

# Net Zero Progress Report 2024

Status of Climate Protection in the City of Zurich with GHG inventory up to 2023

#### Legal notice

#### Editor

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Direct emissions from the entire city and the city administration have decreased in recent years. This means the city is on track.

#### **New in this report**

Compared to the Net Zero Progress Report 2022 (publication: November 2023), the Net Zero Progress Report 2024 reflects the current findings in the year of publication with the following changes:

The indirect greenhouse gas emissions for the entire city are shown in detail for the first time for the years 1990 (year for setting the target), 2010, 2015, 2020, 2022 (reference year for the reduction path) and 2023.

The direct and indirect greenhouse gas emissions of the city administration are shown for the first time. They have been calculated for the years 1990, 2010, 2022 and 2023 in accordance with the current international standards for corporate GHG inventories.

The direct greenhouse gas emissions of the entire city in the areas of buildings and waste disposal have been updated to the current status (2023). No precise figures are available for mobility in 2023, as the data basis for this is only updated every two years.

# The most important findings

#### Net zero for direct GHG emissions: Ambitious, but realistic

Direct emissions from the entire city and the city administration have decreased in recent years. This means the city is on target.

The net zero targets for direct emissions from the city as a whole and the city administration are ambitious, but realistic. The city administration makes its contribution by developing and implementing strategies and plans for net zero in a consistent, timely and uncompromising manner. The city administration has more leeway with a net zero target for the administration than for the entire city. This leeway must be exploited.

The city administration makes a major contribution to net zero direct emissions for itself and the entire city by producing and supplying heat and electricity in a climate-friendly way, decarbonizing and expanding public transport, and removing and storing CO<sub>2</sub> during waste disposal.

In order to achieve the net zero target for the entire city by 2040, it is above all necessary for the city's population and businesses to take climate-friendly action. The measures taken by the city administration facilitate and enable it to reduce emissions in its area of responsibility.

### **Cutting indirect GHG emissions in half is a major** challenge for everyone

Indirect GHG emissions have increased since 1990, making the climate protection targets of the entire city and the city administration a major challenge for everyone. In order to reduce emissions by 30 % compared to 1990, they currently need to be approximately cut in half. In the entire city, the increase can be attributed in particular to more air travel and increased construction activity.

Global climate protection efforts are making products and services more climate-friendly and ahelp to reduce indirect emissions. However, it is uncertain whether this is happening quickly and sufficiently in all areas. It is therefore also important that the population and the economy are using their flexibility to reduce indirect emissions and act in a more climate-friendly way. If fewer and more climate-friendly goods and services are purchased in the City of Zurich, indirect emissions will also decrease. To improve the basic conditions in the surrounding area, the city administration exerts influence on politics and business.

Through sustainable procurement, the city administration can reduce its indirect GHG emissions and act as a role model and a promoter of innovation. With its own purchasing and usage behavior, the city administration has an effective lever for reducing its indirect emissions. By procuring climate-friendly goods and services, it is helping to move the market towards net zero.

#### Making a difference together

To take effective action, the city administration needs to work with stakeholders who are also committed to net zero. It needs to cooperate with companies and business networks, with non-governmental organizations and with other municipalities, the federal government and the canton. Proactive stakeholder management is necessary.

The city administration applies leverage in areas that cause particularly high levels of GHG emissions and in which it has room to maneuver. As it has no competence for legal requirements in many areas, the city administration is setting a good example and developing new solutions. In particular, creative, innovative measures are needed to reduce indirect emissions.



Further information on this report can be found on Zurich's Net Zero website.

# **At a glance:**Climate protection in Zurich

Zurich aims to be climate-neutral within the city limits by 2040. The indirect GHG emissions outside the city are also to be reduced. The city administration wants to set a good example.

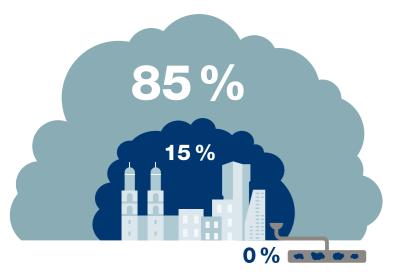
#### Status 2023 entire city

12.5 t CO<sub>2</sub>-eq/inhab. and year

Indirect greenhouse gas emissions

#### 2.3 t CO<sub>2</sub>-eq/inhab. and year

Direct greenhouse gas emissions



#### Targets for the entire city by 2040

6.7 t CO<sub>2</sub>-eq/inhab. and year

Minus 30 % indirect greenhouse gas emissions per inhabitant compared to 1990

#### Net 0 t CO<sub>2</sub>-eq/inhab. and year

Net zero direct greenhouse gas emissions











#### Direct greenhouse gas emissions







Negative greenhouse gas emissions

#### Status 2023 city administration

421,000 t CO2-eq/year

Indirect greenhouse gas emissions

269,000 t CO2-eq/year

Direct greenhouse gas emissions

#### City administration targets up to 2035\*

**205,000 t CO<sub>2</sub>-eq/year** 

Minus 30 % indirect greenhouse gas emissions compared to 1990  $\,$ 

#### Net 0 t CO<sub>2</sub>-eq/year

Net zero direct greenhouse gas emissions

# Greenhouse gas emissions and climate protection measures as of 2023 for entire city

# Buildings 1.2 direct 2.5 indirect

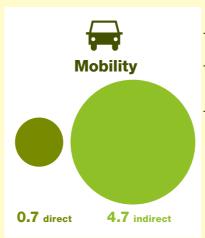
#### **Measures**

- Replace heating systems, expand district heating
- Refurbish buildings, optimize operation, use heat sparingly
- More efficient and cycle-oriented construction with optimized building materials
- Produce and purchasemore renewable electricity; use electricity more efficiently



#### Measures

- Healthy and environmentally conscious eating
- Avoid food waste
- Choose sustainably produced food



#### Measures

- Avoid traffic, shorten distances
- Shift traffic to public transport, walking and cycling
- Make transportation climate-friendly (without fossil fuels)



#### Measures

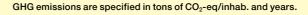
- Choose climatefriendly products and use them longer
- Strengthen the circular economy
- Consume with restraint



0.3 direct

#### Measures

 Extract and store CO<sub>2</sub> at waste incineration plant and Werdhölzli site



0.01 indirect

 $\mathbf{5}$ 

<sup>\*</sup> The target year for the supply of heat to third parties is 2040.

# Fundamentals of climate protection

#### **Technical terms for climate protection**

The basics of climate protection provide an overview of terms that are frequently used in this report. They are intended to show how issues relevant to climate protection are understood in the City of Zurich.

#### **Net zero**

Net zero means that the amount of greenhouse gases released into the atmosphere is no greater than the amount removed from it, either naturally or using technology. In order to achieve the net zero target, all greenhouse gas emissions must be avoided insofar as this is technically and economically possible or socially acceptable. The remaining unavoidable emissions, for example from waste recycling, are to be offset with negative emissions. The GHG inventory is therefore balanced and net zero.

#### GHG emissions (greenhouse gas emissions)

The emission of greenhouse gases (GHG) into the atmosphere as a result of human activity has a global impact on the climate. The best known and most important greenhouse gas is carbon dioxide ( $CO_2$ ), which is produced during the combustion of fossil fuels (oil, coal and natural gas). Other greenhouse gases are methane and nitrous oxide as well as fluorinated or "F" gases, which are often used as refrigerants. The various greenhouse gases have varying effects on the climate. In order to make the climate impact of the various greenhouse gases comparable, it is converted to that of  $CO_2$  and shown as " $CO_2$ -equivalents" ( $CO_2$ -eq). Example: 1 kg of methane corresponds to 28 kg of  $CO_2$ -eq with regard to its climate impact.

#### **Negative GHG emissions**

Greenhouse gases that are removed from the atmosphere and permanently stored reduce the greenhouse gas effect and consequently global warming. Removal is referred to as a "negative emission" because it reverses GHG emissions.  $\rm CO_2$  can be bound naturally by plants or technically from the air and from exhaust gases. If organic material is burned and the  $\rm CO_2$  released is extracted from the exhaust gas and stored permanently, this leads to negative GHG emissions because the  $\rm CO_2$  is removed from the natural carbon cycle.

#### **Carbon Capture and Storage (CCS)**

CCS is the abbreviation for the technical extraction and storage of CO<sub>2</sub> from exhaust gases.

#### **Direct and indirect GHG emissions**

GHG emissions are differentiated according to whether they are caused directly by one's own activities (direct emissions) or whether they are caused by other contributors along the value chain (indirect emissions). The direct and indirect emissions differ in the entire city and in the city administration.

#### Entire city as a source of GHG emissions

In the GHG inventory, "entire city" refers to all greenhouse gas emitters in the urban area. The direct GHG emissions for the entire city include all emissions within the city limits. They are caused by households and businesses in the urban area (for example when heating buildings with natural gas), but also by visitors and commuters in the city (for example when driving a petrol car). Indirect GHG emissions from the entire city are triggered by activities in the City of Zurich, but are released outside the city area. They are generated by the production of goods and services consumed by the city's population or by the production of construction materials for buildings and the civil engineering infrastructure in the City of Zurich. The mobility of the urban population outside the city is also counted as indirect GHG emissions. Business trips by employees of Zurich companies who live outside Zurich are not taken into account.

#### City administration as a source of GHG emissions

The city administration is accounted for like a company. In addition to all organizational units of the administration, participating interests in which the city administration can influence the strategic orientation, e.g. companies in which the City of Zurich holds a majority share, are also counted as administration. Accounting for the city administration is therefore independent of accounting for the entire city and the city limits. The direct GHG emissions originate from sources owned or controlled by the municipality, regardless of whether they are located inside or outside the city limits. Example: The greenhouse gases resulting from a journey in a diesel-powered VBZ bus (run by public transport operator of City of Zurich) always count as direct emissions of the city administration, even if the journey takes place outside the city area. Indirect GHG emissions from the city administration come from sources that it cannot influence directly, e.g. from the production of procured goods or from heating a rented building, even if it is located in the city area.

#### Reference year 2022

The year 2022 is designated as the reference year because the climate protection targets for the entire city and the city administration came into force and a linear reduction path was specified in this year. Changes in GHG emissions and progress in climate protection are compared with the reference year.

#### **Gray GHG emissions, gray energy**

Gray GHG emissions is another term for embodied GHG emissions. Gray energy is used in a similar way. It comprises the non-renewable primary energy that must be expended for a product or service before it can be used. Gray energy includes the energy required for raw material extraction, production and transportation.

The net zero targets for direct emissions for the entire city and the city administration are ambitious, but realistic.

#### **How GHG inventories** are created

There are no available measurements that show, for example, exactly how much greenhouse gas is released into the air by human activity in the City of Zurich. GHG inventories are therefore calculated in order to obtain information on GHG emissions that is as reliable as possible. They show how much greenhouse gas is emitted by which activities. For a better overview, the GHG emissions are assigned to city administration can be found on the Internet. areas (buildings, mobility, waste disposal, etc.).

Using the example of direct GHG emissions from heat generation in the city, the steps involved in the accounting

Additional components process are shown here.

#### 1. Survey activities

The first step is to determine which activities cause GHG emissions. These activities are then quantified using suitable data from measurements, models or estimates. Using the example of heat generation: How much energy from which energy source is required for heating in Zurich? The data should be as accurate and specific to the City of Zurich as possible. Exact sales figures are known for gas and district heating; for other energy sources, consumption can be calculated on the basis of the number, operating time and output of the heating systems in the city.

#### 2. Determine emission factors

Emission factors indicate how many GHG emissions are produced per activity, for example how many CO<sub>2</sub>-equivalents are produced per kilowatt hour of natural gas for heating. Emission factors are derived on the basis of scientific and industry-related data and can be retrieved from databases used for life cycle assessments.

#### 3. Calculate and add up emissions

Activities multiplied by the respective emission factors result in the GHG emissions. In the example: In 2023, around 1,900 GWh of natural gas (including biogas imports) was used to heat buildings in the City of Zurich, which caused around 330,000 t of CO2-eq of direct emissions. The results of the accounting for heat generation can be seen in Chapter 3.2.

The reliability of GHG inventories depends on how accurate and complete the data used is in regard to activities and emission factors. The accounting of direct emissions is usually more precise than that of indirect emissions. For indirect emissions, it is more complex to record activities (e.g. the number of cell phones purchased in the city) and associated emission factors (e.g. emissions per cell phone). GHG inventories from the distant past, such as for 1990, show greater uncertainties than current GHG inventories.

Data from the past is often incomplete and was structured and collected differently than data from the present. Some adjustments are therefore necessary in order to obtain data for 1990 that is as comparable and reliable as possible.

The GHG inventories in this report currently provide the best possible representation of GHG emissions. The representation will become clearer and more refined over the next few years as new data is added. More detailed information on the climate footprint of the entire city and the

## of climate protection reporting

The 2024 Climate Action Plan sets out in detail which packages of measures can be used to reduce the direct and indirect emissions of the entire city and describes the most important targets and measures of the city administration. Quantified reduction targets are also defined for each area for direct emissions.

The net zero cockpit provides detailed data on the direct and indirect emissions of the entire city over several years and describes the measures of the Climate Action Plan. For direct emissions, the outlook also shows how emissions will develop up to 2040 if the packages of measures in the Climate Action Plan are implemented as planned.

At stadt-zuerich.ch/netto-null further studies and information can be found, including a GHG inventory for the city administration, an environmental study that estimates how indirect emissions could develop, and an explanation of the origin of the data for the GHG inventory for the entire



Climate **Action Plan:** 



# Overview: Zurich on the way to net zero

For the first time, new climate inventories provide an overview of the status of all four climate protection targets for the entire city and the city administration. They show: Direct emissions are decreasing, bringing the net zero target closer. Indirect GHG emissions, on the other hand, have increased since 1990, making their reduction targets more difficult to achieve.

#### The main targets

In a referendum in 2022, the population of the City of Zurich decided to reduce the direct GHG emissions of the entire city to net zero by 2040 and to reduce indirect GHG emissions per inhabitant by 30 % compared to 1990. Even more ambitious goals apply for the city administration: by 2035, it is to achieve net zero direct emissions, reduce its indirect emissions by 30 % and implement all measures within its sphere of influence that contribute to achieving the overall city targets (with the exception of heat supply for third parties).

#### Urban greenhouse gas emissions are not decreasing linearly

Politicians have set a linear reduction path for the City of Zurich's climate protection targets. Accordingly, GHG emissions are to be reduced by the same amount each year until the target is reached. In reality, however, GHG emissions do not change evenly and deviations from the linear reduction path occur.

One reason for this is that measures are implemented gradually in individual years and then often reduce emissions in erraticly. This is clearly evident, for example, in the planned reduction in direct emissions from waste disposal: when the planned CCS plant at the Hagenholz waste incineration plant goes into operation in 2035, CO<sub>2</sub> emissions will decrease significantly. The expansion of district heating is also taking place in large individual steps rather than at a uniform pace.

Annual differences are also evident in climate-related activities. For example, construction activity in the City of Zurich fluctuates from year to year. As a result, the associated indirect emissions also fluctuate. These fluctuations are particularly evident because the emissions from construction projects are reported in full in the year of completion and are not distributed and amortized (annualized) over the lifetime of a building.

#### Climate protection targets and current status

Direct GHG emissions minus negative emissions

**Entire city** 

Initial value in 2022

2.4 ⊢ t of CO₂-eq/year/inhab.

Status in 2023

**- 2.3** ⊢

t of CO<sub>2</sub>-eq/year/inhab.

Target value for 2040

net zero

t of CO<sub>2</sub>-eq/year/inhab.

Net zero by 2040

City administration

Initial value in 2022

**261,000** ⊢

t of CO<sub>2</sub>-eq/year

Status in 2023

ı **269,000** ⊦

t of CO<sub>2</sub>-eq/year

Target value for 2035

net zero

t of CO2-eq/year

Net zero by 2035

Indirect GHG emissions

**Entire city** 

Initial value in 2022

**12.6** ⊢

t of CO<sub>2</sub>-eq/year/inhab.

Status in 2023

**₁ 12.5** ⊦

12.5

t of CO<sub>2</sub>-eq/year/inhab.

Target value for 2040

6.7

t of CO<sub>2</sub>-eq/year/inhab.

Minus 30 % per inhabitant by 2040 (compared to 1990)

City administration

Initial value in 2022

**448,000** ⊢

t of CO2-eq/year

Status in 2023

421.000 **F** 

t of CO2-eq/year

**Target value for 2035** 

approx. 205,000

t of CO2-eq/year\*

Minus 30 % by 2035 (compared to 1990)

\* without heat/cold generation for other power consumers

# Entire city: On track for direct emissions, major challenge posed by indirect emissions

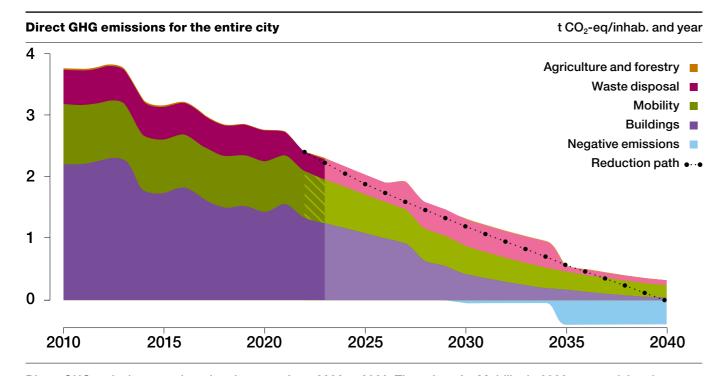
The direct GHG emissions of the entire city are on a net zero course and have continued to decrease from 2022 to 2023. Indirect GHG emissions, on the other hand, have increased since 1990. It is a major challenge for everyone to reduce indirect emissions by 30 % compared to 1990 levels.

#### **Direct GHG emissions continue to fall**

The fact that direct GHG emissions have fallen further is due to a further reduction in emissions in the building sector 1,100 fossil heating systems have been replaced by renewable heating systems; heating oil and natural gas consumption have dropped.

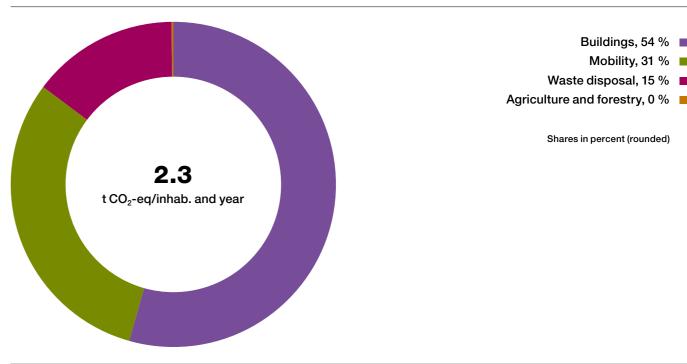
This brings the net zero target for direct emissions in the entire city by 2040 one step closer. However, it remains ambitious and requires climate-friendly decisions by the population and companies. And it is essential that the city administration consistently implements its plans and strategies as a high priority.

In the building sector, it depends in particular on whether the replacement of heating systems progresses at the same pace and district heating is expanded as planned by 2040. Electrification is a key factor in mobility. And for the overall net zero target, it is crucial that the CCS plant for CO<sub>2</sub> removal at the Hagenholz waste incineration plant can go into operation in 2035.



Direct GHG emissions continued to decrease from 2022 to 2023. The values for Mobility in 2023 are provisional (hashed area).

#### Direct GHG emissions for the entire city 2023



The building sector is responsible for more than half of the direct GHG emissions in the city.

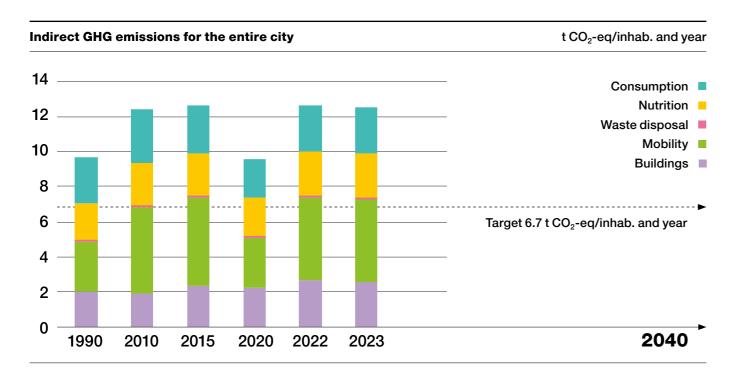
#### **Indirect GHG emissions have increased since 1990**

The indirect GHG emissions of the entire city have increased since 1990 (year for setting the target). In 1990 the annual indirect emissions per inhabitant were still around 9.8 t  $\rm CO_2$ -eq. In 2022 it was around 25 % more. Indirect emissions in the areas of mobility and buildings in particular have risen because more flying and construction is taking place.

As indirect GHG emissions have increased, it has become more difficult to achieve the reduction target. The annual indirect emissions per inhabitant are to decrease by 30 % compared to 1990 and drop to around  $6.7\,\mathrm{t\,CO_2}$ -eq. In 2023 indirect emissions amounted to 12.5 tons. They must therefore be nearly cut in half by 2040. The current data for 2023 does not yet allow any statement to be made about the development trend in indirect GHG emissions since the reference year 2022.

Whether the target is achieved also depends on whether and how quickly progress is made in climate protection outside the city.

Net Zero Progress Report 2024



Indirect GHG emissions for the entire city have increased by around 25 % since 1990.

#### **Environment study: Progress not fast and extensive enough**

If the world as a whole becomes more climate-friendly, the goods and services we purchase from outside the city will also have a smaller GHG inventory and indirect GHG emissions will drop. A study commissioned by the City of Zurich investigated what developments can be expected outside the city area.

The good news: Climate Protection targets are rapidly gaining ground in international politics and business. If these targets are actually achieved in full and on time, they will make a major contribution to reducing indirect emissions. However, there are still major uncertainties and implementation gaps: Ambitious goals and measures actually implemented often diverge.

The time factor also plays a role. The City of Zurich aims to achieve its climate protection targets by 2035 and 2040. Outside the city, however, the target year is usually 2050. Some progress in climate protection outside the city will therefore only occur after the City of Zurich has already achieved its targets.

There is a general sense of uncertainty as to how the environment will develop. There is a lack of data, global value chains are complex and it is often unclear in which countries the individual processing steps of a product take place. However, this has a major impact on GHG emissions – for example, the proportion of renewable, climate-friendly energy in the electricity mix varies from country to country.



Environment analysis: Factors contributing to indirect emissions in the city of Zurich (INFRAS, 2024)

#### **Climate Action Plan:**

#### Use room to maneuver for innovative measures

The city administration can only directly influence the indirect emissions of the entire city to a small extent. The level of indirect emissions is influenced by the basic political and economic conditions outside the city, but is also directly dependent on the behavior of the population and companies in the city. Above all, the city administration can implement measures that enable and facilitate climate-friendly behavior, for example through consulting or by providing and promoting climate-friendly alternatives. It can reduce indirect emissions with its own actions, particularly through climate-friendly procurement. And it can exert influence on federal and cantonal policy as well as on the economy so that the environment and basic conditions become more climate-friendly. To this end, the city administration is seeking cooperation with stakeholders who are also committed to net zero. Joint and innovative measures are required to reduce indirect emissions by 50 percent.

The Climate Action Plan summarizes the city administration's specific goals and measures in so-called packages of measures. Twelve new packages of measures have been defined for indirect emissions in the Climate Action Plan 2024.



Climate Action Plan: 2024 version

#### Overview of the packages of measures by sector and direct and indirect GHG emissions of the entire city

Sector	Packages of measures for direct GHG emissions	Packages of measures for indirect GHG emissions (new)
Buildings	G1: Heating system replacement and expansion of thermal networks G2: Reduction of the thermal energy requirement	G3: Circular construction G4: Optimization of building materials G5: Sufficient construction G6: Optimization of electricity use G7: Expansion of renewable electricity
Mobility	<ul> <li>M1: Traffic avoidance</li> <li>M2: Shifting motorized individual transport in the direction of eco-mobility</li> <li>M3: Compatible traffic management</li> </ul>	M4: Climate-friendly international passenger transport M5: Climate-friendly domestic transport M6: Circulation-oriented, sufficient civil engineering
Waste disposal	EN1: CO <sub>2</sub> extraction and storage (CCS)	No packages of measures for indirect GHG emissions
Nutrition	No packages of measures for direct GHG emissions	E1: Reduce food losses E2: Healthy, environmentally friendly nutrition
Consumption	No packages of measures for direct GHG emissions	K1: Circular, climate-friendly consumption K2: Circular, climate-friendly production of consumer goods
Agriculture and forestry (new)	L1: Reduce agricultural greenhousegases L2: Climate-friendly livestock farming	No packages of measures for indirect GHG emissions

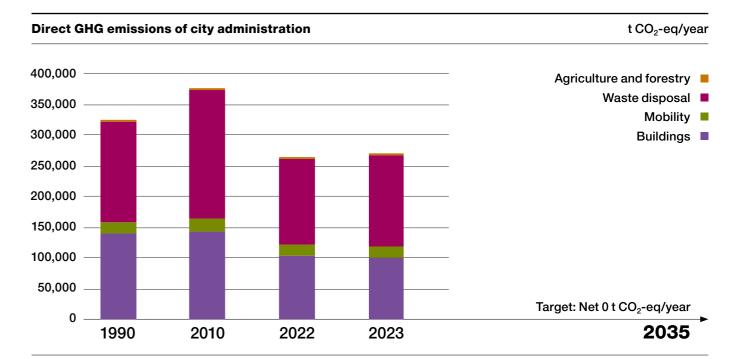
# City administration: Services for the public determine GHG emissions

The city administration should play a pioneering role in climate protection and act as a role model by achieving its targets by 2035. The GHG inventory shows that since 1990, the city administration's direct GHG emissions have dropped slightly, while indirect emissions have increased by 40 %.

#### **Direct GHG emissions have decreased**

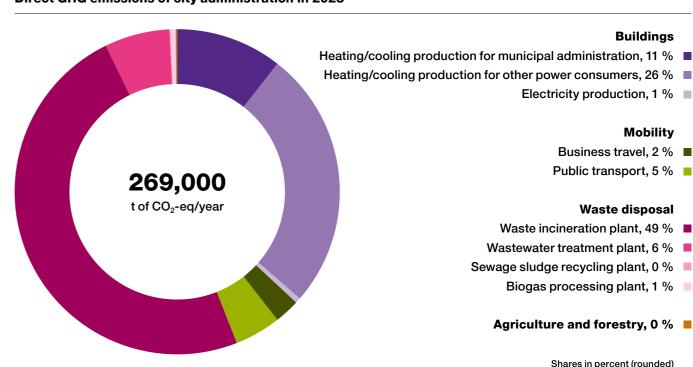
The city administration's direct emissions have dropped by around 25 % since 2010 – even though the city and the administration have grown during this time. The greatest reduction in direct emissions was achieved in the area of waste disposal thanks to the closure of the Josefstrasse waste incineration plant. Direct emissions from buildings and mobility have also decreased slightly.

Around 80 % of direct emissions are generated because the administration provides services to the public: it treats wastewater, recycles waste, supplies district heating and electricity, and operates public transport within the city and beyond its borders. If the city administration produces and supplies heat and electricity in a climate-friendly way, decarbonizes and expands public transport, and removes and stores CO<sub>2</sub> from waste disposal services, it not only reduces its own direct emissions. It also makes a significant contribution to net zero for the entire city. Corresponding measures were already listed in the 2023 Climate Action Plan. If they are implemented consistently and urban strategies and plans are supplemented and further developed, the 2035 net zero target for the city administration's direct GHG emissions is realistic.



The city administration's direct emissions have decreased by around 25 % since 1990 (GHG inventory of the Zurich city administration, EBP 2024).

#### Direct GHG emissions of city administration in 2023



Around 80 % of the city administration's direct GHG emissions are generated because the administration provides services to the public (Carbon footprint of the Zurich city administration, EBP 2024).



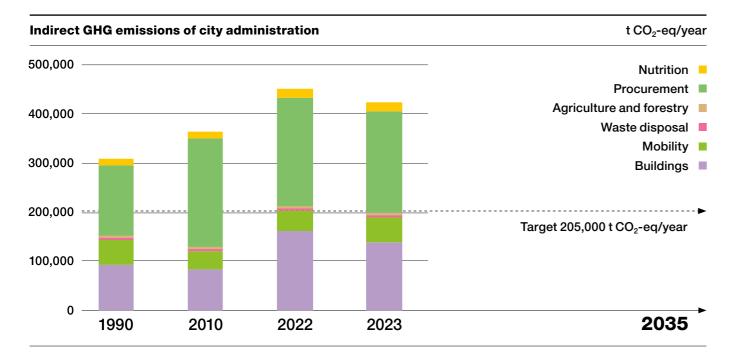
Greenhouse gas balance of the Zurich city administration, EBP 2024

## Indirect GHG emissions have increased by almost 40 % since 1990

The city administration's indirect GHG emissions have increased by almost  $40\,\%$  since 1990 (the year the target was set). This makes it more difficult to achieve the reduction target of minus  $30\,\%$  compared to 1990. In relation to the reference year 2022, indirect emissions must now be reduced by  $50\,\%$  in order to reach the target.

Around half of indirect emissions come from the procurement of services and goods. Further procurements also particularly take place in the areas of buildings and mobility. Indirect emissions are caused, for example, by procured building materials or vehicles. Indirect emissions fluctuate significantly from year to year, mainly because the administration's construction activity varies from year to year.

Sustainable procurement therefore plays a key role in reducing indirect GHG emissions. By targeting demand for goods and services with a small GHG inventory, the city administration acts as a role model and driving force for innovation and can make it easier for climate-friendly products to break into the market. Sustainable procurement also makes use of circular economy approaches. For example, if products are used for longer periods or materials are reused, procurement volumes and indirect emissions can be reduced.



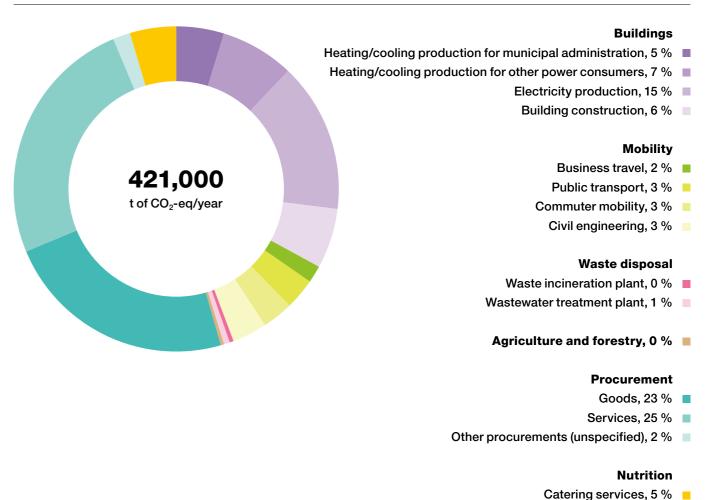
The city administration's indirect GHG emissions have increased since 1990, particularly in the areas of procurement and buildings. The 2035 target value does not include the heat supply for third parties in the building sector, as this falls under the 2040 targets for the entire city (GHG inventory of the Zurich city administration, EBP 2024).

#### **Implementation strategies in progress**

Compared to the entire city, the city administration has greater leeway for reducing its own GHG emissions. Nevertheless, it will be challenging to achieve the climate protection targets by 2035. However, the city administration is also highly dependent on the basic conditions and the environment, particularly with regard to indirect emissions.

Achieving the climate protection targets by 2035 is ambitious. The administration is currently developing implementation strategies in which measures to reduce GHG emissions are reviewed and supplemented with a view to achieving the targets.

#### Indirect GHG emissions of city administration in 2023



Around 50 % of the city administration's indirect GHG emissions originate from the procurement of services and goods (GHG inventory of the Zurich city administration, EBP 2024).

Shares in percent (rounded)

# In detail: GHG emissions of the entire city by sector

The ongoing conversion of the heating supply is leading to a reduction in direct GHG emissions for the entire city. In the case of indirect emissions, however, the increase in air traffic and construction activity since 1990 has led to an increase.

Less heating oil and natural gas is consumed and the proportion of renewable heat increases.

> The increased construction activity causes more indirect GHG emissions.

**Indirect GHG emissions from** air travel have more than tripled since 1990.

> **Negative emissions from waste** incineration will make it possible to achieve the net zero target in future.

Food waste is responsible for around 20 % of food-related emissions.

> **Consumer goods are responsible for** around two-thirds of indirect emissions in the consumption sector.

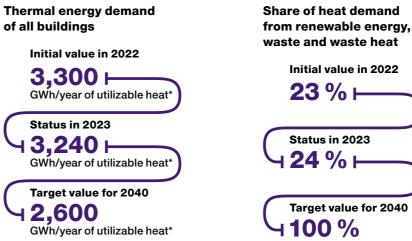
#### **Buildings**

Direct GHG emissions from buildings have decreased because heating is increasingly renewable and climate-friendly. Indirect emissions, on the other hand, have risen because more new buildings and conversions are being built.

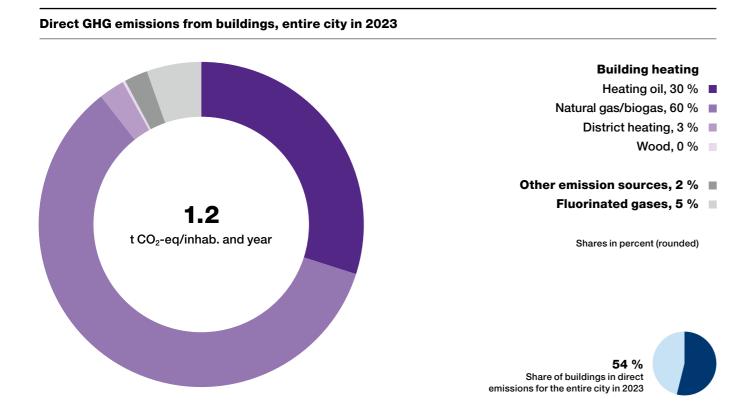
#### Direct emissions: Less natural gas and heating oil, more renewable heat

The conversion of the heating supply is progressing. Less heating oil and natural gas is consumed and the proportion of renewable heat increases. As a result, direct GHG emissions in the building sector decreased by around 8 % in 2023 compared to the previous year. Within a year, 1,100 fossil-fuel heating systems have been replaced by district heating or heat pumps. This shows that the city's subsidy program for the replacement of fossil-fuel heating systems and the revised Energy Act of the Canton of Zurich are having an impact. Since 2022, the Energy Act has required the replacement of oil and gas heating systems at the end of their service life with environmentally friendly heating solutions.

The expansion of district heating is essential if this trend is to continue. The Climate Action Plan envisages that by 2040, 50 % of the heat in the city will be supplied by district heating networks that use renewable sources or waste heat from waste incineration. At present, part of the district heating is still generated using heating oil and natural gas (peak load coverage).



<sup>\*</sup> Average over 5 years

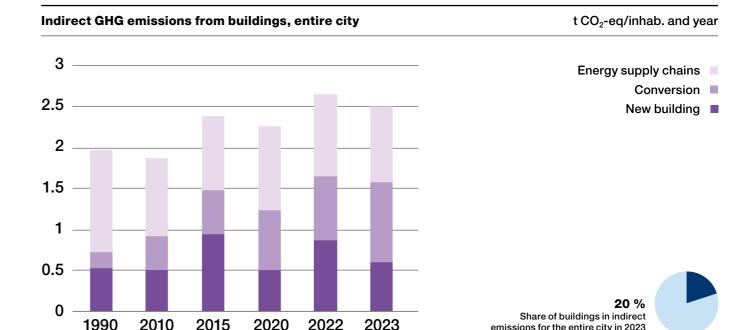


Heating oil and natural gas still cause a large proportion of the direct GHG emissions of the entire city in the building sector.

#### Indirect emissions: Increase due to more construction activity

Compared to 1990 (the year in which the target was set), significantly more construction is taking place in the City of Zurich. This will create space for the growing population and support the high-quality inner city development of the city. In addition, the operation of the building pool is becoming more energy-efficient thanks to renovations and new buildings. However, increased construction activity also causes more indirect GHG emissions. This is because building materials such as steel and concrete are intensive in terms of energy and greenhouse gases. Since 1990, indirect emissions from new buildings and, increasingly, conversions have more than doubled.

In contrast, indirect emissions from the energy supply chain in the building sector have decreased since 1990. This refers to the EN "gray emissions" of energy sources for heating, which are produced, for example, to extract and process crude oil and transport it to Zurich. Overall, however, indirect emissions in the building sector have increased due to construction activity.



The increase in construction activity since 1990 has led to more indirect GHG emissions for the entire city.

#### **Climate Action Plan: Limiting gray emissions in construction**

1990

Building with fewer indirect GHG emissions is possible. The Climate Action Plan outlines three approaches: Materials are used longer in the cycle. which reduces the need for new materials; building materials with a small GHG inventory are chosen; and buildings are planned more efficiently, for example by reducing substructures or providing slimmer primary structures with less mass.

In the construction industry, limits for "gray GHG emissions" have been developed for standard construction methods for new buildings and conversions. They specify how much greenhouse gas may be emitted during the construction of a building. The city administration is working within the scope of its possibilities to ensure that such limits for standard construction methods are achieved when building within the city. For example, it is committed to ensuring that corresponding limits are included as binding in higher-level legislation.

The Climate Action Plan now also includes packages of measures for renewable electricity. The measures contained in these packages are designed to expand the production of renewable electricity while at the same time optimizing electricity consumption. The goal is to ensure the necessary amount of renewable electricity for decarbonization, for example for the operation of heat pumps or electric vehicles.



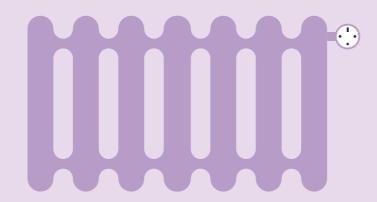
Climate Action Plan: 2024 version

emissions for the entire city in 2023

#### **Energy consumption is dropping and** progress is being made in construction.

#### **Heating systems are becoming climate-friendly**

Direct GHG emissions from buildings dropped in 2023 compared to the previous year because heating is increasingly renewable and climate-friendly. The number of oil and gas heating systems in the City of Zurich is decreasing.



Annual thermal energy consumption (final energy) by energy source

2022 2023



1,950 GWh 1,820 GWh

Natural gas and imported biogas

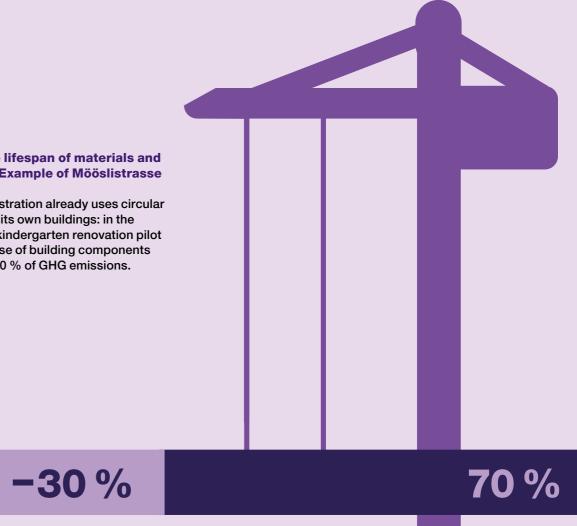


710 GWh 660 GWh

Heating oil

#### **Extending the lifespan of materials and** components: Example of Mööslistrasse pilot project

The city administration already uses circular construction in its own buildings: in the Mööslistrasse kindergarten renovation pilot project, the reuse of building components saved around 30 % of GHG emissions.



#### **Electricity consumption is decreasing**

In the City of Zurich, annual electricity consumption per person has been reduced since 1990, partly due to improved efficiency.



1990

**7.8 MWh** 

2023

**6.0 MWh** 

Annual electricity consumption per person

#### **Conversions on the rise**

Construction activity in the City of Zurich has increased significantly compared to 1990. This will create space for the growing city, and the operation of the building pool will become more energy-efficient thanks to renovations and new buildings. However, more construction also causes more indirect GHG emissions. This is because building materials such as steel and concrete are intensive in terms of energy and greenhouse gases.

Floor area of conversion projects



379,000 m<sup>2</sup> 3,102,000 m<sup>2</sup>

27

#### **Mobility**

Zurich residents drive less within and outside the city, but fly much more than in 1990. This has led to a sharp increase in indirect emissions in the mobility sector.

#### **Direct emissions: Linear reduction path assumed**

No data is available for 2023 that would allow a comparison with the direct emissions from mobility in 2022. The calculation is based on data from an urban traffic model that is only updated every two years. The development of direct emissions in the mobility sector will therefore not be apparent until 2024. For 2023, it was provisionally assumed that emissions have decreased as predicted. In fact, individual indicators (traffic measurement points, number of electric vehicles) suggest that the volume of traffic is decreasing and is becoming increasingly electrified.

The "Urban Space and Mobility 2040" strategy adopted in 2024 places a new focus on climate-neutral and active mobility, and defines measures at the neighborhood, city and regional levels.

## **Indirect emissions: More flights lead to strong increase**

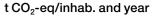
Zurich residents fly a lot: in 2023 they each traveled an average of around 10,000 km by plane. This is five times more than in 1990 (the year the target was set). Accordingly, indirect GHG emissions from air travel have more than tripled. At 3.3 t  $\rm CO_2$ -eq/inhab. in 2023, air travel alone caused more indirect emissions than the nutrition or consumption sectors (2.6 t each). Without air travel, the indirect GHG emissions caused by mobility would have decreased.

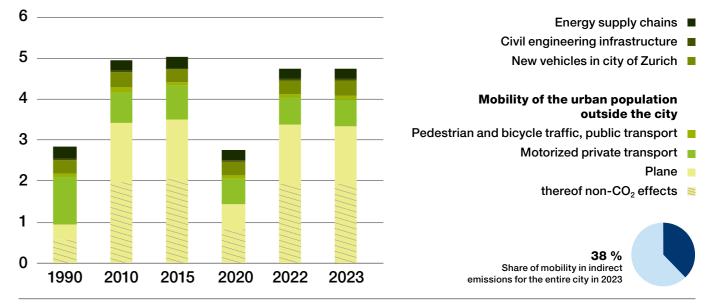
In 2023, people in Zurich traveled a 25 % shorter distance by car outside the city than in 1990 and covered around 90 % longer distances by public transport. Thanks to this and to improvements in vehicle technology, indirect emissions from motorized private transport have been reduced by almost 50 %.

Share of mileage covered by hybrid and all-electric cars in the city



#### Indirect GHG emissions from mobility, entire city





Indirect GHG emissions in the mobility sector have increased since 1990 because people are flying more (mobility data outside the city based on HSLU microcensus evaluation).

#### Climate Action Plan: Using the scope for climate-friendly travel

The Climate Action Plan defines packages of measures for climate-friendly international passenger transport and climate-friendly domestic commuter and leisure transportation.

In principle, the city administration has limited leeway for action when it comes to international passenger transport. The most effective measure is the responsibility of the population and companies: a reduction in air travel directly reduces emissions. But the city administration can also take action. In a strategy on international passenger transport, it wants to develop measures that work towards reducing emissions from air travel, for example by shifting air travel to trains or buses, or by operating aircraft more efficiently and without fossil fuels. To do this, it requires cooperation with business and politics. With its travel policy, the city administration shows in an exemplary manner how flights can be avoided as far as possible on business trips.

Some of the measures defined in last year's Climate Action Plan for direct emissions are already having an impact on domestic commuter and leisure traffic. A shift to public transport or the electrification of motorized private transport also reduces indirect emissions outside the city.

Emission reductions can also be achieved in the construction of infrastructure. Similar to building construction, civil engineering is also to be planned and built in a circular, sufficient manner. However, indirect emissions from civil engineering only play a subordinate role in the mobility sector.



Climate Action Plan: 2024 version

# Zurich residents use public transport more and drive less, but they also fly a lot more. E-mobility is becoming increasingly important.

#### Less car, more plane

People in Zurich travel more outside the city by public transport and less by car, but fly much more than in 1990. This has led to a sharp increase in indirect emissions in the mobility sector.

Source: HSLU microcensus evaluation.

Annual kilometers traveled outside the city per inhabitant

#### 1990 2023



4,600 km

A,500 km

4,500 km

1,700 km

450 km
430 km
Other means of transportation

**Plane** 

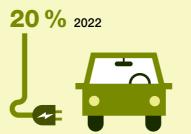


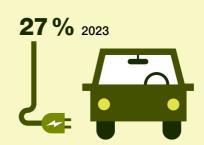
Emissions of internal combustion cars and electric bikes in comparison A fast electric bike leads to significantly lower GHG emissions over its entire life cycle than a car with an internal combustion engine.





Direct and indirect emissions per kilometer driven





New registrations of electric vehicles
The proportion of new registrations of
electric cars is increasing. In 2023, more
than one in four new cars in the city of
Zurich was entirely electric. Electric cars
replace gasoline and diesel cars, reducing
direct GHG emissions.

#### The city administration drives electric

The number of electric vehicles used by the city administration is increasing. In 2023, almost 90 % of all vehicles procured by the city administration had an all-electric drive. The Disposal and Recycling department (ERZ) procured exclusively all-electric heavy trucks and work machines for the first time in 2023.



90%

of the city administration vehicles procured in 2023 were entirely electric

31

#### **Waste disposal**

Recycling waste or treating wastewater is important from an environmental point of view, but this also causes greenhouse gases. However, waste incineration also supplies waste heat for district heating networks. In addition, CO<sub>2</sub> can be extracted from their exhaust gases and stored in the future. Negative emissions make it possible to achieve the net zero target.

#### More waste, but also more waste heat for heating

The Hagenholz waste incineration plant in Zurich incinerated around 10 % more waste in 2023 than in the previous year, but also generated more district heating.

The amount of waste incinerated does not depend directly on the amount of waste in the city of Zurich. The waste comes from all over the canton and is distributed to the existing waste incineration plants by the Zurich Waste Planning Department. The Hagenholz waste incineration plant therefore receives sufficient waste to fully utilize its capacity.

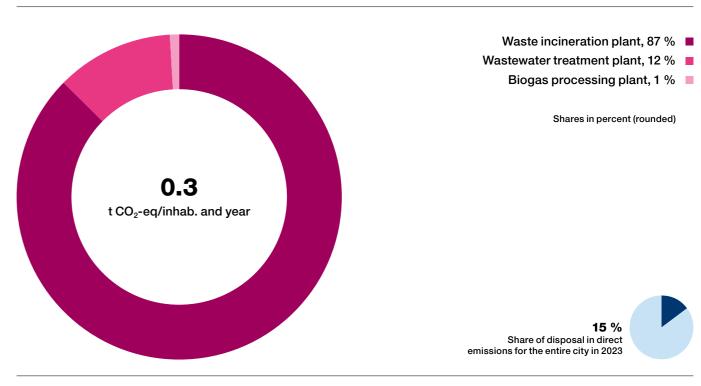
About half of the waste consists of organic material such as bulky waste. Its utilization is climate-neutral; the  $\rm CO_2$  released is returned to the natural carbon cycle. The direct climate-impacting GHG emissions come from the recycling of plastic and other petroleum-based substances in waste.

Starting in 2035, a large proportion of the  $\mathrm{CO}_2$  in the exhaust gas from the Hagenholz waste incineration plant is to be extracted and stored in a so-called CCS (Carbon Capture and Storage) plant. This will reduce direct GHG emissions to a large extent. At the same time, the  $\mathrm{CO}_2$  from the recycling of organic waste will be extracted and stored, resulting in negative emissions.

The waste heat from waste incineration is already being fed into the district heating network, thereby avoiding GHG emissions from oil and gas heating systems. With the construction of a third incineration line at the Hagenholz waste incineration plant, more waste heat will be available for district heating beginning in 2027, allowing further fossil fuels to be replaced. The climate-relevant  $\rm CO_2$  footprint of the third recycling line is therefore positive. However, direct emissions from waste incineration will increase temporarily until the CCS plant is built.

Waste heat from waste incineration is fed into the district heating network, thereby avoiding GHG emissions from oil and gas heating systems.

#### Direct GHG emissions from disposal, entire city in 2023



The Hagenholz waste incineration plant is responsible for the majority of direct GHG emissions in the area of waste disposal.

#### Planning for CCS plants is on track

Planning for the CCS facilities is progressing as planned. A feasibility study for the facility at the Hagenholz waste incineration plant is to be available in 2025. The current plan is to load the captured CO<sub>2</sub> onto a train using a pipe system and then to transport it to the storage site. Switzerland and Norway intend to work closely together on storage. In May 2024, the city administration hosted a stakeholder dialog with business, science and government authorities from both countries on the topic of CCS.

Even before the CCS facility at the Hagenholz waste incineration plant, a smaller CCS plant is to be built at the Werdhölzli sewage sludge recycling plant. The population approved a loan of CHF 35.5 million for this purpose in September 2024. From the end of 2028, the plant is expected to generate up to 24 000 tons of negative emissions per year.

Indirect emissions in the waste disposal sector play a subordinate role, accounting for 0.8 percent of all indirect emissions.

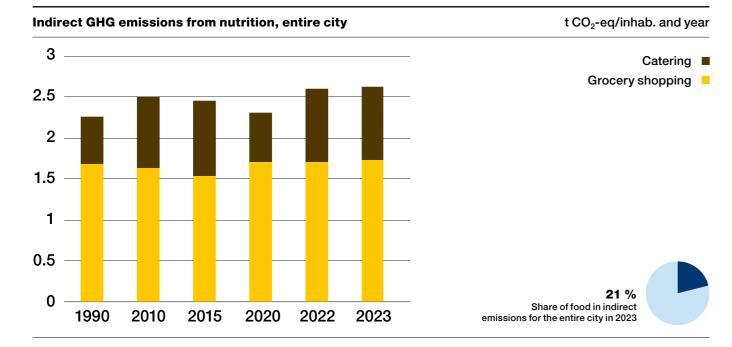
#### **Nutrition**

Animal-based nutrition cause half of the indirect GHG emissions of purchased food. Fewer animal products and less food waste can significantly reduce emissions.

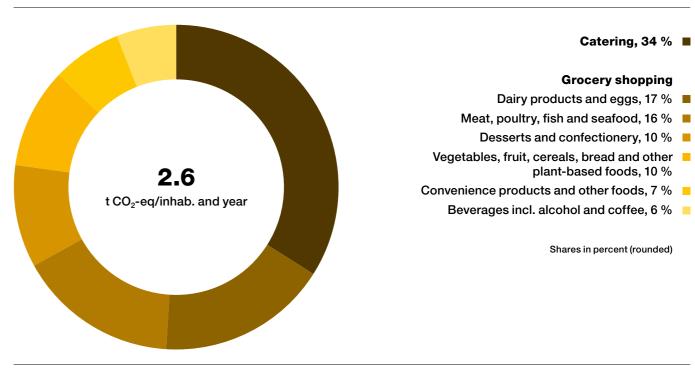
## Food waste and animal products cause high indirect emissions

The cultivation of food causes considerable indirect emissions outside the City of Zurich. Overall, food-related emissions have risen slightly since 1990 (the year the target was set). In 2023 around one-third of this was generated by catering in restaurants and two-thirds by food sold in stores in the City of Zurich. Meat and fish, dairy products and eggs each account for around 25 % of indirect emissions from the food we buy.

A significant proportion of GHG emissions could be avoided by reducing food waste. In the city of Zurich, a total of around 50,000 tons of food wasted in private households and restaurants in 2024 could have been avoided. This means that food waste is responsible for around 20 % of nutrition-related emissions in Zurich.



Indirect GHG emissions from nutrition, entire city in 2023



Meat and fish, dairy products and eggs each account for around 25 % of indirect GHG emissions from the food we buy.

## Climate Action Plan: Implement measures of the Nutrition Strategy

One of the goals of the "Sustainable Nutrition Strategy for the City of Zurich" is to reduce indirect emissions from food per inhabitant by 40 % by 2040 compared to 1990. Measures from this strategy have been incorporated into the Climate Action Plan. A package of measures aims to reduce food waste. The population can avoid food loss through conscious shopping and cooking habits, correct storage and better planning. To this end, the city administration carries out awareness-raising and educational measures such as the "Klima à la Carte" (Climate à la Carte) campaign and supports various initiatives, such as the "Madame Frigo" platform for passing on surplus food.

A further package of measures strengthens healthy, climate-friendly food. Eating more plant-based proteins instead of meat and consuming less alcohol and fewer sweets and snacks helps a person's health and the climate. The city runs information campaigns on healthy eating, organizes further training and promotes access to fresh, local and seasonal food, for example through community gardens.



Climate Action Plan: 2024 version

Nutrition-related GHG emissions have risen slightly since 1990.

# Less meat and less food waste can significantly reduce emissions.

#### Animal products and greenhouse gas emissions

Animal products cause higher GHG emissions than plant-based foods. In terms of volume, they account for less than 20 % of all food purchases in Zurich's stores. But they are responsible for around half of the food-related emissions from food purchased in the city of Zurich.

Proportion by weight of purchased food

Meat, poultry, fish and seafood **4** %

Dairy products and eggs 13 %



Share of GHG emissions from purchased food

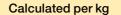
Meat, poultry, fish and seafood **24** %

Dairy products and eggs **26** %

If all Zurich residents ate a purely plant-based diet two days a week ...

CO<sub>2</sub>-eq per year

By adopting conscious eating habits and consuming mainly plant-based foods, the population can help Zurich achieve its climate protection targets.





Hard cheese 10 kg CO<sub>2</sub>-eq



Egg 5 kg CO<sub>2</sub>-eq



Hummus 2 kg CO<sub>2</sub>-eq

#### Plant-based foods cause fewer emissions

The agricultural production of food in particular, and not transportation or packaging, is the main contributor to GHG emissions.







#### **Edible food in waste**

In Switzerland, around one-third of all food is thrown away across the entire food chain, which corresponds to around 330 kg per person per year.

Source: foodwaste.ch



Source: foodwaste.ch



#### Consumption

Indirect emissions from consumption have increased slightly since 1990. Around two-thirds come from consumer goods such as clothing, furniture and IT equipment, and one-third from the purchase of services in the hotel, healthcare and cultural sectors.

#### From the throwaway society to the circular economy

Consumer goods caused around two-thirds of indirect emissions in the consumption sector in 2023. Almost a third of emissions are generated by services in the hotel industry, healthcare providers, and cultural and educational institutions. Consumer goods such as clothing, furniture and computers are largely sourced from abroad and cause indirect GHG emissions during their production. There are virtually no direct emissions from consumption in the city.

Services also have an impact on the climate: an extended wellness weekend in the mountains, medical treatment or a visit to an open-air venue also lead to indirect emissions. In the GHG inventory of the entire city, consumption includes all goods and services that are not already included in the other areas of the GHG inventory.

Indirect emissions in the area of consumption are derived on the basis of the average household budget in the Canton of Zurich. The data for 1990 in particular (the year the target was set) is uncertain.

#### Indirect GHG emissions consumption, entire city t CO2-eq/inhab. and year 3.5 Services | (health, education, culture, hotel and others) Goods (clothing, IT, home furnishings, 2.5 leisure goods and others) 2 0.5 21 % Share of indirect consumption 1990 2010 2015 2020 2022 2023 emissions for the entire city in 2023

## Climate Action Plan: Buying less and in a more climate-friendly way

The packages of measures for reducing indirect emissions focus on consumer behavior, climate-friendly production and extending the service life of goods. Consuming less and choosing climate-friendly products significantly reduces indirect emissions. Goods that are used for a long time and are kept in the economic cycle make new purchases unnecessary. With information campaigns, pilot projects and services for processing and reuse, the city administration supports the population in circular and climate-friendly consumption.

The city administration also supports the circular production of goods and services. Among other things, it advises SMEs (small and medium-sized enterprises) on the circular economy and supports the innovative, climate-friendly production of goods with the "KlimUp" funding program. With sustainable procurement, the city administration can reduce its own indirect emissions, act as a role model and a promoter of innovation, and increase demand for climate-friendly goods.

Studies show that goods or recyclable materials that can still be used often end up in household or bulky waste. With further offers for the reuse of goods, e.g. offers to swap and pass on goods that are still usable, the city administration is helping to reduce the amount of waste, thereby lowering GHG emissions.



Climate Action Plan: 2024 version

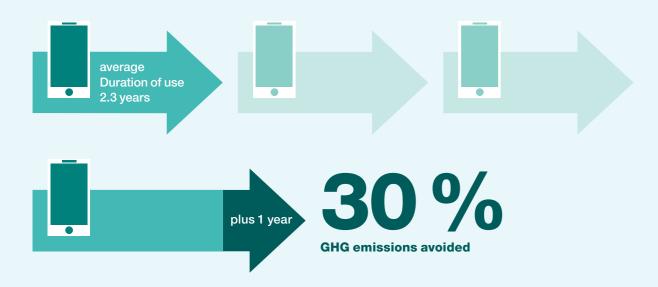
The city administration is helping to reduce the amount of waste by offering additional services for recycling and reuse goods, e.g. trading and repair exchanges.

Consumer goods are responsible for around two-thirds of indirect emissions in the consumption sector.

# Choosing climate-friendly products and using them longer significantly reduces indirect emissions.

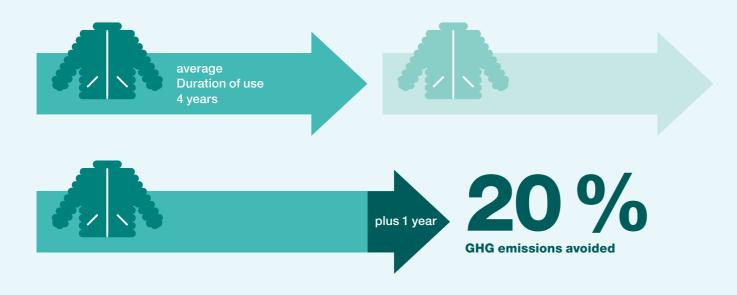
#### **Extend service life**

Those who use their cell phone longer and wait until later to buy a new one avoid GHG emissions.



#### **Wear clothes longer**

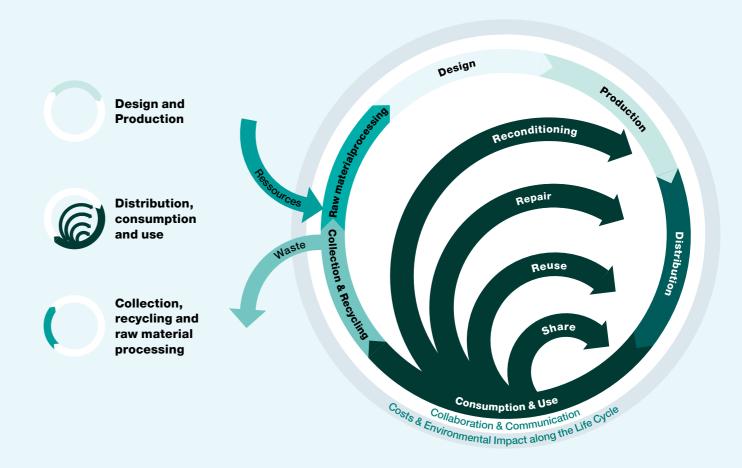
Those who wear their winter jacket longer and wait until later to buy a new one avoid GHG emissions.



Source: INFRAS, 2022: Ecological impact of a longer useful life of consumer products in Switzerland.

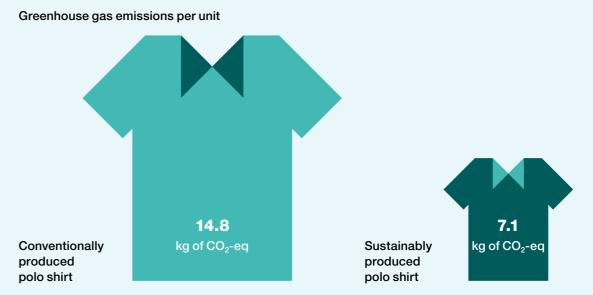
#### **Product cycle phases**

The more sustainably a product is manufactured, used and reused, the better the overall balance of the product throughout its life cycle. The "Circular Zurich" circular economy strategy pursues the goal for Zurich's economy and society to increasingly use sustainably designed products and materials. These are to be shared, reused, repaired and reconditioned.



#### Sustainable procurement by the city administration reduces GHG emissions

A polo shirt does not show how many GHG emissions its production causes. Transparency is provided by the City of Zurich's textile calculator: it records ecological and social criteria and calculates the GHG emissions and the fairness of the production conditions involved. This allows the public sector to select the most sustainable product from the tenders received. In the example the most climate-friendly polo shirt saves around 50 % of the GHG emissions compared to a conventionally produced polo shirt.





Further information on this report can be found on the net zero website of the City of Zurich.

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