amending Act No. 61/2000 Coll., on maritime navigation, as amended**

In the context of EU directives: Directive (EU) 2019/883 of the European Parliament and of the Council of 17 April 2019 on port reception facilities for the delivery of waste from ships and Directive (EU) 2019/1159 of the European Parliament and of the Council of 20 June 2019, it is necessary to ensure their transposition into the relevant national law, i.e. Act No. 61/2000 Coll., on maritime navigation, as amended.

The proposed national legislation seeks to improve the protection of the seas against pollution. A requirement for the disposal of ship-generated waste in ports will be introduced, which will apply to all vessels at sea.

Shipowners will therefore have an incentive to comply with these obligations as a result of greater pollution penalties and the introduction of flat-rate fees for handing over waste in ports, without linking it whether or not it is actually handed over.

- **Draft amending Act No. 49/1997 Coll., on civil aviation and amending Act No. 455/1991 Coll., on trade licensing (Trade Licensing Act), as amended, as amended (hereinafter only the "Civil Aviation Act")**

Regulations were adopted at EU level - Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, Commission Delegated Regulation (EU) 2019/945 of 12 March 2019 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems, Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft, and Commission Implementing Regulation (EU) 2019/103 amending Implementing Regulation (EU) 2015/1998 as regards clarification, harmonization and simplification as well as strengthening of certain specific aviation security measures -, the implementation of which in the Czech Republic requires the adoption of an amendment to the Civil Aviation Act. In particular, the Act needs to specify entities that will be authorized to perform the individual tasks arising from the above regulations, to set sanctions for non-compliance with the rules they lay down and, last but not least, to adjust some existing institutes to comply with EU law.

The draft legislation also aims to make partial changes to Part Eight, governing the protection of civil aviation against acts of unlawful interference.

- **Draft amending Act No. 114/1995 Coll., on inland navigation, as amended (hereinafter referred to as the "Inland Navigation Act")**

In 2020, the process of transposing Directive (EU) 2017/2397 of the European Parliament and of the Council of 12 December 2017 on the recognition of professional qualifications in inland navigation and repealing Council Directives 91/672/EEC and 96/50/EC will be launched. This entails the need to amend the Inland Navigation Act.

That Directive introduces uniform requirements for the crew members of inland waterway vessels throughout the EU, and therefore de facto abolishes in particular the specific

regime of navigation on the Rhine and the adjacent waterways. There is thus a significant positive shift, especially in the area of access of crew members from all EU countries to the pan-European inland navigation market. In order to increase the safety of navigation, the status of a compulsory practical examination is also newly introduced.

The Directive also lays down uniform crew member certificates in a Europe-wide framework and introduces a new Europe-wide database of issued crew members' certificates. This will significantly help, among other things, in the performance of inspection activities.

In connection with the necessary amendment to the Inland Navigation Act, it will be necessary to replace the existing Decree No. 42/2015 Coll., on the competence of persons to guide and operate vessels, with a completely new decree.

Tools to secure financial resources

The following anticipated financial needs will be specified in the document Evaluation of the Impacts of the COVID 19 Pandemic Crisis on the Financing of the Transport Policy of the Czech Republic for the Period of 2021 - 2027 with an Outlook until 2050, which will be submitted to the government by 31 December 2021.

Transport infrastructure

The transport sector is largely dependent on funding from public budgets. On the other hand, as the only sector it is burdened with an additional excise duty, which is so high that its transfer back to the transport sector would be able to satisfactorily solve the problems not only of the construction of transport infrastructure but also the financing of transport service. In this sense, the transport sector is self-financing. Transferring the entire excise duty on mineral oils back to the transport sector would cause considerable difficulties in financing other state needs. However, the maintenance and development of the transport infrastructure is the responsibility of the public sector and its responsibility is to ensure effective financing. The year-on-year unpredictable changes in budgetary frameworks constitute the biggest source of inefficiency (preparation and implementation of larger transport infrastructure units is a matter of 10 to 15 years). In times of economic recession and budgetary savings, which must be expected in the long run, it is not a question of increasing the budget for transport (this depends on societal priorities), but of stabilizing resources. It is therefore important to launch a policy debate on increasing the share of excise duty on mineral oils intended for the transport sector, with the increase being offset by an equivalent reduction in state budget subsidies for the maintenance and development of transport infrastructure and for financing transport service. The overall impact on the state budget would thus be neutral, there would only be a reduction in the manoeuvring room for compiling the state budget - but there would be additional mandatory expenditure. A possible grant from the state budget for the development of transport infrastructure after increasing the share of excise duty for the transport sector would be possible on the basis of a policy decision of the government of the Czech Republic (e.g. to meet the European commitment to complete the TEN-T network and to ensure national co-financing of the Operational Programme Transport for 2021 - 2027) and in order to meet the Czech Republic's commitments in the field of energy savings, reduction of greenhouse gas emissions and pollutants.

Another important conventional and already established source of finance is traffic charging. In the future, the scope of the tolled road network and the category of tolled vehic-

les will expand. The measure must be in line with the development of collection technologies, as the collection overhead must not exceed 30% of the amount collected²⁴. In this context, several measures need to be put in place on lower-class roads to protect the infrastructure from heavy traffic bypassing tolled sections, namely by restricting traffic, for example through legislation restricting the use of certain parts of the infrastructure by heavy goods vehicles. The current legislation already allows for this. The output-based charging will gradually include, in accordance with European legislation, the gradual internalization of externalities.

Railway charging will continue to be harmonized. Especially on the main railway lines, charging must contribute to solving the problem of insufficient permeability (limiting the importance of weight categories of trains). In parallel with the financing of construction projects on railways, it is necessary to ensure the financing of vehicles to use properly the improved parameters of the railway infrastructure by operating trains.

The transport sector will continue to be a major recipient of European funds in the period of 2021-2027. Although the total financial package will be smaller than in the period of 2014-2020, at the same time the number of financed priorities will be reduced. Given that transport infrastructure is perceived as a very important priority, it is justifiable that the share of European funds intended for the Czech Republic be higher. However, it will be necessary to ensure a national share of co-financing, which is another reason for increasing the stability of financing by abolishing the subsidy from the state budget and replacing it with a higher share of excise duty.

An important aspect in the financing of transport infrastructure is the gradual reduction of funds from European sources (ERDF, Cohesion Fund, CEF), both in connection with the reduction of the European budget (Brexit) and the growing economic level of the Czech Republic within the EU. This will gradually place greater demands on national and alternative financing of transport infrastructure and will mean higher demands on project prioritization set out in the follow-up document Transport Sector Strategy.

Alternative financing of transport infrastructure

In view of the above legitimate need to stabilize the resources, it is desirable that this stabilization be achieved by an optimal mix of measures on the part of resources. These options are elaborated in more detail in the document Transport Sector Strategies. Alternative sources of financing (repayable funds of private investors) can also serve as an additional tool for stabilizing resources.

PPP projects and possibly other financial instruments cannot be considered as a tool that would sustainably increase the total volume of resources for transport infrastructure. The increase in resources will, of course, be reflected in the short term, when private funds are invested in new construction. After the completion of the construction, additional revenues from charging will also emerge. However, the total amount of compensation to the concessionaire who will provide for the PPP project will always be in total higher than the additional revenues generated by the project. However, the current increase in investments resulting from the implementation of PPPs is desirable in periods of possible significant decline in investments from public sources, although it will be reflected in future availability payments, which will have to be paid from the State Fund for Transport Infrastructure's resource mix. For this reason, only very important sections of our trans-

²⁴ See Article 7(5)(b) of Directive 1999/62/EC of the European Parliament and of the Council of 17 June 1999 on the charging of heavy goods vehicles for the use of certain infrastructures, as amended.

port network should be selected for PPP projects. The key is to set up a good contractual relationship with the providers of finance. The issue of PPP projects is elaborated in more detail in the document Transport Sector Strategies. The costs associated with alternative financing of transport infrastructure must be included in the evaluation of the economic efficiency of transport construction projects.

Summary

To ensure the needs of transport infrastructure, it is necessary to ensure a stable budget at the level of CZK 110 billion per year.

Infrastructure for publicly accessible filling and charging stations with alternative energy

To support public stations, an amount of approximately CZK 4 billion will be allocated from the Operational Programme Transport and possibly from other European funds.

Public services

Public transport in the Czech Republic still has an outdated vehicle fleet. However, European co-financing will not systematically solve the problem. The problem must be solved by having to select public transport operators in tenders not only on the basis of price, but also according to the criterion of quality of services and vehicle fleet. Due to the cost of the vehicle fleet, it is necessary to organize tenders for at least 10 - 15²⁵ years and take sufficient account of the issue of depreciation of the required vehicles in the organized tenders. It is necessary to avoid the creation of an internal debt; the customer must pay to the carrier the costs associated with simple and extended reproduction of the vehicle fleet. A long-term contractual relationship therefore requires stable financing. It is therefore necessary to link the financing of public transport with specific tax incomes, such as the share of revenue from excise duty collection, or to set up financing as part of energy savings in transport, as public transport contributes significantly to energy savings and to the reduction of emissions of greenhouse gases and pollutants in the case of its greater use at the expense of individual car transport.

In the case of public transport, the individual lines are also interconnected. Therefore, even a slight reduction in the budgetary framework can lead to the disintegration of the whole public transport system after reaching a certain degree. Therefore, the savings must be based on interconnected and optimized transport service plans (taking into account the local specifics of restricting the service of small municipalities by rail and strengthening the backbone lines by an interchange system, or exclusivity payments for profit-making lines). The system must also include an order for individual towns with a population of over 15 thousand.

The Ministry of Transport provides transport service to the state using national transport trains which have a supra-regional or international nature pursuant to Section 4(1) of Act No. 194/2010 Coll., on public passenger transport services and amendments to other acts, as amended (hereinafter "Act No. 194/2010 Coll."). In order to ensure transport service, the Ministry of Transport, as the customer, concludes contracts on public services in passenger transport with carriers pursuant to Section 8 of Act No. 194/2010 Coll. In addition to this ordered transport, carriers may operate commercial long-distance transport services outside public service contracts without the right to compensation for any losses from

²⁵ See Regulation No. 1370/2007/EU.

public budgets. For public service contracts concluded after 3 December 2009, the key legislation is Regulation No. 1370/2007 of the European Parliament and of the Council on public passenger transport services by rail and by road and repealing Council Regulations (EEC) Nos 1191/69 and 1107/70 ("Regulation No. 1370/2007"). This Regulation establishes a competitive tendering procedure as the basic method of selecting a public service carrier and contains certain exceptions enabling the customer to conclude a public service contract on the basis of a direct award²⁶.

In the area of financing of transport service using national transport trains in the Czech Republic, the Ministry of Transport prepares its public service orders on the basis of the scope of financial resources in the specific indicator of the state budget "Track transport" in chapter 327 of the Ministry of Transport. In the case of railway services, the key is the duration of the contract - the effective term of the public service contract. If the vehicle fleet is not to consist only of depreciated vehicles whose economic and technical life has expired and whose availability is limited to some already established carriers, the acquisition of vehicles must be financially feasible for the duration of the contract. Therefore, in the case of tenders, the part of the offer price allocated for the acquisition of vehicles decreases with the increasing duration of the contract, as it can be spread over a longer period of time. At the same time, the sustainability of the project is growing from the point of view of the banking sector, and obtaining foreign capital is easier and cheaper for carriers. Due to the expected number of operating sets, the gradual tendering of individual sets will ensure the gradual opening of the market at short intervals.

Concluding contracts for a period of 10-15 years does not mean the necessity of a completely constant range of services, but it requires a stable financial framework. Significant changes in the area of financing are not only a problem for the provision of public services, but they also directly jeopardize the process of market opening and can be highly risky in case of concluded long-term contracts. In connection with tenders, it will therefore be necessary to set a range of ordered public services when preparing tender documents for the selection of a carrier so that the sum of compensation from all public service contracts in individual years of validity of the contracts does not exceed the planned financial framework.

Transport contributes to the final energy consumption in the Czech Republic roughly to the same extent as industry and households. However, in the previous programming period, programmes to reduce energy consumption by increasing energy efficiency were applied (and brought positive results) only in industry and households, not in transport. It is therefore necessary to support innovative investments from public sources that will bring energy savings in transport as well, especially in mass public transport, in which means of transport are used significantly more than in individual transport.

For the purposes of transport service, it will be necessary to provide CZK 5.5 billion per year for long-distance railway transport from the Ministry of Defence's chapter. It will be necessary to spend CZK 3.2 billion per year from the state budget as a contribution to the regions for the operation of regional railway service.

Research, development and innovation - departmental programme

Effective and long-term support for research, development and innovation in transport can only be ensured through the implementation of a departmental programme which

²⁶ Using direct award, the customer can provide public services with an internal operator, in emergency situations, for small contracts or public services by track transport on a national or regional railway.

directs funds to priority areas in a coordinated and effective manner and thus contributes to the development of the entire system. In 2019, the Ministry of Transport prepared and approved a departmental Programme for the Support of Applied Research, Experimental Development and Innovation in the field of Transport - TRANSPORT 2020+, which focuses on supporting projects of applied research and experimental development and reflects the needs and priorities in the field of transport. The specific objectives of the TRANSPORT 2020+ programme reflect the needs and priorities and thus set its basic orientation. These are the following areas: 1) Sustainable transport, 2) Safe and resilient transport and transport infrastructure, 3) Accessible and interoperable transport, and 4) Automation, digitization, navigation and satellite systems. The TRANSPORT 2020+ programme, implemented by the Technology Agency of the Czech Republic, is implemented in 2020-2026, with a total expenditure of CZK 2,437.5 million, of which CZK 1,950 million from state budget expenditures. To ensure continued support, it is necessary to subsequently prepare and implement a follow-up programme with sufficient financial allocation sufficiently in advance. The fulfilment of some objectives of the Transport Policy can also be supported by other programmes implemented by the Technology Agency of the Czech Republic. The necessary expenditures will be secured in a standard way in cooperation with the Council for Research, Development and Innovation within the limits of support for research, development and innovation approved for the given periods without increased requirements for the state budget.

Road safety

Ensuring sufficient funding is one of the crucial components determining the effective implementation of the measures set out in the National Road Safety Strategy, and thus the reduction of high socio-economic losses caused by traffic accidents. The financing of road safety measures in the expected volume of CZK 250 million will be an integral part of the National Road Safety Strategy for 2021 - 2030 (these funds concern campaigns and other organizational measures and not measures such as transport infrastructure modifications and the construction of ITS facilities).

Telematics, unless part of the transport infrastructure

ITS in relation to transport is a complex area. At present, vehicles and equipment on the transport infrastructure are supported by a number of ITS systems. The issue of ITS has a wide reach both in the range of services offered and in the possibilities of using these systems. In general, these are systems for informing passengers, managing and directing traffic, addressing its safety and smoothness. ITS systems provide a comprehensive view of all modes of transport and facilitate solutions for the coordination of the interconnection of different transport systems. ITS systems help better manage stressful situations stemming from the ever-increasing intensity of traffic and the resulting critical situations.

ITS applications do not generate financial, but only economic benefits, therefore it is necessary to ensure their financing from public sources, in accordance with the follow-up Strategic Plan for the Development of ITS in the Czech Republic until 2027 with an outlook until 2050. The annual need from the state budget is estimated at CZK 12.8 billion.

Ensuring clean mobility objectives (charging and filling stations for alternative energy and support for alternative energy vehicles)

Providing public infrastructure for alternative fuels is a basic prerequisite for the application of new types of automobiles in the Czech Republic. Therefore, it will be necessary to significantly strengthen the financial resources of the Operational Programme Transport

for the period of 2021 - 2027. The implementation of the programme will help build a basic network, which will then be developed on a commercial basis. In the preparation of the Operational Programme Transport for the period of 2021 - 2027, a total amount of CZK 4 billion is planned for the area of infrastructure for alternative fuels.

National transport model of passenger and freight transport

The national multimodal transport model is a tool that significantly streamlines the preparation of transport structures, as it significantly refines the inputs into economic calculations and thus optimizes the spending of investment funds in the order of billions of CZK. It is therefore necessary to continue to refine and regularly validate and update this transport model, as well as to ensure staffing for its operation and maintenance so that these activities can be provided by the state administration in the long term.

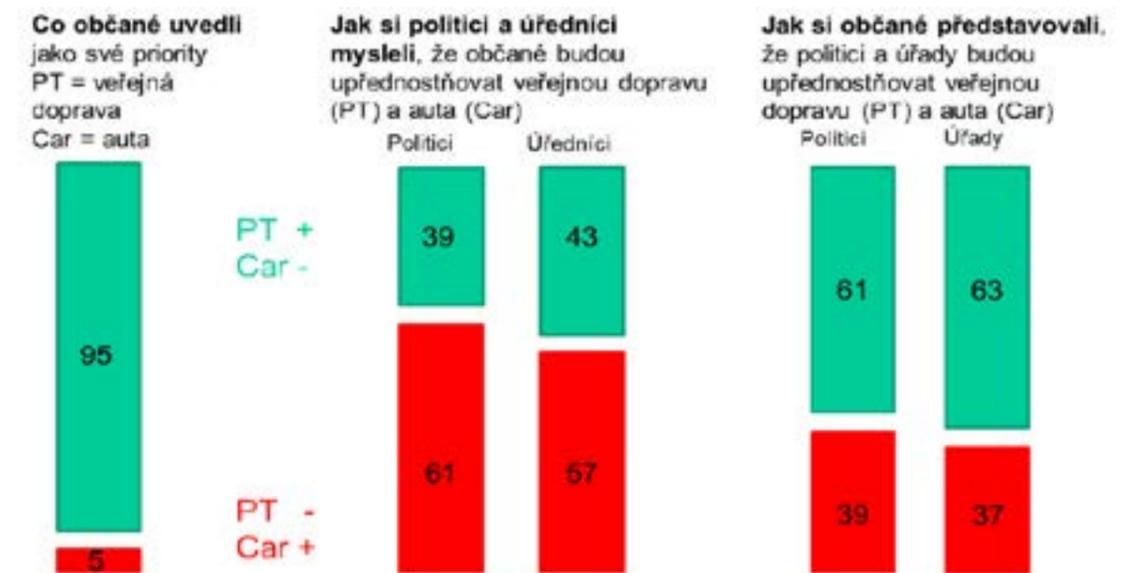
Information tools and promotion of Transport Policy objectives

In addition to hard measures, which include capital construction, the Transport Policy must also address soft measures, which focus on the transport behaviour of the population and companies. In the case of passenger transport, the resulting behaviour is determined by traditions (examples during education in the family and at school), the influence of the mass media and the conditions created by political representations at all levels. In freight transport, the price for transport (without externalities) and the reliability of transport play a major role. Political decisions can also significantly influence this area, for example the setting of emission limits for CO₂ in the automotive industry, which leads not only to a significant increase in the share of electric cars in the production mix, but also to a greater use of rail transport in logistics and distribution.

Transport Policy objectives must be presented at the appropriate levels, otherwise they will not be achievable. Compared with a number of European countries (especially Alpine, Nordic or economically developed coastal countries), the Czech Republic has considerable potential for improvement in the field of education and awareness. It must also include "dispelling myths" or conflicting expectations in different areas. Examples include the need to address the issue of reducing the impact on global climate change, reducing energy consumption and reducing pollutant emissions, and on the other hand the widespread notion that the transport system consists and must consist primarily of road (freight and individual passenger transport) transport and that everything else is just an irrelevant, albeit useful, supplement. A simplified view of transport statistics, which really shows the predominant volumes of road transport, contributes to this. But a more detailed look is needed. In the case of urban mobility or in the case of sections with regular and strong traffic flows, where the conditions are suitable in terms of the quality of transport infrastructure, the situation looks different. A large part of the volume of road transport is performed over short distances, during general service of the territory and within the framework of irregular transport and smaller consignments. At the same time, it is clear that with a simplified view of the coexistence of transport modes, it is not possible to meet the above objectives while maintaining the economic functions of transport.

Political representation

Politicians of all levels, as elected representatives, are interested in topics that they believe are the focus of voters. The issue of transport is undoubtedly just such a topic because transport directly affects the life of every citizen. However, in some areas where there are sufficient conditions for modes of transport alternative to individual car transport, foreign surveys show different preferences of citizens from what political representatives think about these preferences. As an example, the following is a survey from Leipzig, Germany, which documents misperceptions of politicians and authorities, leading to conflicts in transport planning:



Co občané uvedli jako své priority	What citizens have stated as their priorities
PT = veřejná doprava	PT = public transport
Car = auta	Car = cars
Jak si politici a úředníci myslí, že občané budou upřednostňovat veřejnou dopravu (PT) a auta (Car)	How politicians and officials thought citizens would prefer public transport (PT) and cars (Car)
Politici	Politicians
Úředníci	Officials
Jak si občané představovali, že politici a úřady budou upřednostňovat veřejnou dopravu (PT) a auta (Car)	How citizens imagined that politicians and authorities would prefer public transport (PT) and cars (Car)
Úřady	Authorities

For these reasons, it is necessary to provide explanations so that the measures implemented in the field of transport policy are based on knowledge of the wider context. The mass media must also play an important role in this.

Mass media

The mass media have a great influence on the transport behaviour of the population, but to a large extent they report from similar viewpoints as politicians. This is reinforced by the nature of journalistic work with specific working hours and the need to work in the field, which cannot be ensured without the flexibility provided by a car. Many reports from transport give the public the feeling that in the transport sector it is only a matter of tackling the problem of congestions in case of closures or accidents, which must be

solved by massively building additional motorway capacities, without pointing out other possible alternative solutions.

Public

To a great degree, the public's transport behaviour largely predetermines a number of transport policy measures and there is feedback at play (the average transport behaviour of the population predetermines decisions on measures, creating new conditions in the transport sector, which newly influence the way the population behaves). Experience shows that the initial mistrust of public transport, if high-quality, sufficiently frequent and accessible services can be ensured, is gradually turns into a great popularity of public transport and more prudent use of cars. This trend is evident, for example, in Prague's urban and suburban transport or in long-distance transport. The decisive factor is a positive motivation of the population caused by the high quality and sufficient quantity of public transport.

Monitoring and final evaluation of the Transport Policy

The specificity of transport policy is that the role of action plans is fulfilled by follow-up processes, concepts and strategies, which are listed in Chapter 4. The transport policy will be monitored by preparing an evaluation by 2024 at the latest. The evaluation will be the basis for the elaboration of the Transport Policy update, including the proposal of corrective steps, to be elaborated in 2025 at the latest. Monitoring will evaluate the individual objectives and measures of the Transport Policy and the fulfilment of its indicators, which are listed in a separate annex.

Risks related to non-fulfilment with Transport Policy objectives

The fulfilment of transport policy goals may be jeopardized for political reasons - in the event of a change of government, the representatives of the new political representation are very often reluctant to continue the ongoing processes and initially seek a significant change of course, even though transport policy objectives are set independently of ideologies. individual political directions. Another risk is a significant budget reduction - especially in the area of transport service, maintenance and repair and development of transport infrastructure, and last but not least, measures in the area of equipping transport infrastructure with modern technologies are perceived as less important.

Creating conditions for the competitiveness of the regions and the Czech Republic

In particular, the following can be identified as risks:

- significant regional lobbying, as a result of which differences in the provision of transport infrastructure between regions may increase. Political representations of some regions tend to be more active and promote faster development of transport infrastructure in their region at the expense of other regions, regardless of the actual state of infrastructure in individual regions,
- significant cuts for the area of maintenance and development of transport infrastructure, including year-on-year fluctuations in the financial framework (construction of transport infrastructure is usually a matter of 3-4 years),

Failure to meet the target would lead to broadening disparities in the development of regions, and at the same time the competitive position of the Czech Republic in international trade will not increase (creating better conditions for Czech exports).

Freight transport as part of the logistics process using the benefits of all modes of transport

Risks arise in particular if measures to support multimodality are not implemented (financial reasons, non-compliance with public access requirements in private terminals and ports).

Failure to meet the objectives will not make it possible to sufficiently reduce the environmental and public health impacts of freight transport, the economic efficiency of medium and long-distance transport will not increase (impact on exports), sufficient response to changes in energy availability will not be possible and it will not be possible to meet European targets for reducing greenhouse gas emissions.

Public service in passenger transport, a functional system in passenger transport and addressing transport problems in cities

The biggest risk is the reduction of expenditures from public budgets going into transport service, while even a small reduction in expenditures will lead to a large reduction in the functionality of the system.

The disintegration of the public transport system (roughly half of the volume of passenger transport is provided by public transport) would have implications for the capacity of the transport infrastructure (congestions on roads, especially in cities), resulting in direct economic losses from congestion. Another consequence would be impacts on the environment and public health, a lack of response to changes in energy availability will not be possible and it will not be possible to meet European targets for reducing greenhouse gas emissions.²⁷

Increasing transport safety

The biggest problems in transport safety are in road transport, especially in the area of the human factor. The biggest risks are in particular the lack of law enforcement and the slow deployment of ITS systems.

Provision of energy for transport

The civilizational challenge of reducing the effects of global climate change, reducing pollutant emissions and ensuring sufficient energy in a carbon-neutral economy requires a new approach in the transport sector, which is the main topic of this Transport Policy. The current 93% share of fossil fuels in energy for transport is already unsustainable in the coming years. It will not be possible to achieve the goals without the cooperation of transport segments, without the application of modern technologies and without the

²⁷ The impacts can be illustrated on urban mass transport in Prague, which receives the largest financial resources for operation of all sectors of transport service - in the city, urban mass transport carries out 59% of passenger transport journeys (excluding pedestrian transport). The transfer of these services to individual transport is not possible, as the current road system has difficulty managing the current scope of individual car transport. Individual car transport cannot satisfy transport needs due to space requirements in the transport process and parking.

introduction of alternative energies in all modes of transport, especially on the basis of the use of electricity, which shows significantly higher energy efficiency.

Financial resources for transport infrastructure, maintenance and development of transport infrastructure

Stopping the modernization of the transport infrastructure network due to insufficient financing would have a significant negative impact on the competitiveness of the Czech Republic and the regions (especially for exports, but also for labour mobility). Significant savings in transport infrastructure financing usually lead to the start of positive feedback processes, as a result of which public budget deficits widen²⁸.

Social issues, education and qualifications

The transport sector is facing the problem of scarce professions, which threatens the competitiveness of the whole sector.

Subsidiarity

The interconnection of individual levels - European, national, regional and local - is important for the transport sector. The Transport Policy reflects the objectives of the European transport policy, but equally important is the link with the strategic documents of the regions and large cities. The biggest risk is the application of the principle of independent competence, if the solution proposed by the local government only focuses on the issue of "its" territory, regardless of the links to adjacent regions and the national level. Within the principle of subsidiarity, the Transport Policy has a recommendatory and methodological nature for local governments, but regional strategies need to take over the basic principles set by the national and European level and supplement them with regional specifics (the Transport Policy has the same relationship to the European transport policy).

Modal split of the Transport Policy and related processes, concepts and strategies²⁹

Passenger transport volumes [mil. pkm]		2010	2011	2012	2013	2014	2015	2016	2017	2018
Rail transport	mil. pkm	6,590.0	6,714.0	6,264.7	7,600.6	7,796.5	8,298.1	8,843.4	9,497.6	10,286.0
Bus transport	mil. pkm	10,335.7	9,266.7	9,015.4	9,025.6	10,010.2	9,995.9	10,257.1	11,177.8	10,950.4
Air transport	mil. pkm	10,902.0	11,585.6	10,611.6	9,603.9	9,756.6	9,701.0	10,202.6	11,326.2	12,841.3
Inland waterway transport	mil. pkm	12.8	14.8	17.3	16.2	20.7	13.5	12.2	12.5	12.4
Public transport	mil. pkm	15,617.4	15,281.5	16,624.8	16,276.2	16,270.3	16,100.0	17,387.1	17,824.2	17,906.1
trams	mil. pkm	3,862.7	3,752.6	4,040.7	4,026.3	3,981.0	3,909.0	4,172.5	4,309.9	4,277.0
trolleybuses	mil. pkm	1,061.8	1,018.4	1,009.8	988.6	972.2	856.0	868.9	837.7	856.8
Metro	mil. pkm	4,719.0	4,593.2	5,358.6	5,206.4	5,243.6	5,516.7	6,195.4	6,433.3	6,457.8
buses	mil. pkm	5,973.9	5,917.3	6,215.7	6,054.9	6,073.5	5,818.3	6,150.3	6,243.3	6,314.5
Road transport	mil. pkm	63,570.0	65,490.0	64,260.0	64,650.0	66,260.0	69,705.0	72,255.0	74,327.0	77,971.0
Total	mil. pkm	107,027.9	108,352.6	106,793.8	107,172.5	110,114.3	113,813.5	118,957.4	124,165.3	129,967.2

Freight transport volumes [mil. tkm]		2010	2011	2012	2013	2014	2015	2016	2017	2018
Rail transport	mil. tkm	13,770.4	14,315.8	14,266.2	13,964.9	14,574.2	15,261.1	15,618.6	15,843.8	16,564.2
Road transport	mil. tkm	51,832.1	54,830.3	51,228.0	54,893.0	54,092.0	58,713.7	50,314.7	44,274.0	41,073.0
Inland waterway transport	mil. tkm	679.5	695.0	669.3	693.5	656.5	584.9	620.4	622.7	554.0
Air transport	mil. tkm	22.379	21.966	16.574	24.324	35.037	31.082	30.942	31.989	29.628
Oil pipelines	mil. tkm									
Total	mil. tkm	66,304.4	69,863.1	66,180.1	69,575.7	69,357.7	74,590.8	66,584.6	60,772.4	58,220.8

Carbon dioxide (CO ₂) emissions		2010	2011	2012	2013	2014	2015	2016	2017	2018
Total transport	th. tonnes	18,143	18,178	17,825	17,672	18,330	19,056	19,966	20,499	20,838

²⁸ The slowdown in the development of transport infrastructure has a number of direct and indirect effects on public budget revenues in the short to medium term - non-elimination of public health effects, congestion losses (estimated loss of up to 2.5% of the GDP within the EU), reduced purchasing power of the population (reduced employment in construction, lower labour mobility), etc.

²⁹ The possible completion of the Danube - Odra - Elbe project is not included.

Estimated modal split in case of non-fulfilment of the Transport Policy and related processes, concepts and strategies

Passenger transport volumes [mil. pkm]		2019	2020	2021	2022	2023	2024	2025	2030	2035	2050
Rail transport	mil. pkm	11,191.3	11,918.9	12,431.0	12,447.3	12,187.0	11,862.9	11,438.0	10,771.0	10,112.0	8,730.0
Bus transport	mil. pkm	10,561.0	10,579.0	10,808.0	10,037.0	9,768.0	9,463.0	9,325.0	9,260.0	8,925.6	8,103.6
Air transport	mil. pkm	11,942.3	12,246.3	12,920.0	13,312.0	13,681.0	14,012.0	14,387.0	15,537.0	15,962.8	16,844.0
Inland waterway tr.	mil. pkm	13.4	13.9	14.2	14.4	14.7	15.1	15.2	15.3	15.4	16.6
Public transport	mil. pkm	18,205.0	18,438.4	18,696.7	18,923.6	18,825.2	18,822.4	19,643.3	19,579.0	18,513.0	17,457.9
trams	mil. pkm	4,404.7	4,420.0	4,447.0	4,461.0	4,450.1	4,438.1	4,401.3	4,191.0	3,905.0	3,902.2
trolleybuses	mil. pkm	862.0	858.0	853.0	847.6	843.1	841.3	838.0	827.0	819.0	809.0
Metro	mil. pkm	6,558.3	6,631.4	6,765.7	6,882.0	6,902.0	6,941.0	7,920.0	8,171.0	7,471.0	7,340.7
buses	mil. pkm	6,380.0	6,529.0	6,631.0	6,733.0	6,630.0	6,602.0	6,484.0	6,390.0	6,318.0	5,406.0
Road transport	mil. pkm	79,050.0	80,200.0	81,900.0	84,002.0	85,826.0	86,214.0	87,100.0	89,732.0	93,167.0	100,463.0
Total	mil. pkm	130,963.0	133,396.5	136,769.9	138,736.3	140,301.9	140,389.4	141,908.5	144,894.3	146,695.8	151,615.0
Freight transport volumes [mil. tkm]		2019	2020	2021	2022	2023	2024	2025	2030	2035	2050
Rail transport	mil. tkm	16,510.3	16,566.6	16,637.6	16,999.0	16,870.6	16,553.0	16,323.0	15,087.0	14,128.2	13,730.8
Road transport	mil. tkm	35,733.5	34,312.0	33,756.0	33,956.0	33,988.0	34,141.0	34,720.1	41,485.0	44,936.7	55,083.3
Inland waterway tr.	mil. tkm	559.4	592.0	637.6	665.5	693.1	730.8	758.8	864.8	944.5	991.3
Air transport	mil. tkm	21.770	24.569	29.392	32.575	33.115	34.238	34.542	35.631	36.925	40.282
Oil pipelines											
Total	mil. tkm	17,091.5	51,495.2	51,060.6	51,653.1	51,584.8	51,459.0	51,836.4	57,472.4	60,046.3	69,845.7
Carbon dioxide (CO ₂) emissions											
		2019	2020	2021	2022	2023	2024	2025	2030	2035	2050
Total transport	th. tonnes	20,929	21,021	20,150	21,310	19,510	19,730	20,082	21,390	22,930	25,232

Estimated modal split in the case of fulfilment of the Transport Policy and related processes, concepts and strategies

Passenger transport volumes [mil. pkm]		2019	2020	2021	2022	2023	2024	2025	2030	2035	2050
Rail transport	mil. pkm	11,191.3	12,117.9	13,112.0	13,105.3	13,957.0	14,815.9	15,662.0	18,172.0	21,512.0	25,320.0
Bus transport	mil. pkm	10,561.0	10,579.0	10,808.0	11,437.0	12,168.0	12,663.0	13,205.0	15,809.0	17,213.6	19,503.6
Air transport	mil. pkm	11,942.3	12,246.3	12,920.0	13,312.0	13,681.0	14,012.0	14,387.0	15,537.0	15,962.8	16,844.0
Inland waterway tr.	mil. pkm	13.4	13.9	14.2	14.4	14.7	15.1	15.2	15.3	15.4	16.6
Public transport	mil. pkm	18,205.0	18,478.4	18,796.7	19,053.6	19,447.2	20,663.4	21,602.3	23,581.0	24,975.0	27,781.9
trams	mil. pkm	4,404.7	4,460.0	4,547.0	4,591.0	4,760.1	4,898.1	5,102.3	5,791.0	5,995.0	6,711.2
trolleybuses	mil. pkm	862.0	858.0	853.0	847.6	856.1	865.3	874.0	929.0	1,100.0	1,270.0
Metro	mil. pkm	6,558.3	6,631.4	6,765.7	6,882.0	6,941.0	7,920.0	8,520.0	9,171.0	9,771.0	10,840.7
buses	mil. pkm	6,380.0	6,529.0	6,631.0	6,733.0	6,890.0	6,980.0	7,106.0	7,690.0	8,109.0	8,960.0
Road transport	mil. pkm	79,050.0	80,200.0	81,900.0	82,002.0	82,226.0	82,724.0	82,900.0	81,732.0	80,167.0	78,463.0
Total	mil. pkm	130,963.0	133,635.5	137,550.9	138,924.3	141,493.9	144,893.4	147,771.5	154,846.3	159,845.8	167,929.0
Freight transport volumes [mil. tkm]		2019	2020	2021	2022	2023	2024	2025	2030	2035	2050
Rail transport	mil. tkm	16,510.3	16,636.6	16,787.6	17,025.0	17,470.6	17,853.0	18,223.0	20,587.0	21,103.2	23,730.8
Road transport	mil. tkm	35,733.5	34,312.0	33,756.0	33,156.0	32,631.0	32,141.0	32,520.1	32,485.0	32,936.7	31,083.3
Inland waterway tr.	mil. tkm	559.4	592.0	637.6	665.5	693.1	730.8	758.8	864.8	944.5	991.3
Air transport	mil. tkm	21.770	24.569	29.392	32.575	33.115	34.238	34.542	35.631	36.925	40.282
Oil pipelines											
Total	mil. tkm	52,825.0	51,565.2	51,210.6	50,879.1	50,827.8	50,759.0	51,536.4	53,972.4	55,021.3	55,845.7
Carbon dioxide (CO ₂) emissions											
		2019	2020	2021	2022	2023	2024	2025	2030	2035	2050
Total transport	th.	20,929	20,821	20,130	19,830	19,650	19,430	19,082	17,990	16,250	14,232

Explanation of terms

- Combined transport** combined transport is a system of transporting goods in one and the same transport unit or road vehicle, where the majority of the route takes place by rail, inland waterway or sea without handling the goods themselves, with the initial (collection) or final (delivery) part usually taking place by road.
- Multimodal transport** transport of goods by at least two different modes of transport - it is therefore a broader concept than combined and intermodal transport, because in this case, when changing the mode of transport, the transported goods themselves may or may not be handled.
- Track transport** pursuant to the Act on Railways, it includes transport systems with a fixed track, i.e. railway transport, tram transport, Metro, cable cars and trolleybus transport.
- Rail transport** includes railway transport, tram transport and Metro.
- Tram-train systems** connection of tram and railway transport without the need to change using special vehicles meeting the conditions of operation on railway and tram lines
- High-speed Connections** operational infrastructure system of high-speed railways in the Czech Republic, including new high-speed lines, modernized high-speed and modernized conventional lines of higher parameters, including the rolling stock and operational concept
- Accu-trolley vehicles** vehicles using a battery that can be recharged while driving on an electrified line, in addition to a traction current collector, in order to obtain electric current for propulsion. Sometimes these vehicles are referred to as battery-powered.
- Bimodal vehicles** electric vehicles from trolleys and with internal combustion engine for driving on non-electrified sections of lines.

List of abbreviations

ACRI - Association of the Czech Railway Industry

AGR - European Agreement on Main International Traffic Arteries

AGC - European Agreement on Main International Railway Lines

AGN - Agreement on Main Inland Waterways of International Importance

AGTC - European Agreement on Important International Combined Transport Lines and Related Installations

BESIP - Road Safety

BIM - Building Information Modelling

B+R - Bike and Ride

CBA - Cost Benefit Analysis

CEF - Connecting Europe Facility

DI - Transport Infrastructure

D-O-L - Danube-Odra-Elbe water corridor

DSP - Documentation for Building Permit

EIA - Environmental Impact Assessment

EC - European Commission

ERDF - European Regional Development Fund

ERTMS - European Rail Traffic Management System

ESA - European Space Agency

ETCS - European Train Control System

EU - European Union

FIDIC - Uniform Conditions of Contracts

GNSS - Global Navigation Satellite System

GPS - Global Positioning System

GDP - Gross Domestic Product

HV - Economic Committee

IAD - Individual Car Transport

ICT - Information and Communication Technology

IDS - Integrated Transport System

ITS - Intelligent Transport Systems

JIT - Just in Time delivery

JSDI - Unified Traffic Information System

KD - Combined Transport

K+R - Kiss and Ride

MHD - Urban Mass Transport

MD - Ministry of Transport

MF - Ministry of Finance

MMR - Ministry of Regional Development

MPO - Ministry of Industry and Trade

MPSV - Ministry of Labour and Social Affairs

MŠMT - Ministry of Education, Youth and Sports

MV - Ministry of the Interior

MZe - Ministry of Agriculture

MŽP - Ministry of the Environment

NAIADES - Integrated European Action Programme for Inland Waterway Transport

NOx - Nitrogen Oxides

NSBSP - National Road Safety Strategy

UN - United Nations

PM - Airborne Dust, Fine Particles

SRES - Supported Energy Sources

PPP - Public Private Partnership

PSP ČR - Chamber of Deputies of the Parliament of the Czech Republic

P+R - Park and Ride

SUMP - Sustainable Urban Mobility Plans

RFID - Radio Frequency Identification

RS - High-speed Connection

ŘSD - Directorate of Roads and Motorways

RUD - Budget Determination of Taxes

SEA - Strategic Environmental Assessment

SEK - State Energy Concept

SFDI - State Fund for Transport Infrastructure

SFŽP – State Environmental Fund

Germany - Federal Republic of Germany

SRR 21+ - Regional Development Strategy of the Czech Republic 21+

SPŽP - State Environmental Policy

STK - State Technical Inspection

SŽ - Railway Administration

TA - Transport Assessment

TAČR - Technology Agency of the Czech Republic

TEN-T - Trans-European Transport Network

TSI - Technical Specification for Interoperability

R&D&I - Research, Development and Innovation

VHD - Public Mass Transport

ZOP - Basic Terms and Conditions



**Transport Policy of the Czech Republic
for the period of 2021 - 2027,
with an outlook until 2050**



Ministry of Transport