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FSO News

02 Territory and environment

Neuchâtel, February 2018

Air emissions accounts

More than 60% of the greenhouse gas footprint originates abroad

According to the footprint approach, Swiss greenhouse gas emissions in 2015 totalled 116.2 million tonnes of CO_2 equivalents. In addition to domestic emissions, this includes emissions arising abroad in the manufacture of goods and services destined for Switzerland. At 76.1 million tonnes of CO_2 equivalents, foreign emissions account for almost two-thirds of Switzerland's total footprint. This finding comes from the Federal Statistical Office's (FSO) newly calculated pilot accounts.

Greenhouse gases emitted abroad are increasing

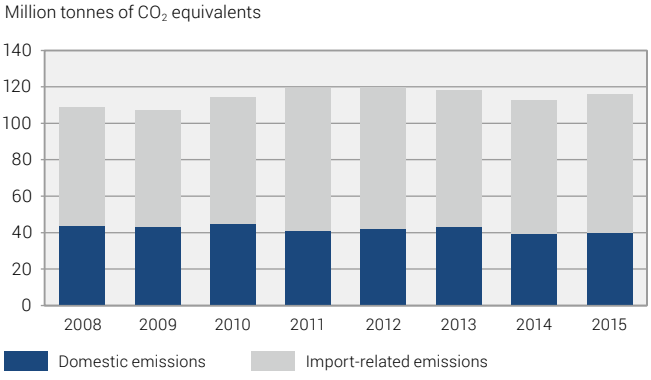
The greenhouse gas footprint is a statistical concept that calculates the total greenhouse gas emissions caused by the final demand for goods and services in Switzerland. In contrast to the greenhouse gas inventory, developed for the Kyoto Protocol, it includes not only greenhouse gases emitted in Switzerland but also emissions arising abroad due to Swiss final demand. As the Swiss economy relies heavily on foreign trade there is a big difference between the greenhouse gas footprint and the greenhouse gas inventory.

The greenhouse gas footprint and domestic emissions have grown at different rates (G1). With variations, the greenhouse gas footprint increased between 2008 and 2015 by 7% to 116.2 million tonnes of CO_2 equivalents (Mt CO_2 e). This corresponds to 14 tonnes of CO_2 e per person. Domestic emissions due to Swiss final demand accounted for 40% in 2008, falling to 35% in 2015. In return, emissions occurring abroad rose over the same time period from 60% to 65%.

This time series should be regarded as pilot accounts that will be consolidated and extended in the coming years (see page 4).

Greenhouse gas footprint[1]

Greenhouse gas emissions due to final domestic demand — **G1**



[1] Pilot accounts. Greenhouse gas emissions included: CO_2, CH_4, N_2O

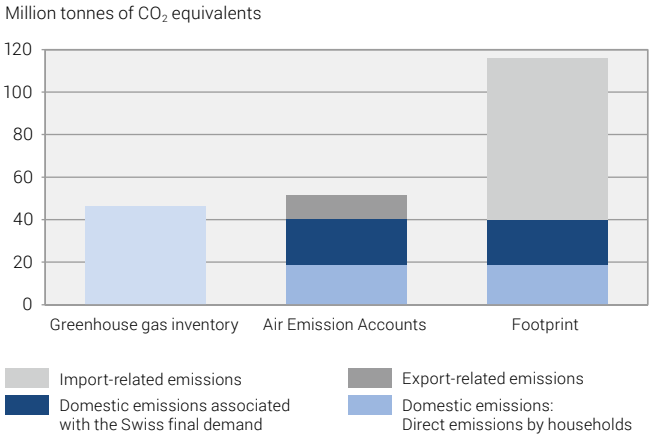
Source: FSO – Environmental accounting

From greenhouse gas inventory to footprint

The calculations presented here take into account the three main greenhouse gases[1]: Carbon-dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Swiss emissions of these gases are listed in the *greenhouse gas inventory,* calculated for the implementation of the Kyoto Protocol. In 2015 it stood at 46.3 Mt CO_2 e. (G 2). These are emissions occurring in Switzerland regardless of whether the person or enterprise causing them is resident in Switzerland. With regard to emissions caused by transport it is important to note that calculations are based on fuel purchased in Switzerland (sales principle) and that emissions from international air transport and shipping are not included.

Switzerland's greenhouse gas emissions, 2015[1]

Comparison of different accounting approaches — **G 2**



[1] Pilot accounts. Greenhouse gas emissions included: CO_2, CH_4, N_2O

Sources: FSO – Environmental accounting; FOEN – Greenhouse gas inventory © FSO 2018

The *air emissions accounts* from environmental accounting are consistent with the FSO's national accounts. The resident principle applies to the air emissions accounts: The greenhouse gas emissions of resident units (businesses and households) are recorded. This means that emissions from road freight vehicles registered in Switzerland, for example, are also attributed to Switzerland when they occur abroad. Furthermore, all emissions from Swiss airlines are included. At 51.3 Mt CO_2 e, the total amount of the air emissions accounts is therefore higher than that of the greenhouse gas inventory (G 2). Because the air emissions accounts are consistent with the national accounts, domestic emissions can be attributed to households and economic sectors. The air emissions accounts include not only emissions occurring in Switzerland for the manufacture of goods and service for final domestic demand but also all emissions that are made in Switzerland to manufacture products for export (export-related emissions).

The *greenhouse gas footprint* is a measurement that has to be modelled. There are various methods for doing this: the results presented here are based on the air emissions accounts, the input-output tables (IOT) from the national accounts and a weighting of the import related-emissions (see page 4).

According to this approach the greenhouse gas footprint in 2015 totalled 116.2 Mt CO_2 e and was more than twice as large as the greenhouse gas emissions according to the Kyoto Protocol (G 2). This difference in size demonstrates the complementary perspective the footprint provides, particularly in a country like Switzerland that maintains intense trade relations with the rest of the world.

Broken down by source, some 16% of greenhouse gas emissions derive from households through private transport and heating. Another 18% derive from the Swiss economy in the manufacture of goods and services that are actually consumed in Switzerland. The greatest percentage of emissions, however, is "hidden" in the imports and occurs abroad in the manufacture of goods and services that are imported and used in Switzerland. As these import-related emissions eventually end up in goods and services used in Switzerland, they also contribute to Switzerland's greenhouse gas footprint. Import-related emissions account for 76.1 Mt CO_2 e or roughly two-thirds of the total footprint (G 2).

As the footprint takes into account the greenhouse gas emissions due to final demand in Switzerland, export-related emissions are not included in the calculation as the exports are consumed not in Switzerland but in another country.

Footprint by components of the final demand

The greenhouse gas emissions of which the footprint is composed can be broken down not only by their source at home and abroad but also by components of the final demand (G 3).

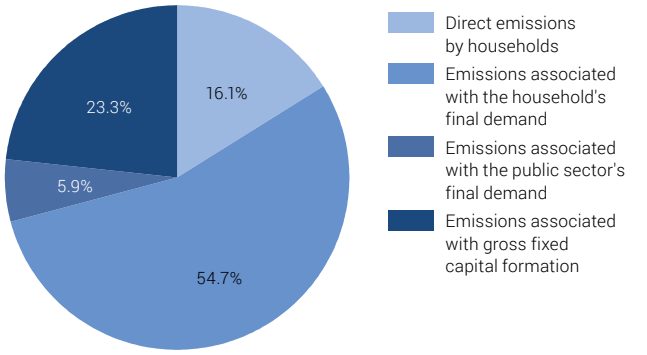
From this perspective, goods and service consumed by Swiss households account for the largest part of the footprint. If the direct emissions due to traffic and heating are included, households were responsible for 82.3 Mt CO_2 e in 2015 or 71% of the total footprint. In comparison, at 6.8 Mt CO_2 e the footprint associated with the public sector's consumption expenditure is considerably smaller.

Another important component of the footprint is gross fixed capital formation. This is formed by long-term investments made by Swiss households, businesses and the State in fixed assets such as machinery, real estate or IT infrastructure. Greenhouse gas emissions totalling 27.1 Mt CO_2 e arise from the final demand for these asset investments.

Overall, financial expenditure is reflected in each component's share of the footprint: Roughly 58% of the Swiss final demand is attributed to households, 15% to the public sector and just under 26% is spent on gross fixed capital formation.

[1] The greenhouse gas inventory according to the Kyoto Protocol also includes the synthetic gas groups HFC, PFC, SF_6 and NF_3. In 2015 these accounted for 4.0% of greenhouse gas emissions. Due to the method used, these gas groups are not included in our calculation.

Greenhouse gas footprint by components of final domestic demand, 2015[1] G3

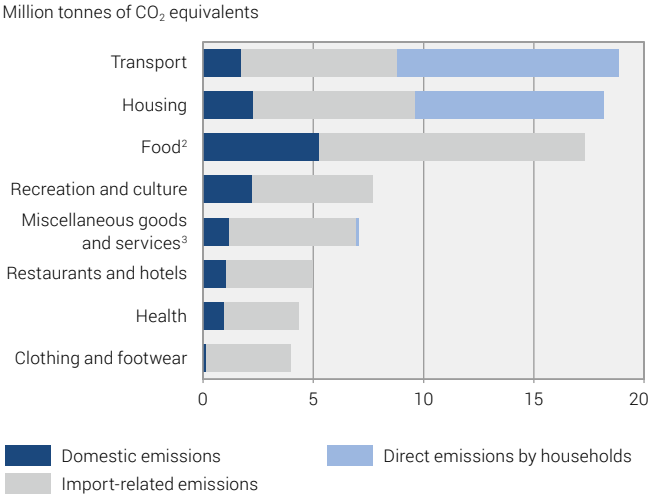


Total Emissions: 116.2 Million tonnes CO_2-equivalents

[1] Pilot accounts. Greenhouse gas emissions included: CO_2, CH_4, N_2O

Sources: FSO – Environmental accounting

Household's greenhouse gas footprint by expenditure categories, 2015[1] G4



[1] Pilot accounts. Greenhouse gas emissions included: CO_2, CH_4, N_2O
[2] food, non-alcoholic and alcolohic beverages and tobacco
[3] furnishings, household equipment and routine household maintenance, communication, education and miscellaneous goods and services

Source: FSO – Environmental accounting

In households, transport, housing and food cause the largest footprint

The share of the greenhouse gas footprint directly or indirectly (through consumed goods and services) attributed to households can be broken down in greater detail by expenditure item (G 4). It can be seen that the largest share is due to transport, i.e. 18.8 Mt CO_2 e. This represents 23% of the households' footprint although transport accounts for only 9% of households' final consumption expenditure. The transport footprint includes both direct emissions from private transport as well as emissions related to the economy and caused by air transport, public transport, refined petroleum products as well as the trade, manufacture and maintenance of vehicles. Transport-related emissions are, however, also found in other consumer goods and services. For example, the emissions arising from the transport of food are attributed to food.

The housing footprint as well as monetary expenditure on housing both account for just under a quarter of private households' total footprint or consumption expenditure. In a similar fashion to that of the transport footprint, the housing footprint is composed of both direct emissions (heating) and emissions from a series of economic sectors that produce or provide housing-related goods and services. These include the supply of energy as well as sewerage and waste disposal. However, emissions arising from housing construction are not included here as they belong to the gross fixed capital formation mentioned above.

In contrast to the transport and housing footprint, the food footprint does not contain any direct household emissions: greenhouse gas emissions are entirely integrated into economic production. The share of food consumption (incl. alcoholic beverages and tobacco) in the footprint is 21%. Household expenditure on food accounts for 13% of total final consumption expenditure.

At 9%, the share of the consumer item leisure and culture in the footprint is similar in size to the same items' share in total household consumption expenditure (8%). Because package holidays with flights are part of leisure and culture consumption, a considerable portion of greenhouse gas emissions in this sector are caused by air transport.

With the exception of transport and housing, where a large part of the footprint arises from direct household emissions, import-related emissions generate a larger share of the footprint in all other expenditure items than domestic emissions. At 96%, the share of emissions arising abroad is particularly high for clothing and footwear; for food it is 70%.

More Information

www.statistics.admin.ch → Look for statistics → Territory and environment → Environmental accounting

Calculation method and data used

Calculation method used

There are various approaches towards modelling the greenhouse gas footprint. For the FSO pilot accounts, the results of which are presented in this publication, the method known as environmentally extended input-output analysis was used. This is based on a combination of air emissions accounts from environmental accounting and the input-output tables (IOT) from the national accounts as well as a weighting of the import-related emissions.

The IOT are tables used to describe in detail the flow of goods and services in the Swiss economy. The most up-to-date version is for the year 2011 and the modelling for that year is therefore the most reliable (which is also the reason why 2011 was chosen as the reference year for the following comparison with other calculation methods). To model the footprint for the remaining years between 2008 and 2015, the IOT were estimated for this period using a statistical balancing procedure.

The weighting of the imported goods and services takes into account the CO_2 intensity of the place of origin of Swiss imports. A distinction is also made between the different economic regions: Africa, Asia, Europe, Japan, Middle East, North America, Oceania, Russia and South America. The greenhouse gas intensity (for 63 product groups) of exports from the EU are weighted across the whole economy with a ratio of total CO_2 emissions to the gross national product (GDP) for each economic region. The weights are based on data from Eurostat and the International Energy Agency (IEA). The French Service de la donnée et des études statistiques (SDES) uses the same weighting procedure to calculate France's greenhouse gas footprint.

A comparison of different calculation methods

Apart from the environmentally extended input-output analysis approach, the footprint can also be calculated using life cycle assessment coefficients. This method is based on the domestic greenhouse gas emissions and the emissions of the imported products throughout their production processes and adds them together for the whole economy. The advantage of this method is that it takes into account a detailed level of products. The Federal Office for the Environment (FOEN) has commissioned the calculations of the greenhouse gas footprint by using this method (FOEN 2014)[1]. The result is comparable to the FSO pilot account presented here (G 5). The advantage of the environmentally extended input-output analysis is that the footprint is consistent with the national accounts and that the emissions can be attributed to the groups of goods and services consumed.

Another possibility is to calculate the footprint on the basis of a multi-regional input-output table (MRIOT), as has been conducted by the Organisation for Economic Cooperation and Development (OECD). These results are also comparable to those obtained using the method presented here. The MRIOT is a complex modelling of international trade relations by combining the IOTs of several countries. MRIOT's strong point is that trade flows between countries can be presented explicitly. In comparison with the MRIOT-based calculation, the weighting used for the FSO pilot accounts is simplified but based on a similar concept.

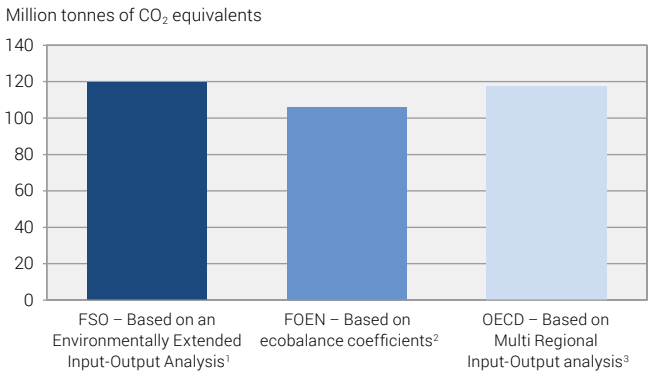
Further development of the method

Switzerland's greenhouse gas footprint has been calculated here for the first time by the FSO. These are pilot accounts and the method will be consolidated and further developed in 2018. As soon as a new IOT is published, the time series can be examined in more detailed and extended.

[1] FOEN (2014): Development of Switzerland's worldwide environmental impact.

Greenhouse gas footprint of Switzerland, 2011

Comparison of various calculation methods — **G 5**



[1] Pilot accounts. Greenhouse gas emissions included: CO_2, CH_4, N_2O.
[2] Development of Switzerland's worldwide environmental impact (FOEN, 2014). The greenhouse gas emissions consider the gases CO_2, CH_4 and N_2O.
[3] OECD calculates only the CO_2 footprint. The result presented here is an extrapolation for the two other considered gases.

Sources: FSO – Environmental accounting; FOEN; OECD

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