

Land use in Switzerland

Results of the Swiss land use statistics 2018



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1 Overview: changing land use

'Urban sprawl', 'retreating glaciers', 'bush encroachment in the Alps': Our changing landscape provides the media with headlines and politics with plenty to talk about. Around a fifth of Swiss land has a different use today than the one it had only thirty years ago. While settlements and forests are expanding, the agricultural area is constantly diminishing. The 'Land use statistics' provide precise data on these and the many other small-scale and subtle changes in land use.

Switzerland's landscapes are – with the exception of its mountains – for the most part man-made: Over the course of thousands of years of use, they have been profoundly reshaped by man. Even in places where nature still seems to be untouched and untamed – in mountain forests or in conservation areas – an informed observer can usually find more or less obvious signs of human intervention. At the same time, land use is continuously changing – and with it the Swiss landscape. Some changes are striking, such as the construction of a new housing settlement or alpine meadows and forests buried under rockfall. Other developments take place so slowly and inconspicuously that people are hardly aware of them, such as the gradual upward shift of the treeline.

Reliable information on land use in Switzerland and how it is changing – on a large and small scale – is provided by the 'Land use statistics'. The most important findings are summarised in this publication. On the basis of high-resolution aerial photographs, they are compiled every few years by the Federal Statistical Office using the same methods, enabling precise comparisons over long periods of time (see insert on page 8).

The four main categories of land use

The Land use statistics classify the areas of Switzerland based on their use, into four main categories, which in turn can be divided into many sub-categories (G1). The four main categories of land use are settlement and urban areas, agricultural areas (including alpine agriculture), wooded areas (forests and woods),



Parts of a settlement destroyed by flooding The course of the river has been straightened and new houses are being built (Silenen UR).

as well as areas classified as unproductive areas. The latter are used little or not at all by people but are of great value in terms of the environment and landscape. In particular, these include watercourses as well as unused vegetation, cliffs, boulders and areas covered by glaciers in the mountains. In 2018, settlement and urban areas occupied the smallest share of Switzerland's surface area with 8%, agricultural areas the largest share with 35%. Wooded and unproductive areas occupied 32% and 25% of the land respectively in 2018.

Land use in Switzerland, 2018

Breakdown into 4 main categories and 17 sub-categories; areas measured in square kilometres

G 1

Switzerland's total territory: 41 291 km²

Settlement and urban areas 3 271 km², 8% of the national territory

Agricultural areas 14 525 km², 35% of the national territory
 Wooded areas 13 134 km², 32% of the national territory

Unproductive areas (25%, 10 361 km²)

Meadows, Alpine agricultural area 5 033 km² Forest 11 539 km² pastures 5 128 km² Arable land 3 884 km² 01 Woods 953 km² 642 km² Bare land 4 635 km² Unproductive vegetation 2 915 km² Standing water 1 434 km² Building areas 1 657 km² Transportation areas 983 km² Glacier, firn 1 030 km² Rivers 347 km²

 01: Orchard, vineyard and horticulture area (480 km²)
 03: Recreational areas and cemeteries (209 km²)

 02: Industrial and commercial areas (256 km²)
 04: Special settlement areas (168 km²)

Source: FSO - Land use statistics (AREA)

Major regional differences

The proportions of land the four main categories occupy vary depending on the biogeographical region (G2: see insert for the term biogeographical region). Seen as a percentage, settlement and urban areas in the Mittelland, for example, occupy an area (17%) that is more than twice the national average, whereas in the Alpine regions they are much less common. The percentage share of agricultural areas, on the other hand, is above the national average in the Mittelland (48%) and in the Jura (42%), but clearly below this average in the western Central Alps (18%) and on the southern flank of the Alps (Ticino and the southern valleys of Graubünden) (12%). Wooded areas are proportionally over-represented on the southern flanks of the Alps, whereas their percentage share in the Central Alps is considerably smaller than the national mean. At 41% in the east and 55% in the west, unproductive areas are, in contrast, very dominant in the central alpine regions. Unproductive areas account for 10% of land in the Mittelland (lakes in particular). In the Jura their percentage share is vanishingly small.

The biogeographical regions

For a country of its size, Switzerland has a considerable variety of different natural areas and habitats with the Alps forming a clear dividing line. As a consequence, there are major regional differences in land use that have to be taken into account when interpreting the Land use statistics. For this purpose, the current publication mainly uses the spatial classification known as "biogeographical regions". These divide Switzerland into six regions, which with regard to flora and fauna - and also in terms of climate, topography and soil composition - present a certain uniformity (G3).

Regional analyses of the Land use statistics are possible not only by biogeographical region but also by canton, commune, or altitude, etc. Such analyses are also presented from time to time in this publication. Additional regional analyses can be found online at: www.landuse-stat.admin.ch.



Biogeographic regions of Switzerland

The differences between the biogeographical regions are to a large extent a reflection of the prevalent altitudes. The height above sea level is known to have significant influence on land use by means of temperature and vegetation (G4). Thus, the land covered by agricultural areas declines in absolute figures from 600 metres upwards, and also declines in terms of percentage with increasing altitude from 800 metres. An exception to this are areas situated between 1800 and 2400 metres, where alpine pastures and meadows bring about a slight and short-lived increase in agricultural areas. In contrast, at medium altitudes between 800 and 1800 metres, wooded areas account for a particularly large proportion of the surface area. Their prevalence comes to an abrupt end, however, above 2000 metres. In Switzerland, the treeline lies at about this height, which varies depending on the

Land use by main category and biogeographical region, 2018



Source: FSO - Land use statistics (AREA)

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G 4

G 2

Land use by main category and altitude (metres above sea level), 2018



Source: FSO - Land use statistics (AREA)

region and exposure (north or southern flank). Above 2000 metres is where unproductive areas in the form of unused vegetation, rock, boulders and glaciers begin to dominate. A substantial portion of unproductive areas is also found in the lowest lying parts of the country, namely in the form of lakes. Settlement and urban areas are also at their most widespread in the lowest lying areas. 84% of these areas are found below 800 metres. In the past, larger villages and towns were often only able to exist in places with the most fertile agricultural areas and where a ready and reliable supply of food was available. In addition, settlement growth in recent decades has been particularly strong at lower altitudes both in absolute figures and percentage-wise.

More settlement and urban areas - fewer agricultural areas

The oldest comparable data from the Land use statistics are from 1985. Since then, the percentage of settlement and urban areas in the total surface area has increased continuously by about 1.9% to 7.9% in 2018 (G5). Over the same period the proportion of wooded areas has also risen continuously, by a total of 1.4 percentage points, whereas that of agricultural areas has declined by 2.8 percentage points. The proportion of unproductive areas has hardly changed (-0.5 percentage points).

Land use by main category, 1985-2018 G 5 100% 80% 37.9 36,7 35,9 35.2 60% 40% 20% 25,6 25,4 25,3 25,1 0% 2009 2018 1985 1997 Settlement and urban areas Agricultural areas Wooded areas (forest and woods) Unproductive areas Source: ESO - Land use statistics (AREA) © ESO 2021

The Land use statistics

Objective

The Land use statistics produced by the Federal Statistical Office (FSO) provide information about the use and coverage of land in Switzerland and also on how these change over time. It is therefore an essential tool for long-term spatial observation. The findings of the Land use statistics make it possible to assess whether and to what extent the changes in land use coincide with the objectives of Swiss spatial development policy and hence also with the desire for a more economic approach towards the resource that is land.

Methods

The Land use statistics are based on high-resolution aerial photographs, which cover the whole of Switzerland's territory and which are made available to the FSO by the Federal Office of Topography. A grid with sample points spaced 100 meters apart overlays the photographs, providing 4.1 million sample points on which the statistics are based. Interpretation work



Left: Aerial photograph with sample points and interpretation keys Right: Aerial photo interpretation using three-dimensional image reviewing

ascertains land use and coverage for each individual point. 72 land use categories are available for use, each of which can be allocated to one of the four main categories; settlement and urban areas, agricultural areas, wooded areas and unproductive areas. Land use classification takes place through visual interpretation of photographs on a 3D screen.

Survey years

With the publication of the present results, a time series of four methodologically harmonised surveys is now available. It is based on aerial photographs from the following years:

- 1979-1985 (1st survey, simplified description: 1985)
- 1992-1997 (2nd survey, 1997)
- 2004-2009 (3rd survey, 2009)
- 2013-2018 (4th survey, 2018)

The first three surveys were conducted roughly 12 years apart after which the interval was shortened to nine years. The data are published by region and in the order in which the aerial photographs were taken (always starting in South-West Switzerland). Data for the whole of Switzerland are ready for publication just under three years after the last aerial photographs have been taken.

New: Use of artificial intelligence

For the fifth survey, which began in summer 2021, photo interpretation was carried out using self-learning algorithms (artificial intelligence) for the first time. The interval between surveys will in future be shortened to six years.

Nine football pitches a day are lost to building development

The extent of land use change becomes clearer when instead of looking at percentage shifts, the evolution of the individual areas is considered. Settlement and urban areas, for example, grew between 1985 and 2018 by 776 km² or 31%. For every day of this 33-year period, an average area equivalent to nine football pitches was built on for the first time (this includes green areas within settlements such as gardens or parks) (G6). The rate of settlement growth, has abated somewhat over time: Although settlements were still growing by 10 football pitches a day between 1985 and 1997, between 1997 and 2009 this number had fallen to nine and between 2009 and 2018 to eight per day.

The total increase in wooded areas between 1985 and 2018 was 589 km² (+5%), equivalent to seven football pitches per day. Rewooding slowed down considerably from the first to the second observation period, after which it gained pace again. Agricultural areas shrank between 1985 and 2018 by a total of 1143 km² (-7%), equivalent to an average of 13 football pitches per day. In just over three decades, cultivated land of around twice the surface area of Lake Geneva was lost. This trend also slowed down initially, only to speed up again later. Here, as was the case for wooded areas, this temporary weakening of the long-term trend was partly related to changes in agricultural policy (see chapter 3). Lastly, unproductive areas declined between 1985 and 2018 by 222 km² (2%), equivalent to just under three football pitches per day.

New settlements in the Mittelland. new forests in the mountains

Settlement growth mainly concerned lower-lying parts of the country, above all the Mittelland, the valley floors of Valais and the Alpine Rhine as well as the Magadino plateau and south Ticino (G7, page 10). New forests and woods, in contrast, arose in the Alps in particular. Some 19% of the Swiss territory had a different use in 2018 to the one it had as recently as 1985 (change at the level of the 72 land use categories, see insert on page 8). Larger, contiguous areas without change are found almost exclusively in high alpine regions, where unproductive areas such as rock, boulders and glaciers dominate.

Change in land use in football pitches¹ per day

Increase and decrease by main category and observation period



Source: FSO - Land use statistics (AREA)

Land use change as a giant zero-sum game

The net increases and decreases of the individual main categories cited above are the result of a complicated zero-sum game, in which each category wins or loses certain areas at the cost of or in favour of other categories. Although new settlement and urban areas appeared, for example, at the same time others disappeared.

The graphic representation of the transfer of areas between the four main land use categories (G8, page 10) shows that the growth of settlement and urban areas took place almost exclusively at the cost of agricultural areas. Wooded areas also grew at the large expense of agriculture. Here, as already mentioned, the change took place essentially at higher altitudes, where abandoned alpine pastures and meadows first became unproductive vegetation and were subsequently taken over by forest.

Main newly emerged uses, 1985-2018

G 7

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G 8



Source: FSO - Switzerland's Land Use Statistics (AREA)

Converted land areas 1985-2018

Transfers between the 4 main categories



Source: FSO - Land use statistics (AREA)



2 Settlement and urban areas: towns and villages continue to grow, but at a slower pace

Switzerland is becoming increasingly built-up. Between 1985 and 2018, settlement and urban areas increased by almost a third across the country. Residential areas grew by as much as 61% – twice as fast as the population. However, settlement growth has slowed slightly in the last three decades.

In 2018, settlement and urban areas occupied 3271 km² in Switzerland as a whole. This represents 8% of the total national territory, roughly equal to an area the size of the canton of Vaud. Settlement and urban areas comprise not only buildings in the strict sense, but also all facilities and infrastructure related to housing, work, recreation and mobility – including diverse green areas such as gardens or public parks.

Housing and mobility take up the most space

The largest category within settlement and urban areas is the residential area, with a 35% share in 2018 (G9). In addition to residential buildings and garages, the residential area encompasses surrounding areas such as driveways, open spaces, lawns, and gardens, etc. The transportation area also took up much space, accounting for a 30% share comprised mainly of roads but also railway and airport areas. Industrial and commercial areas had a much smaller percentage share (8%), as did other building areas, which are comprised in particular of public and agricultural buildings; in 2018, they accounted for around 16% of settlement



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and urban areas. Recreational areas and cemeteries, which in addition to parks also include cemeteries, playgrounds and sports fields as well as allotments, accounted for a 6% share and special settlement areas for 5%. The extremely diverse category 'special settlement areas' includes infrastructure facilities such as power stations and waste water treatment plants, but also dumps and temporary installations such as construction sites or gravel pits.

The proportion of settlement and urban areas in the total surface area greatly depends on the topography. The relatively flat Mittelland is by far the most densely populated region; in international comparison it is also considered a highly populated region. Here, settlement and urban areas covered some 17% of the entire surface area in 2018, whereas the corresponding share in the Jurassic Arc was only about half (8%), and in parts of the Alps hardly rose above 2% (G10, page 11).

Almost a third larger in three decades

Between 1985 and 2018, settlement and urban areas in Switzerland increased by 776 km² or 31% (G11). Thus, in three decades an additional area almost the size of the canton of Neuchâtel was built on. However, during this period settlement growth gradually slowed down. Whereas in the period between 1985 and 1997, an annual average increase in settlement and urban areas of 27 km² was seen, between 1997 and 2009 this figure had fallen to 23 km² and between 2009 and 2018 to 20 km² (cf. also page 9).

Between 1985 and 2018, growth in settlements was strongest in the agglomeration belts and in the major conurbations, such as the Olten-Winterthur-Lucerne triangle or between Geneva and Lausanne (G12). But settlement and urban areas also saw considerable growth in the rural areas of the Mittelland (in the Fribourg area and in the Lake Constance region), in the alpine valley plains and in parts of the Jura and the northern flank of the Alps. In the western Central Alps (Valais) at 49% the increase was even higher than the national average.



Settlement and urban areas by type of use G 11

Source: FSO - Land use statistics (AREA)

Not all types of settlement and urban areas grew at the same pace. Between 1985 and 2018, the residential area grew most – in terms of both absolute figures and percentage – namely by 434 km² or 61% (G13, page 13). The area used for housing, therefore, grew considerably faster than the population (see page 14). Recreational areas and cemeteries also showed high growth rates with +46% (see also page 16 and 17) as did industrial and commercial areas with +41%. Much weaker growth was seen in the increase of the transportation area with +19% and other building areas with +14%. Over the observation period, the rise in the transportation areas was much weaker than that of



Source: FSO – Switzerland's Land Use Statistics (AREA)



Housing and industrial buildings are built on farmland (La Chaux-de-Fonds NE).

[©] FSO 2021

vehicle stocks and kilometre performance (see page 16). Special settlement areas even saw a 15% decline between 1985 and 2018. This was because several motorway sections were completed at this time and the corresponding major road works closed. In many places, gravel pits and dumps were also revegetated or rewilded.

Growth especially at the cost of cultivated land

Nine tenths of the new settlement and urban areas were built between 1985 and 2018 on former agricultural areas. Just one tenth were built on land that had previously been covered with forest or woods or on so-called unproductive land (G14). This can be explained by the fact that existing settlements are usually surrounded by agricultural areas. Agricultural land does not enjoy the same legal protection as the forest, where a legal obligation exists to offset forest clearing. Unproductive areas on the other hand are mainly found in remote places and are therefore hardly affected in terms of surface area by the expansion of the built environment.

The type of usage that most frequently had to make way for new building developments depends on the type of the new settlement and urban area. Industrial and commercial areas,

Newly created settlement and urban areas 1985–2018 by previous use



Total: 874 km² newly created settlement and urban areas (gross increase: Revegetating and rewilding of existing settlement and urban areas have not been deducted)

Source: FSO – Land use statistics (AREA) © FSO 2021



Reading aid, industrial and commercial areas: Between 1985 and 2018, new industrial and commercial areas were built on an area totalling 111 km². This increase in area was made at the cost of former arable land and meadows in particular. But many new industrial and commercial areas (around a quarter) were also built on areas that had previously been used as settlement and urban areas. Between 1985 and 2018, area gains were offset by losses totalling 36 km². Generally, the former industrial and commercial areas were still being used as settlement and urban areas, respecial urban areas, etc.) in 2018. If we deduct the losses in area from the gains (net result), we see that industrial and commercial areas expanded by a net area of 75 km². This is a change of +41%.

Source: FSO - Land use statistics (AREA)

Growth in the different types of settlement area, 1985-2018

Newly created areas by previous use - lost areas by new use - change difference

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G 13

for example, grew in particular at the expense of the most fertile agricultural areas, arable land (G13, centre). This is in no small part due to the fact that for large industrial buildings only very flat regions are generally considered. These same regions are also ideal for arable farming. The situation is different for residential buildings, as hillsides are suitable for their construction and due to good views and sunlight exposure can be especially sought after. As the new residential buildings there are mostly built on former meadows, farm pastures, orchards or vineyards, these categories together account for more than half of all usages superseded by the new residential area.

Rewilding and repurposing

Settlements are dynamic entities. Although in many places they increase in size, occasionally settlement and urban areas "disappear", i.e. they are returned to another form of usage (G13, left-hand side). Such revegetating or rewilding has already been mentioned above in relation to abandoned gravel pits and dumps. They are, however, the exception to the rule: The total settlement and urban area that disappeared between 1985 and 2018 was a relatively modest 97 km².

A larger area was concerned by shifts between the different types of settlement and urban areas: A total of 262 km² of settlement and urban areas was used for another of the six different types of usage than was the case in 1985.

The population is growing – the residential area even more so

The 61% increase between 1985 and 2018 in the residential area (residential buildings and surroundings) mentioned above means that the area used for housing increased in the past three decades almost twice as much as did the population (+32%) (G15). While in 1985 residential space consumption was 110 m² per person, by 2018 this figure had risen to 134 m². The main reasons for this are people's increasing expectations in terms of dwelling size as well as a rise in small households of only one or two people. These trends have also led to a considerable increase in the living space per person (occupied interior surface) since the 1980s (1980: $34m^2$, 2018: $46m^2$, according to the FSO Building and dwelling statistics).

The disproportionate growth in residential areas compared with the population was offset by disproportionately low growth in other building areas, transportation areas and special settlement areas between 1985 and 2018 (cf. G13 page 13). For this reason, at +31%, overall settlement and urban areas grew at roughly the same pace as the population. Accordingly, the consumption of

Growth in settlement areas



¹ Data only collected for 1985, 1997, 2009 and 2018, which are the final years of respective multi-year survey periods

Sources: FSO – Land use statistics (AREA), Population and Household © FSO 2021 Statistics (ESPOP 1985-2010, STATPOP 2011–2018)



A multi-family house is built on former arable land (Bauma ZH, 1988/2018).



settlement and urban areas per inhabitant also remained almost unchanged. In 2018 it was 396 m², compared with 391 m² in 1985. In the years in between, however, it hardly rose above the 400 m² mark.

First signs of dense building

Despite the rapid growth in residential areas in the past three decades, statistical signs of a trend reversal can also be discerned towards a more economic use of the sparse land resources. The annual growth rates of single and two-family houses, which are especially wasteful in terms of land use, have actually declined in recent decades, while they have risen considerably for the space-saving multi-family houses. Proportionally, the fewest new single and two-family houses were built – unsurprisingly – in the urban centres and the surrounding fringe, where suitable building zones are rare and land prices are high (G16). The reduction in size of the land surrounding buildings can be seen as another indication of dense building. This can be observed at least for single and two-family house. While the building area to surrounding land ratio was 1:4.6 in 1985, it had fallen to 1:4.2 by 2018.

The trend towards a better utilisation of the residential area is confirmed further by the Buildings and Dwellings statistics, which also show a shift in construction activity in favour of (larger) multi-family houses. Residential buildings constructed between 2016 and 2019 have on average almost twice as many dwellings (4.1) as those built between 2001 and 2005 (2.1). Between 1981 and 2000 the average value was 2.4 dwellings per building.

Industry and commerce are moving to the agglomeration belt...

Between 1985 and 2018, new industrial and commercial areas were mainly built in the agglomeration belts and close to motorway connections (G17). In particular transport and logistics firms, which need a lot of room for warehouses and vehicles, prefer to establish themselves close to motorways and railway lines.

... and disappearing from inner cities

Contrary to the general trend of growing industrial and commercial areas, in some places a reverse trend can be observed – especially in inner city or periurban areas where industrial and commercial areas have frequently declined, in some cities (Zurich, Basel, and Winterthur) to a marked extent. The "deindustrialisation" of city centres was already at its peak in the 1970s with the disappearance of traditional industrial areas (mechanical engineering or the textile industry, for example). The widespread conversion of these areas, however, only began in the 1990s, as the transition from agricultural area to building land in the towns reached its limits. The industrial and commercial areas abandoned between 1985 and 2018 were replaced essentially by new housing (26%), other building areas (22%) and transportation areas (18%). A substantial portion of them, however, are still waiting for a new purpose (empty buildings, cleared grounds and construction sites).

Share of single and two-family houses, 1985 – 2018 G16



Source: FSO - Switzerland's Land Use Statistics (AREA)

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Industrial and commercial areas, 1985–2018 G 17



Source: FSO - Switzerland's Land Use Statistics (AREA)



Agriculture gives way to sport: construction and extension of the National Youth Sport Centre (Tenero TI).

More roads, but much more traffic

In recent decades many new roads have been built and existing sections extended, mainly to connect the newly built residential, industrial and building areas to the road network. Across Switzerland, the road areas (traffic lanes and corresponding areas of grassland) grew by 124 km² between 1985 and 2018, equal to five times the surface area of the Walensee. Nevertheless, expressed as a percentage, at +18%, the growth in the road areas is nowhere near that of the motor vehicle stock at +90% and of kilometre performance (kilometres covered by motor vehicles) at +59% (G18). Today there is considerably less road surface available per vehicle than was the case thirty years ago. With an increase of 68% between 1985 and 2018, above-ground parking areas have kept more in pace with the growth of the vehicle stock.

More space for playing golf, less for gardening

As we have already seen, recreational areas and cemeteries grew overall by 46% between 1985 and 2018. But a breakdown by individual types of use reveals major differences (G19). Extremely strong growth can be seen for golf courses, whose area more than quadrupled in the observation period (+325%). More than two-thirds of this increase took place, however, between the surveys of 1997 and 2009: since then the 'golf boom' seems to have diminished somewhat.

Other sports facilities also increased greatly between 1985 and 2018 (+40%) as well as public parks (+49%). In the same period only weak growth was seen in contrast for camping areas (+13%) and cemeteries (+8%); garden allotments even decreased in size (-13%).

Change in road areas compared with road traffic



road motor vehicles excl. mopeds

² vehicle-kilometres travelled in passenger and goods transport

motorways, roads and paths; with green road environs, but without parking spaces. Data only collected for 1985, 1997, 2009 and 2018, which are the final years of respective multi-year survey periods

Sources: FSO – Land use statistics (AREA), Goods transport statistics (GTS), Passenger © FSO 2021 transport performance (PV-L); FSO, FEDRO – Road vehicle stock (MFZ)

Recreational areas and cemeteries by type of use G 19



Source: FSO - Land use statistics (AREA)

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G 18

Almost two-thirds of settlement and urban areas are "sealed"

The green spaces within settlements are not only limited to the aforementioned recreational areas and cemeteries. Also private gardens, the often lushly planted land surrounding houses, the green strips alongside roads, etc., ensure that settlements are much more than a mosaic of tarmac and concrete. Settlements sometimes surpass areas used for agricultural or forestry in terms of biodiversity. Nevertheless, in 2018 almost two-thirds of settlement and urban areas, i.e. 63%, were "sealed". This term is used to describe soils that have been covered with non-porous materials, thus robbing them of the majority of their ecological function (filtering and retaining water, breakdown of pollutants, etc.). The degree of sealing varies by type of settlement area and is particularly high (88%) for industrial and commercial areas as well as for transportation areas (85%) (G20). Comparatively very low values are shown, unsurprisingly by recreational areas and cemeteries (23%) as well as special urban areas (32%). The low degree of sealing of special urban areas can be explained by the fact that this category includes building sites, guarries and dumps which contain much open soil - which is, however, seldom "green".

Sealing has recently gathered speed again

In parallel to settlement growth, sealed areas have increased greatly in the past decades rising from 1487 km² in 1985 to 2081 km² in 2018 (+594 km²). While during the period between 1985 and 1997, an average of 19.4 km² soil was sealed for the first time per year, this value fell in the period 1997–2009 to 16.9 km², only to rise again in the most recently available observation period, the years between 2009 and 2018 to 17.6 km² (G 21). The trend in recent years, therefore, has taken a different direction to that envisaged in the "Swiss National Soil Strategy" approved by the Federal Council. The strategy's first goal is namely to reduce net annual land consumption to zero by 2050, using the degree of soil sealing as an indicator.¹

Degree of soil sealing of the different settlement areas, 2018



Source: FSO - Land use statistics (AREA)

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G 20

Annual increase in sealed surfaces

Average annual increase by observation period and type of sealed surface G 21

Square kilometres (km²)



Source: FSO - Land use statistics (AREA)

¹ Soil sealing as an indicator for land consumption will be replaced at a later stage by a national land function map. See: Swiss Federal Council (2020): Swiss National Soil Strategy, Bern, p. 22.



3 Agricultural areas: reduction of over 1000 km² in three decades

Between 1985 and 2018, agriculture across Switzerland lost an area roughly twice the size of Lake Geneva: in low-lying areas to new settlements and in the mountains to forest. Recently this trend has even gathered pace. Nevertheless, in 2018 more than one in every three square metres of land continued to be used as agricultural land.

Despite growing pressure from settlements, in large parts of Switzerland the landscape is still shaped by agriculture. With an expansion of 14 535 km² and a 36% share in Switzerland's surface area, in 2018 cultivated land represented the largest of the four main categories of land use. According to the Land use statistics, agricultural areas comprise all areas that are used for the commercial production of plant and animal based food. Greenhouses are also included, but household gardens and agricultural buildings such as farmhouses, barns or sheds, which count as settlement and urban areas, are not.

70% of agricultural areas are grass

Large parts of Switzerland are relatively high-lying areas and from an agricultural point of view, due to climate, topography or soil composition, are suited exclusively or predominantly to the keeping of livestock. Consequently, and grassland in the form of natural meadows and farm pastures account for the majority of this cultivated land together with the alpine agricultural area. In 2018 these two types of land use accounted for about a third of the total agricultural area (G22). "Farm pastures" are pastures in permanent settlement areas, i.e. where livestock (excepting the summer period when cattle are in alpine meadows) are usually





kept and are thus "on the farm". At 27%, arable land also accounted for a considerable part of agricultural areas, whereas the share of orchard, vineyard and horticulture areas at 3% was relatively small.

In 2018, in the Mittelland and in the Jura, the percentage of agricultural areas in the total surface area, at 48% and 42% respectively, were higher than the national average. In contrast, in the western Central Alps, at 18% and on the southern flanks of the Alps, at 12%, they are clearly below it (G 23, page 19).

Switzerland's arable areas are found almost exclusively (94%) in the Mittelland and in the Jura, where they account for 57% and 31% respectively, of the agricultural area (G24). In the alpine regions, in contrast, cattle farming clearly predominates, with meadows and (alpine) pasture accounting for 88% to 99% of land. Furthermore, in the western Central Alps, orchard, vine-yard and horticulture areas are relatively well represented (9%). This is mainly accounted for by the extensive wine-growing area in Lower Valais.

Continuing losses

Between 1985 and 2018 agricultural areas across Switzerland declined by 1143 km² or 7% (G 25). This means that in three decades arable land equivalent to an area roughly twice the size of Lake Geneva was lost – mostly to settlement and urban areas and forests (see below).

The loss of agricultural land was particularly rapid in the observation period 1985–1997: At that time an average of 43 km² of agricultural area was lost every year in Switzerland (G26). Between 1997 and 2009, at 27 km² per year, the loss was considerably lower. Changes to agricultural policy probably contributed to this slowing down. Thanks to the instrument of direct payments introduced in 1999 as payment for public and environmental services, farmers were given an incentive to continue farming alpine agricultural areas that had previously been regarded as unprofitable and in some cases to use again areas that had become overgrown. The most recent observations available, however, show that losses have once again gained pace. Between 2009 and 2018 an average of 33 km² of agricultural area had to make way for other uses, representing an annual loss the size of Lake Brienz.

Particularly sharp decline in southern Switzerland

The decline in the agricultural area between 1985 and 2018 concerned all biogeographic regions of Switzerland – but to varying degrees (G 27, page 21). In terms of percentage, the losses were greatest on the southern flanks of the Alps with –20% and in the western Central Alps with –14%. The Jura and the northern flanks of the Alps, however, with declines of –4% and –5% respectively, were comparatively stable. Losses in the Mittelland, with –8%, were roughly in line with the nationwide mean of –7%. In absolute figures, losses were most marked where the largest reserves of arable land are found, namely in the Mittelland with –450 km² and



Agricultural areas by type of use

G25

G 26



Annual change in agricultural areas

Average annual change by observation period





Agricultural areas by biogeographical regions,

Growth in the different types of agricultural area, 1985-2018

Lost agricultural areas by new use - newly created agricultural areas by previous use - net change

G 29



Reading aid, arable land: Between 1985 and 2018, new arable land was created on an area totalling 320 km2. This gain in area was largely at the cost of other agricultural types of use. Between 1985 and 2018, area gains were offset by losses totaling 802 km². In 2018, 516 km² of the lost arable land continued to be used for agriculture, the remainder was mostly (266 km²) converted to different types of settlement area (industrial and commercial areas, residential area, other building areas, and transportation areas). If we deduct the losses in area from the gains (net result), we see that arable land during the period declined by a net area of 482 km². This is a change of –11%.

Source: FSO - Land use statistics (AREA)

on the northern flanks of the Alps with -209 km². Areas with the most pronounced losses were the Olten-Zurich-Lucerne triangle, the Lake Geneva region as well as Lower Valais and Fribourg region (G 28, page 21).

Major losses of arable land and orchard, vineyard and horticulture area

A breakdown of agricultural land lost from 1985–2018 by type of land use shows that – in absolute figures – the decline in arable land with a total of –482 km² was the greatest (G29, page 21, right hand side of the graph). At the same time, the alpine agricultural area showed a loss of 401 km² and the orchard, vineyard and horticulture area one of 257 km². For the comparatively small category of the orchard , vineyard and horticultural area, the above-mentioned loss was equivalent to a reduction in the cultivated area of a staggering 35%. This is much greater than the percentage loss of arable land (–11%) and the alpine agricultural area (–7%). The greatest loss in the orchard, vineyard and horticulture area took place between 1985 and 2009; since then the decline has slackened (see G26, p. 20). The area covered by meadows and farm pastures remained practically unchanged between 1985 and 2018.

What replaces lost agricultural land?

Among agricultural areas that underwent a change in use between 1985 and 2018, and which consequently "disappeared", just over half (52%) became settlement areas, above all residential areas (22%) (G30). On 30% of repurposed land, new forests and woods grew, 18% became unproductive areas.

Meadows and farm pastures were the most affected by repurposing to settlement areas (358 km² between 1985 and 2018), followed by arable land (266 km²) and orchard, vineyard and horticulture areas (124 km²) (G29, page 21). New forests and woods grew primarily on alpine agricultural areas (280 km²) but also on former meadows and farm pastures (142 km²). Where cultivated land became an unproductive area, mainly alpine agricultural Lost agricultural areas 1985-2018 by new use G 30 Industrial and commercial areas Residential area Other building areas Transportation areas Other settlement and urban areas Forest and woods Unproductive areas 18% 0% 10% 20% 30% Total: 1 493 km² lost agricultural area (gross losses: newly cultivated areas are not included)

Source: FSO – Land use statistics (AREA)

areas were concerned (235 km²). This was mainly alpine meadows and pasture that became grown over with bushes and scrub, which is essentially the first stage of reforestation.

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The cartographic representation of the newly emerging uses (G31, page 23) shows particularly clearly that a distinction can be made between two – also spatially separated – main forms of cultivated land loss. Whereas agricultural areas in the Mittelland and the valley floors mostly made room for new settlements, in the mountainous alpine regions, scrub encroachment dominates. Where it is no longer profitable, farming of alpine meadows and pastures has been abandoned, resulting initially in the growth of scrub (unproductive vegetation) and later that of woods and forests (see also page 27).



A larch forest grows on a mostly neglected and therefore bush-encroached alp (Arbedo-Castione TI, 1987/2019).

Lost agricultural areas: main newly emerged uses, 1985-2018

G 31



Source: FSO - Switzerland's Land Use Statistics (AREA)

When fields become meadows and meadows fields

The fact that agricultural areas, as seen above, have developed very differently depending on the type of use (arable land, meadows/pastures, alpine agricultural areas, orchard, vineyard and horticulture areas) is not only due to a stark repurposing as settlement area or forest. Often, even more decisive are the type and direction of the quite pronounced "internal transfers" of cultivated land between the various agricultural uses (see G29, page 21, yellow bars). Overall, in 2018 1100 km² of agricultural areas was dedicated to a different use type (out of the four use types) than in 1985. At the same time signs of both an intensification and expansion of the agricultural land use could be observed: Mixed crops such as traditional fruit tree orchards were replaced in many places by specialised forms of cultivation and in some areas additional fields, greenhouses, intensive orchards and vineyards bear testimony to more intensive farming. Conversely, many former arable areas are used today for more extensive livestock farming, in particular for suckler cows or horse keeping. The repurposing of arable fields to meadows was particularly marked (following agricultural policy reforms) in the observation period between 1997 and 2009, when the area of meadow and pasture land even increased (G26, page 20).

Some places even saw some new agricultural areas

Contrary to the general trend, in some places, the agricultural area was able to expand between 1985 and 2018 (see G29, page 21). Through the clearing of woods, brush forest, woodland pasture and scrub alpine agricultural area, meadows and farm pastures have been re-established in some places. Furthermore, the mild winters of recent years and the consequent early thawing have allowed previously unproductive vegetation to grow more densely at higher levels, rendering it partly usable as pasture and thus repurposing it as agricultural land. At lower altitudes, however, in some places gravel pits,, dumps and large building sites have been closed and the resulting areas then re-cultivated.

Efforts to preserve standard fruit trees bear fruit

As late as the middle of the 20th century, vast standard fruit tree orchards characterised the landscape in many regions of Switzerland - especially in Thurgau, Baselland or around Lake Zug. Their fruit was an important supply of food in winter, stored in the cellar or preserved as dried fruit. Often, an even greater portion of the harvest was fermented and consumed in the form of cider or brandy. In the 1950s however, field fruit areas declined rapidly. There were many reasons for this decline: Some standard fruit tree orchards were replaced by low-maintenance bush fruit trees, others impeded the mechanical cultivation of meadows and fields, and many - because they often stood at the edge of settlement areas - had to make way for new residential and commercial buildings. Often disease led to clearing of trees. In 1985, the first survey year of the modern Land use statistics, there were still 450 km² of traditional orchards in Switzerland (G32). A guarter of a century later, in 2009, not even half of that was left (221 km²).

Nowadays, however, standard fruit trees are more highly valued again, for scenic and ecological reasons, and the Confederation also encourages their cultivation financially by means of direct payments. Efforts to preserve standard fruit trees seem to be bearing fruit: In the nine years between 2009 and 2018, the area of field fruit trees across Switzerland declined by only 22 km² to 199 km² and in many places standard fruit tree orchards have recently been re-established.

Cultivated land under glass and foil: Greenhouse areas on the rise

Plant cultivation does not only take place under the open sky: Vegetables, lettuces, and berries are increasingly grown in greenhouses in this country too. This type of cultivation makes larger harvests possible and extends the vegetation period, on the other hand it often interferes with the landscape.

The area covered by greenhouses in Switzerland doubled between 1985 and 2018, from 5 to 10 km² (G33). This figure includes all permanent glass and foil constructions on agricultural areas. Larger, local concentrations of greenhouses are found in the canton of Geneva, in the Seeland region in the cantons of Bern and Fribourg, in the north-west of the canton of Zurich, in the Lake Constance region as well as in Lower Valais and in the Magadino plain.

With the growing pervasiveness of greenhouses and the gradually emerging possibility in the near future of high-tech indoor agriculture (vertical farming), the traditional understanding of agricultural land as freshly ploughed fields and green meadows may one day be out of step with reality. In this event, the categories of the Land use statistics will also need to be adapted to the new circumstances.

Field fruit tree areas (standard fruit trees)





Greenhouse areas

Permanent glass and foil constructions on agricultural areas



Source: FSO - Land use statistics (AREA)

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G 33



Over time a greenhouse complex has grown on arable areas (Niederbipp BE).



4 Wooded areas: the forest is reclaiming lost ground

Almost a third of Switzerland is covered by forests and wooded areas. Between 1985 and 2018 these gained additional areas totalling 589 km² (+5%), corresponding to an area nearly the size of Lake Geneva. Almost exclusively, the increases concerned mountain areas in which trees grew again in abandoned alpine agricultural areas and where signs can be seen of a rising treeline due to climate change.

Areas known as "wooded areas" are all covered by trees and larger woods, with the exception of fruit tree areas as well as trees growing within parks and gardens. In 2018, wooded areas covered a total of 13 134 km². This is almost a third (32%) of Switzerland's territory.

The majority of wooded areas, i.e. 88%, was accounted for by forests in the strict sense, the rest by brush forest (5%) and woods (7%) (G 34). Forests are larger, enclosed or sparse stocks of trees



with a height of more than 3 metres. Brush forests, in contrast, are made up of smaller, shrub-like trees such as green alder, dwarf mountain pine or certain types of willow. They are found exclusively in the alpine space, often close to the treeline. Woods include hedges as well as small groups of trees, for example surrounded by cultivated land or along watercourses.



Source: FSO - Switzerland's Land Use Statistics (AREA)

Much forest in the south and the Jura

In Switzerland, the regions with the most trees are the southern flanks of the Alps and the Jurassic Arc (G35) where wooded areas accounted for roughly half of the total area in 2018. Forests and woods covered around a third of the land area on the northern flanks of the Alps. In the Mittelland and the Central Alps they covered about a quarter.

Depending on the altitude, soil composition, and forestry use, the predominant types of forest in a given locality vary widely: from damp alluvial forests to typical beech groves or alpine conifer forests. The amount of space occupied by wooded areas in lower lying areas is dictated by humans in how they use the land. In higher lying areas, in contrast, it is mostly nature that curbs the expansion of forests in the form of the climate-governed treeline. Depending on the situation and exposure, in Switzerland this stands at roughly between 1800 and 2200 metres above sea level.

Wooded areas have recently started to expand faster

For many centuries, forests in Switzerland were driven back ever further. In addition to increasing the arable and pasture land, the forest was also cleared to obtain wood for fuel, construction and later for industry. This trend was reversed in the mid-1800s, when thanks to the coming of the railways, large amounts of cheaper coal could be imported, thus replacing to an ever-growing extent the use of wood for fuel. Furthermore, in 1876, due to the effect of repeated natural disasters, the Confederation issued a prohibition of forest clearing and ordered the large-scale reforestation of protective forests in mountain regions. To the present day, the Forest Act requires compensation for forest clearing, provided that the clearing is not of areas that have grown recently, and in addition to forestry utilisation and protection from natural hazards, also mentions recreation ("well-being") as one of the forest's important functions.

Forest regrowth in Switzerland also continued slowly but surely throughout the period observed in the modern Land use statistics between 1985 and 2018. Altogether, in the space of just over three decades, wooded areas increased by 589 km² or 5%. This growth was u-shaped: while wooded areas grew every year between 1985 and 1997 by 23 km² on average, this figure dropped in the following observation period (1997-2009) to 10 km², only to rise again in the most recent period (2009-2018) to 22 km² per year. The considerably slower expansion of wooded areas between 1997 and 2009 could be explained, amongst other things by the agricultural direct payments introduced in 1999. These created an incentive for farmers to start using alpine agricultural areas again that had previously been practically unviable, instead of letting them gradually become overgrown with trees. As will be explained below, the increase in the wooded area in the long term is mainly due to the alpine agricultural area becoming overgrown.



Wooded areas, 1985–2018

G 37





Wooded areas (forest and woods) by altitude

Source: FSO - Land use statistics (AREA)

Increases almost only at higher altitudes

The expansion of wooded areas between 1985 and 2018 took place first and foremost in the pre-Alps and Alps (G37, page 26). The regrowth of forests was particularly marked on the southern flanks of the Alps (Ticino, Val Mesolcina and Val Calanca), in the Gotthard region (Uri, Surselva and Goms) and in parts of lower Valais. Overall one can say that: The higher the location, the greater the percentage increase in the wooded area (G38, page 27). In zones higher than 2000 metres above sea level, i.e. in the region of the treeline, the wooded area has grown by a third and more. Below 1000 metres, however, the size of the wooded area has remained fairly stable.

Scrub encroachment of alpine pastures and rise of the treeline

The expansion of wooded areas in higher locations is mostly due to the overgrowing of alpine agricultural areas: When meadows and pastures are no longer regularly mowed or grazed by cattle, shrubs and bushes, and later forests, grow on them.

Growth in the different types of wooded area, 1985-2018

Newly created areas by previous use - lost areas by new use - net change



Newly created wooded areas (forest and woods) 1985–2018 by previous use



have not been deducted)

Source: FSO - Land use statistics (AREA)

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G 40

G 39

Forest (excl. brush forest) Net result: Percentage change: Lost forest by new use +814 km² +583 km² +5% -231 km² Newly grown forest by previous use Brush forest +177 km² +59 km² +10%-118 km² Woods +385 km² -53 km² -438 km² - 600 km² - 400 km² – 200 km² 0 km² 200 km² 400 km² 600 km² 800 km² 1000 km² Other agricultural areas Settlement Alpine Unproductive areas¹ Other wooded areas (permanent settlement zoned) and urban areas adricultural area Reading aid, forest: Between 1985 and 2018, new forest grew on an area totalling 814 km². These gains in area were mostly at the cost of other wooded areas (brush forest and woods),

of unproductive areas and alpine and other agricultural areas. Between 1985 and 2018, area gains were offset by losses totalling 231 km². If we deduct the losses in area from the gains (net result), we see that forest expanded by a net area of 583 km² during the observation period. This is a change of +5%.

¹ especially bushes, shrubs and weeds, boulders, and sand

Source: FSO - Land use statistics (AREA)

sharp percentage increase in wooded areas above 2000 metres (see above). This is nothing more than proof that the natural treeline has risen in recent decades.

A precise breakdown shows that between 1985 and 2018, some 52% of newly wooded areas grew on previously unproductive land, 29% on former alpine agricultural areas and 17% on (also at mostly higher altitudes) agricultural areas in the permanent settlement zone (G39, page 27). The high proportion of unproductive areas is in many cases the result of the reforestation of agricultural areas. This is because when a meadow or pasture becomes a forest, initially small shrubs and bushes grow on it and in the statistics, appears for a certain amount of time as an "unproductive area". Only once it has become covered with larger groups of trees does it become "wooded". A similar succession takes place after mudflows and landslides.

After many years of decline: signs of a trend reversal in woods

Woods are a particular form of wooded area and include – as seen at the start of the chapter – hedges and individual groups of trees which are surrounded by agricultural or unproductive areas. In contrast to forests and brush forests the total surface areas of woods declined between 1985 and 2018, by 53 km² or 5% (G 40, page 27). More than half of this decline is due to bush encroachment. Over time, the woods expanded, until eventually enclosed forests or brush forests had developed. Conversely, in many places woods were cleared to prevent the development of forests or to make it easier to farm the land mechanically by removing any obstacles. The decline of the woods is one of the reasons why the once structurally rich Swiss agricultural landscape has in many places become poorer, from both an aesthetic and ecological point of view.

However, a closer look at the timescale of this decline reveals that only the period between 1985 and 2009 is concerned (-93 km²) and that since that time woods have again increased (+40 km). Although the expansion primarily concerns groups of trees surrounded by unproductive and agricultural areas in higher locations, lower lying woods have also recently gained some ground in lower lying cultivated land. One of the reasons for this may be the "biodiversity contributions", a direct payment instrument that compensates farmers financially for cultivating hedges, copses, riparian woodlands, and wooded pasture.



Trees are growing again in the alpine pasture hamlet (Bregaglia GR)

Climate change as a challenge to the forest

In terms of surface area, the Swiss forest has kept up well in recent years. More than that – as we have seen, it has even expanded. Its extensive legal protection should continue to protect wooded areas effectively in the future from growing pressure from settlements. But the forest in its current form faces another sort of danger, namely from the accumulation of periods of drought and heatwave associated with climate change. In recent years these have already had an adverse effect on several tree species. In many places, the extremely dry summers of 2018 and 2019 caused the death of spruce and beech trees in particular and at least in the short term weakened the forest so that it is more susceptible to disease, pests and gales. The Land use statistics, however, can only provide rudimentary information on forest health.¹

Data on forest health is provided in particular by the Swiss Forest Protection unit (WSS) as well as by the "Long-term forest ecosystem monitoring program" (LTER), which are both units of the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL).



5 Unproductive areas: glaciers continue to shrink

Almost a quarter of Switzerland's territory is used for neither agriculture, forestry, nor settlement. These "unproductive areas" include in particular large parts of Switzerland's mountains above the treeline. However, such areas are also subject to a certain degree of change: for example, between 1985 and 2018, the surface area of glaciers diminished by almost a third.

In the Land use statistics, the term "unproductive areas" describes land where no forest grows, land that cannot be cultivated due to low yields, and land which cannot be settled due to hostile conditions. In 2018, unproductive areas accounted for 10 361 km² of Switzerland's territory. However, "unproductive" does not mean worthless. In fact, quite the opposite is true. In the form of mountain massifs, glaciers, lakes or wetlands, unproductive areas contain some of Switzerland's most beautiful landscapes – areas of high value, from an ecological aspect but to no small extent also in terms of tourism. A large part of the water bodies are used to generate electricity. More than half of the electricity produced in Switzerland comes from hydropower stations.



Source: FSO - Land use statistics (AREA)

Many unproductive areas in the alpine space

Almost half of the unproductive areas consists of rock and boulders, known as "bare land", which is found almost exclusively in the mountains (G41). Just over a quarter of the unproductive area is covered by unproductive vegetation, i.e. primarily alpine grasses and herbs, shrubs, bushes, wetlands etc. The remaining quarter is formed of standing water and rivers as well as permanent snow in the form of glaciers and firn fields. In relation to Switzerland's entire surface area, in 2018 some 4% were covered with bodies of water and just over 2% by glaciers and firn.

Unproductive areas, 2018



G 42

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As already mentioned, the majority of the unproductive areas are found in the Alps. In the central alpine regions, unproductive areas occupy more than half of the territory, on the southern flanks of the Alps a third and on the northern flank of the Alps a quarter (G42, page 29). Their share in the Mittelland is just one tenth and in the Jura only 1%. Unproductive areas in the Mittelland are mostly lakes and rivers.

Despite strong local dynamics, little change in total area

Over the past ten decades, overall the size of the unproductive area has changed relatively little. Between 1985 and 2018, a decline of 222 km² or 2% was recorded (G43). Nevertheless, upon closer inspection, the unproductive areas reveal a considerable dynamic (G44). An important driver is the shrub encroachment of abandoned alpine meadows and pastures, mentioned in the previous chapters. In the course of such shrub encroachment processes, unproductive areas in the form of bush and shrub vegetation initially appear. These are then, in turn, replaced by larger woods and trees – i.e. by wooded areas. The usage category of unproductive vegetation, therefore, shows both winners and losers for the period between 1985 and 2018. It won almost half of its gains at the expense of agricultural areas and on the other

hand most of its losses were in favour of wooded areas. Whether a certain region recorded more gains or losses depends largely on how advanced shrub encroachment is in that area. In regions in which encroachment has recently intensified, unproductive areas in the form of shrubs and bushes frequently increased between 1985 and 2018 (G45). In contrast, decreases were seen in regions where bush encroachment or reforesting have to a large



Growth in the different types of unproductive area, 1985-2018

Newly created areas by previous use – lost areas by new use – net change



Reading aid, unproductive vegetation: Between 1985 and 2018, new unproductive vegetation areas grew on an area totalling 497 km². These area gains were made especially at the cost of other unproductive areas (in particular bare land) as well as alpine agricultural areas. Between 1985 and 2018, area gains were offset by losses totalling 520 km². Generally, unproductive land gave way to forest and woodland (wooded areas). If we deduct the area losses from the area gains (result), areas covered by unproductive vegetation declined by a net area of 23 km². This is a change of –1%.

Source: FSO - Land use statistics (AREA)

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G 44

extent already taken place, as is the case in particular in Ticino and the Chablais region. Considering Switzerland's territory as a whole in the observation period, there were more losses than gains.

After rockfall, landslides or mudflows, a similar succession is seen to that taking place in abandoned agricultural areas. These natural events are guite common in the alpine space and are continuously creating new unproductive areas in the form of rock and gravel deposits, which then usually become overgrown by various pioneering plants until a plant community typical for the habitat - such as forest - is re-established.

Glaciers are retreating to the highest altitudes

A second important driver in the dynamic of unproductive areas is climate change. The relatively high average temperatures of the recent past have led glaciers and firn fields to lose a third of their surface area between 1985 and 2018 (G 43, page 30). This is a loss of 505 km², almost equalling the size of Lake Constance (541 km²). In terms of surface area, the speed at which glaciers are shrinking has remained relatively stable over the past three decades.



Glacier ice melts, leaving behind a lake (Chüeboden glacier VS/TI, at approx. 2700 metres above sea level)

Between 1985 and 2018, as one would expect, the lowest-lying glaciers and firn fields experienced the greatest losses (G46): The most recent survey was only able to identify extremely small residual areas (4 km²) of perennial snow in locations below 2000 metres above sea level. Substantial losses were also seen between 2000 and 2500 metres above sea level and between 2500 and 3000 metres, with -52% and -44%, respectively. Ice was able to survive much better in locations above 3000 metres - but decreases were discovered even there.



Source: FSO - Switzerland's Land Use Statistics (AREA)

G 46

Decline in glacier areas by altitude (metres above sea level), 1985-2018



Source: FSO - Land use statistics (AREA)

...and leaving behind rock and boulders

When glacier ice melts, mostly boulders and rocky areas remain. This "bare land" thus increased sharply between 1985 and 2018, by a net total of 286 km², or 10% (G44, page 30). So far, plant colonisation of the areas opened up by melting glacier ice since 1985 has only very rarely been observed.

Static lakes, dynamic rivers

In contrast to the types of usage mentioned above (glaciers, bare land, unproductive vegetation), no major change in the surface area of standing water were observed between 1985 and 2018 (G 44, page 30). Smaller reductions resulted in some places from the filling in of gravel pits as well as naturally through aggradation and aridification. Occasional increases occurred mainly due to the retreat of glaciers, which from time to time led to the creation of small lakes.

Rivers were much more dynamic than lakes - also in terms of how their surface area developed. The displacement of material that occurs with flooding means that unimproved streams and rivers widen their beds in places at the expense of other types of usage, whereas in other places very little water can reach them, leading to the reappearance of permanent vegetation there. This natural dynamic takes place in particular between rivers and forests and woods (wooded areas) (G44, page 30). In recent years, rivers in many places have deliberately been given more room for ecological reasons to protect them from flooding, by reopening artificially closed streams or removing dams. Such measures are the main reason why the total area of rivers rose by a net total of 15 km² (or 6%) between 1985 and 2018. In addition, thanks to similar rewilding efforts, wetlands also expanded somewhat between 1985 and 2018, namely by 18 km² or 19%.

Structures to protect settlement areas and transport routes

Unproductive areas are not always part of the unbuilt landscape: Some 0.4% of such areas have structural interventions in the form of protective structures against natural hazards. Between 1985 and 2008, areas with flood defences increased by a third and those with avalanche and rockfall control structures doubled. These trends are probably less due to an increase in the potential for natural hazards than to rising awareness of the risks as well as the necessity to protect newly built infrastructure in locations exposed to hazards.



A seemingly natural pond appears in an abandoned gravel pit (Pfungen ZH, 1987/2018).



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The Federal Statistical Office's land use statistics have provided data on the situation and changes with regard to land use in Switzerland since 1985. This publication contains information on the main national results from 1985 to 2018 in the categories of settlement, agriculture, and wooded and unproductive areas.

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