The Federal Statistical Office's Transport Statistics System

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Abstract

The availability of data that reliably reflect the temporal and spatial evolution of passenger and goods transport activity at nationwide level is crucial to a wide range of purposes. Projects related to infrastructure and transport planning, as well as transport economics and politics, highly depend on such resources. The Swiss Federal Statistical Office (FSO) is in charge of the collection and dissemination of a broad set of transport data.

To this end, the FSO follows a consistent strategy of exploiting already existing data sources as much as possible. Data not available from such registers are collected by means of statistical surveys. With the current article, we provide an overview of the different transport related data sets, as well as their collection and processing methodologies for the generation of transport statistics at the FSO.

We present some of the insights gained from those data and discuss future endeavours.

We are convinced that our data provide a valuable resource to researchers aiming to understand transport phenomena that are both of a general nature and unique to Switzerland.

Keywords

public statistics, transport statistics, mobility and transport, Swiss federal government administration, federal statistical office, FSO

1. Introduction

The Federal Statistical Office is the national center of public statistics in Switzerland. Its mission is to provide the public and other users with reliable statistical data on all aspects important to society, politics and economy. Among those data, statistics focusing on transport are a fundamental part.

Statistics are used in order to quantify variables (characteristics) of interest at a defined point in time and space, for example the number of passenger cars matriculated in Switzerland in the year 2010 (reference day 30 September). As far as the same methodology is used, regularly updated statistics allow following the chronological development of such variables and may indicate the need for measures in order to influence their future developmental trajectory. Transport is a social phenomenon touching many different aspects at an individual as well as a societal level.

The FSO chooses a systemic approach in order to mirror all major aspects associated with transport. This means, that data on inputs (e.g. financial, energetic, ground surface resources), characteristics of the transport system (e.g. infrastructure, means of transport, kilometer performance, transport enterprises) as well as wanted (e.g. passenger transport, goods transport) and unwanted outputs (e.g. accidents, emissions) are of main interest (Altwegg & Martin, 2005). In order to meet the needs of statistics in these areas, the FSO publishes data[1] according to the main topics listed in table 1.

For the transport statistics production, the FSO collaborates closely with many other units of government administration, such as the Federal Office for Spatial Development (ARE), Federal roads office (FEDRO), Federal Office of Transport (FOT), Federal Office of Civil Aviation (FOCA), Federal Office for the Environment (FOEN) and the Swiss Federal Office of Energy (SFOE) (BFS, 2011). Thanks to this coordination, which is ensured by a convention, data needs are detected in time and synergies can be exploited.

This paper is not conceived as a report of a scientific study. Its purpose is to give an overview of the activities at the FSO concerning transport statistics production and to motivate researches to make full use of the available data. For more detailed information on particular subjects please visit the FSO webpage (www.bfs.admin.ch) or contact us by e-mail (verkehr@bfs.admin.ch) or phone (+ 41 (0)58 463 64 68).

[1] The information on the FSO webpage is most complete in German and French. Not all documents are currently available in Italian and English.

Table 1

Domain	Main focus	Data collection method
Costs and funding	determination of the social costs of transport flux of financial resources between state levels	census, sample survey, and modeling depending on transport mode and cost category (details in table 2)
Transport infrastructure	quantification of transport networks and nodes description of network load (road)	census, sample survey (network load)
Vehicles	quantification of different types of means of transport	analysis of registry
Passenger transport	quantification of transport performance by transport mode quantification of traffic patterns	registry analysis, sample surveys and census (transport performance by public transport and plane), modeling
Goods transport	quantification of transport performance by transport mode	analysis of registries, sample survey (road freight transport), census (rail freight transport), modeling
Traffic accidents	quantification of accidents by severity and means of transport	census
Environmenal impacts	estimation of resource consumption estimation of generated emissions	sample survey, modeling
Cross sectional topics (public transport and aviation)	quantification of transport infrastructure transport performance (passenger, goods)	census (public transport), analysis of register (aviation)

2. Methods

2.1 Data collection

The FSO has strong methodological competences, which are ensured by a team of 13 trained mathematicians and statisticians with advanced academic degrees. These experts are consulted on methodological approaches during the design and analysis phases associated with production of a statistic.

For the production of transport relevant statistics, a broad set of methodologies are applied, such as analysis of registries, census, sample survey, and modeling. The general strategy applied at the FSO is to keep the response burden caused by the data collection process as low as possible. Therefore, the exploitation of already existing administrative data is the preferred method for statistics production. For example, the motor vehicle registry (operated by the FEDRO) is used for the production of vehicle stock related statistics.

Not all needed information is available in already existing registries. Also, sometimes the legal bases to access registries for statistics production does not yet exist. In these cases, data have to be collected by other means, such as census and sample surveys. In a census, every single member of the population is surveyed in order to obtain information concerning variables of interest. Census methodology is only applied in cases where the required quality of results cannot be assured by sample surveys. This is usually the case when the population of interest is rather small in size – which results in a limited number of respondents (e.g. companies). The generation of the statistics of public transport is an example where census methodology has to be applied.

In the already mentioned sample survey, a representative number of randomly chosen respondents are consulted in order to obtain information on variables of interest (Zimmermann, Morgenthaler, & Hulliger, 2005). Results from surveyed respondents are extrapolated to the entire population from which the sample was drawn. In this method, the results are *estimates* that are associated with an *error of estimation* (by convention reported as the 95% confidence interval of the respective estimate).

In both census and sample survey, different tools for the data collection process are used:

- paper questionnaires (i.e. road freight transport statistics)
- electronic surveys (i.e. road freight transport statistics, statistics of public transport)
- transmission of database extracts (i.e. aviation, road freight transport statistics)

- computer assisted telephone interviews CATI (i.e. mobility and transport microcensus, statistics of travel behaviour)
- computer assisted personal interviews CAPI (i.e. cross border freight traffic, transalpine and international passenger transport)

Sometimes it is impossible to obtain information on variables from physical respondents. For example, external costs[2] cannot be assessed by traditional consulting of respondents. In such cases, the statistics are results of modeling procedures[3] that take auxiliary and/or correlating information (indicators) into account.

Modeling procedures are applied as well in situations, where constantly performed surveys would not be justifiable in terms of cost-benefit considerations. For example, aggregated key figures for freight transport performance from light utilitary vehicules (mostly vans) are modeled using vehicle stock size and economic situation as indicators in years without surveys.

Often several data collection methods have to be applied in conjunction in order to produce a particular statistic. As an example, the different data collection methods used to calculate costs of transport are shown in table 2.

[2] costs not borne by their originator (e.g. costs generated by a disease due to exposure to transport related emissions)

[3] depending on the complexity of the matter at hand, modeling procedures are complemented with specific study results and analysis of registries

Table 2

Cost category	Road transport			Rail transport	Air transport
	Private motorised	Public transport	Human-powered		
Infrastructure	census	sample survey	sample survey	census	sample survey
Means of transport	modeling	sample survey	sample survey	census	sample survey
Accidents	modeling	modeling	modeling	modeling	modeling
Health and environment	modeling	modeling	modeling	modeling	modeling

2.2 Harmonised data processing

The value of statistics depends on its comparability to peer values. Usually the Swiss transport statistics are compared across time (chronological development) and/or space (different regions within Switzerland; Switzerland in comparison to other countries).

In order to achieve this, data processing must be transparent and harmonised across statistic production periods and/or countries. Data processing methods, such as imputation of missing data or statistical extrapolation are reported in dedicated methods reports available at the FSO webpage.

A subset of the produced transport statistics (road freight transport statistics, statistics of public transport, statistics of travel behaviour) are shared with the statistical office of the European Union (Eurostat). Variable definitions (standardised nomenclatures), data quality requirements and statistics production cycles are coordinated by Eurostat. The manual for the production of road freight transport statistics is an example on how the statistics production process is harmonised across countries (Eurostat, 2011).

In addition to written instructions, member countries of the EU and Switzerland meet regularly in working or coordinating groups to share experiences and coordinate improvements of the statistics production process. This type of coordination requires a lot of

effort from both organisers and participants - but it is primordial for the production of statistics allowing comparisons across countries at a European level.

3. Results & Discussion

The FSO publishes transport statistics in regular intervals. Usually in monthly, quarterly, yearly or quinquennial intervals - depending on data needs and complexity of the production process of the particular statistics. The publication intervals by survey / statistic are listed in table 3. All publications are freely available on the FSO webpage. A subset is available in print.

Publications are supplemented by tables of aggregated data. Those tables can be accessed by either navigating through the topics of interest or by a search in the statistical encyclopedia (http://www.bfs.admin.ch/bfs/portal/de/index/themen/11/22/lexi.html). Some data (vehicle stock, road traffic accidents) is available through STAT-TAB cubes, which is a flexible tool, allowing the production of customised tables by joining and crossing variables of interest (https://www.pxweb.bfs.admin.ch/default.aspx?px_language=de).

In the following part of this paper, four examples of transport statistics results published by the FSO are presented.

Table 3

Domain	Survey / Statistic	Publication intervals	Most recent period published
Costs and funding	costs of motorised road and rail transport	yearly	2012
	total costs of transport	quinquennial	2010
Transport infrastructure	length of road network	yearly	2014
	length of rail network	quinquennial	2010
	swiss automatic road traffic counts[4]	yearly	2014
Vehicles	road, vehicle stock	yearly	2015
	road, first registrations	monthly	2015 / 3
	public transport	quinquennial	2010
	air	yearly	2014
	water (private)	yearly	2015
Passenger transport	passenger transport performance	yearly	2014
	mobility and transport microcensus	quinquennial	2010
	transalpine and international passenger transport	quinquennial	2007
	commuter mobility	yearly	2013
	travel behaviour	yearly	2014
Goods transport	road, heavy domestic vehicles	yearly	2014
	road, foreign vehicles	quinquennial	2014
	road, light domestic vehicles	decennial	2013
	rail	yearly	2014
Traffic accidents	traffic accidents	yearly	2015
Environmental impacts	ground surface usage	quinquennial	2004/2009
	energy consumption	yearly	2014
	air pollutants	yearly	2013
	noise pollution	interval not defined	2010 (road) 2006 (rail, air traffic)
Crossectional topics	public transport	yearly	2014
	aviation	yearly	2014

Source: FSO

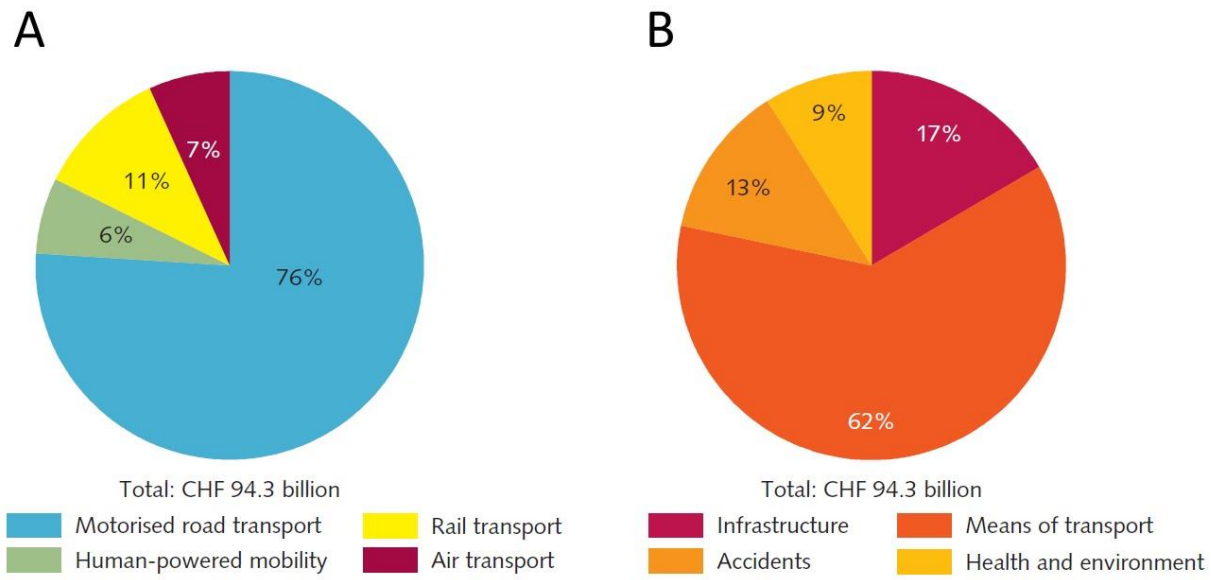
[4] The FEDRO is collecting road traffic count data and thus primary contact for detailed information

3.1 Costs of transport

The statistics on total costs of transport is the result of a rather complex data collection procedure, as illustrated in table 2. In 2010, transport costs toted up to 94.3 billion Swiss franks. Most of it are accounted for by the motorised road transport followed by rail transport, air transport and human-powered mobility (figure 1 / A).

The same data grouped by cost category reveals that most costs are accounted for by means of transport followed by infrastructure, accidents and health and environment.

Figure 1 Total costs of transport by transport mode (A) and cost category (B) in 2010.

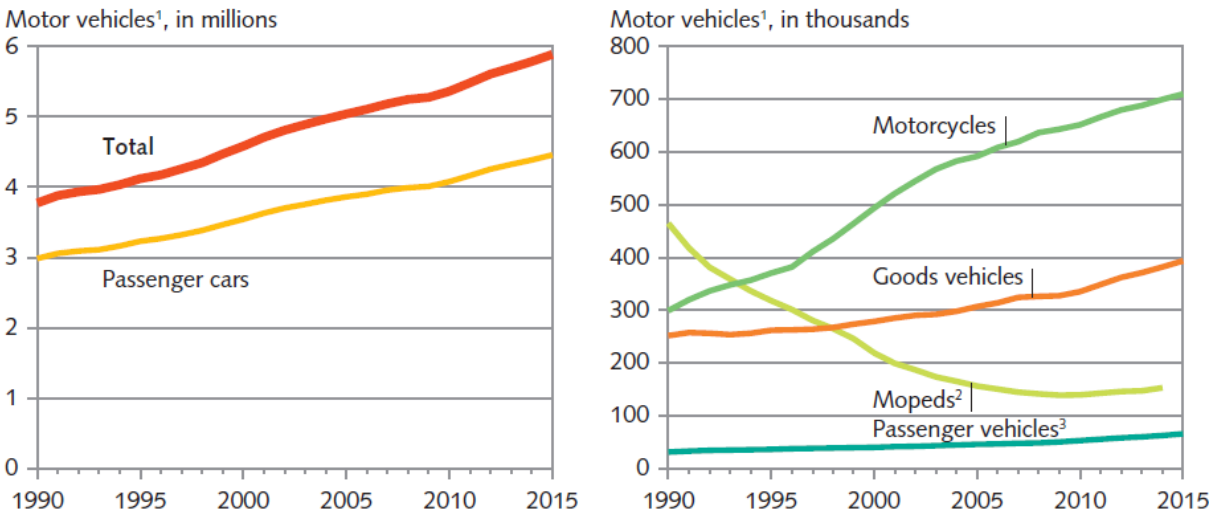


Source: FSO

3.2 Chronological development of road vehicle stock

The road vehicle stock size is constantly rising (Figure 2, left panel, depicted in red). This pattern of growth in stock size is not found in all vehicle categories equally. Some categories, such as motorcycles and goods vehicles show increased growth rates whereas the moped stock decreased considerably during the past 25 years. These patterns may reflect general shifts in consumer needs.

Figure 2 Chronological development of road vehicle stock and vehicle type.



1 Stock as of 30 Sept. (incl. Fed. Govt. vehicles; excl. army vehicles), mopeds on 31 Dec.
2 including all e-bikes requiring a motorcycle registration plate
3 not including trolleybuses

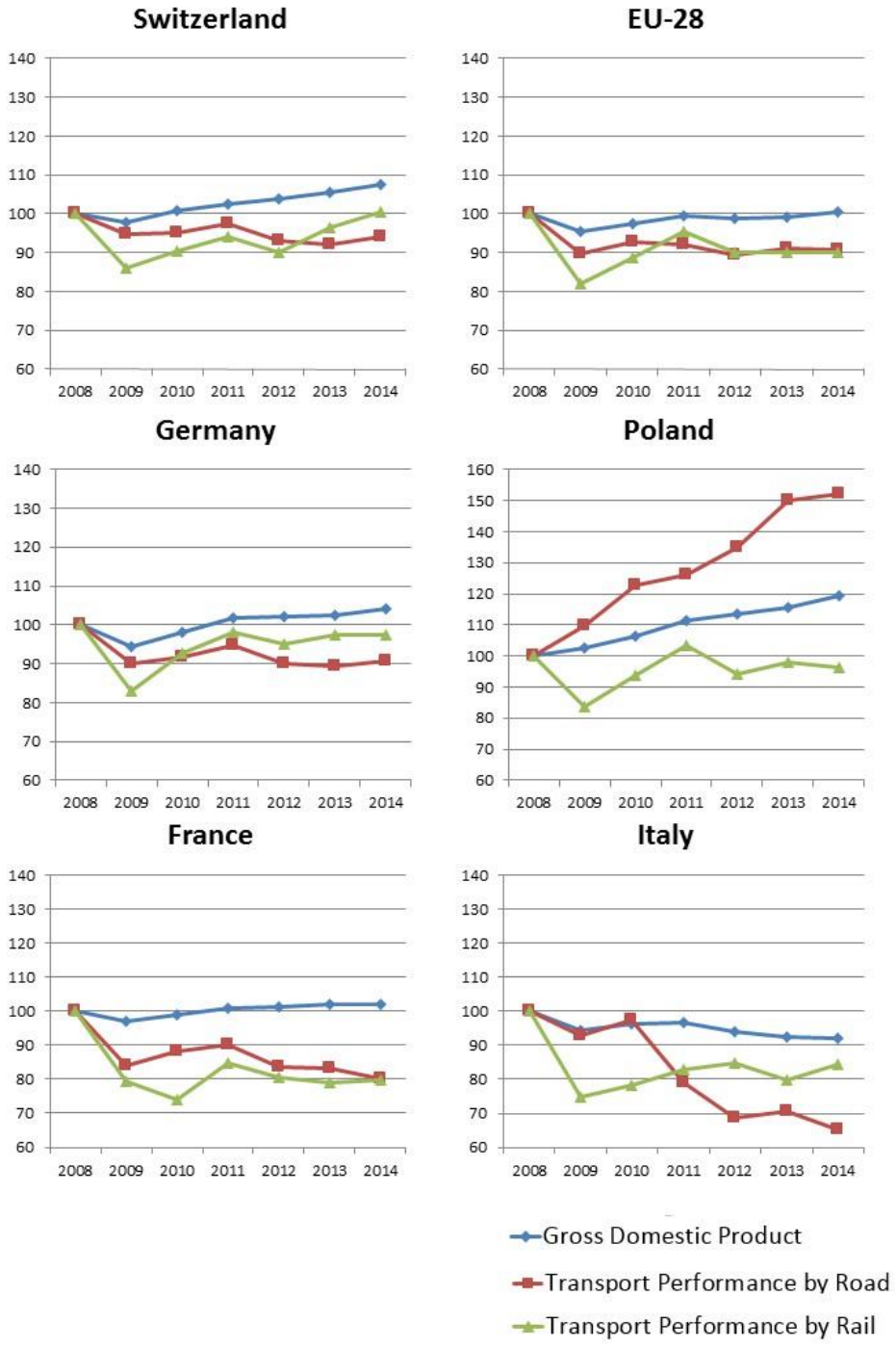
Source: FSO, FEDRO

3.3 Across country comparisons of recent development in freight transport performance

We observe a reduction of the overall transport performance by Swiss lorries as well as by lorries matriculated in other European countries in 2009 as a consequence of the financial crisis. Whereas the GDP indicates a growth of economy in Switzerland, transport performance by Swiss lorries did not yet fully recover from this crisis. This is mostly due to a lower demand for international transport, since our neighbouring countries and important trading partners recover slower from the financial crisis. The transport performance in France and Italy did decrease considerably during the past years.

The eastward expansion of the European Union provided access to the European transport market for countries like Poland. Transport performance by polish road vehicles shows a steep increase – challenging the European Market with lower production costs in transport industry.

Figure 3 Chronological development of the Gross Domestic Product (GDP, real gross domestic product in national currency, chained-linked volumes, 2010 reference year), transport performance (ton kilometers) by heavy road freight vehicles (matriculated in the respective countries; domestic and international performance) and rail. Indices 2008 = 100. Reproduced from the current publication on goods transport in Switzerland (BFS, Güterverkehr in der Schweiz, 2015).



Source: FSO, Eurostat

3.4 Mobility behaviour of the Swiss resident population

In table 4 key figures of the 2010 Mobility and Transport Microcensus are reported. It shows that the Swiss resident population kept increasing its daily distance between 2005 and 2010. Most of the daily distance is due to leisure traffic. The biggest share of the daily distance is covered by private motorised transport. The share of households with cars is bigger than the share of households with bicycles.

Table 4 Key results from the 2010 Mobility and Transport Microcensus

Daily distance per person (domestic)	36.7 km
Increase in the daily distance between 2005 and 2010	+4%
Share of leisure traffic in daily distance	40%
Share of work-related traffic in daily distance	24%
Share of motorised private transport in daily distance	66%
Share of public transport in daily distance	23%
Daily travel time per person (domestic, excluding waiting and transfer times)	83.4 minutes
Annual mobility per person (domestic and abroad, incl. all trips)	20,484 km
Share of households with car(s)	79%
Share of households with bicycle(s)	69%

Source: FSO

3.5 Future endeavours

Members of the mobility and transport section will keep optimising production processes to meet the evolving needs for statistics. There are concrete plans to improve several statistics to include more information:

- the statistics on costs and financing of transport shall be extended to navigation
- goods transport statistics shall contain more detailed information on intermodal transport
- transalpine and international passenger transport may include public road transport in future

A major focus as well is to reduce response burden for the statistics production and to extend the use of analysis of registries.

We strongly encourage researchers to exploit the data provided by the FSO whenever meaningful. Also, we would like to learn about improvement potential concerning the provided statistics products from researchers in the field.

4. Acknowledgements

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