



GOVERNMENT  
PRINCIPALITY OF LIECHTENSTEIN

# Liechtenstein's First Biennial Transparency Report

Submission of February 2025  
under the Paris Agreement



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## **Imprint**

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# **I National inventory report**

## ***National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases***

### **I.A General information**

Liechtenstein submits its national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases as a stand-alone report. The most recent submission as of 30 April 2024 (national inventory document) and 8 January 2025 (common reporting tables) is available on the UNFCCC website as well as on the website of the Liechtenstein Office of Environment<sup>1</sup>.

## **II Tracking progress**

### ***Information necessary to track progress made in implementing and achieving nationally determined contributions under Article 4 of the Paris Agreement***

### **II.A National circumstances and institutional arrangements**

With its neighbouring country Switzerland, Liechtenstein forms a customs and monetary union governed by a customs treaty [FL Gov, 1980]. On the basis of this union, Liechtenstein is linked to Swiss foreign trade strategies, with a few exceptions: Liechtenstein—contrary to Switzerland—is a member of the European Economic Area. The Customs Union Treaty with Switzerland impacts greatly on environmental and fiscal strategies. Many Swiss levies and regulations for special goods, for example, environmental standards for motor vehicles and quality standards for fuels, are also adopted and applied in Liechtenstein. For the determination of GHG emissions, Liechtenstein appreciates having been authorised to adopt a number of Swiss methods and Swiss emission factors.

For the interpretation of Liechtenstein's emissions and removals it is important to recognise that Liechtenstein is a small central European country in the Alpine region with a population of 39,677 inhabitants (2022) and with an area of 160 km<sup>2</sup>.

In recent years, various research programmes on the effects of global climate warming in the Alpine region have been conducted. Particularly relevant for Liechtenstein, which is situated between Switzerland and Austria, are Swiss studies, such as the ones by the Swiss Advisory Body on Climate Change [OCCC, 2024].

In November 2018, the "Climate Scenarios for Switzerland" [CH Gov, 2018] were published. These scenarios are more detailed compared to previous studies and particularly more regionally differentiated. The historical development and projections indicate that noticeable effects are to be expected. Liechtenstein published "Facts and figures about the climate in Liechtenstein" showing expected temperature and precipitation in the year 2060 [OE 2020].

In 2013 and 2018, the Swiss Federal Office for the Environment FOEN and MeteoSwiss (Swiss Federal Office of Meteorology and Climatology) published a report which shows numerous indicators that demonstrate changes in the climate in Switzerland, whether in the cryosphere, the hydrosphere, vegetation, human health, the economy or society as a whole [FOEN, 2018]. The results are also representative for Liechtenstein [OE 2020] as conditions in Liechtenstein are comparable to the Swiss Alps. The results can therefore give valuable insights about climate change related future risks. Currently heat maps are under development which will display urban heat intensity patterns of high heat exposure, which will be used as a tool for urban planning as of 2025.

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<sup>1</sup> <https://www.llv.li/de/privatpersonen/freizeit-umwelt-und-tierhaltung/wald-natur-landschaft-klima/klimaschutz>

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## II.A.1 Government Structure

*The subsequent paragraphs provide a brief overview of Liechtenstein's governance structure.*

### Political organisation of Liechtenstein: The people, the supreme political authority

The Principality of Liechtenstein is a constitutional hereditary monarchy on a democratic-parliamentary basis. Dualism, the division of state power, is anchored in the constitution. The two sovereigns, prince and people, are bound to this. The Princely House provides the Head of State and has guaranteed continuity for more than 300 years. Day-to-day politics is largely determined by the elected parliament (legislative) and the government (executive).

An important formal instrument of direct democracy is the referendum. Within 30 days of the official announcement of the relevant state parliament resolution, at least 1,000 state citizens entitled to vote or at least three municipalities can request a referendum in the form of a unanimous municipal assembly resolution. If it concerns the constitution as a whole, or individual parts of it, or a state parliament resolution that concerns the approval of a state treaty, this request must be supported by at least 1,500 state citizens or four municipalities who are eligible to vote.

In addition, also at municipal level a referendum can be initiated: One sixth of the voters in a municipality can request that resolutions of the municipal council be dealt with in the municipal assembly.

### Administrative Structure

The parliament, as the representative of the people, and the princely house, represented by the sovereign, are the legislative powers in Liechtenstein. If there is disagreement between them, a referendum decides. The 25 members of parliament, called *Landtag*, are elected by the people for four years in universal, direct and secret elections in two election circles. The upper land (*Oberland*) has 15 members of parliament, the lower land (*Unterland*) has 10 members of parliament. The parliament is the legislative authority of the country and is convened and closed by the prince. Elections for the mandate period 2021–2025 were held on 7 February 2021.

The legislative system comprises several hierarchical levels and all legislation must ultimately comply with the Constitution of Liechtenstein. Decisions by the Liechtenstein Parliament are subject to referenda by the Liechtenstein population.

The executive authority is the Liechtenstein Government with five members. The Deputy Prime Minister is currently overseeing the environment portfolio and is, as the Minister of Home Affairs, also responsible for energy.

Civil and criminal cases are heard initially by the *Landgericht*, at appeal level by the *Obergericht* and at supreme court level by the *Oberster Gerichtshof*. Public law cases are dealt with by the Administrative Court and the *Staatsgerichtshof*. The courts are all located in the capital Vaduz.

The Office of Environment (OE) reporting to the Deputy Prime Minister is responsible for the implementation of acts in the areas of agriculture, forestry, environmental protection and climate. As such it oversees compiling the emission data and bears the overall responsibility for Liechtenstein's national greenhouse gas inventory and Biennial Transparency (BTR) reporting. In addition to the OE, the Office of Economic Affairs (OEA), the Office for Foreign Affairs (OFA) the Office of Statistics (OS) and the Office of Building Construction and Spatial Planning (*Amt für Hochbau und Raumplanung, AHR*) participate directly in the compilation of the BTR process. The OEA is responsible for the implementation of all energy related measures. The AHR bears the overall responsibility for the transport sector.

Liechtenstein is a member of the United Nations, the European Economic Area, the Council of Europe and the Organisation for Security and Co-operation in Europe (OSCE). Sustainability is defined as an important government goal in relation to society, the economy, finances and the state.

## Relevant inter-ministerial decision-making processes or bodies

Within the Liechtenstein administration, interdepartmental exchange and consultation is an important pillar during the preparation phase of legal provisions or other matters requiring a decision by the Liechtenstein Government. The leading offices, mandated by the respective member of the Liechtenstein Government, therefore conduct, as a matter of routine, interdepartmental as well as official public consultation. All communes of Liechtenstein are invited to provide feedback during the consultation phase as well. The received feedback is, to the extent possible, considered. It is also presented to parliament during the first hearing. Given the small size of the country and the direct line of the OE to the Minister of Environmental Affairs, the inter-ministerial decision-making process can be considered very smooth and efficient.

## International relations

Liechtenstein is a member of several international organisations (e.g. the OECD, Alpine Convention, International Monetary Fund (IMF) and specialised agencies of the United Nations). Since 18 September 1990, Liechtenstein has been a full member of the United Nations.

Liechtenstein and Switzerland form a customs and monetary union governed by a customs treaty. Liechtenstein—contrary to Switzerland—however, is a member of the European Economic Area. The Customs Union Treaty with Switzerland impacts greatly on environmental and fiscal strategies. Many Swiss levies and regulations for special goods (for example, environmental standards) are also adopted and applied in Liechtenstein.

Liechtenstein has, through the European Economic Area (EEA), a strong relationship with the European Union (EU). Liechtenstein is also a member of the European Environmental Agency, one of the most important agencies for European cooperation on environmental issues. Concerning climate policy measures, Liechtenstein is bound to the legislation of the European Union. Liechtenstein is also participating in the EU emission trading scheme. Table 1 summarises the milestones of Liechtenstein's foreign policy.

Table 1: Short history of Liechtenstein

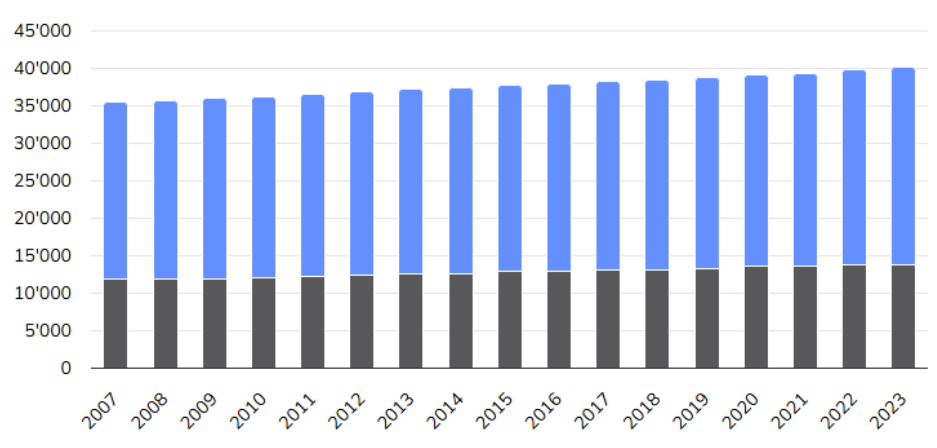
|             |                                                                                             |
|-------------|---------------------------------------------------------------------------------------------|
| <b>1806</b> | Inclusion in the Confederation of the Rhine: Liechtenstein becomes a sovereign state        |
| <b>1852</b> | Customs treaty with the Austrian Empire                                                     |
| <b>1862</b> | A new constitution comes into force which provides for a parliament to represent the people |
| <b>1919</b> | Cancellation of the customs treaty with Austria                                             |
| <b>1924</b> | Customs treaty with Switzerland, introduction of the Swiss franc as the official currency   |
| <b>1950</b> | Membership of the International Court of Justice at The Hague                               |
| <b>1960</b> | Supplementary protocol on participation in EFTA                                             |
| <b>1978</b> | Member of the Council of Europe                                                             |
| <b>1990</b> | Liechtenstein becomes the 160th member of the UN                                            |
| <b>1991</b> | Member of EFTA                                                                              |
| <b>1995</b> | Liechtenstein joins the EEA and the WTO                                                     |

## II.A.2 Population profile

As of December 2023, Liechtenstein's permanent population consisted of 40,015 people, with the proportion of women being 50.4%. Liechtenstein is one of the smallest countries in Europe and the world. The population is spread over eleven municipalities. Schaan forms Liechtenstein's largest municipality with around 6,100 inhabitants. Around 5,800 people live in the capital, Vaduz. In 2023, the foreign permanent population increased by 87 people to 13,721 people,

around 34.3% of the total population. The number of people with Liechtenstein citizenship living in Liechtenstein grew by 251 people to 26,294 people in the same period. The foreign nationals are mainly from Switzerland, Austria, Germany and Italy.

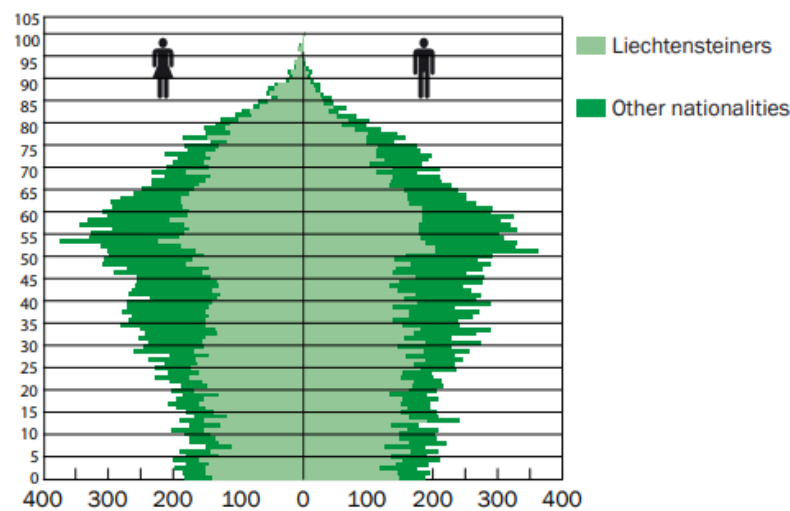
Figure 1: Liechtenstein’s resident population by Liechtenstein (blue) vs other nationalities (black) between 2007 and 2023



Data source: Liechtenstein in Figures [OS, 2024a]

Figure 2 shows the demographic structure of Liechtenstein in 2022 by age, sex and nationality. A growing proportion of the population is of retirement age, while the share of persons below the age of 20 has been declining since the 1970s.

Figure 2: Age distribution by age, sex and nationality in Liechtenstein at the end of 2022



Data source: Liechtenstein in Figures [OS, 2024a]

### II.A.3 Geographical profile

Liechtenstein is situated between Switzerland and Austria in the centre of the Alpine arc. With a total area of 160 km<sup>2</sup>, it is the fourth smallest country in Europe and the sixth smallest country in the world. It extends 24.7 km from north to south and 12.4 km from east to west. Its western neighbour Switzerland is around 260 times larger than Liechtenstein. In the west and south, the national frontier runs alongside the Swiss cantons of *St. Gallen* and *Graubünden* for 41 km. In the north and east, Liechtenstein shares a 37 km long frontier with the Austrian federal state of *Vorarlberg*. The highest mountain is *Grauspitz* at 2,599 m above sea level. The lowest point is *Ruggeller Riet* at 430 m above sea level.

Figure 3: Liechtenstein's geographical situation



Data source: Liechtenstein in Figures [OS, 2024a]

Liechtenstein counts 11 municipalities, two of which are in the mountain area 700 metres above sea level.

Table 2: Liechtenstein's municipalities, area, height and population density 2022

| District/<br>municipality | Area<br>(km <sup>2</sup> ) | Height above<br>sea level (m) | Population density<br>(inhabitants/km <sup>2</sup> ) |
|---------------------------|----------------------------|-------------------------------|------------------------------------------------------|
| <b>Liechtenstein</b>      | <b>160.5</b>               |                               | <b>247</b>                                           |
| Upland                    | 125.5                      |                               | 201                                                  |
| Vaduz                     | 17.3                       | 460                           | 336                                                  |
| Triesen                   | 26.5                       | 512                           | 206                                                  |
| Balzers                   | 19.7                       | 477                           | 240                                                  |
| Triesenberg               | 29.7                       | 886                           | 89                                                   |
| Schaan                    | 26.9                       | 462                           | 225                                                  |
| Planken                   | 5.3                        | 786                           | 91                                                   |
| Lowland                   | 35.0                       |                               | 414                                                  |
| Eschen                    | 10.4                       | 457                           | 442                                                  |
| Mauren                    | 7.5                        | 472                           | 604                                                  |
| Gamprin                   | 6.2                        | 468                           | 281                                                  |
| Ruggell                   | 7.4                        | 433                           | 340                                                  |
| Schellenberg              | 3.6                        | 630                           | 311                                                  |

Data source: Liechtenstein in Figures [OS, 2024a]

## II.A.4 Economic profile

Liechtenstein has a very diverse national economy with a large number of small and medium-sized enterprises. The strong industrial sector and financial services providers contribute the most to the Gross Domestic Product (GDP). At the same time, the contribution of the public sector to the national economy is comparatively small. On 26 May 1924, Liechtenstein adopted the Swiss Franc (CHF) as its legal currency. All coins, banknotes and other means of payment used in Switzerland have since been recognised as official legal tender in Liechtenstein.

### Gross domestic product, workforce and gross value added by sectors

A distinctive feature of Liechtenstein's national economy is the large number of inward cross-border commuters. In 2022, 57% of Liechtenstein's work force consisted of this group. Since the GDP is generated by the entire work force, country comparisons of GDP per capita can result in misleading conclusions in the case of Liechtenstein. Hence, GDP per person employed may be considered a more appropriate figure to compare Liechtenstein to other countries. GDP

has risen to CHF 7 billion in 2021, while Gross National Income (GNI) per inhabitant decreased. This is mainly explained by the increasing number of commuters contributing to Liechtenstein's GDP.

Table 3: Liechtenstein's Gross Domestic Product and Gross National Income per year for the most recent available years

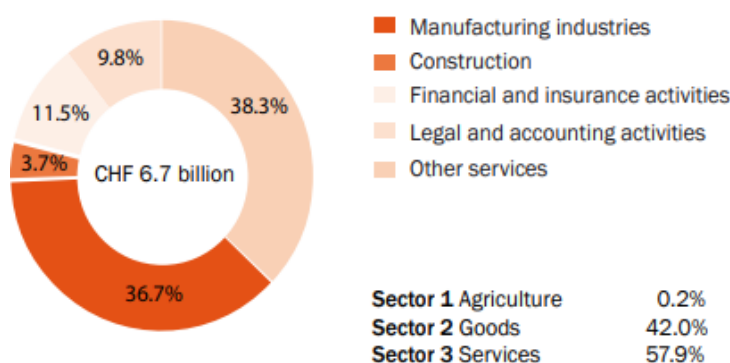
#### GDP and GNI at current prices

| Year | Gross domestic product (GDP) | GDP per employed person | Gross national income (GNI) | GNI per inhabitant |
|------|------------------------------|-------------------------|-----------------------------|--------------------|
|      | in billion CHF               | in CHF                  | in billion CHF              | in CHF             |
| 2017 | 6.4                          | 197 300                 | 6.6                         | 175 050            |
| 2018 | 6.5                          | 196 380                 | 6.8                         | 176 870            |
| 2019 | 6.4                          | 187 150                 | 6.2                         | 161 570            |
| 2020 | 6.0                          | 178 730                 | 6.5                         | 165 880            |
| 2021 | 7.0                          | 212 610                 | 6.5                         | 165 570            |

Data source: Liechtenstein in Figures [OS, 2024a]

Liechtenstein's economy is dominated by its two largest sectors: the service sector (57.9%) and manufacturing industries (36.7%).

Figure 4: Economic structure (2021) Measured as the share of gross value added of the respective sector in total gross value added



Data source: Liechtenstein in Figures [OS, 2024a]

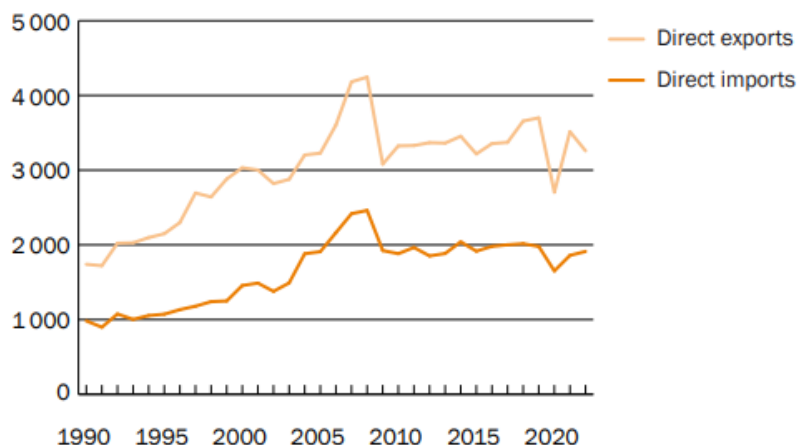
## International trade patterns and workforce

Liechtenstein has no mineral resources and, historically, no heavy industry, and the country's economy strongly depends on trade with other countries. It continues to be shaped significantly by its goods production. In 2022, the goods-producing sector provided 34% of all jobs. This represents a remarkably high proportion compared to other European countries. Jobs in the goods-producing industries are provided by a total of 642 companies. These companies are mainly small companies with fewer than 50 persons employed. They are engaged in a large number of specialised market niches and contribute to the broad diversification of Liechtenstein's economy. The most important branches include mechanical engineering, manufacturing of electrical machinery, vehicle components, dental technology, the production of food, as well as construction work. Due to Liechtenstein's limited domestic market, especially larger companies are heavily export oriented. The most important export destinations for Liechtenstein's goods-producing industries are Switzerland, Germany and the USA [OS, 2024a].

In 2022, direct goods exports without Switzerland amounted to CHF 3,258 million, which corresponds to a 7.3% reduction compared to 2021. In 2022, direct goods imports without Switzerland amount to CHF 1,912 million corresponding to a 2.9% increase compared to 2021.

Goods exchange with and via Switzerland is not recorded because of the customs union.

Figure 5: Direct goods exports and imports (without Switzerland) in million CHF

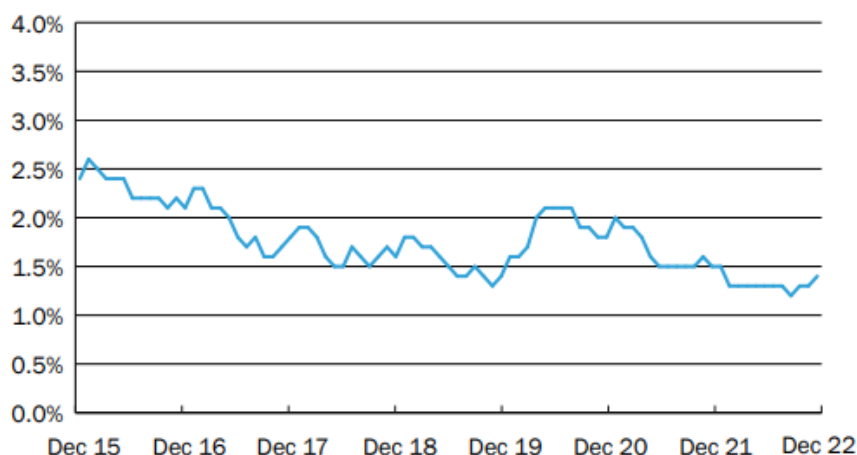


Data source: Liechtenstein in Figures [OS, 2024a]

## Unemployment, public debt rate and general government spending ratio

Liechtenstein's unemployment rate is one of the lowest worldwide and stood at 1.3% at the end of 2022. 370 jobseekers have been recorded, of which 283 were recorded as unemployed in 2022. Unemployed persons are those who are registered at the Office of Economic Affairs, who live in Liechtenstein and who are able to take up employment within two weeks. Due to statistical recording difficulties, persons who enter a longer-term further education programme or who are on maternity leave are also counted as unemployed.

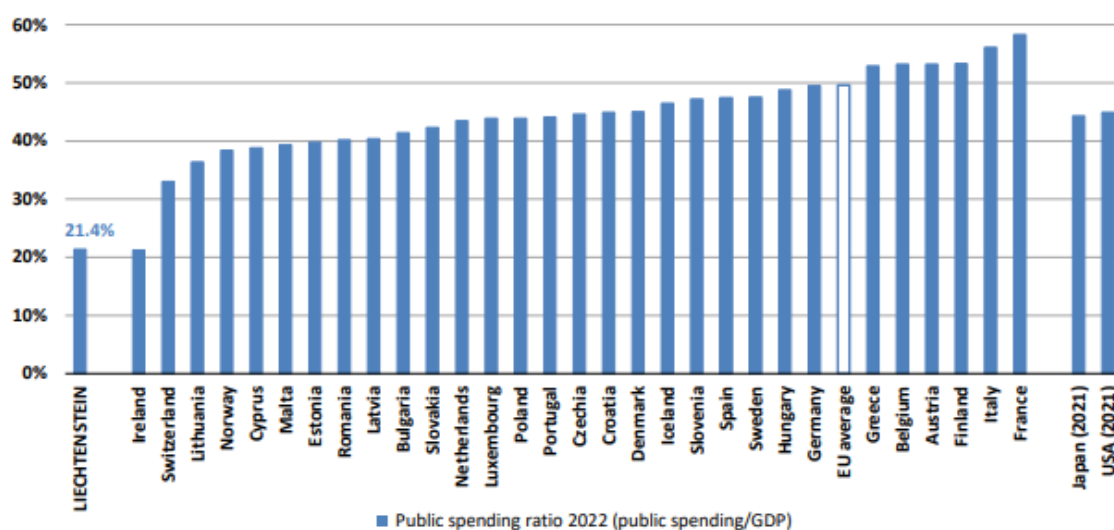
Figure 6: Unemployment rate



Data source: Liechtenstein in Figures [OS, 2024a]

Liechtenstein is distinguished by great prosperity, high political/economic stability as well as by an excellent situation of its public finances. Liechtenstein belongs to the Standard & Poor's highest rated group of countries (long-term rating: AAA) with a stable outlook. In 2023, only 11 of the 137 rated countries held the top rating of AAA [FL Gov, 2024a].

Figure 7: Public spending ratio 2022

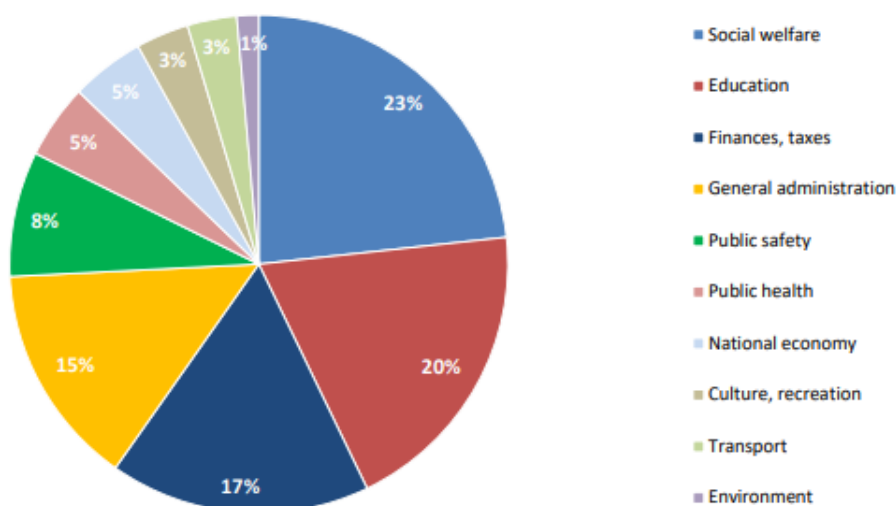


Data source: Economic and financial data [FL Gov, 2024a]

At 21.4% the public spending ratio, corresponding to the consolidated public spending of the central government, the local governments and social security funds in relation to the GDP, was very low in Liechtenstein in 2022.

The total expenditure of the central government's current account in 2023 was approximately CHF 917 million (2022: CHF 874 million). The two largest expenditure areas were social welfare and education, which together account for about 43% of central government spending. Expenditure of the municipalities amounted to CHF 295 million in 2022 (2021: CHF 274 million). In 2022, the central government and municipalities made consolidated total gross investments of CHF 113.4 million (2021: CHF 82.3 million).

Figure 8: Central government expenditure by area of responsibility in 2023



Data source: Economic and financial data [FL Gov, 2024a]

## II.A.5 Climate profile

### Temperature

Liechtenstein's climate is directly connected to the topography of the Upper Rhine Valley and characterised by warm down-slope winds. The mean annual temperature at the SwissMetNet station of Vaduz is 10.6°C for the current standard reference period 1991–2020. SwissMetNet is the official meteorological monitoring network of the Swiss Federal Office of Meteorology and Climatology MeteoSwiss. Since temperature records began in 1871 the average temperature in Liechtenstein has increased by 2°C [OE 2020].

Expected future developments and impacts are described in section 6.1 of Liechtenstein's eighth national communication [OE, 2023]. In the following, more detailed information is provided with regard to temperature, precipitation, climate indices, and extreme events.

Figure 9: Mean annual temperature in Vaduz Liechtenstein since 1974

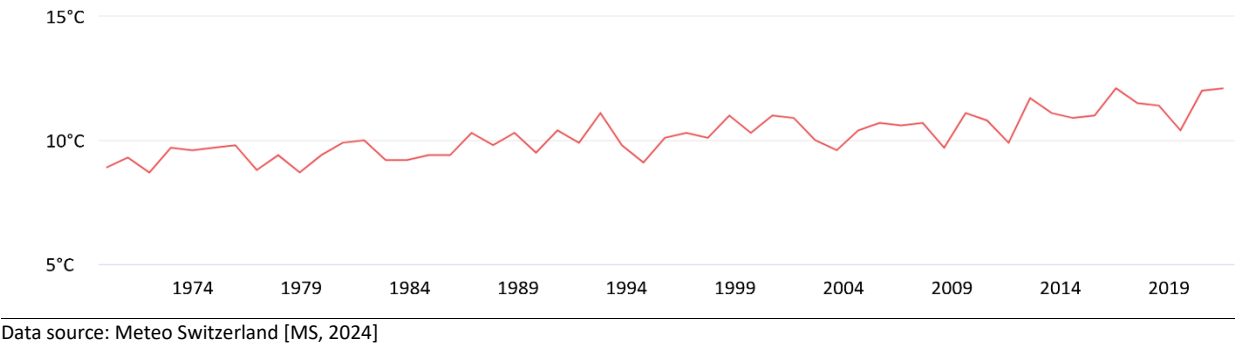
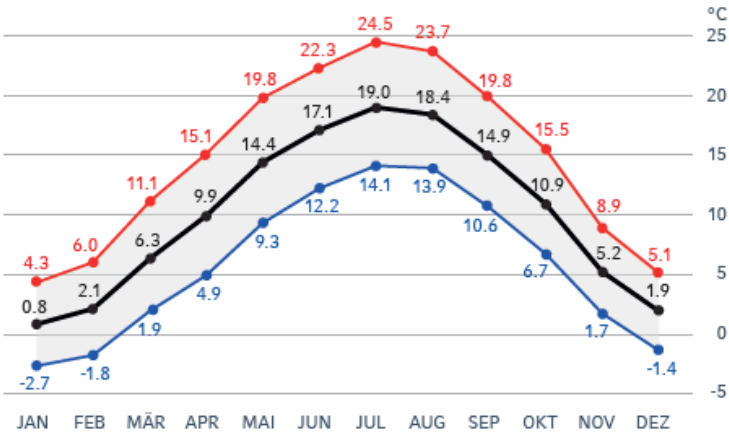


Figure 10: Average temperature (black), medium temperature max (red), medium temperature min (blue) from January to December in °Celsius



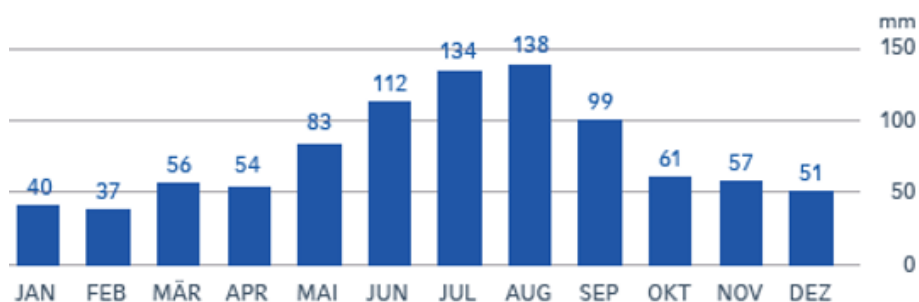
Data source: Meteo Swiss [MS, 2024]

### Precipitation

In Liechtenstein, systematic recording of precipitation began in 1961 at the SwissMetNet Station in Vaduz. In Switzerland, measurements date back to the middle of the 19<sup>th</sup> century. Compared to the clearly observable long-term changes in mean temperature, trends in mean precipitation amounts are less pronounced. Still, the annual total precipitation in

the Rhine Valley shows a significant increase of 13% over of the last 130 years [OE 2020]. Precipitation is generally most pronounced in spring and summer.

Figure 11: 2023 Precipitation total from January to December in mm Vaduz



Data source: Meteo Swiss [MS, 2024]

## II.A.6 Sector details

### II.A.6.1 Energy

As there are no domestic gas, oil and coal resources, Liechtenstein's primary energy sources are limited to wood, hydro- and solar power. Combustion-based emissions in Liechtenstein's energy system therefore always result from fossil energy imports.

#### Energy supply and final energy consumption

Table 4 shows energy consumption from domestic and imported sources. Energy consumption in 2022 was 6.1% lower than average consumption over the last five years. Compared to the previous year, energy consumption decreased by 16.1%. The decrease in energy consumption in 2022 is also linked to warmer weather.

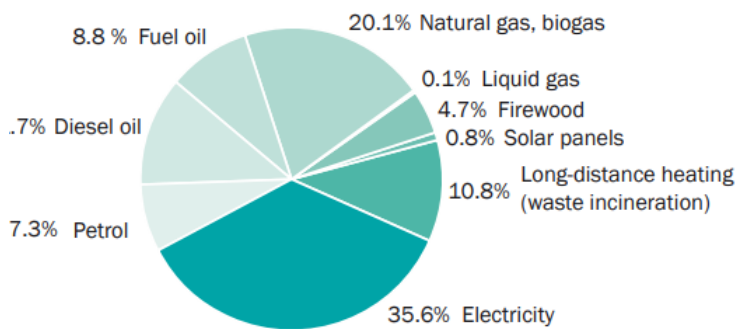
Table 4: Energy consumption/imports, 2022

| in GWh                                        | 2015           | 2020           | 2021           | 2022           |
|-----------------------------------------------|----------------|----------------|----------------|----------------|
| <b>Total</b>                                  | <b>1 241.3</b> | <b>1 194.5</b> | <b>1 235.1</b> | <b>1 148.9</b> |
| Electricity                                   | 395.2          | 402.3          | 417.6          | 409.3          |
| Petrol                                        | 113.8          | 90.4           | 94.7           | 84.3           |
| Diesel oil                                    | 138.5          | 137.0          | 145.4          | 134.8          |
| Fuel oil                                      | 158.1          | 132.4          | 113.4          | 101.5          |
| Natural gas, biogas                           | 260.8          | 247.5          | 275.2          | 231.1          |
| Liquid gas                                    | 1.0            | 1.0            | 0.9            | 0.8            |
| Firewood                                      | 58.2           | 45.5           | 44.1           | 53.6           |
| Solar panel                                   | 10.3           | 9.9            | 9.6            | 9.3            |
| Long-distance heating<br>(waste incineration) | 105.6          | 128.5          | 134.2          | 124.1          |
| Self supply                                   | 135.2          | 155.7          | 155.6          | 149.2          |
| Consumption per<br>inhabitant in MWh          | 33.0           | 30.6           | 31.4           | 29.0           |

Data source: Liechtenstein in Figures [OS, 2024a]

In 2022, electricity, natural gas, heating oil, diesel oil and petrol were amongst the major energy sources in Liechtenstein. These sources are strongly dependent upon energy imports. The proportion of own energy supply to total energy consumption is 13%. Energy production in Liechtenstein is limited to the energy sources electricity, firewood and biogas.

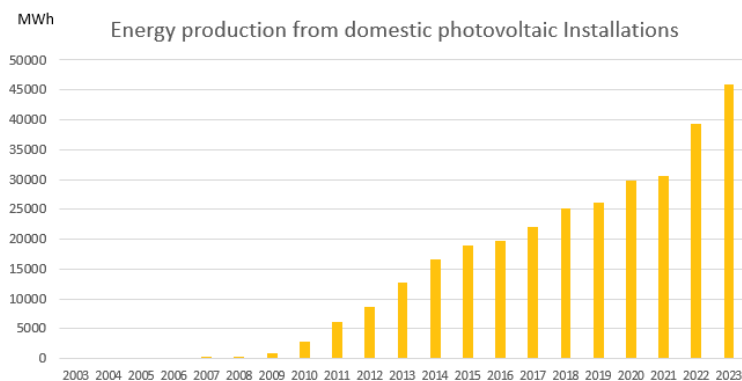
Figure 12: Energy consumption by energy source, 2022



Data source: Liechtenstein in Figures [OS, 2024a]

Energy produced from domestic photovoltaic installations is on a steady rise in Liechtenstein. In 2023 more than 45,000 MWh have been produced by domestic photovoltaic installations.

Figure 13: Energy production from photovoltaic installations



Data source: Liechtenstein in Figures [OS, 2024a]

Energy prices, taxes and subsidies

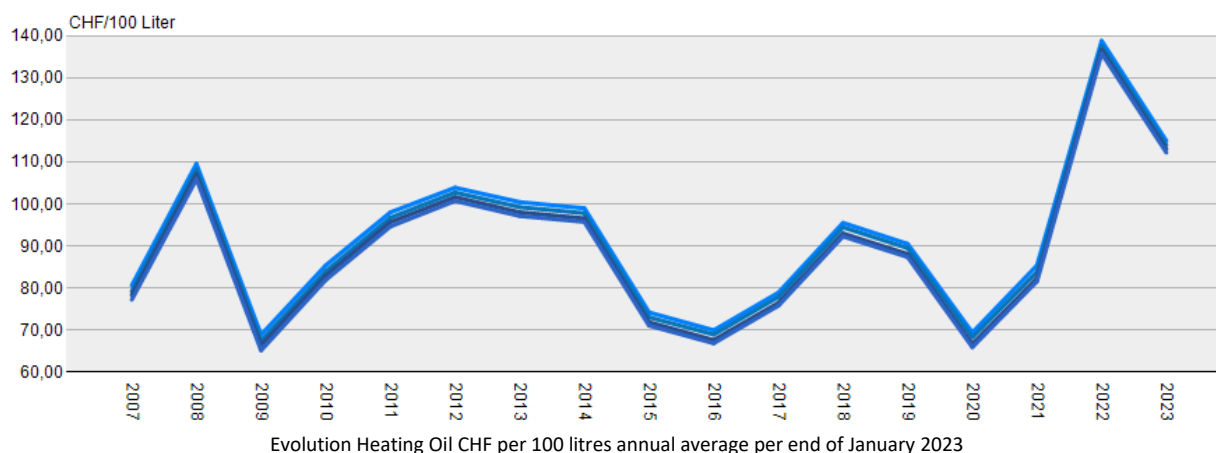
Because of Liechtenstein’s customs union with Switzerland, Swiss legislation incorporated into the customs treaty governing the union is directly applicable in Liechtenstein. In addition, Liechtenstein and Switzerland have introduced a CO<sub>2</sub> levy applicable on fossil fuels with identical tax levels in both countries. This results in energy prices being almost identical in Switzerland and Liechtenstein. Reference is made to the Swiss chapter on energy prices of the Swiss Biennial Transparency Report, figure 24 [FOEN, 2024].

In Switzerland and Liechtenstein energy prices at the retail level are composed of the basic price, the value-added tax (8.1%), as well as various energy taxes and climate levies. Energy taxes and climate levies depend on the fuel type and are shown in Figure 14 and Figure 15 below. Liechtenstein does not compile its own statistics on the development of energy prices but uses Swiss statistics.

Prices for heating oil reached a historic low in the mid-1990s. Real prices of heating oil then increased from 2000 and have been stagnant, though fluctuating, since 2007. The development of the real energy prices of petrol and natural gas was similar, but less pronounced, with an increase between the mid-1990s and 2008 and flat but fluctuating since then.

According to the Swiss Consumer Price Index of the Federal Statistical Office Switzerland [FSO, 2024], the average price of heating oil in 2023 was CHF 115.03 per 100 litres for a purchase quantity of 3,001–6,000 litres. In 2022, the price was CHF 138.82 per 100 litres according to the figure of OS.

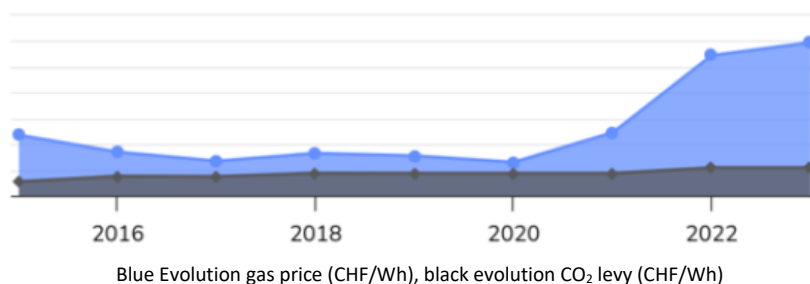
Figure 14: Evolution of the price for heating oil per end of 2023



Data source: Liechtenstein in Figures [OS, 2024a]

The gas prices for households were increasing heavily in 2021 while the CO<sub>2</sub> levy was kept at a similar level as in previous years.

Figure 15: Price of gas for households CO<sub>2</sub> levy per end of 2023



Data source: Liechtenstein in Figures [OS, 2024a]

In contrast to the other energy sources, real electricity prices decreased slightly between the mid-90s and 2008, then increased in the following years. In 2020 the real price of electricity was similar to the 1995 level.

As Table 5 shows, electricity prices in Liechtenstein generally increased since 2016. In the first semester of 2023 electricity prices were significantly higher than in the second semester of 2023.

Table 5: Electricity prices for households and small businesses in Liechtenstein

| Date             | Range | Price in Rappen/kWh (without VAT) |             |             |              |
|------------------|-------|-----------------------------------|-------------|-------------|--------------|
|                  |       | Annual energy consumption in kWh  |             |             |              |
|                  |       | Up to 1000                        | 1000 - 2500 | 2500 - 5000 | 5000 - 15000 |
| as of 01.01.2016 | Max   | 19.377                            | 19.295      | 19.191      | 19.050       |
|                  | Min   | 13.982                            | 13.982      | 13.982      | 13.982       |
| as of 01.01.2023 | Max   | 39.027                            | 38.945      | 38.841      | 38.700       |
|                  | Min   | 32.032                            | 32.032      | 32.032      | 32.032       |
| as of 01.07.2023 | Max   | 34.027                            | 33.945      | 33.841      | 33.700       |
|                  | Min   | 27.032                            | 27.032      | 27.032      | 27.032       |
| as of 01.10.2023 | Max   | 29.027                            | 28.945      | 28.841      | 28.700       |
|                  | Min   | 22.032                            | 22.032      | 22.032      | 22.032       |

Data source: Liechtenstein in Figures [OS, 2024a]

Table 6 shows the relative comparison of energy prices in Switzerland and its neighbouring countries as of January 2022 [FOEN, 2024], i.e. before the increases that started in the course of 2022. The price for gasoline in Switzerland and Liechtenstein was about the same as in Germany and Italy, but somewhat higher compared to France and Austria. Diesel oil was generally more expensive in Switzerland and Liechtenstein compared to its neighbouring countries. Although the table below from [FOEN, 2024] has been produced for Switzerland only, it is also applicable to Liechtenstein, as Liechtenstein prices equal Swiss energy prices.

Table 6: Energy prices for households and small businesses in Switzerland and Liechtenstein and its neighbouring countries as of January 2022, including all taxes and levies (relative prices with prices for Switzerland set to 100.0)

| Country     | Gasoline | Diesel oil | Gas oil |
|-------------|----------|------------|---------|
| Switzerland | 100.0    | 100.0      | 100.0   |
| Germany     | 100.0    | 89.1       | 92.6    |
| France      | 94.8     | 87.0       | 112.0   |
| Italy       | 100.3    | 89.9       | 150.6   |
| Austria     | 81.2     | 78.1       | 93.2    |

Data source: Switzerland BTR [FOEN, 2024]

## II.A.6.2 Transport

### Overview

Liechtenstein's road network consists of 420 km of asphalted and 425 km of unpaved roads. The well-developed public transport relies mostly on buses, which connect the eleven municipalities with each other and with the railway networks in Switzerland and Austria. The railway line links Feldkirch in Austria to Buchs in Switzerland and has three stops in Liechtenstein.

### Passenger transport (land-based)

The most important transport network in Liechtenstein is the road network. The only railway is a 9 km long route crossing the country from Feldkirch (Austria) to Buchs (Switzerland), operated by the Austrian Federal Railways (ÖBB). Public transport is ensured by a dense network of buses. On the Swiss side of the Liechtenstein border there is a motorway. Over the last thirty years, the number of motor vehicles in Liechtenstein has almost doubled. In 2023, a total of 30,961 automobiles were registered, corresponding to a degree of motorisation of around 780 automobiles per 1,000

inhabitants as Table 7 illustrates. This value (far) exceeds motorisation levels of other European countries. The neighbouring countries of Switzerland and Austria have around 540 and 570 passenger cars per 1,000 inhabitants, respectively.

Pursuant to decision 1753/2000/EC, which has been incorporated into the EEA Agreement, Liechtenstein is required to determine the average CO<sub>2</sub> emissions of automobiles newly introduced into circulation each year. Liechtenstein also has committed to following the path established by Regulation (EC) 443/2009, which sets emission performance standards for new passenger cars.

Table 7: Motor Vehicles in Liechtenstein

| Year<br>(as at 30.6.) | Motor vehicles |                          | Passenger cars |                          |
|-----------------------|----------------|--------------------------|----------------|--------------------------|
|                       | Number         | per 1 000<br>inhabitants | Number         | per 1 000<br>inhabitants |
| 1990                  | 21 233         | 746                      | 16 891         | 594                      |
| 2000                  | 28 447         | 877                      | 21 784         | 672                      |
| 2010                  | 35 291         | 983                      | 26 890         | 749                      |
| 2020                  | 40 997         | 1 058                    | 30 434         | 785                      |
| 2022                  | 41 631         | 1 059                    | 30 654         | 780                      |
| 2023                  | 41 987         | 1 058                    | 30 961         | 780                      |

Data source: Liechtenstein in Figures [OS, 2024a]

## Freight transport (land-based)

The economic growth of recent years has led to an increase in freight transport to and from Liechtenstein. In addition to various industrial companies that operate their own logistics centres and truck fleets, several larger transport and logistic companies primarily operate in the lower part of Liechtenstein (*Unterland* region) towards the Austrian border. By the end of 2017, 254 transport operator licenses had been issued. Of these, 71 companies held a Euro license, collectively accounting for 546 license copies. The Euro license is valid for commercial cross-border goods transport within the EEA and Switzerland. No license is required for in-house transport with own vehicles or for domestic transport within Liechtenstein.

In 2018, goods transport in Liechtenstein accounted for an average of 0.24% of total road traffic. Of this, 49.5% were linked to domestic transport, 43.7% were inbound and outbound traffic, and 6.8% consisted of transit journeys. At the border crossing between Liechtenstein and Austria (Schaanwald-Tisis) the highest share of heavy freight traffic has been recorded, averaging 5.9% of total traffic in 2018. This highlights the importance of this crossing for economic relations between Liechtenstein, Austria, and southern Germany. The counting stations with the highest absolute volumes of heavy goods traffic, with the exception of the Eschen-Bendern station, are all located at national borders.

In collaboration with neighbouring Austria a mobility survey for freight transport has been developed. Data is expected for the first quarter of 2025 as indicated in the 2023 mobility monitoring report [FL Gov, 2024b].

Rail freight transport is not considered under the Mobility Concept 2030 [FL Gov, 2020], which is the key policy document related to transport. This is due to the lack of data and the limited influence of direct goods transport on Liechtenstein's territory.

The main measures pursued over the last 4 years were the creation of incentives for the logistics centres to be closer to the highways. The Government of Liechtenstein also approved the construction of a dedicated road for freight transport, but this is currently on hold following the filing of a complaint by a local resident and awaits the ruling of the Constitutional Court.

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## Aviation

There is no international Airport in the territory of Liechtenstein. The closest airports to Liechtenstein are the international airports in Zurich (Switzerland) and Munich (Germany), as well as the regional airports in Altenrhein, Friedrichshafen and Memmingen. In the 1940s, a small airfield for private aviation existed briefly in Schaan. Today, the only private airfield of Liechtenstein is located in Balzers and is used exclusively for helicopters.

### II.A.6.3 Industry and services

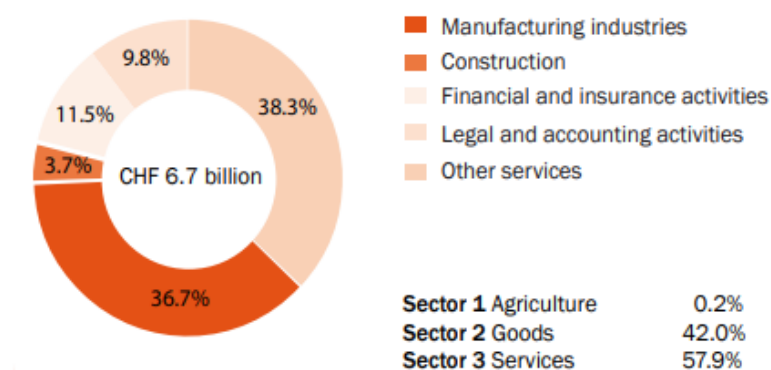
At the end of 2022, Liechtenstein had 42,514 employed persons. More than half of the work force lives abroad commuting from Switzerland, Austria or Germany to Liechtenstein. Over two thirds of the work force are foreign citizens. In 2022, 0.6% of employment has been attributed to sector 1 agriculture, 35% to the sector 2 goods and 64.4% to the sector 3 services. [OS 2023e]. In 2022, the annual unemployment rate stood at 1.3%, the lowest in years.

The structure of its industry sector clearly reflects that Liechtenstein is relatively poor in natural resources. Similarly, to Switzerland, the textile industry marked the beginning of industrialisation in Liechtenstein. Currently, in addition to mechanical devices and engines, Liechtenstein's industry is specialised in the production of high-precision instruments, and artificial teeth. Of importance is also the food processing industry.

Figure 16 shows the economic structure in Liechtenstein, measured as the share of gross value added of the respective sector in total gross value added.

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Figure 16: Economic Structure 2021



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Data source: Liechtenstein in Figures [OS, 2024a]

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As indicated in Table 8, the sector with the highest share in employment by far is the services sector with 64.4%, of which some 17% are linked to activities in the banking and assurance sector. The table further illustrates that most sectors depend heavily on inward commuters.

Table 8: Employment by economic branch, 2022

|                                                                            | Resident population<br>in gainful employment |                                  | Employed in Liechtenstein |               | Share<br>in % |
|----------------------------------------------------------------------------|----------------------------------------------|----------------------------------|---------------------------|---------------|---------------|
|                                                                            |                                              | of which<br>outward<br>commuters | Inward<br>commu-<br>ters  | Total         |               |
| <b>Total</b>                                                               | <b>20 977</b>                                | <b>2 616</b>                     | <b>24 153</b>             | <b>42 514</b> | <b>100.0</b>  |
| Sector 1 Agriculture                                                       | 248                                          | 12                               | 34                        | 270           | 0.6           |
| Sector 2 Goods                                                             | 5 674                                        | 791                              | 9 983                     | 14 866        | 35.0          |
| Mining & quarrying                                                         | 30                                           | 2                                | 57                        | 85            | 0.6           |
| Manufacturing                                                              | 3 842                                        | 614                              | 8 629                     | 11 857        | 79.8          |
| Energy & water supply;<br>sewerage & waste remediation                     | 227                                          | 31                               | 143                       | 339           | 2.3           |
| Construction                                                               | 1 575                                        | 144                              | 1 154                     | 2 585         | 17.4          |
| Sector 3 Services                                                          | 15 055                                       | 1 813                            | 14 136                    | 27 378        | 64.4          |
| Wholesale & retail trade; repair<br>of motor vehicles & motorcycles        | 1 868                                        | 397                              | 1 602                     | 3 073         | 11.2          |
| Transportation & storage                                                   | 502                                          | 92                               | 547                       | 957           | 3.5           |
| Accommodation & food service<br>activities                                 | 558                                          | 61                               | 484                       | 981           | 3.6           |
| Information & communication                                                | 532                                          | 87                               | 625                       | 1 070         | 3.9           |
| Financial & insurance activities                                           | 1 735                                        | 120                              | 3 018                     | 4 633         | 16.9          |
| Real estate activities                                                     | 130                                          | 17                               | 67                        | 180           | 0.7           |
| Legal & accounting activities                                              | 1 603                                        | 33                               | 1 536                     | 3 106         | 11.3          |
| Activities of head offices;<br>management consultancy<br>activities        | 486                                          | 38                               | 566                       | 1 014         | 3.7           |
| Architectural & engineering<br>activities; technical testing &<br>analysis | 589                                          | 96                               | 400                       | 893           | 3.3           |
| Scientific research &<br>development; other technical<br>activities        | 266                                          | 34                               | 132                       | 364           | 1.3           |
| Administrative & support<br>service activities                             | 952                                          | 83                               | 1 586                     | 2 455         | 9.0           |
| Public administration;<br>compulsory social security                       | 1 649                                        | 84                               | 480                       | 2 045         | 7.5           |
| Education                                                                  | 994                                          | 174                              | 507                       | 1 327         | 4.8           |
| Human health & social work<br>activities                                   | 2 077                                        | 378                              | 1 212                     | 2 911         | 10.6          |
| Arts, entertainment, recreation                                            | 421                                          | 22                               | 727                       | 1 126         | 4.1           |
| Other service activities                                                   | 529                                          | 67                               | 285                       | 747           | 2.7           |
| Households as employers                                                    | 131                                          | 2                                | 330                       | 459           | 1.7           |
| Activities of extraterritorial<br>organisations                            | 33                                           | 28                               | 32                        | 37            | 0.1           |

Data source: Liechtenstein in Figures [OS, 2024a]

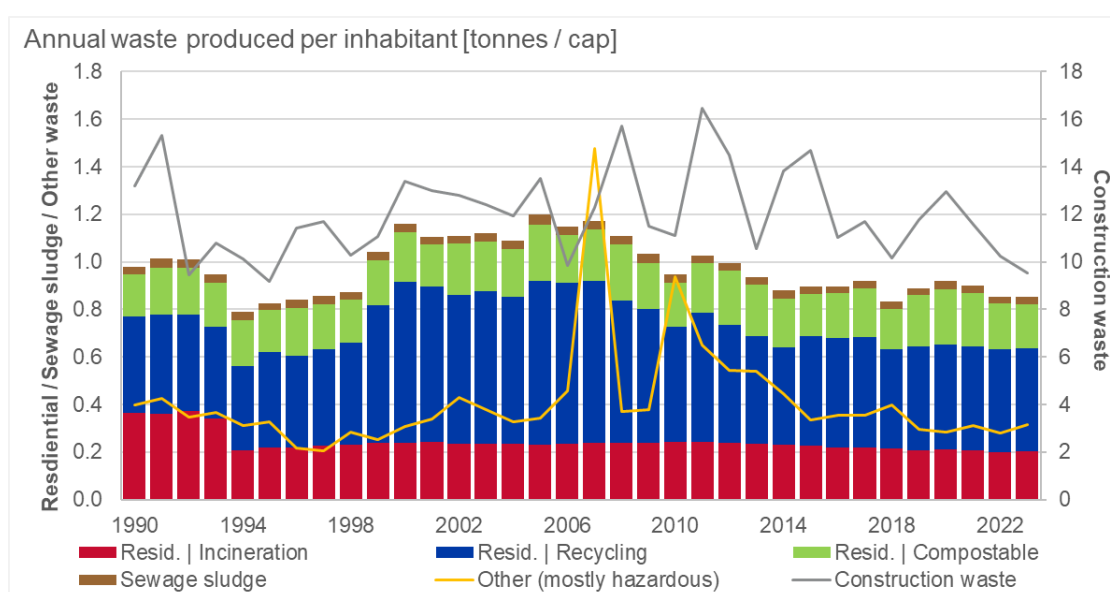
#### II.A.6.4 Waste

The vast majority (~90% by weight) of waste produced in Liechtenstein is inert waste from the construction sector which takes up significant space in dedicated landfills but does not produce emissions. Households are responsible for 8% of waste, but none of this is landfilled: More than 65% of residential waste is collected for recycling, a quarter is organic waste, which is composted where possible, and the remaining quarter is incinerated across the border in Switzerland. The waste incineration plant delivers energy (heat and steam) back to Liechtenstein. The dominant source of emissions in the sector is therefore sewage sludge, which constitutes less than 0.5% of total waste by weight. After the

introduction of fees on municipal waste along the ‘polluter-pays’ principle in 1994, residential waste production per capita declined temporarily, then rebounded by the turn of the millennium (see Figure 17).

There are no managed waste disposal sites in Liechtenstein. There are three landfill sites which are managed (e.g. sealing, control of water quality), but they operate exclusively for inert materials and therefore do not cause any greenhouse gas emissions. The amount of landfill volume fluctuates strongly depending on building activities and market conditions. The transition from “landfilling in the country” to “exporting MSW and industrial waste” to Switzerland for incineration started during the 1960s and was concluded in 1974, when the last municipality in the country stopped landfilling. Before 1974, some waste (municipal and other) was landfilled along the river Rhine in sandy soils which were not suitable for agriculture. In the year 1998, those sites were recorded in a 'contaminated site register'. About 20 of all registered contaminated sites are from waste dumping. They are not managed (they are not really “landfills” but rather “contaminated sites”). No landfill gas was collected for flaring or energy recovery.

Figure 17: Development of waste volumes per capita with treatment paths since 1990



Data source: Waste statistics 2024 [OS, 2024b]

## II.A.6.5 Building stock and urban structure

With an area of 160 km<sup>2</sup> Liechtenstein is the fourth smallest country in Europe. Woods/forest area accounts for 68 km<sup>2</sup> (42.2%), agricultural area for 52 km<sup>2</sup> (32%), non-productive area for 23 km<sup>2</sup> (14.3%) and settlement area for 18 km<sup>2</sup> (11.3%). These figures are based on the area statistic of 2019 [OS,2019], and are updated on average every 4–8 years.

### Building stock

In 2023, a total of 11,420 residential buildings with 22,067 apartments were recorded in Liechtenstein. Compared to the previous year, this represents an increase of 59 buildings (0.5%) and 165 apartments (0.8%).

A total of 19,138 apartments were classified as permanently occupied, meaning they had been registered as occupied at least once during the past two years. Of these, 18,345 apartments were occupied on 31 December 2023. 793 apartments, or 4.1%, were unoccupied [OS, 2023a]. Table 9 provides an overview of the evolution of housing types since 2014. Single family homes are still relatively popular.

Table 9: Houses by housing type since 2014

| Category | Buildings total | Other buildings | Other residential buildings | Multi storey residential buildings | Two family homes | Single family homes |
|----------|-----------------|-----------------|-----------------------------|------------------------------------|------------------|---------------------|
| 2014     | 10,782          | 322             | 1,917                       | 971                                | 1,287            | 6,285               |
| 2015     | 10,856          | 328             | 1,975                       | 976                                | 1,280            | 6,297               |
| 2016     | 10,932          | 328             | 2,063                       | 971                                | 1,296            | 6,274               |
| 2017     | 10,984          | 327             | 2,051                       | 1,025                              | 1,329            | 6,252               |
| 2018     | 11,090          | 330             | 2,049                       | 1,060                              | 1,349            | 6,302               |
| 2019     | 11,130          | 334             | 2,066                       | 1,080                              | 1,362            | 6,288               |
| 2020     | 11,203          | 333             | 2,073                       | 1,123                              | 1,357            | 6,317               |
| 2021     | 11,266          | 335             | 2,085                       | 1,137                              | 1,370            | 6,339               |
| 2022     | 11,361          | 338             | 2,117                       | 1,145                              | 1,393            | 6,368               |
| 2023     | 11,420          | 326             | 2,126                       | 1,148                              | 1,384            | 6,436               |

Data source: Housing Registry [OS, 2023a]

## Urban structure

Liechtenstein's urban structure reflects its small size, mountainous terrain, and its dual character as both a rural and urbanised country. All of Liechtenstein's municipalities including the capital Vaduz are relatively small. As such also the population density is modest as the image below illustrates. While most villages are located in the valley along the river Rhine, which also forms the natural border with Switzerland, there are two mountain villages, Planken and Triesenberg, at more than 700 metres above sea level.

Figure 18: Birds eye view of Liechtenstein



Swiss Airforce, 2009

The country comprises 11 municipalities, each with its own administrative center. While none are large cities, Vaduz (the capital) and Schaan are the most significant urban hubs. Buildings are typically low-rise, with single-family homes and small apartment buildings dominating the residential landscape. Commercial and industrial zones are relatively modest in scale.

Urban sprawl is minimal due to strict zoning laws and a focus on preserving agricultural and forest land. Urban planning incorporates green spaces and aims to harmonise development with the environment. This includes the preservation

of forested areas and the creation of recreational zones. The urban structure supports efficient transportation, with a well-developed public transport system of buses connecting all municipalities and cross-border regions.

Proximity to regional economic hubs like Zurich and Munich influences urban planning, particularly regarding cross-border workers and goods transportation. One of the biggest challenges in term of environmental protection is managing urban growth while preserving natural landscapes and agricultural land. Accordingly, ensuring energy efficiency is a key priority in urban planning.

## II.A.6.6 Agriculture

Agricultural land (excluding alpine pastures) accounts for about 22% of Liechtenstein's 16,054 hectares (ha). In 2022, 0.6% of all persons employed in Liechtenstein were working in agriculture and forestry. For the farmers, the dairy industry plays an important role. Some 55 dairy farms produced around 14 million kilogram of milk in 2022. In total 95 farms were registered in 2022. Of these, more than a third is certified to produce according to organic farming production methods. In Liechtenstein, the cultivation of forage crops is of particular importance. The share of forage crops amounts to 28% of the agricultural area. 60% of the agricultural area is used as permanent grassland.

International challenges, as well as the changes in agricultural policies, require strong flexibility from Liechtenstein's farmers. The demand for more efficient and sustainable farming practices is constantly growing. Liberalisation of world markets has also led to some deregulation in Liechtenstein. In addition, the agricultural sector has to provide an increasing number of services that are not remunerated by markets, but required by public interests. The Agricultural Law, adopted in 2008, addresses the above-mentioned issues and promotes the trend towards greater ecological agriculture in Liechtenstein. To maintain soil fertility, the environmental impact is minimised by environmentally friendly forms of production, such as integrated production and organic farming. Landscape maintenance and conservation are also considered as a task of agriculture and their importance will continue to increase.

By means of the Agriculture Law Liechtenstein aims to promote environmentally friendly and animal-friendly agriculture as well as permanent pastures on swampy and mixed soils. In the case of wildflower meadows, the preservation of which is of particular interest to nature conservation, the demands on ecological cultivation are even higher. In parallel with Switzerland, the Ecological Performance Certificate was introduced for environmentally friendly cultivation and welfare-oriented animal husbandry. All registered farms operate according to these principles. Direct payments are only paid if the practice corresponds to the provisions of the animal protection legislation and the environmental protection provisions. The use of agricultural aids (fertilisers, pesticides) is strictly regulated.

Since 2002, farming of animals consuming roughage is supported through a direct payment system. Livestock increased since 2016. Liechtenstein's agriculture primarily relies on animal husbandry, which generates 70% of agricultural revenue. The Water Protection Act, which entered into force in 2003 and is comparable to the Swiss law, specifies a cap on the maximum number of cattle allowed per land area.

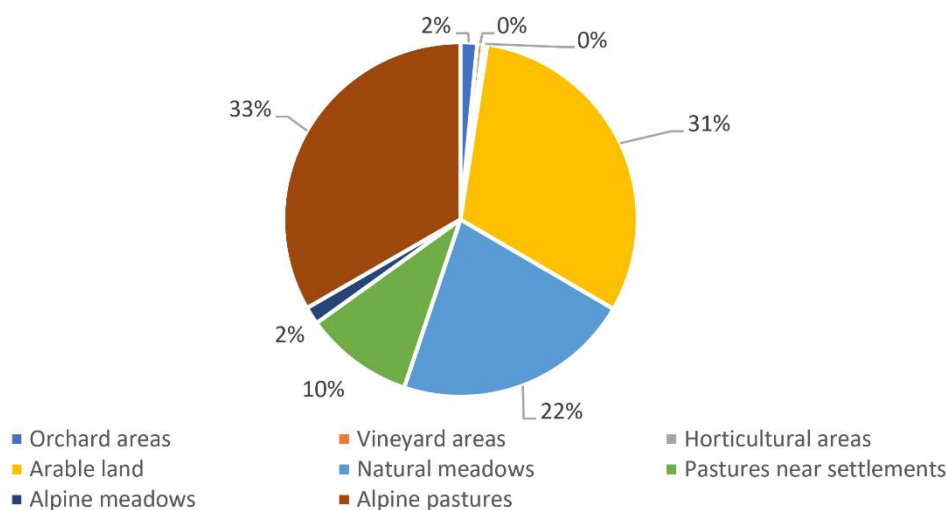
Figure 19: Livestock and milk production

|                                  | 2000   | 2010   | 2020   | 2022   |
|----------------------------------|--------|--------|--------|--------|
| Cattle                           | 5 054  | 5 993  | 6 327  | 6 272  |
| of which cows                    | 2 562  | 2 807  | 2 764  | 2 665  |
| Equidae                          | 379    | 489    | 455    | 454    |
| Pigs                             | 2 013  | 1 690  | 1 465  | 1 557  |
| Sheep                            | 3 319  | 3 656  | 3 829  | 4 436  |
| Goats                            | 239    | 416    | 494    | 498    |
| Poultry                          | .      | 12 626 | 15 291 | 20 472 |
| Bee colonies                     | 953    | 1 173  | 1 175  | 1 068  |
| Milk production<br>(in 1 000 kg) | 12 968 | 13 493 | 13 135 | .      |

Data source: Liechtenstein in Figures [OS,2024a]

The large share of pastures and meadows also indicates that the majority of farms keep ruminants as indicated in Figure 20. Apart from Alpine pastures, the largest area is attributed to arable land.

Figure 20: Use of agriculture areas 2019



Data source: Environment Statistic [OS, 2024b]

In line with the Agriculture Law, the government submits an agricultural policy report to parliament every four years which tracks the economic situation of domestic farms and addresses the further development and orientation of agricultural policy for subsequent years. The latest agricultural policy report has been issued in 2022. It introduced measures relevant to climate change mitigation and adaptation. The measures of the agricultural policy report of 2022 [FL Gov, 2022] complement the Liechtenstein Climate Strategy 2050 [FL Gov, 2023].

### II.A.6.7 Forest

Covering an area of around 6,700 ha (42% of the country's territory), forests play a significant role in Liechtenstein [OS, 2019]. For this reason, sustainability in forestry has been accorded great importance ever since the introduction of the Forestry Regulations in 1865. Important goals of the current Forestry Act [FL Gov, 1991] include the qualitative and quantitative (prohibition of clearing) preservation of forest stocks and the promotion of nature-friendly forest management. The Forest Act and the associated Forestry Ordinance [FL Gov, 1995] stipulate that forests fulfil various functions. Besides the legally enshrined welfare function of the forest, which includes its positive effects on climate, these also stipulate that the forest and its management, respectively, must, inter alia, serve the protection of nature which includes, inter alia, preservation of biodiversity. They also contain a legal obligation for a sustainable management of forests, with due consideration of all of their functions.

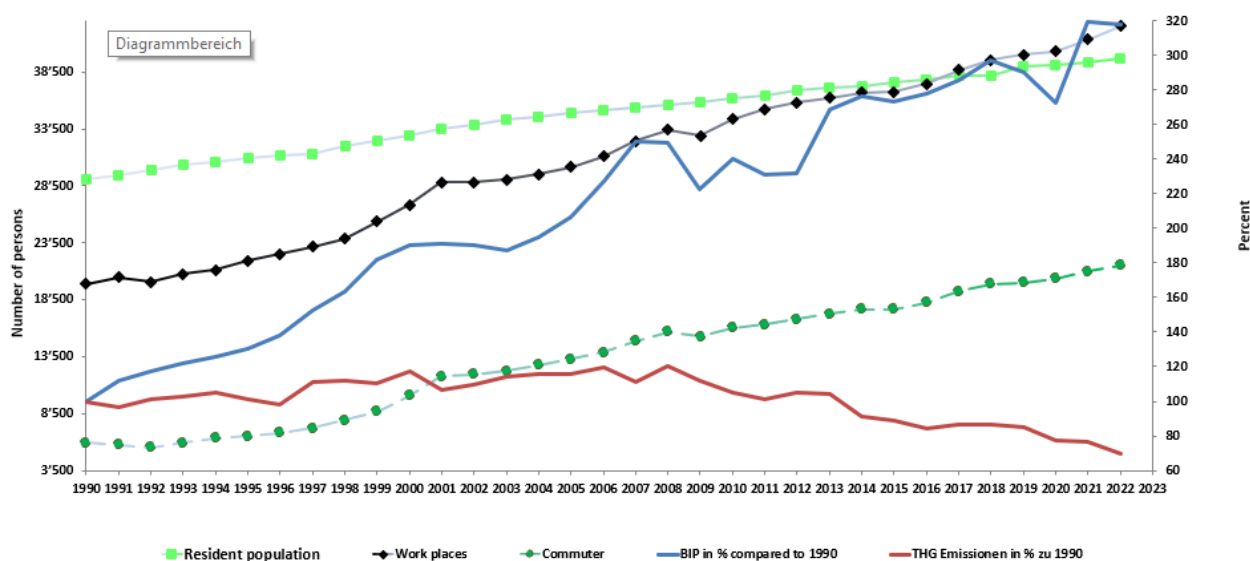
Liechtenstein now maintains forest reserves encompassing 19% of the forest area (1,274 ha), where all forms of forestry activities are prohibited as well as special forest areas of about 479 ha (7%) to preserve old and traditional forms of forest management or rare forest communities.

### II.A.7 How national circumstances affect greenhouse gas emissions and removals over time

#### Total greenhouse gas emissions

Emissions had been rising steadily in the second half of the last century spurred by economic and population growth. The passing of key energy regulations in 2008 led to a reversal of trends and was able to initiate an era of steady emissions reductions.

Figure 21: Liechtenstein's GHG emissions indexed compared to 1990, in relation to key underlying drivers: resident population, employees/commuters and GDP

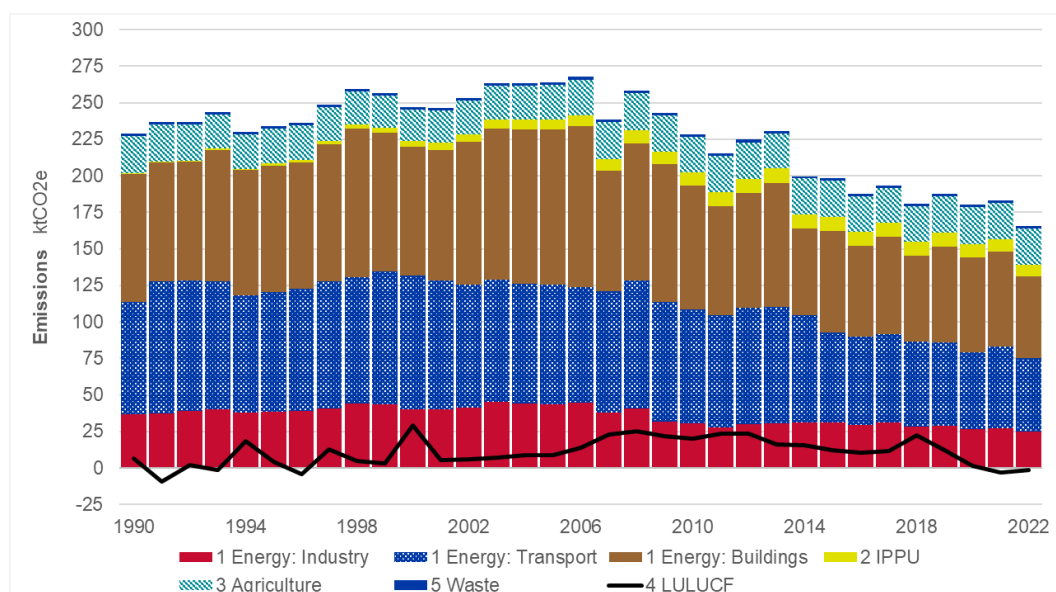


Data sources: Emissions: [OE, 2024a]; Gross domestic product: [FL Gov, 2024a]

Liechtenstein's greenhouse gas emissions stem primarily from the buildings, transport and industry sectors. Because Liechtenstein's domestic electricity production is entirely fossil-free, there are no domestic emissions from this sector. Smaller contributions come from the waste and agriculture sectors.

Each sector is discussed briefly in turn in the following sections. For more detail on how Liechtenstein's emissions are calculated, Liechtenstein's National Inventory [OE, 2024a] can be consulted.

Figure 22: Liechtenstein's GHG emissions by sector



Data source: Emissions from National Inventory [OE, 2024a]

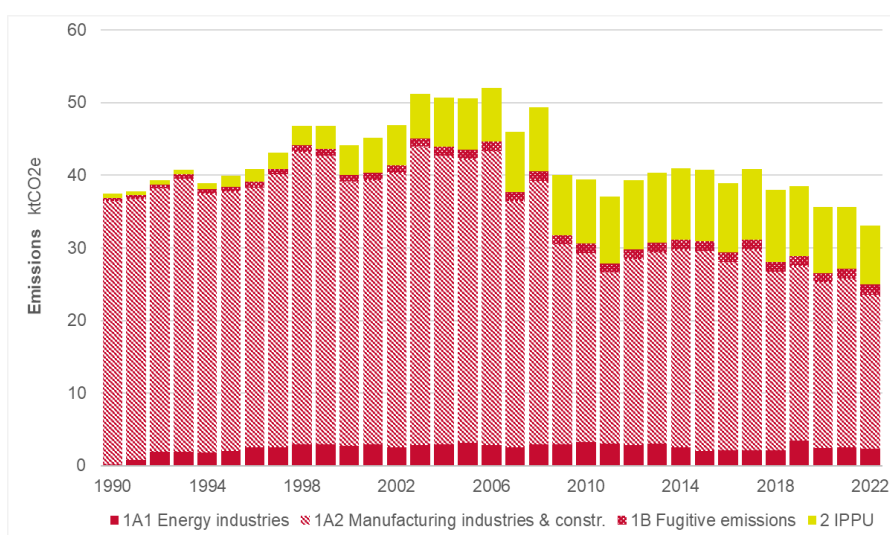
## Greenhouse gas emissions related to industry

Liechtenstein's largest sector in economic terms is the manufacturing sector and it also contributes significantly to total emissions. Emissions from this source category have declined by 41.0% since 1990. Gaseous fuels are the most important energy carrier in Liechtenstein in 2022: Emissions from gaseous fuels decreased by 41.3% compared to 1990.

Industrial emissions are comparatively small but increasing in relevance. Due to the lack of heavy industry within the borders of Liechtenstein, there are only small sources of F-Gases and emissions are low. Still, the use of F-Gases has increased substantially throughout the period 1990–2022, which leads to a relative increase of emissions in sector 2 by approximately a factor of 12. The most important source category is 2F Product uses as substitutes for ozone-depleting substances (ODS) due to the replacement of CFCs with HFCs. The main factor influencing the increase in HFC emissions in refrigeration and air conditioning are the increasing population of Liechtenstein, the increasing number of households, the increasing number of persons employed in the industrial and service sectors, and the increasing number of registered cars.

Fugitive emissions and emissions from energy industry are small in comparison. Since 1990, Liechtenstein's gas-grid has been extended and natural gas has replaced oil as the main heating fuel in buildings. Total emissions have increased by about a factor of 13 since 1990 due to the addition of gas-using CHP plants.

Figure 23: Liechtenstein's GHG emissions in industry



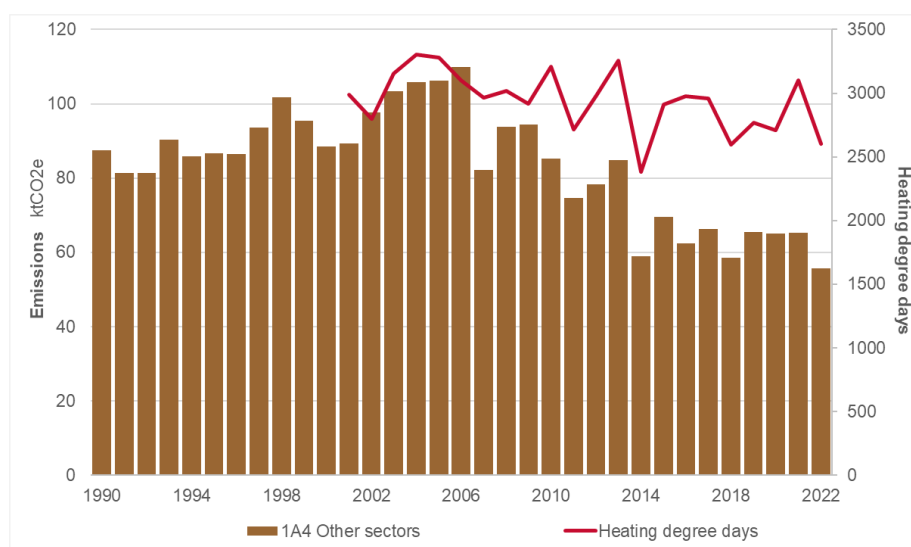
Data source: Emissions from National Inventory [OE, 2024a]

## Greenhouse gas emissions related households and services

Emissions in the residential and commercial sector stem primarily from the combustion of heating oil and gas. Given Liechtenstein's climate, an important driver of emissions from category 1A4 are heating degree days, which generally correlate well with the use of heating fuels (see Figure 24). A strong temporal correlation is expected for heating by gas, while heating oil will show storage effects.

Various emission reduction measures in Liechtenstein are influencing fuel consumption. For instance, the increase in the CO<sub>2</sub> levy in 2016, which caused an increase in sales of heating oil in 2015 and a reduced apparent consumption in 2016 and subsequently again an increase in 2017. The fuel levy was further increased in 2018. Also, in 2018, the relative reduction of sales of heating oil is stronger than the relative decrease of heating degree days, and, vice versa, the increase of heating oil sales in 2019 is higher as would have been expected due to the increase of heating degree days.

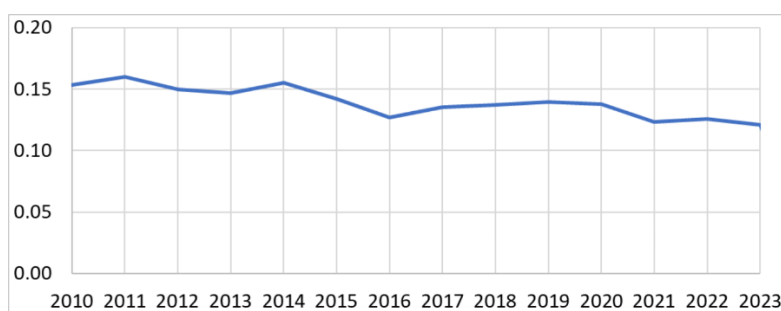
Figure 24: Liechtenstein's GHG emissions in the building sector (households and services), in comparison to heating degree days



Data sources: Emissions from National Inventory [OE, 2024a]; Heating degree days from 4<sup>th</sup> Monitoring Report [FLGov, 2024]

Another factor is the installation of a district heating pipeline in 2009, which contributed to the stronger declining trend in CO<sub>2</sub> emissions in comparison to the trend in heating degree days in subsequent years. An extension of this network is now underway and this, combined with energy efficiency, leads to a decoupling between heating degree days and high-carbon heat demand, and thus CO<sub>2</sub> emissions, despite a growth in building area (see Figure 25). A further reduction in emissions is expected to be observed in the 2023 inventory, as use of heating oil and gas reduced by 2% compared to 2022, despite an increase in heating degree days by about 2% [FLGov, 2024].

Figure 25: Fossil fuel use in GWh per heating degree day



Data source: 4<sup>th</sup> Monitoring Report [FLGov, 2024]

## Greenhouse gas emissions related to transport

Emissions in transport stem almost entirely from road-based transport in Liechtenstein: The small rail section in the North of the country is electric, there are no ports or airports, and the heliport in the South only contributes a very small share<sup>2</sup>.

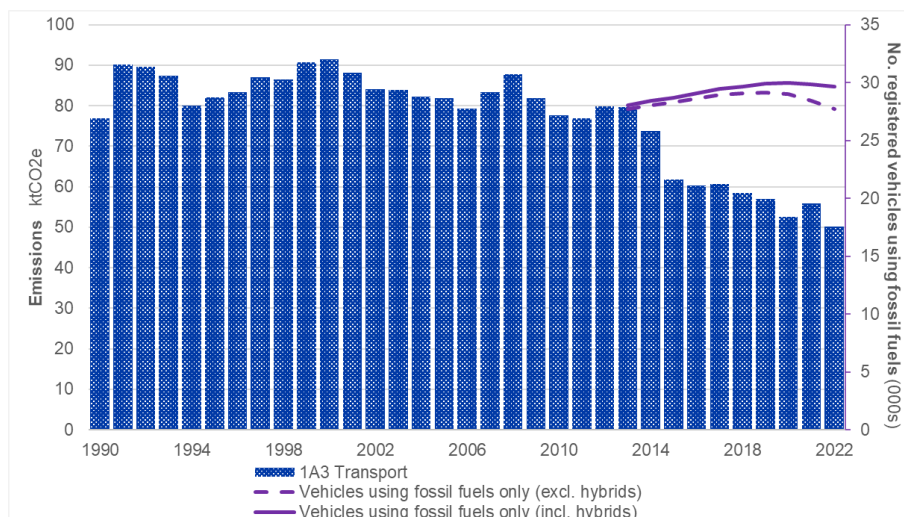
Liechtenstein is a highly motorised country, with private vehicle ownership standing at 780 automobiles per 1000 inhabitants, which is one of the highest in the world<sup>3</sup>. Private vehicles represent 74% of vehicles in Liechtenstein; the rest

<sup>2</sup> Around 1 kt CO<sub>2</sub> per year or ~0.5% of total emissions or ~1–2% of transport emissions as per GHG inventory.

<sup>3</sup> Based on passenger cars per country in 2020 from [OICA, 2024]

are primarily two- and three-wheelers (12%), followed by goods vehicles (9%). Fuel use and emissions are not reported by vehicle type. It must be noted that because of the size of the country, the emissions for transport shown in Figure 26 could differ significantly from the emissions caused by vehicles registered in Liechtenstein and/or persons living or working in Liechtenstein. This is due to the large amount of cross-border commuting.

Figure 26: Liechtenstein's domestic GHG emissions in the Transport sector



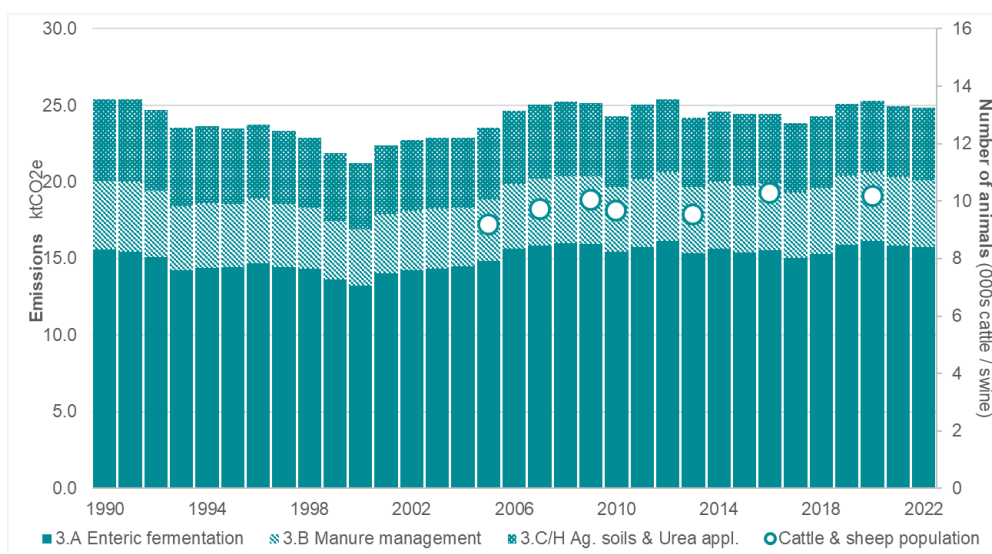
Data sources: Emissions from National Inventory [OE, 2024a]; Vehicle numbers from national vehicle statistics [OS, 2024c]

The overall trend shows a decrease in emissions based on domestically purchased fuels of 35% between 1990 and 2022, mostly due to a clear decreasing trend since 2012. This stands in contrast to rising, then stabilising numbers of domestically registered combustion engine vehicles. The disparity could be explained by the phenomenon of fuel tourism, as fuel prices are often lower in neighbouring countries. The 8.0% drop in 2020 was likely connected to increased working from home during the pandemic.

## Greenhouse gas emissions related to agriculture

Emissions from agriculture are broadly stable at around 25 kt CO<sub>2</sub>eq/a (see Figure 27). After a small decrease in the 1990s, they have increased again since around 2000, returning almost to 1990 levels.

Figure 27: Liechtenstein's GHG emissions in Agriculture



Data sources: Emissions from National Inventory [OE, 2024a]; Livestock numbers from national livestock statistics [OS, 2024d]

Two-thirds of emissions in agriculture stem from enteric fermentation, with the rest due in roughly equal shares to manure management and fertiliser use.

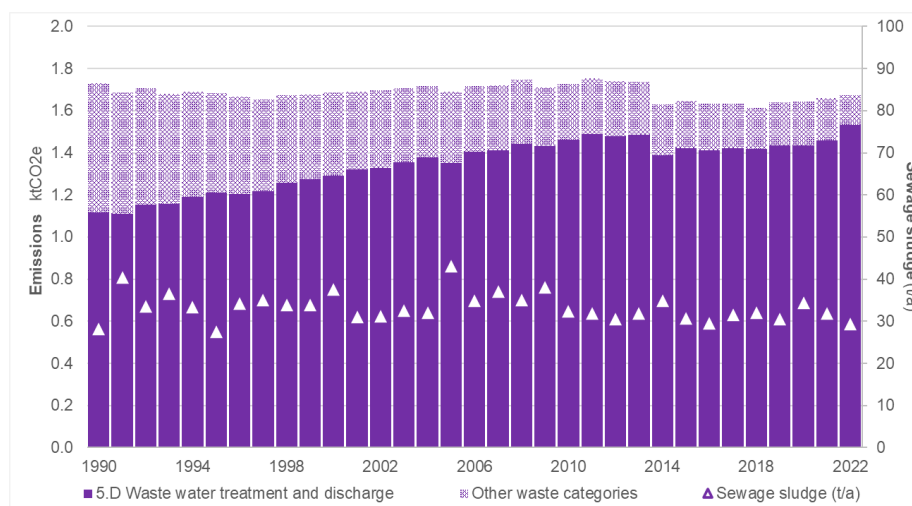
Enteric fermentation emissions come almost entirely from ruminants, mostly cattle. Emissions levels are therefore influenced heavily by livestock numbers which are fairly stable (see Figure 19). An additional factor is the productivity of dairy cattle, as high-yield cattle results in higher (per animal) emission factors.

Similarly, manure management also varies with livestock population, again primarily cattle. This is also reflected in the agricultural soils strategy which lists emissions from animal manure applied to soils as one of the most important sub-categories. Other factors include changes in husbandry systems from stall towards loose housing systems (in the course of the agricultural policy reforms during the 1990s and the early twenty-first century).

### Greenhouse gas emissions related to waste

Emissions in the waste sector are mostly due to sewage sludge (category 5.D Waste water treatment and discharge), albeit this representing a very small portion of total waste as most municipal waste is incinerated (see section II.A.6.4). Reported emissions are stable at around 1.7 kt CO<sub>2</sub>e. Until 2014, sewage gas was used as fuel for boilers or co-generation. Since then, all sewage gas has been upgraded and supplied to the gas grid, which resulted in a visible drop in emissions from 2013 to 2014. In source category 5A Solid waste disposal, a steady decrease of greenhouse gas emissions can be observed due to an end to landfilling in 1974.

Figure 28: Liechtenstein's GHG emissions in Waste



Data sources: Emissions from National Inventory [OE, 2024a]; Sewage values from national waste statistics [OS, 2024b]

### II.A.8 Liechtenstein's institutional arrangements to track progress made in implementing and achieving the nationally determined contributions

The Office of Environment (OE) is in charge of establishing emission inventories and climate protection. The national inventory report—which is submitted to the UNFCCC annually and published on the website of the Liechtenstein Office of Environment<sup>4</sup>—is fundamental for tracking the greenhouse gas emission reduction objectives Liechtenstein committed to at national and international level.

The Emissions Trading Act [FL Gov, 2012] sets up the general framework for the fulfilment of Liechtenstein's reduction obligations originating from the ratification of the Kyoto Protocol and the Paris Agreement.

<sup>4</sup> <https://www.llv.li/en/individuals/recreational-environmental-and-animal-management/forest-nature-landscape-climate/climate-protection>

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In addition to tracking achieved emissions reductions, the Energy Office (*Energiefachstelle*) tracks key metrics and associated targets which affect emissions in the energy sector (the largest contributor to emissions), and publishes these in the annual monitoring report for parliament.

### **II.A.8.1 Liechtenstein's arrangements for tracking internationally transferred mitigation outcomes**

Liechtenstein's emissions trading registry is used for the tracking of internationally transferred mitigation outcomes (ITMOs). Directive 2009/29/EC was adopted in 2009 and provides for the centralisation of the EU ETS operations into a single European Union registry operated by the European Commission as well as for the inclusion of the aviation sector, which is not applicable in Liechtenstein. At the same time, and with a view to increasing efficiency in the operation of their respective national registries, the EU Member States who are also Parties to the Kyoto Protocol (25) plus Iceland, Liechtenstein and Norway decided to operate their registries in a consolidated manner in accordance with all relevant decisions applicable to the establishment of Party registries, in particular Decision 13/CMP.1 and decision 24/CP.8.

Liechtenstein is currently negotiating a bilateral agreement under Art. 6.2 of the Paris Agreement and as soon as the format has been agreed by the Conference of the Parties, serving as the meeting of the Parties to the Paris Agreement, aims to use the union registry as a basis for recording of Internationally Transferred Mitigation Outcomes (ITMOs).

### **II.A.9 Arrangements for domestic implementation, monitoring, reporting, archiving of information and stakeholder engagement related to the implementation and achievement of the nationally determined contributions**

Pursuant to the NDC registry<sup>5</sup> Liechtenstein submitted its intended Nationally Determined Contribution (NDC) in 2015. In September 2017 Liechtenstein ratified the Paris Agreement. In accordance with Article III, paragraph 22 of Decision 1/CP.21 any country that submitted an INDC prior to joining the Paris Agreement has the INDC recognised as its first NDC upon ratification, unless the country opted otherwise. As Liechtenstein did not opt otherwise, the NDC report of this section is based on the submission of 2015.

Liechtenstein's NDC encompasses a reduction target within a time frame from 2021 until 2030 with 1990 as the reference year for reductions. The scope of Liechtenstein's NDC covers all sectors relevant to the state's greenhouse gas emissions.

Subsequent to the submission of its (updated) NDC, expected for 2025, Liechtenstein is aiming to provide further detail for domestic implementation, monitoring, reporting and archiving as well as stakeholder implementation and achievements of the nationally determined contribution.

#### **II.A.9.1 Environmental and climate policy framework in Liechtenstein (policymaking process)**

This section describes policies and measures implemented or planned to be implemented in Liechtenstein with the aim of becoming climate neutral by 2050 and to reduce emissions by 55% by 2030 in order to achieve the emission reduction commitments agreed on in the national and international context.

Liechtenstein has integrated climate policy into the individual sectoral policies, specifically energy policy, environment policy, transport policy, agricultural and forestry policy. All of these areas encompass measures that contribute to the reduction of greenhouse gases. To ensure a coordinated implementation, the government passed its first climate strategy in 2007. The Strategy requires an interdisciplinary coordination in the fields of environment, energy, building, transportation, agriculture and forestry with respect to the development of climate policy measures. The strategy was once revised in 2015; a new climate strategy has been published in 2022 and slightly updated in 2023 [FL Gov, 2023].

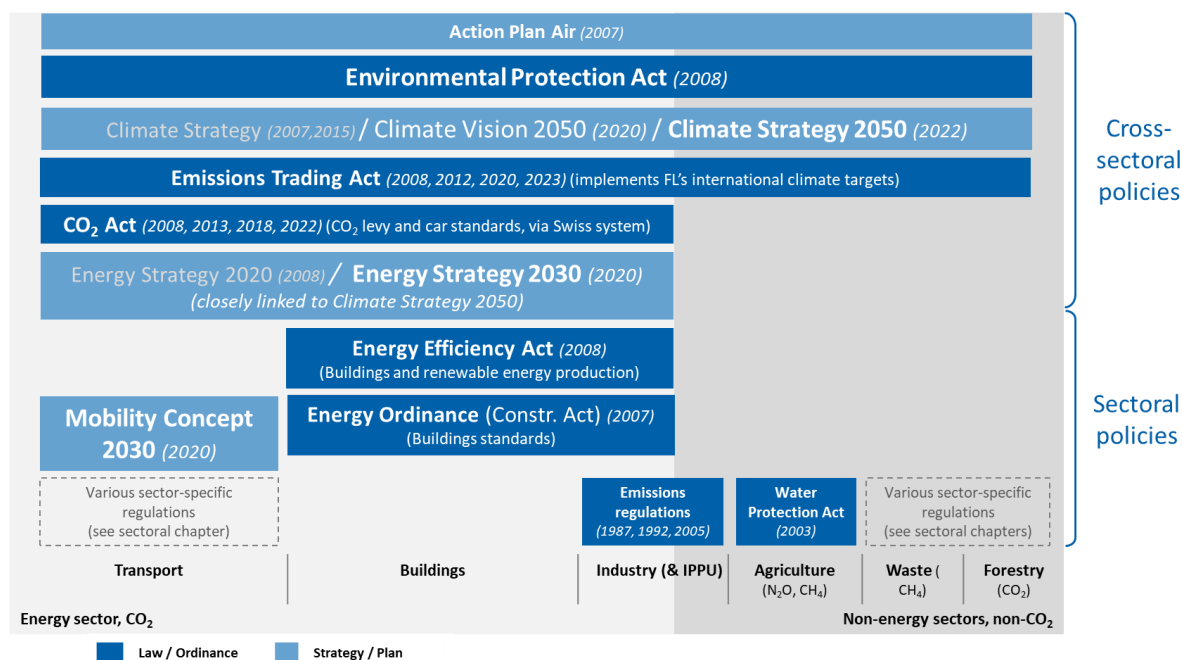
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<sup>5</sup> <https://unfccc.int/NDCREG>

Liechtenstein's Ministry of Environment and the Office of Environment are the coordinating authorities with respect to the execution of the strategy.

In 2018, the Liechtenstein Government took note of the Liechtenstein climate adaptation strategy. The adaption strategy [FL Gov, 2018] formulates goals and principles for adaptation and describes the cross-sectoral challenges and measures in adapting to climate change in Liechtenstein. With the adoption of the Liechtenstein Climate Vision 2050 in 2020 [FL Gov, 2020a], the Liechtenstein Government has decided that Liechtenstein will become climate neutral by 2050.

Figure 29: Overview and dates of key policies across all sectors



Data source: own visualisation

Because of the small size of the country, cross-border cooperation plays an important role. Especially important is the relationship with Switzerland and the cooperation among the countries in the Lake Constance area. Due to the customs treaty, cross-border measures and bilateral execution are simplified in many areas, because various Swiss legal acts are directly applicable in Liechtenstein pursuant to the treaty. Where Swiss legal acts apply, Liechtenstein as a rule executes the provisions similarly to a Swiss canton (e.g. Swiss Act and Ordinance on mineral oil tax). Accordingly, most policy areas are very closely linked with Swiss policy in terms of both content and execution.

Pursuant to the cross-border cooperation with Switzerland, Liechtenstein and Switzerland concluded "The bilateral Agreement between the Principality of Liechtenstein and the Swiss Confederation on Environmental Levies within the Principality of Liechtenstein" in 2010 [CH Gov, 2010]. The agreement enables Liechtenstein to implement several environmental levies of Switzerland into national law while using the existing infrastructure of the Swiss authorities for the execution of the respective national laws. The Ministry of Environment and the Office of Environment and the Office for Foreign Affairs are the competent authorities with respect to the execution of the bilateral agreement.

One of the core elements of Liechtenstein's policies is the linkage to energy conservation throughout the various sectors. The targeted reduction of fossil fuel use aims at a modification of longer-term trends in anthropogenic GHG emissions and thereby also serves the objective of the Climate Convention.

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### **II.A.9.2 Strategies for sustainable development and long-term mitigation strategies**

Liechtenstein has adopted the UN Agenda on Sustainable Development 2030 in 2015, which has become part of the government's regular legislative planning cycle. An overview of Liechtenstein's implementation of the 2030 Agenda for Sustainable Development of the United Nations is available in Liechtenstein's sustainability report [FL Gov, 2023a].

In the negotiations on the agenda, Liechtenstein successfully advocated for the topics of the rule of law and gender equality, as well as for an effective mechanism to review the implementation of the agenda. The rule of law has been described as essential for achieving sustainable development and is embedded in several specific targets. Gender equality for women and girls is defined as one of the 17 Sustainable Development Goals. Regarding the review process, initial steps were taken in the Agenda to ensure that this responsibility is not left exclusively to governments, but allows equal participation by UN organisations, other international organisations, civil society representatives, the private sector, and other stakeholders.

These goals were already formulated in a 2013 resolution on the High-Level Political Forum, which is responsible for reviewing sustainability efforts, and solidified in General Assembly Resolution 70/290 on the review mechanism's architecture for the 2030 Agenda. The SDG Alliance Liechtenstein is a strong civil society partner in Liechtenstein actively promoting SDGs in the region. Inter alia it published an SDG toolbox supporting enterprises and municipalities in implementing the SDGs.

In 2019, Liechtenstein presented its first Voluntary National Review on the national implementation of the 2030 Agenda for Sustainable Development at the UN High-Level Political Forum in New York. The second Voluntary National Review was presented in 2023. All reports have been published<sup>6</sup>.

One of the overarching objectives with regard to the incorporation of the sustainable development principle is to combat global warming. By ratifying the Paris Agreement in 2017, Liechtenstein internationally committed to contribute to the stabilisation of greenhouse gas emissions at a level that prevents dangerous anthropogenic interference with the climate system. In the long term, this requires that Liechtenstein reduces its greenhouse gas emissions to net zero. This target lays the foundations for Liechtenstein's long-term climate strategy to 2050 [FL Gov, 2023].

### **II.A.9.3 Principles and instruments of Liechtenstein's environment and climate policy, including enforcement and administrative procedures**

The principles and instruments of Liechtenstein's environmental policy are stipulated in the Liechtenstein Act on the Protection of Environment [FL Gov, 2018]. It is addressing a wide spectrum of issues, ranging from pollution of air, water and soil, and exposure to noise, to protecting stratospheric ozone or reducing and managing waste. The core climate act is the CO<sub>2</sub> Act.

Several policy areas are linked directly or indirectly to the reduction of Liechtenstein's greenhouse gas emissions. Fiscal incentives are recognised as an essential instrument for promoting the efficient use of resources. The main instruments are the definition of legally binding emission limits, introduction of levies on substances or practices with negative environmental impacts as well as the obligation of environmental impact assessments for particular facilities and installations.

The Emission Trading Act [FL Gov, 2012] defines Liechtenstein's long-term greenhouse gas emission reduction targets and sets the pace for the implementation of specific policies and measures. Liechtenstein is also participating in the European Economic Area (EEA) and is obliged to adopt EU legislation considered relevant to the EEA, which is the case for all acts under the EU's Fit for 55 package.

Table 10 shows the summary of legal instruments and the respective enforcement mechanism.

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<sup>6</sup> [www.llv.li/sdgberichte](http://www.llv.li/sdgberichte).

Table 10: Enforcement and implementation responsibilities for core provisions of climate acts and energy acts

| Instrument/measure                                                             | Act                  | Article     | Enforcement                                                                                                                                                                                                                                                                            | Responsibility       |
|--------------------------------------------------------------------------------|----------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| Objective /Target                                                              | Emission Trading Act | Article 4   | Sets the global reduction target of 55% and defines that 40% of the reduction has to be achieved by domestic measures.                                                                                                                                                                 | Government           |
| Emissions trading scheme                                                       | Emission Trading Act | Articles 30 | Companies taking part in the emissions trading scheme have to cover their emissions with emission allowances. Emissions not covered entail a penalty of 125 Swiss francs per tonne of CO <sub>2</sub> equivalents.                                                                     | Government           |
| Negotiated reduction commitments (for exemption from the CO <sub>2</sub> levy) | CO <sub>2</sub> Act  | Art. 7      | Companies have to commit to reducing their greenhouse gas emissions. If commitments are not fulfilled, a penalty of 125 Swiss francs is due per tonne of CO <sub>2</sub> equivalents that has been emitted in excess and excess emissions need to be covered with emission allowances. | Government CH und FL |
| CO <sub>2</sub> emission regulations for newly registered vehicles             | CO <sub>2</sub> Act  | Article 11  | If targets are not met, importers of vehicles (passenger cars and light duty trucks) have to pay a fine.                                                                                                                                                                               | Government           |
| Partial compensation of CO <sub>2</sub> emissions from motor fuel use          | CO <sub>2</sub> Act  | Article 9   | If the obligation to compensate is not fulfilled, a fine of 160 Swiss francs per tonne of CO <sub>2</sub> must be paid.                                                                                                                                                                | Government           |

Sector specific interim targets have been defined in the Climate Strategy 2050 but not been enshrined in legal texts across all main sectors. Alongside the definition of additional sectoral interim targets, measures related to non-compliance shall be incorporated in the next revision of the Emission Trading Act, which is planned for 2026. It is foreseen that, in case of domestic non-compliance with sector targets, the Government of Liechtenstein introduces additional measures in consultation with the main affected parties.

#### II.A.9.4 Arrangements for the monitoring and evaluation of policies and measures

For most policies in Liechtenstein, monitoring reports are produced regularly and submitted to parliament. In addition, numerous reporting obligations arise from international commitments linked to the ratification of international agreements and obligations i.e. reported on under the Agreement of the European Economic Area. Liechtenstein forms a customs and monetary union with Switzerland, governed by a customs treaty [FL Gov, 1980] and an agreement on the environment levy. The CO<sub>2</sub> levy is administered by Swiss authorities, which also bears the overall responsibility for the monitoring of the CO<sub>2</sub> scheme.

With regards to climate reports, the Office of Environment (OE) is the main responsible entity. It is in charge of compiling the emission data and bears overall responsibility for Liechtenstein's national greenhouse gas inventory. In addition to the OE, the Office of Economic Affairs (OEA), the Office of Statistics (OS) and the Office of Building Construction and Spatial Planning (*Amt für Hochbau und Raumplanung, AHR*) participate directly in the compilation of the inventory. Several other administrative and private institutions are involved in inventory preparation.

#### CO<sub>2</sub> levy on heating and process fuels

The Swiss Federal Office for the Environment has undertaken an evaluation of the CO<sub>2</sub> levy on heating and process fuels with the goal to estimate the impact of the CO<sub>2</sub> levy on emissions from heating and process fuels since its introduction, using both a modelling approach as well as data collected from a firm-level survey [FOEN, 2015].

#### CO<sub>2</sub> emission regulations for newly registered vehicles

The CO<sub>2</sub> emission regulations for newly registered vehicles are enforced by a sanction mechanism. Accordingly, compliance with the CO<sub>2</sub> emission regulations is monitored and evaluated on a case-by-case basis for small importers (in case the imported vehicle exceeds the CO<sub>2</sub> emission regulations a penalty has to be paid before the vehicle is licensed), or quarterly to annually for large importers. Data on the specific CO<sub>2</sub> emissions of newly registered vehicles are evaluated and published annually by the Swiss Federal Office of Energy.

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## Energy Strategy and Energy Act

The Energy Strategy 2030 [FL Gov, 2020b] and the Energy Vision 2050 are regularly monitored. The fourth energy monitoring report of the Government of Liechtenstein covering the reporting year 2023 was published in November 2024 [FL Gov, 2024c].

## Emissions trading scheme

As a member of the European Union's Emission Trading scheme, Liechtenstein is bound to the reporting obligations under the EEA agreement.

## Mobility Concept

The Mobility Concept 2030 is continually monitored and the Government of Liechtenstein publishes a monitoring report on an annual basis [FL Gov, 2024b].

## Liechtenstein Forest Inventory

The main tool to monitor forestry activities is the forest inventory, which is carried out every 12 years by the OE. The latest report on the status of forests in 2022 was published in 2024 [FL Gov, 2024d].

## Agricultural policy report

The main monitoring tool for agriculture is the agriculture policy report, which was last issued in 2022 [FL Gov, 2022].

### II.A.9.5 Arrangements for the archiving of information

The Act on Archiving [FL Gov, 1997] ensures that documents from all institutions that are valuable for legal, political, economic, historical, social or cultural reasons are archived by the Liechtenstein archives. In addition, reports have to be made available in the national library. The obligatory archiving also covers all information prepared with regard to e.g. the greenhouse gas inventory, the national and international reporting obligations, the legislative process, and the implementation of policies and measures.

### II.A.10 Changes in institutional arrangements since previous biennial transparency report

No changes in institutional arrangements occurred compared to Liechtenstein's eight national communication and fifth biennial report [OE, 2023].

## II.B Liechtenstein's nationally determined contribution

### *Description of Liechtenstein's nationally determined contribution under Article 4 of the Paris Agreement, including updates*

Liechtenstein's NDC encompasses a reduction target of 40% below 1990 emissions levels, to be achieved within a time frame from 2021 until 2030. The scope of Liechtenstein NDC covers all sectors relevant to the state's greenhouse gas emissions [FL Gov, 2015].

Subsequent to the submission of the first NDC, Liechtenstein is aiming, in the course of 2025, to provide further detail on its NDC, in terms of domestic implementation, monitoring, reporting, archiving, stakeholder implementation and target achievement. In Liechtenstein, the target has already been increased in 2022. However, the NDC submission confirming the updated target is still outstanding and submission is planned for spring 2025.

Table 11: Description of Liechtenstein's NDC (see also the appendix of the CTF-NDC tables)

|                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Target(s) and description, including target type(s), as applicable                                                                                       | Absolute economy-wide emission reduction target of 40% by 2030 compared with a base year.                                                                                                                                                                                                                                                                                           |
| Target year(s) or period(s), and whether they are single-year or multi-year target(s), as applicable                                                     | Single year target 2030.                                                                                                                                                                                                                                                                                                                                                            |
| Reference point(s), level(s), baseline(s), base year(s) or starting point(s), and their respective value(s), as applicable                               | Base year: 1990.<br>Provisional base line value in 1990 (total emissions excluding LULUCF), subject to change due to recalculations of the national GHG inventory is 0.229 million tonnes CO <sub>2</sub> equivalents (based on the National Inventory Report 2024). The value for the final accounting will be defined in the first inventory submission covering data up to 2030. |
| Time frame(s) and/or periods for implementation, as applicable                                                                                           | 2021-2030                                                                                                                                                                                                                                                                                                                                                                           |
| Scope and coverage, including, as relevant, sectors, categories, activities, sources and sinks, pools and gases, as applicable                           | Gases covered: CO <sub>2</sub> (including indirect CO <sub>2</sub> ), CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs, SF <sub>6</sub> , NF <sub>3</sub>                                                                                                                                                                                                                             |
| Intention to use cooperative approaches that involve the use of ITMOs under Article 6 towards NDCs under Article 4 of the Paris Agreement, as applicable | Sectors covered (as reported in the national inventory report): energy; industrial processes and product use; agriculture; land-use, land-use change and forestry; waste; other.                                                                                                                                                                                                    |
| Any updates or clarifications of previously reported information, as applicable                                                                          | Liechtenstein will realise its first NDC mainly domestically and will partly use internationally transferred mitigation outcomes (ITMOs) from cooperation under Article 6.                                                                                                                                                                                                          |

### Preview: Liechtenstein's first nationally determined contribution (2021–2030)

Liechtenstein contributes a small share of global emissions but has per-capita emissions in line with European levels. Liechtenstein is committed to reducing these emissions to contribute to global efforts to combat climate change. In its first (I)NDC in 2015 Liechtenstein set a target to reduce emissions by 40% below 1990 levels by 2030 and is currently on track to achieving and exceeding this target (see Figure 30). Liechtenstein plans to formally communicate a strengthened target and net-zero by 2050 goal in the course of 2025.

## II.C Information necessary to track progress

### *Information necessary to track progress made in implementing and achieving nationally determined contributions under Article 4 of the Paris Agreement*

The Emission Trading Act (*Emissionshandelsgesetz* (EHG)) [FL Gov, 2012], anchors in law a GHG emission reduction target, reducing GHG emissions by 55% compared to the base year 1990. Article 4 of the EHG, spells out a long-term goal to reach climate neutrality by 2050, and an interim target to reduce greenhouse gas emissions by 45% below 1990 levels by 2030. Reductions are primarily to be achieved domestically, with at least 40% reduced in Liechtenstein.

### II.C.1 Accounting approach

For tracking of progress made against Liechtenstein's first NDC, and likely also for the future strengthened NDC, the chosen indicator is total GHG emissions excluding LULUCF.

Table 12: Definitions of indicators to track progress (CTF Table 1)

| Indicator(s) selected to track progress                                                                          | Description                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Total emissions excluding LULUCF                                                                                 | Emissions and removals from all sectors (1 Energy, 2 IPPU, 3 Agriculture, 5 Waste) except Sector 4 LULUCF                                    |
| Information for the reference point(s), level(s), baseline(s), base year(s) or starting point(s), as appropriate | Base year: 1990                                                                                                                              |
| Updates in accordance with any recalculation of the GHG inventory, as appropriate <sup>b</sup>                   | Emissions in both, the base year and the target year, are subject to recalculation until the first inventory which covers the period to 2030 |
| Relation to NDC <sup>c</sup>                                                                                     | This indicator is the main indicator track progress under Liechtenstein's first NDC (2015)                                                   |

## II.C.2 Selected indicator, relation to nationally determined contribution

For the tracking of progress towards implementing and achieving the NDC, an indicator is used which has the same unit and metric as the NDC base year and target values. The chosen indicator is 'annual total GHG emissions excluding LULUCF', consistent with the scope of the NDC in CO<sub>2</sub>eq.

As reported in CTF-NDC table 2, the indicator 'total emissions excluding LULUCF' corresponds total CO<sub>2</sub> equivalent emissions and removals of all gases (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, SF<sub>6</sub>, NF<sub>3</sub>, and indirect CO<sub>2</sub>) from all sectors (1, 2, 3, 5, and 6) as reported in the national greenhouse gas inventory.

## II.C.3 Target assessment and tracking progress

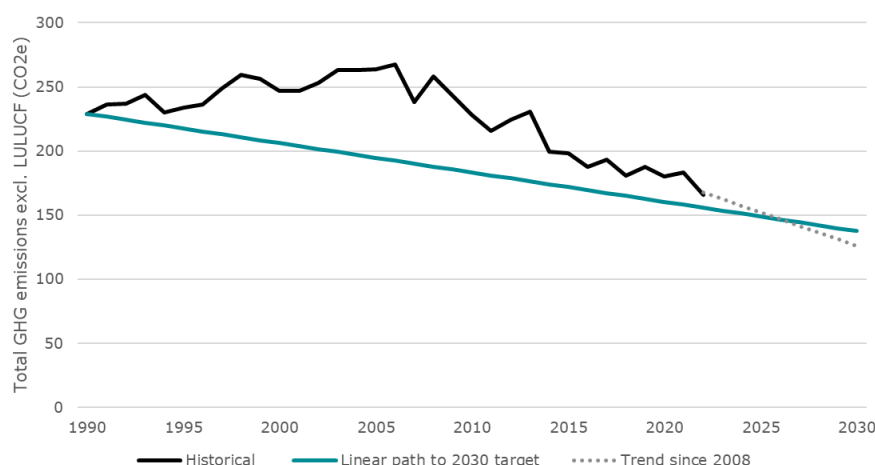
Liechtenstein is to cut emissions by 40% by 2030 compared to the base year 1990. The final accounting can only take place once the greenhouse gas inventory covers all years up to 2030 (i.e. in the fifth biennial transparency report to be submitted in 2032). Meanwhile, CTF-NDC table 4.1 provides the currently available provisional values (subject to future recalculations in the greenhouse gas inventory), namely:

- Total emissions excluding LULUCF in the base year 1990: 229.0 kilotonnes of CO<sub>2</sub> equivalents
- The value for the target level, i.e. 60 per cent of total emissions excluding LULUCF in the base year 1990: 137.4 kilotonnes of CO<sub>2</sub> equivalents
- Total emissions excluding LULUCF in the years 2021 and 2022

Based on the emissions inventory 2024 and assuming a continuing trend in emissions reductions, Liechtenstein appears to be on track to achieving the aims of its first NDC (see Figure 30).

Liechtenstein aims to realise its first NDC mainly domestically but may also use internationally transferred mitigation outcomes (ITMOs) from cooperation under Article 6.

Figure 30: Liechtenstein's emissions in comparison to a linear path towards the target in its first NDC



Data source: GHG emissions inventory 2024 [OE, 2024a]

## II.D Mitigation policies and measures, actions and plans

***Mitigation policies and measures, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans, related to implementing and achieving a nationally determined contribution under Article 4 of the Paris Agreement***

In this section, policy instruments and related measures which impact the development of greenhouse gas emissions in Liechtenstein are discussed. These are spread over several legal acts and regulations, and many have seen several iterations.

In addition, the relevant strategy documents or roadmaps which bring the various targets, policies and measures together and which provide an overall framework for their interaction are outlined. These strategy documents set out the ambition and direction of travel, as well as many possible measures or scenarios for achieving the goals. It is important to bear in mind the difference between these strategy documents and the legal acts which implement their measures.

### II.D.1 Cross-sectoral policies and measures

#### II.D.1.1 Overview

As mentioned above, Liechtenstein has anchored its climate-related policies and measures within individual sectoral policies. These were brought together in the Climate Strategy first adopted in 2007, and revised in 2015, 2022 and slightly updated in 2023 to reflect the latest target [FL Gov, 2023]. The strategy provides the basis for the coordinated approach required by the competent ministries when drafting sectoral legislation. The Climate Strategy was also the first strategy to formulate the increased emissions target which is expected to be enshrined in Liechtenstein's NDC in the course of 2025.

The responsibility for monitoring the individual measures or policies rests with the respective administration offices in charge of their execution. These authorities provide annual reports of their activities (not only climate change related) to the Liechtenstein Parliament and the public.

While policies and measures addressed in sections II.D.2 to II.D.7 may have small implications beyond their specific policy domain, the policies and measures presented in this section are clearly cross-sectoral in nature and thus discussed separately in the following.

Table 13: Summary of cross-sectoral climate policies and measures. The sector affected is 'cross-cutting' for all policies and measures presented in this table

| Name of policy or measure <sup>a</sup> | Green-house gas(es) affected                                                                        | Objective and/or activity affected                                                                                    | Type of instrument | Status      | Brief description                                                                                                                                                                                                                                                                                                                                                                          | Start year | Implementing entity                            | Estimate of mitigation impact (in-year reduction c.f. prev. year, not cumulative, in kt CO <sub>2</sub> eq) |      |
|----------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------|-------------------------------------------------------------------------------------------------------------|------|
|                                        |                                                                                                     |                                                                                                                       |                    |             |                                                                                                                                                                                                                                                                                                                                                                                            |            |                                                | 2025                                                                                                        | 2030 |
| Environmental Protection Act           | CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs, SF <sub>6</sub> , NF <sub>3</sub> | Prevention of environmentally harmful activities as well as on the remediation and restoration of environmental harms | Regulatory         | Implemented | Legal basis for all regulations and ordinances, especially with respect to air pollution and waste treatment                                                                                                                                                                                                                                                                               | 2008       | Office of Environment                          | NA                                                                                                          | NA   |
| Action Plan Biodiversity 2030+         | CO <sub>2</sub> , CH <sub>4</sub>                                                                   | Preserving existing protected areas and securing new ecologically valuable areas                                      | Planning measure   | Planned     | Policy framework outlining local targets of the of the 1992 Convention on Biological Diversity (CBD)                                                                                                                                                                                                                                                                                       | 2025       | Ministry of Environment, Office of Environment | NA                                                                                                          | NA   |
| Emissions Trading Act                  | CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs, SF <sub>6</sub> , NF <sub>3</sub> | Goal of climate neutrality by 2050 and reduction target of 55% by 2030 legally enshrined                              | Regulatory         | Adopted     | Implementation of Directive 2003/87/EC, Directive 2004/101/EC and Directive 2009/20/EC                                                                                                                                                                                                                                                                                                     | 2008       | Office of Environment                          | IE                                                                                                          | IE   |
| CO <sub>2</sub> Act                    | CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs, SF <sub>6</sub> , NF <sub>3</sub> | Emission reduction linked to transport, housing, industry                                                             | Regulatory         | Adopted     | Implementation of ecological steering levy modelled by Switzerland, reduction of CO <sub>2</sub> emissions from fossil fuels and inducement for an economical use of energy and renewable energy sources. Introduction of emissions regulations for new passenger cars delivery trucks and light semi-trailers, establishment of compensation requirements for emissions from mobile fuels | 2008       | Office of Environment                          | IE                                                                                                          | IE   |
| Climate Strategy 2050                  | CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs, SF <sub>6</sub> , NF <sub>3</sub> | Definition of the increase in the emission reduction target for 2030 from 40% to 55% below 1990                       | Planning measure   | Implemented | Overarching climate strategy covering multiple sectors. Summarises concrete measures to achieve 2030 and 2050, which forms the basis for the NDC submission in 2025                                                                                                                                                                                                                        | 2023       | Ministry of Environment, Office of Environment | 5.54                                                                                                        | 5.54 |
| Water Protection Act                   | CH <sub>4</sub> , N <sub>2</sub> O                                                                  | Cap on maximum number of cattle per area and limits on waste water effluence                                          | Regulatory         | Implemented | Law i.a. spelling out measures to reduce emissions and provides basis for renaturation of rivers                                                                                                                                                                                                                                                                                           | 2003       | Office of Environment                          | IE                                                                                                          | IE   |

### II.D.1.2 Environmental Protection Act (2008)

In Liechtenstein, environmental policies are framed within the so-called Environmental Protection Act (*Umweltschutzgesetz*) of 2008 [FL Gov, 2008]. The Act summarises a set of individual legislative measures in order to streamline procedures within environmental law. The Act is a legislative framework which governs the main aspects of environmental protection, e.g. air pollution and waste treatment. It is comparable to the Swiss Federal Act on the Protection of the Environment. The Act is the legal basis for further ordinances and regulations such as the Ordinance on Air Pollution Control and thereby influences long-term trends in anthropogenic GHG emissions and removals and thus contributes to the objective of the Convention. It contains the following fundamental principles:

- **Precautionary principle:** Environmental damages are to be limited at an early stage
- **Polluter-pays-principle:** Polluters causing detrimental effects have to bear the costs for measures for the protection of the environment

- **Principle of holistic approach:** Environmental problems must be understood and tackled integrally and coherently
- **Cooperation principle:** Authorities and the economy collaborate as far as possible to achieve the goals of environmental protection

With respect to climate and air quality related measures (see Air Quality Ordinance, *Luftreinhalteverordnung*) the Environmental Protection Act constitutes the legal basis for setting emission limits, for example for combustion installations within industry and households. The principles applied within the Environmental Protection Act guarantee that the associated measures are linked to the most efficient and up-to-date technical solutions. As such, the act governs the limitation of emissions for stationary installations, the maximum air pollution level, measures to be taken in the event emissions thresholds are exceeded, and the requirements on engine and heating fuel. An important element is the obligation to provide information to the public.

Requirements on petrol and diesel oil, but also thresholds for particulate matter, are regulated by an Ordinance on Air Pollution: the annual average emissions limit for sulphur dioxide is 20 microgrammes/m<sup>3</sup>. The sale of leaded petrol has been prohibited since 2000. The lead content in unleaded petrol is 0.005 g/l, and the share of carcinogenic benzene may not exceed 1%. The sulphur content in diesel and petrol may not exceed 0.01 g/kg.

With regard to waste treatment the Environmental Protection Act requires the separate disposal of different types of waste. At the level of an ordinance, the government may require that certain waste be recycled, if such recycling improves the ecological balance. The requirements are also based on the polluter-pays-principle. Non-recycled waste is incinerated in the waste incineration plant in Buchs, Switzerland and the energy generated is reused.

The Environmental Protection Act also provides the legal basis for the so called “Action Plan Air” a measure plan effective since 2007 with the aim to reduce a range of emissions. The Action Plan Air itself is not legally binding but provides proposals that have to be considered for future decisions by the Government.

### Planned strengthening

The most urgent need for change is to enable the 1992 inventory of natural priority areas to be updated. In addition, the approval authority in the intervention procedure will be standardised.

Since the Environmental Protection Act has only been revised selectively since it came into force, a major revision is planned and adoption of the updated act is foreseen for the end of 2026. Planned measures entail for instance a provision for financial support to organisations in the environmental sector.

### Estimate of mitigation impact

Under the Environmental Protection Act activities linked to nature restoration will be included. One of the priority measures included is the restoration of peatland, which already has a protection status in Liechtenstein. Through the rewetting of peatland Liechtenstein aims to prevent the peatland from releasing CO<sub>2</sub> emissions.

### Implementing legal acts

As outlined in section II.D.3.4 the revision of the CO<sub>2</sub> law entails a provision that will allow importers to buy domestic emission reduction projects to compensation emission from fuel. Through the income of the compensation levy, the planned peatland project can be financed in parts.

#### II.D.1.3 Action Plan Biodiversity 2030+

The Biodiversity Action Plan 2030+ [FL Gov, 2024e], launched in 2024, foresees implementation of several measures until 2030 and beyond. The plan outlines local targets of the 1992 Convention on Biological Diversity (CBD, Biodiversity

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Convention), i.e. this global agreement is to be implemented in Liechtenstein with the help of the Biodiversity Action Plan 2030+.

The Action Plan takes a holistic approach that reconciles the protection of nature with the needs of the population and the economy, while at the same time creating the basis for a sustainable future. Liechtenstein has a high level of biodiversity. However, this biodiversity is under threat, particularly due to settlement sprawl and fragmentation of habitats, climate change, and the spread of invasive species. Chemical and physical impacts, such as inputs of nutrients, pesticides, and microplastics, as well as disturbance from noise and light, also harm biodiversity.

To meet the current challenges, the Biodiversity Action Plan 2030+ was developed through a participatory process. Targets were set and corresponding measures defined based on seven fields of action. The measures include preserving existing protected areas and securing new ecologically valuable areas. In addition, habitats are to be qualitatively upgraded and restored. Other priorities include the targeted promotion of endangered species and the reduction of chemical and physical impacts.

### Estimate of mitigation impact

The Biodiversity Action Plan 2030+ has just been launched and mitigation estimates are not yet available.

### Implementing legal acts

Activities linked to the Biodiversity Action Plan 2030+ are anchored in the Environmental Protection Act.

## II.D.1.4 Emissions Trading Act (2008, 2012, 2020, 2023)

The EU Emission Trading Scheme (EU ETS) is the most important policy for installations with high energy demand and CO<sub>2</sub> emissions in energy industries, manufacturing industries and industrial processes, as well as N<sub>2</sub>O emissions from chemical industry. Its objective is to limit emissions by means of trading allowances, which have initially been allocated for free or auctioned. While two installations in Liechtenstein have been covered previously, currently no installation in Liechtenstein is subject to the EU ETS.

### Planned strengthening

The European Union is setting up an ETS2 aiming to increase the sectors covered by the ETS scheme and this expansion is also binding for Liechtenstein. Transport and housing shall be included as of 2027. However, since Liechtenstein already introduced a CO<sub>2</sub> levy covering these sectors equalling the ETS2, no mitigation impact is expected until 2030. The sectors covered by ETS2 may be expanded as of 2030, in which case the ETS2 scheme may have a longer-term impact.

### Estimate of mitigation impact

As currently, and most likely also in the foreseeable future, no installation falls under the EU ETS scheme, it is not of practical relevance in Liechtenstein. Therefore, it is not affecting Liechtenstein's emissions. The longer-term impact of the ETS2 scheme can currently not be assessed.

### Implementing legal acts

Following a revision of the Emission Trading Act in 2020 [FL Gov, 2012], due to the implementation of Directive (EU) 2018/410 amending Directive 2003/87/EC, the aforementioned two installations were removed from the EU ETS Policies and measures. Liechtenstein's Emission Trading Act was last revised in 2022 in order to update Liechtenstein's climate targets, which is now set at 55% decrease emission decrease compared to the base year 1990.

## II.D.1.5 CO<sub>2</sub> Act (2008, 2013, 2018, 2022, 2025)

The CO<sub>2</sub> Act [FL Gov, 2013] is the most comprehensive legislative climate measure across Liechtenstein's economy and is therefore considered one of the country's legal centrepieces to reduce greenhouse gases. It aims at reducing CO<sub>2</sub>

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emissions from the energy-related use of fossil energy sources. It does this through a combination of measures, including a CO<sub>2</sub> levy on thermal fuels (*Brennstoffe*), efficiency standards for passenger cars and obligations for CO<sub>2</sub> offsets on fuel importers.

The Liechtenstein CO<sub>2</sub> Act is an integral part of the bilateral Agreement on Environmental Levies between the Principality of Liechtenstein and the Swiss Confederation. Central elements of the levy system are executed by Swiss authorities, such as the application of the levy through Swiss customs authorities or the granting of levy exemptions through the Swiss Federal Office for the Environment. Through this bilateral agreement, Liechtenstein profits from being part of the Swiss levy system; while also being legally bound to implement the Swiss measures into Liechtenstein law.

A central element of the Act, the CO<sub>2</sub> levy on thermal fuels (oil, gas, coal), was already introduced in 2008. The levy covers all sectors of the economy (except motor fuels such as petrol and diesel) as well as private households and is intended to promote the efficient use of fossil fuels in stationary applications.

Liechtenstein bases the expected reduction by the CO<sub>2</sub> levy on the Swiss calculation, being fully integrated into its system. To achieve the reduction targets, the CO<sub>2</sub> Ordinance was revised in parallel with the Swiss CO<sub>2</sub> Ordinance to increase the CO<sub>2</sub> levy to up to CHF 120 per tonne CO<sub>2</sub> as of 2022.

The CO<sub>2</sub> Act also sets CO<sub>2</sub> emissions limits for new passenger cars. Following a revision of the Swiss CO<sub>2</sub> Act in 2018, the Liechtenstein CO<sub>2</sub> Act was also revised to extend these limits to delivery trucks and light semi-trailers. In addition, incentives were implemented for installations to feed more electricity into the public power grid.

The third measure in the CO<sub>2</sub> Act obliges entities which import (motor) fuels (*Treibstoffe*) to compensate a share of up to 90% of the domestic emissions of these fuels.

### Planned strengthening

The updated CO<sub>2</sub> Act has been adopted by parliament in November 2024 and will enter into force in January 2025. The revision of the CO<sub>2</sub> ordinance, which regulates the implementation of the updated CO<sub>2</sub> Act, however, is still ongoing. Accordingly, Liechtenstein reports the updated CO<sub>2</sub> Act as 'adopted', but reports the measures to be further specified in the corresponding CO<sub>2</sub> ordinance as 'planned'. The changes provide i.e. the legal basis of Liechtenstein's climate policy consistent with the Paris Agreement. While mostly covering the same policies and measures as the 2023 CO<sub>2</sub> Act, the updated CO<sub>2</sub> Act includes several adjustments of the policies and a few new measures in order to reach the more ambitious climate target. Within the updated CO<sub>2</sub> Act, the following most important proven policies and measures are continued and, in many cases, strengthened: CO<sub>2</sub> levy on heating and process fuel, negotiated reduction commitments (for exemption from the CO<sub>2</sub> levy), CO<sub>2</sub> emission regulations for newly registered vehicles, partial compensation of CO<sub>2</sub> emissions from motor fuel use

Some further measures introduced or continued within the updated CO<sub>2</sub> Act target the modification of longer-term trends in greenhouse gas emissions and removals and are thus described in section II.D.9

### Estimate of mitigation impact

The CO<sub>2</sub> Act is the cornerstone of Liechtenstein's climate policy and main instrument to reach the domestic climate target. Measures are summarised under the energy sector and mitigation impact is accordingly described under section II.D.2. As the measures under the Liechtenstein CO<sub>2</sub> Act mirror the measures of the Swiss CO<sub>2</sub> Act, the findings of the Swiss evaluation of the CO<sub>2</sub> Act is also applicable in Liechtenstein. In the next Biennial Transparency Report (BTR), Liechtenstein aims to further break down mitigation impacts linked to provisions of the CO<sub>2</sub> Act.

The planned adjustments to the negotiated reduction commitments (for exemption from the CO<sub>2</sub> levy), opening the policy and measures to all companies, is considered to have an impact under the WM/WAM scenarios. The 2025 revision of the CO<sub>2</sub> law includes an expansion of the negotiated reduction commitments (for exemption from the CO<sub>2</sub> levy), opening the policy and measures to all companies is considered to have an impact under the WM/WAM scenarios. Other measures mainly affect emissions under the transport sector and are therefore described under section II.D.3.8

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### II.D.1.6 Climate Strategy 2050

The Climate Strategy 2050 [FL Gov, 2023] adopted in Liechtenstein's Emission Trading Act in 2023 is raising the emission reduction target for 2030 from 40% to 55% below 1990 levels and defining concrete measures designed to achieve this target. The CO<sub>2</sub> Act has also been revised with effect from 2025 as continuation of the existing act, but also to set the legal framework for the commitments under the Paris Agreement. The Climate Strategy provides an overall strategy on the reduction of greenhouse gas emissions in Liechtenstein spelling out key areas and related emission reduction targets. While the Climate Strategy can be considered a cross-sectoral policy instrument it is not an implementation tool. The implementation is steered through the sector specific policy documents outlining concrete measures and referencing to main implementing legal acts. However, not all policy documents do have a long-term timeline (until 2050) and not all measures defined in the strategy have been implemented yet. Therefore, the strategy was considered as a "planned" policy and the effect of its additional measures are considered in the WAM scenario.

#### Estimate of mitigation impact

The With Additional Measures (WAM) scenario projection encompasses planned policies and measures. The Climate Strategy 2050 defines additional (not yet implemented) measures for the sectors energy, IPPU, agriculture and waste. Projections under the WAM scenario are therefore adopted from the Climate Strategy 2050. The Climate Strategy 2050 includes sectoral emission reduction pathways to 2050, reflecting the 2050 climate neutrality target of Liechtenstein. The projections in the WAM scenario follow the emission reduction pathway for the different sectors. Also, the mitigation impact is estimated based on the reduction pathways from the Climate Strategy 2050.

### II.D.1.7 Water Protection Act (2003)

The Water Protection Act (*Gewässerschutzgesetz*) which entered into force in 2003 [FL Gov, 2003] and is comparable to Swiss law, is the main legal act to protect water quality in Liechtenstein. It is cross-cutting in nature and its measures impact the sectors waste and agriculture.

Measures linked to agriculture are comparable to the Swiss law, specifying a cap on the maximum number of cattle allowed per land area. Measures relevant to the waste sector include provisions on the treatment of wastewater. Since most of Liechtenstein's emissions in the waste sector are due to wastewater, this is the most important legislative act with regards to waste.

Article 36 of the Act stipulates that surface waters have to be restored to a condition as close to their natural state as possible. This article has been the basis for a number of smaller renaturations. In addition, an extensive project foreseeing the enlargement of the riverbed of the river Rhine in two locations in Liechtenstein is in the pipeline. Works are due to start 2026. The renaturation is expected to benefit biodiversity and allow for better flood control.

#### Estimate of mitigation impact

Measures in the wastewater treatment plant are expected to reduce emissions from N<sub>2</sub>O as of 2030. CO<sub>4</sub> emissions are also expected to be further reduced through construction measures in the sewage sludge treatments storage room. Emission in the waste sector from sewage sludge are expected to slightly be reduced as of 2030. However, due to the expected increase in inhabitants and commuters net emissions will remain stable as described in section II.D.7.

### II.D.1.8 Environmental levies

With regard to environmental levies, Liechtenstein has concluded a *bilateral Agreement between the Principality of Liechtenstein and the Swiss Confederation on Environmental Levies within the Principality of Liechtenstein* with Switzerland. Environmental levies on pollutants serve to internalise external costs, and to reduce the costs of pollution to society by increasing the proportion paid by polluters themselves.

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The bases for the different environmental levies are found in the following Swiss legal acts:

- Act on the tax for the rehabilitation of contaminated sites
- Act on the incentive tax on petrol and diesel oil with a sulphur content of more than 0.001%
- Act on the incentive tax on “extra light” heating oil with a sulphur content of more than 0.1%
- Act on the incentive tax on volatile organic compounds
- Ordinance on Air Pollution
- CO<sub>2</sub> levy on heating and process fuels

The bilateral Agreement also enables Liechtenstein to use the existing infrastructure of the Swiss authorities for the execution of the respective national laws.

## Planned strengthening

A revision of the agreement of the CO<sub>2</sub> levy also triggers the revision of the bilateral agreement on environment levies, mainly focussing on Swiss legal acts that will be made directly applicable in Liechtenstein through the inclusion in the agreement [CH Gov 2010]. The update will enter into force in spring 2025 and will entail a legal provision of the Swiss Energy Act and is linked to negotiated reduction commitments described under the CO<sub>2</sub> Act (see section II.D.1.5).

## II.D.2 Energy

### II.D.2.1 Overview

Emissions from the energy sector (CRF Sector 1) account for around 80% of emissions in Liechtenstein (see also section II.A.7). The central planning and monitoring instrument for measures and policies in the energy sector is the Energy Strategy 2030. It brings together measures across energy supply and demand in industry, buildings and transport. It is also used as the framework to measure progress at the individual measure level.

Table 14 shows this strategy as well as the various legal instruments which are used to implement the measures contained in the strategy. The strategy and the related legal instruments are discussed in the following sections.

Table 14: Summary of policies and measures in the energy sector, excluding transport. The sectors affected are energy industries, industry (manufacturing and construction) and other (built environment), for all policies and measures presented in this table, except the Energy Strategy 2030 which also includes transport.

| Name of policy or measure <sup>a</sup>                                 | Green-house gas(es) affected      | Objective and/or activity affected                                                                                                   | Type of instrument              | Status                              | Brief description                                                                                                                                                                                                                                                                                                                                                                                                              | Start year | Implementing entity                    | Estimate of mitigation impact (in-year reduction c.f. prev. year, not cumulative, in kt CO <sub>2</sub> eq) |      |
|------------------------------------------------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------|------|
|                                                                        |                                   |                                                                                                                                      |                                 |                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                |            |                                        | 2025                                                                                                        | 2030 |
| Energy Strategy 2030 ( <i>Energie-strategie 2030</i> )                 | Mostly CO <sub>2</sub>            | Governmental strategy that targets a sustainable energy supply, energy efficiency and net zero emissions                             | Planning measure                | Implemented                         | Strategy setting out several possible scenarios for the energy sector on the path to net-zero emissions. Includes a range of measures across industry, buildings, transport and energy generation, most of which are quantified and tracked. Measures are implemented through a range of legal instruments as set out below, as well as cross-cutting acts.                                                                    | 2021       | Office of Economic Affairs, Government | 3.36                                                                                                        | 3.51 |
| Energy Efficiency Act ( <i>Energie-effizienzgesetz; EEG</i> )          | Mostly CO <sub>2</sub>            | Legal framework that targets increased efficiency in energy use and promotes use of renewable energy                                 | Regulatory, Economic instrument | Implemented                         | The programme increases the energy efficiency of buildings and promotes the use of renewable energy providing subsidy for building insulation, replacement of fossil-fuelled heating systems and the installation of solar panels. It also sets the framework for renewable electricity tariffs and data collection to monitor energy use and establishes governing structures for energy policy and programme implementation. | 2008       | Office of Economic Affairs             | IE                                                                                                          | IE   |
| Energy Ordinance to the Construction Act ( <i>Energie-verordnung</i> ) | CO <sub>2</sub>                   | Regulations which set standards for building envelopes and building technology with the aim of increasing building energy efficiency | Regulatory                      | Implemented                         | New buildings, renovations and individual installations (heaters, air conditioners, ventilation systems) must comply with minimum insulation values and maintenance schedules, according to Ordinance / SIA Norm 380/1 and other minimum requirements.                                                                                                                                                                         | 2007       | Building and Fire Safety Authority     | IE                                                                                                          | IE   |
| EU Directive Energy performance of buildings (2010/31/ EU)             | CO <sub>2</sub>                   | Minimum energy performance requirements for buildings or building units are set with a view to achieving cost-optimal levels         | Regulatory                      | Implemented (strengthening planned) | Before construction starts, the technical, environmental and economic feasibility of high-efficiency alternative systems is considered                                                                                                                                                                                                                                                                                         | 2010       | Office of Economic Affairs             | NA                                                                                                          | NA   |
| European Energy Award label ( <i>Energiestadt</i> )                    | CO <sub>2</sub> , precursor gases | Reduction of CO <sub>2</sub> emissions at municipality level                                                                         | Labelling                       | Implemented                         | The programme requires municipalities to set targets for the increased use of renewable energy and energy-efficient technologies for all premises. Since 2012 all 11 municipalities are certified with the European Energy Award                                                                                                                                                                                               | 2004       | NA                                     | NA                                                                                                          | NA   |

### II.D.2.2 Energy Strategy 2030

In 2020, the Government adopted its Energy Strategy 2030, which contains three targets and several possible scenarios for national energy policy covering the period 2021–2030. It focusses on the promotion of efficient energy use (energy conservation), electrification of building heat and transport, and increased use of renewable energy sources. The Energy Strategy formulated three main targets at the time, though the updated target has since been superseded by the Climate Strategy:

- an increase in the share of renewable energy in total final energy use from 22% in 2019 to 30% by 2030

- 
- an increase in energy efficiency to reduce final energy demand by 20% below 2008 levels by 2030
  - a 40% reduction in GHG emissions below 1990 levels by 2030; updated in 2023 to a 55% target in the Climate Strategy

The Energy Strategy 2030 brings together a range of measures covering all energy-related sectors. The measures are implemented through multiple cross-cutting legal instruments and through dedicated laws, regulations or programmes. Table 15 shows the measures and the legal instruments which implement them.

The Energy Strategy had also set out a forward-looking vision for the energy system in a net-zero economy in 2050. This vision became part of the Climate Strategy 2050.

In 2023, a total of CHF 17.3 million was provided in subsidies under the *Energieeffizienzgesetz*, with the majority of this spending going to photovoltaic installations and demonstration or 'other' projects. Of the remaining CHF 5.3 million for building measures with a quantified impact on domestic emissions, the largest share (83%) was spent on subsidising heat pump and wood-fired heating installations, and most of the remainder (13%) on renovations of existing buildings. A minority share was spent on subsidising highly efficient new builds, heat pump boilers and thermal solar collectors. In addition to this, almost all of Liechtenstein's municipalities provide additional funds to projects subsidised at the national level pursuant to the Energy Efficiency Act. There are no cost estimates on the measure 'Electrification of Transport'; the impact on public finances would primarily stem from lost revenue due to the motor vehicle tax waiver for electric and hybrid vehicles.

The following sub-sections present more detail on the Energy Strategy, and the legal instruments through which it is implemented for measures that affect domestic emissions in the industry and building sectors and in energy generation. Legal instruments which only affect measures in the transport sector are discussed separately in section II.D.3.

Not shown in Table 15 or discussed in the following sections are all those measures in the Energy Strategy that focus on renewable electricity generation, primarily subsidies for photovoltaic installations and the provision of a green electricity label for power from the local utility. This is because they only affect emissions outside Liechtenstein, namely from imported electricity.

The Energy Strategy 2030 also addressed the need to minimise adverse effects of its proposed measures as required by Art. 2 paragraph 3 of the Kyoto Protocol. The proposed set of measures has been checked against its compatibility with economic as well as social requirements.

Table 15: Measures in tracked under the heading of the Energy Strategy 2030

| Name of measure <sup>a</sup>                                                     | Sector                                           | Description                                                                                                                                                                                                                                              | Implementing Act                                                                                                         | Legal instruments supporting deployment                                                                                                                                                                                                                                                                   | Estimate of mitigation impact (in-year reduction c.f. prev. year, not cumulative, in kt CO <sub>2</sub> eq) |             |
|----------------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-------------|
|                                                                                  |                                                  |                                                                                                                                                                                                                                                          |                                                                                                                          |                                                                                                                                                                                                                                                                                                           | 2025                                                                                                        | 2030        |
| Building efficiency subsidies                                                    | 1A4 Other (buildings)                            | Renovation of the building envelope of older buildings is subsidised with up to CHF 200'000 to decrease energy demand; subsidies for buildings built to very high efficiency "Minergie" standards                                                        | EEG (II.D.2.3) implements the subsidy system for renovations                                                             | CO <sub>2</sub> levy in CO <sub>2</sub> act (II.D.1.5) (increases cost of fossil heating systems thus improving savings from renovations and incentive to buy highly efficient buildings)                                                                                                                 | 0.24                                                                                                        | 0.24        |
| Heating/hot water system replacement subsidies                                   | 1A4 Other (buildings)                            | Subsidies of up to CHF 20'000 for installation of non-fossil heating systems in buildings with good insulation levels, primarily heat pumps (also: wood boilers, solar thermal)                                                                          | EEG (II.D.2.3) implements the subsidy system for renewable heating systems                                               |                                                                                                                                                                                                                                                                                                           | 1.26                                                                                                        | 1.26        |
| Building standards                                                               | 1A4 Other (buildings)                            | Minimum energy efficiency standards are set for all new buildings.                                                                                                                                                                                       | Energy ordinance to the Construction Act (II.D.2.4)                                                                      |                                                                                                                                                                                                                                                                                                           | 0.09                                                                                                        | 0.09        |
| Electrification of Transport                                                     | 1A3 (transport)                                  |                                                                                                                                                                                                                                                          |                                                                                                                          |                                                                                                                                                                                                                                                                                                           | 0.61                                                                                                        | 0.76        |
| Appliance standards                                                              | 1A2/1A4 (manufacturing & construction/Buildings) | Minimum standards for all appliances, motors and lighting products licensed for sale in the EU. Timely implementation of the relevant EU directives and information campaigns for consumers and companies to further deployment of efficient appliances. | Sets out minimum standards of appliances imported into the customs union Liechtenstein Switzerland                       | CO <sub>2</sub> levy in CO <sub>2</sub> act (II.D.1.5) (increases cost of fossil heating systems thus improving savings from the use of efficient heating appliances)                                                                                                                                     | 0.27                                                                                                        | 0.27        |
| Industry efficiency                                                              | 1A2 (manufacturing & construction)               | Target agreements with larger industrial sites to reap energy efficiency potential.                                                                                                                                                                      | CO <sub>2</sub> levy in CO <sub>2</sub> act (II.D.1.5) as industrial sites which agree efficiency targets are reimbursed |                                                                                                                                                                                                                                                                                                           | 0.01                                                                                                        | 0.01        |
| Renewable heat                                                                   | 1A2/1A4 (manufacturing & construction/Buildings) | Subsidies for renewable energy and CHP installations as well as expansion of the district heating network.                                                                                                                                               | EEG (II.D.2.3) implements the subsidy system for centralised wood-fired or biogas heat plants as well as CHP plants      | The extension of the district heat network is a key element for increasing the number of industrial installations and households connected to the waste heat from the local incineration plant. It is funded through a combination of direct investment by the publicly owned utility and the government. | 0.88                                                                                                        | 0.88        |
| <b>Total estimated impact of measures tracked under the Energy Strategy 2030</b> |                                                  |                                                                                                                                                                                                                                                          |                                                                                                                          |                                                                                                                                                                                                                                                                                                           | <b>3.36</b>                                                                                                 | <b>3.51</b> |

## Planned strengthening

A hoped for strengthening of the measures in the measure groups of heating/hot water systems and building standards to achieve the aims of the Climate Strategy 2050 was rejected in a public referendum in January 2024. Government is currently reconsidering how to formulate alternative measures.

## Estimate of mitigation impact

As shown in Table 15, the estimated mitigation impact of the measures tracked under the Energy Strategy (which includes measures in transport) combine to around 3.36 kt CO<sub>2</sub>eq in 2025 (vs 2024 emissions) and 3.51 kt CO<sub>2</sub>eq in 2030 (vs 2029 emissions).

## Implementing legal instruments

As shown in Table 15, the Energy Strategy's measures relevant to climate protection are implemented chiefly through the Energy Efficiency Act (and associated Ordinances), the Construction Act (and associated Ordinances) and the Vehicle Tax (reported under Transport in section II.D.3).

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Other legal acts which affect the effectiveness of these legal instruments are the CO<sub>2</sub> levy under the CO<sub>2</sub> act (see section II.D.1.5), and appliance standards based on the EU Ecodesign Directive (Directive 2009/125/EC), as well as other taxes and levies in the Transport sector (reported in section II.D.3)

### II.D.2.3 Energy Efficiency Act

This act implements subsidies for a range of measures in the Energy sector. It also establishes programmes and oversight procedures. As shown in Table 15, subsidies under the Act can be granted for the refurbishment of building envelopes for energy savings purposes and for the replacement of fossil heating systems with renewable and/or low emissions sources.

The act also establishes two important organisational structures:

- **Energy Commission:**
  - advises the Government on energy policy and communicates its views on all fundamental questions of energy policy
  - consists of experts from all relevant areas (architecture, energy industry, other industries, manufacturing and trades, administrative offices, environmental organisations)
- **Energy Office** (*Energiefachstelle*) within the Office of Economic Affairs:
  - advises municipalities and private parties on all areas of energy conservation
  - is responsible for the approval and administration of subsidy applications
  - coordinates with other government offices to drive implementation of the measures set out in the energy strategy
  - provides information to the public through lectures, radio discussions, and personal interactions

#### Estimate of mitigation impact

The mitigation impact of this law includes, amongst others, the impact shown in Table 15, for the measures ‘building efficiency subsidies’ and ‘heating/hot water system replacement subsidies’ under the Energy Strategy which add up to around 1.5 kt CO<sub>2</sub>eq per year (compared with the previous year).

### II.D.2.4 Energy Ordinance to the Construction Act

The Energy Ordinance (*Energieverordnung*) of 2007 [FL Gov, 2003] is pursuant to the Construction Act and slightly pre-dates the Energy Efficiency Acts [FL Gov, 2008]. Its purpose is the efficient use of energy in buildings.

The ordinance sets detailed quantified limit values for all installations and devices which affect the energy use of a building, including heating, cooling, ventilation and lighting. It pertains to both, new builds and renovations or extensions, and to residential as well as commercial buildings. It also regulates how energy use should be monitored and reported for the purpose of energy bills and the requirements for building energy certification.

#### Estimate of mitigation impact

The ordinance is wide-reaching in nature and has many overlaps with other measures, so its exact impact is not easy to estimate. Nevertheless, a rough minimum estimate of its impact is provided in Table 15, for the measure ‘building standards’ under the Energy Strategy which amounts to around 0.09 kt CO<sub>2</sub>eq per year (compared with the previous year).

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### II.D.2.5 Recast of the EU Energy Performance of Buildings Directive (2010/31/ EU) (EPBD II)

The European directive (EU 2024/1275 amending EU directive 2010/31/EU) in the building sector is of EEA relevance and therefore directly applicable in Liechtenstein although mostly transposed into national law. The recast of the EU Directive on the Energy Performance of Buildings (2010/31/ EU), also known as EPBD II, sets the framework for efforts to maximise energy efficiency in the European building sector. The directive influences activities in the building sector within Liechtenstein, but also indirectly affects the sector through the significant amount of trade involved. The areas of influence of the directive include quality standards or emission limits, monitoring processes, import regulations, product development, ingredient regulations, fuel composition standards and others.

The Liechtenstein Government attempted to strengthen local building regulations, based on Swiss building standards ‘MuKE 2014’, in 2023, which would have brought all local regulations in line with EPBD II requirements and even exceeded them. However, this decision was reversed by popular referendum in January 2024. A different approach to strengthening local building laws is now being prepared.

#### Estimate of mitigation impact

The impact on emissions of the EPBD II is not estimated as it influences activities both within other measures and policies but also outside them.

### II.D.2.6 Energy Award label for municipalities

Although not a national policy, the *Energiestadt*® label is an important driver for emission reduction in Liechtenstein as a lot of action needs to be taken at the municipal level.

The label is awarded to a town or municipality that has made above-average efforts in municipal energy and climate policy—measured against the available scope for action. A re-audit takes place every four years to confirm the quality and continuous commitment of the municipality. Triesen was the first Liechtenstein municipality to be *Energiestadt* labelled. Since 2012, all of Liechtenstein’s 11 municipalities are certified.

The label process assesses the potential for improvements in energy efficiency and emissions reduction for each municipality separately, then scores it for progress against that potential. Reaching 75% of the available potential results in a ‘Gold’ award status, which has been achieved by four of the eleven municipalities in Liechtenstein.

#### Estimate of mitigation impact

Since the emission reduction efforts at municipal level overlap heavily with reductions accounted for at national level, their impact is not shown here separately to avoid double counting.

## II.D.3 Transport

### II.D.3.1 Overview

Emissions from the transport subsector (CRF Sector 1A3) account for around 30% of emissions in Liechtenstein, almost all of it from road transport (see also section II.A.7). The Mobility Concept 2030 (*Mobilitätskonzept 2030*) is the heart of national transport policy, outlining various measures and key projects run by the government to contend with and balance various mobility needs and challenges while maintaining quality of life. The Office of Building Construction and Spatial Planning (*Amt für Hochbau und Raumplanung, AHR*) is the executing entity supervised by the Ministry for Infrastructure and Justice. It is subject to annual reporting and evaluation. Its measures are implemented through, as well as supplemented by, a variety of legal instruments. Besides the measures and projects set out in the Mobility Concept, Liechtenstein is using various motor vehicle tax and fuel tax policies to achieve a steering effect.

In addition, Liechtenstein cooperates with its neighbouring countries Switzerland and Austria (especially the Swiss canton of St. Gallen and Austrian federal state Vorarlberg) to ensure smooth public transport across national borders. Liechtenstein advocates strongly for the enhancement of public transportation routes, the extension and/or preservation of existing train stops in the surrounding area, as well as increased frequency of public transport via trains and busses.

Since emissions from aviation in Liechtenstein are of minor importance (with only 0.45% of national total, excl. LULUCF) no specific national policies exist to address these sources. The respective emissions stem from only one small heliport. No international shipping activities occur in Liechtenstein. Based on these national circumstances, Liechtenstein does not promote and implement ICAO and IMO decisions to limit emissions from aviation and marine bunker fuels.

Table 16: Summary of policies and measures in the transport sector.  
The sector affected is transport for all policies and measures presented in this table

| Name of policy or measure <sup>a</sup>                                | Greenhouse gas(es) affected | Objective and/or activity affected                                                             | Type of instrument | Status      | Brief description                                                                                                                                                                                                                                                                                                                                  | Start year | Implementing entity                                              | Estimate of mitigation impact (in-year reduction c.f. prev. year, not cumulative, in kt CO <sub>2</sub> eq) |      |
|-----------------------------------------------------------------------|-----------------------------|------------------------------------------------------------------------------------------------|--------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|------|
|                                                                       |                             |                                                                                                |                    |             |                                                                                                                                                                                                                                                                                                                                                    |            |                                                                  | 2025                                                                                                        | 2030 |
| Mobility Concept 2030 ( <i>Mobilitätskonzept 2030</i> )               | CO <sub>2</sub>             | Maintain and improve living standards in and economic attractiveness of Liechtenstein          | Planning measure   | Adopted     | The concept aims to ensure the mobility of all actors in Liechtenstein in view of expected demographic and economic developments and geographical constraints by improving different transport modes and optimising their interplay.                                                                                                               | 2020       | Government, Office of Building Construction and Spatial Planning | IE                                                                                                          | IE   |
| CO <sub>2</sub> emission regulations for newly registered vehicles    | CO <sub>2</sub>             | Limits for emissions from newly registered vehicles (passenger cars, vans, trucks)             | Regulatory         | Implemented | EU CO <sub>2</sub> emission targets for 2025 and 2030 for newly registered vehicles. Vehicle importers have to pay a penalty if the individually specified target is not met.                                                                                                                                                                      | 2013       | Office of Environment                                            | NE                                                                                                          | NE   |
| Partial compensation of CO <sub>2</sub> emissions from motor fuel use | CO <sub>2</sub>             | Mitigation projects as compensatory measure (instead of a CO <sub>2</sub> levy on motor fuels) | Regulatory         | Implemented | Obligation for importers to offset parts of the CO <sub>2</sub> emissions from motor fuel use. Surcharge paid by the consumer on imported fuels cannot exceed 0.05 Swiss francs per litre of fuel.                                                                                                                                                 | 2013       | Office of Environment                                            | IE                                                                                                          | IE   |
| Motor vehicle tax exemption ( <i>Motorfahrzeugsteuer</i> )            | CO <sub>2</sub>             | Promote adoption of alternative propulsion systems and smaller vehicles                        | Fiscal             | Implemented | For most vehicles, the vehicle tax increases with increased weight. Since 1999 it is waived completely for electrically propelled, hybrid and gas-propelled vehicles.                                                                                                                                                                              | 1999       | National Road Office                                             | 0.5                                                                                                         | 0.76 |
| Heavy vehicle charge ( <i>Schwerverkehrsabgabe</i> )                  | CO <sub>2</sub>             | Reduction of transalpine road traffic, limit increase in heavy vehicles on the road            | Fiscal             | Implemented | Charges applied to passenger and freight transport vehicles of more than 3.5 tonnes gross weight, aiming at a shift of transalpine transport from road to rail. The level of the charge depends on the distance driven, the maximum weight, and emissions standards of the individual vehicle.                                                     | 2001       | National Road Office, FOCBS                                      | NE                                                                                                          | NE   |
| Mineral oil tax reduction on biofuels and natural gas                 | CO <sub>2</sub>             | Promotion of low-carbon or carbon-free motor fuels                                             | Fiscal             | Implemented | Tax reduction of 0.4 Swiss francs per litre of gasoline equivalent for natural gas and liquefied petroleum gas (LPG). Complete tax exemption for biogas and other renewable fuels used in combustion engines if certain ecological and social criteria are met. Tax revenue losses are compensated by increasing tax rates on liquid fossil fuels. | 1996       | Office of Environment, FOCBS                                     | IE                                                                                                          | IE   |

### II.D.3.2 Mobility Concept 2030

While not primarily aimed at emission reduction, the Mobility Concept's interventions are expected to lend strong support to the aims of national climate policy. The Concept contains around 50 measures organised into four packages (see Figure 31) and ten specific key projects. Especially the measure packages focussed on public transport and non-motorised transport and on cycling and public transport capacity increases are expected to reduce motorised traffic and thus CO<sub>2</sub> emissions.

Figure 31: Mobility Concept 2030 overview of measures

| Mobility Concept 2030                                                                                                                                                                  |                                                                                               |                                                                                                                                                       |                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| Enhancing public & non-motorised transport (15)                                                                                                                                        | Increasing capacity (18)                                                                      | Increasing efficiency (11)                                                                                                                            | Traffic safety (4)                                          |
| Improvements to bus system<br>(Network extension, better bus stops, bus priority on single lanes, potential ticket abolition, long-distance coach services, switch to electric busses) | Additional road capacity in areas of traffic jams, extension of road bridges across the Rhine | Mobility management (possible obligation for all public organisations, support for adoption by private organisations)                                 | Safety improvements for cycle lanes and pedestrian crossing |
| Regional train (S-Bahn)                                                                                                                                                                |                                                                                               | Digital car sharing offerings                                                                                                                         |                                                             |
| Bike/train interface improvements                                                                                                                                                      | Road tunnels or similar options for crossing train lines                                      | Fuel switch (possible subsidies for non-ICE)                                                                                                          |                                                             |
| Multimodal digital mobility services                                                                                                                                                   | Additional cycle bridges across the Rhine                                                     | Urban planning improvements (siting of industrial parks near highway entries)                                                                         |                                                             |
| Cycling infrastructure improvements (network cohesion and extension, cycle highways, cycle parking, signalling)                                                                        | Investigation of new, alternative systems for high capacity public transport                  | Road capacity optimisation through adaptive lane switching, bus gatekeeper systems, parking fees, traffic jam management, possibility of road pricing |                                                             |
|                                                                                                                                                                                        | Possibility of changing political framework conditions                                        |                                                                                                                                                       |                                                             |

Data Source: Own visualization

Since its adoption in 2020, the government has, inter alia:

- continued the programme for the step-wise conversion of the mainly diesel-powered public bus fleet to electric propulsion
- continued the extension and overhaul of cycling infrastructure
- proposed an obligation for mobility management in state-owned enterprises and passed this through a public consultation process
- continued road expansion projects in high traffic jam areas

Liechtenstein also benefits from the expansion of the rail network across the border in Switzerland. However, plans to extend this network further into the country were stalled following a popular vote in 2020.

### Estimate of mitigation impact

Because of the large overlap between different measures in the concept, no quantitative estimate of emissions impact is foreseen.

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### II.D.3.3 CO<sub>2</sub> emission regulations for newly registered vehicles

With the updated CO<sub>2</sub> Act in force as of 1 January 2025, strengthened emission reduction targets for newly registered cars, vans and heavy-duty vehicles in line with the regulation of the European Union were adopted (referring to the Worldwide Harmonised Light Vehicle Test Procedure).

For newly registered passenger cars, the targets will be 93.6 grams of CO<sub>2</sub> per kilometre from 2025 onward and 49.5 grams of CO<sub>2</sub> per kilometre from 2030 onward. For newly registered vans, the targets will be 153.9 grams of CO<sub>2</sub> per kilometre from 2025 onward and 90.6 grams of CO<sub>2</sub> per kilometre from 2030 onward.

For newly registered heavy-duty vehicles, the updated CO<sub>2</sub> Act introduces CO<sub>2</sub> emission reduction targets, defined as a percentage reduction from the baseline provided in the regulation of the European Union: a 15 per cent reduction from 2025 onward and a 30 per cent reduction from 2030 onward.

### Estimate of mitigation impact

The strong influence of cross-border purchasing of fuels is hampering the impact of the mineral oil tax and CO<sub>2</sub> compensation levy on domestic emissions from domestically sold fuel. The annual purchase of fuels in Liechtenstein is available and has, according to the latest survey, slightly increased in 2023 compared to 2022.

### II.D.3.4 Partial compensation of CO<sub>2</sub> emissions from motor fuel use

According to the Liechtenstein CO<sub>2</sub> Act, producers and importers of fossil motor fuels are required to pay a compensation for the CO<sub>2</sub> emissions caused by the combustion of these fuels. Unlike Switzerland, Liechtenstein does not currently earmark the compensation fee. In other words, Liechtenstein is budgeting for national and domestic investments without taking the actual gain through the CO<sub>2</sub> act into consideration. However, Liechtenstein is following Switzerland's levy scheme and applies the offset or compensation level determined by the Swiss Federal Council. The share of CO<sub>2</sub> emissions from motor fuels to be offset by fuel importers within the customs union Switzerland and Liechtenstein are as follows:

- 2% in 2014–2015
- 5% in 2016–2017
- 8% in 2018–2019
- 10% in 2020
- 12% in 2021

As of 2022, the share of CO<sub>2</sub> emissions from motor fuels to be offset by fuel importers within Switzerland shall be at least 15%. The total share, to be reached by means of emission reduction projects within Switzerland and abroad, shall be:

- 17% in 2022
- 20% in 2023
- 23% as of 2024

From 2025 onward, the revised CO<sub>2</sub> Act stipulates that the share of CO<sub>2</sub> emissions from motor fuels to be offset by fuel importers shall be at least 5% and at most 90%.

### Planned strengthening

The planned strengthening in the framework of the CO<sub>2</sub> Ordinance foresees that the share of CO<sub>2</sub> emissions from motor fuels to be offset by fuel importers within the customs union Switzerland and Liechtenstein shall be at least 12%. The

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total share, to be reached by means of emission reduction projects within Switzerland and abroad, shall be 25% in 2025 and increase by 5% each year to finally reach 50% in 2030.

Liechtenstein adjusted its CO<sub>2</sub> act to allow importers to buy domestic emission reduction certificates. This option was not available previously, as no domestic projects were available. A project linked to emission reduction through restoration of peatland is currently planned in Liechtenstein. The income of the compensation fee will be used to partially finance the peatland project.

### Estimate of mitigation impact

The mitigation impact of the above-mentioned peatland project cannot be estimated yet, as the key parameters still need to be defined.

#### II.D.3.5 Motor vehicle tax exemption

Since 1994, all vehicles registered in Liechtenstein need to pay an annual vehicle tax which, for most vehicles, increases with increasing weight of the vehicle. The tax system was amended in 1999 to exempt alternative propulsion systems from the tax: vehicles with electric, hybrid or gas-based propulsion systems are completely exempt from the annual charge to incentivise adoption.

The basis for levying the motor vehicle tax is the Law on Motor Vehicle Tax of 1994. The assessment basis for calculating the motor vehicle tax is usually the total weight of the vehicle (unladen weight + maximum payload), except motorcycles which are taxed by engine capacity. Currently, the weight-based vehicle tax for the highest weight category is set at CHF 34.25/100kg weight for individual passenger vehicles, CHF 6.85/100kg weight for goods vehicles and group passenger vehicles, CHF 1.15/100kg weight for agricultural vehicles.

### Planned strengthening

Efforts by the government to revise this system towards a system that, inter alia, replaces the complete waiver with a reduced charge, met with public resistance in 2023. A potential future revision, which could be modelled on new concepts being developed in Switzerland, could move towards road pricing or another method to ensure that mostly stationary vehicles would be taxed less than vehicles that are heavily used.

### Estimate of mitigation impact

The deployment of electric and hybrid vehicles is tracked under the Energy Strategy. Its impact is estimated at around 0.61 kt CO<sub>2</sub>eq in 2025 (vs 2024 emissions) and 0.76 kt CO<sub>2</sub>eq in 2030 (vs 2029 emissions).

#### II.D.3.6 Heavy vehicle charge

In 2001, Liechtenstein introduced a Heavy Vehicle Fee in cooperation with Switzerland.

The fee aims to shift transalpine freight from road to rail and is based on the polluter-pays-principle. The fee applies to all passenger and freight transport vehicles of more than 3.5 tonnes of total weight. It is calculated according to three criteria: (i) kilometres travelled with the Swiss/Liechtenstein customs territory, (ii) permissible maximum laden mass according to the vehicle registration certificate, and (iii) emission standard according to EURO classes. The charge is set at a maximum of 3.10 Swiss francs per hundred tonne kilometres for the most pollution EURO class. Heavy vehicles with battery-electric or fuel cell drives are currently exempt from the charge.

### Planned strengthening

The current heavy vehicle charge is reaching its limits due to technical developments: 90% of vehicles subject to the heavy vehicle charge are now in the most favourable tax category. Accordingly, the heavy vehicle charge is currently

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being developed further. During spring 2024, the Liechtenstein Government submitted a draft revision of the relevant legislation for public consultation<sup>7</sup>.

### Estimate of mitigation impact

Heavy goods vehicles contribute a small share to domestic emissions as these only reflect fuels sold within the country boundaries. The impact on domestic emissions is therefore not estimated.

#### II.D.3.7 Mineral oil tax reduction on biofuels and natural gas

A mineral oil tax is usually levied on sales of mineral oils. The Swiss mineral oil tax is, as part of the customs union with Switzerland, directly applicable in Liechtenstein. Similar to other acts where Swiss legal acts apply, Liechtenstein as a rule executes the provisions similarly to a Swiss canton.

Complete tax exemptions for biogas and other renewable fuels used in combustion engines have been granted, if ecological and social criteria are met. However, complete tax exemptions for biogas and other renewable fuels used in combustion engines have been granted, if ecological and social criteria are met. In March 2014, the Swiss Parliament decided to tighten these criteria by amending the Mineral Oil Tax Act as well as the Environment Protection Act. In the framework of the revision of the Liechtenstein CO<sub>2</sub> Act, an extension until 2030 of the mineral oil tax reduction on biofuels and natural gas was adopted.

#### II.D.3.8 Further relevant measures

##### Air pollution control measures at cantonal and communal level

The municipalities are in charge of the implementation of the Ordinance on Air Pollution Control. Within the transport sector, measures include e.g. parking space management.

#### II.D.4 Industrial processes and product use

##### II.D.4.1 Overview

Emissions from IPPU (CRF Sector 2) account for less than 1% of emissions in Liechtenstein (see also section II.A.7). The key GHG emission reduction policies in the industry sector control CO<sub>2</sub> emissions from fossil fuel use and are implemented under the CO<sub>2</sub> Act (see section II.D.1.5) and partially captured by measures tracked under the Energy Strategy 2030 (see section II.D.2.2).

With the signing of the Kigali Amendment to the Montreal Protocol in 2020, Liechtenstein has committed to reduce its emissions of F-Gases by 2036 to 15% of the average level in the period 2011–2013. This target is also incorporated in the Liechtenstein Climate Strategy 2050 (see section II.D.1.6.) and implemented through the Swiss Ordinance on Chemical Risk Reduction which applies in Liechtenstein due to the customs union. Emissions of F-Gases and precursor gases, such as Non-Methane Volatile Organic Compounds (NMVOCs), are subject to different specific policies and measures. A key instrument linked to NMVOCs has been levied since 1 January 2000, amounting to CHF 2.00 per kilogramme of NMVOC emitted into the air. Since 2003, the fee has been CHF 3.00 per kilogramme of NMVOC. As a market-based instrument in the field of environmental protection, it creates a financial incentive to further reduce NMVOC emissions.

Another applicable Swiss Ordinance concerns the movement of toxic waste according to which waste containing hydrofluorocarbons (HFCs) counts as special waste. The movement of such waste is hence controlled, subject to licensing and must be carried out in an environmentally sound manner. Additional relevant measures can be found in the Ordinances

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<sup>7</sup> [https://www.llv.li/serviceportal2/amtstellen/stabstelle-regierungskanzlei/bua\\_056\\_2024\\_abaenderung-des-schwerverkehrsabgabegesetz.pdf](https://www.llv.li/serviceportal2/amtstellen/stabstelle-regierungskanzlei/bua_056_2024_abaenderung-des-schwerverkehrsabgabegesetz.pdf)

on Air Pollution Control (see section II.D.1.2) and on the Incentive Tax on Volatile Organic Compounds (see section II.D.1.8).

Table 17: Summary of policies and measures in the IPPU sector.  
The sector affected is IPPU for all policies and measures presented in this table

| Name of policy or measure <sup>a</sup>                                | Green-house gas(es) affected | Objective and/or activity affected                                                     | Type of instrument | Status      | Brief description                                                                                                                                                                                           | Start year | Implementing entity   | Estimate of mitigation impact (in-year reduction c.f. prev. year, not cumulative, in kt CO <sub>2</sub> eq) |      |
|-----------------------------------------------------------------------|------------------------------|----------------------------------------------------------------------------------------|--------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------------|-------------------------------------------------------------------------------------------------------------|------|
|                                                                       |                              |                                                                                        |                    |             |                                                                                                                                                                                                             |            |                       | 2025                                                                                                        | 2030 |
| Swiss Ordinance on Chemical Risk Reduction                            | F-Gases                      | Reduction in use and emissions of F-Gases. Kigali Amendment to the Montreal Protocol A | Regulatory         | Implemented | Regulations relating to, inter alia, compressed gas containers, foams, solvents containing PFCs, HFCs or HFES, refrigerants, extinguishing agents, and SF <sub>6</sub> in electrical distribution equipment | 2003       | Office of Environment | NA                                                                                                          | NA   |
| Ordinance on Air Pollution Control ( <i>Luftreinhalteverordnung</i> ) | NMVOCs                       | Emissions limits on NMVOCs                                                             | Regulatory         | Implemented | Regulation under Environmental Protection Act setting limits on emissions of NMVOCs and specifying that installations should capture these as close to source as possible                                   | 2008       | Office of Environment | NA                                                                                                          | NA   |

## II.D.5 Agriculture

### II.D.5.1 Overview

Emissions from agriculture (CRF Sector 3) account for around 15% of emissions in Liechtenstein (see also section II.A.7). While emissions in agriculture are smaller than emissions from the energy sector, a significant reduction effort is also expected from planned policies and measures in this sector. The planned policies and measures in the Climate Strategy 2050 (see section II.D.1.6) aim to reduce agricultural emissions by 52% until 2050 compared to 1990.

Table 18 lists key policies in the agricultural sector. In addition, several of the cross-cutting measures in section II.D.1 apply as well, most notably the Water Protection Act (section II.D.1.7)

Table 18: Summary of policies and measures in the agriculture sector.  
The sector affected is agriculture for all policies and measures presented in this table

| Name of policy or measure <sup>a</sup>            | Greenhouse gas(es) affected        | Objective and/or activity affected                                                 | Type of instrument              | Status      | Brief description                                                                                                                                                                                                                                               | Start year | Implementing entity   | Estimate of mitigation impact (in-year reduction c.f. prev. year, not cumulative, in kt CO <sub>2</sub> eq) |      |
|---------------------------------------------------|------------------------------------|------------------------------------------------------------------------------------|---------------------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------------|-------------------------------------------------------------------------------------------------------------|------|
|                                                   |                                    |                                                                                    |                                 |             |                                                                                                                                                                                                                                                                 |            |                       | 2025                                                                                                        | 2030 |
| Agricultural Law ( <i>Landwirtschaftsgesetz</i> ) | CH <sub>4</sub> , N <sub>2</sub> O | Law aimed at ensuring a sustainable, reliable and market-ready agricultural system | Regulatory, Economic instrument | Implemented | The law aims to ensure the supply of agricultural products to the population, the integrity of soil, air and water, protection of biodiversity and from natural disasters. It includes, inter alia, subsidies for organic agriculture and ecological practices. | 2009       | Office of Environment | IE                                                                                                          | IE   |
| Agricultural Policy Report                        | CH <sub>4</sub> , N <sub>2</sub> O | Protection of agricultural soils and reduction of emissions                        | Planning measure                | Adopted     | Policy document outlining measures to reduce emissions                                                                                                                                                                                                          | 2024       | Office of Environment | IE                                                                                                          | IE   |
| Climate-Effective Agriculture Project             | CH <sub>4</sub> , N <sub>2</sub> O | Protection of biodiversity, emission reduction                                     | Regulatory, Economic instrument | Planned     | Pilot project limited to 6 farms until 2027. As of 2030 climate friendly production processes will receive incentive payments at national level.                                                                                                                | 2025       | Office of Environment | NA                                                                                                          | NA   |

### II.D.5.2 Agricultural Law

The Agricultural Law (*Landwirtschaftsgesetz*, LWG) was passed in 2009 [FL Gov, 2009a]. It sets up regulations for any agricultural activity, including production quality standards, reporting requirements, labelling obligations for products and trading rules. It also sets the framework for all subsidy payments to farming operations, to incentivise and steer a wide range of agricultural activities.

#### Planned strengthening

A new action plan for climate effective agriculture practices is under development, with publication expected for 2025. The plan will list, and incentivise climate-effective practices, such as

- Optimised manure and fertiliser management, already practiced by organic farms
- Expansion of alternative grazing methods which result in lower emissions of greenhouse gases compared to indoor housing of animals
- Introduction of a sustainability assessment tool, which will enable rewarding of climate friendly practices in future

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Through the Climate-Effective Agriculture project<sup>8</sup> approximately six pilot farms will assess from 2025 to 2027 how the measures from the 2022 agricultural policy report can be implemented on a nationwide scale. To this end, the farms will evaluate various sustainability analyses and test effectiveness. Starting in 2028, the tools, mechanisms, and measures that prove successful during the pilot phase will be extended to all farms across the country.

### Estimate of mitigation impact

As the Climate-Effective Agriculture project is under development, the impact of the related measures is not yet described in detail. However, the impact is included in the estimated impact of the Climate Strategy 2050 (see section II.D.1.6). Existing subsidies do not primarily aim at GHG reduction, so the impact on emissions is not monitored. Until 2030 no significant impact on livestock figures is expected. As livestock is the main emission driver, the projections remain stable until 2030 despite the ongoing activities.

## II.D.5.3 Agricultural Policy Report (2022)

The agricultural policy report is produced every four years by the government. It serves as both, a monitoring report and a strategy document, setting goals for the next period. It was issued last in 2022 [FL Gov, 2022].

The goals set out in the report were based on a report titled 'Further development of agricultural policy in the Principality of Liechtenstein' from 2021, and focus on three main pillars: (1) an impact-oriented development towards ecological agriculture, (2) a strengthening of innovation, knowledge and regional value creation and (3) a broadening of agricultural policy to include all relevant agricultural stakeholders and society as a whole.

The report noted that use of fertiliser per cultivated area was relatively high in Liechtenstein in comparison to neighbouring countries, likely contributing to deposition levels of ammonia and other nitrogen compounds above critical load levels. An obligation for low-emission fertiliser use was subsequently put in place in 2023.

The report also called for improved and more detailed data collection on climate relevant activities, such as fertiliser use, emissions inventories and biodiversity impacts.

### Estimate of mitigation impact

The goals and policies set out in the report and implemented through associated legal acts are expected to contribute substantially to reaching the overall goal of halving agricultural emissions between 1990 and 2050 as set out in the Climate Strategy 2050. The emission reduction is therefore captured under the Climate Strategy (see section II.D.1.6)

## II.D.6 Land use, land-use change and forestry

### II.D.6.1 Overview

Covering an area of around 6,700 ha (42% of the country's territory), forests play a significant role in Liechtenstein.

Forests, and their importance for climate protection as carbon sinks, are governed by the laws and regulations shown in Table 19, most notably the Forestry Act. Emissions from LULUCF (CRF Sector 4) have varied in the past and are currently representing a small sink, roughly 1% of emissions in Liechtenstein (see also section II.A.7).

In addition to the Forestry Act, international agreements (such as the 1993 Helsinki Ministerial Conference on the Protection of Forests in Europe) provide the basis for modern forest management. The natural rejuvenation of forests with local tree species appropriate to the location and the promotion of graded forest stock structures are foreseen.

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<sup>8</sup> <https://www.klimawirksame-landwirtschaft.li/projektinformation>

Table 19: Summary of policies and measures in the land use and forestry sector.  
The sector affected is LULUCF for all policies and measures presented in this table

| Name of policy or measure <sup>a</sup>       | Green-house gas(es) affected | Objective and/or activity affected               | Type of instrument   | Status      | Brief description                                                                                                                           | Start year | Implementing entity   | Estimate of mitigation impact (in-year reduction c.f. prev. year, not cumulative, in kt CO <sub>2</sub> eq) |      |
|----------------------------------------------|------------------------------|--------------------------------------------------|----------------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------------|-------------------------------------------------------------------------------------------------------------|------|
|                                              |                              |                                                  |                      |             |                                                                                                                                             |            |                       | 2025                                                                                                        | 2030 |
| Forestry Act                                 | CO <sub>2</sub> (sinks)      | Sustainable cultivation of forests               | Regulatory           | Implemented | Qualitative and quantitative (prohibition of clearing) preservation of forest stocks and the promotion of nature-friendly forest management | 1991       | Office of Environment | NA                                                                                                          | NA   |
| Forestry Ordinance ( <i>Waldverordnung</i> ) | CO <sub>2</sub> (sinks)      | Performance target                               | Regulatory           | Implemented | Regulates enforcement of key provisions of the Forestry Act                                                                                 | 1995       | Office of Environment | NA                                                                                                          | NA   |
| Forest Inventory                             | CO <sub>2</sub> (sinks)      | Stocktaking, Monitoring                          | Planning, Monitoring | Implemented | Provides an overview of the condition of Liechtenstein's forests, published every twelve years                                              | 1986       | Office of Environment | NA                                                                                                          | NA   |
| Forest Strategy 2030+                        | CO <sub>2</sub> (sinks)      | Binding specifications for future use of forests | Planning             | Planned     | Strengthening climate resilience of the Liechtenstein forest, maintain protective function                                                  | 2024       | Office of Environment | NA                                                                                                          | NA   |

## II.D.6.2 Forestry Act (1991) and Forestry Ordinance (1995)

The Forestry Act [FL Gov, 1991] includes the qualitative and quantitative (prohibition of clearing) preservation of forest stocks and the promotion of nature-friendly forest management. The Act and the associated Forestry Ordinance [FL Gov, 1995] stipulate that forests fulfil various functions. Besides the legally enshrined welfare function of the forest and positive effects on climate, these also stipulate that the forest and its management, respectively, serve the protection of nature which includes the preservation of biodiversity. They also contain a legal obligation for a sustainable management of forests, with due consideration of all of their functions.

In addition to the Forestry Act, international agreements (such as the 1993 Helsinki Ministerial Conference on the Protection of Forests in Europe) provide the basis for modern forest management. The natural rejuvenation of forests with local tree species appropriate to the location, the promotion of graded forest stock structures, and the ecological improvement of the edges of forests. In general, the promotion of biological diversity in forests is becoming an increasingly important part of Liechtenstein forest management. Being a signatory of FOREST EUROPE, Liechtenstein has signed the Bratislava Ministerial Declaration of 2021, committing, inter alia, to preservation of forest biodiversity.

### Planned strengthening

Currently no update of the forestry act and the forestry ordinance are planned.

## II.D.6.3 Forest Inventory

The inventory of Liechtenstein's forests is a key document for understanding the state of forests in the country. It is published every twelve years with the latest version being issued in 2024, describing the state of forests in 2022 [FL Gov, 2024d].

The report showed that since 2010, forests had increased their coverage by just under 5% and shrub forests by just under 10%. This is mostly due to natural growth. Logging volumes in Liechtenstein are lower than net growth. The report also assesses the composition of forests in terms of species and age and reports where additional measures need to be taken for an optimal mix.

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## Estimated impact

The inventory is an important data source to track impacts and inform policy making but does not in itself constitute a mitigation measure. It therefore does not have an ascribed mitigation impact.

### II.D.6.4 Liechtenstein Forest Strategy 2030+

The forest ecosystem is under increasing pressure, as evidenced by the growing occurrence of storm damage, beetle infestations, fungal diseases in recent years. In response the Liechtenstein Government issued the Forest Strategy 2030+ in March 2024 [FL Gov, 2024e], outlining measures along the following priority areas:

- Strengthening the forest's climate resilience
- Meeting the diverse societal demands on the forest as effectively as possible
- Preserving and promoting the forest's biodiversity
- Ensuring the forest's protective function in the long term

The current Forestry Act is still offering a solid basis for the implementation of activities under the above-mentioned priority areas. Liechtenstein has a long history of preserving forest areas. Therefore, it is anticipated that no major revision of the Forestry Act is required to implement the below described planned strengthening measures.

## Planned strengthening

The increase in temperature in the Alpine Arc has a devastating impact on Liechtenstein's forests. The promotion and maintenance of diverse, site-adapted, and climate-resilient forest stands is therefore a key priority. This requires forest management practices to be aligned closely with the latest findings from climate research.

The increasing deer population is hampering rejuvenation of the forests. Therefore, integrative conservation efforts entail management plans for unified hunting and forestry practices. Furthermore, efforts are underway to increase preparedness to better address damage events.

## Estimated impact

There are no quantitative estimates available of the planned measures. In the medium- to long-term, climate change mitigation efforts cannot be sustained without adaptation. Adaptive forest management in Liechtenstein aims to avoid major emissions from collapsing forest stands that are not adapted to climate change. The overall long-term impact of the Liechtenstein Forest Strategy 2030+ is expected to be positive. But it is assumed that a decrease in biomass is necessary. Liechtenstein's forests are currently characterized by high carbon stocks. In pursuing this objective, increased short-term emissions from forest management are to be expected, but in the long-term, removals should compensate for them.

## II.D.7 Waste

### II.D.7.1 Overview

Emissions from waste (CRF Sector 5) account for less than 1% of emissions in Liechtenstein (see also section II.A.7). Reduction effects are also negligible, since there are currently no implemented and adopted policies and measures which lead to strong reductions in this sector.

In Liechtenstein, the Ministry of Environment together with the Office of Environment are responsible for developing legislation and policies to ensure the recovery and environmentally sound disposal of waste, coordinating the planning of waste disposal facilities and implementing the policy framework in close collaboration with the eleven municipalities. The basis for waste legislation in Liechtenstein is the Environmental Protection Act (2008) (see section II.D.1.2).

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Because of the customs treaty with Switzerland Swiss waste law also applies in Liechtenstein. The Swiss Federal Office for the Environment (FOEN) monitors the import, export and transit of waste and hazardous waste for Liechtenstein. Switzerland is a member of the OECD and the Basel Convention and therefore carries out these controls according to the OECD and the Basel Convention decisions. The authorities of Liechtenstein will be informed in every case and have the possibility to refuse unwanted exports, imports and transits of waste.

The Waste Management Plan which also includes the Waste Prevention Programme was passed by the government in January 2020. The Waste Management Plan contains different measures concerning collaboration, disposal and biogenic waste for each municipality and for the Office of Environment. The plan mainly concentrates on landfill planning. There is also a plan to develop a nationwide concept for the energetic recovery and reuse of compost. The Waste Prevention Programme includes measures to reduce the amount of waste by awareness-raising measures and dissemination of information to the public.

### Planned strengthening

As described in section II.A.6.4, most of the waste produced in Liechtenstein (~90% by weight) is inert waste from the construction sector which does not produce emissions. Households are responsible for 8% of waste, but none of this is landfilled.

In relation to one-way plastic products Liechtenstein introduces all measures taken by the customs union with Switzerland so no unilateral measures are necessary. Only in relation to food waste, Liechtenstein has initiated its own sensitisation programmes. While all of these measures are expected to have a positive impact in reducing household waste, they do not have a mitigation impact as Liechtenstein does not have its own incineration plant. However, measures linked to improved water treatment do have an impact also on emission from the waste sector as described in section II.A.9.1

### Estimate of mitigation impact

According to the Climate Strategy 2050 [FL Gov, 2023], GHG-emissions in the waste sector are expected to increase slightly until 2050, despite technical optimisations, as the population is expected to increase further. Therefore, the effect of planned policies and measures is negligible in the waste sector, although slight improvements are foreseen as further described in section II.D.1.6.

### Implementing legal acts

The policies described above are implemented through a range of legal acts, mostly directly applicable due to the customs union with Switzerland. Two key acts relevant in the waste sector, the Environmental Protection Act (2008) (see section II.D.1.2) and the related Ordinance on the prevention and disposal of waste are shown in Table 20. In addition, other cross-cutting measures in section II.D.1 apply as well, most notably the Water Protection Act (section II.D.1.7).

Table 20: Summary of policies and measures in the waste sector.  
The sector affected is waste for all policies and measures presented in this table

| Name of policy or measure <sup>a</sup>            | Green-house gas(es) affected      | Objective and/or activity affected                                                                                    | Type of instrument | Status      | Brief description                                                                                                                                               | Start year | Implementing entity   | Estimate of mitigation impact (in-year reduction c.f. prev. year, not cumulative, in kt CO <sub>2</sub> eq) |      |
|---------------------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------------|-------------------------------------------------------------------------------------------------------------|------|
|                                                   |                                   |                                                                                                                       |                    |             |                                                                                                                                                                 |            |                       | 2025                                                                                                        | 2030 |
| Environmental Protection Act                      | all                               | Prevention of environmentally harmful activities as well as on the remediation and restoration of environmental harms | Regulatory         | Implemented | Legal basis for all regulations and ordinances, especially with respect to air pollution and waste treatment                                                    | 2008       | Office of Environment | NA                                                                                                          | NA   |
| Ordinance on the prevention and disposal of waste | CH <sub>4</sub> , CO <sub>2</sub> | Interdiction of landfilling of combustible waste                                                                      | Regulatory         | Implemented | Legal basis to protect people, animals, plants and their biological communities, waters, the soil and the air from harmful effects or nuisances caused by waste | 2016       | Office of Environment | NA                                                                                                          | NA   |

## II.D.7.2 Further relevant measures

No additional measures reported.

## II.D.8 Policies and measures no longer in place

Until 2010 the government supported private purchases of electric scooters and electric bicycles by up to 50% of the costs. This achieved an increased substitution of short automobile rides.

## II.D.9 Modification of longer-term trends in greenhouse gas emissions and removals

Liechtenstein's policies are, as outlined in the Climate Strategy 2050, generally set out to mitigate short and longer-term anthropogenic greenhouse gas emissions. Further activities are outlined in this section. The longer-term impact and trends of these are hard to estimate, as the measures focus on establishing a low-emission economy overall and also follow the whole-of-society approach as the following example illustrates:

**LIFE Climate Foundation:** Since 2012, the Government provides financial support to the LIFE Climate Foundation Liechtenstein (established in 2009) on a regular basis. The aim of the LIFE Climate Foundation Liechtenstein is to act as a driving force in constructively shaping the development and promotion of market-based instruments in the field of climate protection and thus to contribute to the achievement of the global climate protection goals. The Not-for-Profit foundation concluded a cooperation agreement with the Swiss Climate Foundation. Since 2012, Liechtenstein-based SMEs are eligible to apply for financial (upfront) support if they implement efficiency measures or if they seek financial help for the development of innovative projects that demonstrate a GHG mitigation impact. Additionally, the LIFE Climate Foundation aims to further strengthen public awareness by organising events and workshops which cover climate change and other ecological topics. The foundation acts within the framework of a Public-Private Partnership. The participation of business representatives as well as stakeholders from the science and policy sectors provides important access to the relevant actors and driving forces within environmental and carbon markets. Further information is available on [www.klimastiftung.li](http://www.klimastiftung.li).

**Training and advisory services:** The Office of Economic Affairs is supporting projects related to resource efficiency and the circular economy, in addition to existing funding opportunities in the areas of digitalisation, innovation, and export promotion. In June 2024, the government approved a service agreement with the organisation Reffnet.ch, the Swiss Resource Efficiency Network. It is a strong cooperation partner that helps businesses save materials, energy, and costs. The focus of its consulting services is on resource efficiency, specifically addressing material flows (e.g., water, metals,

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food, cement, plastics), the circular economy, and food waste. Reffnet is organised as an association and is co-financed and supported by the Swiss Federal Office for the Environment. Its members include various organisations and companies.

Removal measures linked to Carbon Capture and Storage (CCS) are not yet spelled out under the measures. CCS, i.e. the capture and storage of fossil and process-based CO<sub>2</sub> at installations to reduce emissions is currently not applicable in Liechtenstein as there are no point source capture installations. However, work is underway to set the legal framework for CCS so the framework is ready for gradually addressing hard-to-abate emissions. No site for CO<sub>2</sub> storage has been identified in Liechtenstein, but with further development of technologies further assessments will be carried out.

## **II.D.10 Economic and social consequences of response measures**

Liechtenstein is a small country and feedback from the population to policymakers is very direct and the country sees lively political debate. In addition, there is the option of a public referendum to challenge any law considered inappropriate. As such, democratic instruments are very strong and would prevent erratic climate taxing schemes. Furthermore, Liechtenstein's subsidy scheme in the energy sector can be considered very generous and effective in counterbalancing social and economic consequences of response measures.

### **Economic consequences of response measures**

The finance sector plays an important role in Liechtenstein. The main financial institutions started shifting financial flows towards climate-friendly investments. This transition presents short-term challenges for some other sectors. Industries reliant on fossil fuels are facing higher costs and likely a decline in demand for high-emission goods, fossil fuels, and inefficient vehicles. However, Liechtenstein companies operate under the same regulations as their European competitors and therefore no negative effects on European competitiveness are expected. Additionally, exemptions from the CO<sub>2</sub> levy are available to all sectors, which can help mitigate financial burdens.

### **Social consequences of response measures**

The existing CO<sub>2</sub> levy will continue to be applied, which has an impact on the financial situation of households. However, the switch to non-fossil heating systems is expected to lower energy costs. In addition, building owners can benefit from increased property values following energy-efficiency renovations.

In the building sector, measures to subsidise climate-friendly heating systems and energy-efficient building renovations will continue. Not only property owners benefit from the subsidies, but also tenants, the construction industry, and local businesses, particularly small and medium-sized enterprises.

Public transport is also continuing to be heavily subsidised. Costs for annual bus subscriptions, for instance, are reimbursed at least partially by several municipalities.

Around two-thirds of the levy revenues originating from the industrial and commercial sector are returned to it by granting subsidies to employers' obligations under the Old Age and Survivors Insurance (*Alters- und Hinterlassenenversicherung, AHV*), with the remaining one-third earmarked for environmental policy measures, such as the feed-in tariffs for renewable energy production.

## **II.E Summary of greenhouse gas emissions and removals**

This section presents a brief summary of Liechtenstein's greenhouse gas emissions and removals by gas and sector. Further information is provided in the CRT tables and in the national inventory document (NID) submitted as a stand-alone document [OE, 2024a].

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Liechtenstein's greenhouse gas emissions in the year 2022 amount to 165.5 kt CO<sub>2</sub> equivalent (CO<sub>2</sub>eq) excluding LULUCF sources or sinks (including LULUCF: 164.4 kt CO<sub>2</sub>eq). Total emissions in 2022 (excl. LULUCF) have declined by 27.7% compared to 1990.

Accounting for 77.5% of the total emissions in 2022 (excl. LULUCF), CO<sub>2</sub> is the dominant greenhouse gas (GHG) emitted in Liechtenstein. CH<sub>4</sub> emissions represent 13.1% and N<sub>2</sub>O emissions 4.6% of the total GHG emissions. The emission trends 1990–2022 by gas are summarised in Table 21.

Sector 1 energy is the most important source category in Liechtenstein, accounting for 79.1% of Liechtenstein's GHG emissions (excl. LULUCF) in 2022. Sector agriculture accounts for 15%, IPPU for 4.9% and waste for 1% of total GHG emissions (excl. LULUCF) in 2022. Table 22 shows the emission trends for all major source and sink categories. As the largest share of emissions originated from sector 1 energy, the table shows the contributions of the source categories attributed to it in more detail (1A1–1A5, 1B).

Table 21: Summary of Liechtenstein's GHG emissions in CO<sub>2</sub>eq (kt) by gas. The last column shows the percentage change in emissions in 2022 as compared to the base year 1990. HFC emissions have increased by about a factor of 81'465 in 2022 compared to 1990

| Greenhouse Gas Emissions                                        | 1990         | 1995         | 2000         | 2005         | 2010         |
|-----------------------------------------------------------------|--------------|--------------|--------------|--------------|--------------|
| CO <sub>2</sub> equivalent (kt)                                 |              |              |              |              |              |
| CO <sub>2</sub> emissions incl. net CO <sub>2</sub> from LULUCF | 205.6        | 208.5        | 245.9        | 237.6        | 210.3        |
| CO <sub>2</sub> emissions excl. net CO <sub>2</sub> from LULUCF | 199.0        | 204.2        | 216.9        | 229.0        | 190.8        |
| CH <sub>4</sub> emissions incl. CH <sub>4</sub> from LULUCF     | 21.5         | 20.1         | 18.7         | 20.8         | 21.4         |
| CH <sub>4</sub> emissions excl. CH <sub>4</sub> from LULUCF     | 21.5         | 20.1         | 18.7         | 20.8         | 21.4         |
| N <sub>2</sub> O emissions incl. N <sub>2</sub> O from LULUCF   | 8.7          | 8.6          | 8.1          | 7.8          | 8.0          |
| N <sub>2</sub> O emissions excl. N <sub>2</sub> O from LULUCF   | 8.5          | 8.4          | 7.8          | 7.5          | 7.6          |
| HFCs                                                            | 0.0          | 1.1          | 3.5          | 6.4          | 8.4          |
| PFCs                                                            | NO           | 0.0          | 0.0          | 0.1          | 0.1          |
| SF <sub>6</sub>                                                 | NO           | NO           | 0.1          | 0.3          | 0.0          |
| Unspecified mix of HFCs and PFCs                                | NO           | NO           | NO           | NO           | NO           |
| NF <sub>3</sub>                                                 | NO           | NO           | NO           | NO           | NO           |
| <b>Total (including LULUCF)</b>                                 | <b>235.8</b> | <b>238.2</b> | <b>276.4</b> | <b>272.9</b> | <b>248.2</b> |
| <b>Total (excluding LULUCF)</b>                                 | <b>229.0</b> | <b>233.8</b> | <b>247.0</b> | <b>263.9</b> | <b>228.3</b> |

| Greenhouse Gas Emissions                                        | 2013         | 2014         | 2015         | 2016         | 2017         |
|-----------------------------------------------------------------|--------------|--------------|--------------|--------------|--------------|
| CO <sub>2</sub> equivalent (kt)                                 |              |              |              |              |              |
| CO <sub>2</sub> emissions incl. net CO <sub>2</sub> from LULUCF | 208.0        | 176.5        | 171.7        | 159.5        | 166.6        |
| CO <sub>2</sub> emissions excl. net CO <sub>2</sub> from LULUCF | 192.5        | 161.2        | 159.7        | 149.7        | 155.5        |
| CH <sub>4</sub> emissions incl. CH <sub>4</sub> from LULUCF     | 21.3         | 21.5         | 21.3         | 21.4         | 20.9         |
| CH <sub>4</sub> emissions excl. CH <sub>4</sub> from LULUCF     | 21.3         | 21.5         | 21.3         | 21.4         | 20.9         |
| N <sub>2</sub> O emissions incl. N <sub>2</sub> O from LULUCF   | 8.0          | 7.9          | 7.9          | 7.8          | 7.8          |
| N <sub>2</sub> O emissions excl. N <sub>2</sub> O from LULUCF   | 7.6          | 7.5          | 7.5          | 7.4          | 7.4          |
| HFCs                                                            | 9.2          | 9.4          | 9.5          | 9.2          | 9.5          |
| PFCs                                                            | 0.0          | 0.0          | 0.0          | 0.0          | 0.0          |
| SF <sub>6</sub>                                                 | 0.2          | 0.1          | 0.0          | 0.0          | 0.0          |
| Unspecified mix of HFCs and PFCs                                | NO           | NO           | NO           | NO           | NO           |
| NF <sub>3</sub>                                                 | NO           | NO           | NO           | NO           | NO           |
| <b>Total (including LULUCF)</b>                                 | <b>246.7</b> | <b>215.4</b> | <b>210.5</b> | <b>198.0</b> | <b>204.8</b> |
| <b>Total (excluding LULUCF)</b>                                 | <b>230.8</b> | <b>199.8</b> | <b>198.1</b> | <b>187.7</b> | <b>193.3</b> |

| Greenhouse Gas Emissions                                        | 2018         | 2019         | 2020         | 2021         | 2022         | 1990-2022     |
|-----------------------------------------------------------------|--------------|--------------|--------------|--------------|--------------|---------------|
| CO <sub>2</sub> equivalent (kt)                                 |              |              |              |              |              | %             |
| CO <sub>2</sub> emissions incl. net CO <sub>2</sub> from LULUCF | 164.6        | 160.3        | 142.8        | 142.1        | 126.9        | -38.3%        |
| CO <sub>2</sub> emissions excl. net CO <sub>2</sub> from LULUCF | 142.6        | 148.7        | 141.6        | 145.6        | 128.4        | -35.5%        |
| CH <sub>4</sub> emissions incl. CH <sub>4</sub> from LULUCF     | 21.2         | 21.9         | 22.1         | 21.8         | 21.7         | 0.5%          |
| CH <sub>4</sub> emissions excl. CH <sub>4</sub> from LULUCF     | 21.2         | 21.9         | 22.1         | 21.8         | 21.7         | 0.5%          |
| N <sub>2</sub> O emissions incl. N <sub>2</sub> O from LULUCF   | 7.9          | 8.1          | 8.0          | 7.9          | 8.0          | -8.3%         |
| N <sub>2</sub> O emissions excl. N <sub>2</sub> O from LULUCF   | 7.5          | 7.7          | 7.6          | 7.6          | 7.6          | -10.4%        |
| HFCs                                                            | 9.6          | 9.3          | 8.8          | 8.2          | 7.8          | see caption   |
| PFCs                                                            | 0.0          | 0.0          | 0.0          | 0.0          | 0.0          | -             |
| SF <sub>6</sub>                                                 | 0.1          | 0.0          | 0.1          | 0.1          | 0.1          | -             |
| Unspecified mix of HFCs and PFCs                                | NO           | NO           | NO           | NO           | NO           | -             |
| NF <sub>3</sub>                                                 | NO           | NO           | NO           | NO           | NO           | -             |
| <b>Total (including LULUCF)</b>                                 | <b>203.4</b> | <b>199.6</b> | <b>181.6</b> | <b>180.1</b> | <b>164.4</b> | <b>-30.3%</b> |
| <b>Total (excluding LULUCF)</b>                                 | <b>181.0</b> | <b>187.7</b> | <b>180.1</b> | <b>183.3</b> | <b>165.5</b> | <b>-27.7%</b> |

Table 22: Summary of Liechtenstein's GHG emissions by source and sink categories in CO<sub>2</sub>eq (kt). The last column shows the per cent change in emissions in 2022 compared to the base year 1990

| Source and Sink Categories       | 1990                            | 1991         | 1992         | 1993         | 1994         | 1995         | 1996         | 1997         | 1998         | 1999         |
|----------------------------------|---------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
|                                  | CO <sub>2</sub> equivalent (kt) |              |              |              |              |              |              |              |              |              |
| <b>1 Energy</b>                  | <b>201.3</b>                    | <b>208.9</b> | <b>209.7</b> | <b>217.8</b> | <b>203.8</b> | <b>207.0</b> | <b>208.9</b> | <b>221.4</b> | <b>232.3</b> | <b>229.7</b> |
| 1A1 Energy industries            | 0.2                             | 0.8          | 1.9          | 2.0          | 1.8          | 2.1          | 2.6          | 2.5          | 2.9          | 2.9          |
| 1A2 Manufacturing ind. & constr. | 36.3                            | 35.9         | 36.3         | 37.6         | 35.6         | 35.7         | 35.7         | 37.6         | 40.3         | 39.8         |
| 1A3 Transport                    | 76.9                            | 90.2         | 89.5         | 87.4         | 80.0         | 82.0         | 83.3         | 86.9         | 86.5         | 90.7         |
| 1A4 Other sectors                | 87.6                            | 81.4         | 81.4         | 90.3         | 85.8         | 86.6         | 86.5         | 93.6         | 101.7        | 95.4         |
| 1A5 Other                        | NO                              | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           |
| 1B Fugitive emissions from fuels | 0.4                             | 0.5          | 0.5          | 0.6          | 0.6          | 0.7          | 0.7          | 0.8          | 0.8          | 0.9          |
| <b>2 IPPU</b>                    | <b>0.6</b>                      | <b>0.6</b>   | <b>0.6</b>   | <b>0.7</b>   | <b>0.9</b>   | <b>1.6</b>   | <b>1.8</b>   | <b>2.2</b>   | <b>2.7</b>   | <b>3.2</b>   |
| <b>3 Agriculture</b>             | <b>25.4</b>                     | <b>25.4</b>  | <b>24.7</b>  | <b>23.5</b>  | <b>23.7</b>  | <b>23.5</b>  | <b>23.7</b>  | <b>23.3</b>  | <b>22.9</b>  | <b>21.9</b>  |
| <b>5 Waste</b>                   | <b>1.7</b>                      | <b>1.7</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.7</b>   |
| <b>Total (excluding LULUCF)</b>  | <b>229.0</b>                    | <b>236.5</b> | <b>236.7</b> | <b>243.7</b> | <b>230.1</b> | <b>233.8</b> | <b>236.1</b> | <b>248.6</b> | <b>259.6</b> | <b>256.5</b> |
| <b>4 LULUCF</b>                  | <b>6.8</b>                      | <b>-9.4</b>  | <b>1.8</b>   | <b>-1.6</b>  | <b>18.3</b>  | <b>4.5</b>   | <b>-4.1</b>  | <b>12.8</b>  | <b>4.6</b>   | <b>3.3</b>   |
| <b>Total (including LULUCF)</b>  | <b>235.8</b>                    | <b>227.1</b> | <b>238.5</b> | <b>242.2</b> | <b>248.3</b> | <b>238.2</b> | <b>232.0</b> | <b>261.4</b> | <b>264.2</b> | <b>259.7</b> |

| Source and Sink Categories       | 2000                            | 2001         | 2002         | 2003         | 2004         | 2005         | 2006         | 2007         | 2008         | 2009         |
|----------------------------------|---------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
|                                  | CO <sub>2</sub> equivalent (kt) |              |              |              |              |              |              |              |              |              |
| <b>1 Energy</b>                  | <b>220.0</b>                    | <b>217.8</b> | <b>223.1</b> | <b>232.4</b> | <b>232.0</b> | <b>231.6</b> | <b>233.8</b> | <b>203.4</b> | <b>222.3</b> | <b>208.1</b> |
| 1A1 Energy industries            | 2.8                             | 2.9          | 2.5          | 2.8          | 3.0          | 3.1          | 2.9          | 2.6          | 2.9          | 3.0          |
| 1A2 Manufacturing ind. & constr. | 36.4                            | 36.4         | 37.9         | 41.2         | 39.8         | 39.1         | 40.5         | 33.9         | 36.3         | 27.5         |
| 1A3 Transport                    | 91.5                            | 88.1         | 84.0         | 83.8         | 82.3         | 81.8         | 79.2         | 83.4         | 87.8         | 81.9         |
| 1A4 Other sectors                | 88.4                            | 89.4         | 97.6         | 103.5        | 105.8        | 106.3        | 109.9        | 82.3         | 93.9         | 94.5         |
| 1A5 Other                        | NO                              | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           |
| 1B Fugitive emissions from fuels | 0.9                             | 1.0          | 1.0          | 1.1          | 1.2          | 1.2          | 1.3          | 1.3          | 1.3          | 1.2          |
| <b>2 IPPU</b>                    | <b>4.0</b>                      | <b>4.8</b>   | <b>5.5</b>   | <b>6.2</b>   | <b>6.8</b>   | <b>7.1</b>   | <b>7.5</b>   | <b>8.2</b>   | <b>8.8</b>   | <b>8.3</b>   |
| <b>3 Agriculture</b>             | <b>21.2</b>                     | <b>22.4</b>  | <b>22.7</b>  | <b>22.9</b>  | <b>22.9</b>  | <b>23.6</b>  | <b>24.6</b>  | <b>25.0</b>  | <b>25.2</b>  | <b>25.1</b>  |
| <b>5 Waste</b>                   | <b>1.7</b>                      | <b>1.7</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.7</b>   |
| <b>Total (excluding LULUCF)</b>  | <b>247.0</b>                    | <b>246.7</b> | <b>253.0</b> | <b>263.1</b> | <b>263.4</b> | <b>263.9</b> | <b>267.6</b> | <b>238.4</b> | <b>258.1</b> | <b>243.3</b> |
| <b>4 LULUCF</b>                  | <b>29.4</b>                     | <b>5.5</b>   | <b>6.2</b>   | <b>6.8</b>   | <b>9.0</b>   | <b>9.0</b>   | <b>13.8</b>  | <b>23.0</b>  | <b>25.1</b>  | <b>21.5</b>  |
| <b>Total (including LULUCF)</b>  | <b>276.4</b>                    | <b>252.1</b> | <b>259.2</b> | <b>270.0</b> | <b>272.4</b> | <b>272.9</b> | <b>281.4</b> | <b>261.4</b> | <b>283.2</b> | <b>264.8</b> |

| Source and Sink Categories       | 2010                            | 2011         | 2012         | 2013         | 2014         | 2015         | 2016         | 2017         | 2018         | 2019         |
|----------------------------------|---------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
|                                  | CO <sub>2</sub> equivalent (kt) |              |              |              |              |              |              |              |              |              |
| <b>1 Energy</b>                  | <b>193.5</b>                    | <b>179.4</b> | <b>188.0</b> | <b>195.2</b> | <b>163.7</b> | <b>162.2</b> | <b>152.1</b> | <b>158.0</b> | <b>145.2</b> | <b>151.3</b> |
| 1A1 Energy industries            | 3.3                             | 3.1          | 2.8          | 3.0          | 2.5          | 2.0          | 2.2          | 2.1          | 2.2          | 3.4          |
| 1A2 Manufacturing ind. & constr. | 26.1                            | 23.6         | 25.7         | 26.4         | 27.3         | 27.6         | 25.9         | 27.7         | 24.6         | 24.1         |
| 1A3 Transport                    | 77.7                            | 76.9         | 79.9         | 79.6         | 73.7         | 61.7         | 60.3         | 60.6         | 58.5         | 57.0         |
| 1A4 Other sectors                | 85.2                            | 74.7         | 78.3         | 84.9         | 58.9         | 69.5         | 62.5         | 66.4         | 58.6         | 65.4         |
| 1A5 Other                        | NO                              | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           |
| 1B Fugitive emissions from fuels | 1.3                             | 1.2          | 1.3          | 1.3          | 1.3          | 1.3          | 1.3          | 1.3          | 1.3          | 1.3          |
| <b>2 IPPU</b>                    | <b>8.8</b>                      | <b>9.2</b>   | <b>9.5</b>   | <b>9.7</b>   | <b>9.9</b>   | <b>9.9</b>   | <b>9.5</b>   | <b>9.8</b>   | <b>10.0</b>  | <b>9.6</b>   |
| <b>3 Agriculture</b>             | <b>24.3</b>                     | <b>25.1</b>  | <b>25.4</b>  | <b>24.2</b>  | <b>24.6</b>  | <b>24.4</b>  | <b>24.5</b>  | <b>23.8</b>  | <b>24.3</b>  | <b>25.1</b>  |
| <b>5 Waste</b>                   | <b>1.7</b>                      | <b>1.8</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.6</b>   | <b>1.6</b>   | <b>1.6</b>   | <b>1.6</b>   | <b>1.6</b>   | <b>1.6</b>   |
| <b>Total (excluding LULUCF)</b>  | <b>228.3</b>                    | <b>215.4</b> | <b>224.7</b> | <b>230.8</b> | <b>199.8</b> | <b>198.1</b> | <b>187.7</b> | <b>193.3</b> | <b>181.0</b> | <b>187.7</b> |
| <b>4 LULUCF</b>                  | <b>19.9</b>                     | <b>23.6</b>  | <b>23.7</b>  | <b>15.9</b>  | <b>15.6</b>  | <b>12.4</b>  | <b>10.3</b>  | <b>11.5</b>  | <b>22.4</b>  | <b>12.0</b>  |
| <b>Total (including LULUCF)</b>  | <b>248.2</b>                    | <b>239.0</b> | <b>248.4</b> | <b>246.7</b> | <b>215.4</b> | <b>210.5</b> | <b>198.0</b> | <b>204.8</b> | <b>203.4</b> | <b>199.6</b> |

| Source and Sink Categories       | 2020                    | 2021         | 2022         | 1990-2022      |
|----------------------------------|-------------------------|--------------|--------------|----------------|
|                                  | CO <sub>2</sub> eq (kt) |              |              | %              |
| <b>1 Energy</b>                  | <b>144.1</b>            | <b>148.2</b> | <b>130.9</b> | <b>-35.0%</b>  |
| 1A1 Energy industries            | 2.4                     | 2.6          | 2.3          | 1252%          |
| 1A2 Manufacturing ind. & constr. | 22.8                    | 23.2         | 21.3         | -41%           |
| 1A3 Transport                    | 52.5                    | 55.9         | 50.1         | -35%           |
| 1A4 Other sectors                | 65.0                    | 65.2         | 55.8         | -36%           |
| 1A5 Other                        | NO                      | NO           | NO           | -              |
| 1B Fugitive emissions from fuels | 1.3                     | 1.4          | 1.4          | 236%           |
| <b>2 IPPU</b>                    | <b>9.1</b>              | <b>8.5</b>   | <b>8.1</b>   | <b>1249%</b>   |
| <b>3 Agriculture</b>             | <b>25.3</b>             | <b>24.9</b>  | <b>24.8</b>  | <b>-2.2%</b>   |
| <b>5 Waste</b>                   | <b>1.6</b>              | <b>1.7</b>   | <b>1.7</b>   | <b>-3.3%</b>   |
| <b>Total (excluding LULUCF)</b>  | <b>180.1</b>            | <b>183.3</b> | <b>165.5</b> | <b>-27.7%</b>  |
| <b>4 LULUCF</b>                  | <b>1.5</b>              | <b>-3.1</b>  | <b>-1.1</b>  | <b>-116.8%</b> |
| <b>Total (including LULUCF)</b>  | <b>181.6</b>            | <b>180.1</b> | <b>164.4</b> | <b>-30.3%</b>  |

## II.F Projections of greenhouse gas emissions and removals

This section covers Liechtenstein's greenhouse gas emissions under the scenarios With Measures (WM) and With Additional Measures (WAM):

- The WM scenario projection encompasses currently implemented and adopted policies and measures, primarily from the energy sector
- The WAM scenario projection also encompasses planned policies and measures. Liechtenstein's Climate Strategy 2050 defines additional measures for the sectors energy, IPPU, agriculture and waste. Because these additional measures have not yet been implemented through legal instruments, the projections under the WAM scenario are therefore adopted from the Climate Strategy 2050

Liechtenstein's greenhouse gas emissions primarily originate from the energy sector, responsible for almost 80% of Liechtenstein's total emissions (see section II.E). Therefore, the focus for the elaboration of Liechtenstein's projections lies on the energy sector.

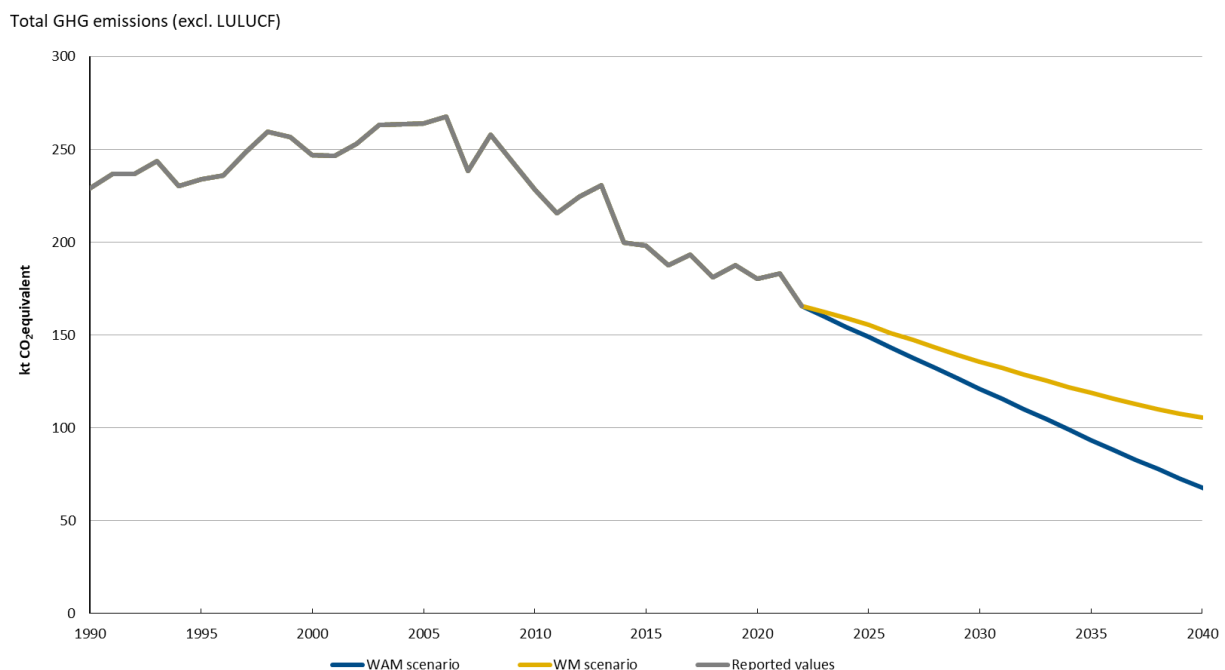
### II.F.1 Results

The following sections provide a summary of Liechtenstein's greenhouse gas emissions and removals under the WM and WAM scenarios, for total GHG by sector (section II.F.1.1) and by gas for all sectors (II.F.1.2). The total greenhouse gas projections correspond to the key indicator determining progress against Liechtenstein's NDC.

#### II.F.1.1 Projections of total greenhouse gas emissions

Figure 32 shows the results of the projections of total GHG emissions (excl. LULUCF) from 1990 to 2040 under the WM and WAM scenarios for Liechtenstein. The detailed results for the WM and WAM scenarios are presented in the following sections.

Figure 32: Liechtenstein's total GHG emissions (excl. LULUCF) in CO<sub>2</sub>eq under the WM and WAM scenario from 1990 to 2040



Data source: 1990–2022 reported values from [OE, 2024a]; 2023–2040 projected values

### II.F.1.1.1 WM Scenario

Table 23 and Figure 33 show the development of Liechtenstein's total GHG emissions in CO<sub>2</sub>eq between 1990 and 2040 under the WM scenario. Total GHG emissions (excl. LULUCF) have decreased by 27.9% from 1990 to 2022 (reported values). The energy sector is the largest source of GHG emissions in Liechtenstein, contributing to > 79% of total GHG emissions (excl. LULUCF) in 2022. As shown in Figure 33, the energy sector is also the main driver of changes in total GHG emissions.

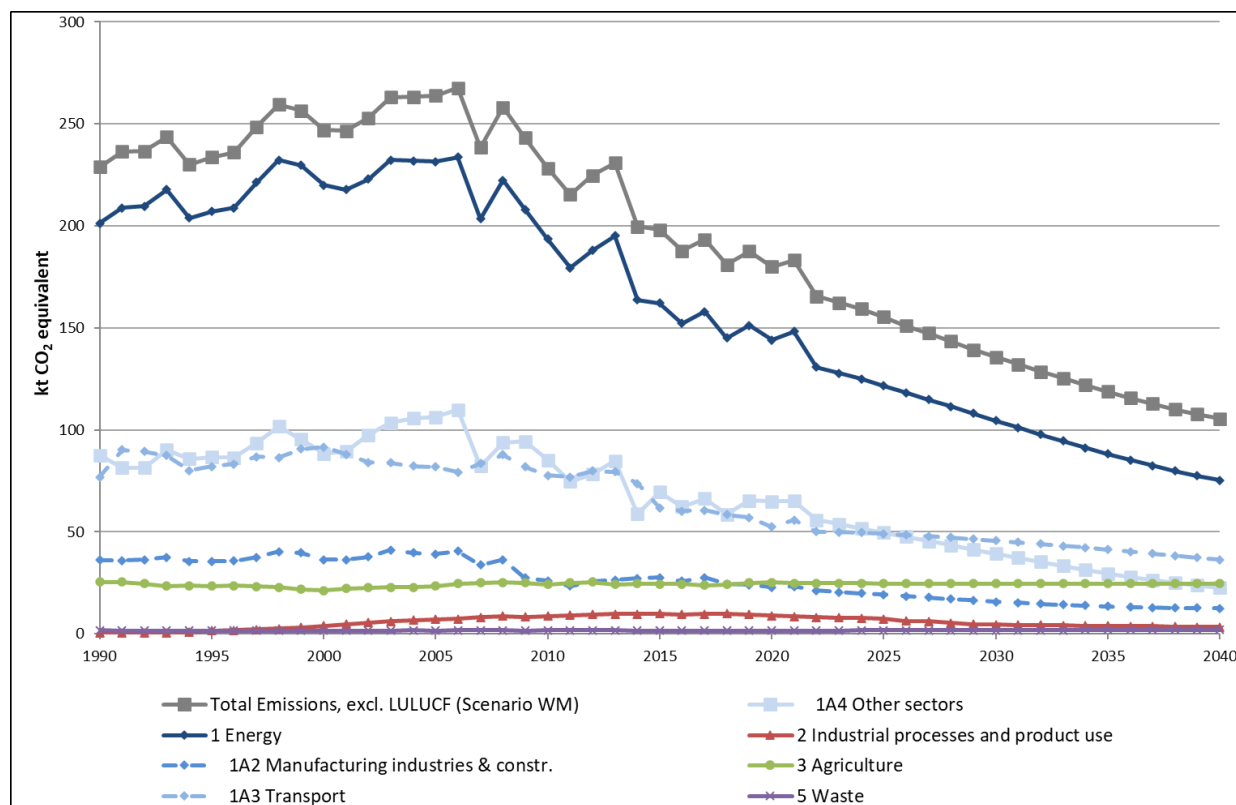
From 2022 to 2040 a further reduction of total GHG emissions by 36% is projected under the WM scenario. GHG emissions in the energy sector are projected to decrease by 42%. Emissions from the IPPU and agriculture sectors are projected to decrease by 59% and 1% respectively, while emissions from the waste sector are projected to increase by 21% from 2022 to 2040.

The total reduction in GHG emissions (excl. LULUCF) from 1990 to 2040 under the WM scenario is projected to be 54%.

Table 23: Liechtenstein's total GHG emissions in CO<sub>2</sub>eq by sector under the WM scenario 1990–2040 (reported values for 1990–2022 from [OE, 2024a]; projected values for 2023–2040)

| CO <sub>2</sub> eq<br>in kt CO <sub>2</sub> equivalent |                                              | Reported data (GHG inventory) |              |              |              |              |              |              |              | Projections  |              |              |              |
|--------------------------------------------------------|----------------------------------------------|-------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| IPCC                                                   | Source/Sink Categories                       | 1990                          | 1995         | 2000         | 2005         | 2010         | 2015         | 2020         | 2022         | 2025         | 2030         | 2035         | 2040         |
| <b>Total</b>                                           | <b>Emissions, excl. LULUCF (Scenario WM)</b> | <b>229.0</b>                  | <b>233.8</b> | <b>247.0</b> | <b>263.9</b> | <b>228.3</b> | <b>198.1</b> | <b>180.1</b> | <b>165.5</b> | <b>155.5</b> | <b>135.7</b> | <b>118.8</b> | <b>105.4</b> |
| <b>1</b>                                               | <b>Energy</b>                                | <b>201.3</b>                  | <b>207.0</b> | <b>220.0</b> | <b>231.6</b> | <b>193.5</b> | <b>162.2</b> | <b>144.1</b> | <b>130.9</b> | <b>121.6</b> | <b>104.5</b> | <b>88.2</b>  | <b>75.4</b>  |
| <b>1A</b>                                              | Fuel combustion                              | 200.9                         | 206.4        | 219.1        | 230.4        | 192.2        | 160.9        | 142.8        | 129.5        | 120.3        | 103.2        | 86.8         | 74.0         |
|                                                        | 1A1 Energy industries                        | 0.2                           | 2.1          | 2.8          | 3.1          | 3.3          | 2.0          | 2.4          | 2.3          | 2.3          | 2.3          | 2.3          | 2.3          |
|                                                        | 1A2 Manufacturing industries & constr.       | 36.3                          | 35.7         | 36.4         | 39.1         | 26.1         | 27.6         | 22.8         | 21.3         | 19.2         | 15.8         | 13.5         | 12.6         |
|                                                        | 1A3 Transport                                | 76.9                          | 82.0         | 91.5         | 81.8         | 77.7         | 61.7         | 52.5         | 50.1         | 49.1         | 45.7         | 41.4         | 36.4         |
|                                                        | 1A4 Other sectors                            | 87.6                          | 86.6         | 88.4         | 106.3        | 85.2         | 69.5         | 65.0         | 55.8         | 49.7         | 39.3         | 29.6         | 22.7         |
|                                                        | 1A5 Other                                    | NO                            | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           |
| <b>1B</b>                                              | Fugitive emissions from fuels                | 0.4                           | 0.7          | 0.9          | 1.2          | 1.3          | 1.3          | 1.3          | 1.4          | 1.4          | 1.4          | 1.4          | 1.4          |
|                                                        | 1B1 Solid fuels                              | NO                            | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           |
|                                                        | 1B2 Oil and natural gas                      | 0.4                           | 0.7          | 0.9          | 1.2          | 1.3          | 1.3          | 1.3          | 1.4          | 1.4          | 1.4          | 1.4          | 1.4          |
| <b>2</b>                                               | <b>Industrial processes and product use</b>  | <b>0.6</b>                    | <b>1.6</b>   | <b>4.0</b>   | <b>7.1</b>   | <b>8.8</b>   | <b>9.9</b>   | <b>9.1</b>   | <b>8.1</b>   | <b>7.4</b>   | <b>4.7</b>   | <b>4.0</b>   | <b>3.3</b>   |
| <b>3</b>                                               | <b>Agriculture</b>                           | <b>25.4</b>                   | <b>23.5</b>  | <b>21.2</b>  | <b>23.6</b>  | <b>24.3</b>  | <b>24.4</b>  | <b>25.3</b>  | <b>24.8</b>  | <b>24.8</b>  | <b>24.7</b>  | <b>24.7</b>  | <b>24.7</b>  |
| <b>4</b>                                               | <b>LULUCF</b>                                | <b>6.8</b>                    | <b>4.5</b>   | <b>29.4</b>  | <b>9.0</b>   | <b>19.9</b>  | <b>12.4</b>  | <b>1.5</b>   | <b>-1.1</b>  | <b>6.3</b>   | <b>6.3</b>   | <b>6.3</b>   | <b>6.3</b>   |
| <b>5</b>                                               | <b>Waste</b>                                 | <b>1.7</b>                    | <b>1.7</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.6</b>   | <b>1.6</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.8</b>   | <b>1.9</b>   | <b>2.0</b>   |
| <b>Memo item</b>                                       | <b>International bunkers (aviation)</b>      | <b>0.4</b>                    | <b>0.4</b>   | <b>0.5</b>   | <b>0.5</b>   | <b>0.8</b>   | <b>1.2</b>   | <b>0.9</b>   | <b>1.0</b>   | <b>1.0</b>   | <b>1.0</b>   | <b>1.0</b>   | <b>1.0</b>   |

Figure 33: Liechtenstein's total GHG emissions (excl. LULUCF) in CO<sub>2</sub>eq by sector under the WM scenario from 1990 to 2040



Data source: 1990–2022 reported values from [OE, 2024a]; 2023–2040 projected values

### II.F.1.1.2 WAM scenario

Table 24 and Figure 34 show the development of Liechtenstein's total GHG emissions in CO<sub>2</sub>eq between 1990 and 2040 under the WAM scenario.

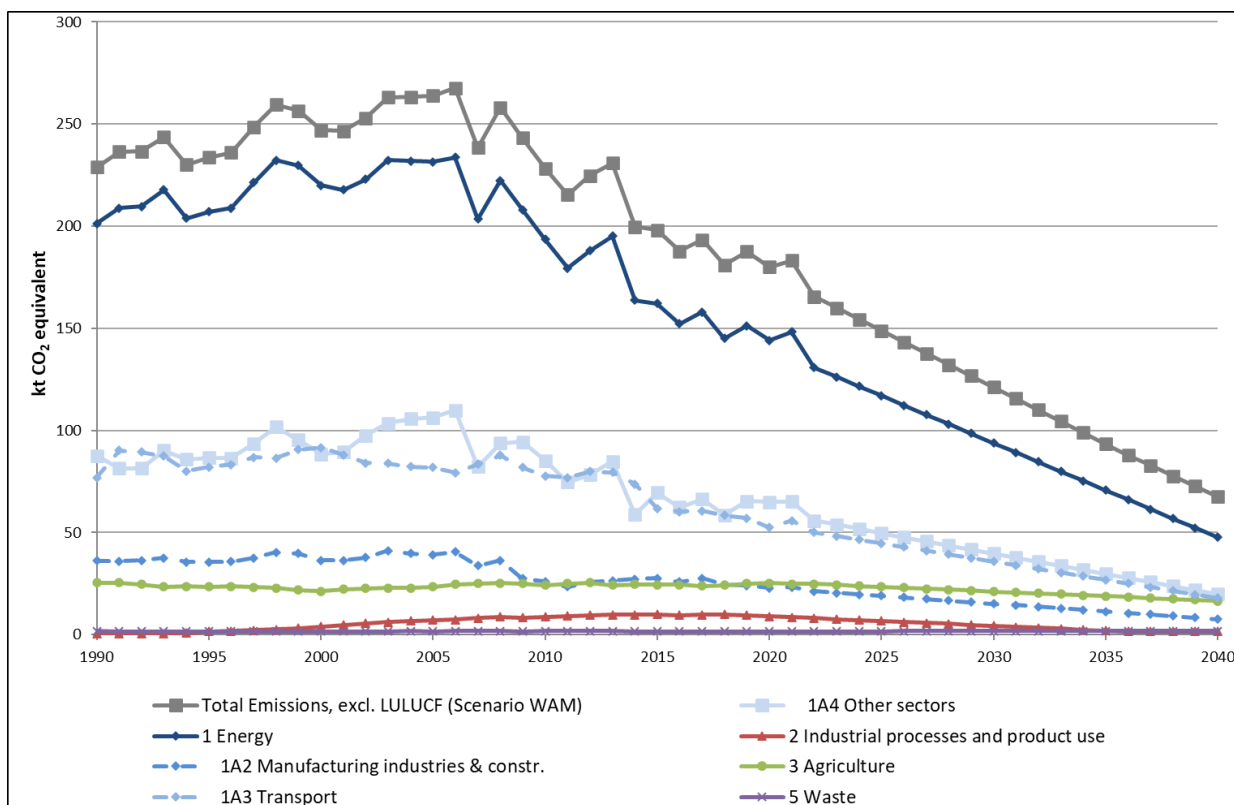
Total GHG emissions are expected to decrease by 59% from 2022 to 2040 under the WAM scenario. GHG emissions in the energy sector are expected to decrease by 64%. Emissions from the IPPU and agriculture sectors are expected to decrease by 81% and 33% respectively, while emissions from the waste sector are expected to increase by 13% from 2022 to 2040.

The total reduction in GHG emissions (excl. LULUCF) from 1990 to 2040 under the WAM scenario is projected to be 70%.

Table 24: Liechtenstein's total GHG emissions in CO<sub>2</sub>eq by sector under the WAM scenario 1990–2040 (reported values for 1990–2022 from [OE, 2024a]; projected values for 2023–2040)

| CO <sub>2</sub> eq<br>in kt CO <sub>2</sub> equivalent |                                               | Reported data (GHG inventory) |              |              |              |              |              |              |              | Projections  |              |             |             |
|--------------------------------------------------------|-----------------------------------------------|-------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|-------------|
| IPCC                                                   | Source/Sink Categories                        | 1990                          | 1995         | 2000         | 2005         | 2010         | 2015         | 2020         | 2022         | 2025         | 2030         | 2035        | 2040        |
| <b>Total</b>                                           | <b>Emissions, excl. LULUCF (Scenario WAM)</b> | <b>229.0</b>                  | <b>233.8</b> | <b>247.0</b> | <b>263.9</b> | <b>228.3</b> | <b>198.1</b> | <b>180.1</b> | <b>165.5</b> | <b>148.9</b> | <b>121.2</b> | <b>93.4</b> | <b>67.6</b> |
| <b>1</b>                                               | <b>Energy</b>                                 | <b>201.3</b>                  | <b>207.0</b> | <b>220.0</b> | <b>231.6</b> | <b>193.5</b> | <b>162.2</b> | <b>144.1</b> | <b>130.9</b> | <b>117.0</b> | <b>93.9</b>  | <b>70.7</b> | <b>47.6</b> |
| <b>1A</b>                                              | Fuel combustion                               | 200.9                         | 206.4        | 219.1        | 230.4        | 192.2        | 160.9        | 142.8        | 129.5        | 115.6        | 92.5         | 69.4        | 46.2        |
|                                                        | 1A1 Energy industries                         | 0.2                           | 2.1          | 2.8          | 3.1          | 3.3          | 2.0          | 2.4          | 2.3          | 2.1          | 1.6          | 1.2         | 0.8         |
|                                                        | 1A2 Manufacturing industries & constr.        | 36.3                          | 35.7         | 36.4         | 39.1         | 26.1         | 27.6         | 22.8         | 21.3         | 19.0         | 15.2         | 11.4        | 7.6         |
|                                                        | 1A3 Transport                                 | 76.9                          | 82.0         | 91.5         | 81.8         | 77.7         | 61.7         | 52.5         | 50.1         | 44.8         | 35.8         | 26.9        | 17.9        |
|                                                        | 1A4 Other sectors                             | 87.6                          | 86.6         | 88.4         | 106.3        | 85.2         | 69.5         | 65.0         | 55.8         | 49.8         | 39.8         | 29.9        | 19.9        |
|                                                        | 1A5 Other                                     | NO                            | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO          | NO          |
| <b>1B</b>                                              | Fugitive emissions from fuels                 | 0.4                           | 0.7          | 0.9          | 1.2          | 1.3          | 1.3          | 1.3          | 1.4          | 1.4          | 1.4          | 1.4         | 1.4         |
|                                                        | 1B1 Solid fuels                               | NO                            | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO          | NO          |
|                                                        | 1B2 Oil and natural gas                       | 0.4                           | 0.7          | 0.9          | 1.2          | 1.3          | 1.3          | 1.3          | 1.4          | 1.4          | 1.4          | 1.4         | 1.4         |
| <b>2</b>                                               | <b>Industrial processes and product use</b>   | <b>0.6</b>                    | <b>1.6</b>   | <b>4.0</b>   | <b>7.1</b>   | <b>8.8</b>   | <b>9.9</b>   | <b>9.1</b>   | <b>8.1</b>   | <b>6.7</b>   | <b>4.4</b>   | <b>2.0</b>  | <b>1.5</b>  |
| <b>3</b>                                               | <b>Agriculture</b>                            | <b>25.4</b>                   | <b>23.5</b>  | <b>21.2</b>  | <b>23.6</b>  | <b>24.3</b>  | <b>24.4</b>  | <b>25.3</b>  | <b>24.8</b>  | <b>23.5</b>  | <b>21.2</b>  | <b>18.9</b> | <b>16.6</b> |
| <b>4</b>                                               | <b>LULUCF</b>                                 | <b>6.8</b>                    | <b>4.5</b>   | <b>29.4</b>  | <b>9.0</b>   | <b>19.9</b>  | <b>12.4</b>  | <b>1.5</b>   | <b>-1.1</b>  | <b>6.3</b>   | <b>6.3</b>   | <b>6.3</b>  | <b>6.3</b>  |
| <b>5</b>                                               | <b>Waste</b>                                  | <b>1.7</b>                    | <b>1.7</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.6</b>   | <b>1.6</b>   | <b>1.7</b>   | <b>1.7</b>   | <b>1.8</b>   | <b>1.8</b>  | <b>1.9</b>  |
| <b>Memo item</b>                                       | <b>International bunkers (aviation)</b>       | <b>0.4</b>                    | <b>0.4</b>   | <b>0.5</b>   | <b>0.5</b>   | <b>0.8</b>   | <b>1.2</b>   | <b>0.9</b>   | <b>1.0</b>   | <b>1.0</b>   | <b>1.0</b>   | <b>1.0</b>  | <b>1.0</b>  |

Figure 34: Liechtenstein's total GHG emissions (excl. LULUCF) in CO<sub>2</sub>eq by sector under the WAM scenario from 1990 to 2040



Data source: 1990–2022 reported values from [OE, 2024a]; 2023–2040 projected values

## II.F.1.2 Projections of greenhouse gas emissions by gas

### II.F.1.2.1 WM scenario

#### CO<sub>2</sub> emissions

Table 25 and Figure 35 show the development of CO<sub>2</sub> emissions under the WM scenario from 1990 to 2040. From 1990 to 2022 (reported values), CO<sub>2</sub> emissions (excl. LULUCF) decreased by 35%. As shown in Figure 35, CO<sub>2</sub> emissions are dominated by the energy sector.

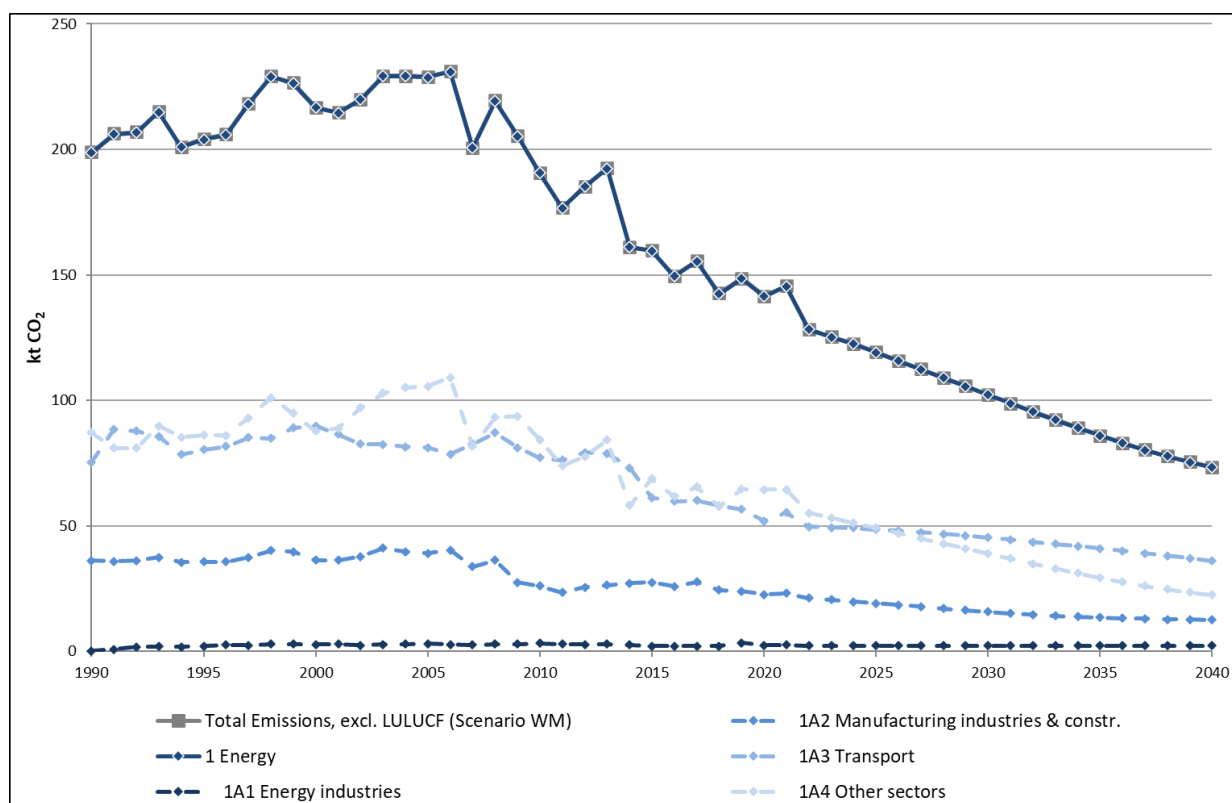
From 2022 to 2040, a further reduction of CO<sub>2</sub> emissions (excl. LULUCF) by 43% is projected. A major share of these projected reductions is attributed to sectors 1A4 other sectors, 1A3 transport and 1A2 manufacturing industries and construction, and in particular to the measures from the Energy Strategy 2030: heat pumps, district heat in households and industry, and electric mobility.

Total CO<sub>2</sub> emissions (excl. LULUCF) under the WM scenario are projected to be reduced by 63% from 1990 to 2040.

Table 25: Liechtenstein's total CO<sub>2</sub> emissions by sector under the WM scenario 1990–2040 (reported values for 1990–2022 from [OE, 2024a]; projected values for 2023–2040)

| CO <sub>2</sub><br>in kt CO <sub>2</sub> eq |                                              | Reported data (GHG inventory) |               |               |               |               |               |               |               | Projections   |               |               |               |
|---------------------------------------------|----------------------------------------------|-------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| IPCC                                        | Source/Sink Categories                       | 1990                          | 1995          | 2000          | 2005          | 2010          | 2015          | 2020          | 2022          | 2025          | 2030          | 2035          | 2040          |
| <b>Total</b>                                | <b>Emissions, excl. LULUCF (Scenario WM)</b> | <b>199.0</b>                  | <b>204.2</b>  | <b>216.9</b>  | <b>229.0</b>  | <b>190.8</b>  | <b>159.7</b>  | <b>141.6</b>  | <b>128.4</b>  | <b>119.2</b>  | <b>102.2</b>  | <b>86.0</b>   | <b>73.4</b>   |
| <b>1</b>                                    | <b>Energy</b>                                | <b>198.7</b>                  | <b>204.0</b>  | <b>216.6</b>  | <b>228.7</b>  | <b>190.6</b>  | <b>159.5</b>  | <b>141.5</b>  | <b>128.2</b>  | <b>119.1</b>  | <b>102.1</b>  | <b>85.9</b>   | <b>73.3</b>   |
| <b>1A</b>                                   | <b>Fuel combustion</b>                       | <b>198.7</b>                  | <b>204.0</b>  | <b>216.6</b>  | <b>228.7</b>  | <b>190.6</b>  | <b>159.5</b>  | <b>141.5</b>  | <b>128.2</b>  | <b>119.1</b>  | <b>102.1</b>  | <b>85.9</b>   | <b>73.3</b>   |
|                                             | 1A1 Energy industries                        | 0.1                           | 2.0           | 2.7           | 3.0           | 3.2           | 2.0           | 2.4           | 2.3           | 2.2           | 2.2           | 2.2           | 2.2           |
|                                             | 1A2 Manufacturing industries & constr.       | 36.2                          | 35.6          | 36.3          | 39.0          | 26.0          | 27.5          | 22.7          | 21.2          | 19.1          | 15.7          | 13.5          | 12.6          |
|                                             | 1A3 Transport                                | 75.4                          | 80.3          | 89.8          | 81.1          | 77.1          | 61.2          | 52.0          | 49.6          | 48.6          | 45.3          | 41.0          | 36.0          |
|                                             | 1A4 Other sectors                            | 87.0                          | 86.1          | 87.8          | 105.6         | 84.4          | 68.8          | 64.4          | 55.1          | 49.1          | 38.9          | 29.3          | 22.5          |
|                                             | 1A5 Other                                    | NO                            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            |
| <b>1B</b>                                   | <b>Fugitive emissions from fuels</b>         | <b>0.0001</b>                 | <b>0.0002</b> | <b>0.0003</b> | <b>0.0003</b> | <b>0.0004</b> | <b>0.0004</b> | <b>0.0004</b> | <b>0.0004</b> | <b>0.0004</b> | <b>0.0004</b> | <b>0.0004</b> | <b>0.0004</b> |
|                                             | 1B1 Solid fuels                              | NO                            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            |
|                                             | 1B2 Oil and natural gas                      | 0.0001                        | 0.0002        | 0.0003        | 0.0003        | 0.0004        | 0.0004        | 0.0004        | 0.0004        | 0.0004        | 0.0004        | 0.0004        | 0.0004        |
| <b>2</b>                                    | <b>Industrial processes and product use</b>  | <b>0.20</b>                   | <b>0.16</b>   | <b>0.17</b>   | <b>0.20</b>   | <b>0.15</b>   | <b>0.14</b>   | <b>0.11</b>   | <b>0.12</b>   | <b>0.10</b>   | <b>0.07</b>   | <b>0.06</b>   | <b>0.05</b>   |
| <b>3</b>                                    | <b>Agriculture</b>                           | <b>0.06</b>                   | <b>0.05</b>   | <b>0.05</b>   | <b>0.05</b>   | <b>0.04</b>   | <b>0.05</b>   | <b>0.04</b>   | <b>0.05</b>   | <b>0.05</b>   | <b>0.04</b>   | <b>0.04</b>   | <b>0.04</b>   |
| <b>4</b>                                    | <b>LULUCF</b>                                | <b>6.6</b>                    | <b>4.3</b>    | <b>29.0</b>   | <b>8.6</b>    | <b>19.5</b>   | <b>12.0</b>   | <b>1.2</b>    | <b>-1.5</b>   | <b>5.9</b>    | <b>5.9</b>    | <b>5.9</b>    | <b>5.9</b>    |
| <b>5</b>                                    | <b>Waste</b>                                 | <b>0.01</b>                   | <b>0.01</b>   | <b>0.01</b>   | <b>0.01</b>   | <b>0.01</b>   | <b>0.01</b>   | <b>0.01</b>   | <b>0.01</b>   | <b>0.01</b>   | <b>0.01</b>   | <b>0.01</b>   | <b>0.01</b>   |
| <b>Memo item</b>                            | <b>International bunkers (aviation)</b>      | <b>0.43</b>                   | <b>0.43</b>   | <b>0.49</b>   | <b>0.48</b>   | <b>0.84</b>   | <b>1.19</b>   | <b>0.93</b>   | <b>1.02</b>   | <b>1.02</b>   | <b>1.02</b>   | <b>1.02</b>   | <b>1.02</b>   |

Figure 35: Liechtenstein's total CO<sub>2</sub> emissions (excl. LULUCF) by sector under the WM scenario from 1990 to 2040. Sectors IPPU, agriculture and waste cause negligible CO<sub>2</sub> emissions compared to the energy sector. Thus, the CO<sub>2</sub> emissions from these sectors are not shown separately in the graph



Data source: 1990–2022 reported values from [OE, 2024a]; 2023–2040 projected values

## CH<sub>4</sub> emissions

Table 26 and Figure 36 show the development of CH<sub>4</sub> emissions under the WM scenario from 1990 to 2040.

From 1990 to 2022 (reported values), CH<sub>4</sub> emissions increased by 0.5%. As shown in Figure 36, the sector agriculture is the most important source of CH<sub>4</sub> emissions, mainly driven by animal numbers (particularly cattle), which have a significant impact on CH<sub>4</sub> emissions (see also II.A.7).

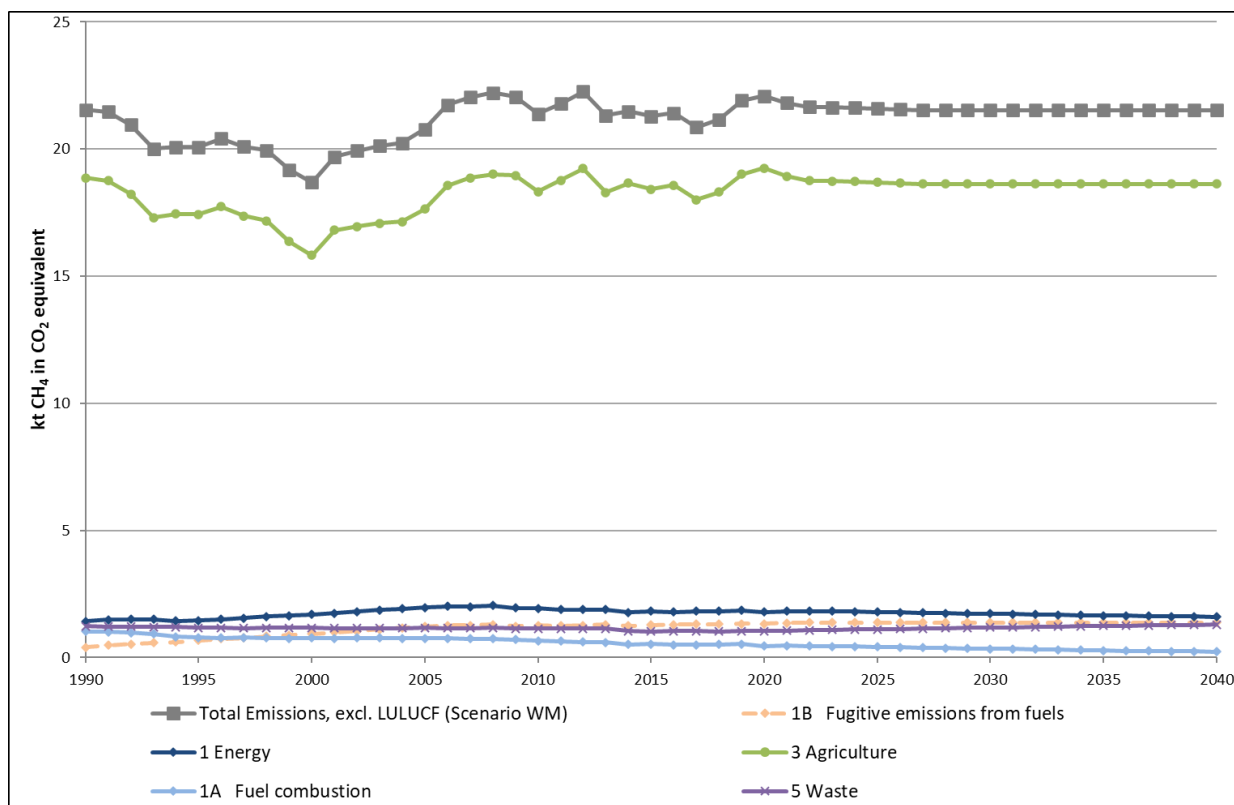
Total CH<sub>4</sub> emissions are projected to slightly decrease by 0.6% from 2022 to 2040. According to the currently implemented PaMs, no substantial changes in animal numbers are expected. This is in line with the projected CH<sub>4</sub> emissions from the sector agriculture, which are expected to remain at a similar level, with only a slight decrease by 0.7% from 2022 to 2040. CH<sub>4</sub> emissions from the waste sector are expected to increase by 21%.

From 1990 to 2040 total CH<sub>4</sub> emissions are projected to decrease slightly by 0.1% under the WM scenario.

Table 26: Liechtenstein's total CH<sub>4</sub> emissions in CO<sub>2</sub>eq by sector under the WM scenario 1990-2040 (reported values for 1990–2022 from [OE, 2024a]; projected values for 2023–2040)

| CH <sub>4</sub><br>in kt CO <sub>2</sub> eq |                                              | Reported data (GHG inventory) |               |               |               |               |               |               |               | Projections   |               |               |               |
|---------------------------------------------|----------------------------------------------|-------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| IPCC                                        | Source/Sink Categories                       | 1990                          | 1995          | 2000          | 2005          | 2010          | 2015          | 2020          | 2022          | 2025          | 2030          | 2035          | 2040          |
| <b>Total</b>                                | <b>Emissions, excl. LULUCF (Scenario WM)</b> | <b>21.5</b>                   | <b>20.1</b>   | <b>18.7</b>   | <b>20.8</b>   | <b>21.4</b>   | <b>21.3</b>   | <b>22.1</b>   | <b>21.7</b>   | <b>21.6</b>   | <b>21.5</b>   | <b>21.5</b>   | <b>21.5</b>   |
| <b>1</b>                                    | <b>Energy</b>                                | <b>1.43</b>                   | <b>1.46</b>   | <b>1.70</b>   | <b>1.98</b>   | <b>1.93</b>   | <b>1.82</b>   | <b>1.79</b>   | <b>1.83</b>   | <b>1.79</b>   | <b>1.72</b>   | <b>1.65</b>   | <b>1.60</b>   |
| <b>1A</b>                                   | Fuel combustion                              | 1.02                          | 0.79          | 0.78          | 0.76          | 0.67          | 0.54          | 0.46          | 0.46          | 0.42          | 0.35          | 0.28          | 0.23          |
|                                             | 1A1 Energy industries                        | 0.00                          | 0.03          | 0.04          | 0.04          | 0.04          | 0.03          | 0.03          | 0.03          | 0.03          | 0.03          | 0.03          | 0.03          |
|                                             | 1A2 Manufacturing industries & constr.       | 0.02                          | 0.02          | 0.02          | 0.02          | 0.01          | 0.01          | 0.01          | 0.01          | 0.01          | 0.01          | 0.01          | 0.01          |
|                                             | 1A3 Transport                                | 0.70                          | 0.46          | 0.39          | 0.32          | 0.20          | 0.10          | 0.08          | 0.08          | 0.08          | 0.07          | 0.07          | 0.06          |
|                                             | 1A4 Other sectors                            | 0.30                          | 0.28          | 0.34          | 0.38          | 0.41          | 0.40          | 0.34          | 0.34          | 0.30          | 0.24          | 0.18          | 0.14          |
|                                             | 1A5 Other                                    | NO                            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            |
| <b>1B</b>                                   | Fugitive emissions from fuels                | 0.41                          | 0.67          | 0.93          | 1.22          | 1.26          | 1.29          | 1.33          | 1.37          | 1.37          | 1.37          | 1.37          | 1.37          |
|                                             | 1B1 Solid fuels                              | NO                            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            |
|                                             | 1B2 Oil and natural gas                      | 0.41                          | 0.67          | 0.93          | 1.22          | 1.26          | 1.29          | 1.33          | 1.37          | 1.37          | 1.37          | 1.37          | 1.37          |
| <b>2</b>                                    | <b>Industrial processes and product use</b>  | <b>NO</b>                     | <b>NO</b>     | <b>NO</b>     | <b>NO</b>     | <b>NO</b>     | <b>NO</b>     | <b>NO</b>     | <b>NO</b>     | <b>NO</b>     | <b>NO</b>     | <b>NO</b>     | <b>NO</b>     |
| <b>3</b>                                    | <b>Agriculture</b>                           | <b>18.9</b>                   | <b>17.4</b>   | <b>15.8</b>   | <b>17.6</b>   | <b>18.3</b>   | <b>18.4</b>   | <b>19.2</b>   | <b>18.8</b>   | <b>18.7</b>   | <b>18.6</b>   | <b>18.6</b>   | <b>18.6</b>   |
| <b>4</b>                                    | <b>LULUCF</b>                                | <b>NO</b>                     | <b>NO</b>     | <b>NO</b>     | <b>NO</b>     | <b>NO</b>     | <b>NO</b>     | <b>NO</b>     | <b>NO</b>     | <b>NO</b>     | <b>NO</b>     | <b>NO</b>     | <b>NO</b>     |
| <b>5</b>                                    | <b>Waste</b>                                 | <b>1.24</b>                   | <b>1.17</b>   | <b>1.17</b>   | <b>1.17</b>   | <b>1.13</b>   | <b>1.03</b>   | <b>1.05</b>   | <b>1.07</b>   | <b>1.11</b>   | <b>1.18</b>   | <b>1.24</b>   | <b>1.30</b>   |
| <b>Memo item</b>                            | <b>International bunkers (aviation)</b>      | <b>0.0001</b>                 | <b>0.0001</b> | <b>0.0001</b> | <b>0.0001</b> | <b>0.0002</b> | <b>0.0002</b> | <b>0.0002</b> | <b>0.0002</b> | <b>0.0002</b> | <b>0.0002</b> | <b>0.0002</b> | <b>0.0002</b> |

Figure 36: Liechtenstein's total CH<sub>4</sub> emissions in CO<sub>2</sub>eq (excl. LULUCF) by sector under the WM scenario from 1990 to 2040



Data source: 1990–2022 reported values from [OE, 2024a]; 2023–2040 projected values

## N<sub>2</sub>O emissions

Table 27 and Figure 37 show the development of N<sub>2</sub>O emissions under the WM scenario from 1990 to 2040.

From 1990 to 2022 (reported values), N<sub>2</sub>O emissions (excl. LULUCF) decreased by 10%. As with CH<sub>4</sub>, the main source of N<sub>2</sub>O emissions is the sector agriculture, where animal numbers have a high influence on emissions (especially source categories 3B Manure Management and 3D Agricultural Soils). Agricultural N<sub>2</sub>O emissions decreased by 7% from 1990–2022. N<sub>2</sub>O emissions also decreased in sector 1 energy and 2 IPPU.

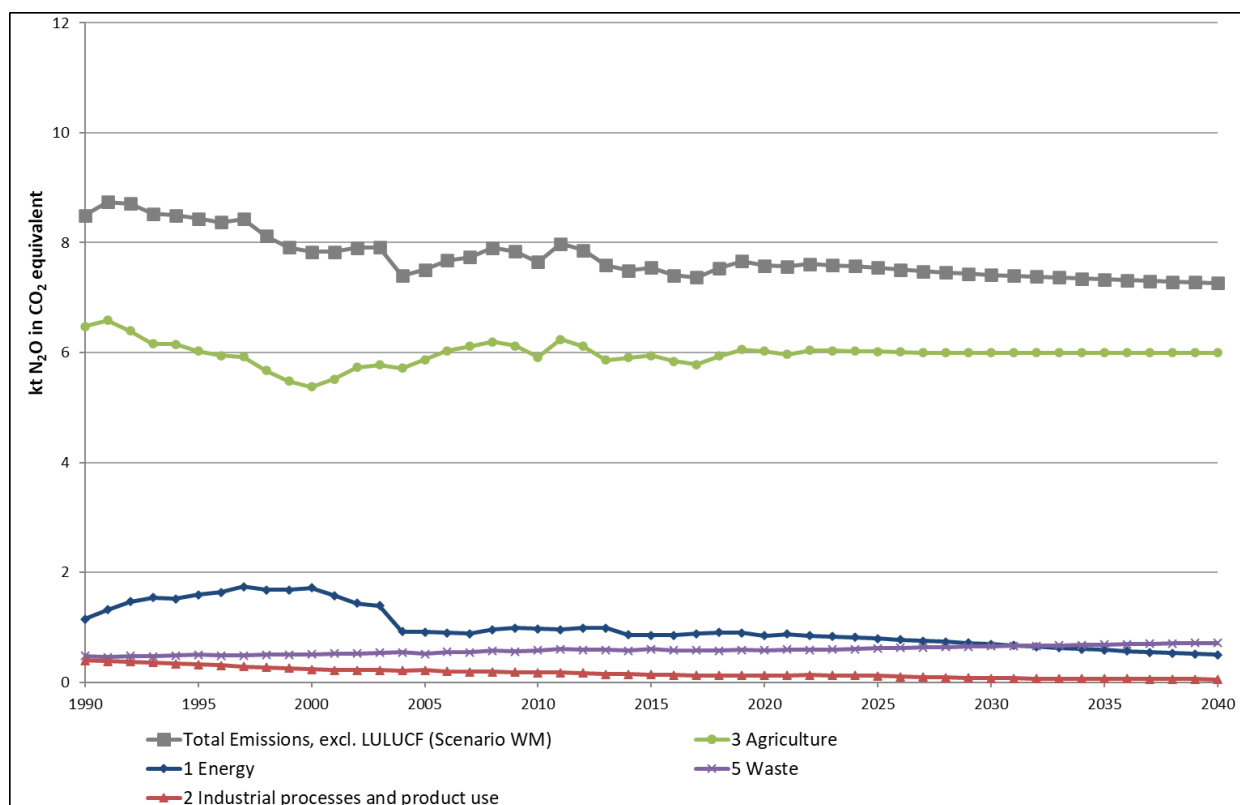
From 2022 to 2040, a further reduction of N<sub>2</sub>O emissions (excl. LULUCF) by 5% is projected. The reduction results from reductions in sectors energy and IPPU. As with CH<sub>4</sub> emissions, agricultural N<sub>2</sub>O emissions are expected to remain at a similar level (–0.7%) and N<sub>2</sub>O emissions from the Waste sector are expected to increase by 21% from 2022 to 2040.

Total N<sub>2</sub>O emissions (excl. LULUCF) are expected to decrease by 14% under the WM scenario over the period 1990–2040.

Table 27: Liechtenstein's total N<sub>2</sub>O emissions in CO<sub>2</sub>eq by sector under the WM scenario 1990-2040 (reported values for 1990–2022 from [OE, 2024a]; projected values for 2023–2040)

| N <sub>2</sub> O<br>in kt CO <sub>2</sub> eq |                                              | Reported data (GHG inventory) |             |             |             |             |             |             |             | Projections |             |             |             |
|----------------------------------------------|----------------------------------------------|-------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| IPCC                                         | Source/Sink Categories                       | 1990                          | 1995        | 2000        | 2005        | 2010        | 2015        | 2020        | 2022        | 2025        | 2030        | 2035        | 2040        |
| <b>Total</b>                                 | <b>Emissions, excl. LULUCF (Scenario WM)</b> | <b>8.50</b>                   | <b>8.44</b> | <b>7.83</b> | <b>7.51</b> | <b>7.65</b> | <b>7.54</b> | <b>7.58</b> | <b>7.61</b> | <b>7.55</b> | <b>7.42</b> | <b>7.33</b> | <b>7.27</b> |
| <b>1</b>                                     | <b>Energy</b>                                | <b>1.15</b>                   | <b>1.59</b> | <b>1.71</b> | <b>0.91</b> | <b>0.97</b> | <b>0.86</b> | <b>0.85</b> | <b>0.85</b> | <b>0.80</b> | <b>0.69</b> | <b>0.59</b> | <b>0.50</b> |
| <b>1A</b>                                    | <b>Fuel combustion</b>                       | 1.15                          | 1.59        | 1.71        | 0.91        | 0.97        | 0.86        | 0.85        | 0.85        | 0.80        | 0.69        | 0.59        | 0.50        |
|                                              | 1A1 Energy industries                        | 0.05                          | 0.05        | 0.06        | 0.06        | 0.07        | 0.00        | 0.00        | 0.01        | 0.01        | 0.01        | 0.01        | 0.01        |
|                                              | 1A2 Manufacturing industries & constr.       | 0.08                          | 0.07        | 0.07        | 0.08        | 0.07        | 0.08        | 0.07        | 0.07        | 0.06        | 0.05        | 0.04        | 0.04        |
|                                              | 1A3 Transport                                | 0.80                          | 1.25        | 1.30        | 0.45        | 0.45        | 0.39        | 0.44        | 0.43        | 0.42        | 0.39        | 0.35        | 0.31        |
|                                              | 1A4 Other sectors                            | 0.23                          | 0.22        | 0.28        | 0.31        | 0.38        | 0.38        | 0.33        | 0.34        | 0.31        | 0.24        | 0.18        | 0.14        |
|                                              | 1A5 Other                                    | NO                            | NO          | NO          | NO          | NO          | NO          | NO          | NO          | NO          | NO          | NO          | NO          |
| <b>1B</b>                                    | <b>Fugitive emissions from fuels</b>         | NO,NA                         | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       |
|                                              | 1B1 Solid fuels                              | NO                            | NO          | NO          | NO          | NO          | NO          | NO          | NO          | NO          | NO          | NO          | NO          |
|                                              | 1B2 Oil and natural gas                      | NO,NA                         | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       |
| <b>2</b>                                     | <b>Industrial processes and product use</b>  | <b>0.40</b>                   | <b>0.32</b> | <b>0.24</b> | <b>0.22</b> | <b>0.18</b> | <b>0.14</b> | <b>0.13</b> | <b>0.13</b> | <b>0.12</b> | <b>0.07</b> | <b>0.06</b> | <b>0.05</b> |
| <b>3</b>                                     | <b>Agriculture</b>                           | <b>6.47</b>                   | <b>6.03</b> | <b>5.38</b> | <b>5.87</b> | <b>5.92</b> | <b>5.95</b> | <b>6.02</b> | <b>6.04</b> | <b>6.02</b> | <b>6.00</b> | <b>6.00</b> | <b>6.00</b> |
| <b>4</b>                                     | <b>LULUCF</b>                                | <b>0.18</b>                   | <b>0.18</b> | <b>0.30</b> | <b>0.33</b> | <b>0.36</b> | <b>0.39</b> | <b>0.37</b> | <b>0.35</b> | <b>0.38</b> | <b>0.38</b> | <b>0.38</b> | <b>0.38</b> |
| <b>5</b>                                     | <b>Waste</b>                                 | <b>0.48</b>                   | <b>0.50</b> | <b>0.51</b> | <b>0.51</b> | <b>0.58</b> | <b>0.60</b> | <b>0.58</b> | <b>0.59</b> | <b>0.61</b> | <b>0.65</b> | <b>0.69</b> | <b>0.72</b> |
| <b>Memo item</b>                             | <b>International bunkers (aviation)</b>      | <b>0.00</b>                   | <b>0.00</b> | <b>0.00</b> | <b>0.00</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> |

Figure 37: Liechtenstein's total N<sub>2</sub>O emissions in CO<sub>2</sub>eq (excl. LULUCF) by sector under the WM scenario from 1990 to 2040



Data source: 1990–2022 reported values from [OE, 2024a]; 2023-2040 projected values

## F-Gas emissions

Table 28 and Figure 38 show the development of F-Gas emissions under the WM scenario from 1990 to 2040.

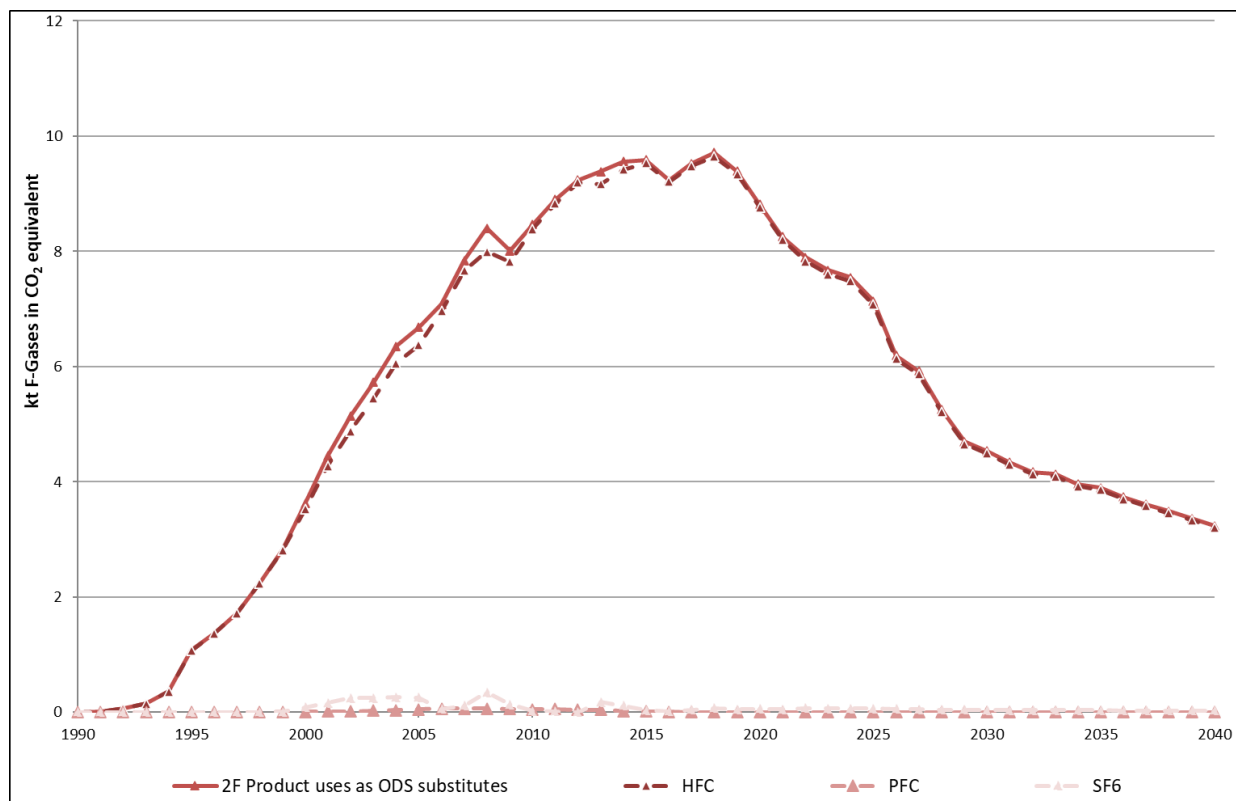
From 1990 to 2022 (reported values), emissions of F-Gases increased by a factor of about 82,000, F-Gas emissions reached a peak in 2018 and have decreased slightly thereafter. F-Gas emissions are vastly dominated by HFC.

From 2022 to 2040, emissions of F-Gases are expected to decrease by 59%. In total, F-Gas emissions in the period 1990–2040 under the WM scenario are projected to increase by a factor of about 34,000. However, the increasing trend seems to have stopped in 2018.

Table 28: Liechtenstein's total F-Gases emissions in CO<sub>2</sub>eq by sector under the WM scenario 1990–2040 (reported values for 1990–2022 from [OE, 2024a]; projected values for 2023–2040)

| HFC, PFC and SF <sub>6</sub><br>in kt CO <sub>2</sub> eq |                                       | Reported data (GHG inventory) |      |      |      |      |      |      |      | Projections |      |      |      |
|----------------------------------------------------------|---------------------------------------|-------------------------------|------|------|------|------|------|------|------|-------------|------|------|------|
| IPCC                                                     | Source/Sink Categories                | 1990                          | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 | 2022 | 2025        | 2030 | 2035 | 2040 |
| Total                                                    | Emissions, excl. LULUCF (Scenario WM) | 0.00                          | 1.07 | 3.62 | 6.68 | 8.47 | 9.59 | 8.82 | 7.89 | 7.14        | 4.53 | 3.90 | 3.24 |
| 2F                                                       | Product uses as ODS substitutes       | 0.00                          | 1.07 | 3.62 | 6.68 | 8.47 | 9.59 | 8.82 | 7.89 | 7.14        | 4.53 | 3.90 | 3.24 |
|                                                          | HFC                                   | 0.00                          | 1.07 | 3.52 | 6.37 | 8.39 | 9.53 | 8.76 | 7.83 | 7.08        | 4.49 | 3.86 | 3.21 |
|                                                          | PFC                                   | NO                            | 0.00 | 0.01 | 0.05 | 0.05 | 0.01 | 0.00 | 0.00 | 0.00        | 0.00 | 0.00 | 0.00 |
|                                                          | SF <sub>6</sub>                       | NO                            | NO   | 0.09 | 0.26 | 0.02 | 0.04 | 0.05 | 0.07 | 0.06        | 0.04 | 0.03 | 0.03 |

Figure 38: Liechtenstein's total F-Gases emissions in CO<sub>2</sub>eq (excl. LULUCF) by sector under the WM scenario from 1990 to 2040



Data source: 1990–2022 reported values from [OE, 2024a]; 2023–2040 projected values

## II.F.1.2.2 WAM scenario

### CO<sub>2</sub> emissions

Table 29 and Figure 39 show the development of CO<sub>2</sub> emissions under the WAM scenario from 1990 to 2040. From 1990 to 2022 (reported values), CO<sub>2</sub> emissions (excl. LULUCF) decreased by 35%.

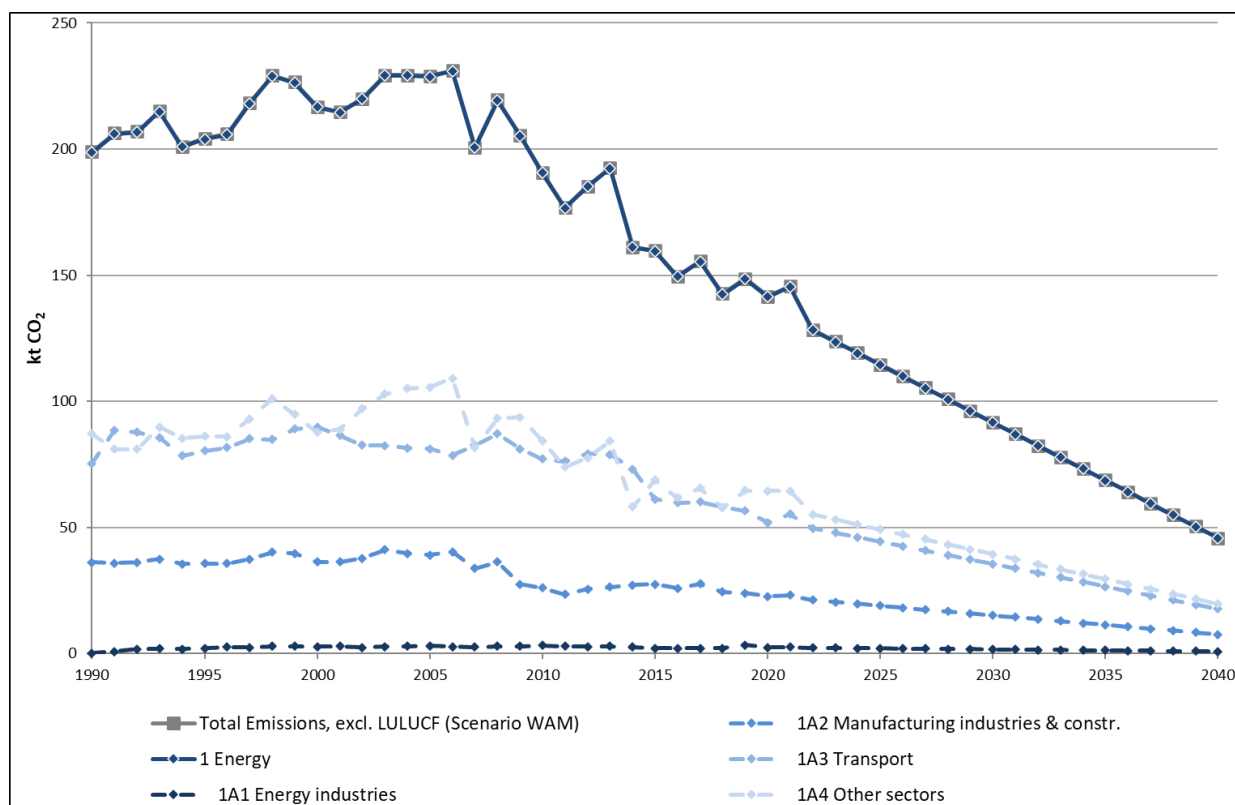
From 2022 to 2040, a further reduction of CO<sub>2</sub> emissions (excl. LULUCF) by 64% is projected. A significant reduction in CO<sub>2</sub> emissions is expected in the energy sector, if PaMs are strengthened to meet the reduction pathway of the Climate Strategy 2050 [FL Gov, 2023], which is considered as the WAM scenario.

Total CO<sub>2</sub> emissions (excl. LULUCF) under the WAM scenario are projected to be reduced by 77% from 1990 to 2040.

Table 29: Liechtenstein's total CO<sub>2</sub> emissions by sector under the WAM scenario 1990-2040 (reported values for 1990–2022 from [OE, 2024a]; projected values for 2023–2040)

| CO <sub>2</sub><br>in kt CO <sub>2</sub> eq |                                               | Reported data (GHG inventory) |              |              |              |              |              |              |              | Projections  |             |             |             |
|---------------------------------------------|-----------------------------------------------|-------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|
| IPCC                                        | Source/Sink Categories                        | 1990                          | 1995         | 2000         | 2005         | 2010         | 2015         | 2020         | 2022         | 2025         | 2030        | 2035        | 2040        |
| <b>Total</b>                                | <b>Emissions, excl. LULUCF (Scenario WAM)</b> | <b>199.0</b>                  | <b>204.2</b> | <b>216.9</b> | <b>229.0</b> | <b>190.8</b> | <b>159.7</b> | <b>141.6</b> | <b>128.4</b> | <b>114.6</b> | <b>91.7</b> | <b>68.7</b> | <b>45.8</b> |
| <b>1</b>                                    | <b>Energy</b>                                 | <b>198.7</b>                  | <b>204.0</b> | <b>216.6</b> | <b>228.7</b> | <b>190.6</b> | <b>159.5</b> | <b>141.5</b> | <b>128.2</b> | <b>114.4</b> | <b>91.6</b> | <b>68.7</b> | <b>45.8</b> |
| <b>1A</b>                                   | Fuel combustion                               | 198.7                         | 204.0        | 216.6        | 228.7        | 190.6        | 159.5        | 141.5        | 128.2        | 114.4        | 91.6        | 68.7        | 45.8        |
|                                             | 1A1 Energy industries                         | 0.1                           | 2.0          | 2.7          | 3.0          | 3.2          | 2.0          | 2.4          | 2.3          | 2.0          | 1.6         | 1.2         | 0.8         |
|                                             | 1A2 Manufacturing industries & constr.        | 36.2                          | 35.6         | 36.3         | 39.0         | 26.0         | 27.5         | 22.7         | 21.2         | 18.9         | 15.1        | 11.4        | 7.6         |
|                                             | 1A3 Transport                                 | 75.4                          | 80.3         | 89.8         | 81.1         | 77.1         | 61.2         | 52.0         | 49.6         | 44.3         | 35.4        | 26.6        | 17.7        |
|                                             | 1A4 Other sectors                             | 87.0                          | 86.1         | 87.8         | 105.6        | 84.4         | 68.8         | 64.4         | 55.1         | 49.2         | 39.3        | 29.5        | 19.7        |
|                                             | 1A5 Other                                     | NO                            | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO          | NO          | NO          |
| <b>1B</b>                                   | Fugitive emissions from fuels                 | 0.0001                        | 0.0002       | 0.0003       | 0.0003       | 0.0004       | 0.0004       | 0.0004       | 0.0004       | 0.0004       | 0.0004      | 0.0004      | 0.0004      |
|                                             | 1B1 Solid fuels                               | NO                            | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO           | NO          | NO          | NO          |
|                                             | 1B2 Oil and natural gas                       | 0.0001                        | 0.0002       | 0.0003       | 0.0003       | 0.0004       | 0.0004       | 0.0004       | 0.0004       | 0.0004       | 0.0004      | 0.0004      | 0.0004      |
| <b>2</b>                                    | <b>Industrial processes and product use</b>   | <b>0.20</b>                   | <b>0.16</b>  | <b>0.17</b>  | <b>0.20</b>  | <b>0.15</b>  | <b>0.14</b>  | <b>0.11</b>  | <b>0.12</b>  | <b>0.10</b>  | <b>0.06</b> | <b>0.03</b> | <b>0.02</b> |
| <b>3</b>                                    | <b>Agriculture</b>                            | <b>0.06</b>                   | <b>0.05</b>  | <b>0.05</b>  | <b>0.05</b>  | <b>0.04</b>  | <b>0.05</b>  | <b>0.04</b>  | <b>0.05</b>  | <b>0.04</b>  | <b>0.04</b> | <b>0.03</b> | <b>0.03</b> |
| <b>4</b>                                    | <b>LULUCF</b>                                 | <b>6.6</b>                    | <b>4.3</b>   | <b>29.0</b>  | <b>8.6</b>   | <b>19.5</b>  | <b>12.0</b>  | <b>1.2</b>   | <b>-1.5</b>  | <b>5.9</b>   | <b>5.9</b>  | <b>5.9</b>  | <b>5.9</b>  |
| <b>5</b>                                    | <b>Waste</b>                                  | <b>0.01</b>                   | <b>0.01</b>  | <b>0.01</b>  | <b>0.01</b>  | <b>0.01</b>  | <b>0.01</b>  | <b>0.01</b>  | <b>0.01</b>  | <b>0.01</b>  | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> |
| <b>Memo item</b>                            | <b>International bunkers (aviation)</b>       | <b>0.43</b>                   | <b>0.43</b>  | <b>0.49</b>  | <b>0.48</b>  | <b>0.84</b>  | <b>1.19</b>  | <b>0.93</b>  | <b>1.02</b>  | <b>1.02</b>  | <b>1.02</b> | <b>1.02</b> | <b>1.02</b> |

Figure 39: Liechtenstein's total CO<sub>2</sub> emissions (excl. LULUCF) by sector under the WAM scenario from 1990 to 2040. Sectors IPPU, agriculture and waste cause negligible CO<sub>2</sub> emissions compared to the energy sector. Thus, the CO<sub>2</sub> emissions from these sectors are not shown separately in the graph



Data source: 1990–2022 reported values from [OE, 2024a]; 2023–2040 projected values

## CH<sub>4</sub> emissions

Table 30 and Figure 40 show the development of CH<sub>4</sub> emissions under the WAM scenario from 1990 to 2040.

From 1990 to 2022 (reported values), CH<sub>4</sub> emissions increased by 0.5%. As shown in Figure 40, the sector agriculture is the most important source of CH<sub>4</sub> emissions, mainly driven by animal numbers (particularly cattle), which have a significant impact on CH<sub>4</sub> emissions (see also II.A.7).

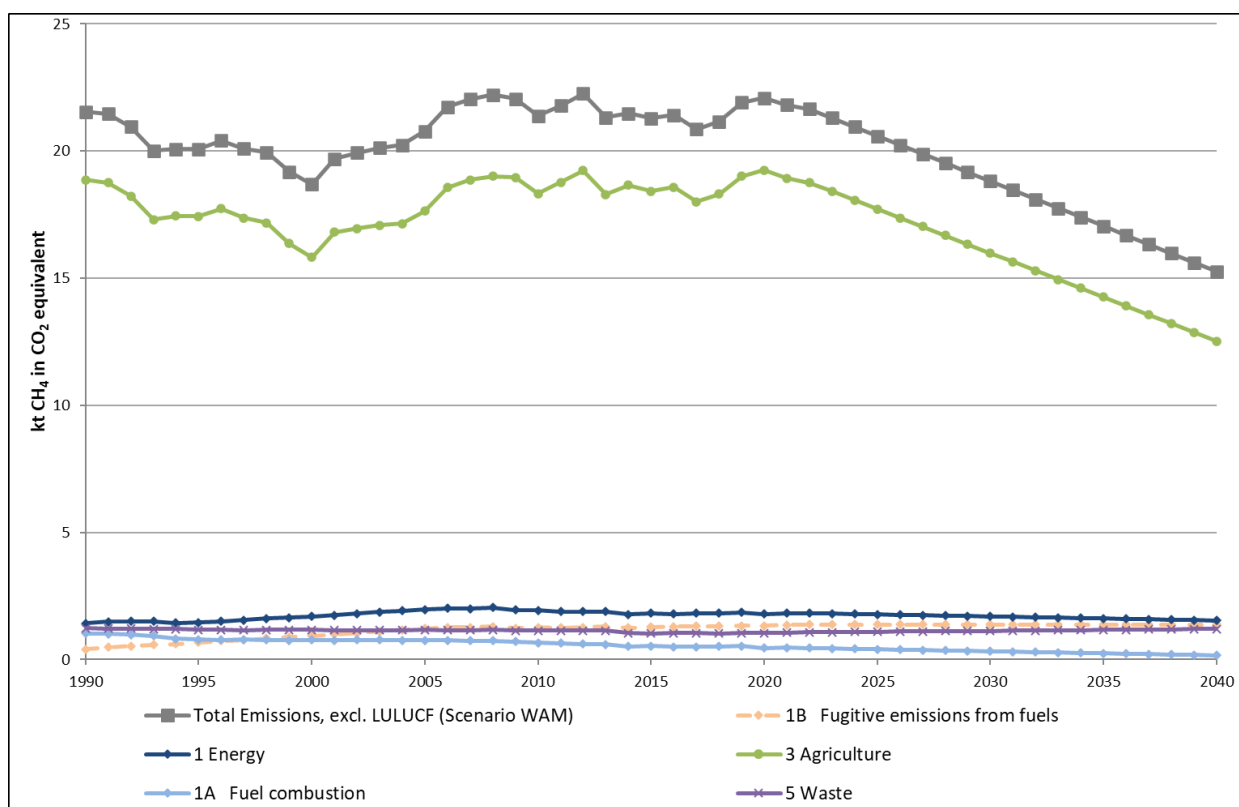
From 2022 to 2040, CH<sub>4</sub> emissions are projected to decrease by 30%. In the sector agriculture substantial reductions in CH<sub>4</sub> emissions are expected, if PaMs are strengthened as planned (see also 0) to meet the reduction pathway of the Climate Strategy 2050 [FL Gov, 2023], which is considered as the WAM scenario.

Total CH<sub>4</sub> emissions (excl. LULUCF) are projected to decrease by 29% from 1990 to 2040 under the WAM scenario.

Table 30: Liechtenstein's total CH<sub>4</sub> emissions in CO<sub>2</sub>eq by sector under the WAM scenario 1990–2040 (reported values for 1990–2022 from [OE, 2024a]; projected values for 2023–2040)

| CH <sub>4</sub><br>in kt CO <sub>2</sub> eq |                                               | Reported data (GHG inventory) |               |               |               |               |               |               |               | Projections   |               |               |               |
|---------------------------------------------|-----------------------------------------------|-------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| IPCC                                        | Source/Sink Categories                        | 1990                          | 1995          | 2000          | 2005          | 2010          | 2015          | 2020          | 2022          | 2025          | 2030          | 2035          | 2040          |
| <b>Total</b>                                | <b>Emissions, excl. LULUCF (Scenario WAM)</b> | <b>21.5</b>                   | <b>20.1</b>   | <b>18.7</b>   | <b>20.8</b>   | <b>21.4</b>   | <b>21.3</b>   | <b>22.1</b>   | <b>21.7</b>   | <b>20.6</b>   | <b>18.8</b>   | <b>17.0</b>   | <b>15.3</b>   |
| <b>1</b>                                    | <b>Energy</b>                                 | <b>1.43</b>                   | <b>1.46</b>   | <b>1.70</b>   | <b>1.98</b>   | <b>1.93</b>   | <b>1.82</b>   | <b>1.79</b>   | <b>1.83</b>   | <b>1.78</b>   | <b>1.70</b>   | <b>1.62</b>   | <b>1.54</b>   |
| <b>1A</b>                                   | <b>Fuel combustion</b>                        | 1.02                          | 0.79          | 0.78          | 0.76          | 0.67          | 0.54          | 0.46          | 0.46          | 0.41          | 0.33          | 0.25          | 0.16          |
|                                             | 1A1 Energy industries                         | 0.00                          | 0.03          | 0.04          | 0.04          | 0.04          | 0.03          | 0.03          | 0.03          | 0.03          | 0.02          | 0.02          | 0.01          |
|                                             | 1A2 Manufacturing industries & constr.        | 0.02                          | 0.02          | 0.02          | 0.02          | 0.01          | 0.01          | 0.01          | 0.01          | 0.01          | 0.01          | 0.00          | 0.00          |
|                                             | 1A3 Transport                                 | 0.70                          | 0.46          | 0.39          | 0.32          | 0.20          | 0.10          | 0.08          | 0.08          | 0.07          | 0.06          | 0.04          | 0.03          |
|                                             | 1A4 Other sectors                             | 0.30                          | 0.28          | 0.34          | 0.38          | 0.41          | 0.40          | 0.34          | 0.34          | 0.30          | 0.24          | 0.18          | 0.12          |
|                                             | 1A5 Other                                     | NO                            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            |
| <b>1B</b>                                   | <b>Fugitive emissions from fuels</b>          | 0.41                          | 0.67          | 0.93          | 1.22          | 1.26          | 1.29          | 1.33          | 1.37          | 1.37          | 1.37          | 1.37          | 1.37          |
|                                             | 1B1 Solid fuels                               | NO                            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            |
|                                             | 1B2 Oil and natural gas                       | 0.41                          | 0.67          | 0.93          | 1.22          | 1.26          | 1.29          | 1.33          | 1.37          | 1.37          | 1.37          | 1.37          | 1.37          |
| <b>2</b>                                    | <b>Industrial processes and product use</b>   | NO                            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            |
| <b>3</b>                                    | <b>Agriculture</b>                            | <b>18.9</b>                   | <b>17.4</b>   | <b>15.8</b>   | <b>17.6</b>   | <b>18.3</b>   | <b>18.4</b>   | <b>19.2</b>   | <b>18.8</b>   | <b>17.7</b>   | <b>16.0</b>   | <b>14.3</b>   | <b>12.5</b>   |
| <b>4</b>                                    | <b>LULUCF</b>                                 | NO                            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            | NO            |
| <b>5</b>                                    | <b>Waste</b>                                  | <b>1.24</b>                   | <b>1.17</b>   | <b>1.17</b>   | <b>1.17</b>   | <b>1.13</b>   | <b>1.03</b>   | <b>1.05</b>   | <b>1.07</b>   | <b>1.09</b>   | <b>1.13</b>   | <b>1.17</b>   | <b>1.21</b>   |
| <b>Memo item</b>                            | <b>International bunkers (aviation)</b>       | <b>0.0001</b>                 | <b>0.0001</b> | <b>0.0001</b> | <b>0.0001</b> | <b>0.0002</b> | <b>0.0002</b> | <b>0.0002</b> | <b>0.0002</b> | <b>0.0002</b> | <b>0.0002</b> | <b>0.0002</b> | <b>0.0002</b> |

Figure 40: Liechtenstein's total CH<sub>4</sub> emissions in CO<sub>2</sub>eq (excl. LULUCF) by sector under the WAM scenario from 1990 to 2040.



Data source: 1990–2022 reported values from [OE, 2024a]; 2023–2040 projected values

## N<sub>2</sub>O emissions

Table 31 and Figure 41 show the development of N<sub>2</sub>O emissions under the WAM scenario from 1990 to 2040. From 1990 to 2022 (reported values), N<sub>2</sub>O emissions (excl. LULUCF) decreased by 10%.

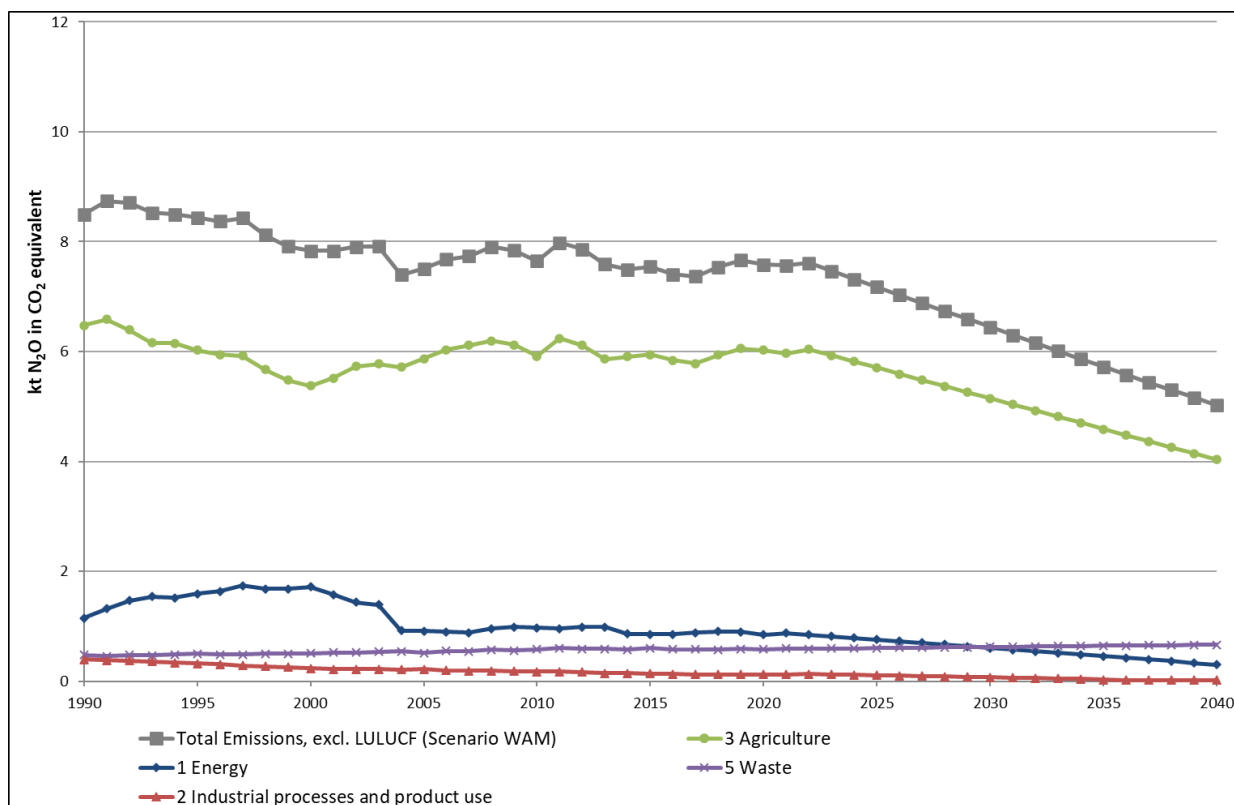
From 2022 to 2040, a further reduction of N<sub>2</sub>O emissions (excl. LULUCF) by 34% is projected under the WAM scenario. N<sub>2</sub>O emissions are expected to decrease from 2022 to 2040 in the sectors agriculture (-33%), energy (-64%) and IPPU (-81%), if PaMs are strengthened to meet the sectoral reduction pathway of the Climate Strategy 2050 [FL Gov, 2023], which is considered as the WAM scenario.

Total N<sub>2</sub>O emissions (excl. LULUCF) are expected to decrease by 41% under the WAM scenario over the period 1990–2040.

Table 31: Liechtenstein's total N<sub>2</sub>O emissions in CO<sub>2</sub>eq by sector under the WAM scenario 1990–2040 (reported values for 1990–2022 from [OE, 2024a]; projected values for 2023–2040)

| N <sub>2</sub> O<br>in kt CO <sub>2</sub> eq |                                               | Reported data (GHG inventory) |             |             |             |             |             |             |             | Projections |             |             |             |
|----------------------------------------------|-----------------------------------------------|-------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| IPCC                                         | Source/Sink Categories                        | 1990                          | 1995        | 2000        | 2005        | 2010        | 2015        | 2020        | 2022        | 2025        | 2030        | 2035        | 2040        |
| <b>Total</b>                                 | <b>Emissions, excl. LULUCF (Scenario WAM)</b> | <b>8.50</b>                   | <b>8.44</b> | <b>7.83</b> | <b>7.51</b> | <b>7.65</b> | <b>7.54</b> | <b>7.58</b> | <b>7.61</b> | <b>7.17</b> | <b>6.45</b> | <b>5.72</b> | <b>5.03</b> |
| <b>1</b>                                     | <b>Energy</b>                                 | <b>1.15</b>                   | <b>1.59</b> | <b>1.71</b> | <b>0.91</b> | <b>0.97</b> | <b>0.86</b> | <b>0.85</b> | <b>0.85</b> | <b>0.76</b> | <b>0.61</b> | <b>0.45</b> | <b>0.30</b> |
| <b>1A</b>                                    | Fuel combustion                               | 1.15                          | 1.59        | 1.71        | 0.91        | 0.97        | 0.86        | 0.85        | 0.85        | 0.76        | 0.61        | 0.45        | 0.30        |
|                                              | 1A1 Energy industries                         | 0.05                          | 0.05        | 0.06        | 0.06        | 0.07        | 0.00        | 0.00        | 0.01        | 0.01        | 0.00        | 0.00        | 0.00        |
|                                              | 1A2 Manufacturing industries & constr.        | 0.08                          | 0.07        | 0.07        | 0.08        | 0.07        | 0.08        | 0.07        | 0.07        | 0.06        | 0.05        | 0.04        | 0.03        |
|                                              | 1A3 Transport                                 | 0.80                          | 1.25        | 1.30        | 0.45        | 0.45        | 0.39        | 0.44        | 0.43        | 0.38        | 0.30        | 0.23        | 0.15        |
|                                              | 1A4 Other sectors                             | 0.23                          | 0.22        | 0.28        | 0.31        | 0.38        | 0.38        | 0.33        | 0.34        | 0.31        | 0.25        | 0.18        | 0.12        |
|                                              | 1A5 Other                                     | NO                            | NO          | NO          | NO          | NO          | NO          | NO          | NO          | NO          | NO          | NO          | NO          |
| <b>1B</b>                                    | Fugitive emissions from fuels                 | NO,NA                         | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       |
|                                              | 1B1 Solid fuels                               | NO                            | NO          | NO          | NO          | NO          | NO          | NO          | NO          | NO          | NO          | NO          | NO          |
|                                              | 1B2 Oil and natural gas                       | NO,NA                         | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       | NO,NA       |
| <b>2</b>                                     | <b>Industrial processes and product use</b>   | <b>0.40</b>                   | <b>0.32</b> | <b>0.24</b> | <b>0.22</b> | <b>0.18</b> | <b>0.14</b> | <b>0.13</b> | <b>0.13</b> | <b>0.11</b> | <b>0.07</b> | <b>0.03</b> | <b>0.02</b> |
| <b>3</b>                                     | <b>Agriculture</b>                            | <b>6.47</b>                   | <b>6.03</b> | <b>5.38</b> | <b>5.87</b> | <b>5.92</b> | <b>5.95</b> | <b>6.02</b> | <b>6.04</b> | <b>5.71</b> | <b>5.15</b> | <b>4.59</b> | <b>4.03</b> |
| <b>4</b>                                     | <b>LULUCF</b>                                 | <b>0.18</b>                   | <b>0.18</b> | <b>0.30</b> | <b>0.33</b> | <b>0.36</b> | <b>0.39</b> | <b>0.37</b> | <b>0.35</b> | <b>0.38</b> | <b>0.38</b> | <b>0.38</b> | <b>0.38</b> |
| <b>5</b>                                     | <b>Waste</b>                                  | <b>0.48</b>                   | <b>0.50</b> | <b>0.51</b> | <b>0.51</b> | <b>0.58</b> | <b>0.60</b> | <b>0.58</b> | <b>0.59</b> | <b>0.60</b> | <b>0.62</b> | <b>0.64</b> | <b>0.67</b> |
| <b>Memo item</b>                             | <b>International bunkers (aviation)</b>       | <b>0.00</b>                   | <b>0.00</b> | <b>0.00</b> | <b>0.00</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> |

Figure 41: Liechtenstein's total N<sub>2</sub>O emissions in CO<sub>2</sub>eq (excl. LULUCF) by sector under the WAM scenario from 1990 to 2040



Data source: 1990–2022 reported values from [OE, 2024a]; 2023–2040 projected values

## F-Gas emissions

Table 32 and Figure 42 show the development of F-Gas emissions under the WAM scenario from 1990 to 2040.

From 1990 to 2022 (reported values), emissions of F-Gases increased by a factor of about 82,000. F-Gas emissions reached a peak in 2018 and have decreased slightly thereafter.

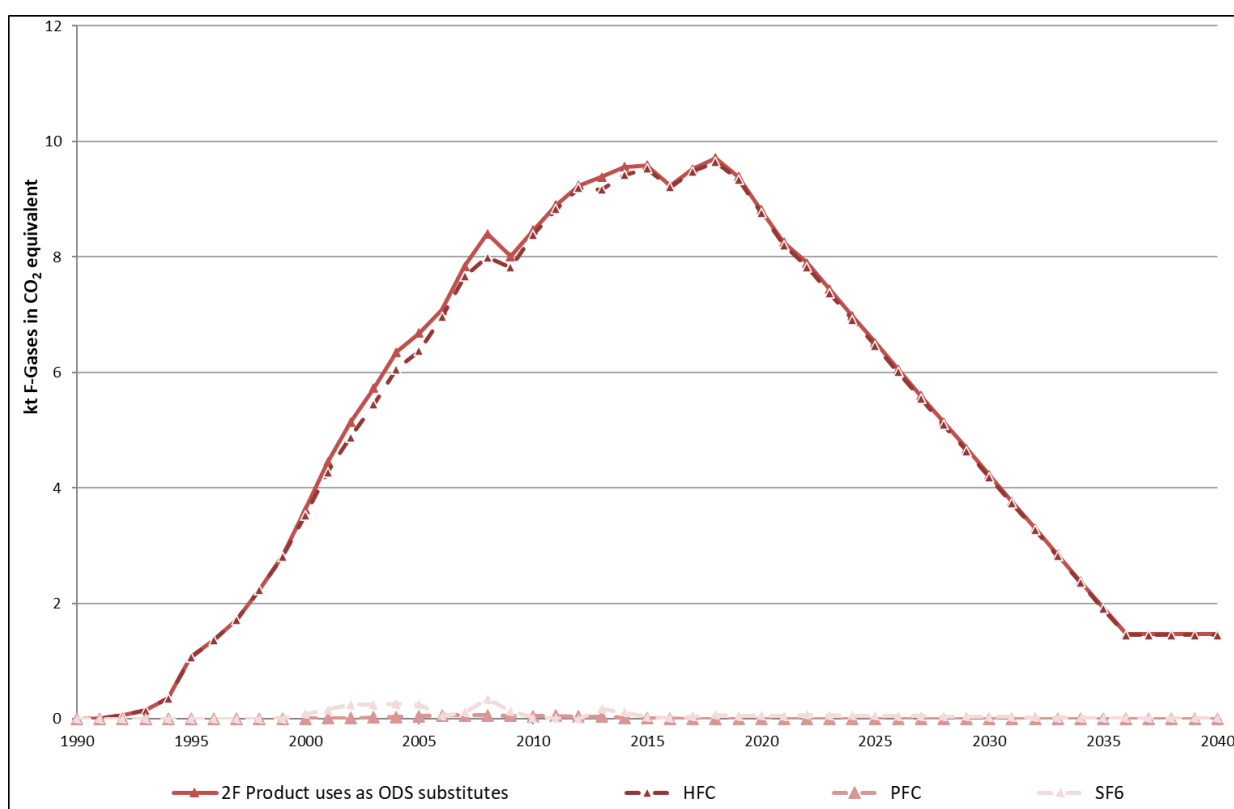
From 2022 to 2040, emissions of F-Gases are expected to decrease by 81%, if PaMs are strengthened to meet the reduction pathway of the Climate Strategy 2050 [FL Gov, 2023] and the target of the Kigali Amendment (see II.D.4), which is considered as the WAM scenario.

Total F-Gas emissions in the period 1990–2040 under the WAM scenario are expected to increase by a factor of about 15,000. However, the increasing trend is expected to have stopped in 2018.

Table 32: Liechtenstein's total F-Gases emissions in CO<sub>2</sub>eq by sector under the WM scenario 1990-2040 (reported values for 1990–2022 from [OE, 2024a]; projected values for 2023–2040)

| HFC, PFC and SF <sub>6</sub><br>in kt CO <sub>2</sub> eq |                                        |                               |      |      |      |      |      |      |      |             |      |      |      |
|----------------------------------------------------------|----------------------------------------|-------------------------------|------|------|------|------|------|------|------|-------------|------|------|------|
|                                                          |                                        | Reported data (GHG inventory) |      |      |      |      |      |      |      | Projections |      |      |      |
| IPCC                                                     | Source/Sink Categories                 | 1990                          | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 | 2022 | 2025        | 2030 | 2035 | 2040 |
| Total                                                    | Emissions, excl. LULUCF (Scenario WAM) | 0.00                          | 1.07 | 3.62 | 6.68 | 8.47 | 9.59 | 8.82 | 7.89 | 6.52        | 4.22 | 1.93 | 1.47 |
| 2F                                                       | Product uses as ODS substitutes        | 0.00                          | 1.07 | 3.62 | 6.68 | 8.47 | 9.59 | 8.82 | 7.89 | 6.52        | 4.22 | 1.93 | 1.47 |
|                                                          | HFC                                    | 0.00                          | 1.07 | 3.52 | 6.37 | 8.39 | 9.53 | 8.76 | 7.83 | 6.46        | 4.19 | 1.91 | 1.46 |
|                                                          | PFC                                    | NO                            | 0.00 | 0.01 | 0.05 | 0.05 | 0.01 | 0.00 | 0.00 | 0.00        | 0.00 | 0.00 | 0.00 |
|                                                          | SF <sub>6</sub>                        | NO                            | NO   | 0.09 | 0.26 | 0.02 | 0.04 | 0.05 | 0.07 | 0.06        | 0.04 | 0.02 | 0.01 |

Figure 42: Liechtenstein's total F-Gases emissions in CO<sub>2</sub>eq (excl. LULUCF) by sector under the WM scenario from 1990 to 2040



Data Source: 1990–2022 reported values from [OE, 2024a]; 2023–2040 projected values

## II.F.2 Policies and measures considered under the WM and WAM scenarios

Table 33 shows, for each policy or measure discussed in section II.D whether and how the policy or measure impacts the emissions projections shown in section II.F.1 above. The methodology for calculating projections impact is laid out in section II.F.3 by sector.

Table 33: Policies and measures considered under the WM and WAM scenarios  
(policies and measures marked with a dot are considered under the respective scenario)

| Policy or Measure                                                               | Section in II.D | Sector             | WM  | WAM | Remark                                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------|-----------------|--------------------|-----|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environmental Protection Act (2008)                                             | II.D.1.2        | Cross-cutting      | (●) | (●) | Legal basis for implementation of other laws. Included in projection indirectly through impact of other laws.                                                                                                                  |
| Action Plan Biodiversity 2030+                                                  | II.D.1.3        | Cross-cutting      | -   | -   | Not explicitly linked to emission projections.                                                                                                                                                                                 |
| Emissions Trading Act (2008, 2012, 2020, 2023)                                  | II.D.1.4        | Cross-cutting      | (●) | (●) | Legal basis for emission reduction measures. Included in projection indirectly through impact of other laws.                                                                                                                   |
| CO2 Act                                                                         | II.D.1.5        | Cross-cutting      | (●) | (●) | Affects impact of measures in industry and building sectors. Included in projection indirectly through impact of measures in the Energy Strategy primarily.                                                                    |
| Climate Strategy 2050                                                           | II.D.1.6        | Cross-cutting      | -   | ●   | Planning document outlining existing and additional measures to reach the revised 55% goal and climate neutrality by 2050.                                                                                                     |
| Water Protection Act (2003)                                                     | II.D.1.7        | Cross-cutting      | (●) | (●) | Affects evolution of waste and agriculture emissions, especially in the WAM.                                                                                                                                                   |
| Energy Strategy 2030, of which measures pertaining to...                        | II.D.2.2        | Energy             | ●   | ●   | All emissions projections under the sector energy fuel combustion (1A) are reported under the heading of the Energy Strategy                                                                                                   |
| ...Building efficiency subsidies                                                | [as above]      | Energy             | ●   | -   | No additional reductions in WAM as no policy strengthening foreseen                                                                                                                                                            |
| ...Heating/hot water system replacement subsidies                               | [as above]      | Energy             | ●   | -   | Strengthened law to achieve WAM rejected in a popular referendum in 2024. An alternative suggestion is being formulated.                                                                                                       |
| ...Building standards                                                           | [as above]      | Energy             | ●   | -   |                                                                                                                                                                                                                                |
| ...Electrification of Transport                                                 | [as above]      | Energy / Transport | ●   | ●   | WAM includes faster move towards a fully electrified fleet in line with the aims of the Climate Strategy 2050                                                                                                                  |
| ...Appliance standards                                                          | [as above]      | Energy             | ●   | -   | No additional reductions in WAM as no policy strengthening foreseen                                                                                                                                                            |
| ...Industry efficiency                                                          | [as above]      | Energy             | ●   | -   | No additional reductions in WAM as no policy strengthening foreseen                                                                                                                                                            |
| ...Renewable heat                                                               | [as above]      | Energy             | ●   | ●   | WAM includes construction of a large wood fired plant or a central biogas plant. Projects are highly uncertain at time of writing.                                                                                             |
| Energy Efficiency Act                                                           | II.D.2.3        | Energy             | (●) | (●) | Legal act implementing the measures in the Energy Strategy in the areas of building efficiency and heat systems and renewable heat.                                                                                            |
| Energy Ordinance to the Construction Act                                        | II.D.2.4        | Energy             | (●) | -   | Legal act implementing the measures in the Energy Strategy in the area of building standards.                                                                                                                                  |
| Recast of the EU Energy Performance of Buildings Directive (2010/31/ EU)        | II.D.2.5        | Energy             | (●) | -   | Legal act implementing the measures in the Energy Strategy in the area of building standards.                                                                                                                                  |
| Energy Award label for municipalities                                           | II.D.2.6        | Energy             | -   | -   | Measure at municipal level which overlaps significantly with other measures in the Energy Strategy. Impact not separately evaluated.                                                                                           |
| Mobility Concept 2030                                                           | II.D.3.2        | Transport          | -   | -   | Overarching framework to bring together activities in the Transport space. No climate focus, so no quantifications available, but some transport measures tracked under the Energy Strategy 2030 instead.                      |
| CO2 emission regulations for newly registered vehicles                          | II.D.3.3        | Transport          | -   | -   | Not included in emissions projections as calibration of assumptions challenging given cross-border fuel trade.                                                                                                                 |
| Partial compensation of CO2 emissions from motor fuel use                       | II.D.3.4        | Transport          | (●) | (●) | The impact of the tax on purchasing or driving behaviour is not direct, so this is not explicitly modelled, but indirectly impact the modelled measure of adoption of electric/hybrid vehicles under the Energy Strategy 2030. |
| Motor vehicle tax exemption                                                     | II.D.3.5        | Transport          | (●) | (●) | [as above]                                                                                                                                                                                                                     |
| Heavy vehicle charge                                                            | II.D.3.6        | Transport          | -   | -   | Emissions from heavy vehicles difficult to estimate separately and not modelled separately                                                                                                                                     |
| Mineral oil tax reduction on biofuels and natural gas                           | II.D.3.7        | Transport          | -   | -   | Not explicitly modelled as uptake is marginal and expected impact small.                                                                                                                                                       |
| Swiss Ordinance on Chemical Risk Reduction & Ordinance on Air Pollution Control | II.D.4          | IPPU               | (●) | (●) | Not explicitly modelled, but expected to impact emissions development.                                                                                                                                                         |
| Agricultural Law                                                                | II.D.5.2        | Agriculture        | (●) | (●) | Not explicitly modelled, but expected to impact emissions development.                                                                                                                                                         |
| Agricultural Policy Report                                                      | II.D.5.3        | Agriculture        | (●) | (●) | Not explicitly modelled, but expected to impact emissions development.                                                                                                                                                         |
| Forestry Act (1991) and Forestry Ordinance (1995)                               | II.D.6.2        | LULUCF             | (●) | (●) | Not explicitly modelled, but expected to impact emissions development.                                                                                                                                                         |
| Forest Inventory                                                                | II.D.6.3        | LULUCF             | -   | -   | No direct emissions impact, but measure informs policy making                                                                                                                                                                  |
| Liechtenstein Forest Strategy 2030+                                             | II.D.6.4        | LULUCF             | -   | -   | Not implemented yet.                                                                                                                                                                                                           |
| Ordinance on the prevention and disposal of waste                               | II.D.7          | Waste              | (●) | (●) | Not explicitly modelled, but expected to impact emissions development.                                                                                                                                                         |

IPPU: industrial processes and product use; LULUCF: land use, land-use change and forestry;  
WM: with (existing) measures (scenario); WAM: with additional measures (scenario)  
● directly modelled, (●) not directly modelled but indirectly affects other modelled measures; - no direct impact on emissions expected, impact not possible to model, or impact overlapping with other measures

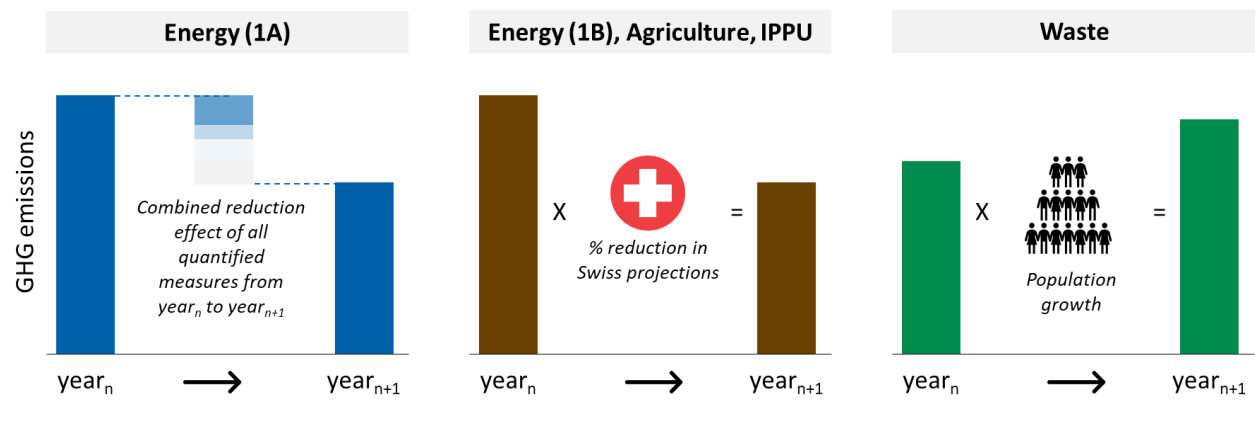
### II.F.3 Methodology

Emissions projections are done separately per sector or subsector for all greenhouse gases together, then later split by gas (see section II.F.3.7). The different approaches per sector or subsector are laid out in the following sections and shown schematically in Figure 43.

Projections based on specific measures are only available for the sector energy (1A Fuel combustion) and transport (1A3 Transport). For the waste sector, projections were calculated based on past emissions and the expected growth in population. Projections for the sectors energy (1B Fugitive emissions from fuels) as well as for IPPU (2) and agriculture (3) were adopted from Switzerland's WM projection in its NC8 [FOEN, 2022]. The projections for LULUCF were assumed to be constant (mean of the latest five inventory years). The projection of international bunkers is also assumed to be constant (mean of last 10 years; note that within the last 10 years, only minor fluctuations occurred in reported emissions).

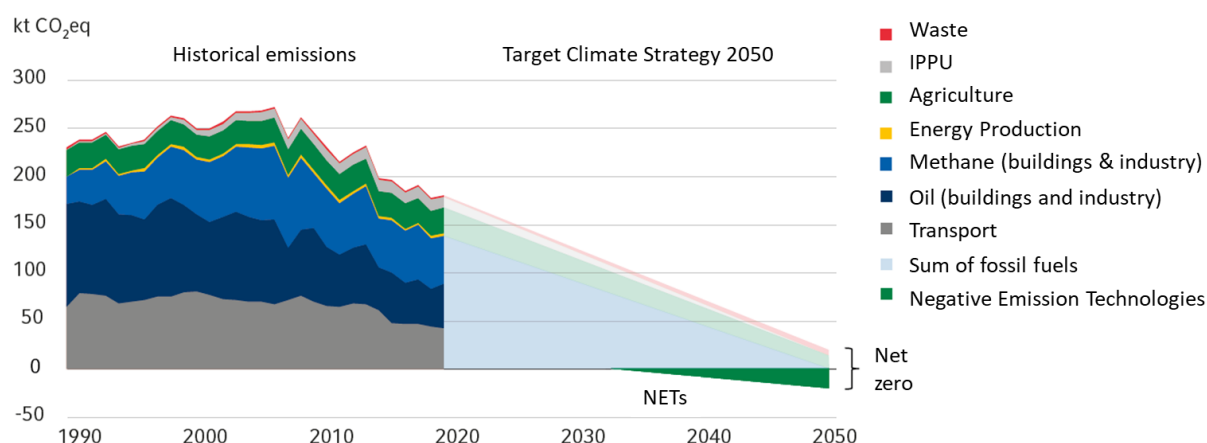
All projections start from the latest inventory year (2022).

Figure 43: Schematic of the approaches used to project Liechtenstein's future GHG emissions in the WM scenario. The gas split is then determined in a second step per sector (see section II.F.3.7)



The WAM scenario for all sectors is based on the emission reduction paths per sector stipulated in the Climate Strategy 2050 [FL Gov, 2023], as not all measures required to reach this reduction path have been implemented or even adopted. Figure 44 shows the original emission reduction paths from the Climate Strategy based on historical emissions to 2019.

Figure 44: Sectoral emission reduction path in the Climate Strategy 2050 used to determine the WAM scenario



### II.F.3.1 Energy | Combustion from fuels (1A)

#### II.F.3.1.1 WM scenario

The energy sector is responsible for around 80% of emissions and therefore the only sector where bottom-up, measure level emissions projections are calculated. Included are only the impacts of measures which can be quantified and which have an impact on domestic emissions. This means that, for example, the considerable effort on renewable electricity expansion is not captured here as the emission reduction benefits are reaped outside the territorial boundary.

The annual incremental impact for each quantifiable measure is estimated in a given year, compared to the preceding year. The sum of the impact of all measures is then subtracted from the emissions in the preceding year and the processes repeated for the next year. Depending on the measure, the estimates are grounded in the updated target values for the Energy Strategy 2030 as communicated in the annual monitoring reports, or additional calculations and estimates to refine these.

In the following we briefly outline the calculation approach per measure group:

| Measure group                                         | Basis for estimating emission reduction                                                                                                                                                                                                                      | Emission factor used (if applicable) |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| <b>Building efficiency subsidies</b>                  | Future annual savings of fossil fuels for heating (GWh/a saved). Based on estimates from subsidy applications for renovation projects in a given year.                                                                                                       | 0.219 t CO <sub>2</sub> /MWh         |
| <b>Heating/hot water system replacement subsidies</b> | Future annual savings of fossil fuels for heating (GWh/a saved). Based on building area served by renewable heating systems, estimated from subsidies given to heating system purchases in a given year.                                                     | 0.219 t CO <sub>2</sub> /MWh         |
| <b>Building standards</b>                             | No monitoring at measure level. Projections assume that targets in Energy Strategy are reached. Assumption that around a fifth of new builds replace existing buildings with fossil heating systems.                                                         | 0.219 t CO <sub>2</sub> /MWh         |
| <b>Electrification of Transport</b>                   | Vehicle stock is modelled based on historical trends. Fuel savings (GWh/a in petrol/diesel saved) are estimated for each vehicle replaced by an electric vehicle or a hybrid. Hybrids are assumed to run a fifth of the time on electricity.                 | 0.234 t CO <sub>2</sub> /MWh         |
| <b>Appliance standards</b>                            | No monitoring at measure level. Projections assume that targets in Energy Strategy are reached. Domestic savings based on reduction in the use of heating fuels.                                                                                             | 0.219 t CO <sub>2</sub> /MWh         |
| <b>Industry efficiency</b>                            | Future annual savings are based on the assumption that the 16 very large manufacturing companies which fall under the CO <sub>2</sub> levy and have agreed reduction paths to get this reimbursed, meet their reduction targets for heat efficiency savings. | 0.219 t CO <sub>2</sub> /MWh         |
| <b>Renewable heat</b>                                 | Projections are based on the continued expansion of the district heating network displacing fossil heating systems.                                                                                                                                          | 0.219 t CO <sub>2</sub> /MWh         |

Note: Overlap between measures should be small and confined to the building sector. Given the large uncertainties in estimating measure impact for such a small country, it is not expected that a quantification of the overlap would yield significant additional accuracy.

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### **II.F.3.1.2 WAM scenario**

The Climate Strategy 2050 [FL Gov, 2023] includes sectoral emission reduction pathways to 2050, reflecting the 2050 climate neutrality target of Liechtenstein. The projection in the WAM scenario follows the emission reduction pathway for the sector energy.

### **II.F.3.2 Energy | Fugitive emissions from fuels (1B)**

#### **II.F.3.2.1 WM and WAM scenario**

No projections are available for Liechtenstein for fugitive emissions from fuels. Therefore, the Swiss NC8 [FOEN, 2022] projections for 2022–2035 were adopted for Liechtenstein in the WM and WAM scenarios. The projection was extended to 2040 based on the linear trend from 2030-2035. Due to the bilateral agreement on environmental levies between Switzerland and Liechtenstein (see section II.D.1.7) and similar technology providers, the Swiss projections align with Liechtenstein's circumstances.

### **II.F.3.3 Industrial processes and product use**

#### **II.F.3.3.1 WM scenario**

No projections are available for Liechtenstein for emissions from industrial processes and product use. Therefore, the Swiss NC8 [FOEN, 2022] projection for 2022–2035 was adopted for Liechtenstein in the WM scenario. Only the Swiss projections of F-gases relevant for Liechtenstein (HFCs, PFCs and SF<sub>6</sub>) in the IPPU sector were considered. The projection was extended to 2040 based on the linear trend from 2030-2035. Due to the bilateral agreement on environmental laws and regulations between Switzerland and Liechtenstein and the similar population structure and level of motorisation, which has a high influence on F-Gas emissions (refrigerators/mobile air conditioning in cars), the Swiss projections are comparable to the circumstances in Liechtenstein.

#### **II.F.3.3.2 WAM scenario**

The Climate Strategy 2050 [FL Gov, 2023] includes sectoral emission reduction pathways to 2050, reflecting the 2050 climate neutrality target of Liechtenstein. The projection in the WAM scenario follows the emission reduction pathway for the sector IPPU.

### **II.F.3.4 Agriculture**

#### **II.F.3.4.1 WM scenario**

No projections are available for Liechtenstein for emissions from sector agriculture. Therefore, the Swiss NC8 [FOEN, 2022] projection for 2022–2035 was adopted for Liechtenstein in the WM scenario. The projection was extended to 2040 based on the linear trend from 2030-2035. Liechtenstein and Switzerland have similar stock farming and cultivation of land. Furthermore, due to the bilateral agreement on environmental laws and regulations between Switzerland and Liechtenstein and subsidies (e.g. direct payment systems), the Swiss projections are comparable to the circumstances in Liechtenstein.

#### **II.F.3.4.2 WAM scenario**

The Climate Strategy 2050 [FL Gov, 2023] includes sectoral emission reduction pathways to 2050, reflecting the 2050 climate neutrality target of Liechtenstein. The projection in the WAM scenario follows the emission reduction pathway for the sector agriculture.

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## **II.F.3.5 Land use, land-use change and forestry**

### **II.F.3.5.1 WM and WAM scenario**

No projections are available for Liechtenstein for emissions from LULUCF. Sources and sinks have shown high fluctuations in the past decades, in particular due to fluctuations of the amount of living biomass on forest land. Accordingly, the projection in the WM and WAM scenario was simplified by keeping total LULUCF emissions on a constant level from 2023–2040, based on the average of the reported net emissions of the last five inventory years (2018–2022).

### **II.F.3.6 Waste**

#### **II.F.3.6.1 WM scenario**

In the WM scenario, emissions in sectors 5A, 5B and 5C are projected based on the emission pathways of these sectors in the Climate Strategy 2050 [FL Gov, 2023]. For sector 5D waste water treatment and discharge, an emission factor based on the GHG-emissions per inhabitant is calculated for the year 2022. This factor is multiplied by the projected development of Liechtenstein's population (see Table 36) to project the GHG-emissions for the years 2023–2040.

Note that in Liechtenstein, the emissions from the waste sector are minor: municipal solid waste and compost are exported to municipal solid waste incineration and composting plants in Switzerland, and there is only one operating wastewater treatment plant in Liechtenstein (in Bendern) (see also section II.A.7).

#### **II.F.3.6.2 WAM scenario**

The Climate Strategy 2050 [FL Gov, 2023] includes sectoral emission reduction pathways to 2050, reflecting the 2050 climate neutrality target of Liechtenstein. The projection in the WAM scenario follows the emission pathway for the sector waste.

### **II.F.3.7 Method for differentiating specific greenhouse gases**

The initial calculation of Liechtenstein's greenhouse gas emission projections is based on total emissions in CO<sub>2</sub> equivalent and thus not differentiated by gas. Following this initial calculation, the differentiated projections for specific greenhouse gases (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O and F-Gases) are conducted using factors derived from the latest greenhouse gas inventory [OE, 2024a]. These factors indicate for each source category or sector the share of a specific gas (e.g., CH<sub>4</sub>) compared to total CO<sub>2</sub> equivalent emissions in the latest inventory year 2022. The only exception is the LULUCF sector, for which the factor is derived from the average emissions over the past five years (2018–2022). This methodology is used because the projections for LULUCF are based on the average emissions from the same time period. Furthermore, emissions in the LULUCF sector show considerable year-to-year fluctuations, and therefore a factor based on a single year's data would be less representative. To calculate the projections per gas, the projections of total CO<sub>2</sub> equivalent emissions of each year are multiplied by these factors. The factors are assumed to be constant for the entire projection period 2023–2040.

Since the energy sector accounts for the majority of Liechtenstein's GHG emissions (>79% in 2022, as detailed in section II.E), the factors are calculated for individual subsectors within the energy sector, specifically (i.e. 1A1, 1A2, 1A3, 1A4, and 1B2). In contrast, the non-energy sectors have a relatively small contribution to Liechtenstein's total GHG emissions. Therefore, for these sectors (i.e. IPPU, agriculture, waste, and LULUCF) the factors are calculated at the sector level (as shown in Table 34).

The factors for CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O and the sum of F-Gases are shown in Table 34. The sum of F-Gas emissions is further subdivided according to the factors for the individual F-Gases (HFC, PFC and SF<sub>6</sub>) in Table 35.

Table 34: Factors describing the share of CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O and the sum of F-Gases emissions in total CO<sub>2</sub>eq emissions, based on the newest reported values (all sectors except LULUCF: year 2022, LULUCF: average of 2018-2022) in Liechtenstein's national inventory [OE, 2024a]

| IPCC             | Source/Sink Categories                      | CO <sub>2</sub> factor<br>(share of CO <sub>2</sub> compared to total CO <sub>2</sub> eq) | CH <sub>4</sub> factor<br>(share of CH <sub>4</sub> compared to total CO <sub>2</sub> eq) | N <sub>2</sub> O factor<br>(share of N <sub>2</sub> O compared to total CO <sub>2</sub> eq) | F-Gases factor<br>(share of F-Gas compared to total CO <sub>2</sub> eq) | sum         |
|------------------|---------------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-------------|
| <b>1</b>         | <b>Energy</b>                               |                                                                                           |                                                                                           |                                                                                             |                                                                         |             |
| <b>1A</b>        | Fuel combustion                             |                                                                                           |                                                                                           |                                                                                             |                                                                         |             |
|                  | 1A1 Energy industries                       | 98.4%                                                                                     | 1.3%                                                                                      | 0.3%                                                                                        | NO                                                                      | 100%        |
|                  | 1A2 Manufacturing industries & constr.      | 99.6%                                                                                     | 0.0%                                                                                      | 0.3%                                                                                        | NO                                                                      | 100%        |
|                  | 1A3 Transport                               | 99.0%                                                                                     | 0.2%                                                                                      | 0.9%                                                                                        | NO                                                                      | 100%        |
|                  | 1A4 Other sectors                           | 98.8%                                                                                     | 0.6%                                                                                      | 0.6%                                                                                        | NO                                                                      | 100%        |
|                  | 1A5 Other                                   | NO                                                                                        | NO                                                                                        | NO                                                                                          | NO                                                                      | NO          |
| <b>1B</b>        | Fugitive emissions from fuels               |                                                                                           |                                                                                           |                                                                                             |                                                                         |             |
|                  | 1B1 Solid fuels                             | NO                                                                                        | NO                                                                                        | NO                                                                                          | NO                                                                      | NO          |
|                  | 1B2 Oil and natural gas                     | 0.0%                                                                                      | 100.0%                                                                                    | NO,NA                                                                                       | NO                                                                      | 100%        |
| <b>2</b>         | <b>Industrial processes and product use</b> | <b>1.4%</b>                                                                               | <b>NO</b>                                                                                 | <b>1.6%</b>                                                                                 | <b>97.0%</b>                                                            | <b>100%</b> |
| <b>3</b>         | <b>Agriculture</b>                          | <b>0.2%</b>                                                                               | <b>75.5%</b>                                                                              | <b>24.3%</b>                                                                                | <b>NO</b>                                                               | <b>100%</b> |
| <b>4</b>         | <b>LULUCF</b>                               | <b>94.0%</b>                                                                              | <b>NO</b>                                                                                 | <b>6.0%</b>                                                                                 | <b>NO</b>                                                               | <b>100%</b> |
| <b>5</b>         | <b>Waste</b>                                | <b>0.6%</b>                                                                               | <b>64.1%</b>                                                                              | <b>35.4%</b>                                                                                | <b>NO</b>                                                               | <b>100%</b> |
| <b>Memo item</b> | <b>International bunkers (aviation)</b>     | <b>99.3%</b>                                                                              | <b>0.0%</b>                                                                               | <b>0.7%</b>                                                                                 | <b>NO</b>                                                               | <b>100%</b> |

Table 35: Factors describing the share of HFC, PFC and SF<sub>6</sub> emissions compared to the total -F-Gases emissions in CO<sub>2</sub>eq, based on the newest reported values (year 2022) in Liechtenstein's national inventory [OE, 2024a]

| IPCC | Source/Sink Categories          | HFC factor<br>(share of HFC compared to total CO <sub>2</sub> eq) | PFC factor<br>(share of PFC compared to total CO <sub>2</sub> eq) | SF <sub>6</sub> factor<br>(share of SF <sub>6</sub> compared to total CO <sub>2</sub> eq) | sum  |
|------|---------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------|------|
| 2F   | Product uses as ODS substitutes | 99.1%                                                             | 0.0%                                                              | 0.9%                                                                                      | 100% |

### II.F.3.8 Key underlying assumptions and parameters

Assumptions and parameters going into the projection calculations are discussed in the sectoral sections above. Table 36 shows key assumptions and how they flow into the projections.

Table 36: Key underlying assumptions and parameters affecting GHG projections

| Description    | Unit     | 2022   | 2025   | 2030   | 2035   | 2040   | Source            | Use in projections                                                                        |
|----------------|----------|--------|--------|--------|--------|--------|-------------------|-------------------------------------------------------------------------------------------|
| Population     | capita   | 39 854 | 40 403 | 41 460 | 42 276 | 42 894 | [OS,2023]         | Used for projections in the waste sector                                                  |
| Motor vehicles | vehicles | 30 654 | 31 480 | 32 510 | 33 580 | 34 650 | [own projections] | Used for projections in the transport sector<br>(Measure on electrification of transport) |

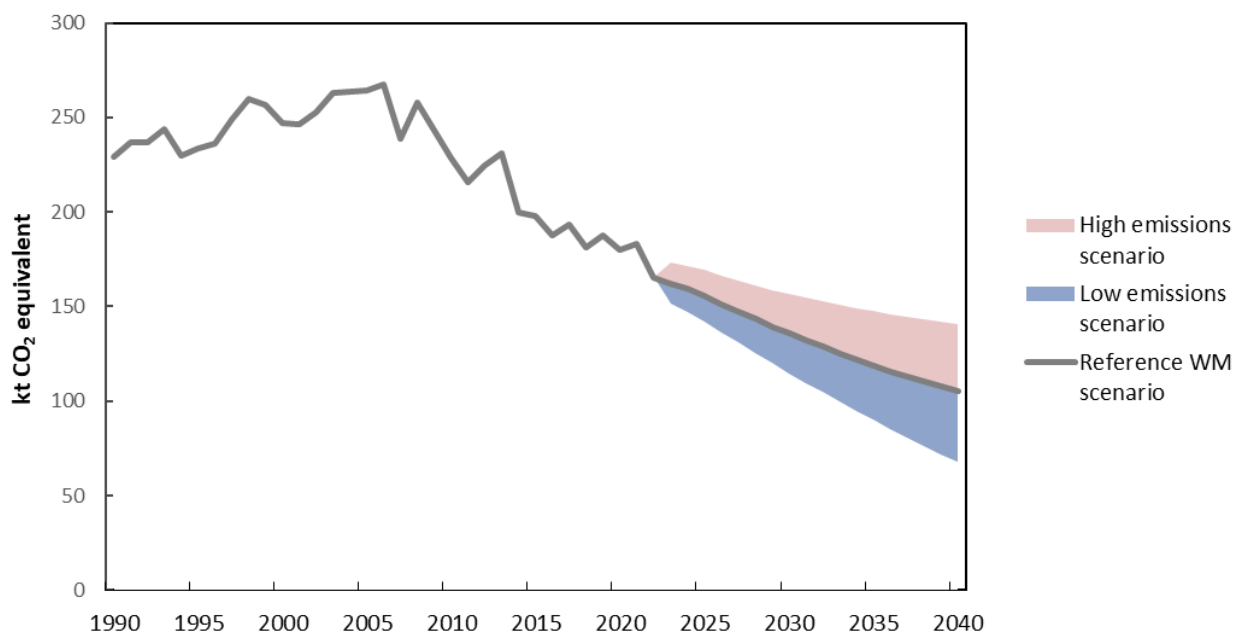
## II.F.4 Sensitivity analysis

Uncertainties in modelling assumptions in the energy sector were estimated at the level of measures as follows for the WM scenario:

- For the measures on building efficiency subsidies and the measures on replacing heating systems in buildings the uncertainty reflects primarily the (uneven) range of historically achieved values
- For the measures on new buildings, the uncertainty reflects the lack of data on the share of new buildings replacing previously existing heated building areas
- For the measure on electric vehicles the uncertainty reflects a range of possible shares of full electric vs hybrid electric vehicles
- For the measure on industrial efficiency an uncertainty of +30% to -100% was assumed
- For all other measures, as well as other sectors (IPPU, agriculture and waste), an uncertainty of 30% was assumed for the low emission and high emission WM scenario

Figure 45 shows the results of the sensitivity analysis. In 2040 the total GHG-emissions (excl. LULUCF) may deviate by -36% or +33% from the reference emissions expected under the WM scenario.

Figure 45: Sensitivity analysis for Liechtenstein's total GHG emissions under the WM scenario. Shown are the total GHG emissions (excl. LULUCF) in kt CO<sub>2</sub>eq for the reference WM scenario and the high emissions and low emissions scenario



Data source: 1990–2022 reported values from [OE, 2024a]; 2023–2040 projected values

## II.F.5 Changes and main differences compared to previous submissions

Liechtenstein has not introduced any significant difference. However, should changes in approach be made in the next BTR submission, Liechtenstein would describe them under this heading.

## II.G Other information

Liechtenstein reported all information relevant to tracking progress in relation to the Nationally Determined Contribution in the earlier sections and does not have other relevant information to report.

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### III Climate change impacts and adaptation

*Information related to climate change impacts and adaptation under Article 7 of the Paris Agreement*

#### III.A General information

Most recent information related to climate change impacts and adaptation can be found in chapter 1.5 of Liechtenstein's eighth national communication and fifth biennial report submitted to the UNFCCC on 10 January. This section is based on the adaptation strategy 2018 [FL Gov,2018].

Due to limited resources, Liechtenstein refrains from reporting on climate change impacts and adaptation in the present first biennial transparency report and plans to update the information available in the above-mentioned reports in its ninth national communication to be submitted in conjunction with the second biennial transparency report. By then, Liechtenstein will also have updated the adaptation strategy and submitted also an adaptation communication to UNFCCC.

*Information on financial, technology development and transfer and capacity-building support provided and mobilised under Articles 9–11 of the Paris Agreement*

#### General comment

Liechtenstein is not a Party included in Annex II to the United Nations Framework Convention on Climate Change (UNFCCC) and is therefore not obliged to adopt and fulfil obligations as defined in Article 4, Paragraphs 3 to 5 of the Convention. However, Liechtenstein would like to voluntarily provide the following information on provision of support required under Articles 9–11 of the Paris Agreement.

#### III.B National circumstances and institutional arrangements

International solidarity is one of the main priorities of Liechtenstein's foreign policy. In particular, international humanitarian assistance and development cooperation with developing countries and with countries affected by disasters and armed conflicts is a traditional focus of Liechtenstein's foreign policy.

Over the past years, public climate finance amounted to around 10% of Liechtenstein's annual budget for International Humanitarian Cooperation and Development (IHCD). In 2022, Liechtenstein voluntarily provided around 3.64 Mio. USD of bilateral and multilateral public climate finance (around 92 USD of climate finance per capita). In 2023, this amount decreased slightly to around 3.52 Mio. USD (around 88USD per capita).

##### III.B.1 Systems and processes

**Office for Foreign Affairs and the Liechtenstein Development Service (LED):** The overall coordination of the IHCD activities lies with the Office for Foreign Affairs. Combatting climate change is one of the focus topics of IHCD.

An intact environment and sustainable use of natural resources are necessary preconditions for the social and economic development of a region. Not only the shortage of certain natural resources, but also the lack of access to these resources, constitutes a growing problem for many poor regions. IHCD seeks to protect the environment and natural resources as a basis of life also for coming generations.

IHCD encompasses all forms of the humanitarian and development cooperation of the State of Liechtenstein and of the LED, which is a foundation under private law, funded by the State and implementing the bilateral development cooperation under the mandate of the IHCD Act. Liechtenstein's engagement focusses on emergency and reconstruction assistance, international refugee and migration assistance as well as bilateral and multilateral development cooperation.

Liechtenstein focusses on financing organisations and projects through core and earmarked funding for international organisations, NGOs, as well as state partners. Liechtenstein, through its IHCD, maintains working relationships with a large number of partners. The LED currently maintains three project offices on the ground in Bolivia, Cambodia and Moldova from where it can directly supervise its projects.

**Emergency and Reconstruction Assistance** offers short-term, urgent assistance in the event of natural disasters, political crises, and armed conflicts. The primary focus is preserving human life and protecting the affected population. Additionally, the medium-term development of social structures and infrastructure is supported to facilitate a quick return to normal life. The urgency of the situation is the main criterion for Emergency and Reconstruction Assistance. Accordingly, there are no geographic priorities. However, special attention is paid to emergency situations that are largely ignored and underfunded by the international community.

**International Refugee and Migration Assistance** is based on a sustainable and comprehensive approach to dealing with global refugee and migration issues. Bilateral activities focus on the Balkan countries. People in need of protection, including minorities, receive support for local integration and long-term improvement of their living conditions. As part of a holistic view of migration, possibilities of circular migration, readmission agreements, and visa questions are also discussed. At the multilateral level, compliance with international legal, human rights, and humanitarian standards for refugees, internally displaced persons, returnees, stateless persons, and other migrants is promoted. In addition, climate displacement has also been an area of specific activities.

The largest pillar of IHCD is **Bilateral Development Cooperation**, which is the responsibility of the LED. For this purpose, the LED receives about 65 % of the overall resources each year. In terms of topics, the LED projects focus on ensuring food security through agroecology, and on improving vocational education and employability of young people. Geographically, the LED focuses on the following 9 countries:

|                |              |            |
|----------------|--------------|------------|
| - Bolivia      | - Mali       | - Senegal  |
| - Burkina Faso | - Moldova    | - Tanzania |
| - Cambodia     | - Mozambique | - Zambia   |

**Multilateral Development Cooperation** is used to fund projects of international organisations or internationally operating non-governmental organisations. This type of engagement is useful especially for problems of a global or cross-border nature, where the international community jointly seeks solutions. In contrast to the LED projects, which are mainly directed to the local level, this track focusses on the improvement of the national and international framework. Focus areas are the protection and promotion of human rights, good governance, the rule of law as well as environment, sustainable development, and climate change.

In addition to the public IHCD, **private individuals**, **associations** and **charitable foundations** from Liechtenstein also show their solidarity in a variety of ways. They make a significant contribution to Liechtenstein's international solidarity and complement the activities of the state actors, the Office for Foreign Affairs and the Liechtenstein Development Service (LED), which play an important role in international cooperation. Through their commitment, private individuals contribute significantly to Liechtenstein's positive international image. So-called public-private partnerships, or PPPs, further enrich this commitment: public and private actors work hand in hand, pooling resources, sharing knowledge and using joint networks to develop sustainable solutions to global challenges.

### III.B.2 Challenges and limitations

Liechtenstein has a small public administration and reporting requirements place a significant burden on the resources available. Especially new obligations can pose challenges due to additional reporting requirements.

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With regard to its overall commitments within IHCD, Liechtenstein focusses on bilateral development cooperation. Recently, the LED has adopted a new strategy 2023–2026, which aims at increasing the impact of the projects by concentrating on fewer priority countries, and fewer topics.

Until now, Liechtenstein has not established a formalised system for tracking and reporting mobilised private finance. As a result, it is not possible to provide aggregated data for this category of climate finance in this first Biennial Transparency Report. The same is true for climate finance through public interventions.

### III.B.3 Experience and good practices

Liechtenstein has a long-standing tradition of bilateral and multilateral solidarity, including the provision of voluntary climate finance under the Kyoto Protocol and the Paris Agreement. Liechtenstein's IHCD is guided by the targets of the Sustainable Development Goals (SDGs) and the principles of the IHCD Act. These entail a commitment from Liechtenstein to assume responsibility within the global community to show solidarity with people who are disadvantaged in terms of their living conditions and quality of life (Article 1 Para 1 of the IHCD Act).

In absolute terms, Liechtenstein is a relatively small provider of climate finance. At the same time, Liechtenstein can play a crucial role in providing initial funding for projects that later can be scaled-up by larger donors. One example is Liechtenstein's funding for a Red Cross Red Crescent Climate Centre research project to Enhance Climate Information and Knowledge Services for resilience in five island countries in the Pacific Ocean in 2020 and 2021. The results have then been used to create a scaled-up project under the leadership of the Green Climate Fund (GCF).

### III.B.4 Enhancing comparability and accuracy of information

Liechtenstein is not a member of the Organisation for Economic Co-operation and Development (OECD) and the Development Assistance Committee (DAC), but Liechtenstein's reporting standards follow those of OECD DAC. This ensures that data provided by Liechtenstein is comparable and accurate.

Liechtenstein's financial contributions as part of its IHCD for 2022<sup>9</sup> and 2023<sup>10</sup> can be found in the respective statements of account of the government to Parliament and the respective Annual Reports of the LED for 2022<sup>11</sup> and 2023<sup>12</sup>.

### III.B.5 National circumstances and institutional arrangements for the provision of technology development and transfer and capacity-building support

**Technology development and/or transfer** is often a component of programmes and projects that support developing countries in their endeavours to mitigate and adapt to climate change.

**Capacity-building** is an essential component of almost all of Liechtenstein's programmes and projects that support developing countries in their endeavours to mitigate and adapt to climate change.

As part of the global effort, Liechtenstein continuously strengthened its cooperation with the private sector and has developed several public private partnerships that foster capacity-building.

All activities and projects related to capacity-building or the transfer of technology take place within the framework of IHCD. Capacity building and transfer of technology are, however, not specially mentioned in the law. Regarding capacity

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<sup>9</sup> See pp. 117-124 of the 2022 Statement of accounts (German only), available at: <https://www.llv.li/serviceportal2/amtstellen/stabstelle-regierungskanzlei/rechenschaftsbericht-2022-web.pdf>.

<sup>10</sup> See pp. 127-135 of the 2023 Statement of accounts (German only), available at: <https://www.llv.li/serviceportal2/amtstellen/stabstelle-regierungskanzlei/rechenschaftsbericht-2023.pdf>

<sup>11</sup> See [https://www.led.li/Portal/UserFiles/files/Der-LED/LED\\_JB\\_2022-DE.pdf](https://www.led.li/Portal/UserFiles/files/Der-LED/LED_JB_2022-DE.pdf)

<sup>12</sup> See [https://www.led.li/Portal/UserFiles/files/LED\\_JB\\_2023\\_210x280mm\\_Druckversion.pdf](https://www.led.li/Portal/UserFiles/files/LED_JB_2023_210x280mm_Druckversion.pdf)

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building or the transfer of technology, there are no specific focus countries. Focus countries exist only within the different categories of IHCD.

### III.C Underlying assumptions, definitions and methodologies

#### General comment

As mentioned in section III.B.4, Liechtenstein is not a member of the OECD and the DAC, but submits data on Official Development Assistance (ODA) and Total Official Support for Sustainable Development (TOSSD) to OECD on an annual basis.

#### (a) The chosen reporting year (calendar year, fiscal year)

Liechtenstein uses the calendar year to report on all information on financial support provided and funds mobilised under Art. 9 of the Paris Agreement. The calendar year coincides with the fiscal year and covers the period from 1 January to 31 December 2022.

As a result, the information provided in sections III.A to III.F of Liechtenstein's first Biennial Transparency Report cover the periods from 1st January to 31st December 2022 and from 1st January to 31st December 2023.

#### (b) The conversion between domestic currency and United States dollars

Liechtenstein pledges and provides its voluntary support solely in domestic currency, Swiss Francs. To convert the amount reported in Swiss Francs to US Dollars in the common tabular format in Section IV.C, Liechtenstein applies the standard annual average exchange rate as published by the OECD<sup>13</sup>. The same exchanges rates are consistently used throughout Liechtenstein's first Biennial Transparency Report and the accompanying CTF-FTC tables.

#### (c) The status (committed, disbursed)

For the fiscal years 2022 and 2023, all voluntary support provided by Liechtenstein, as reported in CTF-FTC Tables III.1 and III.2, has been fully disbursed in the respective fiscal years.

#### (d) The channel (bilateral, regional, multi-bilateral, multilateral)

Article 7 of the IHCD Act defines the channels through which Liechtenstein's IHCD can be carried out. These include contributions to international organisations, states and state agencies and non-governmental organisations.

With regard to the **bilateral**, **regional** and **multi-bilateral channels**, the Liechtenstein authorities, including the LED, generally provide their contributions either directly to partner organisations in the respective recipient country(ies), or to a multilateral organisation for the implementation of a project in a particular country, countries or region.

Liechtenstein's contributions to **multilateral channels** can be either earmarked or unearmarked.

#### (e) The funding source (official development assistance (ODA), other official flows (OOF), other)

The IHCD is Liechtenstein's main instrument for providing the state's Official Development Assistance (ODA) in accordance with the criteria set out by the OECD. In effect, Liechtenstein uses the OECD definitions of official development assistance (ODA) and other official flows (OOF) for its reporting in the CTF-FTC tables.

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<sup>13</sup> 2023: 0.898487212 Swiss Francs per US Dollar; 2022: 0.954656859 Swiss Francs per US Dollar

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**(f) The financial instrument (e.g. grant, concessional loan, non-concessional loan, equity, guarantee, insurance, other (specify))**

For 2022 and 2023, all voluntary public climate finance by Liechtenstein has been provided solely through grants.

**(g) Information on instruments and funding sources reported, including how a Party has determined finance to be concessional and/or ODA, including by using information such as grant equivalency, institution and/or instrument-based approaches**

As mentioned in (f), Liechtenstein's provision of climate finance is solely grant-based and therefore concessional. Because of this, Liechtenstein had no need of any instruments to determine grant equivalency for 2022 and 2023.

**(h) The type of support (e.g., adaptation, mitigation, cross-cutting) & (i) the sector**

Liechtenstein reports on the type of support of its voluntary contributions, including on sectors. Liechtenstein follows the OECD definitions and methodology to determine the type of support.

**(j) The subsector**

Subsectors are not yet recorded comprehensively for all IHCD projects, which is why they are not reported in Liechtenstein's first Biennial Transparency Report.

**(k) Whether it supported capacity-building and/or technology development and transfer objectives**

The promotion of good governance based on human rights, the rule of law, democracy, security and peace, as set out in the IHCD Act, are amongst the guiding principles for all development cooperation projects of Liechtenstein.

Technology development and/or transfer is often a component of programmes and projects that support developing countries in their endeavours to mitigate and adapt to climate change. Since Liechtenstein focusses almost exclusively on financing projects, no particular "transfer-of-technology" framework is in place.

**(l) The support as being climate-specific**

See general comment at the beginning of section III.A. Liechtenstein follows the general OECD methodology for identifying voluntary support as being climate-specific.

**(m) Information on the efforts taken to avoid double counting, including on:**

**i) How double counting among multiple Parties involved in the provision of support was avoided**

With regard to bilateral and multi-bilateral support, Liechtenstein only accounts and reports support it provides on its own. As far as support to multilateral institutions is concerned, Liechtenstein only accounts for its contributions to multilateral institutions.

**(ii) How double counting was avoided among multiple Parties involved in the mobilization of private finance**

Liechtenstein until now has not established a formalised system for tracking and reporting the mobilisation of private finance. Although there is no specific tracking system in place, double counting is fully avoided since Liechtenstein always only accounts for and reports its own contributions.

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**(iii) How double counting was avoided between the resources reported as provided or mobilised, and the resources used under Article 6**

Liechtenstein has not implemented bilateral or plurilateral cooperation under Art. 6.

***(iv) How support is attributed between multiple recipient countries, in cases where a project involves multiple recipient countries and where this information is reported on a country-by-country basis***

For projects involving more than one recipient country, and where the exact distribution key is not contractually defined, Liechtenstein's voluntary climate finance is normally distributed evenly between the recipient countries.

**(n) The definition of public and private finance, in particular where entities or funds are mixed**

All finance that is provided by either the budget of the state or municipalities is considered as public finance. These contributions are always accounted and reported separately and are never mixed together with private funds. Until today, Liechtenstein has never used any mixed funds to provide support. In practice, projects that are co-funded by the state and private actors, are supported directly by both parties and do not involve a mixed fund. Hypothetically, if a mixed fund was used to fund a project or a programme, then the state would only report its own contribution in the annual report to parliament. It would always be clear, which part of the fund is public, and which is private.

**(o) How private finance was assessed as mobilised through public interventions, including by:**

**General comment**

Liechtenstein, until now, has not established a formalised system for tracking and reporting the mobilisation of private finance, including mobilised through public interventions.

**(i) Identifying a clear causal link between a public intervention and mobilised private finance, where the activity would not have moved forward, or moved forward at scale, in the absence of the Party's intervention;**

Not applicable. See general comment above.

**(ii) Providing information on the boundaries used to identify finance as mobilised by public intervention;**

Not applicable. See general comment above.

**(ii) Providing information on the point of measurement (e.g. point of commitment, point of disbursement) of the private finance mobilised as a result of the public intervention, to the extent possible in relation to the type of instrument or mechanism used for the mobilisation**

Not applicable. See general comment above. When measuring voluntary climate finance, Liechtenstein only uses the point of disbursement. If such projects could be measured in future, Liechtenstein would apply the same measurement logic.

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**(p) How it seeks to ensure that support provided and mobilised through public interventions effectively addresses the needs and priorities of developing country Parties for the implementation of the Paris Agreement, as identified in country-driven strategies and instruments, such as biennial transparency reports, NDCs and national adaptation plans**

Any activities that involve public interventions have to abide by the provisions in the IHCD Act. Requirements set out in other legal acts or international conventions would also have to be considered in the fulfilment of these projects. This is also the case when cooperation with the private sector takes place.

**(q) How it seeks to ensure that support provided and mobilised through public interventions is in line with the long-term goals of the Paris Agreement**

The preservation of the environment and the responsible and sustainable use of natural resources and the sustainable improvement of social, economic, cultural and political development in disadvantaged and marginalised regions of the world are two of the core principles of Liechtenstein's IHCD. These principles are codified in the IHCD Act (Article 1) and guide all of Liechtenstein's development aid, including voluntary climate finance. With these activities, Liechtenstein supports recipient countries in their climate mitigation and adaptation action. This in turn helps these countries achieve their national climate goals and as a result, the goals of the Paris Agreement.

**(r) An indication of what new and additional financial resources have been provided, and how it has been determined that such resources are new and additional**

From 2010 to 2015, Liechtenstein established a supplementary budget of a total of CHF 1.3 Mio. for Fast-Start Finance, which was fully new and additional. From 2015 to 2025 the regular IHCD budget has been increased by approximately CHF 7 Mio., which is almost 30%. Although not exactly specified, part of these additional funds is also dedicated to climate finance. Therefore, Liechtenstein has provided a significant amount of new and additional funding in the recent years.

**(s) How the information provided reflects a progression from previous levels in the provision and mobilisation of finance under the Paris Agreement**

The CTF-FTC tables for 2022 and 2023, taken together with previous information provided, for example in Liechtenstein's National Communications under the Kyoto Protocol, show the progression of Liechtenstein's voluntary public climate finance provided.

**(t) Information on reporting on multilateral finance, including:**

**(i) Whether the multilateral finance reported is based on the Party's inflow contribution to a multilateral institution and/or on the Party's share in the outflow of the multilateral institution; (ii) Whether and how multilateral finance has been reported as climate-specific and how the climate-specific share was calculated, including by, for example, using existing international standards; (iii) Whether multilateral finance has been reported as core/general, with the understanding that the actual climate finance amount it would transfer into depends on the programming choices of the multilateral institutions; (iv) Whether and how multilateral finance has been attributed to the reporting Party.**

The amounts reported constitute Liechtenstein's inflow contributions to the respective multilateral institution.

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## **III.D Financial support provided**

*Information on financial support provided and mobilised under Article 9 of the Paris Agreement*

### **III.D.1 Bilateral, regional and other channels**

Liechtenstein provides the relevant information on bilateral and financial support provided, in CTF-FTC Table III.1 for the reporting years 2022 and 2023.

### **III.D.2 Multilateral channels**

Liechtenstein provides the relevant information on financial support provided through multilateral channels in CTF-FTC Table III.2, for the reporting years 2022 and 2023.

### **III.D.3 Information on finance mobilised through public interventions**

Please see general comment above.

## **III.E Support for technology development and transfer provided**

*Information on support for technology development and transfer provided under Article 10 of the Paris Agreement*

See section III.A above.

### **III.E.1 Strategies employed to support technology development and transfer**

See section III.D to III.D.3 above.

### **III.E.2 Support provided at different stages of the technology cycle**

See section III.D to III.D.3 above

### **III.E.3 Support for the development and enhancement of endogenous capacities and technologies**

See section III.D above

### **III.E.4 Private sector activities**

See section III.D to III.D.3 above

### **III.E.5 Knowledge generated**

In the context of natural scientific research on the country, national authorities and private organisations are collaborating with foreign university research facilities and institutes. The goal is to gain ecological insights on a scientific basis that constitute a basis for formulating a sustainable development policy in conjunction with insights gained from economic and socio-cultural surveys and research.

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Liechtenstein supports research activities abroad, with annual contributions to Switzerland (Swiss National Science Foundation, SNSF) and Austria (Austrian Science Fund, FWF). As a member of the EEA, Liechtenstein also participates in European research programmes.

Public institutions in Liechtenstein are also indirectly engaged in technology research. The University of Liechtenstein contributes a budget of CHF 14.6 Mio. to the training of experts and CHF 3 Mio. to research as a base amount.

Liechtenstein also supports some global projects, such as the Red Cross Red Crescent Climate Centre project to enhance climate information and knowledge services for resilience in five island countries in the Pacific Ocean in 2020 and 2021. The project is now funded and continued under the leadership of the green climate fund.

Despite some selected international projects, Liechtenstein is engaged in several collaborations with its neighbouring states and with international bodies. Due to its small size, Liechtenstein focusses on regional linkages and is in contact with Switzerland, Austria and Germany through various international agreements.

## **III.F Capacity-building support provided**

### ***Information on capacity-building support provided under Article 11 of the Paris Agreement***

See section III.A above.

Due to the highly integrated character, it is not possible for Liechtenstein to single out the capacity-building components of all of its development cooperation projects and programmes. In general, a wide variety of bilateral projects entail capacity-building components. Please see CTF-CTC Table III.1 and the official homepage for Liechtenstein development aid<sup>14</sup> for additional information.

### **III.F.1 Strategies employed to provide capacity-building support**

See general comment above.

### **III.F.2 Responding to the existing and emerging capacity-building needs, priorities and gaps**

See general comment above. Policies that promote capacity-building support.

### **III.F.3 Involvement of stakeholders**

See general comment above.

### **III.F.4 Promoting the sharing of lessons learned and best practices**

See general comment above.

## **IV Support needed and received**

### ***Information on financial, technology development and transfer and capacity-building support needed and received under Articles 9–11 of the Paris Agreement***

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<sup>14</sup> <https://www.solidarisch.li/en/projects/tblid/13>

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## **IV.A General information**

Liechtenstein considers itself a developed country. In 2022 and 2023, Liechtenstein did not receive financial, technology development and transfer and capacity-building support as defined under Articles 9-11 of the Paris Agreement.

## **V Information relevant for national communications**

*Information to be reported when national communications and biennial transparency reports are submitted jointly every four years*

### **V.A Vulnerability assessment, climate change impacts and adaptation measures**

Liechtenstein aims to include information on vulnerability and adaption when the next national communication and biennial transparency report are submitted jointly. Most recent information related to climate change impacts and adaptation can be found in chapter 6 of Liechtenstein's eighth national communication and fifth biennial report submitted to the UNFCCC. Further information on adaptation can be found on the website of the Office of Environment<sup>15</sup>.

### **V.B Research and systematic observation**

When national communications and biennial transparency reports are submitted jointly every four years, this section will include updated information on research and systematic observation. Most recent information related to research and systematic observation can be found in chapter 8 of Liechtenstein's eighth national communication and fifth biennial report [OE, 2023].

### **V.C Education, training and public awareness**

When national communications and biennial transparency reports are submitted jointly every four years, this section will include updated information on research and systematic observation. Most recent information related to research and systematic observation can be found in chapter 9 of Liechtenstein's eighth national communication and fifth biennial report [OE, 2023].

## **VI Information on flexibility**

Liechtenstein considers itself a developed country rather than a developing country and therefore does not apply any flexibility. Accordingly, Liechtenstein does not apply any flexibility and does not report further information on flexibility under section VI .

### **VI.A General information**

There is no other relevant information Liechtenstein wishes to report on.

## **VII Improvements in reporting over time**

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<sup>15</sup> <https://www.llv.li/serviceportal2/amtsstellen/amt-fuer-umwelt/klima/anpassungsstrategieklimawandel-li.pdf>

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## **VII.A Areas of improvement identified by the Party and technical expert review team**

*Areas of improvement identified by the Party and technical expert review team in relation to Party's implementation of Article 13 of the Paris Agreement (para. 7(a) of the MPGs)*

Liechtenstein will provide more detailed information under this section after the first reporting cycle under the transparency regime has been concluded. In future, Liechtenstein aims to address all recommendations in a table format with corresponding responses. Recommendations outlined in the report on the technical review of the eighth national communication and the technical review of the fifth biennial report of Liechtenstein have however been duly taken into consideration wherever applicable to the BTR1.

## **VII.B Addressing areas of improvement**

*How the Party is addressing or intends to address areas of improvement as referred to in paragraph 7(a) of the MPGs (para. 7(b) of the MPGs)*

Feedback provided during the past reviews has been much welcomed by Liechtenstein, as it helped to continuously improve the country's reporting and adherence to reporting guidelines. In particular for a small country such as Liechtenstein, the review is helpful in identifying priority areas, which allow the steering of tight resources in a strategic and efficient manner. With regard to issues that cannot be resolved immediately, Liechtenstein is committed to addressing them in the course of the next reporting cycle whenever possible.

## **VII.C Areas of improvement related to flexibility**

*Areas of improvement that are related to the flexibility provisions used (para. 7(c) of the MPGs)*

Liechtenstein considers itself a developed country and does therefore not report any further information on reporting-related capacity-building support needs.

## **VII.D Reporting-related capacity-building support needs**

*Reporting-related capacity-building support needs identified, including those referred to in section VI above and any progress made, including those previously identified as part of the technical expert review in section VII of the MPGs (para. 7(d) of the MPGs)*

Liechtenstein considers itself a developed country and does therefore not report any further information on reporting-related capacity-building support needs.

## **VIII Any other information**

*Any other information the Party considers relevant to the achievement of the objective of the Paris Agreement, and suitable for inclusion in its biennial transparency report*

### **VIII.A General information**

Liechtenstein does not have any relevant other information to reported.

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## **Annex I      REDD+**

### *Technical annexes for REDD+, as applicable*

Liechtenstein is a high-income economy and therefore considers itself to be a developed country Party rather than a developing country Party. Accordingly, Liechtenstein does not report any further information on technical annexes for REDD+.

## **Annex II      Common reporting tables**

### *Common reporting tables for the electronic reporting of the national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases*

The latest as well as previous versions of Liechtenstein's common reporting tables for the electronic reporting of the national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases is available on the website of the UNFCCC as well as on the following website:

[Klimaschutz - Wald, Natur, Landschaft, Klima - Freizeit, Umwelt & Tierhaltung - Privatpersonen - Liechtensteinische Landesverwaltung](#)

## **Annex III      Common tabular formats**

### *Common tabular formats for the electronic reporting of:*

*Information necessary to track progress in implementing and achieving nationally determined contributions under Article 4 of the Paris Agreement*

*Information on financial, technology development and transfer and capacity-building support provided and mobilised under Articles 9–11 of the Paris Agreement*

*Information on financial, technology development and transfer and capacity-building support needed and received under Articles 9–11 of the Paris Agreement*

Liechtenstein's common tabular formats are available on the website of the UNFCCC as well as on the following website:

[Klimaschutz - Wald, Natur, Landschaft, Klima - Freizeit, Umwelt & Tierhaltung - Privatpersonen - Liechtensteinische Landesverwaltung](#)

## **Annex IV      Participation in cooperative approaches**

### *Information in relation to the Party's participation in cooperative approaches, as applicable*

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## Glossary

|                                                    |                                                                                                                                                                                |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AR                                                 | assessment report of the Intergovernmental Panel on Climate Change                                                                                                             |
| BR                                                 | biennial report                                                                                                                                                                |
| CH <sub>4</sub>                                    | methane                                                                                                                                                                        |
| CHF                                                | swiss franc                                                                                                                                                                    |
| CO                                                 | carbon monoxide                                                                                                                                                                |
| CO <sub>2</sub>                                    | carbon monoxide                                                                                                                                                                |
| CO <sub>2eq</sub>                                  | carbon dioxide equivalent                                                                                                                                                      |
| CTF                                                | common tabular format                                                                                                                                                          |
| EEA                                                | European Economic Area                                                                                                                                                         |
| EEA                                                | European Environment Agency                                                                                                                                                    |
| ERT                                                | expert review team                                                                                                                                                             |
| EU                                                 | European Union                                                                                                                                                                 |
| EU ETS                                             | European Union Emissions Trading System                                                                                                                                        |
| Eurostat                                           | statistical office of the European Union                                                                                                                                       |
| FOCBS                                              | Swiss Federal Office for Customs and Border Security (BAZG)                                                                                                                    |
| GCOS                                               | Global Climate Observing System                                                                                                                                                |
| GHG                                                | greenhouse gas                                                                                                                                                                 |
| GWP                                                | global warming potential                                                                                                                                                       |
| HFC                                                | hydrofluorocarbon                                                                                                                                                              |
| IE                                                 | included elsewhere                                                                                                                                                             |
| IPCC                                               | Intergovernmental Panel on Climate Change                                                                                                                                      |
| IPPU                                               | Industrial processes and product use                                                                                                                                           |
| LULUCF                                             | land use, land use change and forestry                                                                                                                                         |
| N <sub>2</sub> O                                   | nitrous oxide                                                                                                                                                                  |
| NA                                                 | not applicable                                                                                                                                                                 |
| NC                                                 | national communication                                                                                                                                                         |
| NE                                                 | not estimated                                                                                                                                                                  |
| NF <sub>3</sub>                                    | nitrogen trifluoride                                                                                                                                                           |
| NMVOC                                              | non-methane volatile organic compound                                                                                                                                          |
| NO                                                 | not occurring                                                                                                                                                                  |
| NO <sub>x</sub>                                    | nitrogen oxides                                                                                                                                                                |
| OE                                                 | Office of Environment                                                                                                                                                          |
| PaMs                                               | policies and measures                                                                                                                                                          |
| PFC                                                | perfluorocarbon                                                                                                                                                                |
| reporting guidelines for supplementary information | guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol. Part II: Reporting of supplementary information under Article 7, paragraph 2 |
| SF <sub>6</sub>                                    | sulfur hexafluoride                                                                                                                                                            |
| SO <sub>x</sub>                                    | sulfur oxides                                                                                                                                                                  |
| UNFCCC reporting guidelines on BRs                 | UNFCCC biennial reporting guidelines for developed country Parties                                                                                                             |

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|                                    |                                                                                                                                                                             |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| UNFCCC reporting guidelines on NCs | guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications |
| WAM                                | with additional measures                                                                                                                                                    |
| WEM                                | with measures                                                                                                                                                               |
| WOM                                | without measures                                                                                                                                                            |

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