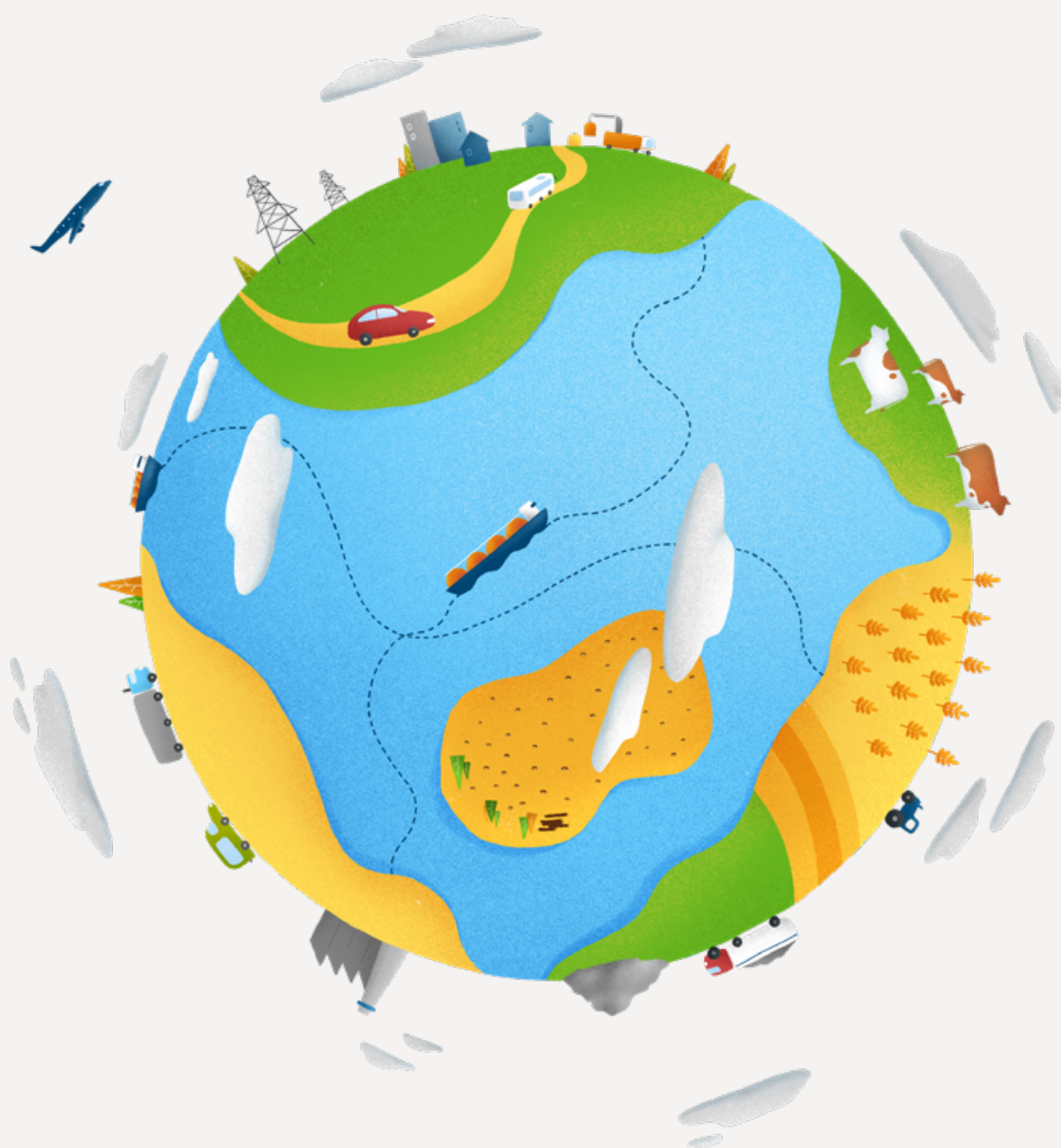


# Evolution of Greenhouse Gas Emissions in Spain, 2005-2020





# Executive Summary

## Executive Summary

This study, the “Evolution of Greenhouse Gas Emissions in Spain, 2005–2020”, presents the evolution of the Spanish economy and the associated greenhouse gas (GHG) emissions over recent years. The data it contains correspond to the initial application in Spain and the other countries in the European Union of the GHG emissions trading system (ETS). The study draws on the verified EU ETS data for Spain, as well as data from the Spanish National Inventory of GHGs for the 16 years studied.

The information is primarily offered in the form of graphs. The Study aggregates data for economic sectors and shows how values have changed in order to offer a better understanding of the evolution of GHG emissions in Spain. It also shows the distribution of emissions across different sectors, both those that are regulated by the EU ETS and those that are exempt, the non–EU ETS sectors or “diffuse” sectors<sup>(\*)</sup> as they are sometimes called. Similarly, the Study demonstrates the progressive decoupling of GHG emissions from the creation of wealth in Spain and the decarbonisation of some of the economic sectors analysed.

The quantitative information included has been obtained from official records and sources, such as the European Environment Agency, the Spanish Ministry for the Ecological Transition and the Demographic Challenge (MITECO), the Spanish Ministry of Industry, Trade and Tourism, the Institute for Energy Saving and Diversification, and the Spanish National Statistics Institute.

In this edition, the impact of the global Covid-19 pandemic is of special relevance, and specifically the results of the extreme measures that were implemented to combat the public health effects of the expansion of the disease. Measures including confining the general population to their homes and the “freezing” of a significant part of the national economy are reflected in the levels of GHG emissions, as can be seen in the detailed graphs. As a result, aggregate emissions reached minimum values over the whole of the historical series. Readers will therefore understand the need to interpret the figures for 2020 with some caution, since by their very nature they constitute anomalous values that do not accurately reflect the general trend of GHG emissions resulting from economic activity in Spain. Their analysis does, however, allow us to arrive at some interesting conclusions.

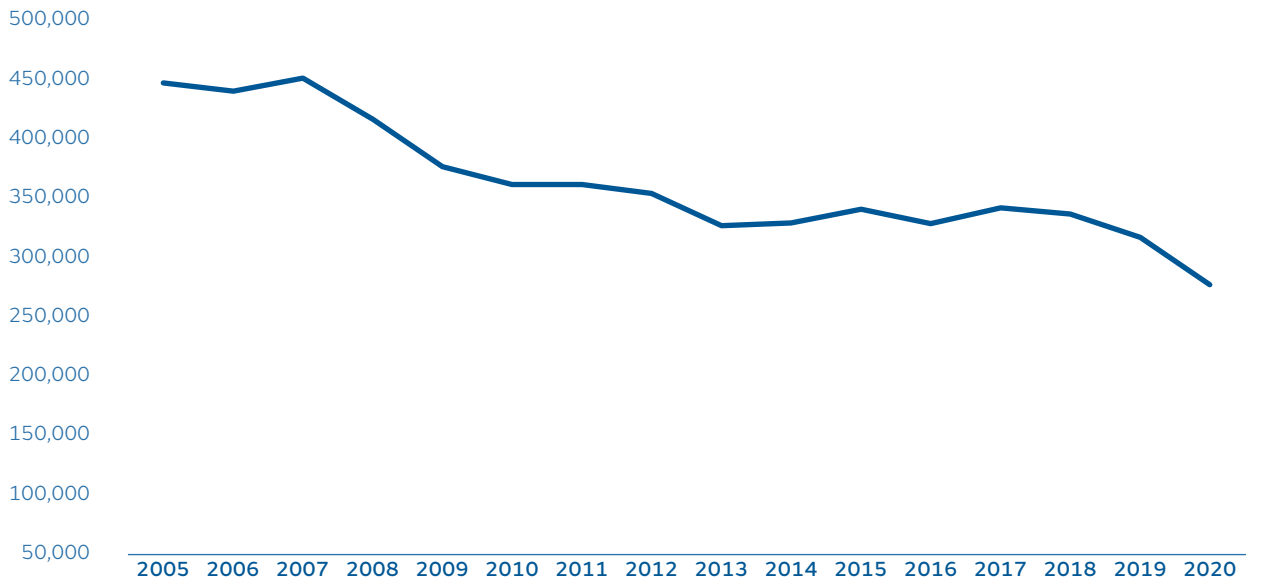
Among the data included in the Study, the following should be highlighted:

- In 2005, Spain was responsible for approximately 8.4% of total GHG emissions in the European Union, while in 2020 this figure was 7.4%. The level of emissions per capita in Spain is slightly below the European average.

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<sup>(\*)</sup> Including transport, agriculture and livestock farming, residential and service sectors, and waste.

### Evolution of GHG emissions (kt CO<sub>2</sub>eq) 2005-2020 (excluding LULUCF).



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
●	442,321	435,529	446,686	412,490	372,607	358,157	357,852	350,635	323,831	325,894	337,416	325,627	338,844	333,251	313,829	274,743

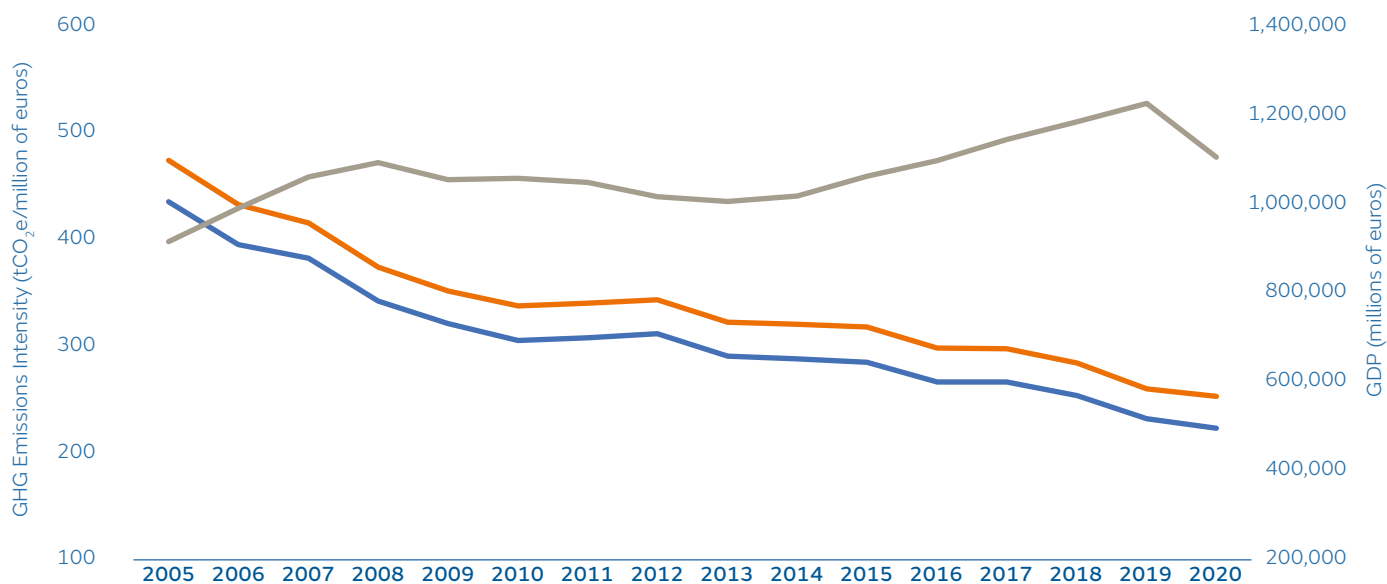
- Total CO<sub>2</sub> equivalent emissions  
(Excluding LULUCF)

Source: MITECO

- Over the period analysed, Spain registered a clear reduction in aggregate gross GHG emissions for the total inventory. This evolution of total emissions represents a reduction of approximately 37% in the year 2020, with respect to 2005. Similarly, emissions per capita have reduced by some 30%. Although the evolution of GHG emissions over this period shows a marked and sustained gradual reduction, it is necessary to point out the exceptional nature of the actions taken in response to the global Covid-19 pandemic. Those measures had direct implications not only for total GHG emissions in 2020 but also for the distribution of emissions across the various sectors. For this reason, the data for 2020 must be viewed in two different ways. On the one hand, they are extremely interesting figures that allow us to identify how patterns of GHG emissions respond to an event with the characteristics of Covid-19 pandemic; and on the other, they must be seen as anomalous parameters within the historical series of data.

- Regarding the intensity of GHG emissions, they have reduced from 476.5 tons of carbon dioxide equivalent per million euros of GDP, to just 244.9 in 2020.

Evolution of emissions per unit of GDP (t CO<sub>2</sub>/million euros of GDP) and evolution of GDP (millions of euros) 2005-2020.



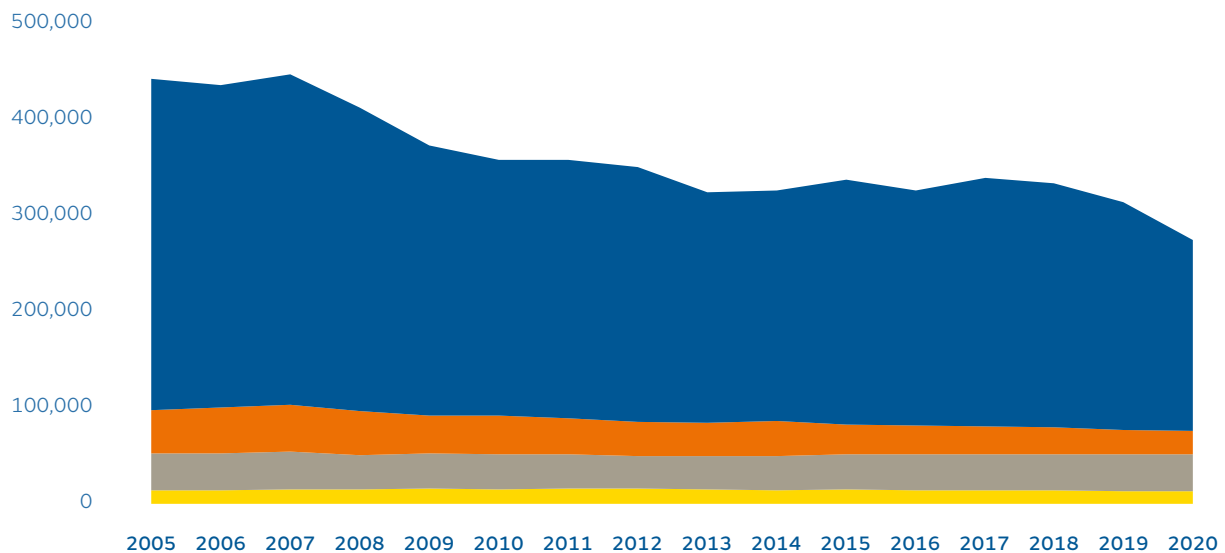
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
●	436.38	394.37	380.54	338.37	316.18	299.65	301.94	306.42	284.46	281.31	277.89	258.37	258.85	245.47	222.21	213.20
●	476.97	433.87	415.31	371.77	348.45	333.88	336.40	340.06	317.37	315.74	313.12	292.35	291.64	277.20	252.00	244.88
●	927,357	1,003,823	1,075,539	1,109,541	1,069,323	1,072,709	1,063,763	1,031,099	1,020,348	1,032,158	1,077,590	1,113,840	1,161,878	1,202,193	1,245,330	1,121,948

- GHG emissions per unit of GDP (t CO<sub>2</sub>/million euros of GDP) (including LULUCF)
- GHG emissions per unit of GDP (t CO<sub>2</sub>/million euros of GDP) (excluding LULUCF)
- Gross domestic product at market prices (in millions of euros)

Source: MITECO-INE

- According to the different sectors considered in the Inventory, the energy sector (consisting of emissions corresponding to the use of energy in transportation, industry, the generation of electricity and heat, and the residential and commercial sectors, among others), was responsible for 75.5% of accumulated emissions over the period considered. The sector of industrial processes produced slightly more than 10% of total emissions, as did the agriculture and livestock farming sector, and in last place was the waste sector which was responsible for the remaining 4%.

### Evolution of total GHG emissions (kt CO<sub>2</sub>eq) by sectors in the Spanish National Inventory of GHGs, 2005-2020.



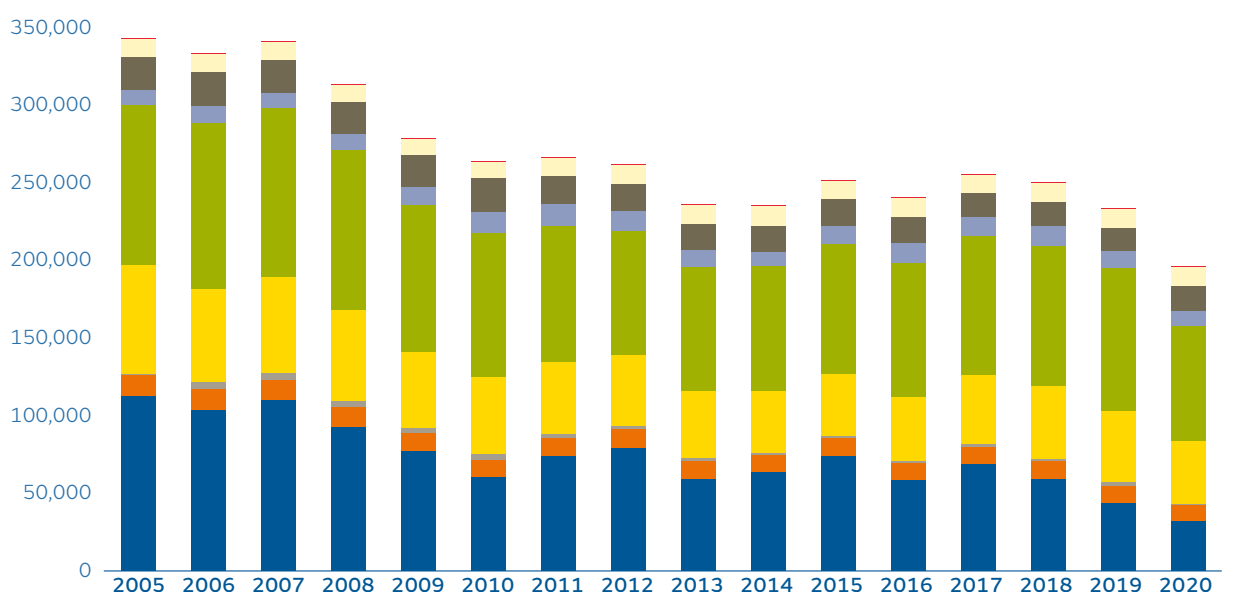
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
●	345,305	335,658	343,750	315,799	281,066	266,385	269,081	265,068	239,663	239,553	254,993	244,028	258,814	253,574	236,768	199,319
●	44,585	47,637	49,213	46,206	39,419	40,524	37,608	35,969	34,824	36,625	31,054	30,588	28,330	27,886	26,123	23,709
●	38,688	37,946	38,870	35,554	35,986	36,169	35,435	34,272	34,333	35,937	36,644	36,721	37,750	37,786	37,644	38,481
●	13,743	14,287	14,853	14,930	16,136	15,078	15,728	15,326	15,011	13,779	14,725	14,292	13,950	14,005	13,293	13,233
○	442,321	435,528	446,686	412,490	372,607	358,157	357,852	350,635	323,831	325,894	337,416	325,628	338,845	333,251	313,828	274,743

- Energy
- Industrial processes
- Agriculture
- Waste
- Total CO<sub>2</sub> equivalent emissions (excluding LULUCF)

Source: CRF 2022

- Regarding the activities reported in this Study, of the emissions accumulated over the entire period (2005-2020) that corresponded to the energy sector (in the form of fuel consumption) approximately 34% originated in the activity of transportation (27% on total emissions), 27% in the generation of electricity (20% of the total), 18% came from the use of fuels in industrial facilities (14% of the total) and almost 11% corresponded to the residential and commercial sectors (8% of the total).

Evolution of GHG emissions (kt CO<sub>2</sub>eq) for each of the Energy Sector (activities requiring fuel combustion) subsectors, 2005-2020.



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Electricity production <sup>(*)</sup>	112,787	104,057	110,206	93,097	77,389	60,460	74,450	79,262	59,271	63,363	74,103	58,690	68,851	59,534	44,043	32,432
Oil refining	12,921	12,872	12,837	12,428	11,611	11,234	11,594	12,045	11,620	11,306	11,455	11,470	11,275	11,365	11,053	10,251
Solid fuel manufacturing and other energy industries	1,039	4,796	4,505	4,396	3,388	3,631	2,116	1,981	2,082	1,568	827	856	1,358	1,337	1,970	846
Manufacturing and construction	69,939	59,576	61,586	58,099	48,060	49,853	46,685	45,537	42,441	39,590	40,135	40,542	44,476	46,600	46,407	40,288
Transport	102,835	106,115	108,464	102,533	95,246	91,908	86,709	79,531	80,334	80,607	83,738	86,581	89,222	90,354	91,532	74,178
Commercial/Institutional sector	9,115	11,682	9,450	10,154	11,093	13,522	14,194	12,801	10,383	8,805	11,463	12,410	12,250	12,645	10,722	9,211
Residential sector	21,814	21,468	21,374	20,662	20,316	21,682	18,092	17,735	16,995	16,567	17,274	17,266	15,354	15,479	14,960	16,164
Agriculture/Forestry/Fishing	11,239	11,278	11,359	10,673	10,461	10,631	11,387	11,893	11,944	12,885	11,493	11,674	11,472	11,770	11,813	11,801
Others	470	514	537	588	488	509	525	411	257	364	490	480	471	412	408	400

- Electricity production<sup>(\*)</sup>
- Oil refining
- Solid fuel manufacturing and other energy industries
- Manufacturing and construction
- Transport
- Commercial/Institutional sector
- Residential sector
- Agriculture/Forestry/Fishing
- Others

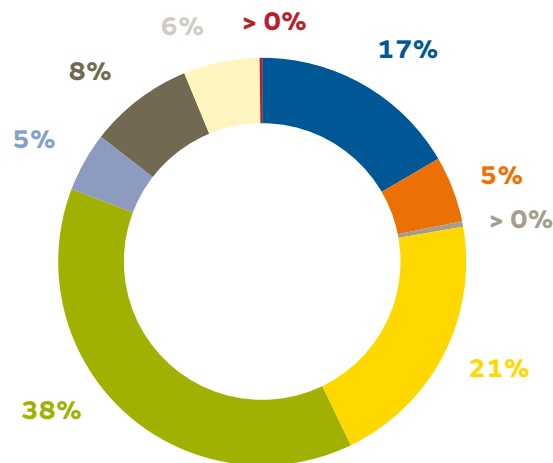
Source: MITECO.

<sup>(\*)</sup> Referred to as "Public production of electricity and heat" in the Spanish National Inventory.



- More specifically, in the year 2020, it can be observed that approximately 38% of the total emissions corresponding to the energy sector (in the form of fuel consumption) originated from the activity of transportation (27% of overall total emissions), 17% from the generation of electricity (12% of the total), 21% came from the use of fuels in industrial facilities (15% of the total) and almost 13% corresponded to the residential and commercial sectors (9% of the total).

Distribution of GHG emissions (kt CO<sub>2</sub>eq and %) for each of the Energy Sector subsectors in 2020.



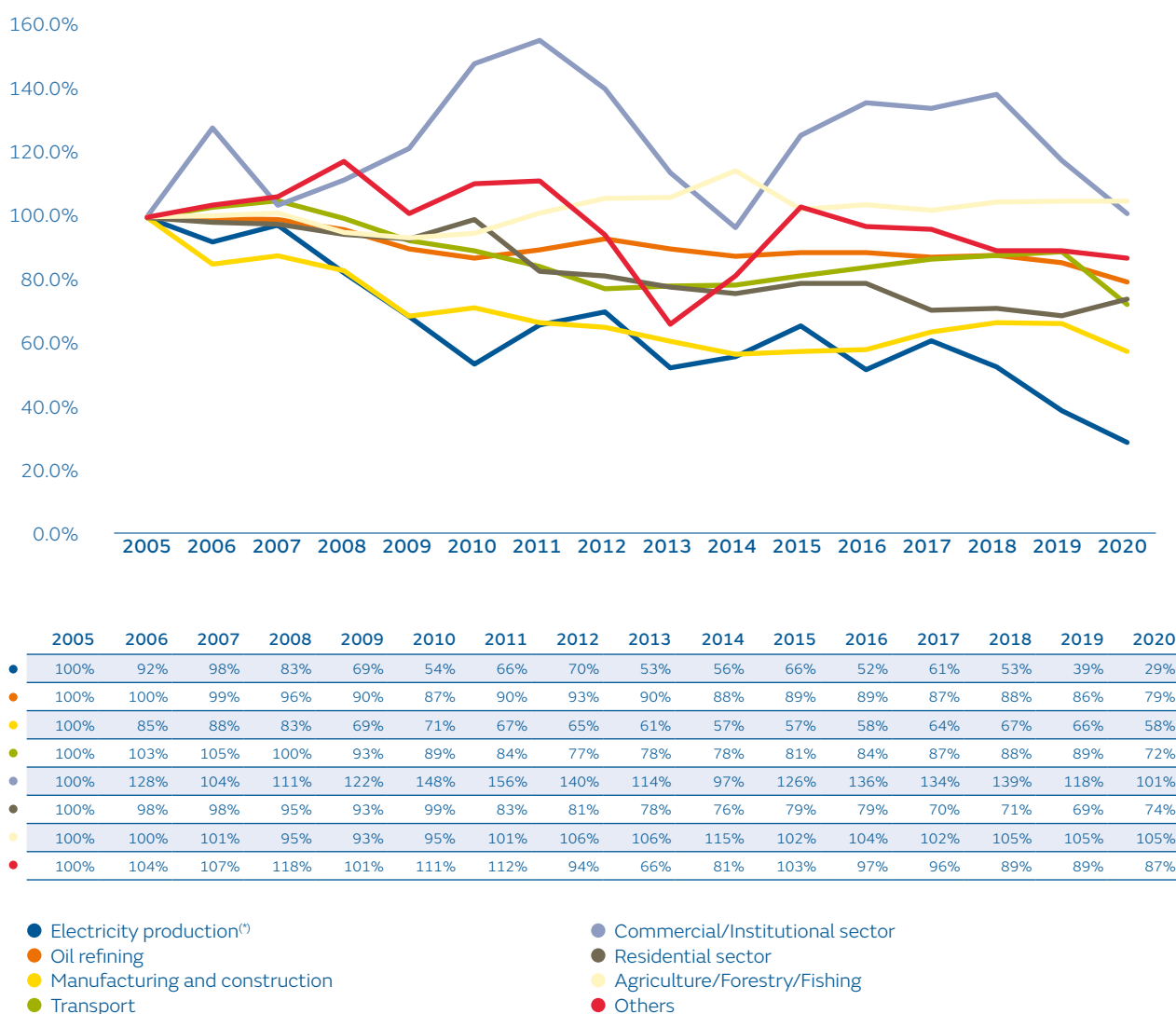
- Electricity production<sup>(\*)</sup>: 32,432
- Oil refining: 10,251
- Solid fuel manufacturing and other energy industries: 846
- Manufacturing and construction: 40,288
- Transport: 74,178
- Commercial/Institutional sector: 9,211
- Residential sector: 16,164
- Agriculture/Forestry/Fishing: 11,801
- Others: 400

Source: MITECO.

<sup>(\*)</sup> Referred to as "Public production of electricity and heat" in the Spanish National Inventory.

It is worth highlighting the different evolution of emissions from the various sectors since 2005. As shown in the following graph, emissions from electricity production have reduced by almost 70% and those from the residential sector have experienced a decrease of nearly 30%. Meanwhile, sectors such as transport have seen an upward trend in recent years, which was limited in 2020.

Evolution of GHG emissions for each of the Energy Sector subsectors, 2005-2020, taking emissions in 2005 as 100%.

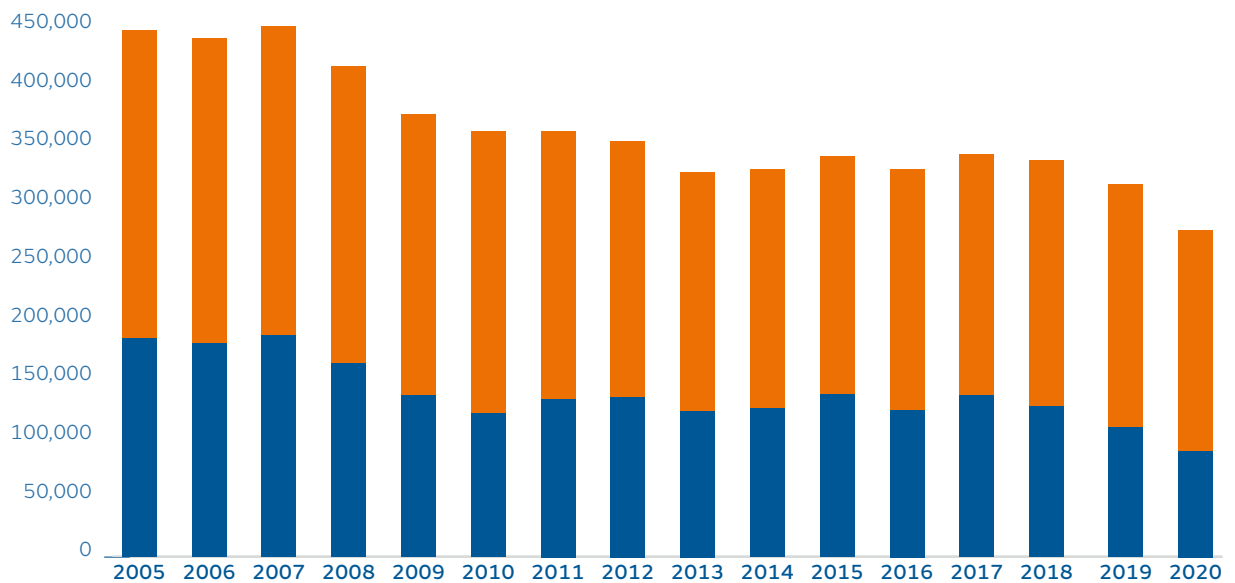


Source: MITECO.

<sup>(\*)</sup> Referred to as "Public production of electricity and heat" in the Spanish National Inventory.

Regarding those sectors governed by the EU ETS regime and the non-EU ETS (“diffuse”) sectors, while in 2005 the latter represented 58% of GHG emissions, by 2018 this figure had increased to 62%. In the opposite direction, emissions from activities covered by the EU ETS saw their share reduced from representing 42% of the national total in 2005 to just 32% in 2020.

Evolution of GHG emissions (kt CO<sub>2</sub>eq) of ETS sectors and non-EU ETS sectors, 2005-2020.



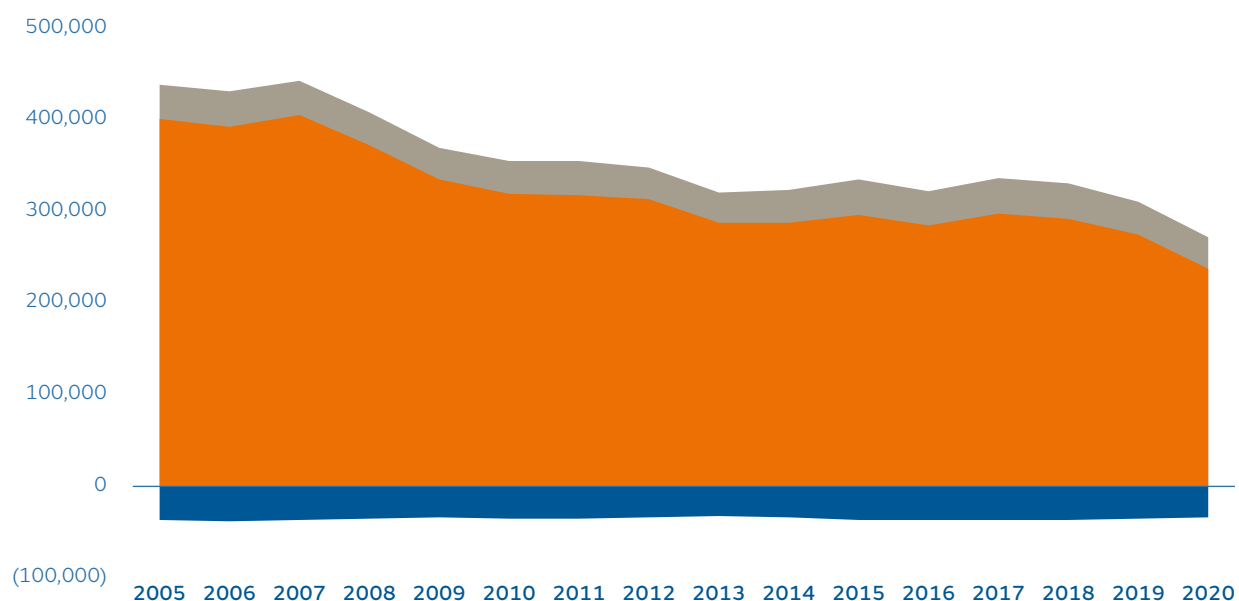
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
●	183,627	179,724	186,573	163,462	136,935	121,483	132,687	135,639	122,808	124,851	137,270	123,556	136,316	127,373	109,522	89,038
●	258,694	255,803	260,112	249,027	235,670	236,673	225,164	214,995	201,022	201,042	200,146	202,070	202,527	205,877	204,305	185,704

- ETS sectors
- Non-EU ETS sectors

Source: MITECO

A new introduction in this edition for 2005–2020 is the inclusion of chapters specifically devoted to the role of sequestration by the LULUCF sector (land use, land use change and forestry).

Evolution of LULUCF sector absorption (kt CO<sub>2</sub>eq), 2005–2020, with respect to total emissions.



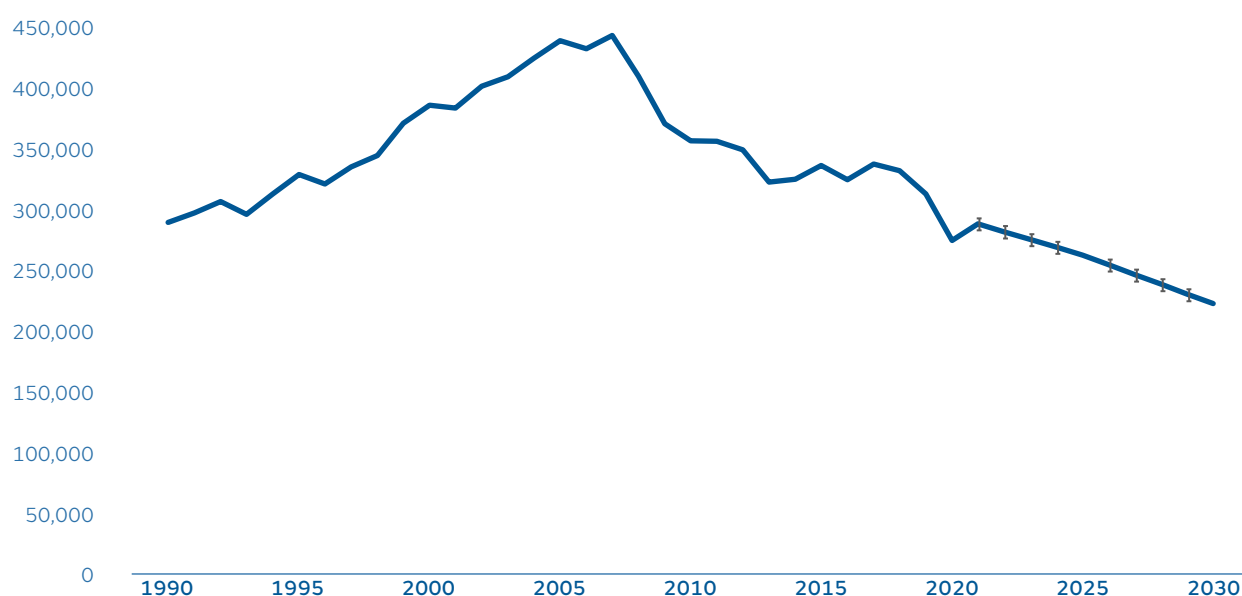
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
●	(37,641)	(39,655)	(37,398)	(37,053)	(34,508)	(36,725)	(36,664)	(34,682)	(33,579)	(35,540)	(37,968)	(37,849)	(38,092)	(38,148)	(37,105)	(35,549)
●	404,681	395,874	409,287	375,436	338,099	321,432	321,188	315,953	290,252	290,354	299,448	287,779	300,753	295,103	276,723	239,194
●	442,321	435,528	446,686	412,490	372,607	358,157	357,852	350,635	323,831	325,894	337,416	325,628	338,845	333,251	313,828	274,743

- LULUCF
- Total emissions (with LULUCF)
- Total emissions (without LULUCF)

Source: CRF 2022

The second new introduction in this edition is the presentation of a prospective exercise that includes a joint long-term vision that combines information on emissions from 1990 up until the objectives established in Spanish national regulations for 2030. In this way, an integrated vision is provided of the path followed by the Spanish national economy and its patterns of GHG emission over 40 years. This analysis highlights the objective of reducing total emissions by 23% with respect to 1990 levels: from 290 million tons of CO<sub>2</sub>eq emitted in 1990 to the target of 221 million tons of CO<sub>2</sub>eq set for 2030.

Total GHG emissions (kt CO<sub>2</sub>eq) corresponding to the Spanish economy for the period 1990-2030.



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	
●	290,104	297,817	307,440	296,865	313,889	330,045	322,247	336,505	345,924	372,916	
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
●	388,091	385,864	403,904	411,771	427,566	442,321	435,528	446,686	412,490	372,607	
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
●	358,157	357,852	350,635	323,831	325,894	337,416	325,628	338,845	333,251	313,828	
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
●	274,743	288,648	282,155	275,662	269,168	262,675	254,509	246,343	238,176	230,010	221,844

● Total CO<sub>2</sub> equivalent emissions. (Excluding LULUCF)

▭ Inferred values

Source: Our own, based on MITECO data

At a time when society as a whole is facing considerable challenges related to international agreements concerning climate change and also considering the objectives of the European Green Deal, Naturgy Foundation presents this publication<sup>1</sup> in order to offer information on greenhouse gas emissions in the different sectors of the Spanish economy in an understandable way.

<sup>(1)</sup> When producing this document, the original values have been rounded off as necessary to eliminate decimal places and in order to facilitate data understanding and handling by the reader. Due to this, minimal differences may occur at some points of the Study.





LIKEN CARBON HUB S.L. is a consulting company that works on climate change issues at a global scale, oriented towards providing services for private companies and public administrations, within the areas of:

- mitigation of greenhouse gas emissions,
- adaptation to the impact of climate change,
- climate regulation and financing, and
- the development of strategies and policies for both public administrations and private businesses aimed at decarbonisation and compliance with the Paris Agreement and the United Nations Framework Convention on Climate Change.

The LIKEN CARBON HUB team has extensive experience in strategic consulting as well as validation and verification of national and international projects, with a presence in four continents. More details at [www.likencarbon.com](http://www.likencarbon.com).

LIKEN CARBON HUB has been part of the World Bank's Article 6 of the Paris Agreement Advisory Group since May 2019.

