Interreg Danube Region

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Active2Public Transport

AUSTRIAN ENERGY AGENCY




Report on carbon intensity and greenhouse gas emissions in the transport sector of the Danube region

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https://interreg-danube.eu/projects/active2public-transport

Active2Public Transport | Better combining cycling, walking and public transport in the Danube region

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1 Greenhouse gas emissions and energy consumption by the transport on land

1.1 INTRODUCTION

1.1.1 Task description and scope

The primary objective of this specific task within the Activity 1.2 covered a compilation of the status quo analysis of the Danube region focusing on the current energy consumption and GHG emissions per mode of transport. This evaluation should support drawing a clear picture of the reduction necessities and possibilities at the beginning of the project implementation.

Data as listed below was in the scope for this evaluation:

- indicators on mobility behaviour (e.g. average number of trips per person, data on commuting and leisure trips, current modal split, average length of daily trips),
- indicators of public transport performance (e.g. annual vehicle kilometres of different vehicle classes),
- energy related indicators (e.g. occupancy rates, source of required energy and GHG emission factors of different transport modes/vehicle classes),
- basic traffic prognosis to run different development scenarios.

A consolidated overview of the data comparison is included in section “Comparative Data Analysis”.

Beyond the evaluation of the status quo, scenarios for shifting car trips to multimodal A2PT modes should be developed, provided that the quality of the provided data is sufficient. The scenarios should underline the potential to reduce GHG emissions, carbon intensity and energy consumption in the project region. The explanations of this part are set out in chapter “Scenarios.”

1.1.2 Method of data collection

The data collection was accomplished as joint activity by all partners. AEA developed a standardised data collection template, that was sent out in April 2024 and delivered by the partners until June 2024. The template, an excel form is included in this report as sperate file annex. The data collection sheet was deliberately kept broad, in order to take into account the large differences in data availability. So, the data collection sheet did not predefine whether a later comparative data analysis would necessarily focus e.g. on passenger transport performance or on vehicle transport performance.

The following data sets were deemed as feasible for all A2PT countries considering that EU member states can rely on standardised data collections (inter alia Eurostat). However, these framework conditions do not apply to Serbia as EU candidate. In this context a certain level of flexibility which parameters could be evaluated and compared.

(1) ENERGY AND GHG EMISSIONS

Energy consumption of passenger transport on land

- Passenger-kilometre (Pkm) by mode of land transport (in percent)
- Vehicle-kilometre (Vkm) by mode of passenger transport (in percent)
- Energy consumption per Vkm of transport modes (share of Mtoe in percent)

Annual GHG emissions from land passenger transport

- GHG emissions in the passenger transport sector (in Mt CO2-eq / year)
- GHG emissions per year on transport modes (in Mt CO2-eq / year)
- Share of renewable energy sources in the transport sector (share of Mtoe in percent)
- Vehicle stock numbers of passenger cars (over time period)
- Vehicle stock numbers of busses (over time period)

(2) INFRASTRUCTURE

- Infrastructure net lengths for roads and railways (in kilometre)

(3) MOBILITY BEHAVIOUR

- Transport performance indicators
- Modal split as share of Pkm
- Mobility opportunities (cars, public transport, bicycles per 1.000 inhabitants)

Priority was given to data collected centrally using the same underlying method (such as EuroStat). For many areas, these homogenised data sources were not available and it was necessary to fall back on data bases that were collected at country level. However, this means that the methodology for collecting the respective data sources is no longer directly comparable and categorisations and delimitations are defined differently.

In other cases, it was not possible to collect complete data sets for all partner countries, as in some cases specific data was not collected at country level. Data quality is discussed in the individual sub-chapters.

1.2 COMPARATIVE DATA ANALYSIS OF STATUS QUO

1.2.1 Socio-spatial indicators of partner countries

The partner countries in the Danube Region differ significantly in terms of area, population and gross domestic product (GDP). All of the following analyses and data comparisons can be interpreted in the context of these basic socio-spatial key figures.

Germany represents the largest country in the consortium in terms of surface area (357 569 km²) as well as inhabitants (84.36 Mio.). In contrast, Slovenia is the smallest participant's country in the Danube Region project with a surface area of 20 273 km² and 2.12 Mio inhabitants. Regarding GDP (the values for Purchasing Power Standards [PPS] is expressed in relation to the European Union average set to equal 100) vary from 123 to 46.

The degree of urbanisation is a measure of the spatial and structural conditions in a country and ranges from 53.9 % (Croatia) to 77.6 % (Germany). The percentage represents the proportion of a country's total population and the number of

inhabitants living in cities or in urbanised areas. In addition to the growth of cities (physical urbanisation), the spread of urban living conditions into neighbouring rural areas (suburbanisation or functional urbanisation) increases the degree of urbanisation. Dense infrastructure networks are a particular urban feature which is evidently linked to the mobility behaviour of its population. Good infrastructural connectivity and a dense public transport network create good conditions for a high modal split of environmentally friendly means of transport in highly urbanised areas. The values for all nine partner countries are presented in the table below.

Table 1: Main indicators of partner countries in the Danube Region

Country	Surface Area [km²]	Inhabitants [Mio.] (2023)	GDP per capita [PPS] (2023)	Degree of Urbanisation (2022)
Austria	83 878	9.10	123	59.3 %
Croatia	56 594	3.85	76	53.9 %
Czechia	78 871	10.83	91	72.5 %
Germany	357 569	84.36	115	77.6 %
Hungary	93 012	9.60	76	58.2 %
Romania	238 398	19.05	80	74.4 %
Serbia	77 612	6.65	46	55.7 %
Slovakia	49 035	5.43	73	56.9 %
Slovenia	20 273	2.12	91	54.5 %

SOURCE: EUROSTAT (2024)

1.2.2 Transport performance in the Danube Region

Transport performance is a performance-related indicator derived from an economic analysis of the transport sector. It indicates the performance of transport service providers or the handling of means of transport on infrastructures within a period. Depending on the perspective from which the transport system is analysed, either passenger transport performance (expressed in unit passenger kilometre - Pkm) or vehicle transport performance (vehicle kilometre - Vkm) is primarily used. Within this project the participating countries from the Danube Region reported both indicators, the vehicle transport performance and the passenger transport performance. The sum of these reported performance indicators in the Danube Region is shown in the table below.

Table 2: Sum of the reported Vehicle and Passenger Transport Performance in the Danube Region

	Passenger Transport Performance [Billion Pkm/year]	Vehicle Transport Performance [Billion Vkm/year]
Road Passenger Transport	1 456.79	924.93
Vehicle class M1 (cars)	1 236.94	890.49
Vehicle class M2 and M3	122.83	9.83
Vehicle class L (motorcycles)	19.98	25.42
Railway Passenger Transport	84.89	0.50
Domestic Aviation	4.28	0.03
Urban Public Transport	11.12	29.39
Walking	20.41	
Cycling	10.57	

SOURCE: INPUTS FROM PROJECT PARTNERS, DATA BASIS 2022

As the data on transport performance was not available at a uniform level of detail, it can only be analysed at a higher aggregated level in some cases. In particular, this applies to the transport performance:

- by vehicle classes M2 and M3,
- on regional, long-distance and urban public transport by busses and coaches,
- by domestic aviation,
- on urban, regional and long-distance railway transport and
- on non-motorized transport.

The data collection sheet for the project asked for transport performance data based on both vehicle kilometres and passenger kilometres. However, there were some gaps in the availability of both performance-related data. Data on passenger transport performance was most frequently available, which is why the comparative analysis of all participating countries must primarily refer to this data.

Due to the lack of data regarding passenger kilometre of cars in Serbia, an assumption had to be made. Although the statistical data on passenger transport performance does not show an evaluation at vehicle class 1 level (cars), data regarding the passenger transport performance are still available for the road passenger transport sector as a hole and at the vehicle class level M2 and M3 (buses). It was therefore assumed that the passenger transport performance for vehicle class M1 is the result of the difference between the road passenger transport sector and vehicle classes M2 and M3.

The following figure illustrates for each country in the Danube Region the number of passengers that are travelling within a year on one road infrastructure kilometre.

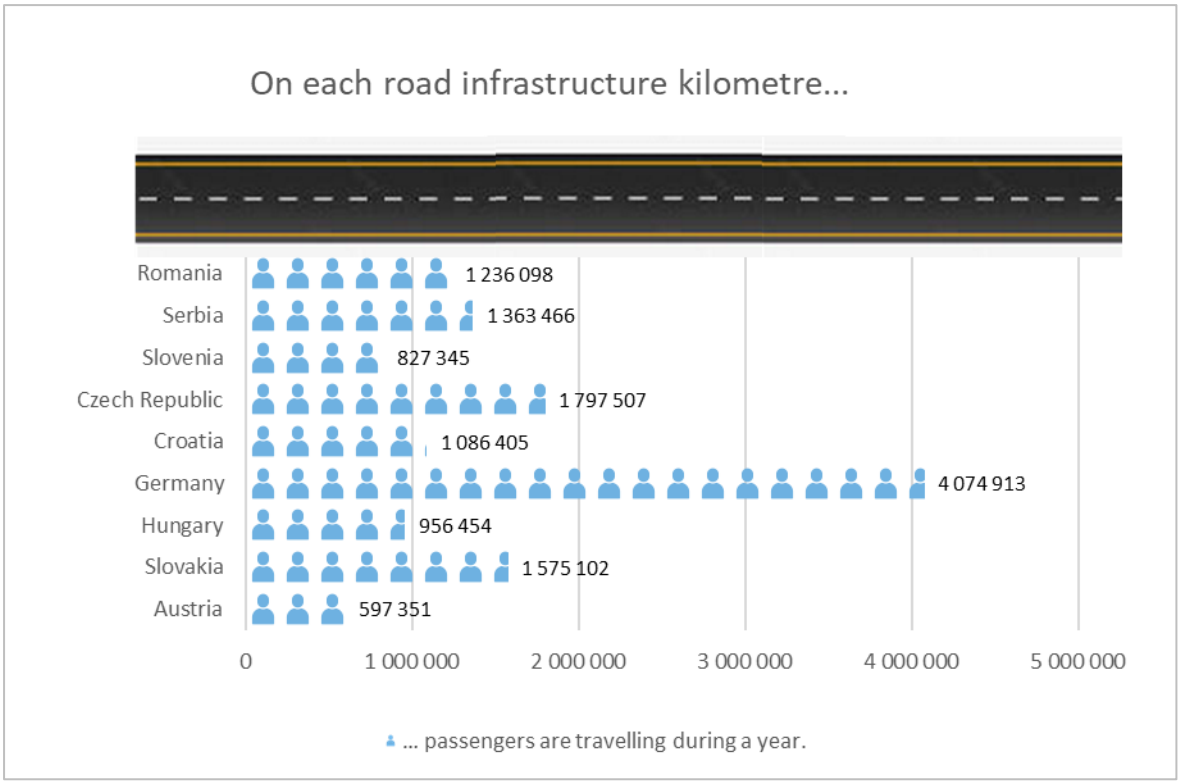

Figure 1: Number of passengers travelling on one road infrastructure kilometre per year in partner countries (Source: Inputs from project partners, data basis 2022)

Germany has the highest value with a rounded 4.1 million passengers per kilometre, while Austria has the lowest value with 0.6 million passengers. In average within a year 1.67 million passengers travel and 1.08 million vehicles drive on each road kilometre that exists in the Danube Region.

In relation to one railway infrastructure kilometre, Austria has the highest specific traffic volume with 2.32 million passengers per year, while Serbia has the lowest at 0.13 million. The average value for the countries in the Danube region is 0.87 million passengers per kilometre of railway infrastructure per year. The data covering all countries is shown in the figure below.

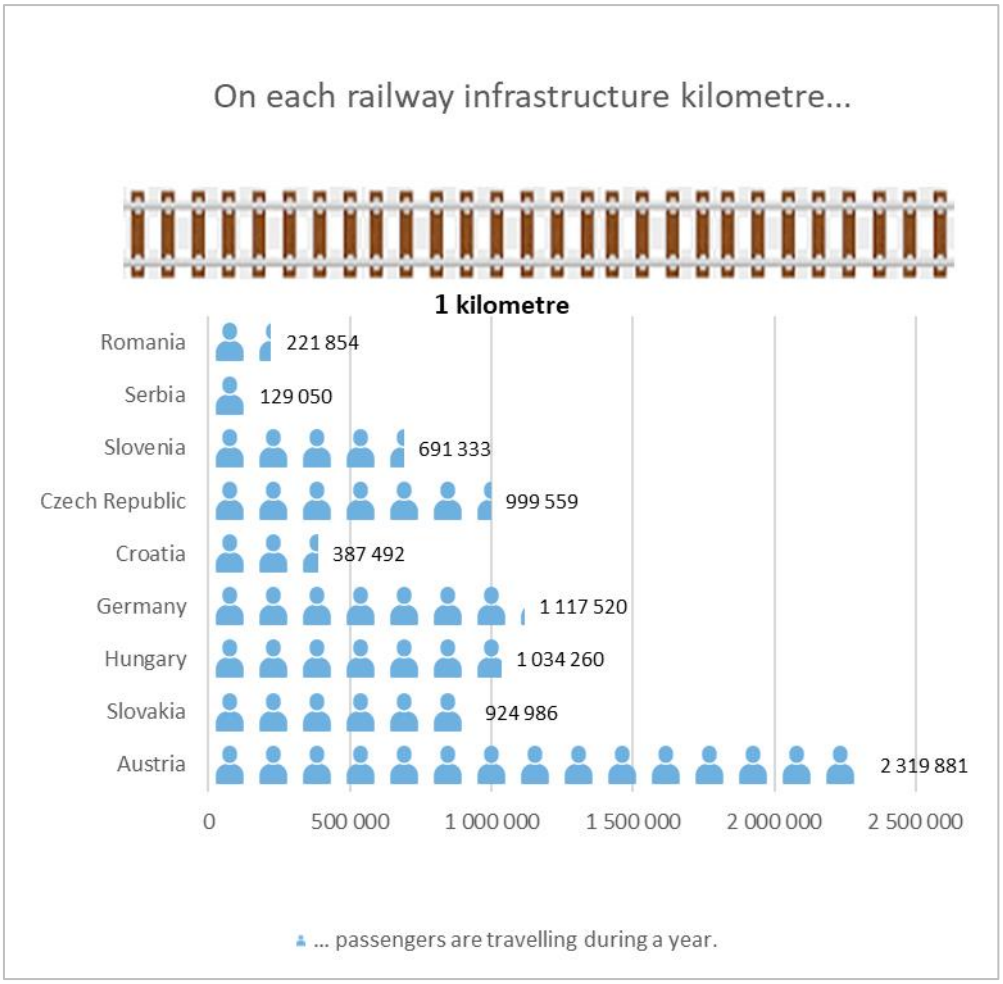

Figure 2: Number of passengers travelling on one railway infrastructure kilometre per year in partner countries (Source: Inputs from project partners, data basis 2022)

The following figure highlights the country-specific deviations in terms of road traffic compared to the average value for the Danube region – both for passengers travelling and vehicles driving on on road infrastructure kilometre. The value for Germany is clearly above the average (in both dimensions pkm and vkm) with the factor of around 2, all other countries are below the average.

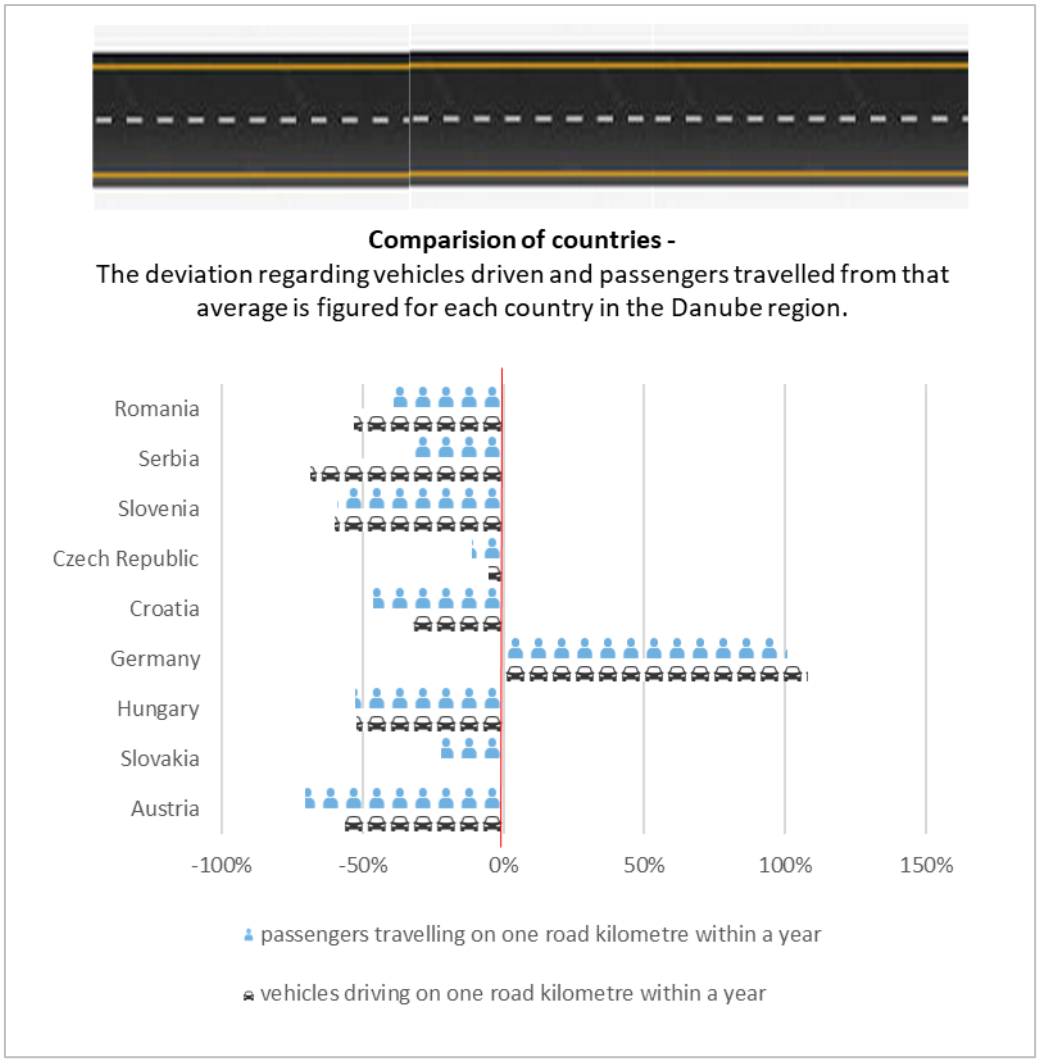

Figure 3: Comparison of countries compared the Danube Region average value for road infrastructure (Source: Inputs from project partners, data basis 2022)

The situation for specific railway traffic appears to be a bit more divers. Data for Austria shows the highest value for railways vehicle kilometre per km infrastructure compared to the average (around 350 % higher) with 166 % passenger kilometre compared to average. The Czech Republic (245%), Hungary (143%) and Slovenia (around 100%) have higher values for vehicle kilometres on the railway infrastructure than the average.

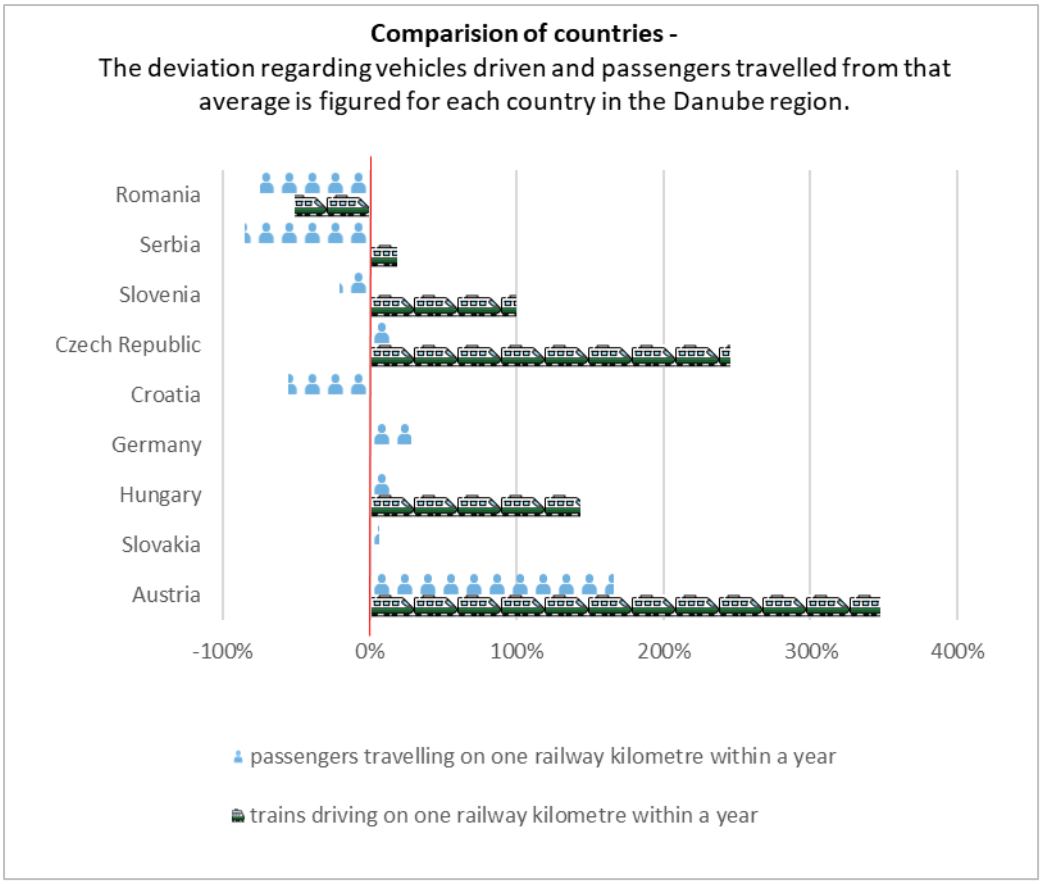

Figure 4: Comparison of countries compared the Danube Region average value for railways infrastructure (Source: Inputs from project partners, data basis 2022)

1.2.3 Current Energy Consumption and GHG Emissions in the Danube Region

In the following, the energy consumption of the passenger transport sector in the Danube Region is presented. In order to compile these energy consumption data a calculation had to be made, as the available energy consumption data in the partner countries weren't sufficiently comparable and the EuroStat data do not provide any energy consumption data by transport mode relating exclusively to passenger transport. This calculation based on both, the performance data of the passenger transport sector reported by the participating countries of the Danube Region and a specific energy consumption factor for each type of transport determined for the Danube Region and compiled by the project Odysee Mure (2024).

Road passenger transport in the Danube Region consumes 49.5 billion kilograms of oil equivalent annually (or 576 517 GWh/year) and rail passenger transport 0.47 billion kilograms of oil equivalent annually (or 5 529 GWh/year).

Table 3: Annual energy consumption from passenger transport in Danube region

Transport Category	Annual Energy Consumption	
	[ktoe/year]	[GWh/year]
Road Passenger Transport	49 571	576 517
... Cars	47 078	547 517
... Buses	2 493	29 000
Railway Passenger Transport	475	5 529
Domestic Aviation	378	4 406

SOURCE: EUROSTAT (2024), ODYSEE MURE (2024), OWN CALCULATIONS

GHG emission data are statistically developed in different ways in the participating countries. However, the EuroStat data provide a general overview based on the same base year and categories. On the one hand, this is a good basis to compare the participating countries. On the other hand, there is also a disadvantage to be considered. The selected EuroStat data certainly focus on fuel combustion in the transport sector. This means that these data certainly address direct GHG emissions caused by the transport sector, and specific GHG emissions (from a scope 2 perspective) caused by electric vehicles, which are already part of the traffic, are not included in these statistics. This limits the ability to identify future GHG savings potential in scenarios.

Due to the fact, that the reported energy consumption from the participating partner countries were not sufficiently comparable and the EuroStat data on energy consumption refers to the entire transport sector and not just for passenger transport, the energy consumption of the passenger transport sector in the Danube Region had to be calculated. This calculation based on both, the performance data of the passenger transport sector reported by the participating countries of the Danube Region and a specific energy consumption factor for each type of transport determined for the Danube Region and compiled by the project Odysee Mure (2024).

If, on the other hand, energy consumption in the Danube region is considered per kilometre of infrastructure, the dominance of road passenger transport is particularly impressive. Approximately 88 % of the energy consumed in passenger transport refers to road passenger transport by car. While trains account for only 8 % and buses for only 4 % of the energy consumption in passenger transport of this region. The figure shows this breakdown depicting the absolute amount of kilogram oil equivalents needed.

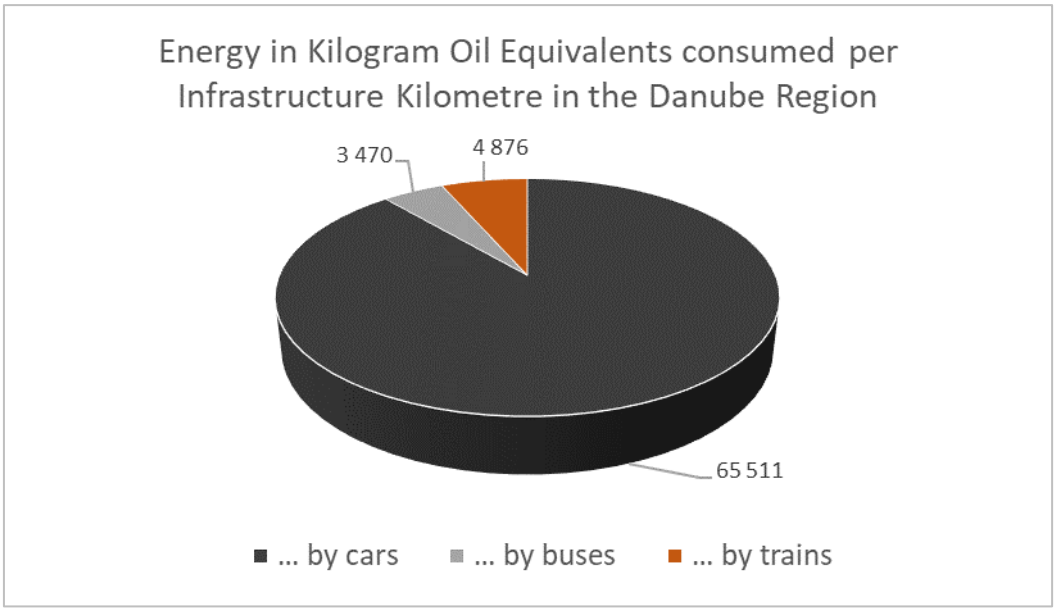

FIGURE 5: ENERGY CONSUMED PER INFRASTRUCTURE KILOMETRE IN THE DANUBE REGION (SOURCE: EUROSTAT 2024)

To illustrate the difference in the level of energy consumed by the countries of the Danube Region, as with the transport performance indicators, a figure is used for both road and rail transport networks. The figures below show, how much energy is consumed annually by the passenger transport sector per kilometre of road or railway in the Danube countries.

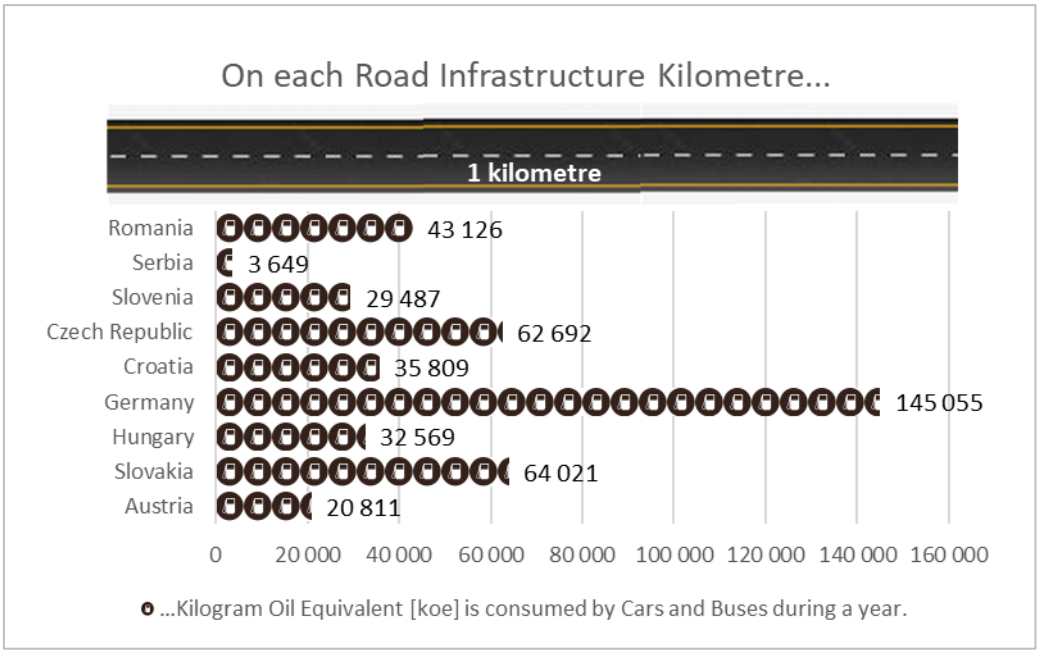

Figure 6: Energy consumed per infrastructure kilometre in the Danube region (Source: EuroStat 2024)

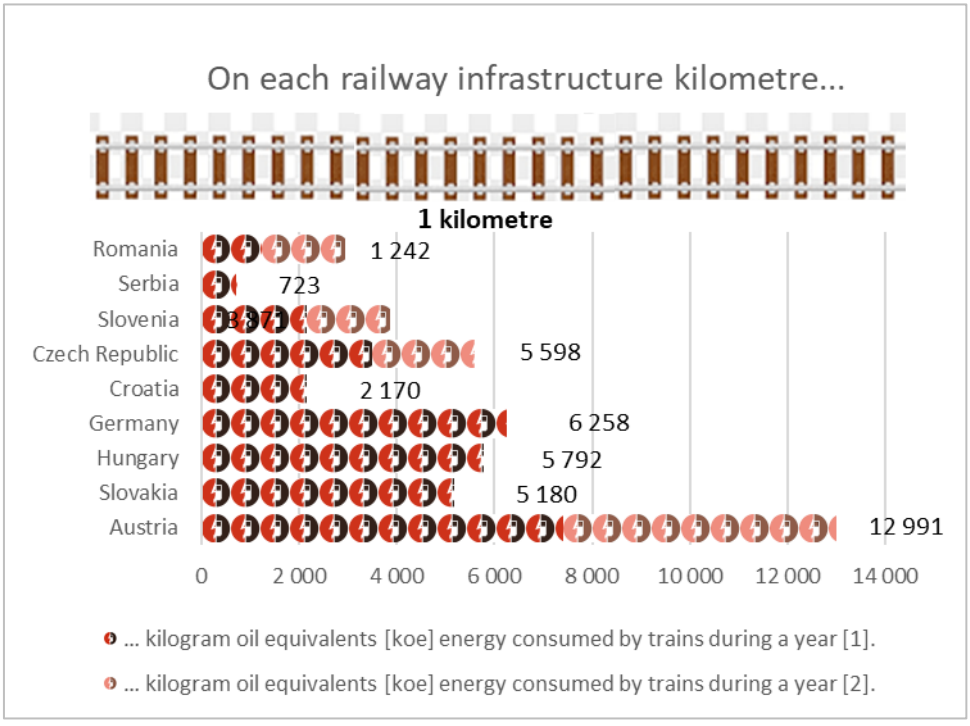

Figure 7: Energy consumed per infrastructure kilometre in the Danube region (Source: EuroStat 2024)

A difference in the absolute net length of the rail network of some countries was found in the statistical data based on different years of the data base. While the railway network broken down on by electrification of tracks based on data from EuroStat (2024a; Data base 2020) is published with data status 2020, the railway network broken down on permitted speed based on data from EuroStat (2024b; Data base 2022) is taken provided for 2022. Herein, differences in absolute net length of some countries railway network were identified. The differences do not appear to be plausibly explainable due to the year of the data basis. The following decision was therefore taken: While for the general analysis the most recent data on net length were used, for the analysis of energy consumption per rail kilometre a range was additionally taken into account, in order to provide a plausible explanation for the sometimes large country differences in individual analysis results (e.g. energy consumed by passenger railway transport per rail kilometre). This is the case for Austria (difference identified: 4,187 km), Czech Republic (difference identified: 5,752 km), Slovenia (difference identified: 961 km), Serbia (difference identified: 1,613 km) and Romania (difference identified: 9,014 km).

Concerning the evaluation of GHG emissions data reported by the partner countries derived from national data sources was not used due to significant uncertainties. Using EuroStat data includes the shortcoming of a potential underestimation. The data appears to to be too low due to the fact, that they only account GHG emissions from fuel combustion in (passenger) transport sector 2022.

The following figure shows CO_2 emissions per kilometre road infrastructure in the Danube Region.

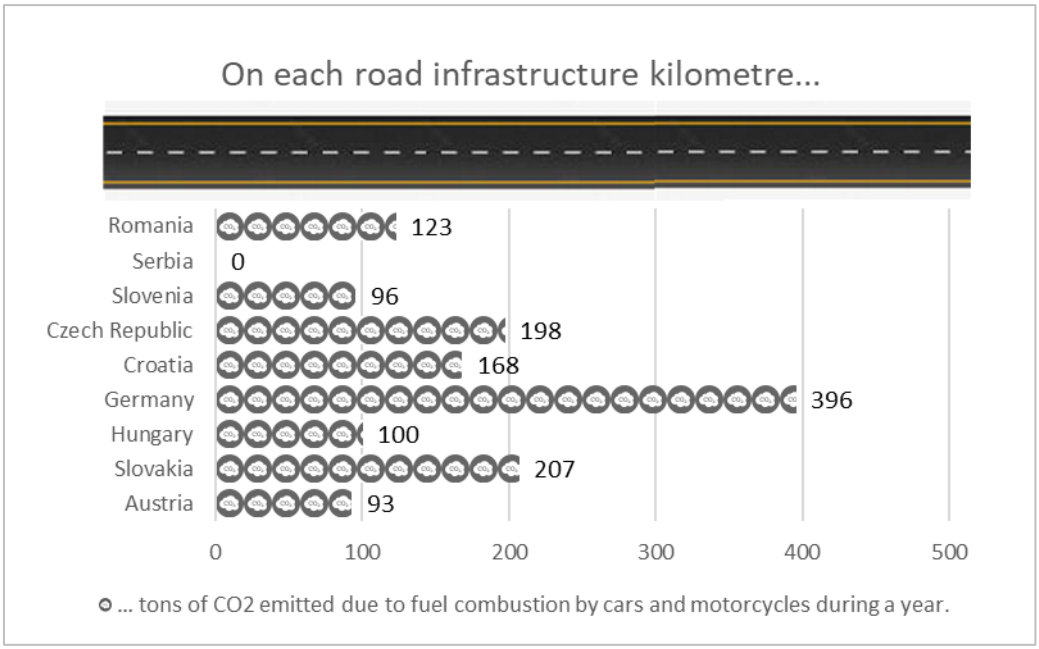

Figure 8: CO_2 emissions per kilometre road infrastructure in the Danube Region (Source: EuroStat 2022, Note: There are no GHG emissions due to fuel consumption available for Serbia at EuroStat)

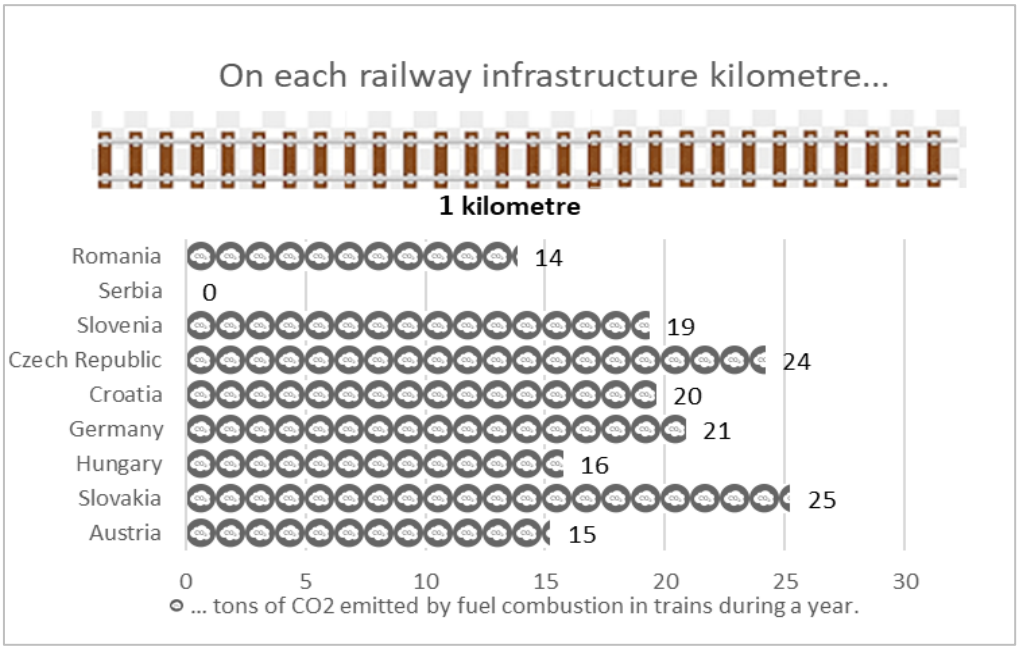

Figure 9: CO_2 emissions per kilometre railway infrastructure in the Danube Region (Source: EuroStat 2022, Note: There are no GHG emissions due to fuel consumption available for Serbia at EuroStat)

1.2.4 Infrastructure

1.2.4.1 Road Infrastructure

For evaluating road infrastructure data, inputs from partners were used as data source, as no no central data source was available. The following categories were taken into account: Highways and E-Roads (European Roads), State Roads, Provincial Roads and Communal Roads. Due to the country specific data collection, the assigned road categories may differ from country to country, leaving room for some uncertainty.

With regard to cycling infrastructure, an attempt was also made to survey the lengths of the cycle path networks in the Danube region. However, the data provided by the project partners could not be used in the country comparison, as the data basis was obviously not available to a sufficient extent, or the cycle path classifications were not standardised. The data collected is included in the master file in the appendix, but is not presented in the report due to the impossibility of plausibility checks.

The following figure provides insights in the relative share for road categories as well as the overall net length in kilometres.

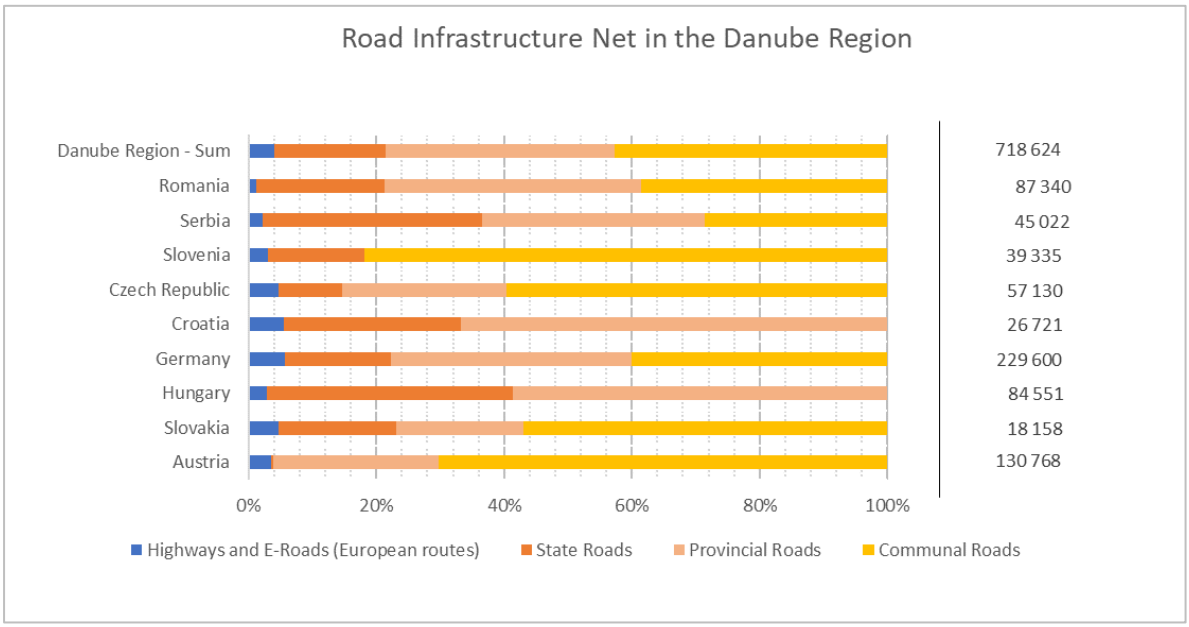

Figure 10: Danube Region Road Net Length, in kilometres (Source: Report from partners, 2024)

Concerning the road density in the Danube Region (see figure below) Slovenia and Austria have the highest value, clearly above the average in the Danube Region.

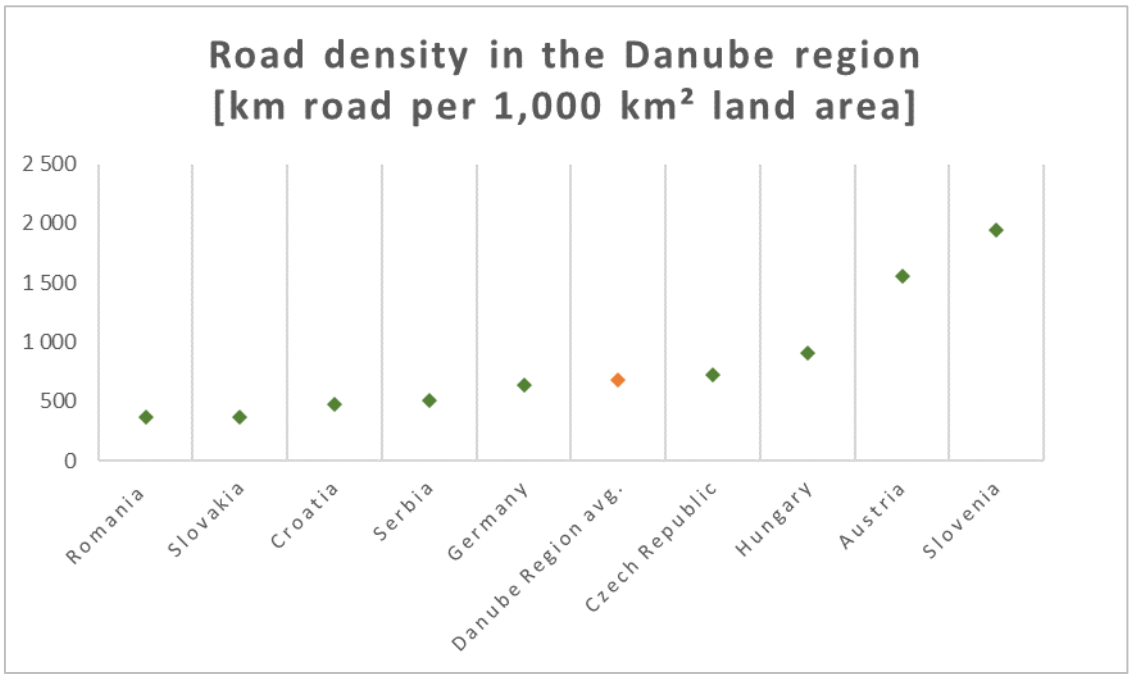

Figure 11: Road density in the Danube region (Source: Reports from partners, EuroStat, 2024)

1.2.4.2 Railway Infrastructure

For the evaluation for railway infrastructure net length the quality of the the infrastructure (permitted speed and electrification) was take into account as well.

The observed difference in the absolute net length of the rail network of some countries, based on EuroStat data from two different years, introduces uncertainty in the interpretation of the analyses and in the comparison of partner countries (see comment above in section “Current Energy Consumption and GHG Emissions in the Danube Region”).

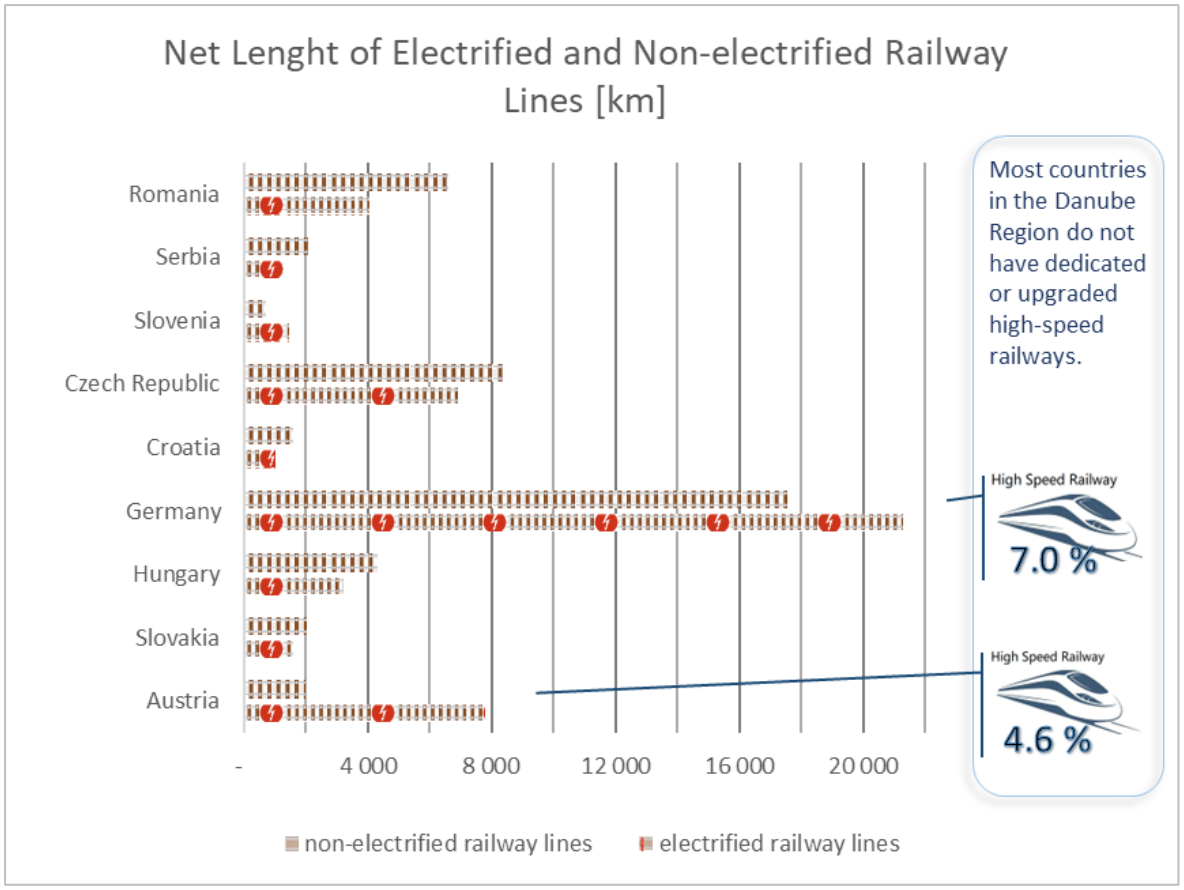

Figure 12: Net length of electrified and non-electrified railway lines (Source: EuroStat, 2024)

Concerning the railway density in the Danube Region (see figure below) Slovakia followed by Czech Republic and Germany have the highest value above the average in the Danube Region.

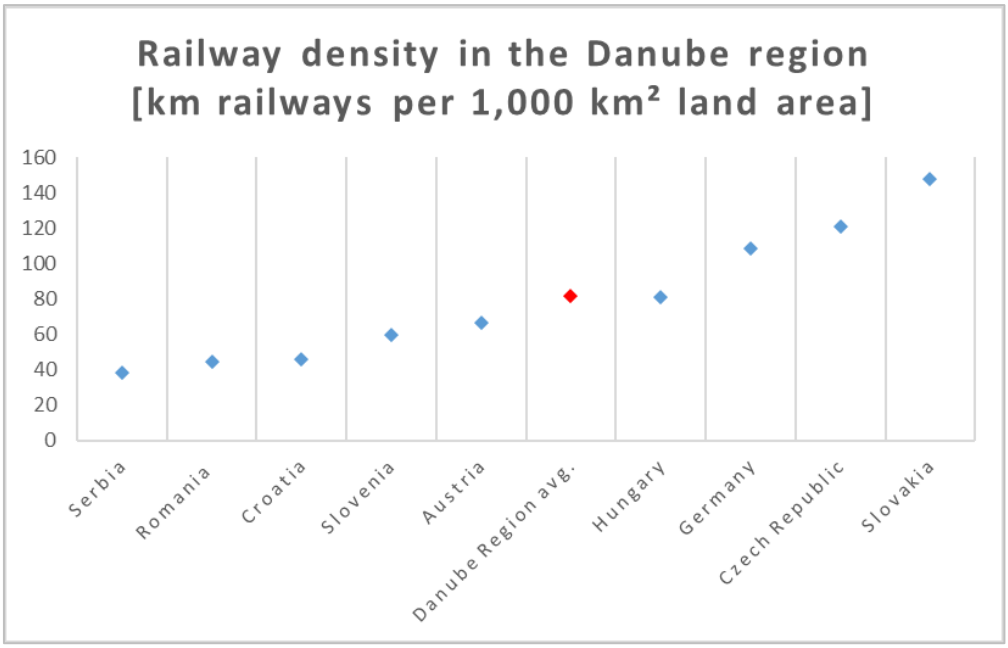

Figure 13: Railway density in the Danube region (Source: Reports from partners, EuroStat, 2024)

1.2.5 Mobility Behaviour

Modal split as distribution of passenger transport volume between different modes or means of transport is a key parameter in transport statistics. Beside that modal split could be evaluated based on the number of trips as well. The modal split describes individual mobility behaviour, its composition depends, among other things, on the respective transport offer and economic decisions and is based on different key figures such as the number of passenger kilometres travelled or simply the number of means of transport chosen regardless of the length of the journey.

In the data collection on country level it became evident that for some countries non-motorised transport was not included in the modal split analysis. Therefore, very different proportions in the country comparison became evident. To enable a cross country comparison, data was taken from central data sources. However, this data collection did not include data on active transport which was initially sought to ensure a seamless processing in the context of scenario development.

To allow cross country comparison even including active transport modes in the modal split the method for evaluation have to be harmonised. However and in particular for the A2PT partner countries a joint basis for the assessment of modal split is not

available, therefore posing a barrier for a robust and meaningful interpretation and comparison of the results in the context of the evaluation of shifting car trips to multimodal A2PT modes as intended by the A2PT project

The following table provides an overview on country specific modal split differentiated according to the segments "passenger cars", "public transport", "railways" and "tram & metro".

Table 4: Modal split overview (Shares of passenger-kilometres in percent)

Country	Passenger Cars	Public Transport	Railways	Tram & metro
Austria	72,1	7,8	13,3	6,8
Croatia	84,4	11,4	2,9	1,3
Czech Republic	77,3	10,7	8,0	4,0
Germany	84,7	4,6	9,2	1,4
Hungary	74,4	15,3	8,0	2,4
Romania	79,0	14,4	3,9	2,7
Serbia	84,4	12,0	1,1	2,4
Slovakia	78,4	12,0	8,8	0,8
Slovenia	86,1	11,6	2,4	-

(SOURCE: "TRANSPORT IN FIGURES", EC, 2024)

The modal split data basis, which is very important for the development of scenarios, can therefore not be used meaningfully, as the differences are very large on the one hand and cannot be plausibly explained on the other (apart from the fact that there are significantly different delimitations in the survey methodology).

1.3 SCENARIOS

As already mentioned in the introductory section, the Activity 1.2 included the development of scenarios for shifting car trips to multimodal A2PT, provided that the quality of the provided data was sufficient. The main purpose for the elaboration of scenarios was to underline the potential to reduce GHG emissions, carbon intensity and energy consumption in the project region. The following part includes an overview on the planned concept of the scenario development, the considerations regarding feasibility as well as a proposal for an alternative approach.

1.3.1 Concept for A2TP scenarios

As starting point for the development of scenarios the data sets from the status quo data analysis was considered,

(1) ENERGY AND GHG EMISSIONS

Energy consumption of passenger transport on land

- Passenger-kilometre (Pkm) by mode of land transport (in percent)
- Vehicle-kilometre (Vkm) by mode of passenger transport (in percent)
- Energy consumption per Vkm of transport modes (share of Mtoe in percent)

Annual GHG emissions from land passenger transport

- GHG emissions in the passenger transport sector (in Mt CO2-eq / year)
- GHG emissions per year on transport modes (in Mt CO2-eq / year)
- Share of renewable energy sources (Mtoe) in the transport sector (in percent)
- Vehicle stock numbers of passenger cars (over time period)
- Vehicle stock numbers of busses (over time period)

(2) INFRASTRUCTURE

- Infrastructure net lengths for roads and railways (in kilometre)

(3) MOBILITY BEHAVIOUR

- Transport performance indicators
- Modal split as share of Pkm
- Mobility opportunities (cars, public transport, bicycles per 1.000 inhabitants)

The time frame for the scenarios was set to the year 2030 being in line with EU's climate goals of reducing EU emissions by at least 55% by 2030 ("Fit for 55"). As first element the baseline trend ("Business as usual") was set. Even if the span 2022 (in general the data origin for the status quo) to 2030 is relatively short in time to measure effects from interventions that start as for example the projects pilot actions in 2025 some influencing factors were considered. Still, particular for mapping transformational processes and inertia effects the level of complexity should be kept low, since more parameters include more blurs and bias and since the scenarios are intended to be sketches of a near future.

The following table includes the data sets used for the status quo analysis as well as the defined respective trend and further options.

Table 5: Assumptions for Baseline Trend (Business as usual)

Factor	Trend	Options
- Passenger Transport Performance **- Vehicle km on different transport modes** **- Pkm on different transport modes**	Keep constant	Trend (increase / decrease, annual change rate in %)
- Vehicle stock numbers	Keep constant	Trend (increase / decrease, annual change rate in %)
- Specific emissions of cars and vans **- Energy consumption (per Vkm) on transport mode**	Simplified „modelling" of new cars in stock (with average value for Danube region)	Country specific trends
- Modal split on passenger kilometres	Keep constant	Apply shift from non-motorized to motorized individual transport

In that scenario, all factors were set constant in general except the topics "specific emissions of cars and vans" as well as "energy consumption (per Vkm) on transport mode". This decision was taken in the light of the CO_2 emission reduction targets for new cars and vans which will enter into force in January 2025 (with the first reduction phase from 2025 – 2029). As subsequent step, factors which support effects for shifting car trips to multimodal A2PT caused by better A2PT infrastructure and services were considered.

The following effects were determined to be positively influenced respectively supported by A2PT measures in general (depending on trip length and purpose):

- using a bike instead of travelling by car for a certain share of individual trips
- using public transport instead of travelling by car
- combining bikes and public transport instead of travelling by car
- combining bikees and public transport and partly replacing car trips car
- combining walking and public transport and partly replacing car trips car

Further measures would contribute to overall emissions reductions, however, were not in the direct scope of A2PT:

- increase of occupancy rate in motorised individual transport
- implementation of corporate mobility management
- increased home office use
- higher uptake of BEVs (beyond trend induced by fleet emission reduction targets)

Finally, two scenarios were seen appropriate to discuss the potential impact of A2PT

- **Scenario #1 „Moderate Impact":** This realistic scenario covers certain uptake of best practice in several parts in all A2PT regions
- **Scenario #2 „High Impact":** This rather optimistic scenarios maps best possible uptake of best practice in all A2PT regions

1.3.2 Considerations regarding feasibility

While diving into the data sets on mobility behaviour are the comparability of data is very weak. At the same time, the change of mobility behaviour is the key to change from a car-orientated society to a society where A2PT modes of transport are the norm in everyday life – and reliable data on mobility behaviour are therefore a central variable in the calculation.

In particular, with the modal split shares it became apparent that the underlying data base (share of trips or share of passenger-km) vary in the partner countries and differ too greatly to gain aggregated Danube Region A2PT scenarios. Also, the high variation of year of the last transport assessment – e.g. in Austria the last assessment was performed in 2013/2014 – adds to the poor comparability of the modal split data. By switching to centralised data sources (EuroStat), it was possible to ensure comparability at country level, but the exclusion of active mobility in the overall analysis is apparent.

Similar pictures of poor comparability occurred also with the data sets of trip purposes, average trip length, average amount of trips and mobility opportunities (access to own car, own bicycle, long-term PT-tickets) per 1,000 inhabitants are to incomplete to use it as parameters for mobility transition scenarios. In any case, the results gained through scenarios with this data are not suitable to relate them in any way to quantitative objectives of the National Energy and Climate Plans (NECPs) nor to the NDC targets.

Within the partner meetings PM2 (July 2024, Olomouc) and PM3 (November 2024, Ulm) this situation was discussed internally with all partners. With their peer feedback and by exchanging with the partners on the practical use of calculated scenarios with not very reliable and therefore contestable figures the consortium agreed not to publish a Danube Region scenario. They questioned the further use of such figures for awareness-raising campaigns or as arguments in publications.

Together with the researchers from KTI and GYS the AEA hold a final online meeting in December 2024 and came fast to the conclusion, that it not reasonable to bring the calculations to the Danube Region level.

1.3.3 Alternative approach and follow up activity

The national transport data from most of the participating countries – in particular indicators of mobility behaviour (modal split, infrastructure net length, trip purpose and average trip length) – showed lack of availability and comparability. Additionally, for the purpose to create A2PT scenario on macro-regional level also the data of active mobility (modal split, cycling infrastructure net length) is too poor to aggregate for a multifactorial calculation model.

Consequently, the methodological approach was reconfigured and led to new reflections on how mobility transition scenarios could still be developed and made fruitful for the development of the A2PT action plans (Activity A 1.5). The new methodological approach is based on the following considerations:

- Instead of data-based scenarios for all countries an exemplary calculation will be made exemplary on Austrian transport data. This will be performed (1) on a national level and (2) on regional level (e.g. Vienna agglomeration including Lower Austria and Burgenland, within period 3.
- The development of this exemplary scenario will be documented as a guide on how to assess data on a regional level and how to interpretate and qualitatively validate the results as participative medium in strategic planning processes (stakeholder interviews, focus group discussion).

With that in mind, the scenarios can be tested within the network of partners and used as a tool for dialogue-based interventions and a basis for further steps. Participative, community-based methodologies such as expert interviews, focus group discussions or similar will serve as considerations for a logic model to prepare Activity A 2.3 to test and disseminate the toolbox. In this context the involvement of PP, regional working groups as well as ASP will gain insights in mobility behaviour patterns in the pilot action regions. The scenarios “business-as-usual”,

It is envisaged that the already established regional A2PT working groups will be used as a forum to align the concept for the evaluation of pilot action implementation as well as to analyse available data (in a timeline) for strategies and campaigns positively affecting modal split changes.

1.4 CONCLUSIONS AND RECOMMENDATIONS

A direct comparison of the countries in the Danube region revealed fundamental differences. Apart from the obvious main indicators such as area and population, parameters such as purchasing power and degree of urbanisation also make a direct comparison sometimes difficult. As long as a common database such as EuroStat is used, an evaluation of the overall data in the Danube region, as well as a country comparison, is relatively robust and, in most cases, meaningful. For some parameters, however, which play a central role in the estimation of effects – in particular shifting car trips to multimodal A2PT – fundamental problems with data availability and quality became apparent – see details in chapter 1.3. However, the comparative data analysis of the status quo (chapter 1.2) offers some interesting findings from that can be summarised as follows:

- In the Danube region, road passenger transport has by far the highest traffic volume with 1,456.79 billion pkm/year or 924.93 billion vkm/year. The car is the most used mode of transport in road passenger transport.
- Railway Passenger Transport is relatively far behind road passenger transport with 85.89 billion pkm/year. Additionally, Urban Public Transport is even lower at 11.12 billion pkm/year.
- In average 1.67 million passengers travel and 1.08 million vehicles drive within one year on each road kilometre that exists in the Danube Region. Germany has the highest density of usage per road kilometer per year with a rounded 4.1 million passengers per kilometre, while Austria has the lowest value with 0.6 million passengers on one of the longest road net length per capita and per area among all participating partners which fit to comparisons that Austria exhibits also one of the highest soil sealing factors in Europe.
- The average value for the participating countries of usage per kilometre of railway infrastructure per year is 0.87 million passengers. In relation to one railway infrastructure kilometre, Austria has the highest specific traffic volume with 2.32 million passengers per year, while Serbia has the lowest railway usage at 0.13 million passengers per kilometre and year.
- In terms of road traffic compared to the average value of the Danube region there are rather large country-specific deviations: The value of passengers travelling in

Germany is clearly above the average (in both dimensions pkm and vkm) with around the factor of 2, all other countries are below the average.

- For deviations in specific railway traffic the situation appears to be a bit more divers. Data for Austria shows the highest value for railways vehicle kilometre per km infrastructure compared to the average (around 350 % higher) with 166 % passenger kilometre compared to average. Czech Republic (245 %) as well as Hungary (143 %) and Slovenia (around 100 %) show higher values compared to average for vehicle kilometres on train infrastructure.
- Concerning energy consumption in the Danube region, per kilometre of infrastructure the dominance of road passenger transport is particularly impressive. **Approximately 88 % of the energy consumed in passenger transport refers to road passenger transport by car.** While trains account for only 8 % and buses for only 4 % of the energy consumption in passenger transport of this region.
- Concerning the road density in the Danube Region (see Figure below) Slovenia and Austria have the highest value, clearly above the average in the Danube Region.
- For railway density in the Danube Region Slovakia followed by Czech Republic and Germany show the highest values above the average in the Danube Region.

With regard to mobility behaviour and specifically the modal split, it has been shown that the survey methods differ so greatly from one another that it is not possible to compare the values. This also means that there is no central basis for the development of macro-regional scenarios for shifting car trips.

As a very important **recommendation on EU-level,** it is suggested that data on modal split including active mobility modes should be prepared using a standardised methodology suitable for central collection (as in EuroStat).

2 Policy review on intermodality of active to public transport

2.1 INTRODUCTION

2.1.1 Task description and scope

A review of general energy and GHG emission related policies as well as more specific policies for transport and mobility on EU and national level was nessecary to understand the state of the art on active and public transport strategies and the intermodality of active to public transport. Content and learnings from the different strategies are a necessary basis to built upon in the development on an A2PT action plan on macro-regional as well as on the regional level. The following question guided the research:

a. How do the policies target the transport sector in general? Do the EU and/or strategies **provide recommandations on combining active mobility (AM) and public transport (PT)**?

b. How explicit do policies from the Danube Region target the **shift from car use to more sustainable intermodal, active to public transport** suggested in addition to decarbonization, green transport technologies and alternative fuels measures?

c. **What kind of measures or solutions are proposed in the policies?** In which action fields – e.g.

- Accessibility of stops, stations and platforms
- Walkable and cycable infrastructure to point-of-interests near stations
- Ticketing, service, info for convenient and easy-to-combine AM and PT
- Shared mobility (bicycles, scooters) at stations
- Cycling carriage on trains or busses
- Safe and sufficient bike parking at stations

The aim was to compare the policy documents of the of the strategies, to built upon existing governmental documents from national and EU authorities.

- **discussion** with PP/ASPs at the 2nd partner meeting
- **recommendations** for the update of NECP / NDCs
- **integration** into the national/regional and the **Danube A2PT Action Plan (A1.5)**

2.2 CONCEPT AND METHOD

Relevant policy documents vary from country to country. To collect the most relevant policy document a clear and simplified concept of policy document types on the different administrative levels - EU, national and regional – was prepared as guideline for the partners to identify the most relevant strategies, master plans, action plans, guidelines, regualtions, laws, etc.

Table 6: Concept of transport and mobility policy documents on European and national level

ADMINISTRATIVE LEVEL	DOCUMENT TYPE	RESPONSIBLE PARTNER
EU-level	**European Green Deal:** Fit-for-55 + specific transport related policies and legislation	AT – AEA
	EU-Danube Region EUSDR Action Plan - PA 1B - Rail-Road-Air Mobility (Action Plan	
National (Must-have)	**NDCs** – Nationally Determined Contributions to the Paris Declaration	AT – AEA CZ – PUM DE – DOU HR – MMP HU – KTI RO – VNC SI – MOP SK – BID SR – DCC
	NECPs – National Energy and Climate Plans	
	Master Plans (or similar strategies) on mobility, public transport, cycling and walking	
	Regulations concerning the connection of public transport, cycling and walking	
Regional (nice-to-have)	Master Plans & Regulations on the connection of public transport, cycling and/or walking (or similar policies)	

The following superordinate structure of documents helped the partners in the process of finding the right documents:

- **National Energy and Climate Plan** (all EU-members, maybe not in EU-canditates like Serbia)
- **National Master Plans**, Action Plans or other strategies that target mobility, transport, energy, environment or similar
- **National Laws and Regulations** on traffic, public transport, active mobility, infrastructure, etc.

Since all partners are expert in the field of A2PT they (1) used their own knowledge and/or (2) activated key stakeholders to provide knowledge on existing documents that refer the connection of active mobility and public transport.

To find the most relevant topics from the policy documents that relate to the A2PT objectivesfrom this project the topics of the A2PT Pilot Actions were reflected with the project team at the first partner meeting (March 2024, Vienna).

Topics from the conceived pilot projects are:

- Infrastructure at stations
- Surrounding of stations
- Ticketing System
- Bike/E-Scooter Sharing Options
- Equipment: bike boxes, bus rackets

KEYWORD GROUPS

The common discussion on pilot activities lead to a common brainstorm of the most relevant keywords all partners should search in order to find the mosrt interessting text passages in the policy documents. Finally the keywords were grouped into the following content-wise in categories

- **Walking,** pedestrian, sidewalk, public space, safe crossings, etc.
- **Cycling,** bicycle, cycle, cycle path, bike parking etc.
- **Active mobility,** active transport, physically active transport, etc.
- **Public transport,** rail, bus, tramway, metro/underground, long distance, urban transport, stations, etc.

- **Sustainable transport,** sustainable modes of transport, environmental friendly transport, etc.
- **Intermodality,** multimodality (in the context of passenger transport only)
- **Other:** .....

Each partner's task was the translation into the national language of their country and search for the keywords in the relevant documents. The found text passages were filled into a policy review template between March and June 2024. The paragraphs were copied into the given template in original language and translated in English with the help of online translation and completition with reviewing if the vocabulary and meaning of the translation was appropriate for professional purposes to review the documents. For each document with relevant content on A2PT, the partners wrote a short summary of highlights in the document and offered their professional opinion on the value of the document to implement A2PT infrastructure and services. Finally, with all the pre-structures, filled in templates the AEA performed a qualtative contant analyses (after Mayring 2014).[1]

2.3 RESULTS

Table 7: Considered and compiled documents from 9 countries of the Danube region

ADMINISTRATIVE LEVEL	NUMBER OF DOCUMENTS
EU- and transnational	15 documents
NECPs (National, binding)	9 NECPs and 2 updated NECPs reviewed)
National Strategies and Plans	57 documents (reviewed)
National Laws and Regulations	56 documents
TOTAL	**139 documents considered / 68 documents reviewed**

Mainly the NDCs, the NECPs and the national strategies were reviewed at this stage and for the purpose to feed into activity A 1.5 the Danube Region A2PT Action Plan as planed in the projects application.

[1] Mayring, P. (2014). Qualitative content analysis: theoretical foundation, basic procedures and software solution. Klagenfurt. Retreived online 2024-08-05: www.ssoar.info/ssoar/bitstream/handle/document/39517/ssoar-2014-mayring-Qualitative_content_analysis_theoretical_foundation.pdf

2.3.1 Nationally determined contributions (NDC)

In 2016, all EU member states and EU canditates signed the UN Paris Agreement on reducing CO2 emissions to follow the path of decarbonizing and climate-neutral future in order "to limit the temperature increase to 1.5°C above pre-industrial levels". In 2020, the 196 countries who signed the Paris Agreement handed in nationally binding climate action plans in form of nationally determined contributions (NDCs). By 2021, the European Union (all member states) decided in form of the "EU Green Deal" to even improve the NDCs from before 2020 to the common goal of a net domestic reduction of at least 55% in greenhouse gas emissions by 2030 compared to 1990.

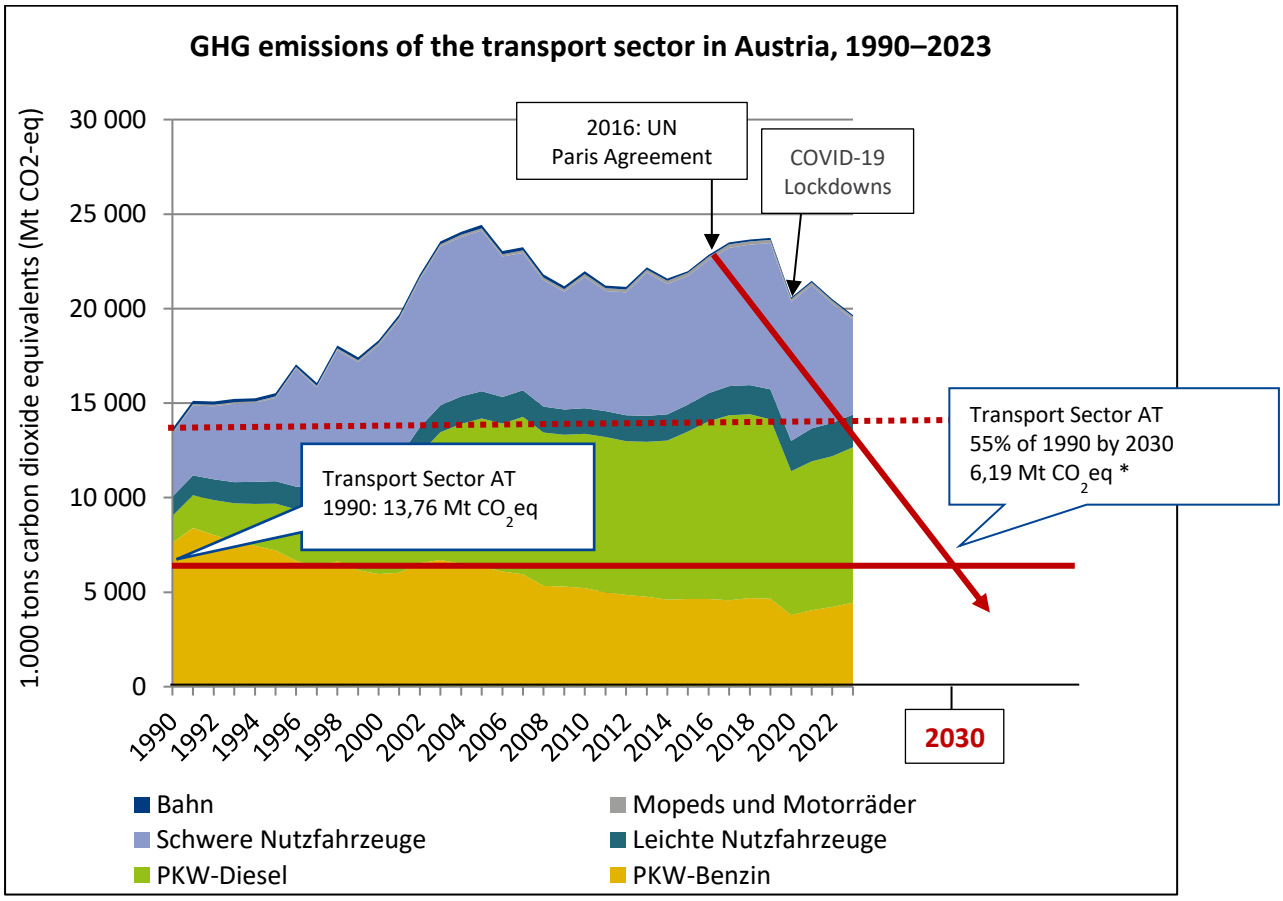

Figure 14: EU NDC of 55% reduction in greenhouse gas emission, demonstrated with GHG emissions of the transport sector in Austria, 1990–2023 (Source: Austrian Environmental Agency – Umweltbundesamt: Preliminary results from NowCast 2024 and own drawing)

*** Note: The figure is from 2019 NECP and left at place for demonstration purpose. The 2024 updated NECP Austria contains no sectoral goals any longer.**

The A2PT partners provided figures for their nationally determined contributions (NDC) as defined by the Paris Agreement 2016 of the UNFCCC (Link) and as updated in 2023 by the European Commission on behalf of the EU and its Member States. All member states of the European Union agreed in Madrid to a net domestic reduction of at least 55% in greenhouse gas emissions by 2030 compared to 1990.

The submitted figures from the project partners were cross-checked with figures from the Climate Resource Online Factsheets (Meinshausen et al. 2023)[2] cited in [brackets].

Table 8: General NDCs and for the transport sector from A2PT partner countries

NDCs	GHG Emissions 1990	GHG Emissions 2005	GHG Emissions 2023	GHG Target by 2030	Country
All sectors	79.1 Mt CO2-eq [82.0]	[52.6] Mt CO2-eq	77.5 Mt CO2-eq	2030: 65.8 Mt CO2-eq [52.6 Mt CO2-eq GHG target from 2019]	Austria
	31.5 Mt CO2-eq [37.6]	[32.1] Mt CO2-eq	24.6 Mt CO2-eq	14.2 Mt CO2-eq [24.2]	Croatia
	[200.5] Mt CO2-eq	[145.8] Mt CO2-eq	--	[85.5] Mt CO2-eq -26% / -827kt CO2eq (-40% by 2030 compared to 2005)	Czechia
	1251 Mt CO2-eq [1284.2]	[980.2] Mt CO2-eq	674 Mt CO2-eq	438 Mt CO2-eq [482.9] (German Climate Change Law: reduction of 65% compared to 1990)	Germany
	73.3 Mt CO2-eq [97.6]	[80.0] Mt CO2-eq	48.5 Mt CO2-eq	56.2 Mt CO2-eq [57.5]	Hungary
	222.5 Mt CO2-eq [243.6]	[141.1] Mt CO2-eq	66.1 Mt CO2-eq (without LULUCF)	102.8 Mt CO2-eq [103.3]	Romania

[2] Meinshausen, M, J. Lewis, J. Guetschow, Z. Nicholls, R, Burdon (2022) "NDC Factsheets", 2022, version 1st December 2023, retrieved on 2025-01-13 from www.climate-resource.com/tools/ndcs

	82.7 Mt CO2-eq [78.2]	[67.7] Mt CO2-eq (2010: [68.6])	62.2 Mt CO2-eq	[59.5] Mt CO2-eq minus 13,2% compared to 2010; minus 33,3% compared to 1990	**Serbia**
	73.9 Mt CO2-eq [65.8]	[51.2] Mt CO2-eq	37.2 Mt CO2-eq	33.1 Mt CO2-eq [30.2]	**Slovakia**
	[29.1] Mt CO2-eq	[23.0] Mt CO2-eq	16.1 Mt CO2-eq	10.7 Mt CO2-eq [15.2] Burden Sharing Decree in Slovenia, i.e. by at least 28-31 % compared to 2005.	**Slovenia**
Transport sector	13.9 Mt CO2eq	--	21.6 Mt CO2-eq	no sector goals in NECP update from 2024	**Austria**
	3.2 Mt CO2-eq		6.7 Mt CO2-eq	1.8 Mt CO2-eq	**Croatia**
	--	--	--	--	**Czechia**
	163 Mt CO2-eq	--	155 Mt CO2-eq	85 Mt CO2-eq From (German Climate Change Law: reduction of ~52% compared to 1990	**Germany**
	8.8 Mt CO2-eq	--	13.8 Mt CO2-eq	no sector goals in NECP update from 2024	**Hungary**
	12.4 Mt CO2-eq	--	6.7 Mt CO2-eq	5.6 Mt CO2-eq (-55%)	**Romania**
	4.5 Mt CO2-eq	--	7.7 Mt CO2-eq (2021)	- 5,1% compered to 2010.	**Serbia**
	6.8 Mt CO2-eq	--	7.8 Mt CO2-eq	NECP sector goal: 8.5 Mt CO2-eq	**Slovakia**
	--	--	5.2 Mt CO2-eq	6.3 Mt CO2-eq (-55%)	**Slovenia**

SOURCES: INPUTS FROM PROJECT PARTNERS, DATA BASIS: JUNE 2024;
COMPLEMENTING DATA FROM MEINSHAUSEN ET AL. 2023 IN [SQUARE BRACKETS]

2.3.2 National Energy and Climate (NECP)

All partner countries have signed the Paris Agreement (EU member states and canditates) and therefore have prepared National Energy and Climate Plans (NECP). The NECPs from EU members can be found here, many of them also as English version: Link

Overview and findings from the NECP analysis

Table 9: Main indicators of partner countries in the Danube Region

NECP	AT	SK	RS	DE	HR	CZ	SI	RO	HU
Walking	**6+ PT**	0	1	2	1	0	**3+ PT**	1	1
Cycling	**6+ PT**	2	1	**5+ PT**	1	1	**3+ PT**	2	2
Active Mobility	**8+ PT**	1*	1	0	1*	1	1*	0	1
Public Transport	**17+ AM**	1	1	20	3	8	3	1	4
Sustainable Transport	4	1	3*	1	5	5*	2*	5*	1
Intermodality / Multimodality	3	1	1	0	0	0	0	1	1

SOURCE: A2PT CONSORTIUM, 2024

* KEYWORD IS ONLY INDIRECTLY MENTIONED BY UNDERSTANDIG THE CONTEXT OF THE PARAGRAPH

From the content analysis performed on the base of the pre-structured relevant text paragraphes translated by the partners, the paragraphs with content of the predefined keyword was counted. All NECPs refer to means of public transport with its important role as a sustainable mode of transport for a climate-neutral future. Most of the partner countries NECPs rarely mention active modes of transport. Also when the documents mention intermodality or multimodality for the last mile between station and final destination of trips, they do not refer to bike but to car sharing or car pooling systems.

The green markings highlight NECPs that mention active mobility and public transport to gether with the objective to better combine active and public transport. From this perspective, **Austria, Slovenia and Germany are frontrunner states in the Danube Region** (the nine countries in this project) that set clear preconditions to implement high quality infrastructure and services to connect walking, cycling and public transport.

Highlights on A2PT in the reviewed NECPs

Concrete solutions in NECPs

Germany - NECP – p 98	Austria – NECP – p 125
• bicycle parking at railway stations. • upgrading structures at junctions between railway lines and roads in favour of cycling (support under railway crossing law).	• multimodal sustainable forms of mobility (bike & ride, bike sharing). • organisational and planning frameworks in local and urban spatial planning for active mobility. • fast-cycling-paths between villages in whole regions.

NECPs – General goals on sustainable modes of transport

Slovenia – NECP – p. 37	Slovakia – NECP – p. 125
• […] upgrade existing railway infrastructure, develop cycling and walking infrastructure, develop integrated public transport, promote sustainable modes of transport, improve the integration of spatial and transport planning, and develop a supportive environment for increased efficiency and use of alternative fuels in transport.	• The use of monitoring and communication technologies is expected to improve inter-modal connectivity within integrated transport systems as well as the accessibility of public transport stations and stops, especially by environmentally friendly modes of transport.

2.3.3 STRATEGIC POLICIES ON NATIONAL LEVEL

Relevant national policy documents on better combining active to public transport from the partner countries are for example:

- Mobility Master Plan
- Cycling Master Plan
- Walking Master Plan
- Active Mobility Action Plan
- Public Transport Infrastructure Plan
- Sustainable Develompent Strategies
- Or other types of recommandation

Overview and findings from national (transport) strategies

Table 10: Main indicators of partner countries in the Danube Region

National Strategies	AT	SK	RS	DE	HR	CZ	SI	RO	HU
Walking	✓	x	x	(✓)	x	Concept of Urban and Active Mobility	x	x	x
Cycling	✓	outdated (source ECF)	x	✓	✓	✓	✓	✓	✓
Mobility Transport	✓	✓	(✓)	✓	✓	✓	✓	✓	✓
other policies mentioned by PP	**>5**	**3**	**6**	**4**	**4**	**4**	**0**	**4**	**2**

SOURCE: A2PT CONSORTIUM, 2024

All partner countries use a strategic mobility or transport policy on national level to steer the countries developement in that sector. Yet the goals and ambitions of each coutry has different directions. Some countries have specific master plans for “smart and intelligent mobility” but do not mention active mobility as part of a “smart and intelligent mobility” rather stress digitally and technologically driven developments and products and their specific requirements.

Nevertheless, 7 from 9 countries have a valid national masterplan on cycling, but only Austria has a approved Master Plan on Walking. Germany already published a preliminary concept and plans to approve a full version of a national Master Plan on Walking in 2025 or 2026. Several other policies such as sustainable development plans mentions active mobility and public transport as modes of transport that should offer improved connectivity but also on the level of strategic policies the picture of the findings from the NECPs is deeped also on the level of non-binding national documents. The impression gained at this level corresponds with those countries that are also with their NECP frontrunners on ambitious strategies to move public transport and active moblity to the next level.

Highlights on A2PT in the reviewed national strategies

WALKING STRATEGY (CONCRETE SOLUTIONS)

Example from Austria – *National Walking Master Plan*

Measure 26: Ensure easy and barrier-free pedestrian access to public transport stops and stations

Easy and safe accessibility and accessibility of stops and platforms **from two sides should** be ensured. This **avoids detours** and makes it much easier for pedestrians to reach stops. **Short access routes** should be ensured through radial alignment. The **access routes should be attractive (pleasant and varied)** and can lead through parks, recreational areas, passages with displays and the like. **Short distances** should be achieved by aligning the route network with the stops and making it easy to see through or cross barriers such as blocks of flats, freeways, railroads or rivers. When designing stops and stations, attention should be paid to **short transfer routes [from one PT to another PT], accessibility and easily understandable signage and information**.

CYCLING STRATEGIES (CONCRETE SOLUTIONS)

Example from Slovenia – *National Cycling Strategies*

"**Using a bicycle significantly increases the accessibility to public transport hubs.**

Due to **limited bike transport capacities on vehicles**, cyclists are also **encouraged to use two bicycles**, where the first and last kilometers of the journey are completed by bike. The first bike is parked at a public transport hub near the starting point of the cyclist's journey during work, school, or errands. The second bike is stored at a hub near the cyclist's destination. **For overnight parking, hubs at journey destinations (gravity centers) must provide high levels of bike security.**

Public **bike-sharing** systems can also play a significant role in multimodal journeys."

TRANSPORT STRATEGIES (CONCRETE SOLUTIONS)

Example Hungary – *National Transportation Infrastructure Development Strategy*

"The number of **bicycle parking and storage facilities** is low, and the infrastructure conditions for **safe bicycle parking and storage** are not in place. The transport of bicycles on public transport is only partially provided."

TRANSPORT STRATEGIES
(DESCRIPTION OF SERIOUS CHALLENGES, UNTYPICAL SOLUTIONS)

Serbia *– National Transport Strategy (Draft)*

„... **the provision of public transport in Serbia as a whole has become problematic** in recent years. **Most of the railway system consists of single-track railways**, with limited speeds and capacities. Network mainly of **private intercity bus lines** complements and competes with railway lines services, but in many **smaller cities and municipalities local public transport is not sufficient**.

About 40% of local self-government units states (LGU) that there is no organized public transport in their area. Only 9% of LGUs have a developed traffic or transportation plan"

LOW-CARBON DEVELOPMENT STRATEGY (SOLUTIONS)

Slovakia – *Low-Carbon Development Strategy*

"Promote cycling by **subsidizing** the creation of new cycling infrastructure, and **plan** ahead and **promote cycling routes in urban road infrastructure as one of the pillars of passenger transport in cities**.

Introducing **bike-sharing** in towns and cities and **integrating it into the public passenger transport** system."

REPORT TO UNFCCC (SOLUTIONS)

Romania's *Fourth Biennial Report under the UNFCCC*

"Promoting alternative transport (cycling, car-pooling, car-sharing, etc.) through urban planning and the **development of an adequate cycling infrastructure (bicycle lanes, parking racks, special carts/compartments for bicycles on the subway and trains, etc.)** and the expansion of walking areas, particularly in large urban areas."

2.4 RECOMMENDATIONS

Integrate A2PT minimum standards for transport polices in countries of the Danube Region

Through the content analysis of policy documents on the national level, the following aspects to better connect cycling and walking should be the minimum requirements regarding high quality in intermodaltiy between active and public transport. These aspects should be at least mentioned as a general demand on national level and should be – if not specified on national level - that should be eleborated by regions, municipalities and public transport providers and should not find entrance in non-binding strategic documents, but if appropriate also be included or revised in laws, regulations, ordiances, national standard or norms and therelike.

The following requirements are the minimum standard to better combine walking, cycling and public transport from the A2PT projects policy review:

WALKING AND PUBLIC TRANSPORT

Acessable for all: The platforms, stations and stops and their surroundings should be accessible and designed for people of all ages and gender, different physical conditions and mental abilities, easy to orientate for native speakers and foreign languges. Public transport infrastructure should be both barrier free as well as protective, safe and secure. Motorized traffic should not obstruct active forms of mobility in the catchment areas of stations and stops.

Short distances: All stops and stations should be integrated in urban and rural areas in a manner that guarantees short walking distances between point of interests and public transport stops and stations. Also the connection of interchanges between different public transport lines, between busse, trains, tramways, metros etc. should be kept short in order to guarantee convenient connections between public transport.

CYCLING AND PUBLIC TRANSPORT

Bike parking at stations and stops: Not only bigger station but also small bus stop should be equipped with sufficient, convenient and safe bike parking facilities. There are different reasons and routines for cyclists who switch to public transport. If applicable and demanded a certain mix of bike parking facilities (bike parking boxes, wether protected bike parking or simple bike parking for short stays) can attract everyday commuters to shift from car to cycle to their next train station.

Bike sharing: To offer of bike sharing system instead of motivating public transport users to park their own bike at the station might be a solution for day tourism or other frequently visited places that need a good connections to public transport.

Bike carriages: The offer to allow to take one's own bike on the train or bus should be possible but also thought through carefully. Since capacities of bike carriages on trains are limited, an elaborate selection of routes, stations or certain time slots can support that the offer is well received by cyclists and other passengers. Regions and towns with touristic and recreational attractions are typical use cases.

APPENDICES

Appendix 1 – Data collection

The data collection basis are two **separate xlsx-files** attached to this report:

- Document review
- Data collection template
- Compelation of all data available, provided by partners and from sources like Euro-Stat.

Appendix 2 – Policy review

NECPs – List of reviewed National Energy and Climate Plans

Document Title	Country	Author, Editor, Publisher	Publication type	Year
NECP - Integrated National Energy and Climate Plan for Austria	AT	Federal Ministry for Sustainability and Tourism, Austria (BMNT)	NECP – national plan [2021-2030]	2019 [2024]
NECP - Integrated National Energy and Climate Plan	SK	Ministry of Economy of the Slovak Republic	NECP – national plan [2021 – 2030]	2019 [2023]
NECP - National Energy and Climate Plan	SR	Ministry of Mining and Energy	NECP – national plan [until 2050]	Waiting for adoption
NECP - National Energy and Climate Plan	DE	Federal Ministry for Economic Affairs and Energy	NECP – national plan [2021-2030]	2020 [2023]
NECP - Integrated national energy and climate plan for the Republic of Croatia for the period from 2021 to 2030	HR	Ministry of Economy and Sustainable Development	NECP – national plan [until 2030]	2020 [2023]
NECP - National Energy and Climate Plan (Update of the Czech National Plan of the Republics in the field of energy and climate)	CZ	Czech Government	Update NECP – national plan [2021-2030 with a 2050 perspective]	2019 [2024]

NECP - Assessment of the final national energy and climate plan of Slovenia (Draft version)	SI	Ministry of Environment, Climate and Energy.	Draft Update NECP – national plan [until 2030]	2019 [2025]
NECP - The 2021-2030 Integrated National Energy and Climate Plan	RO	Government of Romania - Ministry of Energy	National Energy and Climate Plan [for 2021-2030]	2019 [2024]
NECP - National Energy and Climate Plan	HU	Energy Ministry	NECP – national plan [until 2050]	2019 [2024]

European Commission – Link to all documents

List of reviewed National Master and Action Plans

Document Title	Country	Author, Editor, Publisher	Publication type	Year
Mobility Master Plan	AT	Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)	Master Plan [until 2030]	2021
Masterplan Cycling	AT	Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)	Master Plan [2015-2025, Evaluation and Update until 2030]	2014, updated 2024
Masterplan Walking	AT	Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)	Master Plan [until 2030]	
Action plan for the development of electromobility in the Slovak Republic	SK	Ministry of Economy of the Slovak Republic	Action plan [2022 – 2030]	2022
National hydrogen strategy	SK	Prof. Juraj Sinay, Ing. Martin Jesný, Mgr. Ján Weiterschütz, MSc., Ing. Peter Blaškovitš, Ing. Richard Sulík	Strategic plan[2021 – 2030]	2021
Low-Carbon Development Strategy of the Slovak Republic (Nízkouhlíková stratégia rozvoja Slovenskej republiky)	SK	Ministry of Environment of the Slovak Republic	Strategic plan [2020 – 2030 (2050)]	2020
Strategy for intelligent and sustainable mobility of Slovakia	SK	Ministry of Transport of the Slovak Republic	Strategic plan [2021 – 2030]	2022
Strategic plan for the development of transport in Slovakia until 2030	SK	Ministry of Transport of the Slovak Republic	Strategic plan [2017 – 2030]	2016
Concept of territorial development of cycling routes of the Bratislava Self-Governing Region in relation to	SK	Pozemné stavby TTK s.r.o.	Concept, updated [2021 – 2027]	2021

the Integrated Transport System and important points of tourism				
Low Carbon Development Strategy of the Republic of Serbia	SR	Ministry of Environment	Strategy	2023
National Environmental Protection Programme	SR	Ministry of Environment	Strategy	2010
Air Quality programme of the Republic of Serbia with an Action Plan	SR	Ministry of Environment	Guidelines [Effective period until 2030]	2022
Sustainable urban development Strategy of the Republic of Serbia until 2030	SR	Ministry of Construction, Transport and Infrastructure	Strategy [Effective period until 2030]	2019
Draft National Transport stategy and Action plan of the Republic of Serbia	SR	Ministry of Construction, Transport and Infrastructure	Strategy [Effective period until 2030]	Waiting for adoption
Trafffic safety strategy of the Republic of Serbia from 2023 to 2030 with the Action plan for the period from 2023 to 2025	SR	Agency of traffic safety / Government of the Republic of Serbia	Strategy [Effective period until 2030]	2023
Guideline about traffic signals	SR	Ministry of Construction, Transport and Infrastructure	Guidelines	2024
Spatial plan of the Republic of Serbia from 2021 to 2035	SR	Ministry of Construction, Transport and Infrastructure	Guidelines [until 2035]	Waiting for adoption
Tourism development strategy of the Republic of Serbia- 2016-2025	SR	Ministry of Trade, Tourism and Telecommunications	Strategy [until 2025]	2016
Guideline on technical standards of planning, design and construction of facilities, which ensure uninterrupted movement and access for people with disabilities, children and the elderly	SR	Ministry of Construction, Transport and Infrastructure	Guidelines	2015
Manual/Guideline for designing of the roads of the Republic of Serbia	SR	State enterprise Roads of Serbia	Guidelines	Waiting for adoption
Climate Action Plan 2050	DE	Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety	Action Plan [until 2050]	2016, 2nd edition 2019
Climate Action Programme 2030 of the Federal Government of Germany for the Implementation of the Climate Action Plan 2050	DE	Federal Government of Germany	Action Plan [until 2050]	2019

Climate Action Programme 2023 of the Federal Government of Germany	DE	Federal Government of Germany	Action Plan [until 2030]	2023
Long-term strategy for negative emissions to deal with unavoidable residual emissions	DE	Federal Ministry for Economic Affairs and Climate Protection	Master Plan [2024 - 2045]	planned
Interim report of the system development strategy	DE	Federal Ministry for Economic Affairs and Climate Protection	Report [until 2045]	2023
Digital strategy	DE	Federal Ministry for Digital and Transport	Master Plan	2023
Immediate action program for the transport sector due to an exceedance of the permissible annual emission quantity for 2021 on the basis of Section 8 (1) KSG	DE	Federal Ministry for Digital and Transport	Action Programme	2022
National Cycling Plan 3.0	DE	Federal Ministry for Digital and Transport	Master Plan	January 2022
National walking strategy	DE	Federal Ministry for Digital and Transport	Master Plan [until 2030]	planned [expected end of 2024]
National development strategy of the Republic of Croatia until 2030	HR	Croatian Parliament	Master Plan [until 2030]	2021
Transport development strategy of the Republic of Croatia (2017. - 2030.)	HR	Ministry of the Sea, Transport and Infrastructure	Master Plan [until 2030]	2017
Low-carbon development strategy of the Republic of Croatia until 2030 with a view to 2050	HR	Ministry of Economy and Sustainable Development	Master Plan [until 2030]	2021
National Recovery and Resilience Plan 2021 – 2026	HR	Government of the Republic of Croatia	Master Plan [until 2026]	2021
Sustainable tourism development strategy until 2030	HR	Croatian Parliament	Master Plan [until 2030]	2023
National plan for the development of sustainable tourism until 2027	HR	Ministry of tourism and sport	Master Plan [until 2027]	2023
National Cycling Plan for the period from 2023 to 2027	HR	Ministry of the Sea, Transport and Infrastructure	Master Plan [until 2027]	2023
Action Plan for the implementation of the National Cycling Plan for the period from 2023 to 2025	HR	Ministry of the Sea, Transport and Infrastructure	Action Plan [until 2025]	2023

Climate Protection Policy in the Czech Republic, 2017 to 2030 with a view to 2050	CZ	Ministry of the Environment	Politic strategy [from 2017 to 2030 with a view to 2050]	2017
Climate change adaptation strategy in the Czech Republic	CZ	Ministry of the Environment	National Action Plan for Adaptation to Climate Change.	2021
Concept of Urban and Active Mobility - a follow-up document to the Transport Policy of the Czech Republic for the period 2021 - 2027 with a view to 2050	CZ	Ministery of transport	National Masterplan [From 2021- 2027 (view to 2050)]	2021
Concept of smartcities, resilience through smart solutions for municipalities. for cities and regions	CZ	Ministry for Regional Development	National Concept - Follow: Innovation Strategy of the Czech Republic 2019-2030	2021
National Action Plan for Adaptation to Climate Change. 2015, actualization 2021	CZ	Ministry of the Environment	Strategic Action Plan	no year
Transport Policy of the Czech Republic 2021-2027 with a view to 2050	CZ	Office of the Government	Masterplan [2030 (view to 2050)]	no year
Transport Development Strategy in the Republic of Slovenia until 2030.	SI	Ministry of Infrastructure	National Master Plans, National Strategies for transport development [until 2030]	2017
Strategic plan for the development of cycling up to 2030	SI	Ministry of Environment, Climate and Energy (2023).	Strategic plan for cycling development [until 2030]	2023
Romania`s Fourth Biennial Report under the UNFCCC	RO	Government of Romania - Ministry of Environment, Waters and Forests	Biennial Report [until 2040]	2020
Emission reduction strategies for the transport sector in Romania	RO	Expert group: Raul Cazan, Mihai Stoica, Heather Brooks, Lucien Mathieu, Carlos Calvo Ambel, Cristina Mestre, Samuel Kenny	Report [incl. Recommandations/Goals until 2030]	2018
Romania - Climate Change and Low Carbon Green Growth Program	RO	The World Bank	Program [until 2050]	2015
Romania General Transport Master Plan	RO	Government of Romania - Ministry of Transport; prepared by AECOM Ingenieria SRL	Master Plan [until 2030]	2015

Study on the identification, establishment and territorial distribution of the national cycling routes	RO	Government of Romania, Ministry of Development, Public Works and Administration	National Study	2022
National Cycling Plan of Romania, 2022-2030	RO	Ionuț MAFTEI	National Cycling Plan [until 2030]	2022
The National Integrated Urban Development Strategy for Resilient, Green, Inclusive and Competitive Cities 2022-2035 - Romania's Urban Policy	RO	Government of Romania, Ministry of Development, Public Works and Administration	National Strategy [until 2035]	2022
The National Road Safety Strategy for the period 2022-2030	RO	Government of Romania	Road Safety Strategy [until 2030]	2022
National Clean Development Strategy 2020-2050	HU	Innovation and Technology Ministry	Strategy, 2020-2050	2020
National Cycling Strategy 2030	HU	Active and Ecotourism Development Centre	Strategy, until 2030	2023
National Transportation Infrastructure Development Strategy	HU	National Development Ministry	Strategy, until 2050	2014
National Energy Strategy 2030, with outlook to 2040	HU	Innovation and Technology Ministry	Strategy, until 2030	2020

List of considered National Laws and Regulations

Document Title	Country	Author, Editor, Publisher	Publication type	Year
Road Traffic Regulations (Straßenverkehrsordnung, StVO 1960)	AT	Austrian Federal Government	Law / Regulation	last amendment 2024
Federal Roads Act [Bundesstraßengesetz BStG 1971]	AT	Austrian Federal Government	Law / Regulation	last amendment 2024
Shipping and Navigation Act [Schifffahrtsgesetz 1997]	AT	Austrian Federal Government	Law / Regulation	last amendment 2021
Railway Act [Eisenbahngesetz 1957]	AT	Austrian Federal Government	Law / Regulation	last amendment 2024
Various buildings, construction and spatial planning laws of the nine Federal States of Austria	AT	Nine Federal State Governments of Austria	Law / Regulation	no year
Guidelines and Regulations for Planning, Construction and Maintenance of Railways (RVE)	AT	FSV - Austrian Research Association for Roads, Railways and Transport	Guidelines, rules and minimum standards -	continuous revision

			mostly included in laws and ordinances	
RVE 03.01 Structures for Passenger Transport: 03.01.01 Platform Access without Crossing Rail (Januar 2020)	AT	FSV - Austrian Research Association for Roads, Railways and Transport	Guidelines, rules and minimum standards - mostly included in laws and ordinances	2020
Guidelines and Regulations for Planning, Construction and Maintenance of Roads (RVS)	AT	FSV - Austrian Research Association for Roads, Railways and Transport	Guidelines, rules and minimum standards - mostly included in laws and ordinances	continuous revision of the more than 350 RVS documents
RVS 02.01.11 - Principles of traffic planning (German version only)	AT	FSV - Austrian Research Association for Roads, Railways and Transport	Guidelines, rules and minimum standards - mostly included in laws and ordinances	2013
RVS 02.02.36 - Barrier-free road space (German version only)	AT	FSV - Austrian Research Association for Roads, Railways and Transport	Guidelines, rules and minimum standards - mostly included in laws and ordinances	2010
RVS Englisch 02.03.11 Optimization of Local Public Transports – Open Line and Stops	AT	FSV - Austrian Research Association for Roads, Railways and Transport	Guidelines, rules and minimum standards - mostly included in laws and ordinances	2019
RVS 03.02.12 - Pedestrian traffic / RVS AP No. 27 - Application criteria for pedestrian zones (German versions only)	AT	FSV - Austrian Research Association for Roads, Railways and Transport	Guidelines, rules and minimum standards - mostly included in laws and ordinances	2015 (revision ongoing, estimated release 2025)
RVS Englisch 03.02.13 Bicycle Traffic [Add-ons German Version only: RVS AP No. 28 - Surface coatings on cycle paths / RVS AP No. 36 - Green arrow for cyclists]	AT	FSV - Austrian Research Association for Roads, Railways and Transport	Guidelines, rules and minimum standards - mostly included in laws and ordinances	2022
03.04.11 Design of public spaces in residential areas (German version only)	AT	FSV - Austrian Research Association for Roads, Railways and Transport	Guidelines, rules and minimum standards - mostly included in laws and ordinances	2011
03.04.12 Planung und Entwurf von Innerortsstraßen (German version only)	AT	FSV - Austrian Research Association for Roads, Railways and Transport	Guidelines, rules and minimum standards - mostly included in laws and ordinances	2020
RVS Englisch 03.04.13 Child-Friendly Mobility	AT	FSV - Austrian Research Association for Roads, Railways and Transport	Guidelines, rules and minimum standards - mostly included in laws and ordinances	2015 (revision ongoing, estimated release 2025)

RVS 04.02.13 - Traffic calming, noise, air (German version only)	AT	FSV - Austrian Research Association for Roads, Railways and Transport	Guidelines, rules and minimum standards - mostly included in laws and ordinances	2007
Traffic Sign Catalogue (in german)	AT	FSV - Austrian Research Association for Roads, Railways and Transport	Guidelines, rules and minimum standards - mostly included in laws and ordinances	continuous revision
Technical standards TP 179, Design of roads for cyclists 5/2017	CZ	Ministry of Transport	Standards / Regulations - Design of roads for cyclists	2017
Federal Climate Change Act (will be updated, sector goals will be canceled, only total reduction of CO2 emissions – experts expect this to be less forceful)	DE	Federal Government of Germany	Law	12.12.2019 (adopted 18.08.2021)
Law on Road Transport	HR	Ministry of the Sea, Transport and Infrastructure	Law	2018, 2019, 2021, 2022
Law on Roads	HR	Ministry of the Sea, Transport and Infrastructure	Law	2011, 2013, 2014, 2019, 2021, 2022, 2023
Law on road traffic safety	HR	Ministry of the Interior	Law	2008, 2010, 2011, 2013, 2014, 2015, 2017, 2019, 2020, 2022, 2023
Technical regulation on ensuring the accessibility of buildings for people with disabilities and reduced mobility	HR	Ministry of Physical Planning, Construction and State Assets	Technical Regulation	2023
Ordinance on functional categories for determining the cycling route network	HR	Ministry of the Sea, Transport and Infrastructure	Ordinance	2013, 2017
Ordinance on cycling infrastructure	HR	Ministry of the Sea, Transport and Infrastructure	Ordinance	2016
Design of Public Pedestrian Transport Facilities	HU	MAÚT Hungarian Road and Railways Society	Regulation	2023
Design of Cycleable Public Roads	HU	MAÚT Hungarian Road and Railways Society	Regulation	2019
Cycle paths, footpaths and footpaths track structure	HU	MAÚT Hungarian Road and Railways Society	Regulation	2019
Emergency Ordinance no. 195/2002 regarding traffic on public roads	RO	Government of Romania	Regulation - Ordinance	2002

Government Ordinance no. 43/1997 regarding the road regime	RO	Government of Romania	Regulation - Ordinance	1997
Law no. 350/2001 regarding land development and urbanism	RO	Parliament of Romania	Regulation - Law	2001
Law no. 46/2008 – Forestry Code	RO	Parliament of Romania	Regulation - Law	2008
Law no. 250/2020 regarding adopting measures necessary to facilitate the parking of bicycles in public spaces	RO	Parliament of Romania	Regulation - Law	2020
Government Decision no. 441/2022 for the approval of the methodological norms regarding the creation, arrangement and homologation of cycle tourism routes	RO	Government of Romania	Regulation - Decision	2022
Law no. 155/2023 regarding sustainable urban mobility	RO	Parliament of Romania	Regulation - Law	2023
Government Decision no. 1.252/2022 for the approval of the Methodological Norms regarding the creation, arrangement and approval of routes for pedestrian tourism	RO	Government of Romania	Regulation - Decision	2022
SR 1848-1:2011 "Road signs. Indicators and means of road signaling. Part 1: Classification, Symbols and Location"	RO	Romanian Standardization Association	National Standard [Estimated update by end of 2024]	DRAFT – ratified 2024?
STAS 10144/2-91. "Streets. Sidewalks, pedestrian walkways and cycle tracks. Design requirements"	RO	National Commission for Urbanism and Territorial Planning - Institute for Research, Systematization, Design, Territorial Planning and Urbanism	National Standard	1991
Road law -2	SI	Ministry of Infrastructure	National Laws and Regulations	2022, retrieved online May 20, 2024
Railway Safety Act (ZVZelP-1)	SI	Ministry of Infrastructure	National Laws and Regulations	2018, retrieved online May 20, 2024
Railway Transport Act (ZZelP)	SI	Ministry of Transport	National Laws and Regulations	1999, retrieved online May 20, 2024
Regulations on the equipment of railway stations and stops	SI	Public Agency for Railway Transport of the Republic of Slovenia, Ministry of Transport	National Laws and Regulations	2009, retrieved online May 20, 2024

Regulations on the equipment of bus stops, major bus stops and bus stops and the way in which bus stop services are to be provided	SI	Ministry of the Environment, Spatial Planning and Energy, Ministry of Transport	National Laws and Regulations	2004, retrieved online May 20, 2024
Regulations on bus stops	SI	Ministry of Transport	National Laws and Regulations	2011, retrieved online May 20, 2024
Act on Public Passenger Transport	SK	National Council of the Slovak Republic (Národná rada SR)	Law from 2024	2024
Law on climate change	SR	Ministry of Environment	Law [Effective period until 2030]	2021
Law on railways	SR	Ministry of Construction, Transport and Infrastructure	Law	2023
Law on safety on railways u	SR	Ministry of Construction, Transport and Infrastructure	Law	2018
Planning and building act	SR	Ministry of Construction, Transport and Infrastructure	Law	2023
Law on road traffic safety	SR	Ministry of internal affairs of the Republic of Serbia	Law	2023
Law on transport on the road traffic	SR	Ministry of Construction, Transport and Infrastructure	Law	2015
Law on passenger transport in road traffic	SR	Ministry of Construction, Transport and Infrastructure	Law	2020
Law on roads	SR	Ministry of Construction, Transport and Infrastructure	Law	2023
Law on cable cars for transport of peresons	SR	Ministry of Construction, Transport and Infrastructure	Law	2019
Law on housing and building maintenance	SR	Ministry of Construction, Transport and Infrastructure	Law	2020

List of digested European policies

Document Title	Author, Editor, Publisher	Publication type	Year	Region
European Policies on Climate Action				
The European Green Deal - EU's 2030 climate targets	European Commission	EU Strategy	2019	EU
European Climate Law	European Parliament and of the Council	Law	2021	EU

Communication: 'Fit for 55' - delivering the EU's 2030 climate target on the way to climate neutrality (Press Release)	European Commission	EU Implementation Strategy	2021 - 2023	EU
The update of the nationally determined contribution (NDC) of the European Union and its Member States	UNFCCC / European Commission	NDC [until 2030]	2023	EU & UNFCCC
EU Climate Action Progress Report (Link)	European Commission	Status Report on UN-Paris Agreement	2024	EU
Country profiles from Climate Action Progress Report 2022 (Link)	European Commission	Factsheets	2022	EU
Legal documents on Delivering the European Green Deal (Link)	European Commission	EU Legislation (List)	2023	EU
European Policies on Sustainable Mobility, Public Transport & Active Mobility				
Sustainable and Smart Mobility Strategy (incl. Action Plan)	European Commission	Strategy Action Plan	2021	EU
Union Guidelines for the development of the trans-European transport network (TEN-T)	European Commission	Guideline	2021 [provisional agreement 2024]	EU
EU Strategy for Danube Region (EUSDR), Priority Area 1b – to improve mobility and multimodality: Rail, Road and Air Transport - Actions and targets (Link)	Danube Strategy Point & European Commission, DG Regional Policy.	Action Plan	2020	EU - Danube Region
List of EUSDR Targets	Danube Strategy Point & European Commission, DG Regional Policy.	Strategy – List of targets	2019	EU - Danube Region
Pan-European Master Plan on Walking (Link)	UNECE and WHO/Europe - THE PEP Partnership on Healthy Active Mobility	Pan-European Master Plan	2024	UNECE member states
Integrating walking + public transport (Link)	UNECE and WHO/Europe - THE PEP Partnership on Healthy Active Mobility	Policy Brief	2024	UNECE member states
Pan-European Master Plan for Cycling Promotion (Link)	UNECE and WHO/Europe - THE PEP Partnership on Healthy Active Mobility	Pan-European Master Plan	2021	UNECE member states
European Declaration on Cycling (Link)	European Commission	Declaration	2024	EU