BASES

Transport Outlook 2040

Development of passenger and freight transport in Switzerland

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People are becoming increasingly mobile. The Transport Outlook 2040 leads to growth in traffic – on both the roads and railways and for both passengers and freight. The main reason for this is rapid economic and population growth. The analyses nonetheless show that we still have room to manoeuvre, and that the Federal Council's policy of shifting freight from road to rail is working: no other country transports such a high proportion of its freight through the Alps by rail, and volumes are rising. Where passenger transport is concerned, public transport and non-motorised transport account for an increasing share of total travel.

The current infrastructures will not be able to cope with this growth, however. Traffic congestion is taking up more and more of our time. It costs money, and it puts a strain on the environment. At peak times our trains are full. The federal government will therefore continue to invest strategically to eliminate traffic bottlenecks and increase the capacity of our railways. For all of the offices within my Department, the Transport Outlook 2040 is an important element in planning these expansion programmes.

Land and financial resources are limited, however, so it is vital that we look beyond the conventional approach to expanding infrastructure. We aim to harmonise settlement and transport growth more closely, and also achieve better coordination between the different modes of transport. If we manage to smooth out the peaks of transport usage, we will be able to use the existing infrastructures more evenly, and save a great deal of money. A well-balanced system of mobility pricing can help us achieve this.

I also believe that technological and social change offer an enormous opportunity. Human mobility is multi-modal, and having your own car is no longer key. In the future, the focus in business and society will be on mobility services. Who offers these services, and which modes of transport are used, will be of secondary importance. Energy-efficient, autonomous and networked vehicles and car-sharing will become more widespread. Customer-friendly services from the doorstep to the workplace or other destination are the future, and have the potential to reduce mobility costs. With its outstanding transport infrastructure and innovative logisticians, Switzerland is well-placed to address future mobility needs with original ideas. This Transport Outlook 2040 helps us to keep looking ahead.

«We aim to harmonise settlement and transport growth more closely, and also achieve better coordination between the different modes of transport.»

Federal Councillor Doris Leuthard
Head of the Federal Department of the Environment, Transport, Energy and Communications

Relevance of the Transport Outlook 2040

In collaboration with the federal offices concerned, the Federal Office for Spatial Development ARE calculated how transport in Switzerland will develop up to 2040. The findings – in the form of scenarios for passenger and freight transport that cover different modes of transport – serve as a basis for planning expansion programmes for the roads and railways, as well as for transport and spatial planning policy decisions. The results are also useful for the energy perspectives, and for calculating noise and pollutant emissions. The Transport Outlook concentrates on land transport (road and rail, including pedestrian and cycling), to the exclusion of ship and air transport. Their trends, for example in terms of passenger volumes at Switzerland's five largest airports, are nonetheless factored into land-based feeder transport.

The findings are based on «if-then» analyses, and do not represent target scenarios. After the classic reference scenario had been produced, two sensitivity analyses were conducted based on it, and three alternative scenarios drawn up. The reference scenario extrapolates the underlying trends of recent decades, and shows how the use of space and transport might develop given the parameters that apply today. By contrast, the sensitivity analyses assume different population and economic trends – more dynamic and less dynamic growth, respectively – but keep the same assumptions about spatial planning and transport policy. The objective of the explorative alternative scenarios is to analyse bandwidths for conceivable spatial and transport trends.

Transport Outlook 2040 scenarios – overview

Reference scenario

Reference scenario: extrapolates the underlying developments of the past and factors in trends.

Sensitivity analyses: examine the effects of higher and lower population and GDP growth respectively (the «High» and «Low» dimensions).

Alternative scenarios

Alternative scenarios: replicate the development of transport on the basis of different spatial structures for housing and working (densification vs. urban sprawl) and transport policy assumptions.

Balance: integrates aspects of sustainability (e. g. densification) and prioritises public transport.

Sprawl: describes more pronounced urban sprawl throughout the country and gives precedence to individual mobility.

Focus: differentiates more sharply between urban and rural areas, with an emphasis on urbanisation. Transport growth will primarily be in and between cities.

All scenarios and the sensitivity analysis are based on the same expansion programmes, road (PEB, modules 1 – 3, without network extensions) and rail (STEP AS 2025). In contrast to the sensitivity analysis, all scenarios are based on the same demographic and economic reference developments (FSO, SECO).

The Transport Outlook 2040 is based on the transport models established within the DETEC: the National Passenger Transport Model (NPTM) and the Aggregated Goods Transport Method (AGTM). The models themselves are based on the latest data and transport surveys.

The results at a glance

Substantial growth. Transport will continue to increase over the decades to come, albeit at a slower rate compared with the past 20 years. Continued population and economic growth will be offset by the approaching saturation in the level of vehicle ownership, use of public transport travelcards and the number of trips taken per person. There are indications of a modest decoupling of structural growth and the expansion in transport. One of the main reasons for this is an ageing society. Although increasingly active pensioners are a driving force behind passenger transport, the share accounted for by the highly mobile working population is declining. Where demographic structure is concerned, the same also applies in principle to the sensitivity analyses, which are based on stronger and weaker population and GDP growth respectively.

«Despite relief measures to ease congestion, the roads are significantly busier than they were ten years ago.»

High capacity utilisation on roads and railways. Other limiting factors prevent the transport forecasts in the Transport Outlook 2040 from being even higher. Despite relief measures to ease congestion in certain areas, the roads are significantly busier than they were ten years ago. High occupancy levels are also to be expected on public transport in the future, at least at peak commuting times within and between agglomerations. In certain public transport corridors, demand will double by 2040.

pkm: person-kilometres
tkm: tonne-kilometres
vkm: vehicle-kilometres
PMT: private motorised transport (cars and motorcycles)
PT: public transport (train, tram and bus)
NMT: non-motorised transport (bicycle, walking)
For other terms, please refer to the glossary on page 25

Drivers are expected to use alternative routes. The limits to the use of certain sections of high-capacity and major roads will result in motorised traffic being diverted onto local and regional routes. This puts public transport at an advantage for long trips, because unlike road traffic there is no time lost to congestion. Instead, it is «only» less convenient. The modal split will therefore change: by 2040, the share of all transport accounted for by public transport will rise by four percentage points.

Freight transport will lag behind GDP. Market pressures will drive a continuous increase in the productivity of freight transport on both the roads and railways. All in all, freight transport will grow faster than the population, but more slowly than the economy.

Evolution of costs leads to modal shift from road to rail. Assuming a 46 % increase in GDP, both the volume of freight transport and the tonne-kilometres transported will rise by 37 %. The cost of transporting freight by road will increase more than the cost of rail transport, so the modal split in terms of tonne-kilometres will shift by two percentage points towards the railways.

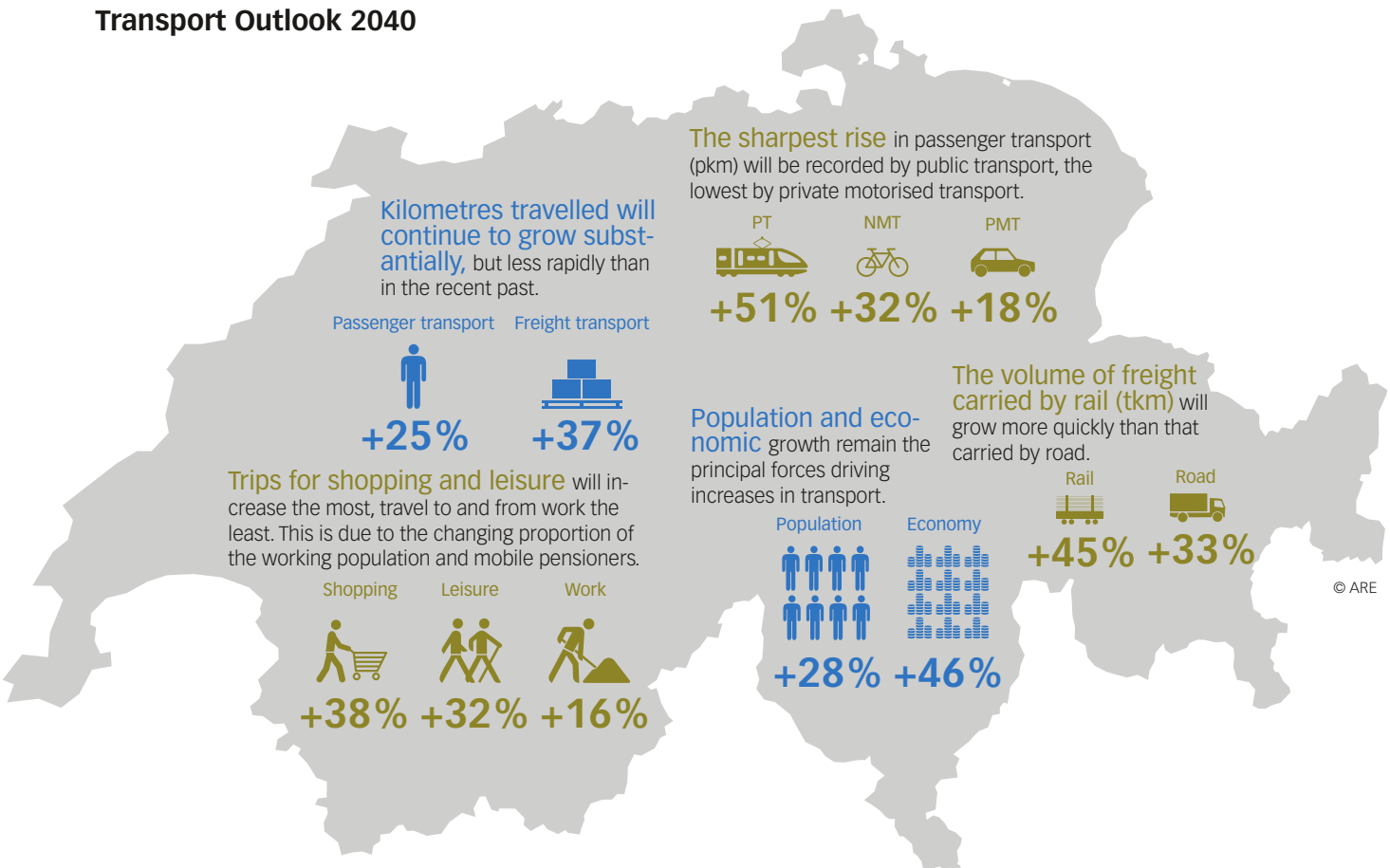
Changes in the categories of goods transported. Sources of energy such as fossil fuels and heating oil are mainly transported by rail. The implementation of the federal government's Energy Strategy 2050 means that these shipments will be of only marginal importance by 2040. However, rail transport will increase its share in combined transport, and in the transport of general and grouped goods.

Balance scenario shows potential (→ scenarios on page 7). The compact way in which space is structured in Switzerland, transport policy geared to public and non-motorised transport, as well as car-sharing schemes and a rise in working from home illustrate the potential in the Balance scenario to cut total person and tonne-kilometres without actually reducing transport volumes, and thus the demand for mobility.

Sprawl scenario highlights limits (→ scenarios on page 7). The Sprawl scenario results in an 11 % increase in vehicle-kilometres travelled by private motorised transport compared with the reference scenario (69 rather than 62 billion vkm). This scenario thus indicates the upper limit of conceivable growth in PMT.

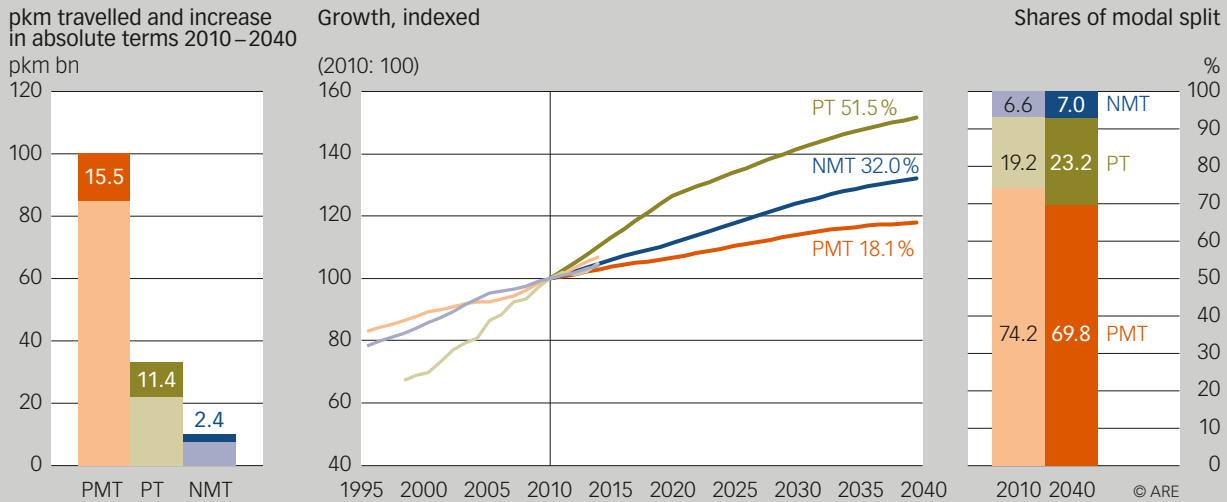
More pronounced urbanisation alone not enough. The Focus scenario (→ scenarios on page 7) is based on differing growth trends in urban and rural areas. Modes of transport will be promoted primarily in urban centres and on the axes linking these urban centres. The resulting effects cancel each other out to some extent, but also prove that more pronounced urbanisation, in combination with a rising proportion of public transport usage, is not sufficient in itself to reduce transport. In the Focus scenario, private motorised transport is the dominant mode of transport on routes to, from and between urban centres.

Transport Outlook 2040



Passenger transport

Person-kilometres travelled up to 2040



Person-kilometres travelled (reference scenario): absolute person-kilometres travelled in 2010 and absolute increase up to 2040 in pkm bn (left); trend from 1995 to 2040, indexed (2010: 100, centre); modal split 2010 and 2040, in % (right).

pkm: person-kilometres
tkm: tonne-kilometres
vkm: vehicle-kilometres
PMT: private motorised transport (cars and motorcycles)
PT: public transport (train, tram and bus)
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For other terms, please refer to the glossary on page 25

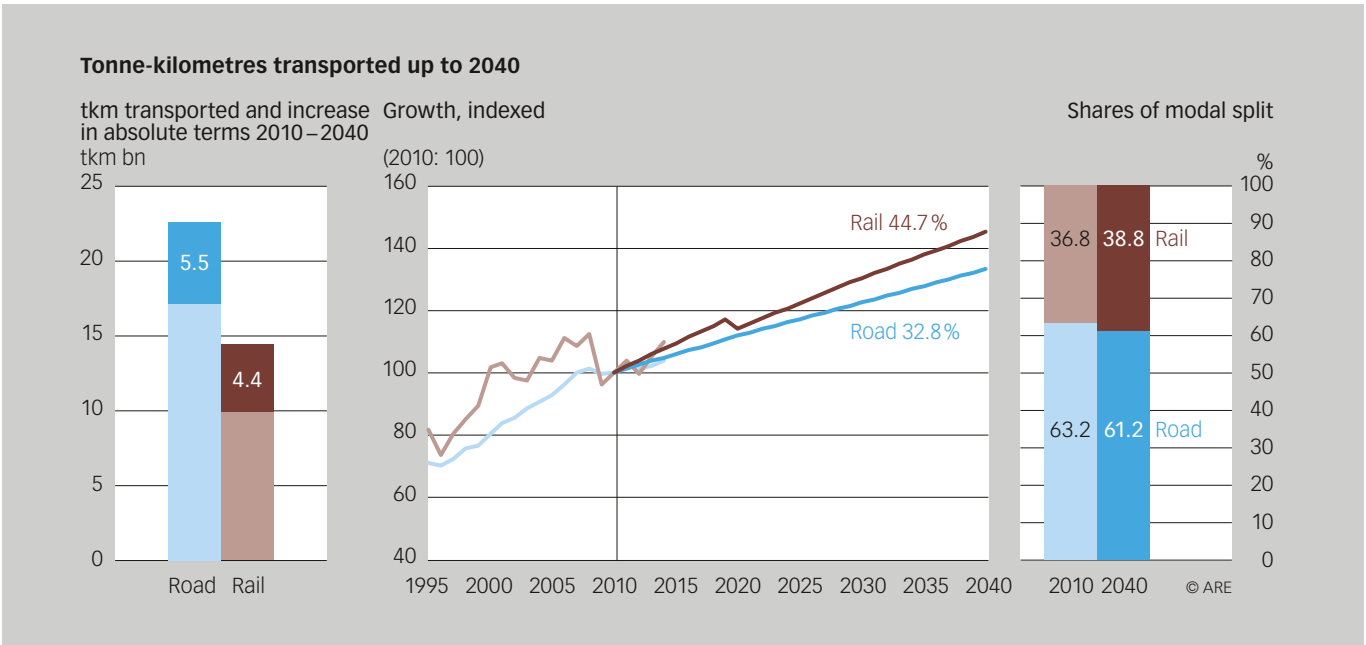
In the reference scenario, the person-kilometres travelled (→ glossary, p. 25) will increase by a quarter by 2040. This is slightly less than projected population growth. The dominant influence of population growth on the increase in transport is clear in all scenarios and sensitivity tests. Dampening effects on transport volumes, such as a decline in the working population as a percentage of the total, will be offset by counter-trends such as greater mobility among the older population.

Growing traffic volumes will overload the road network. Although expansion has brought relief to certain sections of road (bottleneck elimination programme PEB, modules 1 – 3, without network additions, are presupposed), the increase in traffic will result in more time lost in congestion. This will increase the appeal of public transport (PT) for long trips. As, in addition, urbanisation continues, public transport's share of the modal split will increase by four percentage points compared with 2010. Private motorised transport (PMT) will remain by far the most popular mode of transport, however. The overloaded road network in agglomerations and on Switzerland's national highway system will result in traffic being diverted onto lower-grade roads.

PMT to grow less rapidly than in recent years. One of the reasons for this is the approaching saturation in the level of car ownership and the number of trips taken per person. At the same time, there is a shift towards making more trips and travelling greater distances by public and non-motorised transport (NMT).

More significant increase in public transport. The demand for rail travel will double along certain corridors. This raises the question of whether the system can cope with the forecast growth unless further action is taken. The analyses show that the STEP AS 2025 infrastructure expansion programme underlying the Transport Outlook is unlikely to be sufficient to meet total demand adequately. Action must be taken to offer further long-distance and regional services, with the corresponding additions to the infrastructure.

Freight transport



The reference scenario suggests that transport volumes and tonne-kilometres transported will rise by over a third. By 2040, 37 % more tonne-kilometres will be transported using Swiss infrastructures. The State Secretariat for Economic Affairs SECO is predicting an increase in gross domestic product (GDP) of 46 % for the same period.

The tonne-kilometres transported per unit of value of the transported goods (transport intensity) will continue to fall, because more valuable, and at the same time lighter goods, will be transported in the future (freight structure effect). In addition, the service sector is expanding more rapidly than the rest of the economy, while transport-intensive sectors are growing more slowly.

In 2040, 61 % of all tonne-kilometres will be transported by road, which is two percentage points less than in 2010 (owing to a modal shift towards rail). This figure is based on rising capacity utilisation in rail freight transport in combination with a greater increase in the costs of road transport. The tonne-kilometres transported by road-based freight transport will still rise by almost a third, however. The increase in tonne-kilometres transported by rail will be 45 %.

There will be marked changes in the categories of goods transported. According to the Energy Strategy for 2050, there will be a sharp drop in imports of sources of energy (fossil fuels and heating oil). This will affect the railways in particular. However, rail will increase its share of combined transport and the transport of general and grouped goods.

Tonne-kilometres transported (reference scenario): absolute tonne-kilometres transported in 2010 and absolute increase up to 2040 in tkm bn (left); trend from 1995 to 2040, indexed (2010: 100, centre); modal split 2010 and 2040, in % (right).

Sensitivity analyses and alternative scenarios

Sensitivity analyses

In addition to the findings of the reference scenario, the results of higher and lower sensitivities are also available. They are based on the corresponding scenarios for population and economic growth prepared by the Federal Statistical Office FSO and the State Secretariat for Economic Affairs SECO. The sensitivity analyses show a range of transport development in Switzerland while transport and spatial planning policy is kept the same as in the reference scenario.

Alternative scenarios

Three alternative scenarios were defined alongside the reference scenario. They are characterised by differing depths of transport and spatial planning policy intervention, behaviours and lifestyles. There are only minor differences in the number of trips made under the three alternative Balance, Sprawl and Focus scenarios. The way in which space is structured and transport policy have a much greater effect on person and tonne-kilometres transported and the modal split.

Balance – sustainability

Person-kilometres travelled by NMT increase, even at the expense of public transport, because the scenario assumes that cycling and e-bike usage will increase. «Balance» produces the lowest person-kilometre figures of all the scenarios: 138 billion pkm compared with 145 billion pkm under the reference scenario. This shows the potential of a compact use of space in combination with a transport policy based on a «green network» of public and non-motorised transport. This mix reduces person-kilometres travelled, without restricting mobility, expressed as the number of trips. The use of public and non-motorised transport for short trips, in particular, reduces the amount of person-kilometres travelled.

Sprawl – scattered settlements

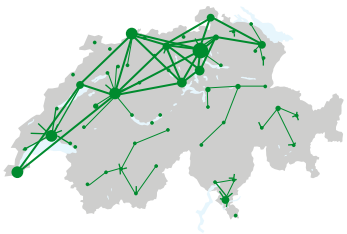
As is to be expected, the Sprawl scenario produces the highest number of vehicle-kilometres travelled by private motorised transport, at 69 million vkm. This is 11 % higher than the reference scenario (62 bn vkm) and 6.5 % above the High sensitivity analysis (65 bn vkm). Sprawl thus illustrates the upper limit of conceivable growth in private motorised transport up to 2040. This does not impact significantly on person-kilometres travelled. With lower car occupancy, among other factors, this figure will be 140 bn pkm in 2040 (reference scenario: 145 bn pkm).

Focus – more pronounced urbanisation

At 141 billion person-kilometres travelled, this scenario foresees neither a significant move away from transport nor a greater modal shift towards PT and NMT. The effects of this scenario emerge when urban and rural areas are examined separately. The assumptions for rural areas tend to promote PMT, i. e. that people will increasingly travel by car between cities and in rural areas. In the absence of parallel measures in these rural areas, this effect will more than cancel out the effect of urbanisation – more public transport in major cities, as well as shorter trips.

Concerning freight transport, the Balance and Sprawl scenarios differ only marginally from the reference scenario. In comparison with passenger transport, there is less variation in the assumptions underlying the scenarios for freight transport. Consequently, the road-to-rail shift of 0.8 percentage points under Sprawl and 2.7 percentage points for Balance come in either side of the 2.0 percentage points of the reference scenario. However, the Focus scenario indicates a greater shift towards road transport, of 3.1 percentage points.

Balance – sustainability



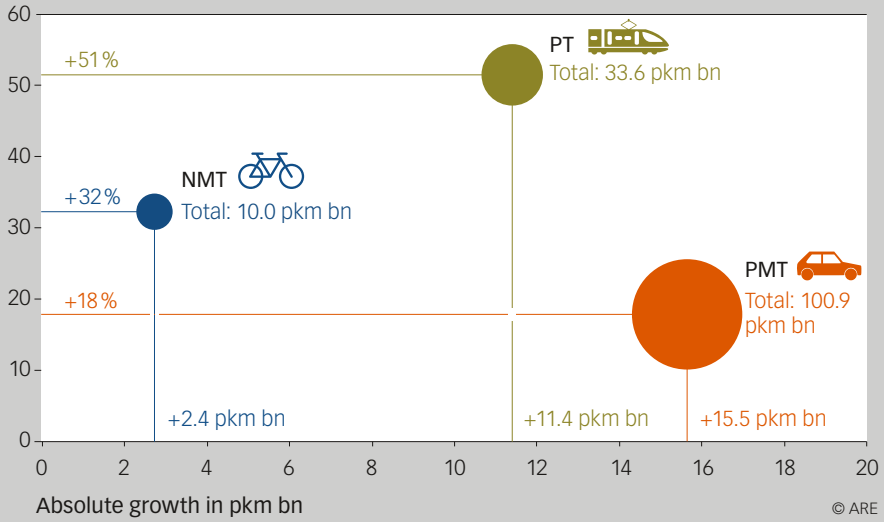
Sprawl – scattered settlements

Focus – more pronounced urbanisation

Passenger transport

Person-kilometres travelled by passenger transport up to 2040

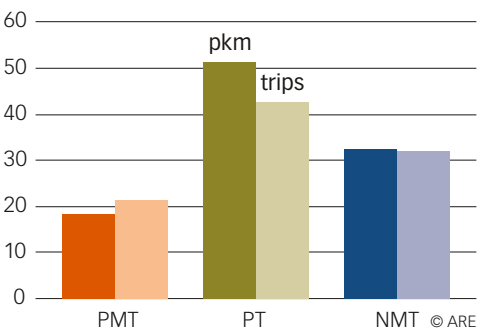
Relative growth, 2010 – 2040 in %



Reference scenario: relative and absolute growth in person-kilometres in % and in pkm, according to mode of transport, 2010 – 40. The size of the dot corresponds to the pkm in 2040.

Volume and person kilometres up to 2040

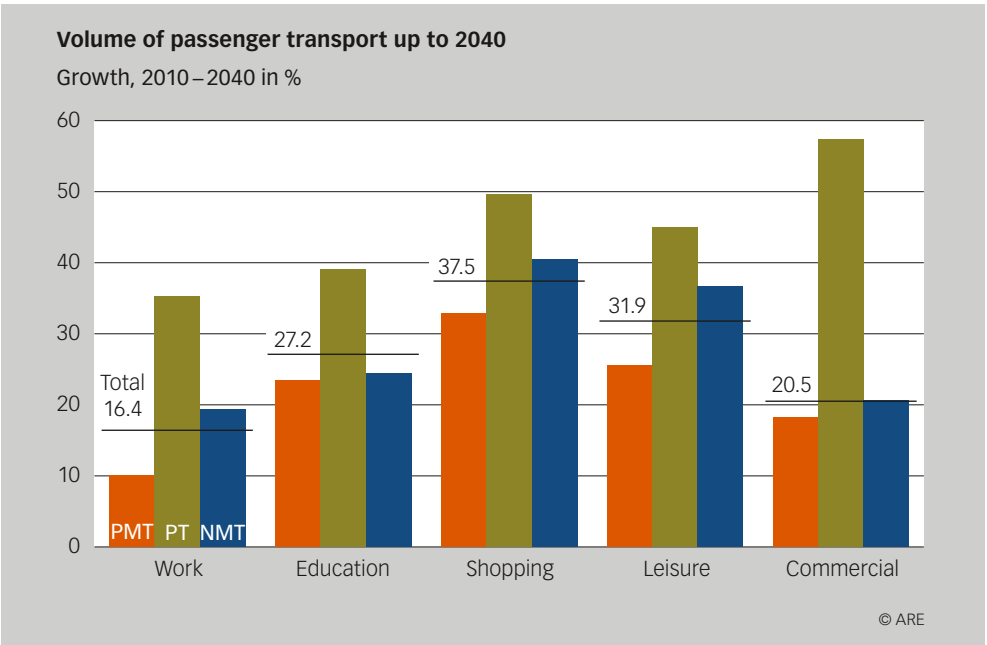
Growth, 2010 – 2040 in %



Reference scenario: growth in volumes on working days, and person-kilometres travelled by mode of transport, 2010 – 40, in percent.

The number of person-kilometres travelled rises by 25 % between 2010 and 2040 – from 115.2 to 144.5 billion pkm. At 51 %, public transport displays the greatest growth rate, with private motorised transport up 18 %, and non-motorised transport rising by 32 %. This results in a shift in the modal split, with the share accounted for by public transport expanding from 19 % to 23 %. Private motorised transport remains by far the dominant mode of transport, however.

Transport will continue to increase, albeit at a slower pace compared with the post-2000 period. Following the marked increase in services in the wake of the Rail 2000 and urban rail expansion programmes, passenger transport rose by an average of 1.6 % per year in the first decade. Annual growth between 2010 and 2020 is put at 1 %, before falling to less than 1 % after 2020. One of the main reasons for this derives from the underlying data on population and economic growth, for which the rates of increase also decline after 2020. Other reasons for the slower growth are that transport services will no longer be expanded to the same extent as to date, and both car and public transport season ticket ownership are nearing saturation levels.



Reference scenario: growth in passenger transport volumes on working days in %, by travel purposes and mode of transport, 2010–40. Volume corresponds to the number of trips.

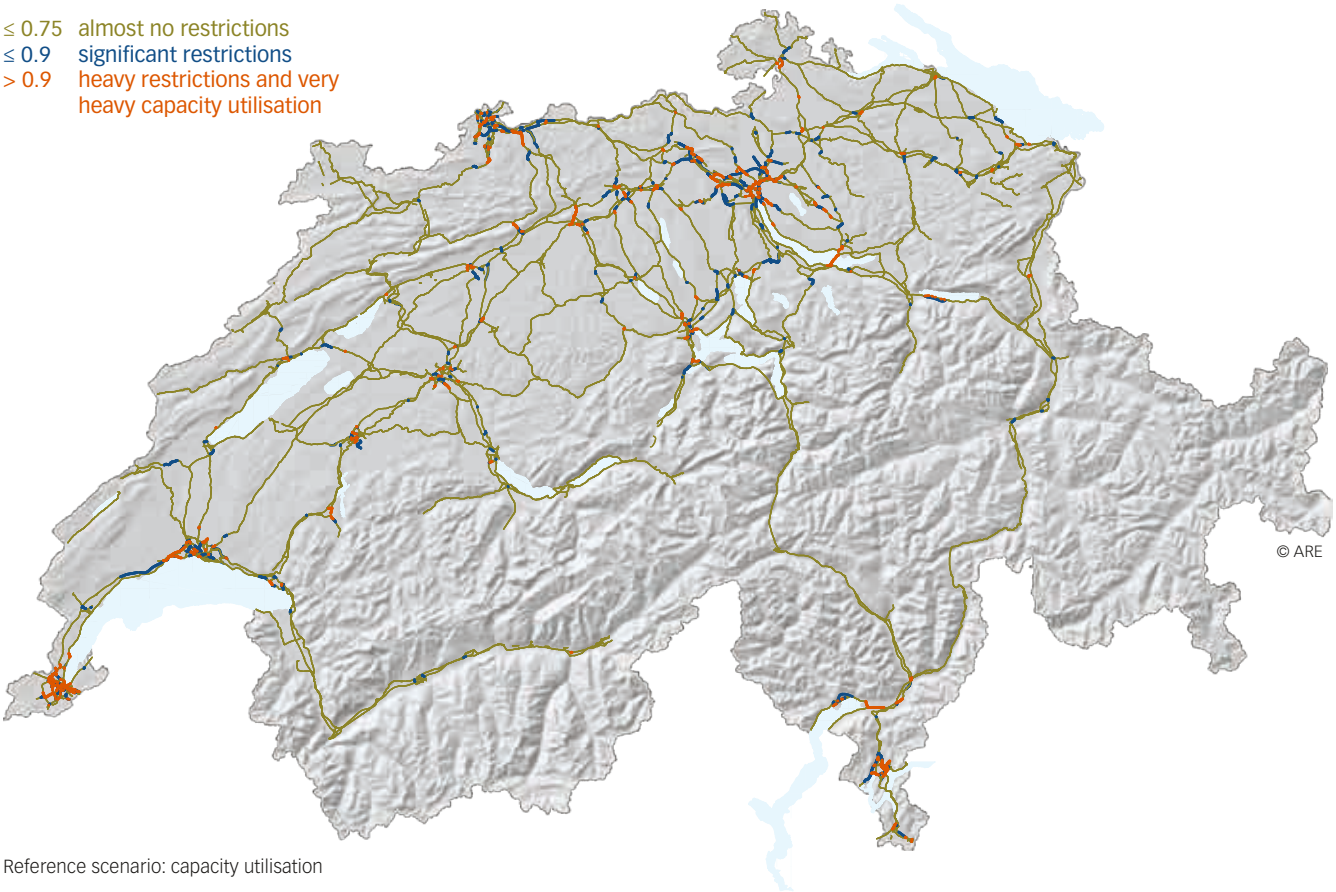
If we analyse the travel purposes, major differences begin to emerge within the overall volume of transport. At 16 %, work-related transport shows the lowest increase. Meanwhile, the rates for leisure and shopping transport are 32 % and 38 % respectively. The main reason for this is demographic: the working population is declining steadily as a percentage of the total, while pensioners account for an increasing share. This older population segment primarily generates leisure and shopping trips. They enjoy better health and appropriate transport services, and will thus make even more trips per day than is the case today. The trend towards flexible working hours and the potential offered by new communication technologies further reduce the relevance of commuting.

Trend in business (commercial) transport also below average, but stronger than that for commuting. Two opposing trends underlie this travel purpose: on the one hand, economic growth and the progressive division of labour result in additional trips, while on the other, new technologies such as video conferencing and remote maintenance systems are limiting growth.

Transport networks

Capacity utilisation on high-capacity and major roads in 2040

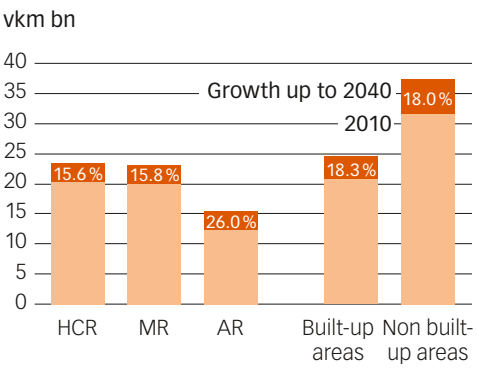
≤ 0.75 almost no restrictions
≤ 0.9 significant restrictions
> 0.9 heavy restrictions and very heavy capacity utilisation



Reference scenario: capacity utilisation (vehicles/capacity) of the high-capacity and major road network, 2040.
Sources: INFOPLAN-ARE, NPTM model, swisstopo
Note: The high-capacity and major roads were selected on the basis of the transport model.

Reference scenario: billions of vehicle-kilometres (vkm) travelled by PMT in 2010 and growth up to 2040 in %, by road category and built-up/non built-up areas.

vkm travelled by PMT by road category and built-up/non built-up areas



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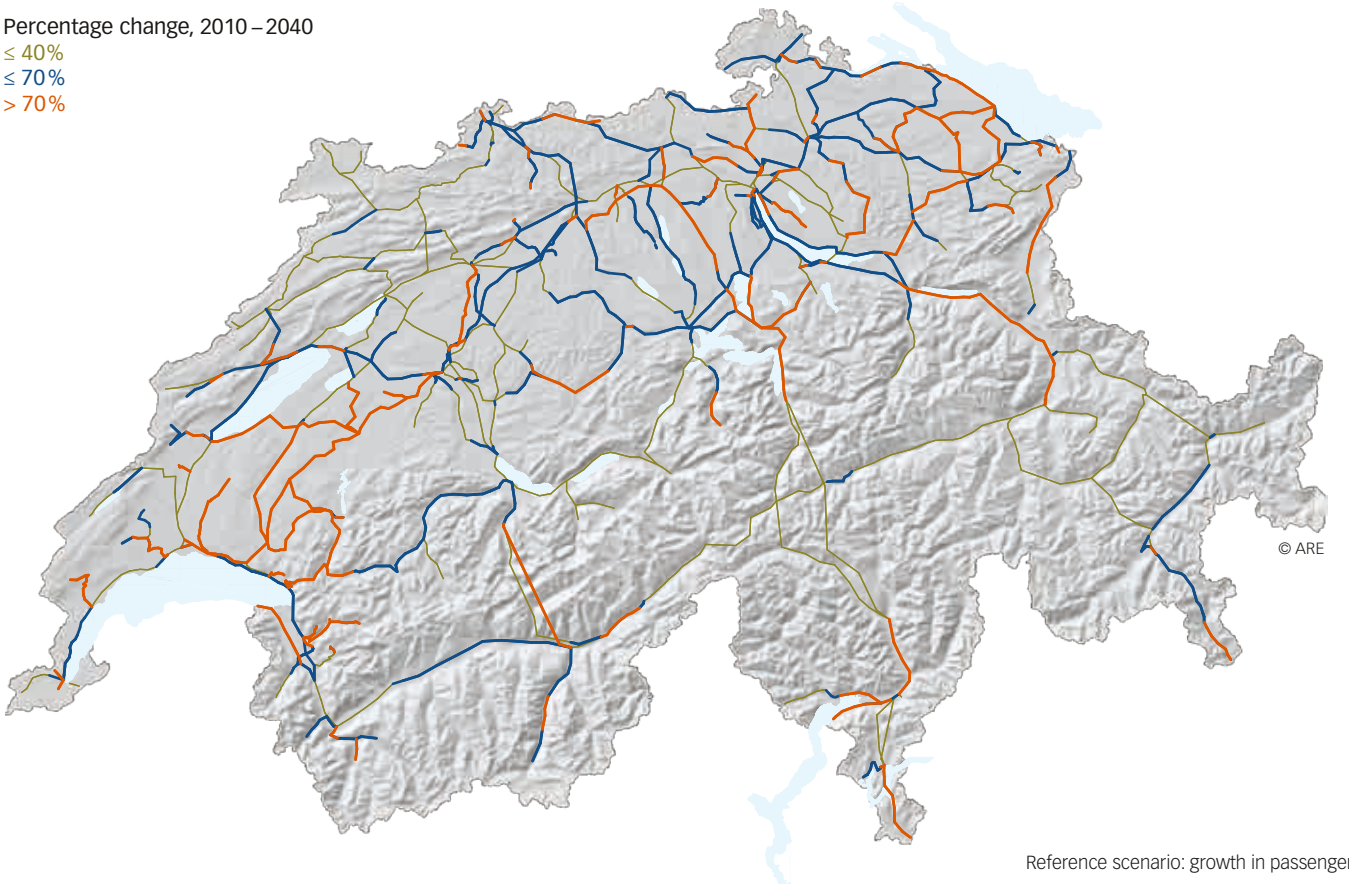
HCR: high-capacity roads
MR: major roads
AR: access roads
Built-up areas: routes in urban areas
Non built-up areas: routes outside urban areas

Vehicle-kilometres travelled by passenger road transport increase by 18 %. This growth affects the lower-category road network – which accounts for 25 % of the vehicle-kilometres travelled – to a greater extent in percentage terms than the motorway and cantonal road networks, which account for 38 % and 37 % respectively. Lower-grade roads take traffic diverted from the high-capacity and major road networks, some sections of which are overloaded. The growing volume of road freight traffic plays a part in this effect. Its increase up to 2040 will take up more space on these primary roads. Despite the implementation of the programme to eliminate bottlenecks in Switzerland's road network, capacity utilisation remains high, especially in the major agglomerations surrounding the cities of Zurich, Basel, Bern, Lausanne, Lugano and Geneva, as well as on routes between these centres.

Development of passenger trips by rail between 2010 and 2040



Reference scenario: growth in passenger trips by rail, up to 2040, in %. Sources: INFOPLAN-ARE, NPTM model, swisstopo
Note: In view of its opening in 2016, no growth rate is given for the Gotthard Base Tunnel. In the interests of standard graphical presentation, it is allocated to the lowest category.

Person-kilometres travelled by public transport will increase by 51 %. This growth will affect almost the entire rail network. In the Mittelland and in particular on sections of the network in the greater Zurich area and in western Switzerland, the increases could see demand as much as double. This latter development is directly related to the dynamic population growth that is expected in the French-speaking cantons and southern Ticino. Along with the expansion that is planned for 2025, this sharp rise up to 2040 is evidence that further action must be taken.


Paket - Terminal
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85
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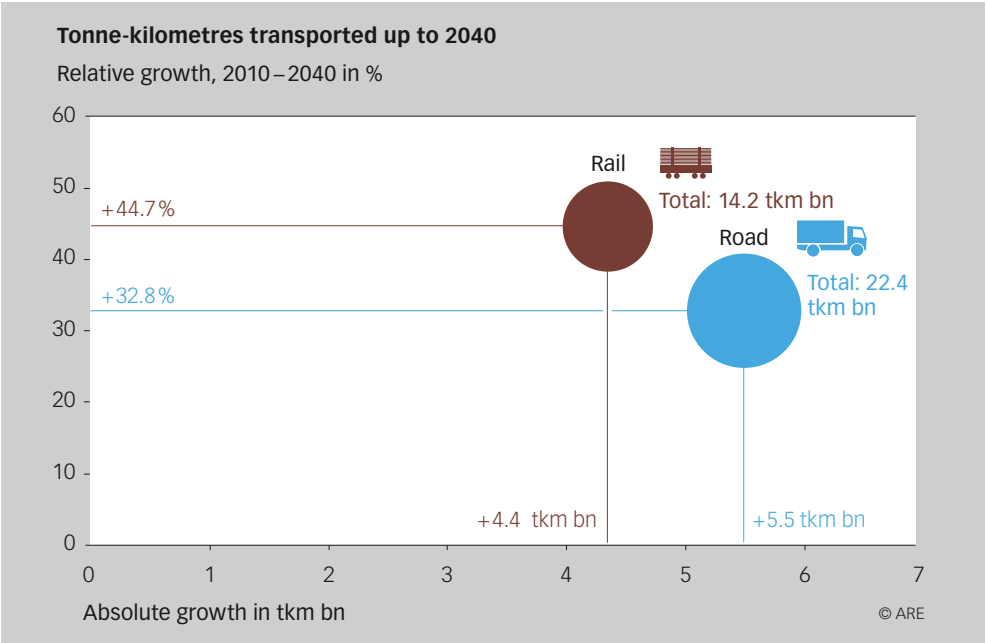
83
dreier

Freight transport



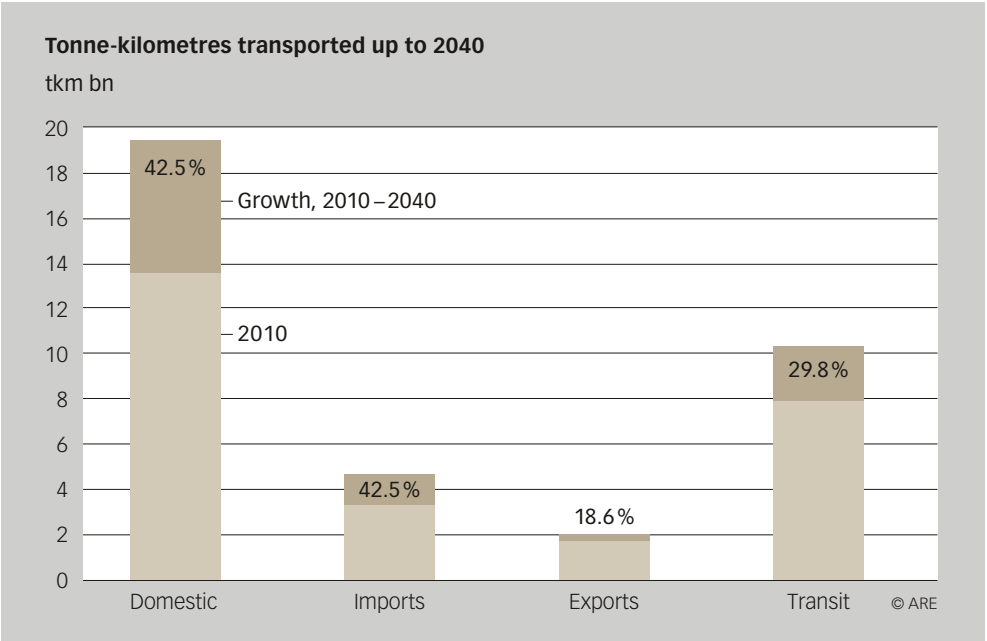
Reference scenario: relative and absolute growth in tonne-kilometres in % and in tkm, by mode of transport, 2010–40.

The reference scenario presupposes that transport volumes and tonne-kilometres transported will rise by over a third. At 574 million tonnes, 37 % more will be transported in 2040 than in 2010. This generates 37 billion tonne-kilometres for Swiss transport infrastructures.

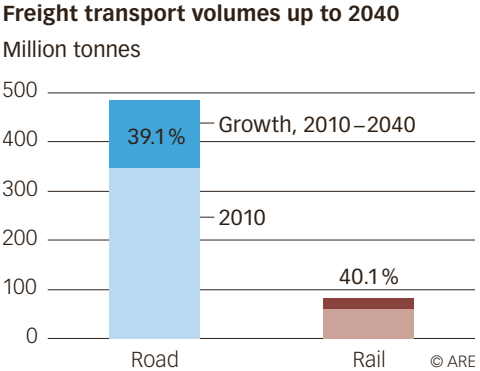
Transport intensity will continue to decline. The reasons for this are the freight structure effect, in other words the transport of lighter and higher-value goods, as well as the structural shift in the economy towards a larger service sector, while manufacturing and thus goods-intensive sectors will grow more slowly than average.

No significant changes are expected in road and rail shares of total market volume in 2040. It is thought that road will account for 84 % and rail for 14 %. (The remaining 2 %, which is not discussed in detail here, is transported on ships along the Rhine, and by long-distance pipelines.) This is despite volumes transported by rail increasing by 40 %, i. e. faster than volumes transported by road (39 %). The freight structure effect and the declining importance of fossil fuel shipments prevent rail achieving any major gains in the modal split – its share will increase by just 0.3 percentage points.

Transport types and goods categories



Reference scenario: tonne-kilometres transported, 2010, and growth up to 2040 in tkm bn and in %, by transport types and goods categories.

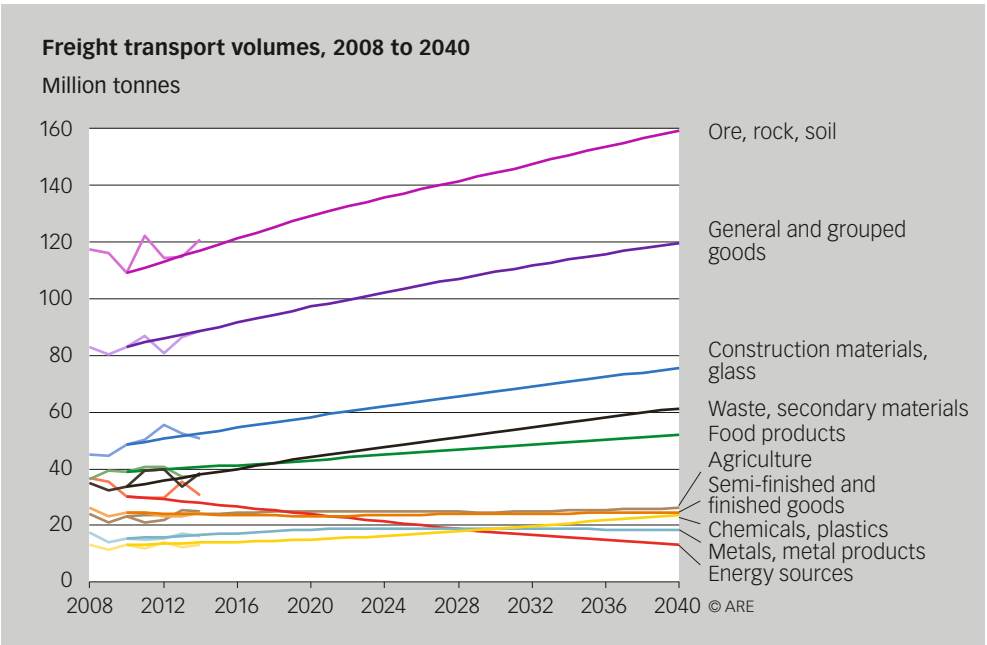


Reference scenario: freight transport volumes, 2010, and growth up to 2040 in millions of tonnes and in %, by mode of transport.

Structural and logistical factors have resulted in changes to the distances covered by freight transport. As a result, there are greater shifts in the (bimodal) split in tonne-kilometre terms than in volume terms. In 2040, 61 % of all tonne-kilometres will be transported by road. This is two percentage points less than in 2010. In the future, these goods will be transported by rail. The tonne-kilometres transported by road-based freight transport will still rise by almost a third, however.

The NEAT base tunnel will impact on tonne-kilometres transported. Transit volumes are expected to rise by 38 %, while tonne-kilometres will expand by a more modest 30 %. The calculations of transport performance leads to reduced kilometres for the base tunnel compared with previous routes.

Tonne-kilometres in domestic transport and imports will rise by a pronounced 43 % each. Categories of goods which are, on average, transported over long distances will expand faster than the market as a whole. Sources of energy are an additional factor where imports are concerned. With only short average transport distances, their decline in importance will have a smaller impact on the average.



Reference scenario: freight transport volumes, 2008 to 2040, in millions of tonnes, by goods category.

By contrast, there will be scarcely any change in the distances that export goods categories are transported. Although «ore, rock, soil» will gain in importance, they are transported only short distances in regional cross-border transport. The distances travelled by «semi-finished and finished goods» are much longer, but volumes in this category will increase at only a below-average rate. This will result in more subdued growth in export tonne-kilometres (+ 19 %).

There are high expectations for growth in the construction sector. The expected volume growth in the «ore, rock, soil» and «construction materials, glass» categories is thus correspondingly positive. In absolute terms, they will account for half of the expansion in total volume. Shipments of «waste and secondary materials» and of «chemicals and plastics» will expand enormously, with rates of 82 % and 81 % respectively. Population growth is one reason for this, but the relevant economic sectors are also expected to grow significantly.

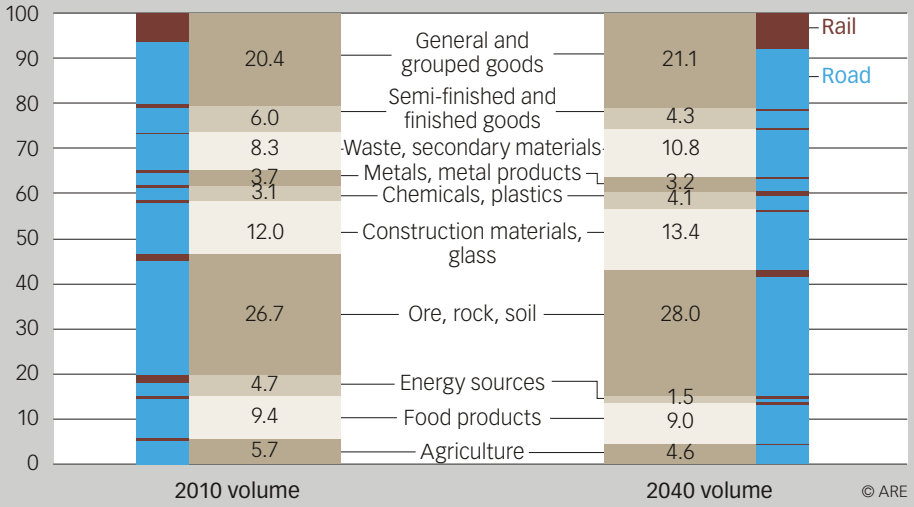
«General and grouped goods» (+ 44 %) will expand marginally faster than the aggregate freight transport market. Expectations about how different sectors will grow are the reason that this increase is not even more dynamic. For example, expansion in the retail sector is only expected to be average, while that for the food products industry will be below average, and the other manufacturing sectors will contract. Rail will increase its share of the growing «general and grouped goods» category by six percentage points, and by nine percentage points in the «chemicals and plastics» category.

With the exception of energy sources, an increase in transport can be expected for all categories of goods. The federal government's Energy Strategy 2050 shows effects. The forecast reduction in the consumption of fossil fuels will cut the associated transport volumes by 56 %. In 2010, energy sources accounted for 7 % of all freight volume. By 2040, this figure will have dropped to 2 %.

Volumes and tonne-kilometres transported

Freight transport volumes (road and rail), 2010 and 2040

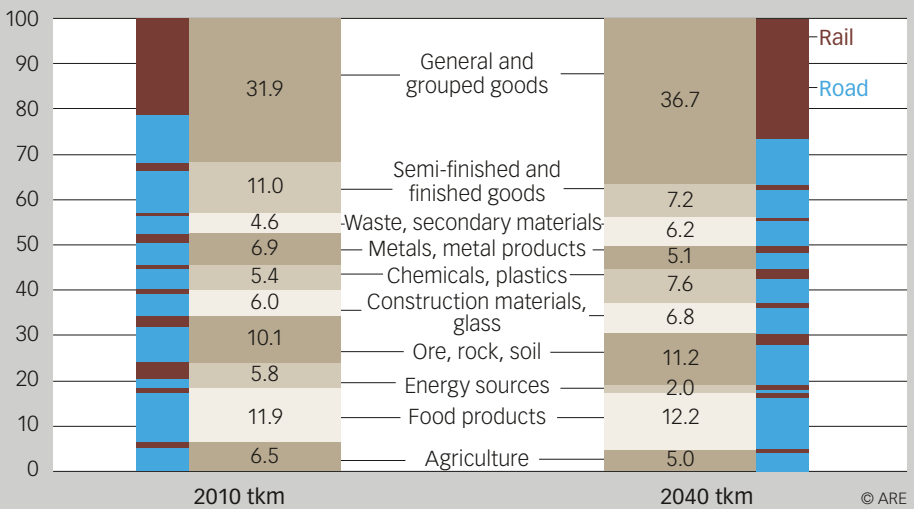
Shares of goods categories in %



Reference scenario: freight transport volumes (road and rail), 2010 and 2040, percentage shares of different goods categories.

Tonne-kilometres transported (road and rail), 2010 and 2040

Shares of goods categories in %



Reference scenario: tonne-kilometres transported (road and rail), 2010 and 2040, percentage shares of different goods categories.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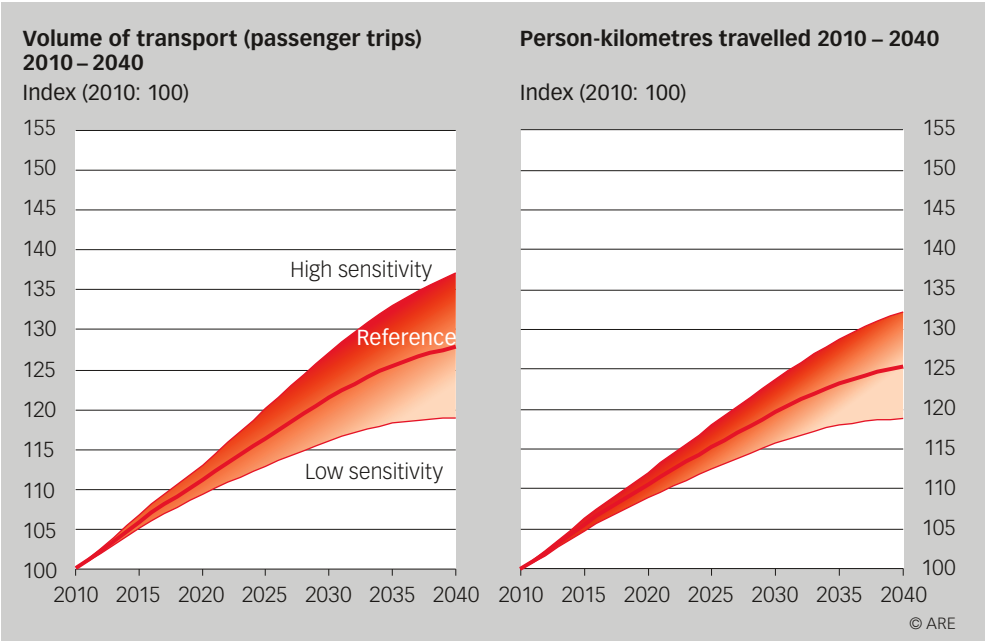
Passenger transport

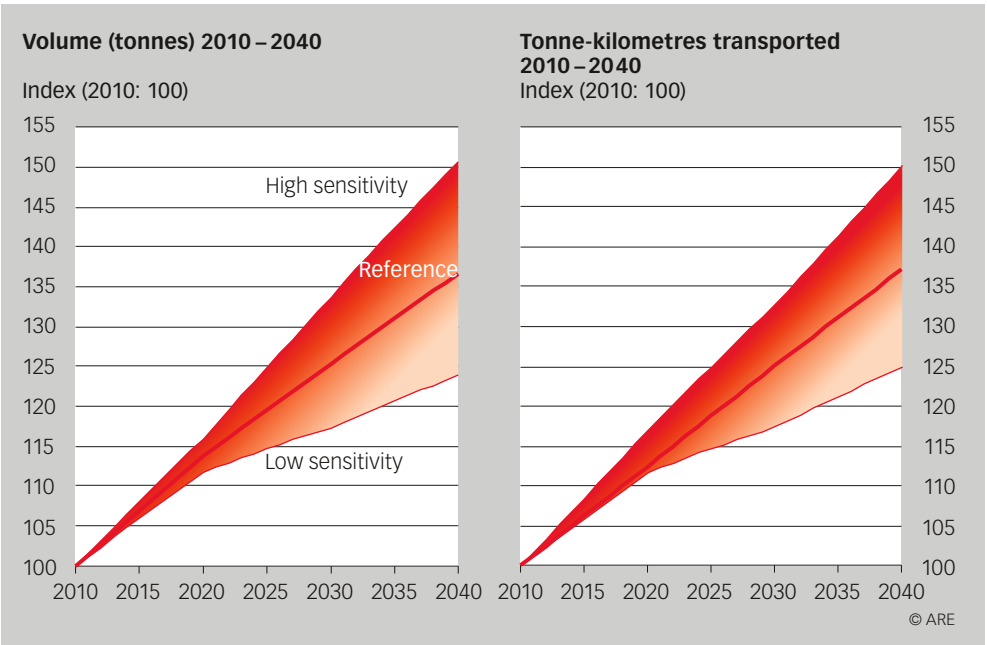


High and Low sensitivity analyses for passenger transport volumes and person-kilometres travelled, 2010 – 40, indexed (2010: 100).

As is the case in the reference scenario, the sensitivity analyses show that the volume of transport will rise faster than the person-kilometres actually travelled. This effect is caused primarily by PMT, for which average distances will decline. The sensitivity analyses also confirm the trend towards covering larger distances by PT. With the High sensitivity analysis, person-kilometres travelled rise by 32 % between 2010 and 2040. This is seven percentage points higher than with the reference scenario. As in the reference scenario, the increase in transport is thus less than that of the population (plus nine percentage points).

The High sensitivity analysis has a more marked impact on the modal split: person-kilometres travelled by PT expand by 12 percentage points more than the reference scenario (63 % vs. 51 %). The gap for PMT is just under five percentage points (23 % vs. 18 % in the reference scenario). With an additional increase of ten percentage points, NMT comes in between the rates for PT and for PMT. With the Low sensitivity analysis, total person-kilometres travelled expand by six percentage points less than in the reference scenario (19 % vs. 25 %). Like its High counterpart, the Low sensitivity analysis indicates that population growth will slow down more (minus nine percentage points) than transport.

Freight transport



High and Low sensitivity analyses for volume and tonne-kilometres in freight transport, 2010 – 40, indexed (2010: 100).

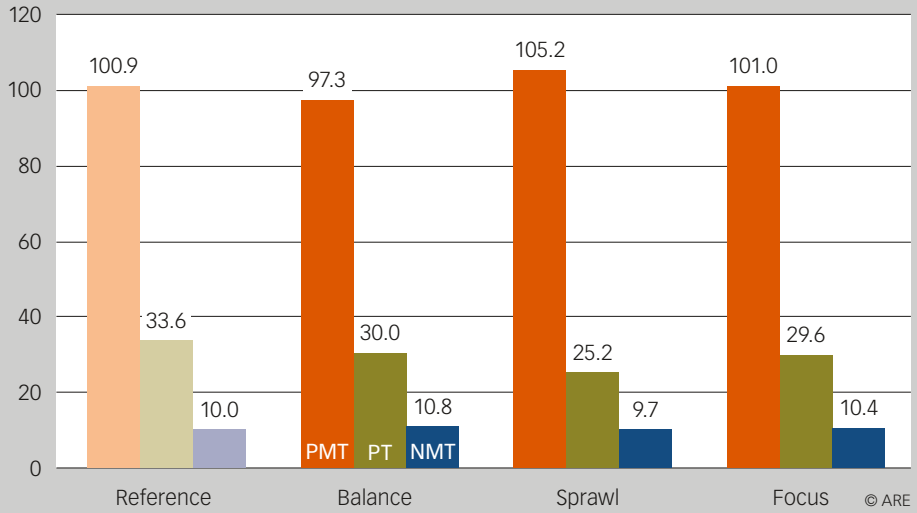
With the High sensitivity analysis, tonne-kilometres transported rise by 50 % up to 2040, which is 13 percentage points more than in the reference scenario (37 %). The modal split based on tonne-kilometres clearly illustrates that, with this analysis, road freight transport declines less than with the reference scenario (1.2 instead of 2 percentage points). One of the reasons for this is local goods distribution and construction site transport, which must necessarily use the roads. With generally higher underlying growth rates, they will gain correspondingly in importance.

With the Low sensitivity analysis, road freight transport's share of tonne-kilometres declines more markedly than in the reference scenario: 2.8 percentage points instead of 2. These findings confirm the effect of the High sensitivity analysis, simply with negative rather than positive figures. The Low sensitivity analysis results in a figure for tonne-kilometres that is 9 % lower than that of the reference scenario, which corresponds to an increase of just 25 % between 2010 and 2040 (reference scenario: + 37 %).

Passenger transport

Person-kilometres travelled by passenger transport up to 2040, by scenario and mode of transport

pkm bn



Alternative scenarios: person-kilometres travelled in pkm, 2040, by scenario and mode of transport.

Balance

The combination of PT-focused mobility, rising occupancy rates for private cars and a compact use of space has person-kilometres travelled by PMT rising by less than in the reference scenario: 14 % instead of 18 %. The increase in PT usage is also lower, at 35 % instead of 51 %. This is surprising, but is explained by the generally lower person-kilometres travelled under the Balance scenario, a compact use of space and the shorter distances. Meanwhile, non-motorised transport grows much more strongly, by 42 % compared with the reference scenario of 32 %. More trips are taken by bicycle and on foot, instead of with PMT or PT as in the other scenarios. Expressed in terms of person-kilometres, the modal split thus shifts by 2.5 percentage points towards PT and 1.2 percentage points towards NMT. Under the reference scenario, these changes are 4.0 and 0.4 percentage points respectively. Compared with the reference scenario, there is a shift of emphasis to non-motorised transport: the Balance scenario expects NMT to pick up owing to an improved cycle infrastructure and more widespread ownership of e-bikes.

Sprawl

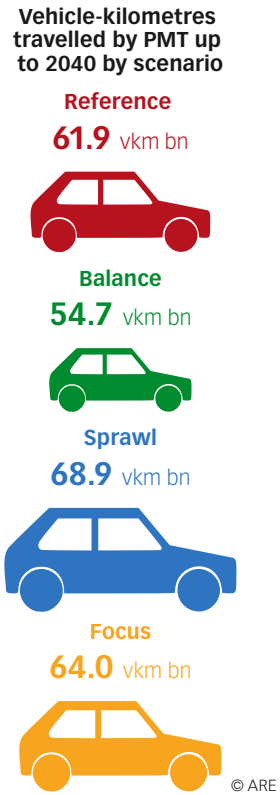
The combination of cost-privileged PMT, more space on high-capacity roads and a growing share of private car use coupled with declining vehicle occupancy rates and a less compact use of space will generate a sharp rise in vehicle-kilometres travelled by PMT (31 % instead of 18 % in the reference scenario). Owing to lower occupancy levels, the Sprawl scenario produces a significant gap between vehicle and person-kilometres travelled by PMT: vehicle-kilometre figures rise sharply, while person-kilometres increase only at the same rate as in the reference scenario. This finding illustrates the very preference for private, motorised mobility postulated by the Sprawl scenario. This focus on PMT results in significantly lower growth in the person-kilometres travelled by PT, of 14 % compared with 51 % in the reference scenario. Non-motorised transport also grows at a lower rate than in the reference scenario (28 % rather than 32 %). Expressed in terms of person-kilometres, the modal split thus shifts by 0.9 percentage points towards PMT, while PT declines 1.2 percentage points and NMT increases by a modest 0.3 percentage points. The declining relative importance of PT is associated

with a less dynamic overall trend in person-kilometres travelled under the Sprawl scenario (22 % growth instead of 25 % in the reference scenario). The increasing number of trips made by the older generation for shopping and leisure purposes should be highlighted here. This results in a slight increase in the total number of trips taken compared with the reference scenario.

Focus

The number of trips also increases at a slightly above-average rate under the alternative Focus scenario. The reason for this is not the higher number of trips per person and day based on a change in mobility behaviour but rather the assumption that, compared with the rural population, city residents have a slightly higher individual mobility demand.

Under the Focus scenario, assumptions about the differences between urban and rural areas result in a larger number of vehicle-kilometres travelled by PMT. Examples of such assumptions are that it is more cost-effective to use PMT in rural areas and more expensive in cities, and that the density of car ownership will rise in rural areas while occupancy rates will fall. The assumptions are the opposite for urban areas. The vehicle-kilometres travelled by PMT increase by 22 % under this scenario, compared with 18 % under the reference scenario. Alongside the focus of the rural population on PMT, reduced PT services are another factor. The person-kilometres travelled by PT increase by 33 % under the Focus scenario, which is about the same as with the Balance scenario (35 %) but much lower than in the reference scenario (51 %). The use of space assumed in the Focus scenario, with its particularly urban character, results in greater demand for short trips within cities, but longer distances between these urban centres are increasingly made by car. With the Focus scenario, non-motorised transport grows faster than in the reference scenario (37 % compared with 32 %) and thus takes a greater share of urban mobility at the expense of PT. Based on person-kilometres travelled, this produces a shift in the modal split with PT increasing by 1.8 percentage points and NMT by 0.7 percentage points, while PMT declines by 2.5 percentage points compared with 2010.



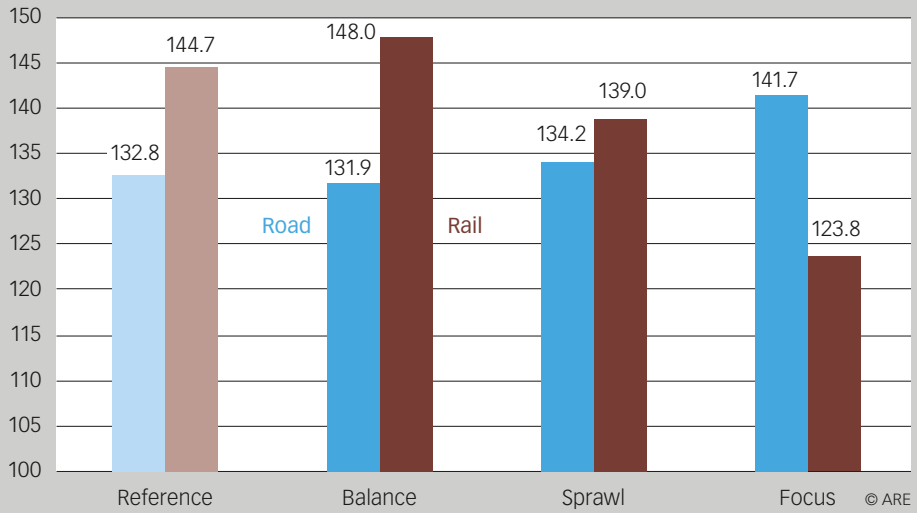
Passenger transport: comparison of the four scenarios (change from 2010 to 2040)

Scenarios		Reference	Balance	Sprawl	Focus
					
Person-kilometres travelled		25 %	20 %	22 %	22 %
Transport volumes*		28 %	28 %	29 %	29 %
Person-kilometres travelled, PT		51 %	35 %	14 %	33 %
Transport volumes, PT*		42 %	40 %	24 %	27 %
Person-kilometres travelled, PMT		18 %	14 %	23 %	18 %
Vehicle-kilometres travelled, PMT		18 %	4 %	31 %	22 %
Transport volumes, PMT*		21 %	14 %	31 %	22 %
Person-kilometres travelled, NMT		32 %	42 %	28 %	37 %
Transport volumes, NMT*		32 %	42 %	28 %	39 %
Modal split**	2010				
PT	19.2 %	23.2 %	21.7 %	18.0 %	21.0 %
PMT	74.2 %	69.8 %	70.5 %	75.1 %	71.7 %
NMT	6.6 %	7.0 %	7.8 %	6.9 %	7.3 %

* based on an average working day ** based on pkm travelled

Freight transport

Growth in tonne-kilometres transported up to 2040, by scenario and mode of transport
2010: 100



Alternative scenarios: increase in tonne-kilometres transported up to 2040, indexed (2010: 100), by scenario and mode of transport.

Balance

All three alternative scenarios are based on the same underlying nationwide freight transport data. There are thus no differences in terms of volume (tonnage). The alternative scenarios also assume less marked shifts in workplace locations, compared with the more dynamic change in population distribution. The underlying data in itself thus limits the expected variation in results between the scenarios. However, modified cost structures, speeds and capacity utilisation lead to changes in the modal split. The Balance scenario shows the expected trend in favour of the railways: rail increases by 0.8 percentage points in the volume-based modal split. Since the railways transport this volume for the longer distances to which it is suited, tonne-kilometres transported are two percentage points higher than in the reference scenario. Vehicle-kilometres travelled by road freight declines by 0.7 percentage points compared with the reference scenario. This is rather more than the figure for tonne-kilometres, thereby confirming the road-to-rail shift effect over long distances in particular.

Sprawl

The assumptions on freight transport (cost structures, speeds, capacity utilisation) made in the Sprawl scenario are the opposite of those which underlie the Balance scenario. Rail gains 0.8 percentage points in the tonne-kilometre-based modal split, which is 1.2 percentage points less than the 2.0 percentage points of the reference scenario, despite difficult scenario conditions for the railways. This increase in the share of tonne-kilometres transported is due in part to the rise in the transport of general and grouped goods that is assumed in the Sprawl scenario. The volume-based modal split, in which rail declines by 0.5 percentage points, confirms this finding: the increase in tonne-kilometres mentioned is generated by the transport of goods categories that are linked to longer transport distances. The increase in tonne-kilometres transported by road is somewhat higher than the reduction in absolute terms that the Balance scenario indicates in comparison with the reference scenario. Vehicle-kilometres travelled are 1 % higher than in the reference scenario. In purely quantitative terms, a comparison of the alternative Balance and Sprawl scenarios

reveals only modest differences, whether positive or negative. The deviations compared with the reference scenario, and with regard to momentum in comparison with passenger transport, are as expected.

Focus

Freight transport by road increases more strongly under the Focus scenario than it does in either of the other two alternative scenarios. This is particularly true of tonne-kilometres transported, but to a lesser extent also of volumes. In contrast to Balance and Sprawl, rail's share declines under this scenario. The reasons for this are primarily structural. With the Focus scenario, the population is concentrated in areas which display a high share of road freight transport, i.e. mainly in urban areas in which deliveries and waste transportation are exclusively by road. The share accounted for by road thus increases accordingly, especially where general and grouped goods are concerned. Although the railways would, in themselves, be a suitable mode of transporting this category of goods, they do not start and end in densely populated urban areas but rather at hubs or terminals. For these inter-urban relations, the Focus scenario makes the same assumptions about rail as in the Sprawl scenario. This trend is overlaid by effects generated by the concentration of chemicals locations in the urban areas of north-west Switzerland, which generates road traffic. This explains the 6.7 percentage point increase in tonne-kilometres transported by road freight compared with the reference scenario. The growth in tonne-kilometres transported is still lower than that indicated under the Sprawl scenario, however, because the shorter point-to-point distances under Focus replace the longer distances typical of the Sprawl scenario.

Freight transport: comparison of the four scenarios (change from 2010 to 2040)

Scenarios		Reference	Balance	Sprawl	Focus
					
Tonne-kilometres transported		37 %	38 %	36 %	35 %
Transport volumes		37 %	37 %	37 %	37 %
Tonne-kilometres transported by road		33 %	32 %	34 %	42 %
Transport volumes on the roads		39 %	38 %	40 %	40 %
Tonne-kilometres transported by rail		45 %	48 %	39 %	24 %
Transport volumes on the railways		40 %	45 %	32 %	32 %
Modal split*	2010				
Road	63.2 %	61.2 %	60.5 %	62.4 %	66.3 %
Rail	36.8 %	38.8 %	39.5 %	37.6 %	33.7 %

* based on tonne-kilometres transported

Methodology

The Transport Outlook is an «if-then» analysis and not a set of forecasts. Its underlying assumptions and hypotheses are based on the latest scientific findings, consolidated in an 18-month process involving experts from both within and outside the federal government. The calculations were made using current methods and transport models. The results were then subject to plausibility testing.

The reference scenario extrapolates the trends in the cause-and-effect relationships observed to date, and also assumes the implementation of the political measures that have been adopted. It does not replicate the abrupt developments that might result, for example, from a rapid launch of automated vehicles. The effects of new technologies were nonetheless factored into the alternative scenarios. The Federal Department of the Environment, Transport, Energy and Communications DETEC aims to identify sudden changes in mobility trends at an early stage in order to create a reliable basis for the long-term planning of infrastructure projects. DETEC therefore continuously monitors developments in mobility, and the Federal Roads Authority FEDRO and the Federal Office of Transport FOT follow a system of rolling planning so that they are able to respond swiftly to change.

Models create the methodological link between structural data, statistical estimates of behavioural parameters and assumptions about Swiss transport policy, on the one hand, and prospective developments on the other. The Transport Outlook applies the strategic National Passenger Transport Model (NPTM) and the Aggregated Goods Transport Method (AGTM). Both models have been validated by international experts, and their application in the national context has been proven in practice. The underlying data is drawn from a number of sources, including the Mobility and Travel Microcensus (MZMV), the stated preference survey of transport mode and route choices, the Freight Transport Survey (GTE), statistics on public transport, surveys of cross-border and transalpine transport, the survey of trucks and vans, and from counting stations on the road and rail networks. Transport companies, the cantons and Switzerland's neighbouring countries (e. g. Germany and Austria) also use transport models to draw up long-term outlooks or forecasts, although the modelling approaches actually applied vary: there are differences in terms of what the transport model is intended to replicate and of the data that is available.

Glossary

Capacity utilisation: the relationship between what is being transported and the capacity of the vehicle. In passenger transport, this is synonymous with occupancy. In freight transport, it is the relation between the weight of the goods being transported and the payload of the vehicle. Capacity utilisation and occupancy correspond to the ratios calculated from passenger/tonne-kilometres and vehicle kilometres.
Combined transport: the transport of goods in standardised form (e. g. containers or semi-trailers) using multiple modes of transport. The relevant technology is used to transfer shipments between these different modes.
Commercial transport, business transport: trips connected with a business activity, official trips.
Commercial vehicles: these are classified into two categories based on their total permitted weight; light goods vehicles up to a maximum of 3.5 t (LGV), and heavy goods vehicles of over 3.5 t (HGV).
Commuting: trips between home and workplace.
Freight structure effect: goods are becoming more individual, smaller, lighter and more valuable. This reduces transport intensity, as fewer tonnes are transported for each franc of goods value.
Goods categories: groups of different goods, classified according to the structure of the underlying statistical data.
HCR: high-capacity roads.
Mobility rate: the mean number of trips per person and day. Mobility rates can be broken down by travel purposes.
Mobility tools: a collective term for public transport travelcards and car ownership.
Modal shift: the provision of transport services using alternative means of transport.
Modal split: the shares of transport volume or vehicle-kilometres accounted for by different modes of transport, expressed in % and totalling 100 %.
Mode: often used as a synonym for means of transport, although «mode» functions as a collective term (e. g. public transport as whole), while «means» refers to buses, trams, etc.
MR: major roads.
Non-motorised transport (NMT): the collective term for pedestrian and bicycle transport.
PEB: bottleneck elimination programme message, modules 1 – 3 (without network additions).
Person/tonne-kilometres travelled/transported: the transport of persons or goods for a certain distance, expressed as person-kilometres (pkm) or tonne-kilometres (tkm).
PMT: private motorised transport (cars and motorcycles).
PT travelcards: half-fare and GA («go as you please») travelcards.
PT: public transport.
STEP AS 2025: a strategic expansion programme for the railway infrastructure up to 2025.
Supply of transport: the built infrastructure in combination with the ability to use it, such as roads and railways, as well as scheduled services.
Transport intensity: the tonne-kilometres transported for every unit of value (such as per franc) of the transported goods.
Transport volumes: the number of trips in passenger transport, and the number of tonnes in freight transport.
Travel distances, transport distances: the distances travelled/transported by passenger and freight transport.
Travel purposes, passenger transport: the purpose for taking a trip, for example to go shopping or for a leisure activity.
Type of freight flow: classification of freight transported according to its destination; import, export, transit or domestic.
Vehicle-kilometres travelled: trips taken over a certain distance, irrespective of car occupancy or freight vehicle capacity utilisation (vkm).
Volume: number of trips in passenger transport, number of tonnes carried in freight transport.

Further information

Further findings and information from the Transport Outlook 2040 project are available on the ARE website at: www.are.admin.ch → Transport and infrastructure → Data → Transport outlook

The following are also available:

- **ARE (2016):** Perspektiven des Schweizerischen Personen- und Güterverkehrs bis 2040, main report. The main report on which this summary is based, containing explanations of retrospective analysis and how the scenarios were created. It also documents all of the results (in German, PDF).
- **ARE (2016):** Perspektiven des Schweizerischen Personen- und Güterverkehrs bis 2040, technical report. A supplement to the main report, containing the technical documentation quantifying the scenarios (in German, PDF).
- **ARE (2016):** Perspektiven des Schweizerischen Personen- und Güterverkehrs bis 2040, synthesis report. A synthesis of the main report (in German, French and Italian, PDF).
- **Overview of findings in table form.** Download from www.are.admin.ch. (in German, Excel).
- **Visum versions of the transport model.** Information on data sources (not available in English): www.are.admin.ch → Transport and Infrastructure → Data → Transport outlook

www.are.admin.ch