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Swiss Federal Roads Office FEDRO

ROADS AND TRAFFIC 2017

Developments, facts and figures



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Dear Reader,

While road infrastructure is not the be-all and end-all, a smoothly functioning road transport system would be virtually impossible without a safe, efficient and widely accepted infrastructure. This is something with which Swiss voters appear to be in full agreement, perhaps because they are aware of the negative consequences that have arisen in those countries that have neglected this basic principle for many years. On 12 February 2017, the referendum on the Motorway and Agglomeration Traffic Fund was adopted by a clear majority, thus paving the way for a new financing structure as of 2018 to secure the long-term funding of the motorways and agglomeration traffic.

The vote in favour of the new fund also signals widespread acceptance of the need for maintenance and renovation of the network, as well as the adoption by the federal government of around 400 kilometres of cantonal roads, which will ease the burden on the involved cantons and enable us to integrate the stretches concerned into the motorway/national roads network. In view of this commitment on the part of the electorate we are devoting an appropriate proportion of this year's report to the topics of infrastructure construction and maintenance.

The implementation of the new fund and the integration of the 400 kilometres of cantonal roads into the motorway/national roads will keep us very busy over the next two years. In the year under review, a major project was completed, namely the 85 kilometre-long A16 ("Transjurane") between Boncourt and Biel. This stretch is particularly important because it links the Jura region directly with the central lowlands and thus provides another direct connection to the north. Other major projects

in progress include the widening of the Zurich northern bypass and construction of the third Gubrist tunnel tube and the Belchen renovation tunnel.

FEDRO is not only active in the area of infrastructure. It is merely a matter of time until automated vehicles networked with one another and communicating with the road infrastructure are in use on our roads. This gives rise to new issues that have to be addressed, including the handling of the associated data. We will have to exert greater influence on traffic control and management in order to handle the increased volume of traffic on the existing and in part expanded roads. Our traffic management measures are intended to keep traffic flowing as smoothly as possible.

We are strongly committed to dealing with all these complex tasks, which involve people, vehicles, infrastructure, data and the financing of road transport. Our overlying objective is to ensure that the motorways and national roads continue to function as efficiently as possible as Switzerland's main traffic axes. This edition of "Roads and Traffic" deals with these issues and a broad variety of other topics. I trust you will find it interesting and informative.

Jürg Röthlisberger
Director, Federal Roads Office (FEDRO)

Highlights of the year

1.3.2016

23 March 2016
9th long-term construction programme

The Federal Council approved the 9th long-term programme for the completion of the motorways and national roads. In the coming four years, an average of 460 million Swiss francs per annum is to be invested in the completion of the network, primarily in the cantons of Bern, Valais, Schwyz and Uri.

22 June 2016
Approval of general project for expansion of the Malley junction

The Federal Council approved the general project for the expansion of the Malley junction to the west of Lausanne. The expansion is to include a new access ramp to the north and south of the junction for traffic travelling in the direction of Maladière. The main objectives are to increase the capacity and safety of this stretch.

5 June 2016
Canton of Schwyz votes in favour of the Axen route

Voters in the canton of Schwyz rejected the initiative against the Axen route. This means that the new approximately 8-kilometre stretch on the A4 between Ingenbohl and Sisikon will be constructed parallel to the existing road.

6 June 2016
Initiation of excavation work on the Zurich northern bypass

The Zurich northern bypass is one of the most heavily frequented motorway stretches in Switzerland. This chronically congested bottleneck is to be eliminated. Federal Councillor Doris Leuthard was present as the major work got under way.

30 June 2016

Pilot mobility pricing project

Most cantons see mobility pricing as an instrument for increasing capacities and thus easing congestion. The Federal Council's concept report confirmed this. DETEC was then asked to examine the options for pilot projects.

14 September 2016
First FEDRO public procurement report

In 2015, the Swiss Federal Roads Office (FEDRO) issued more than 3,000 mandates amounting to a total of around 1.4 billion Swiss francs. According to its public procurement report, which was published for the first time in the year under review, 80 percent of its order volume was issued via competitive tenders.

17 August 2016
Counterproposal to initiative calling for the promotion of cycling

The Federal Council supports the equal treatment of cycling, walking and hiking in traffic policy, but is against the further-reaching demands of the "Velo-Initiative", which aims to promote these types of mobility over others. A counterproposal was submitted for consultation.



23 September 2016

Work on the Belchen tunnel reaches the cantonal border

Workers constructing the third tube of the Belchen tunnel with the 2,000-tonne, 14-metre-wide excavator reached the border between the cantons of Solothurn and Basel-Landschaft.

1 October 2016

Foolproof breath test

An evidential breath test was introduced in Switzerland. From now on, police carrying out breath tests on drivers will only have to order a blood test in exceptional cases.



21 December 2016

Report on automation and digitisation in road traffic

The use of automated vehicles and the networking of vehicles with one another and with the various other options presented by digitisation are opening up attractive opportunities for Switzerland's transport system. The Federal Council published a report outlining preliminary planning for networked mobility and explaining the activities of the federal government in this area.

**3 April 2017
Completion of "Transjurane" motorway**

The A16 (otherwise known as the "Transjurane" motorway) covers a stretch of 85 kilometres from Biel to Boncourt at the national border in the canton of Jura. Federal President Doris Leuthard officially handed over the last section of the Transjurane to traffic. This motorway comprises 22 bridges and 33 tunnels. During its construction, around 13,000 dinosaur tracks were discovered.

30.4.2017

**16 November 2016
Approval of general project for Lucerne bypass**

The Federal Council approved a general project for the Lucerne bypass with the aim of eliminating the bottleneck on the A14 around Lucerne by widening the existing stretch between Rotsee and Buchrain from four to six lanes and constructing a new tunnel.

7 November 2016

Opening of Roveredo bypass

The new Roveredo bypass in the canton of Grisons was handed over to traffic in a ceremony attended by Federal Councillor Doris Leuthard, bringing to an end a long period of hardship in Roveredo – until now, the national road had passed right through the village centre.

**25 November 2016
Opening of second partial motorway stretch in Upper Valais**

A 7-kilometre stretch along the A9 motorway in Valais between Leuk/Susten East and Gampel/Steg West was officially handed over to traffic. This means that a further 24.8 kilometres have to be constructed to complete the A9 in Upper Valais.



**12 February 2017
Fund for financing motorway and agglomeration traffic**

Swiss voters accepted the proposed Motorway and Agglomeration Traffic Fund by a clear majority of 61.9 percent. This fund provides the necessary long-term financial resources for increasing the capacity of the motorways and national roads and for eliminating the existing bottlenecks. The fund also ensures that the federal government will be able to provide adequate support for road projects in the country's towns and agglomerations.

New financing basis for motorways/national roads

On 12 February 2017, Swiss voters accepted the proposed Motorway and Agglomeration Traffic Fund by a clear majority of 61.9 percent. This means that the financing of the motorways and the agglomeration programmes has been placed on a new basis. The proposal included the adoption by the federal government of around 400 kilometres of cantonal roads, thus ensuring that medium-sized towns, agglomerations and mountainous and outlying regions can be better integrated into the motorways and national roads network.

A new era will commence for the motorways and agglomeration programmes on 1 January 2018, when the Motorway and Agglomeration Traffic Fund will replace the existing Infrastructure Fund. Like the Railway Infrastructure Fund, it is incorporated into the Federal Constitution and is of unlimited duration. It will also help close the ever-increasing gap between revenue and expenditure.

Balanced financing

The revenue for the new fund will be sourced from road users as well as the federal treasury and the cantons. To secure the necessary financing, revenue from the oil tax surcharge, the motorway sticker ("Vignette") and the contribution by the cantons towards the expansion of the national roads network will flow into the new fund. In addition, the tax levied by the federal government on imports of cars and spare parts will be earmarked for the new fund instead of flowing into the federal treasury. Furthermore, from 2018 five percent (and from 2020, ten percent) of the oil tax revenue will flow into the new fund, which will have a total of around three billion Swiss francs per annum at its disposal.

As soon as the fund's resources fall below 500 million Swiss francs, the oil tax surcharge will be increased by four cents per litre of fuel. This measure is not expected to become necessary before 2019. The introduction of a tax on electric vehicles is provisionally planned from 2020, and this revenue will also flow into the fund.

The Motorway and Agglomeration Fund will be used for financing the following activities:

- Cleaning and snow clearance, etc. to secure the smooth daily operation of the network;
- Maintenance to secure the lasting quality of the network (including renovation, resurfacing, replacement of bridges, adaptation to new noise abatement and tunnel safety regulations);
- Expansion of capacity through additional lanes on stretches that are no longer able to handle the growing traffic volume;
- Completion of the network – 52 of the 1,892 kilometres (in accordance with the 1960 federal resolution) still have to be constructed. This does not include the 400 kilometres of cantonal roads adopted by the federal government.

New fund improves planning security

The Motorway and Agglomeration Traffic Fund is anchored in the Federal Constitution and is of unlimited duration. This means that the financing of the operation, maintenance and expansion of the motorways/national roads and for agglomeration traffic projects is now secured. The fund also improves planning and realisation security, because construction projects can be subject to delays due to objections, inclement weather conditions or other factors that cannot be influenced. With this new fund, any financial resources that are not used in a given year can be carried forward to the following year. Reserves can also be formed in order to cushion fluctuations in expenditure.

Fund for the Special Financing of Road Transport to remain unchanged

The existing Fund for the Special Financing of Road Transport (sometimes referred to as "road treasury") will coexist with the new fund in a slightly changed form. This fund is financed from half the revenue from the oil tax and, where necessary, from vehicle tax revenue. It is used for financing all road-related tasks and applications that are not financed by the new fund, including:

- Global contributions to the cantons for the costs associated with main roads;
- Contributions for main roads in mountainous and outlying regions;
- Non-project-related contributions to the cantons;
- Project-related contributions towards the Railway Infrastructure Fund for the transfer of the transport of goods from road to rail.
- Research and administration

Strategic development programmes

Targeted expansion of transport infrastructure is required in order to ensure its efficient operation. As with the railway network, the necessary measures for the motorways and national roads will in future be identified and successively implemented within the framework of the STEP (Strategic Motorway Development) programme. Expansion projects are coordinated with those of the railway network and other transport projects in the agglomerations. As a rule, every four years the Federal Council will submit a Dispatch to Parliament concerning an expansion step, together with a petition for the necessary credit facility. Parliament decides on projects and their prioritisation, as well as their financing. Every four years it specifies which new projects are to be implemented. Implementation step 2030 encompasses projects totalling 6.5 billion Swiss francs for the elimination of bottlenecks on the motorway and national roads network.

Following the acceptance of the Motorway and Agglomeration Traffic Fund and the expiry of the referendum deadline for the associated legislation, as of 1 January 2018 the Federal Council enacted the constitutional provisions and the legislative amendments adopted by Parliament. The provisions relating to the integration of around 400 kilometres of cantonal roads into the national roads network will enter into force at a later date. At the same time, various ordinances had to be adapted to the new legal circumstances:



Weyermannshaus junction on the Bern western bypass.

Agglomeration programmes

In the past few years, the agglomeration programmes have evolved into a central pillar of Switzerland's transport and spatial planning. The federal government supports selected transport projects with contributions of between 30 and 50 percent. It co-finances measures that have been developed by the cantons, cities and municipalities within the scope of agglomeration programmes. In this way, several thousand road and public transport projects have been realised during the past ten years, as well as measures relating to cycling and mobility on foot. 45 of the 55 agglomerations (first- and second-generation of agglomeration programmes) have benefited from contributions from the Infrastructure Fund, which was of limited duration and is now almost depleted.

A further 37 agglomeration programmes ("third generation") had been submitted to the federal government by the end of 2016. The projects in question are associated with investments amounting to around twelve billion Swiss francs. The Motorway and Agglomeration Traffic Fund creates the legal basis for the federal government to make the necessary contributions towards agglomeration traffic projects and thus for securing the continued existence of these programmes.

In the initial phase, around 390 million Swiss francs per annum (nominal sum, including inflation and value-added tax) will be available for projects in the agglomerations. With the new fund, too, the federal contributions are to be made in a targeted manner rather than distributing them broadly but less effectively. Submitted agglomeration programmes are examined and prioritised by the Federal Office for Spatial Development (ARE) in close cooperation with the other involved federal authorities. The Federal Council and Parliament are responsible for taking the final decision regarding projects to be supported.



Near Grauholz to the east of Bern.

400 additional kilometres for the motorway network

The existing motorway/national roads network is based on the resolution adopted by Parliament in 1960, which has been adapted over time as necessary. Since then, Switzerland's population and the traffic volume have increased sharply, and housing development has changed considerably, giving rise to the need to adapt the network. In the course of the debate on the Motorway and Agglomeration Traffic Fund, Parliament linked the adoption of the fund to the integration of 382.55 kilometres of cantonal roads into the motorway/national roads network (cf. Table 2). Two new elements were also added, thus increasing the length of the motorway/national roads network by more than one-fifth as of 1 January 2020.

Better connections for mountainous and outlying regions

Thanks to the cantonal roads in question being reclassified as national roads, medium-sized towns and mountainous and outlying regions will benefit from better connections to the network. The new connections include:

- The stretch between Bellinzona and Lugano;
- Neuchâtel to Le Locle;

- The existing stretch of cantonal motorway from Bern to Biel;
- The Oberland motorway in the canton of Zurich;
- The access roads to the Lötschberg loading stations (transport by rail);
- The Grand St. Bernard, Flüela and Hirzel passes.

In the canton of Schaffhausen, the transfer by the federal government of the Schaffhausen-Bargen stretch to the canton represents a departure from the norm. In return, the federal government is to assume responsibility for the stretch from Schaffhausen to Thayngen, which is currently a cantonal road.

Morges and Glattal

The Morges bypass and the Glattal motorway are to be integrated into the motorway/national roads network. In both these regions it has become clear that it will only be possible to eliminate the severe bottlenecks by constructing new stretches. The planning studies for both these elements have been completed. Now that they have been formally adopted into the motorway network resolution, preparations can be made for the next stage (general project).

Adoption of cantonal roads

Following the outcome of the referendum, FEDRO started preparing for the adoption of the stretches in question, which will involve various sub-projects, including determining the current condition of the stretches, organisation, project hand-over, operation, ownership and legal aspects, documentation, special permits and emergency services/general damage prevention, plus the return of the stretch from Schaffhausen to Bargaen.

Cantons to remain involved in the completion of the network

Together with the adoption of the new stretches, the completion of the network is proceeding as planned. This is a task for which the federal government and the cantons are jointly responsible.

The cantons are the contractors, while the federal government bears most of the costs. However, the completion of the network is now to be financed via the Motorway and Agglomeration Traffic Fund.

Around 97 percent of the network has now been completed. The remaining 2.7 percent encompasses 52 kilometres in the cantons of Valais, Bern and Grisons. Of the stretches not yet constructed, a significant proportion is planned in the form of tunnels. The network is expected to be completed by 2034.

Canton	Adaptation of national roads	Length (km)
VS	H21, Martigny-Expo–connection to Grand St. Bernard pass	39.30
SH	H15, Schaffhausen–Thayngen	6.22
SH	N4, Schaffhausen–Bargaen	–11.09
BE	H6, Bern (Schönbühl)–Biel	25.27
FR, BE, NE	H10, Murten–Thielle	14.61
NE	H20, Neuchâtel–Le Locle–Col des Roches	27.10
BE, VS	H223, Spiez–Kandersteg H509, Goppenstein–Gampel	35.42
ZG, ZH	H338, Baar–Hirzel–Wädenswil	13.02
TI	H394, Mendrisio–Stabio–Gaggiolo	4.98
TG, SG	H14, H474, Grüneck–Meggenhus	39.08
TI	H406, H13, Bellinzona–Locarno–Ascona	19.95
ZH	A53, Brüttsellen–Wetzikon–Rüti	26.32
ZH, SG, SZ	A53, Rüti–Rapperswil–Schmerikon–Reichenburg	11.24
SG, AR, AI	H8, St. Gallen (Winkeln)–Herisau–Appenzell	16.65
BL, JU	H18, Delémont East–Hagnau	36.08
GL	H17, Niederurnen–Glarus	8.81
BL	H2, Pratteln–Liestal–Sissach	9.46
AG	H5, Aarau–Aarau-East	5.35
GR	H417, H3 Thusis–Silvaplana	54.78
Total		382.55

Improving traffic flow through dynamic speed control

The volume of traffic on the motorways and national roads has increased by 30 percent since 2005, and the number of hours during which traffic jams occur has doubled during the same period. In order to reduce congestion despite the increasing traffic volume, measures to influence traffic flow are required in addition to the elimination of bottlenecks.

The volume of traffic on the motorways and national roads has increased by 30 percent since 2005, and the number of hours during which traffic jams occur has doubled during the same period. In order to reduce congestion despite the increasing traffic volume, measures to influence traffic flow are required in addition to the elimination of bottlenecks.

Congestion is the most frequent cause of traffic jams on our motorways. Traffic jams and slow-moving traffic have become a daily occurrence in the agglomerations. In 2016, the total number of hours during which traffic jam occurred on the motorways was 24,000.

Long-term analyses of traffic flow on six stretches of the A1 and A2 motorways show that the capacity of this motorway can be most efficiently utilised at speeds below 80 km/h. At this speed, traffic flows more evenly and vehicles travel more closely together than they do at higher speeds. Thanks to the lower differences in speed, traffic flow is smoother as well as safer. This means that on some stretches the capacity can be increased by more than ten percent. The use of systems for dynamically controlling traffic speed is therefore particularly important in the vicinity of bottlenecks on the network so that the available capacity can be more efficiently utilised and traffic can flow more smoothly.

Intervention before a traffic jam can form

Systems for dynamically controlling traffic speed can be used for flexibly adjusting the speed limit to the traffic situation on

certain stretches of motorway in order to prevent traffic jams. As soon as traffic begins to build up, this is detected by a series of sensors and the speed limit indicated on display panels is automatically reduced according to the situation.

The advantage of such systems is that the speed limit only applies temporarily. As soon as the situation eases, the normal speed limit of 120 km/h is restored. Dynamic displays can also be used to warn road users about traffic jams, accidents and dangerous road conditions. These early warnings help reduce the number of abrupt braking manoeuvres and accidents in the vicinity of such hazards.

Use of flexible systems

The Swiss motorway/national roads network is currently 1,840 kilometres long. Dynamic systems for indicating speed limits and displaying warnings are already in use on around 345 kilometres of this network.

If it is not possible or is too costly to install conventional systems on critical stretches, flexible systems can now be used as a suitable alternative. These are simpler and quicker to install and can be operated without the need for fixed power supply and communication facilities. In the next few years, trials are to be carried out with flexible speed limit and hazard warning display systems on two heavily frequented stretches near Thun and Zofingen.



Flexible text displays on motorways provide road users with up-to-date information about the traffic situation.

More detailed information for road users

Traffic flow also depends on the behaviour of each driver. Persistently staying in the left-hand lane, driving too closely behind other vehicles, cutting in on vehicles and accidents caused by distraction can slow down the flow of traffic and give rise to traffic jams. It is therefore important to ensure that drivers are better informed. Alongside dynamic systems that adjust the speed limit to the traffic situation and the elimination of bottlenecks by increasing the capacity of certain stretches and permitting drivers to use emergency lanes, the increased use of variable text displays on motorways is a further measure for improving traffic flow. Information provided on flexible or permanent displays can quickly influence traffic flow.

Positive results in Zurich and Bern

As before, the two worst bottlenecks on the motorway/national roads network are the Zurich northern bypass and the Baregg tunnel. Temporary speed limit reductions are already being trialed during peak periods on the A1 in the vicinity of the Baregg tunnel. In the canton of Bern, dynamic speed control and hazard warning systems are in use on a number of stretches, for example along the A1 between Bern-Wankdorf and Kirchberg, as well as on the A12 (Niederwangen and Bümpliz), the A6 (between Rubigen and Ostring) and the Bern bypass.

Analyses carried out on these stretches show that the capacity utilisation of these stretches is higher than it was before the dynamic speed control and hazard warning systems were installed. Traffic now flows more smoothly along these stretches and there are fewer traffic jams.

Galileo: new satellite navigation system

Switzerland has been participating in the European satellite navigation system, Galileo, since 2014. This is a new civilian navigation system for road transport, aviation and shipping. Galileo has been publicly accessible since December 2016 and will be fully developed by 2020.

The prevailing navigation system, GPS, was originally developed by the USA for use by the armed forces, which are still using it today. In order to avoid dependency on the American system, the EU and the European Space Agency (ESA) decided to develop a European navigation system called Galileo. Unlike GPS, Galileo is for civilian use only and is intended to deliver significantly more accurate data.

Special benefit for road transport

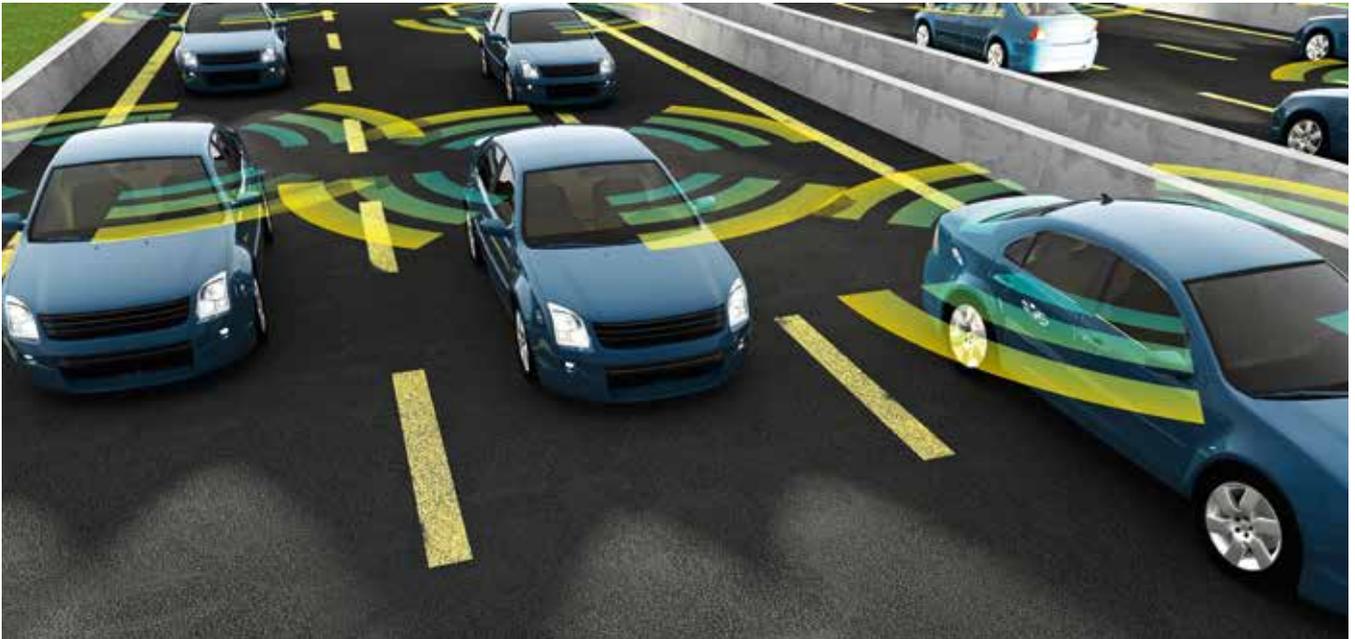
Switzerland has been participating in the European satellite navigation programme since 2014 on the basis of a bilateral cooperation agreement, which secures Switzerland's access to the services provided by the system. In addition, for the awarding of mandates, Switzerland's aerospace and services industry is able to benefit from the same conditions as those that apply in Europe. Road traffic will also greatly benefit from the services provided by Galileo: when it comes to driverless vehicles, new forms of traffic control and monitoring and fees for various services, precise and reliable data and maps are absolutely essential. Galileo will make a lasting contribute towards efficiency in the road transport sector.

Fully operational by 2020

As of the end of 2016, 18 of the planned 24 satellites were in orbit. The Galileo satellite navigation system has been publicly accessible since 15 December 2016 for navigation and search and rescue services. The system is expected to be fully operational as of 2020.



Galileo, the new navigation system for road transport, aviation and shipping, will be operated with 30 satellites as of 2020. (Photo: ESA)



Driverless and networked vehicles offer new opportunities

It is merely a matter of time until driverless and networked vehicles will be in use on our roads. FEDRO is preparing itself for the challenges this entails, including the need for amendments to the existing legislation.

Demand for mobility is constantly increasing. But because the existing infrastructure is approaching the limits of its capacity in our densely populated country, and its expansion would be extremely costly, it is becoming increasingly important to make the fullest possible use of the available capacities. Digitisation in the mobility sector has the potential to significantly increase the efficiency of our transport system, as the Federal Council noted in a report that was published at the end of 2016.

In the view of the Federal Council, automated vehicles could account for a notable proportion of registered road vehicles within the next 15 to 25 years. This could make road transport even safer and would also facilitate access to (road) transport for new user groups (e.g. the elderly, people with disabilities, children).

Automated vehicles will also open up attractive opportunities for public transport services. For example, taxi sharing, car-sharing models and other non-scheduled services could expand or even replace the existing range of services.

In its new official strategy, FEDRO attaches a great deal of importance to intelligent, networked mobility. It has set itself the goal of facilitating the increasing networking of forms of

transport and creating the necessary technological and legal prerequisites for enabling the operation of fully-automated and networked vehicles on the motorway/national roads network. Its overlying objective is to consistently exploit the potentials of intelligent mobility and thus to further enhance road safety and more efficiently utilise the existing infrastructure.

Challenges for FEDRO

FEDRO has already initiated a variety of activities relating to intelligent mobility. For example, it is clarifying various legal aspects, including the amendments that would have to be made to the Federal Road Traffic Act and what driver education would look like in the future. It is also looking into the types of vehicle homologation and conformity procedures that would be required. FEDRO has to identify the conditions under which conventional and automated vehicles would be able to use the roads alongside one another. Another important aspect concerns the exchange of data between vehicles and the road infrastructure. FEDRO and TCS (Touring Club of Switzerland) have created a joint website focusing on developments in this field (www.auto-mat.ch).

Safety remains the highest priority despite scale-back in lighting

FEDRO has been reducing the lighting on the motorway network since 2008. It has been demonstrated that, while this does not reduce the level of road safety, it significantly reduces energy consumption as well as the degree to which fauna are affected by light pollution.

For a broad variety of reasons, lighting installations are being switched off or removed along the majority of open stretches on the main axes, as well as at junctions.

12 million Swiss francs for lighting

Lighting requires electricity, and electricity costs money. The motorway/national roads network consumes around 145 gigawatt hours (GWh) a year, of which lighting alone accounts for 72 GWh at a cost of around twelve million Swiss francs.

Thanks to LED technology and the implementation of the new FEDRO directive governing lighting installations it has been possible to significantly reduce energy consumption in the past few years. This can be cut by a further ten percent by reducing lighting at night based on the frequency of traffic.

Lowering the level of light pollution is another reason for reducing lighting on the network: this reduces the degree to which fauna – particularly birds, bats and insects – are exposed to artificial light. And light pollution can also have a negative effect on our health.

No effect on road safety

It has been demonstrated that switching off or removing lighting on open stretches does not have a negative effect on road safety. Lighting is to be retained in those areas where national roads are accessible to non-motorised road users and pedestrians, for example crossings, underpasses and overpasses. Here, for safety reasons and to ensure adequate visibility the same lighting requirements apply as on municipal and cantonal roads.

Lighting in tunnels

Lighting is essential in the 250 tunnels on the motorway/national roads network. Here, different systems are used to meet the various requirements: lighting of escape routes that has to function even in the event of an interruption in the power supply; optical guidance systems to help road users find their way through the tunnel in safety; and overhead lighting throughout the entire tunnel.

The intensity of lighting in tunnels can be reduced at night because less light is required in order to ensure road safety when the volume of traffic is lower. In the future, it will be possible to equip short tunnels solely with optical guidance systems.

The operation of lighting installations on the motorway/national roads network is the responsibility of the eleven regional offices, while the five infrastructure offices are responsible for their maintenance, repair and replacement.



Lighting is to be reduced on motorways/national roads, but not at rest areas and service stations.

Littering – a tonne of waste per kilometre and year

Throwing away rubbish indiscriminately or on public land has become a widespread problem. In the road network, it is above all rest areas that are affected by littering.

On the motorways and national roads, rest areas are facilities that do not have a restaurant. Here, large numbers of people frequently leave their rubbish behind, both in the picnic area and in the toilets. But rubbish is also left behind at service stations with restaurants, as well on the roadside.

It is difficult to estimate the actual quantity of rubbish that is thrown away on motorways and national roads because the personnel from the regional units (in most cases, employed by cantonal road maintenance services) are responsible for the general cleaning of the network and they constantly remove the litter that is left behind. The collected rubbish is not weighed, but based on past experience, FEDRO estimates that around a tonne of waste is collected per kilometre and year, and the associated costs amount to around two million Swiss francs a year. The quantity of waste varies from region to region, with the largest amounts being found in the vicinity of fast food restaurants.

Cleaning standards

In order to ensure that all rest areas, service areas, outdoor facilities and areas of greenery are kept clean and uniform in appearance, FEDRO has defined standards that have to be complied with by all road cleaning service providers:

- Cleaning and inspections have to be carried out on a regular basis.
- To ensure that rest areas and toilets are kept clean and tidy, they have to be inspected once a day on average, and the findings have to be documented.
- Cleaning has to be carried out more frequently at exposed locations and at sites where an unusually high degree of littering takes place.
- FEDRO also carries out random inspections and notifies the applicable service provider if additional cleaning is required.

Household waste

Rest areas are often illegally used for the disposal of household waste. In order to put a stop to this practice, when a rest area needs to be renovated FEDRO takes care to ensure that the site is clearly visible from all sides and is not concealed behind high bushes, thus making it harder for people to deposit household waste without being seen.

The cleaning of the motorway/national roads is an essential task and extends the service life of road infrastructure. In view of this, FEDRO periodically reviews its cleaning concept, frequency and costs. The concept depends on the category of road (motorway or national road), the traffic frequency and the degree of soiling.

Longer inspection intervals for heavy goods vehicles as of 1 July 2017

With effect from 1 July 2017, heavy goods vehicles will only have to undergo their first and second inspections every two years. This only applies to HGVs and their trailers operated exclusively within Switzerland.

The Federal Council has decided to extend the inspection intervals for HGVs, articulated vehicles and trailers: the first two inspections will only have to be carried out at two-year intervals, while subsequent inspections will be required each year as before. This means that transport companies will no longer need to have their vehicles inspected twice in their initial years of operation, which will also save them a great deal of money. The new regulation will enter into effect on 1 July 2017 and will only apply to vehicles that are operated exclusively within Switzerland. Based on the bilateral agreements between Switzerland and the EU and the regulations applicable in the EU, vehicles used for international transport will still have to undergo standard annual EU inspections.

No risk for other road users

An analysis of technical shortcomings detected during vehicle inspections revealed that the vehicles in the categories in question are in very good condition in the first few years of operation.

Thanks to sophisticated on-board diagnostic systems, as well as improved manufacturing methods and stringent factory-side quality controls, extending the inspection interval does not represent a risk for other road users. Annual inspections will be required from the fifth year of operation onwards.

Cars and motorcycles will also benefit from the new regulations

The new regulations also stipulate an extension of the initial inspection interval for cars and motorcycles from the currently applicable yearly cycle. With effect from 1 February 2017, these vehicles will only have to undergo an initial inspection at the earliest after five years (though not later than after six years). The second inspection is required three years later, and all subsequent inspections have to be carried out every two years. Here, too, vehicle owners can benefit from advanced technologies and higher manufacturing quality.



Interior of an unladen articulated HGV.

More stringent noise regulations for cars and motorcycles

The constant increase in traffic means people are being exposed to higher noise levels. While regulations governing exhaust emissions have been continually tightened in recent years, noise regulations for cars and motorcycles have not changed. But on 1 July 2016, more stringent regulations entered into effect for exhaust systems.

Swiss noise regulations for cars and motorcycles were harmonised with those of the EU in 1995 and again in 1998. Since then, neither the European nor Swiss legislation has changed, even though the volume of motorised road transport has increased by more than 30 percent. Against this backdrop, the UN Economic Commission for Europe (UNECE) and the EU decided to tighten the applicable noise regulations with the aid of a completely new measurement method.

Ban on valve exhaust systems

With effect from 1 July 2016, it is no longer permitted to bring cars onto the market that are equipped with valve exhaust systems fitted with devices for the sole purpose of avoiding noise limit levels. The ban does not apply, however, to valve exhaust systems if they merely alter the noise characteristics without infringing the regulations governing noise limit levels.

In addition, the stipulated noise limit levels have to be complied with in all operating modes and all software settings. For cars, this ban will apply to imports into Switzerland with effect from 30 June 2022.

Use of “decibel killers” in motorcycles now prohibited

With respect to motorcycles, the new regulations have already entered into effect. The use of “decibel killers” in motorcycle silencers has been banned since 1 January 2016. These devices are easy to install and remove.

Furthermore, as with all other motor vehicles, motorcycles are subject to the strict requirements applicable to valve exhaust systems and to all operating modes and installed software: all noise limit levels have to be complied with at all times and in every operating mode. Motorcycles that are imported into Switzerland after 31 December 2016 and which do not meet these requirements will no longer be permitted on Swiss roads.



Motorcycle equipped with an exhaust system that meets the new noise requirements.

Opening of “Transjurane” stretch in April 2017

The A16 (otherwise known as the “Transjurane” motorway) covers a stretch of 85 kilometres from Biel to Boncourt at the national border in the canton of Jura. Federal President Doris Leuthard officially handed over the last section of the Transjurane to traffic on 3 April 2017. This motorway comprises 22 bridges and 33 tunnels. During its construction, around 13,000 dinosaur tracks were discovered.

As the designation “Transjurane” indicates, 48 kilometres of the completed 85-kilometre stretch of the A16 from Boncourt to Biel traverse the canton of Jura, and the remaining 37 kilometres run through the Bernese Jura. As of 3 April 2017, the journey from Boncourt to Biel now takes less than an hour, and the region has a direct link to Switzerland’s central lowlands. This stretch also forms a third link between the Swiss and the French motorway networks (in addition to those in Basel and Geneva).

The completion of this stretch means that the canton of Jura now has direct access to northwest Europe, which will have a positive influence on the economic development of the region. Thanks to the 23 junctions, local traffic – which until now had to use roads in difficult terrain – will be made considerably safer. Accident statistics show that the frequency of accidents on motorways is three times lower than on cantonal and municipal roads. Furthermore, the fact that traffic now bypasses several larger towns means that the quality of life in the Jura region will be higher.

Commencement of construction in 1987 (Jura) and 1989 (Bern)

The construction of the “Transjurane” stretch required 30 years and was initiated in 1987 in the canton of Jura and 1989 in the canton of Bern. The associated projects were managed by the two cantons themselves, while FEDRO (as the representative of the federal government) was responsible for overall supervision. The canton of Jura was able to open the final segment of its stretch (between Delémont-East and Choindez, 4.9 kilometres) on 5 December 2016, while the final segment of the stretch in the canton of Bern (between Court and Loveresse, 8.8 kilometres) was opened on 3 April 2017.

The planners and construction companies had to overcome a variety of difficulties due to the complex topography, as the total of 22 bridges and 33 tunnels clearly underscores. The total cost of the “Transjurane” was 6.6 billion Swiss francs (4 billion for the canton of Jura and 2.6 billion for the canton of Bern). Based on the official cost allocation key, the federal government assumed 95 percent of the costs in the canton of Jura and 87 percent of the costs in the canton of Bern. In addition to the difficult topography, safety requirements and protection of the landscape were major cost factors.

The construction of the “Transjurane” also resulted in plenty of work for palaeontologists, who uncovered 13,000 dinosaur tracks, thus turning Jura into an important palaeontology region.

“Transjurane”: facts and figures

Length: **85** kilometres (48 in the canton of Jura, 37 in the canton of Bern)

Duration of construction: **30** years (1987 to 2017)

33 tunnels/galleries with a total length of 37 kilometres (43 percent of the total stretch)

22 bridges and viaducts with a total length of 6 kilometres (7 percent of the total stretch)

23 junctions

3 service areas (no restaurants)

1 customs post

13,000 dinosaur tracks

Duration of journey from Boncourt to Biel: **55** minutes

Total cost: **6.6** billion Swiss francs

(**77** million Swiss francs per kilometre)



Bévillard tunnel, Bernese Jura.



Creugenat viaduct, canton of Jura.

1.8 billion Swiss francs for completion, expansion and maintenance

The federal government is to invest around 1.8 billion Swiss francs in the motorway/national roads network in 2017: 400 million for the construction of new stretches, around 1.2 billion for the expansion and maintenance of the existing network and 195 million for projects to eliminate bottlenecks.

The motorway/national roads network defined by the federal government will have a total length of 1,892 kilometres, 1,840 of which are now in operation, leaving a further 52 kilometres to be constructed.

The basis for the construction work in 2017 is the 9th long-term programme for the construction of the motorway/national roads network. Here the main priority is the continuation of construction projects that are already in progress, including:

- A9 in Upper Valais
- Eastern segment of the Biel bypass (A5)
- A16 ("Transjurane") in the canton of Bern (construction completed on 4 April 2017, cf. page 18)

A total of 400 million Swiss francs has been budgeted for the construction of new stretches in 2017. The required resources are to be provided from the Infrastructure Fund. The largest credits have been allocated to the following cantons: Valais, 220 million; Bern, 93 million; Jura, 24 million; Schwyz, 15 million.

Expansion and maintenance

Parliament has approved a total of 1.2 billion Swiss francs for financing the expansion and maintenance of stretches already in operation. The required resources are to be provided from the Fund for the Special Financing of Road Transport.

Work on the following major maintenance projects is to commence in 2017:

- A1 SG: Rheineck to St. Margrethen
- A2 BL: Schänzli
- A6 BE: Thun-North to Spiez
- A9 VD: Vennes to Chexbres

Ongoing work on other stretches will be continued in 2017, including:

- A1 GE: Bernex to Ferny
- A2 SO/BL: Belchen renovation tunnel
- A2 TI: Airolo to Quinto
- A2 TI: Mendrisio junction
- A4 SH: Galgenbuck tunnel
- A5 NE: Colombier to Cornaux
- A9 VD: Vallorbe to Essert-Pittet
- A13 GR: Roveredo bypass

For comprehensive information (in German, French or Italian) about the main construction projects on the Swiss motorway network, please visit www.autobahnschweiz.ch.

Elimination of bottlenecks

A total of 195 million Swiss francs has been budgeted for the elimination of bottlenecks in 2017. Most of this will be invested in the widening of the Zurich northern bypass (A1) to 6 lanes.

Fund for Financing Motorway and Agglomeration Traffic

The financing of network completion and bottleneck elimination projects is sourced from the Infrastructure Fund. The Fund for Financing Motorway and Agglomeration Traffic, which was voted in by the Swiss electorate on 12 February 2017, will enter into effect on 1 January 2018. This means that the expansion and maintenance projects will also be financed via the Infrastructure Fund in 2017.

Five major projects on the motorway/national roads network



A1/A13 – renovation of Rheineck to St. Margrethen stretch

Renovation of the entire 8-kilometre stretch from Rheineck to St. Margrethen / 2 lanes always open in each direction during all construction stages / cross-border joint project with Austria / construction of 18 basins to prevent material from entering the Rhine and Lake Constance in the event of an accident / replacement of existing concrete surface with low-noise bitumen-based surface / main work initiated in February 2017 / duration: until beginning of 2019 / total cost: approx. 190 million Swiss francs.



A2 – maintenance of Muttenz-South to Hagnau stretch

Renovation of the stretch from the Muttenz-South junction up to and including the Hagnau junction (10-kilometre stretch) / renovation of 71 engineering structures (bridges, support walls, overpasses, underpasses) / construction of motorway drainwater treatment plant and storage basin / construction of an overpass for lane changes / replacement of operating and safety installations / noise abatement measures / renovation of Schänzli tunnel, demolition and reconstruction of Hagnau tunnel without interruption to traffic flow / one lane will be closed during construction / construction of auxiliary bridges to divert traffic in order to main traffic capacity / duration: spring 2017 until 2022 / total cost: approx. 240 million Swiss francs.



A6 – renovation of Allmend tunnel, Thun

Renovation and retrofitting of the Allmend tunnel as part of the total renovation of the A6 stretch from Rubigen to Thun and Spiez / twin-tube tunnel, renovation work until 2020, one tube closed at a time / diversion for traffic in the direction of Spiez via local above-ground corridor / 2017: construction of corridor, including underpass beneath Allmend military depot / 4th quarter 2017: handover of corridor to traffic, commencement of tunnel renovation / total cost of renovation of Allmend tunnel: approx. 70 million Swiss francs.



A13 – Chur-North-Zizers-Untervaz

The existing northbound lane no longer meets today's requirements (noise, no emergency lanes, deterioration of surface) / relocation of northbound lane between Chur-North and the Zizers junction to run parallel to the southbound lane / renovation of southbound lane and relocation of a 2-kilometre stretch towards the Swiss Federal Railways line (minimisation of loss of agricultural land) / construction of Halmil wildlife bridge to restore the interrupted wildlife corridor / lowering of the Mäschanser river bed and modification of several outlets / duration: 2015 to 2018 / total costs: approx. 105 million Swiss francs.



A9b – Vallorbe to Essert-Pittet

Phase 2 of measures to improve road safety / construction of a central barrier system / adaptation of crash barriers to applicable standards / modification of emergency lane to enable permanent use / renovation of road surface / modification of arrangement of lanes / renovation of engineering structures / replacement of lane crossovers / replacement of bridge bearings / duration: 2016 to 2017 / total costs: approx. 53 million Swiss francs.

Initiation of planning for second Gotthard tunnel tube

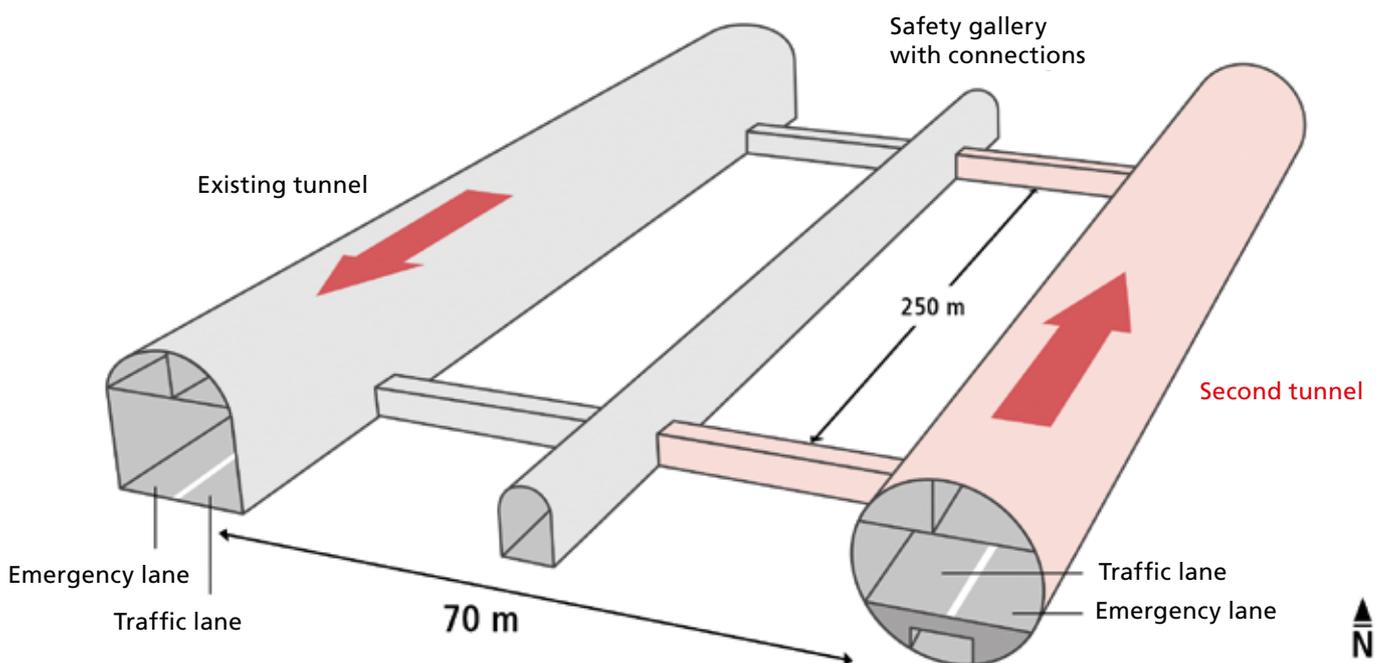
The Gotthard tunnel was opened to traffic in 1980, and in view of its age it will have to be comprehensively renovated in the foreseeable future. Following the outcome of the referendum in 2016, planning has been initiated for the construction of a second tube and subsequent renovation of the existing tunnel. Details of the general project will be released in the near future.

Each year, 6.3 million vehicles pass through the Gotthard road tunnel, 800,000 of which are HGVs. This means it is Switzerland's most important road route through the Alps. The existing tunnel comprises two lanes, which means it has two-way traffic. Since it was opened in September 1980, numerous modifications and renovation measures have been carried out, but now it needs to be comprehensively renovated. In order to maintain traffic flow during the renovation work, a second tube is to be constructed.

The renovation project comprises structural upgrading as well as measures to improve safety by securing compliance with the corresponding regulations and standards, and this means the tunnel will have to be closed to traffic. Based on present-day

knowledge, the costs of constructing a second tube will be around two billion Swiss francs, while the renovation of the existing tunnel will cost around 800 million Swiss francs. Following the outcome of the referendum held on 28 February 2016, FEDRO has been developing the required general project, which is to be approved by the Federal Council in the course of 2017. FEDRO will then prepare and publish the detailed project.

The second tube is to be located to the east of the existing tunnel at a distance of 70 metres. The existing safety shaft will be located in the middle of the two parallel tubes. Connecting galleries between the two tunnels will be constructed at intervals of 250 metres. The profile of the second tunnel will be circular and it will also contain an intermediate ceiling for



housing the ventilation ducts. A utilities duct will be constructed beneath the road surface for housing all the necessary cables and pipelines.

6.3 million tonnes of excavated material

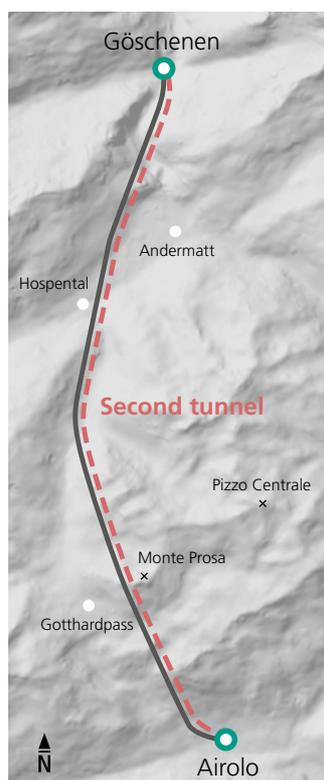
Thanks to the findings obtained during the construction of the existing tunnel, a great deal is known about the geological conditions. Excavation will be carried out from both portals using tunnelling machines, while the additional excavations for the ventilation system, connecting shafts, etc., will be carried out using explosives. Most of the tunnel can be constructed in favourable geological conditions. There are two critical zones (one in the north and the other in the south) that will require special preparatory measures for the excavation machines.

Around 6.3 million tonnes of material will have to be excavated, most of which is to be used for the production of concrete in order to reduce the burden on the environment. Where possible, the remainder will be used for creating shallow water zones of high ecological value in the Urner Lake, as well as for modelling terrain in Ticino and upgrading other areas of land.

Working at the border between two language regions

FEDRO is to assume the role of owner, and is thus responsible for ensuring that the project is completed on time and within budget. Because this is a major project to be implemented at the border between two language regions, responsibility is to be shared by the two regional offices in Zofingen (Central Switzerland) and Bellinzona (Ticino and Grisons).

Bellinzona is to focus on the work on the second tunnel, while Zofingen will handle the renovation of the existing tunnel. These two subprojects will be organised and implemented separately, while working closely together at the appropriate interfaces and sharing findings where applicable.



Work to commence in 2020 at the earliest

Once the Federal Council has approved the general project, FEDRO will develop the detailed (implementation) project and submit it for consultation. This will enable citizens and organisations to lodge objections. The call for tenders will only be published once all objections have been dealt with and the decision regarding planning approval has been taken.

Work is not expected to commence before 2020. The construction of the second tunnel will take around seven years. As soon as it has been completed, the existing tunnel can be closed to traffic and comprehensively renovated – which is also expected to take around seven years. According to the current status of planning, both tunnels will be ready for use from 2030.

Web site: www.astra.admin.ch/gotthard

Switzerland's largest tunnel excavation machine in the Belchen

The Belchen tunnel on the A4 between Eptingen (Basel Landschaft) and Egerkingen (Solothurn) is in need of renovation. To prevent delays on the heavily frequented north-south axis while work is in progress, a separate tunnel is to be constructed. For this purpose, Switzerland's largest tunnel excavation machine (almost 14 metres in diameter) is to be used.

The Belchen tunnel traverses the Jura range. The mountains comprise large quantities of gypsum keuper, which has caused considerable damage to the support structure of the tunnel system due to swelling. This means that the two separate 2-lane tubes dating from 1970 now need to be urgently renovated. In order to accomplish this without causing major traffic delays, an additional tunnel is to be constructed which will ensure that traffic flow can be maintained in the existing tubes.

The Belchen tunnel project has been divided into several sub-projects. In addition to the actual tunnel renovation, these include the installation of operating and safety equipment, water supply, construction of the northern and southern portals, and the construction of a 45-metre-long bridge at the southern portal for crossing over the existing cantonal connection road.

Simultaneous excavation and construction work

Since work commenced in February 2016, a sophisticated logistics system has been in use in the rear section of the largest tunnel excavation machine (13.97 metres in diameter) ever to be operated in Switzerland. At the same time as the machine drills its way into the mountain from south to north, construction work on the new tunnel is being carried out along a 1-kilometre-long stretch.

Relocation of amphibians

Around 550,000 cubic metres of rock will have to be excavated for the construction of the renovation tunnel. The excavated rock is being removed via a conveyor belt to the depot at the southern portal, where reusable material is sorted and used for the construction of the tunnel road surface.

Rock that is no longer usable is transported via a 1,100-metre conveyor to the Fasiswald landfill. But a large colony of midwife toads was living in this disused clay pit, and these protected amphibians had to be relocated before the excavated material could be deposited here. For this purpose, five new habitats for these amphibians were created in cooperation with the canton of Solothurn.

Renovation of the existing tunnel tubes

Once the Belchen renovation tunnel has been completed (probably in 2022), the almost 50-year-old tubes will be renovated. Even after the renovation of the existing tunnel system has been completed, there will always be only two tubes in operation.



Preparation of Switzerland's largest excavation machine (diameter, 13.97 metres) for use in the Belchen tunnel.

Belchen tunnel: facts and figures

Location: on the A2 between Eptingen (Basel Landschaft) and Egerkingen (Solothurn) / Average daily traffic volume: 55,000 vehicles (of which HGVs account for 11 percent) / Location of renovation tunnel: to the west of the existing tubes / Length of renovation tunnel: 3.2 kilometres / Distance from existing tunnel system: 40 to 116 metres / Volume of excavated material: approx. 550,000 cubic metres / Duration of construction of renovation tunnel: 8 years (2014 to 2022) / Costs of renovation tunnel: approx. 500 million Swiss francs / Renovation of existing tunnel tubes: to commence in 2023 / Web site: www.belchentunnel.ch

Third Gubrist tube and widening of Zurich northern bypass to six lanes

The Zurich northern bypass is one of the most heavily frequented motorway stretches in Switzerland. With a daily traffic volume of 120,000 vehicles, this stretch is approaching the limits of its capacity. Several years ago, FEDRO set itself the goal of easing the congestion on this stretch. Federal Councillor Doris Leuthard was present on 6 June 2016 when work on the main projects, i.e. the widening of the stretch from four to six lanes and the construction of a third tube in the Gubrist tunnel, was officially initiated.

The widening of the stretch from four to six lanes is the key project. In addition, the existing motorway stretches, as well as the two tunnel tubes, are to be renovated. These maintenance measures will improve both the functional capacity and the safety of this heavily frequented stretch. A third tunnel tube is also to be constructed: here, work will commence in autumn 2017.

Relief for nearby towns and villages

Various accompanying measures will bring relief for towns and villages in the vicinity. The environment, too, will benefit from noise abatement and drainage measures, as well as compensation areas. FEDRO has developed solutions that will be supported by the canton and municipalities. One of these concerns the plan to cover a 100-metre stretch near Weiningen leading up to the portal.

This major project stands out not only because of its dimensions (see box below), but also because of the installation of a temporary loading terminal in Zurich-Affoltern: the rock excavated during construction will be transported from the

site by rail, thus avoiding the need for around 65,000 HGV journeys. The loading station connected to the Regensdorf-Zurich-Affoltern stretch will be dismantled again when the construction work has been completed.

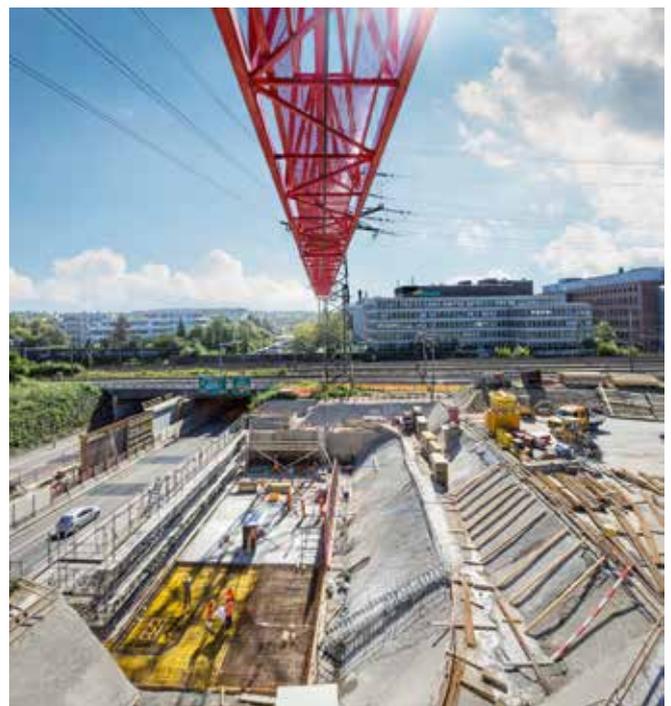
Information pavilion in Regensdorf

Major projects of this kind awaken the interest of the local population, and in view of this the FEDRO regional office in Winterthur has installed an information pavilion in Regensdorf. The exhibition is interactive in nature, is presented in several languages and provides information about the construction project and issues relating to mobility.

Costs totalling 1.55 billion Swiss francs

The costs for the Zurich northern bypass project amount to around 1.55 billion Swiss francs: 938 million for the widening of the stretch and 612 million for the maintenance measures. The overall project is scheduled for completion in nine years' time: the third tube of the Gubrist tunnel is expected to be completed in 2022, while the renovation of the two existing tubes will be carried out in 2025. The widening of the Zurich northern bypass to six lanes is part of module 1 of the bottleneck elimination programme.

Web site: www.nordumfahrung.ch



Crane operator's view of the "Stelzen" roofing (Zurich northern bypass).

Protection of motorway bridges against earthquakes

Most of the bridges on the motorway/national roads network were built before earthquake protection provisions were incorporated into Switzerland's construction standards in 1989. Since 2005, FEDRO has been assessing all the bridges on the network, and the majority of them meet the applicable safety requirements.

In an international comparison, the risk of earthquakes in Switzerland can be classified as low to medium. Nonetheless, it has been underestimated for decades, mainly because Switzerland has not been hit by a major earthquake for more than 100 years. As a consequence of the high level of construction activity in the 20th century, the number of objects that are exposed to the risk of earthquakes has risen enormously. The increasing demand for safety and the decreasing degree of acceptance for interruptions to infrastructure networks have given rise to a strong need to examine engineering structures from the point of view of earthquake resistance.

Two assessment stages

Up-to-date earthquake protection standards were only introduced in Switzerland in 1989, at a time when around 90 percent of the bridges on the motorway/national roads network had already been constructed. This means that some of the existing bridges may not be sufficiently resistant against earthquakes. In order to identify these bridges and subject them to

close examination, a two-stage procedure was developed for assessing earthquake resistance.

The first stage involves carrying out a rough assessment of all bridges based on specific criteria, with the aid of a checklist. Here the main focus is on typical weak points of bridges with respect to earthquake resistance, e.g. the presence of supports, joints and retaining walls.

Frame bridges (with interlinked supports and surfaces) and truss frame bridges (with inclined supports at both ends) with the support structure firmly integrated into the piers are generally regarded as earthquake resistant. However, arched bridges, cable-stayed bridges (with piers and inclined cables) and other special types of bridges are classified as critical structures.

Those bridges classified in the first stage as critical are subsequently subjected to a more detailed assessment and comprehensive examination. Here a calculation is made for each bridge



Effretikon to Winterthur-Ohringen overpass.



Biaschina viaduct in the canton of Ticino between Giornico and Faido.

concerning the extent to which it could become deformed due to the effects of an earthquake. The higher the deformability, the greater the resistance to earthquakes.

Retrofitting measures

For those bridges that are unable to meet the earthquake resistance specifications in the second assessment stage, potential retrofitting measures have to be considered, including, for example:

- Increasing the load resistance or degree of deformability
- Modification of the bridge's rigidity
- Increasing the degree of shock absorption
- Strengthening the support structures
- Seismic insulation of bridge supports

The aim of all retrofitting measures is to optimally harmonise the three main structural properties: load resistance, rigidity and degree of deformability. Instead of increasing the load resistance, the carefully calculated weakening of the support structure – for example through seismic insulation – could be a more suitable measure because this could significantly reduce the effects of an earthquake on the supports.

In each individual case, the choice of retrofitting measures has to be based on considerations of their appropriateness as well as priority of implementation.

Only a handful of bridges need to be retrofitted

The first assessment of the earthquake resistance of motorway bridges was carried out in 2005 and 2006. A total of 4,168 structures (bridges and overpasses) were analysed. 3,368 (81 percent) were found to be sufficiently earthquake resistant, while the remaining 800 (19 percent) were designated as critical in the first assessment stage. For these bridges, FEDRO specified a procedure in 2007 for detailed examinations in the second assessment stage with two levels of priority: here, 261 bridges were classified as first priority, while the remaining 539 were designated second priority.

The in-depth examination of the 261 first-priority structures was carried out by 2012, while the analysis of the remaining 539 second priority structures was completed in 2017.

The analyses show that retrofitting measures will only be required for a handful of the bridges. The implementation of the various measures is expected to be completed by 2030 in accordance with the federal contingency plan. The costs of the retrofitting measures amount to around two percent of the expenditure that would be required to replace all the involved structures.

Transport plan provides a complete picture of the motorways

The federal government uses sectoral plans to visualise its spatial planning duties. The publication of the first edition of the road infrastructure section of the national transport plan provides a complete picture of the motorway projects for the first time. It explains and depicts motorway plans and projects, together with the corresponding measures.

Sectoral plans describe the central tasks of the federal government relating to spatial planning. The aim here is to coordinate the long-term development of infrastructure with spatial development activities. Sectoral plans help the federal government create transparency. This results in higher planning security for the federal government, the cantons and the municipalities. The national transport plan secures the coordination of the entire transport system between road and rail transport, aviation and shipping, and spatial development.

The road infrastructure section completes the national transport plan. In this section, in addition to disclosing its objectives, the federal government also explains how it takes account of the requirements and criteria relating to the motorways and national roads.

In the area of motorway planning, existing procedures already included processes aimed at securing coordination with other administrative levels. The road infrastructure plan represents a new instrument for spatial planning with the respective processes.

In the individual sectoral plans, such as the road infrastructure plan, the focus is on spatial issues. The objectives, tasks and intentions are briefly summarised in the concept section, and the respective objects are listed together by topic or region. The plan is intended to support the relevant authorities, but is also addressed to the general public.

Consultation at the cantonal level in 2017

For the first edition of the road infrastructure plan, information and objects were largely drawn from existing resolutions of the Federal Council and Parliament. It therefore depicts the current status of coordination. A presentation from the point of view of spatial planning will be the subject of a consultation procedure at the cantonal level in the first half of 2017. The cantons have been provided with information about the ongoing activities by the existing coordination groups. The Federal Council hopes to be able to approve the road infrastructure plan by the end of the year.

FEDRO outlines its objectives and procedures

Within the national transport plan, the road infrastructure plan deals exclusively with motorway infrastructure. The powers of the federal government encompass all tasks relating to the motorways and national roads, i.e. from planning and project development through to construction, operation and maintenance. In the measures section of the sectoral plan, FEDRO outlines its objectives and the necessary procedures for fulfilling its official mandate. Here the focus is on planning and project development, because these activities are essential for ensuring that spatial aspects are coordinated with the other federal and cantonal tasks.



The hoverboard is a self-balancing scooter.

Fun vehicles in conflict with road safety

Electric fun vehicles are currently enjoying a boom, but most of these are not permitted on public roads because they do not comply with safety requirements.

So-called “fun vehicles” leave a lot to be desired in terms of safety: many of them are not equipped with the brakes, lights and reflectors that are required for use on public roads. They are therefore not permitted on our roads for safety reasons. Furthermore, our roads are already crowded enough, particularly in towns and cities. Sales outlets are required to inform buyers whether an electric scooter, skateboard, self-balancing scooter or mono-wheel may be used on the roads. Even if they have been approved, such vehicles are not permitted on areas reserved for pedestrians, except by people with restricted mobility.

Approved fun vehicles

Electric scooters with a maximum motor output of 500 watts and a maximum speed of 20 km/h may be operated without a helmet and do not require a licence plate. The same require-

ments apply as those for mopeds. They may be used by people over the age of 14 holding a category M (moped) licence, or by people over the age of 16 without a licence. The same traffic regulations apply as for electric bikes (without a licence plate).

Self-balancing electric scooters: These vehicles require type approval and a yellow moped licence plate. As a rule, the vehicle licence is issued on site at the sales outlet. They may be used by people over the age of 14 holding a category M (moped) licence, or by people over the age of 16 without a licence. Users do not have to wear a helmet. For registered self-balancing electric scooters the same traffic regulations apply as for standard electric bikes. No type approval exists for the majority of these vehicles, and this means they may not be used on public roads in Switzerland.

Via sicura package of measures and its impacts

The objective of Via sicura is to significantly reduce the number of fatalities and serious injuries on Switzerland's roads. To date, 17 of the 20 legislative measures have entered into force. An evaluation has confirmed their positive impacts on road safety.

In 2016, 216 people lost their lives on Switzerland's roads and 3,785 were seriously injured. In 1971, 1,773 people were killed and 18,785 were seriously injured. This positive trend is attributable to the ongoing efforts aimed at improving driving behaviour, safer vehicles and safer road infrastructure.

If these efforts are not pursued further, we have to anticipate that the ongoing population growth and increasing demand for mobility could cause the accident statistics to stagnate or even rise again. This tendency could be heightened by the increase in the proportion of poorly protected road users (e.g. in the area of human-powered mobility) and vulnerable senior citizens. In view of this, three years ago the Federal Council introduced the Via sicura action programme with the aim of increasing the level of safety on Switzerland's roads.

In summer 2016, with its adoption of a postulate submitted by the Transport Commission, the Council of States commissioned the Federal Council to submit the Via sicura measures to an overall evaluation and to propose changes where necessary. The results of the evaluation showed that Via sicura had a positive impact on road safety in the period from 2013 to 2015.

Although the positive impacts of Via sicura were lessened due to negative developments such as an increase in the number of accidents involving e-bike users, at least 100 serious accidents (with fatalities and injuries) were prevented between 2013 and 2015. The outcome should be even more positive once all the introduced measures have begun to take effect in a few years' time. This expectation has already been confirmed by the 2016 accident statistics, which indicate a disproportionate fall in the number of fatalities versus the long-term trend.

One measure has been particularly effective, namely the requirement for motor vehicles to travel with their lights on during the day. Since this measure was introduced, the number of vehicles travelling with their lights on during the day has increased by around 25 percentage points to a level of

95 percent. The fact that vehicles are now more visible during the day has resulted in a decrease in the number of accidents. Other measures that have improved the level of road safety include the introduction of tougher penalties for excessive speeding offences, the total ban on driving under the influence of alcohol (e.g. for professional drivers) and various infrastructure-related improvements.

Overview of Via sicura measures

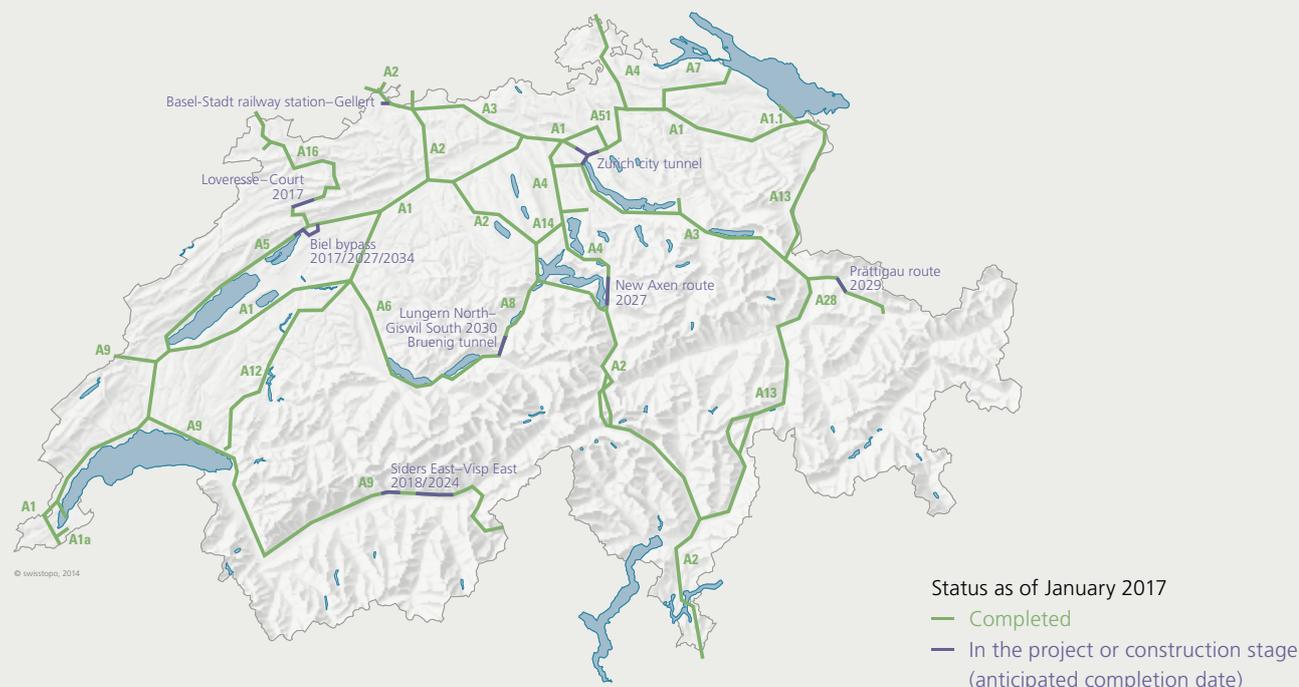
The objective of Via sicura is to significantly reduce the number of fatalities and serious injuries on Switzerland's roads. To accomplish this, measures have been introduced in the following areas:

1. Prevention (e.g. introduction in 2014 of the mandatory use of lights during the day for all motor vehicles).
2. Better enforcement of existing regulations (e.g. since 2013 it has been illegal to warn other drivers about traffic controls publicly and in return for payment).
3. Tougher penalties for serious offences (e.g. since 2013, for excessive speeding), including confiscation of licence for a longer period of time.
4. Infrastructure (e.g. since 2013, obligation for the federal government, cantons and municipalities to identify and eliminate accident black spots in their road networks).
5. Optimisation of information systems (e.g. accident statistics).

Facts, figures, statistics

Completion of four motorway stretches in 2016

Four stretches of motorway were completed in 2016, bringing the total length of the network to exactly 1,840.4 kilometres as of the end of the year. The stretches concerned were Leuk/Susten-East to Gampel/Steg West on the A9 in the canton of Valais; Delémont-East to Choindez on the A16 in the canton of Jura; Dalvazza to Trun on the A28 in the canton of Grisons; and the Roveredo bypass on the A13 in the canton of Ticino, where the former stretch (3.6 kilometres) was demolished and eliminated from the network.



2016: completion of four stretches

Motorway	Canton	Stretch	2 lanes	4 lanes
A9	VS	Leuk/Susten-East–Gampel/Steg West		6.2 km
A13	GR	Roveredo bypass	3.1 km	2.6 km
		Demolition of former stretch		–3.6 km
A16	JU	Delémont-East–Choindez	3.6 km	1.3 km
A28	GR	Dalvazza–Trun	3 km	

Stretches scheduled for completion in 2017

Motorway	Canton	Stretch	2 lanes	4 lanes
A5	BE	Biel-South–Biel-East (Ostast)	–	4.9 km
A16	BE	Court–Loveresse	4.1 km	5.3 km

The Swiss motorway / national roads network

Total length by road category (km)

	8 lane	7 lane	6 lane	5 lane	4 lane	3 lane	2 lane	Mixed-traffic roads	Total
	in use	in use	in use	in use	in use	in use	in use	in use	in use
Zurich	1.2		31.3		116.6	1.9			151.0
Bern			13.2	3.1	126.2		46.9	19.4	208.8
Lucerne			2.6	2.7	53.2				58.5
Uri					37.1		16.3	16.1	69.5
Schwyz				2.7	40.5		2.2	4.3	49.7
Obwalden					1.8		22.3	13.3	37.4
Nidwalden					22.9		2.9		25.8
Glarus					16.6				16.6
Zug			6.0		11.7				17.7
Fribourg					84.2				84.2
Solothurn			6.5	5.4	31.9				43.8
Basel-Stadt			3.5		6.0				9.5
Basel-Landschaft			9.5	3.3	17.4				30.2
Schaffhausen							17.2		17.2
St Gallen				4.3	135.5				139.8
Grisons					43.6		97.7	27.9	169.2
Aargau		1.2	14.0	1.7	82.4				99.3
Thurgau					42.8				42.8
Ticino			7.3	18.0	82.7		30.9		138.9
Vaud	0.6		2.8	5.7	183.4		12.8		205.3
Valais					67.1		15.6	28.6	111.3
Neuchâtel					34.6		3.0	1.9	39.5
Geneva					27.2				27.2
Jura					35.4		11.8		47.2
Total	1.8	1.2	96.7	46.9	1,300.8	1.9	279.6	111.5	1,840.4

As of the end of 2016, the length of the Swiss motorway/national roads network was 1,840.4 kilometres. The 1960 resolution of the Federal Council called for a total of 1,892.5 kilometres. This means that a further 52.1 kilometres have yet to be opened

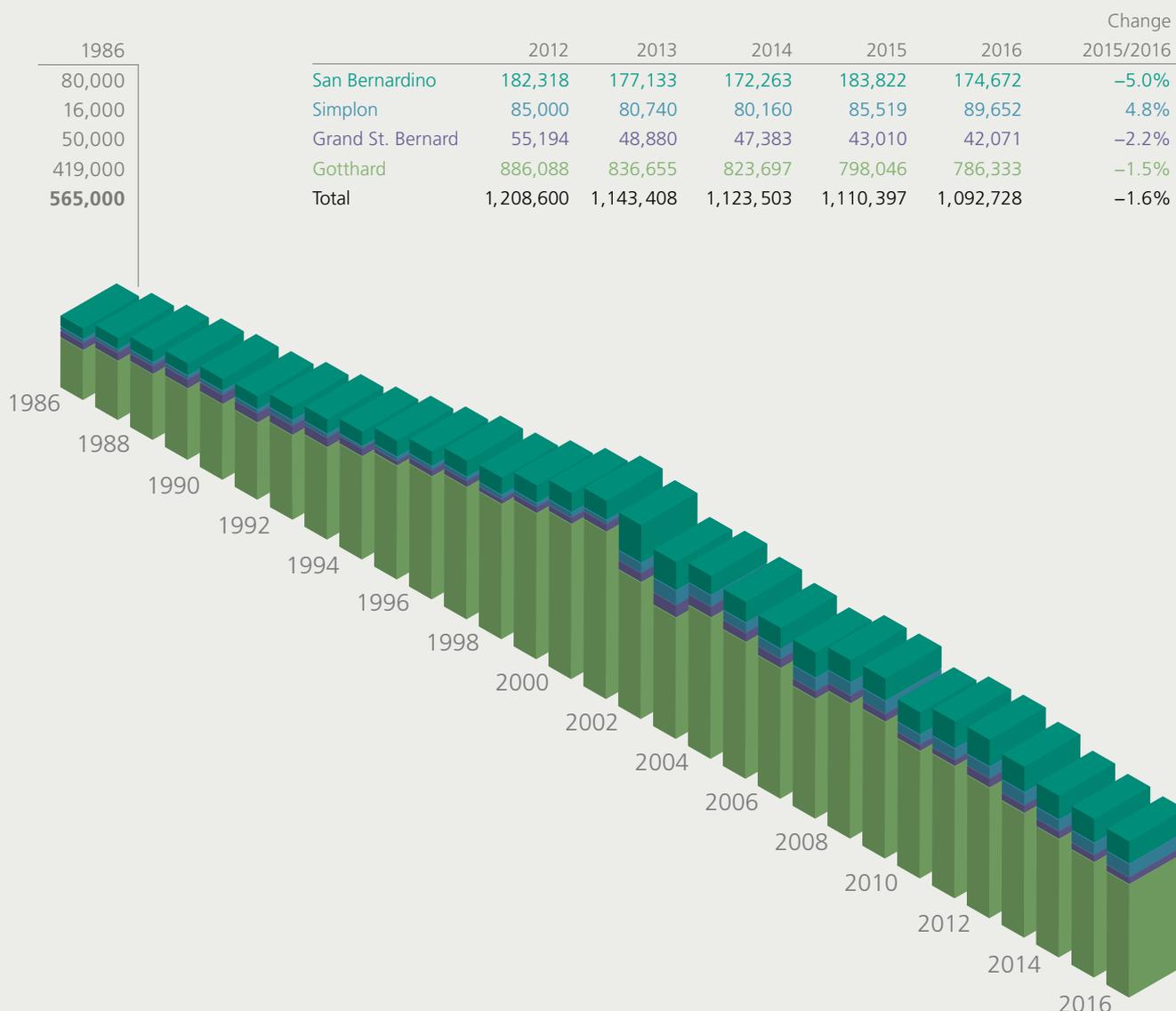
in order to complete the planned network. When the new resolution enters into force on 1 January 2020, an additional 382.55 kilometres of cantonal road will be incorporated into the network.

2017: seven new tunnels (bringing the total on the motorway/national roads network to 250)

Motorway / national road	Canton	Stretch	No. of tubes	Length (m)	Height (m)	Approx. cost (Swiss francs)
A5	BE	Biel-South–Biel-East (Längholz tunnel)	2	2,480	5.2	295 million
A5	BE	Biel-South–Biel-East (Büttenberg tunnel)	2	1,460	5.2	198 million
A16	BE	Court–Loveresse (Sorvilier tunnel)	2	235	5.2	17 million
A16	BE	Court–Loveresse (Bévilard tunnel)	2	200	5.2	17 million
A16	BE	Court–Loveresse (Court tunnel)	1	705	5.2	84 million
A16	BE	Court–Loveresse (Loveresse tunnel)	1	498	5.2	59 million
A16	BE	Court–Loveresse (Malleray gallery)	1	548	5.2	52 million

Volume of transalpine goods traffic down again

In 2016, a total of 1,092,728 heavy goods vehicles crossed through the Swiss Alps, or 17,669 (1.6 percent) fewer vehicles than in 2015. Thus, the downward trend recorded in recent years (-1.2 percent in 2015) persisted in the year under review. The number of vehicles (1.25 million) was slightly below the average for the past ten years. While figures for the Gotthard, San Bernardino and Grand St. Bernard were down, a 4.8 percent increase was recorded for the Simplon.



Source: Federal Roads Office FEDRO

2.4 percent increase in accumulated distance

In 2016, the total accumulated distance travelled on the Swiss motorway/national roads network was 27.131 billion, 2.4 percent more than in 2015.

The accumulated distance travelled on the motorway/national roads network continued to increase: in the year under review, and the figure surpassed 27 billion for the first time. The proportion of heavy goods traffic was around 5.8 percent (1.566 billion vehicles).

The most heavily frequented stretches were those around the agglomerations (Zurich, Basel and Bern – cf. table below). As before, the heaviest traffic volume was recorded in the region of Wallisellen, near Zurich, but no traffic count data are available here for 2016 due to major roadworks. In 2016, the average daily traffic volume in the Baregg tunnel amounted to 133,296 vehicles, an increase of 2.8 percent versus 2015, which roughly corresponds to the overall increase in the traffic volume on the motorway/national roads network.

A total of 24,066 traffic jam hours were recorded on the network in 2016 – five percent more than in 2015. However, this increase was one percentage point lower than last year. The majority of traffic jams were attributable to congestion. In the year under review a significant decline in the number of traffic jams due to roadworks was recorded (–31 percent). FEDRO's policy is to keep lanes open as far as possible, while imposing speed limits for safety reasons.

Highest daily traffic volume (no. of vehicles per day)

		2015	2016	Change in %
ZH	Wallisellen*	145,119	–	–
AG	Baden, Baregg tunnel	129,655	133,296	+2,8
BL	MuttENZ, Hard	132,313	132,499	+0,1
AG	Neuenhof	–	131,734	–
ZH	Zurich northern bypass, Seebach*	109,772	–	–
ZH	Zurich northern bypass, Affoltern*	–	–	–
AG	Würenlos	127,035	128,311	+1,0
ZH	Weiningen, Gubrist	–	–	–
BS	Basel, Gellert Nord**	–	–	–
BE	Schönbühl, Grauholz	108,301	109,861	+1,4

No figures or percentages due to roadwork sites(*) or technical maintenance(**) of equipment.

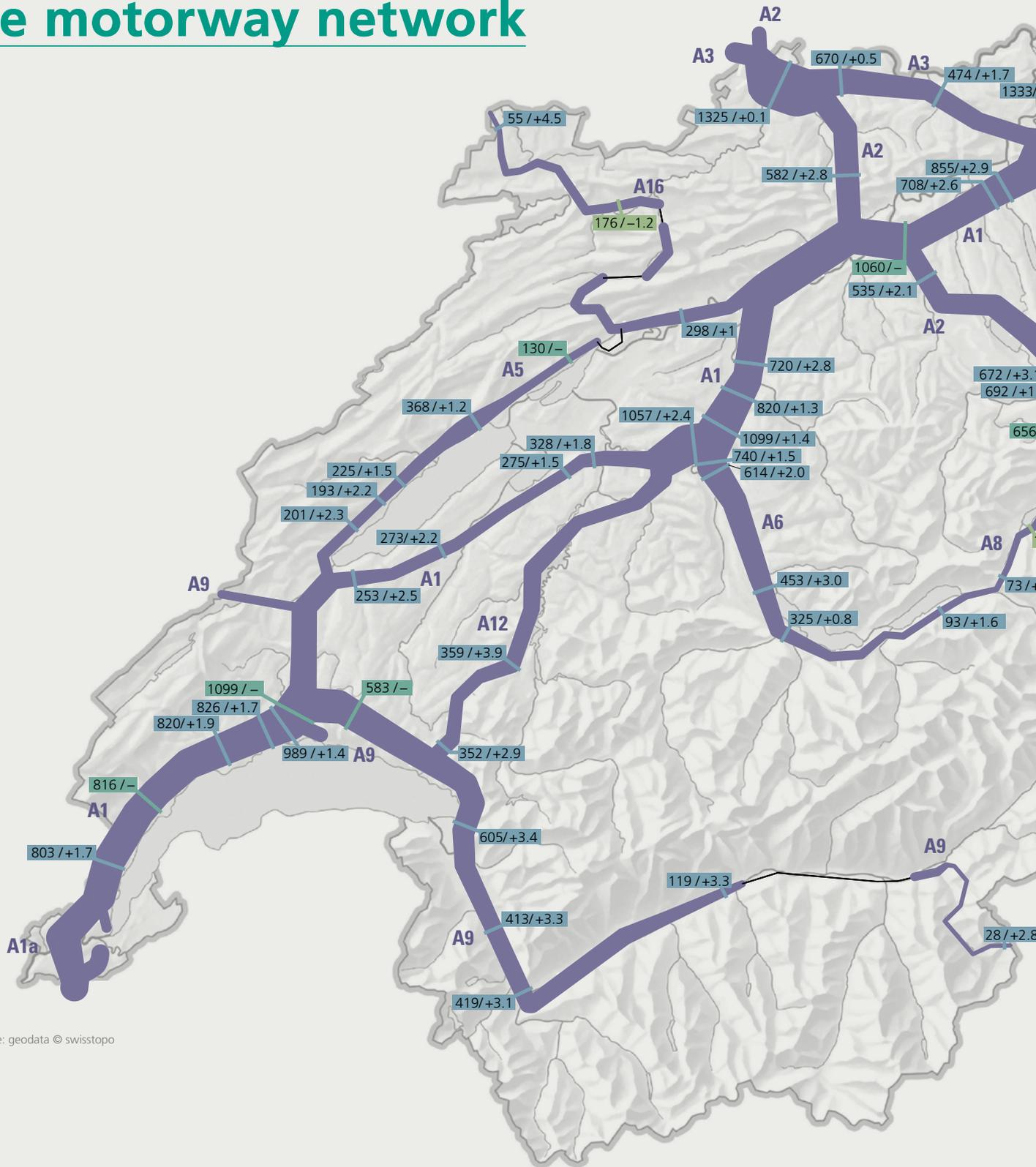
Accumulated kilometres on the Swiss motorway/national roads network

Year	Billion km	Change in %
2013	25.170	–
2014	25.415	+1,0
2015	26.485	+4,2
2016	27.131	+2,4

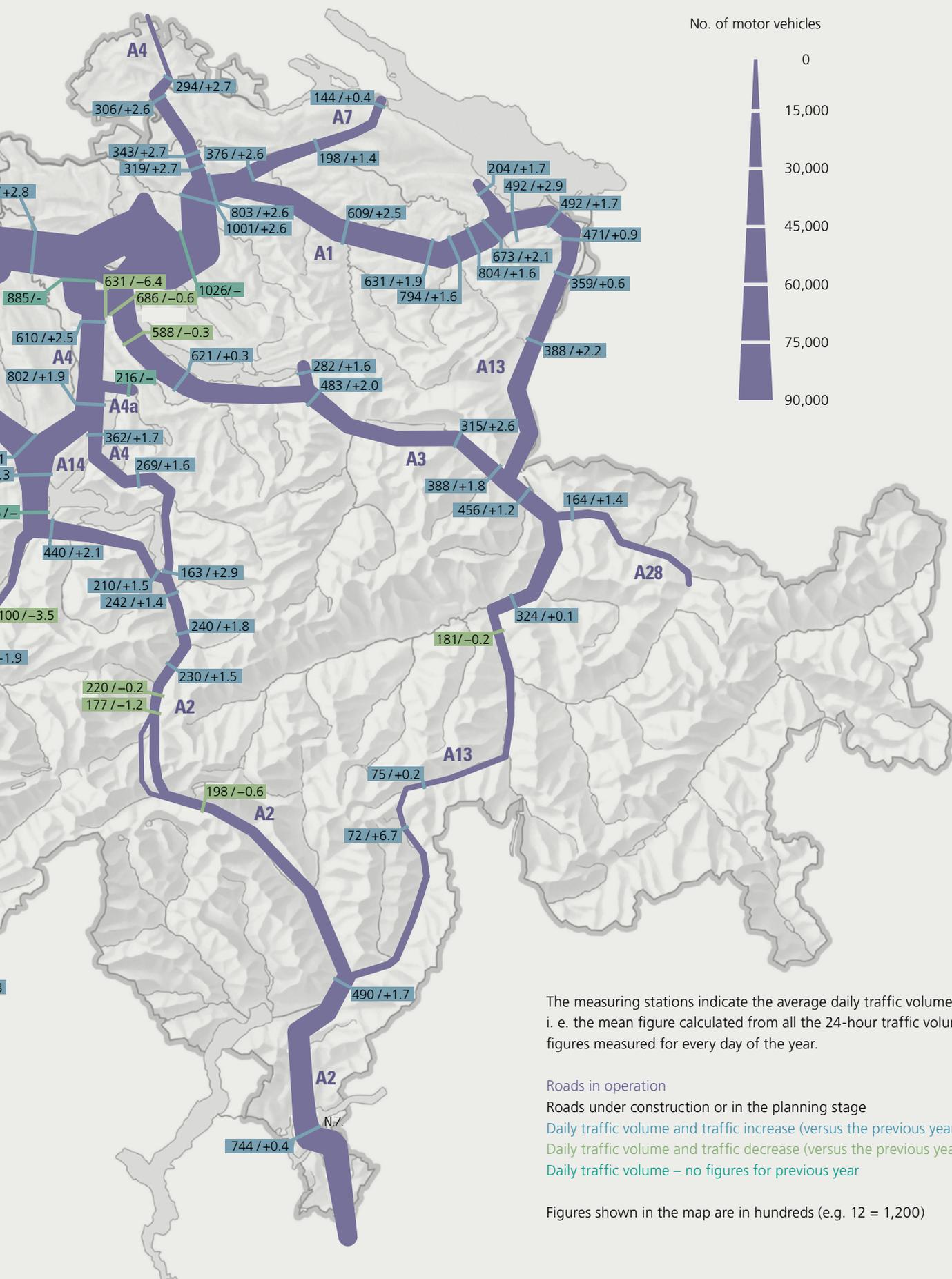
Number of traffic jam hours on Switzerland's motorway/national roads network

Causes	2014	2015	2016	Change in %
Congestion	18,395	19,968	21,211	+9 / +6
Accidents	2,322	2,263	2,420	–3 / +7
Roadworks	674	516	356	–23 / –31
Other	150	91	79	–39 / –13
Total	21,541	22,838	24,066	+6 / +5

Map of traffic volume on the motorway network



Source: geodata © swisstopo



The measuring stations indicate the average daily traffic volume, i. e. the mean figure calculated from all the 24-hour traffic volume figures measured for every day of the year.

- Roads in operation
- Roads under construction or in the planning stage
- Daily traffic volume and traffic increase (versus the previous year, in %)
- Daily traffic volume and traffic decrease (versus the previous year, in %)
- Daily traffic volume – no figures for previous year

Figures shown in the map are in hundreds (e.g. 12 = 1,200)



Almost six million registered vehicles in Switzerland

2016 inventory of motor vehicles in Switzerland

	Motor vehicles (total)	Change versus 2015 (in percent)	Cars			Hybrid drive
			Petrol	Diesel		
Total*	5,980,512	1.61	4,524,029	3,149,902	1,291,500	57,439
Lake Geneva region	1,104,013	1.61	845,651	599,447	231,378	11,071
Vaud	521,827	1.83	410,283	286,694	115,756	5,763
Valais	280,362	2.22	213,611	148,763	62,402	1,624
Geneva	301,824	0.67	221,757	163,990	53,220	3,684
Central plateau	1,348,514	1.63	1,002,167	713,431	272,610	11,294
Bern	735,429	1.45	527,314	368,645	149,882	5,917
Fribourg	233,023	2.39	180,259	129,563	47,625	2,399
Solothurn	201,746	1.72	155,081	112,678	40,171	1,454
Neuchâtel	122,267	1.10	96,938	70,570	24,939	1,095
Jura	56,049	1.68	42,575	31,975	9,993	429
Northwest Switzerland	774,087	1.46	598,229	421,111	165,433	7,904
Basel-Stadt	85,984	0.93	65,956	44,285	20,223	913
Basel-Landschaft	189,909	1.26	146,631	104,690	39,099	1,862
Aargau	498,194	1.63	385,642	272,136	106,111	5,129
Zurich	938,520	1.42	731,975	499,661	215,225	11,542
Eastern Switzerland	897,474	1.66	662,732	453,460	199,585	6,257
Glarus	31,064	1.12	23,231	15,779	7,179	166
Schaffhausen	61,259	1.56	44,970	31,852	12,320	493
Appenzell AR	42,651	1.68	31,345	21,944	8,970	273
Appenzell IR	13,719	2.54	9,456	6,542	2,805	64
St Gallen	367,986	1.45	275,969	188,473	83,324	2,739
Grisons	154,880	1.44	110,726	69,129	40,479	735
Thurgau	225,915	2.21	167,035	119,741	44,508	1,787
Central Switzerland	612,547	2.20	458,710	309,589	140,736	5,785
Lucerne	290,486	2.12	213,061	146,473	62,496	2,790
Uri	26,858	1.36	19,563	13,158	6,249	117
Schwyz	129,772	2.43	98,477	68,599	28,201	1,156
Obwalden	31,082	1.54	22,042	14,566	7,116	246
Nidwalden	35,059	1.69	26,430	18,057	7,889	352
Zug	99,290	2.75	79,137	48,736	28,785	1,124
Ticino	305,357	1.24	224,565	153,203	66,533	3,586

Gas	Electric drive	others	Passenger transport vehicles	Goods vehicles	Agricultural vehicles	Industrial vehicles	Motorcycles	Mopeds incl. fast electric bikes	
								Total	of which e-bikes
10,331	10,724	4,133	69,676	405,566	192,139	68,721	720,381	175,467	–
1,559	1,579	617	11,260	70,269	23,115	10,501	143,217	14,458	–
1,117	664	289	5,401	31,832	13,736	4,110	56,465	7,387	1,747
184	518	120	3,236	19,849	7,810	4,677	31,179	2,601	–
258	397	208	2,623	18,588	1,569	1,714	55,573	4,470	–
2,158	1,729	945	19,368	92,344	60,809	16,825	157,001	56,065	–
1,376	971	523	12,251	53,482	38,812	10,474	93,096	35,155	–
219	295	158	2,698	14,518	9,878	2,331	23,339	7,135	2,132
348	279	151	2,242	13,713	5,507	2,087	23,116	9,661	3,599
133	119	82	1,621	7,055	2,961	1,231	12,461	2,098	376
82	65	31	556	3,576	3,651	702	4,989	2,016	164
1,798	1,407	576	8,362	54,801	17,881	6,550	88,264	30,354	–
333	134	68	857	8,348	167	670	9,986	4,438	1,472
468	376	136	2,034	13,228	3,888	1,612	22,516	7,671	–
997	897	372	5,471	33,225	13,826	4,268	55,762	18,245	–
1,947	2,855	745	9,846	60,683	16,078	10,639	109,299	21,527	9,602
1,369	1,431	630	10,831	63,957	43,426	14,324	102,204	27,368	–
42	44	21	322	2,311	1,392	621	3,187	1,067	273
145	95	65	936	4,156	2,914	782	7,501	1,961	571
56	77	25	548	2,447	2,382	575	5,354	1,423	–
10	31	4	115	901	1,271	266	1,710	505	–
596	568	269	4,133	25,761	15,300	5,118	41,705	12,320	2,800
95	225	63	2,066	12,717	9,266	4,003	16,102	2,889	–
425	391	183	2,711	15,664	10,901	2,959	26,645	7,203	2,031
847	1,243	510	7,474	41,133	26,752	6,808	71,670	21,609	–
516	530	256	3,615	20,130	14,614	2,912	36,154	11,596	4,685
6	22	11	391	1,624	1,322	498	3,460	949	130
147	292	82	1,465	8,094	5,438	1,715	14,583	4,018	828
29	52	33	465	2,165	2,033	488	3,889	1,574	–
32	59	41	449	1,946	1,328	344	4,562	1,350	–
117	288	87	1,089	7,174	2,017	851	9,022	2,122	890
653	480	110	2,535	22,379	4,078	3,074	48,726	4,086	105

* Total; excluding mopeds and fast e-bikes
Source: Swiss Federal Statistical Office

The total number of registered vehicles in Switzerland reached 5,980,512 motor vehicles in 2016 – 94,870 more (1.6 percent) than in the previous year. This means the six-million threshold will soon be surpassed. Since 1990, the inventory of motor vehicles has increased by 55 percent. Cars account for three-quarters of all registered vehicles.

As in 2015, the total number of hybrid vehicles increased again in 2016, by 8,931 to 57,439 vehicles (+18.4 percent). The increase in electric vehicles was even more pronounced, rising by 42.4 percent to a total of 10,724 vehicles.

319,331 new cars put into circulation

New registration of motor cars

	2006	2012	2013	2014	2015	2016
Total	269,748	334,045	310,154	304,083	327,143	319,331
Type						
Limousine	197,913	196,221	174,544	163,298	166,465	155,175
Station wagon	60,602	128,957	127,985	134,195	154,122	156,642
Convertible	11,233	8,867	7,625	6,590	6,556	7,514
Engine capacity (cc)						
Below 1,000	8,015	13,548	18,907	18,942	27,397	27,072
1,000–1,399	46,635	89,272	80,098	77,576	75,995	72,221
1,400–1,799	58,533	78,913	75,025	68,020	69,118	64,217
1,800–1,999	82,328	94,510	84,036	86,115	95,673	98,247
2,000–2,499	30,287	23,217	21,540	20,847	23,076	22,660
2,500–2,999	24,216	21,434	19,429	20,816	22,472	22,966
3,000 and over	19,725	12,227	9,727	9,819	9,530	8,423
Electric motor	9	924	1,392	1,948	3,882	3,525
Gear mechanism						
Manual*	193,841	238,988	221,389	211,701	224,729	210,466
Automatic	73,889	74,151	69,916	73,709	84,352	90,496
Others**	2,018	20,906	18,849	18,673	18,062	18,369
Fuel						
Petrol	185,807	200,576	185,070	180,875	185,469	178,666
Diesel	80,857	124,911	115,656	113,304	127,899	125,595
Gas	1,064	519	791	1,041	1,080	944
Hybrid drive	1,272	6,708	7,158	6,893	8,785	10,587
Electric drive	9	924	1,392	1,948	3,882	3,525
Others	739	407	87	22	28	14
Drive						
4x4	67,073	112,554	111,532	117,059	131,954	141,056
Rear-wheel drive	19,840	19,416	14,924	15,511	17,466	15,756
Front-wheel drive	182,835	202,075	183,698	171,513	177,723	162,519
Output (kilowatts)						
below 60	31,711	29,346	24,615	23,333	24,310	18,340
61–80	59,976	67,143	63,283	54,429	47,614	40,985
81–100	41,083	54,216	53,591	56,189	65,552	68,241
101–120	60,425	81,881	72,726	64,700	67,705	63,049
121–140	22,260	40,593	41,349	45,880	53,137	56,166
141–200	43,479	41,540	35,675	34,219	40,105	41,808
200 and over	10,210	19,289	18,811	25,252	28,682	30,737
Not specified	604	37	104	81	38	5
CO2 emissions (g/km)						
0–50 g	278	994	1,653	2,603	5,523	5,522
51–100 g	2	120,46	17,611	20,277	30,405	32,720
101–150 g	39,073	150,523	159,709	161,607	182,648	198,195
151–200 g	96,634	113,061	91,673	86,482	74,468	67,140
201–250 g	52,268	14,260	12,092	11,865	9,605	7,347
251–300 g	14,775	2,427	1,636	1,865	2,156	2,791
301+ g	4,213	1,383	1,359	1,054	575	813
Not known	62,505	39,351	24,421	18,330	21,763	4,803

* Includes dual clutch transmission and automatic transmission, ** For example, infinitely variable transmission
Source: Swiss Federal Statistical Office

414,986 motor vehicles were put into circulation in Switzerland in 2016 – almost three percent more than in 2015. The most pronounced decreases in initial registrations concerned agricultural vehicles (down by 11.4 percent) and motorcycles (minus seven percent). In the most important category – cars – a total of 319,331 were put into circulation in 2016, or 2.3 percent fewer than in the previous year. By contrast, new registrations in 2015 increased by 7.6 percent.

No. of new vehicles put into circulation (all types)

	2006	2016
Cars	269,748	319,331
Passenger transport vehicles	2,679	5,175
Goods vehicles	26,252	34,781
Agricultural vehicles	3,074	3,314
Industrial vehicles	3,241	4,210
Motorcycles	45,665	48,175
Trailers	19,143	20,895
Total vehicles	369,802	435,881
Total motor vehicles	250,659	414,986

Source: Swiss Federal Statistical Office

Fewer fatalities and serious injuries in 2016

A total of 253 people died in road accidents in Switzerland in 2016 (37 fewer than in 2015). The number of seriously injured people fell by one percent to 3,785. There were also fewer accidents involving motorcyclists and pedestrians, but the figures remained high for e-bike users and cyclists. These figures are derived from the accident database of the Swiss Federal Roads Office (FEDRO).

In 2016, the number of fatalities fell by 15 percent versus the previous year to 216. Since the introduction of nation-wide statistics in 1940, only the figure for 1945 (211) was lower. The highest figure (1,773) was recorded in 1971, and since then the figures have fallen constantly by a total of 88 percent.

The number of motorcyclists killed in road accidents fell to 43 in 2016 (a decrease by 35 percent). As in 2015, 75 occupants of cars lost their lives, while the number of seriously injured people fell by one percent.

Fatally and seriously injured e-bike users and cyclists

In 2016, 24 cyclists were killed in road accidents (one less than in 2015). By contrast, the number of seriously injured cyclists rose slightly from 838 to 854. The sharp increase in the use of e-bikes in the past few years has given rise to a significantly higher number of accidents: a record number of fatalities and serious injuries was recorded in 2015 and 2016 respectively.

The total of 201 accident victims points to an increasing trend. Two-thirds of the accident victims were over the age of 50. Roughly 25 percent of seriously injured e-bike users were riding a high-speed model with pedal support up to 45 km/h.

Decline in the number of fatally injured pedestrians

In 2016, 50 pedestrians were killed on the roads (a decrease by 14 percent), including five children under the age of four, who were not on a pedestrian crossing. Almost half the fatally injured pedestrians were senior citizens, and here too the majority were not using a pedestrian crossing.

Decline in fatalities on the motorways and expressways

In the year under review, the number of people who were fatally injured on motorways and expressways fell to 28, of which 20 were occupants of cars. Four tourists were killed in a tragic accident on the approach to the southern Gotthard portal.

Switzerland's annual road accident statistics are based on the register of road accidents kept by FEDRO, in which accidents on public roads and sites are recorded that involve at least one motorised or non-motorised vehicle, or a pedestrian or equipment similar to a vehicle. The term "fatally injured" applies to people who, as the result of an accident, die on site or within 30 days after the accident. FEDRO has updated its accident statistics website (www.unfalldaten.ch). This website contains tables and graphs relating to road accidents in 2016, plus other useful information. In addition, there is a map on the Federal Geoportal which depicts accidents resulting in fatalities and serious injuries during the period from 2011 to 2016 and classifies them by cause. www.unfalldaten.ch and <http://map.unfalldaten.ch>.

Fatalities

	2015	2016	%
By form of transport			
Cars	75	75	0
Passenger transport vehicles	2	1	-50
Goods transport vehicles	4	2	-50
Motorcycles	66	43	-35
Motor scooters	3	6	+100
Electric bikes	14	9	-36
Bicycles	25	24	-4
Pedestrians	58	50	-14
<i>on pedestrian crossings</i>	18	15	-17
<i>elsewhere</i>	40	35	-13
Others	6	6	0
Total	253	216	-15
By assumed main cause			
Influence of alcohol	30	28	-7
Speeding	29	30	+3
Inattention/distraction	19	20	+5
By type of road			
Motorways and expressways	30	28	-7

Accidents resulting in fatalities/injuries

	2015	2016	%
Fatalities	238	208	-13
Serious injuries	3,612	3,548	-2
<i>life-threatening injuries</i>	174	175	+1
<i>severe injuries</i>	3,438	3,373	-2
Minor injuries	13,886	13,821	-1
Total	17,736	17,577	-1

Serious injuries

	2015	2016	%
By form of transport			
Cars	882	872	-1
Passenger transport vehicles	27	29	+7
Goods transport vehicles	71	61	-14
Motorcycles	1,099	999	-9
Motor scooters	82	72	-12
Electric bikes	163	201	+23
Bicycles	838	854	+2
Pedestrians	600	622	+4
<i>on pedestrian crossings</i>	255	249	-2
<i>elsewhere</i>	345	373	+8
Others	68	75	+10
Total	3,830	3,785	-1
By assumed main cause			
Influence of alcohol	320	371	+16
Speeding	460	417	-9
Inattention/distraction	450	453	+1
By type of road			
Motorways and expressways	258	242	-6

Number of confiscated driving licences down in 2016

70,043 drivers had to surrender their licence in Switzerland in 2016 – 2,133 fewer than in 2015. As in previous years, the main reasons were speeding and drink driving. This is the latest information according to figures from the Administrative Measures database (ADMAS).

In 2016, 29,226 driving licences were confiscated due to speeding, or 4.6 percent fewer than in the previous year (the lowest number since 2005). By way of comparison, the highest number (35,000 licences confiscated) was recorded in 2010.

With a total of 15,084, confiscations due to drink driving were also down slightly versus the previous year. The introduction of the evidentiary breath test on 1 October 2016 did not have an influence on the annual ADMAS statistics, because the new test method was not accompanied by either an easing or a tightening of the regulations.

By contrast, the number of confiscated driving licences due to endangerment of other road users (eating, phoning etc. while driving) increased in the year under review. Here, 1,693 licences were confiscated (an increase by 7.3 percent).

In 2016, more driving licences were withdrawn due to incapacity to drive as the result of sickness or infirmity. Here, the number of withdrawals rose by 10.3 percent to 5,680. The number of licences withdrawn from drivers over the age of 69 increased disproportionately to 2,990 in 2016. While this age group accounted for 47.7 percent of all cases in 2015, in the year under review it represented the majority (52.3 percent).

Administrative measures

	2015	2016	%*
Measures imposed against drivers			
Warnings to holders of a learner's licence	332	308	-7.2
Warnings to holders of a driver's licence	52,991	49,849	-5.9
Withdrawal of learner's licence	3,577	3,438	-3.9
Withdrawal of driver's licence	80,176	78,043	-2.7
Of which withdrawal of provisional licence	6,684	6,551	-2.0
Cancellation of provisional driver's licence	1,505	1,432	-4.9
Refusal of learner's or driver's licence	3,420	3,398	-0.6
Refusal to accept a foreign driver's licence	20,437	20,482	0.2
Instruction in road use	2,058	1,955	-5.0
New driving test	2,827	2,862	1.2
Examination by specialised psychologists	4,376	4,700	7.4
Special requirements	5,331	7,119	-2.9

* Change in percent

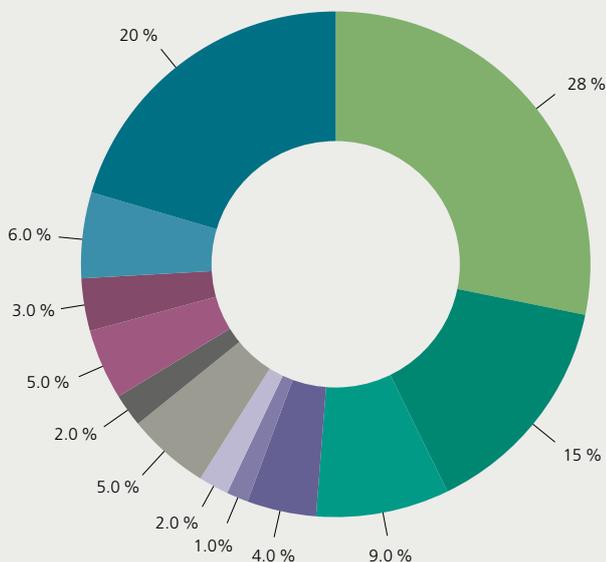
Administrative measures

	2016	%*
Reasons for withdrawal		
Speeding offences	29,226	-4.6
Drink driving (≥ 0.80 ‰ resp. ≥ 0.4 mg / l)	15,084	-3.8
Inattention	8,761	-4.3
Failure to give way	4,556	1.1
Failure to observe traffic signals	1,431	-3.5
Unlawful overtaking	1,978	-8.8
Other driving errors	5,409	2.0
Alcohol addiction	2,177	4.9
Influence of medicaments or drugs	4,675	2.7
Drug addiction	3,430	-1.9
Sickness or infirmity	5,680	10.3
Other reasons	21,139	-3.9
Duration of withdrawal		
1 month	32,788	-3.5
2 month	1,997	-2.9
3 month	16,140	-1.4
4-6 months	7,608	-3.1
7-12 months	2,425	-5.7
More than 12 months	1,103	4.1
Indefinite period	23,185	-1.5
Permanent withdrawal	15	-68.1

* Change in percent

Reasons for withdrawal

in percent



	2016	%*
Age of persons affected		
Under 20	4,135	-6.8
20 to 24	11,715	-4.8
25 to 29	10,684	-5.0
30 to 34	9,630	-3.1
35 to 39	8,068	-2.8
40 to 49	15,363	-5.8
50 to 59	12,750	-1.3
60 to 69	5,979	1.4
70 and over	6,937	14.0

Reasons for withdrawal or refusal of learner's/driver's licence

Learner driving unaccompanied	386	-0.8
Driving error	2,224	-2.0
Drink driving	739	-0.4
Driving without a licence	2,718	-3.2
Failure to pass driving test	193	6.6
Driving despite withdrawal of licence	204	7.4
Theft	431	-2.9
Sickness or infirmity	154	30.5
Other reasons	2,393	-2.0

Reasons for warnings

Speeding	43,001	-3.2
Drink driving (≥ 0.050 to 0.079 ‰)	5,913	-7.2
Inattention	3,467	-11.4
Failure to give way	2,044	-11.7
Driving an unroadworthy vehicle	2,202	-0.3
Failure to observe traffic signals	920	11.7
Unlawful overtaking	284	1.4
Other reasons	7,908	-6.9

* Change in percent versus 2014

- Speeding
- Drink driving (≥ 0.80 ‰ resp. ≥ 0.4 mg / l)
- Inattention
- Failure to give way
- Failure to observe traffic signals
- Unlawful overtaking
- Other driving errors
- Alcohol addiction
- Influence of medicaments or drugs
- Drug addiction
- Sickness or infirmity
- Other reasons

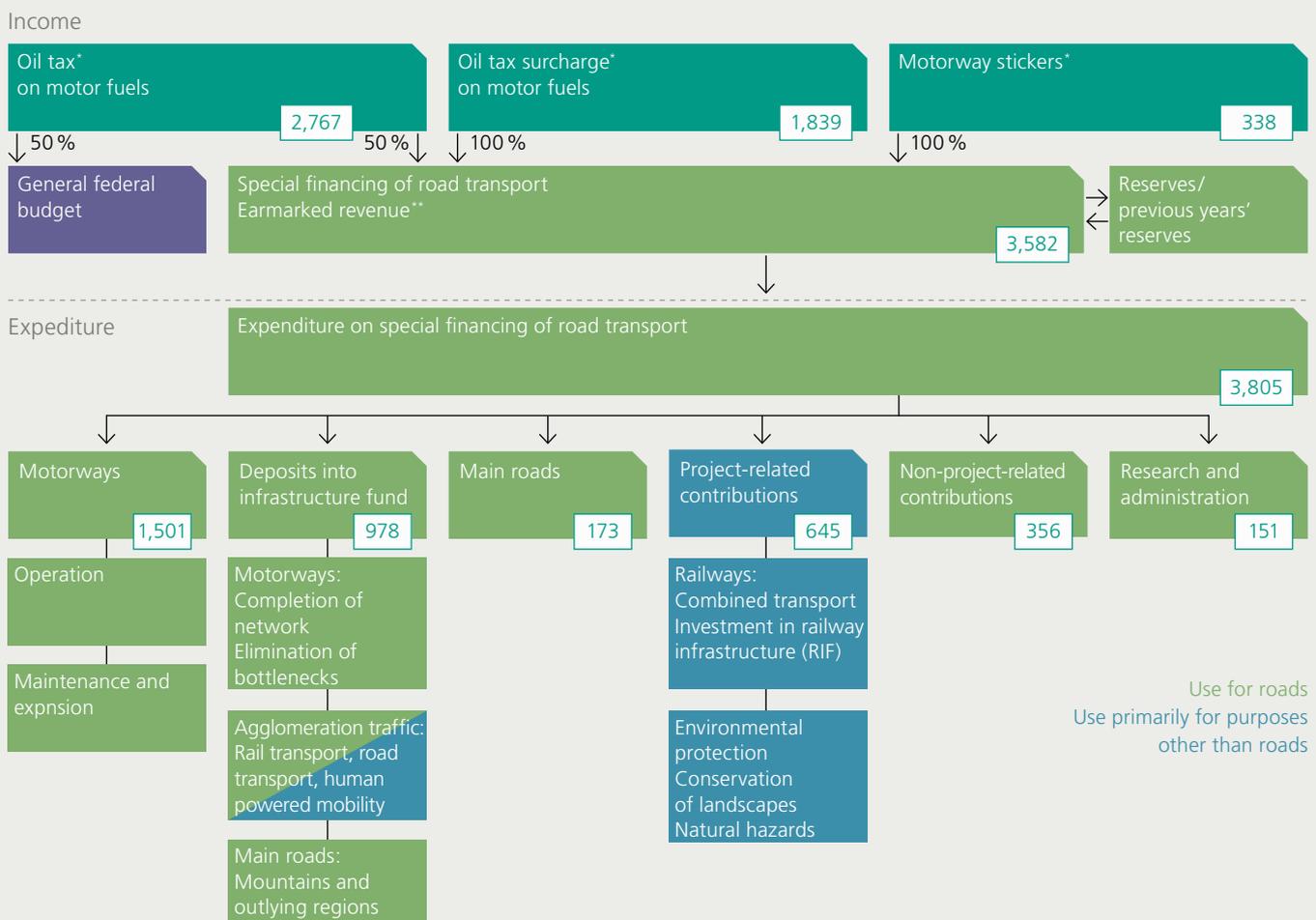
Fund for the Special Financing of Road Transport

At the federal level, the tasks and expenditure relating to road transport are financed via the Special Fund for the Financing of Road Transport. In this fund, the earmarked revenue is used for financing the associated expenditure. The fund's sources are revenue from the oil tax (50 percent) and the oil tax surcharge (100 percent) on fuels (aviation fuels are excluded in both cases), and the net income from the sale of motorway stickers ("Vignettes"). The tax rates and levies specified by law are as follows: oil tax for petrol, 43.12 cents per litre, and for diesel, 45.87 cents per litre (unchanged since 1993); oil tax surcharge, 30 cents per litre (unchanged since 1974). The price of the motorway sticker is 40 Swiss francs a year (unchanged since 1995).

A variety of road traffic-related tasks are financed via the fund: in addition to the financing of federal road infrastructure, i.e. the motorways and national roads, contributions towards cantonal road infrastructure and other federal activities relating to road transport (cf. diagram: project-related contributions) are provided by the fund.

Parliament is responsible for deciding on the annual expenditure for the various areas of activity within the framework of the resolution on the federal budget. The annual difference between income and expenditure increases or reduces the reserves carried forward from the previous years.

Flows of funds in 2016 (in million Swiss francs)



* Net income
 ** Including miscellaneous income (22 million Swiss francs)

Figures based on the national financial accounts.
 Minor differences may arise in some totals due to the rounding up or down of individual figures.

In addition to the above fund, the Infrastructure Fund has been in operation since 2008. Its revenue comes from the Special Fund for the Financing of Road Transport (in the form of fund deposits) and is used for the financing of the motorways and national roads (completion, elimination of bottlenecks), transport infrastructure in cities and agglomerations (private motorised transport, public transport, human-powered mobility) and main roads in mountainous and outlying regions. With the establishment of the Infrastructure Fund, the financing of motorways and national roads was divided among two funds.

Parliament approved a total credit of 20.8 billion Swiss francs (as of 2005, excluding inflation and value-added tax) for the financing of the various tasks and activities. Throughout the fund's duration, Parliament has to approve the annual financial

statement together with the budget and the withdrawals from the fund for the various tasks. When approving the federal budget, it also specifies the amount of the annual deposits to be made into the fund. The fund has a liquidity reserve, the level of which increases or decreases according to the annual difference between the deposits and withdrawals. The duration of the Infrastructure Fund was originally set at 20 years, but it will already be replaced in 2018 following the introduction of the Motorway and Agglomeration Traffic Fund.

Special Fund for the Financing of Road Transport: expenditure, 2014–2016* (in million Swiss francs)

		2014	2015	2016
Motorways/national roads	Operation	346	347	350
	Maintenance/expansion	1,304	1,227	1,151
Infrastructure Fund	Annual deposit	1,029	992	978
Main roads	Contributions to cantons	174	175	173
Project-related contributions	Remuneration, combined transport; contributions for private railway sidings, terminals, etc.	205	188	194
	Fund for major railway projects (NEAT quarter) From 2016, investment in railway infrastructure (RIF)	266	287	290
	Environmental protection	98	91	105
	Protection of cultural heritage and landscapes	15	15	15
	Disaster prevention: protection against flooding	32	32	41
Non-project-related contributions to roads	General contributions to cantons	365	350	349
	Contributions to cantons without motorways	7	7	7
Research/administration		154	153	151
Total expenditure		3,996	3,864	3,805

Infrastructure Fund: revenue, 2014–2016** (in million Swiss francs)

	2014	2015	2016
Completion of the motorway network	547	493	384
Elimination of bottlenecks on the motorways	67	54	131
Contributions to transport infrastructure in towns and urban centres	291	212	211
Contributions for main roads in the mountains and outlying regions	46	46	47
Total withdrawals/expenditure	951	806	773

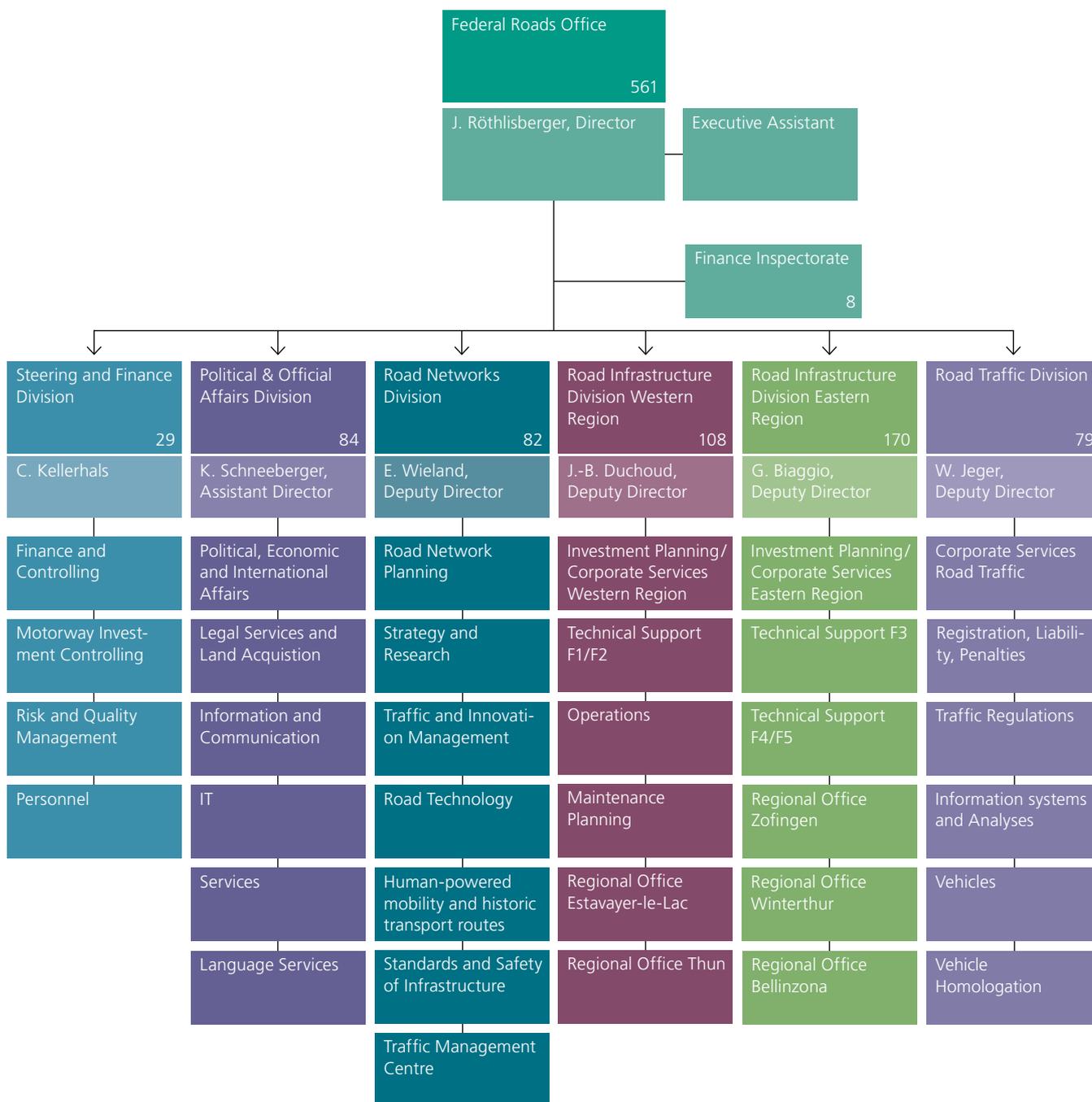
* Figures based on the national financial accounts.

** Based on the liquidity statement.

Minor differences may arise in some totals due to the rounding up or down of individual figures.

Organisational chart of the Federal Roads Office (FEDRO)

Valid from 1 May 2017



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