

# NATIONAL REPORT BY SPAIN

SEPTEMBER 2020

Enhanced Black Carbon and Methane  
Emissions Reductions

Arctic Council Framework for Action



# Report to the Arctic Council by Spain on emissions of black carbon and methane. 2020.

## 1 Introduction

The reduction of Black Carbon and Methane Emissions in the Arctic is of critical importance to tackle Climate change in this rapid changing region. Therefore, Spain acknowledges the Arctic Councils' initiatives on Black Carbon and Methane Emissions Reduction. As an Observer State, we are keen on enhancing multilateral cooperation on Arctic and international issues through the submission of this report.

This report contains the most actual data on emissions and emission projections which are consistent with the data submitted early this year to the European Commission (COM) and the United Nations Framework Convention on Climate Change and the United Nations Convention on Long-range Transboundary Air Pollution.

## 2 Black carbon emissions and future projections

The emissions of black carbon (BC) are submitted voluntarily in the framework of the Convention on Transboundary Air Pollution on Long Distances (CLRTAP) under the Economic Commission for Europe of the United Nations (UNECE). The calculation of the BC inventories is annually performed by the single national entity for emission inventories at the Spanish Ministry for Ecological Transition and Demographic Challenge (MITERD).

The detailed reported data are available at: <https://www.miteco.gob.es/es/calidad-y-evaluacion-ambiental/temas/sistema-espanol-de-inventario-sei/>

Spain reports Black Carbon (BC) emissions for all years since 2000 onwards. In 2018, it has been estimated that 34.94 kilotonnes of black carbon were emitted. The main source was open burning of agriculture residues (50.1% of the 2018 total BC emissions, and a 12.3% increase between 2000 and 2018), followed by residential stationary combustion (23.1% of the 2018 total BC emissions, and a 22.9% increase between 2000 and 2018).

Between 2000 and 2018 total black carbon emissions dropped by 23.2%, from 47.37 kt to 34.94 kt. The main drivers have been the transport emissions, with 26.4% of total 2000 emissions, and a 73.7% reduction between 2000 and 2018.

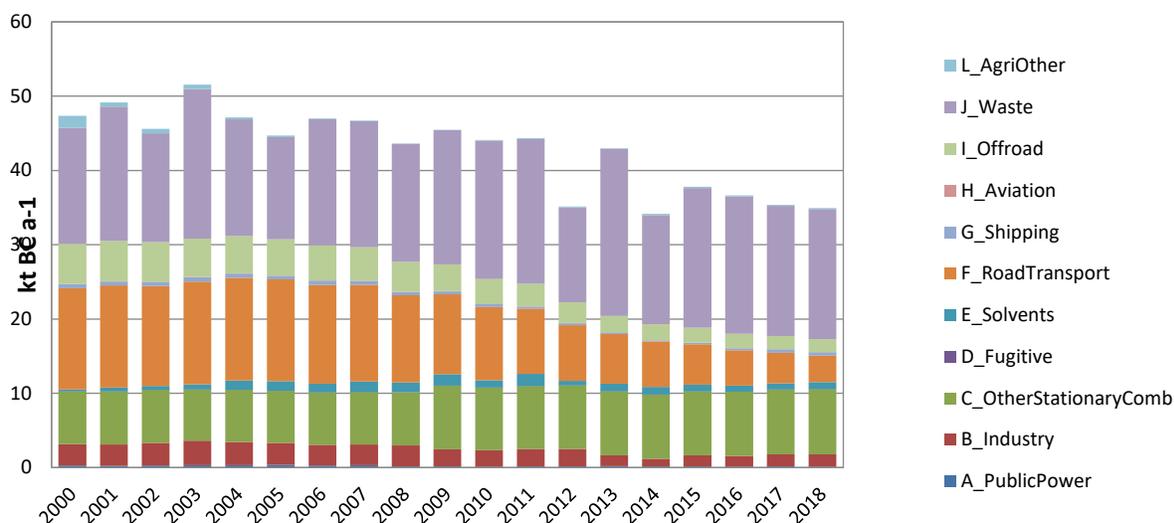


Figure 1. Historical emissions in 2000-2018 of black carbon in Spain split by aggregated sectors.

Currently there is no projection available for the Spanish black carbon emissions. However, the Spanish IIR 2020 does contain emission projections for PM<sub>2.5</sub>. This provides an indication of future BC emissions. Latest PM<sub>2.5</sub> projections (2019) cover the period 2017-2040 and are built upon inventory data from 1990 to 2016 (reported in 2018). International aviation and navigation are also covered as memo items.

In the scenario with existing measures, the emissions projections underpin and are totally coherent with the [Spanish National Air Pollution Control Programme](#) (NAPCC) to be issued by October 2019. PM<sub>2.5</sub> emissions are expected to decrease by approximately 14% in 2030 and by 22% in 2040 compared to 2015 levels.

The projections of emissions in the scenario with additional measures contemplated in the framework of the [Integrated National Energy and Climate Plan](#) (PNIEC) and the PNCCA show a steeper downward trend. The PM<sub>2.5</sub> emissions are expected to decrease by approximately 39% in 2030 and by 44% in 2040 compared to 2015 levels. This downward trend would be directly linked to the impact of the additional energy measures included in the PNIEC.

### 3 Methane emissions and future projections

Methane emissions here reported have been submitted to the UNFCCC in March 2020. Methodologies, parameters and used emission factors are presented in the last National Inventory Report (NIR) available here: <https://unfccc.int/ghg-inventories-annex-i-parties/2020>

The major emitting sources in Spain are animal husbandry in agriculture (61.6% of total CH<sub>4</sub> emissions in 2018) and waste landfilling (25.0% of total CH<sub>4</sub> emissions in 2018).

National total methane emissions have increased by 11.6 % since 1990, although they have been reduced by 1.98% since 2010. This trend has mainly been the result of the variations of emissions of enteric fermentation and managed waste disposal sites.

The emissions of CH<sub>4</sub> from enteric fermentation have varied from 637.5 kt CH<sub>4</sub> in 1990 to 715.1 kt CH<sub>4</sub> in 2010 and 706.8 kt CH<sub>4</sub> in 2018, mainly due to the increase of livestock populations, particularly non-dairy cattle.

The emissions of CH<sub>4</sub> from managed waste disposal sites have varied from 172.9 kt CH<sub>4</sub> in 1990 to 385.6 kt CH<sub>4</sub> in 2010 and 374.0 kt CH<sub>4</sub> in 2018. This upwards trend since 1990 is due to the increment in urban waste treated, despite the increase on the total amount of CH<sub>4</sub> that is captured in recent years and that, therefore, is not emitted directly into the atmosphere.

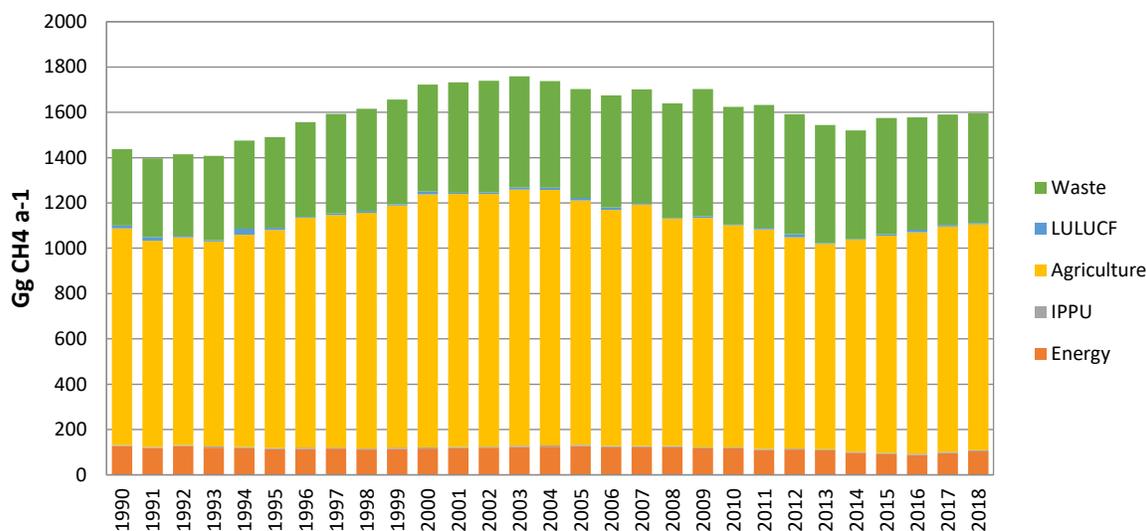


Figure2. Methane emissions in 1990-2018 in Spain by aggregated sector.

Latest edition of the of greenhouse gases emissions projections (2019) submitted by Spain according to reporting obligation (art 14 MMR regulation 525/2013/EU) covers the period 2017-2040 and is built upon inventory data from 1990 to 2016 (reported in 2018). International aviation and navigation are also covered as memo items.

Emissions from the energy sectors, both derived from combustion (NFR 1A), and fugitive emissions (NFR 1B), as well as emissions derived from industrial processes (NFR 2A, B and C) have been built upon the activity variables projected as a result of the scenarios generated by the TIMES-Synergy model. In a complementary manner, emissions from the rest of the non-energy sectors (agriculture, waste and use of products) and emissions and removals linked to land use, changes in land use and forests (LULUCF) have been projected, case by case, according to national forecasts of the main activity variables representative of each sector.

Two scenarios have been considered in the emissions projections, one in which the impact of the existing policies and regulation is foreseen (scenario with WeM measures) and a second scenario including the foreseeable impact on the emissions of the measures and policies considered in the Integrated National Energy and Climate Plan (PNIEC) and in the National Air Pollution Control Program (scenario with additional measures-WaM).

In the scenario with existing measures, the emissions projections underpin and are totally coherent with the Spanish National Air Pollution Control Programme (NAPCC) although in this Programme there aren't quantified reductions of emissions of CH<sub>4</sub>. CH<sub>4</sub> emissions are expected to decrease to approximately 10% in 2030 and 16% in 2040 compared to 2015 levels.

The projections of emissions in the scenario with additional measures contemplated in the framework of the Integrated National Energy and Climate Plan and the NAPCC show a steeper downward trend. The CH<sub>4</sub> emissions are expected to decrease to approximately 26% in 2030 and 37% in 2040 compared to 2015 levels. This downward trend would be directly linked to the impact of the additional energy measures included in the PNIEC.

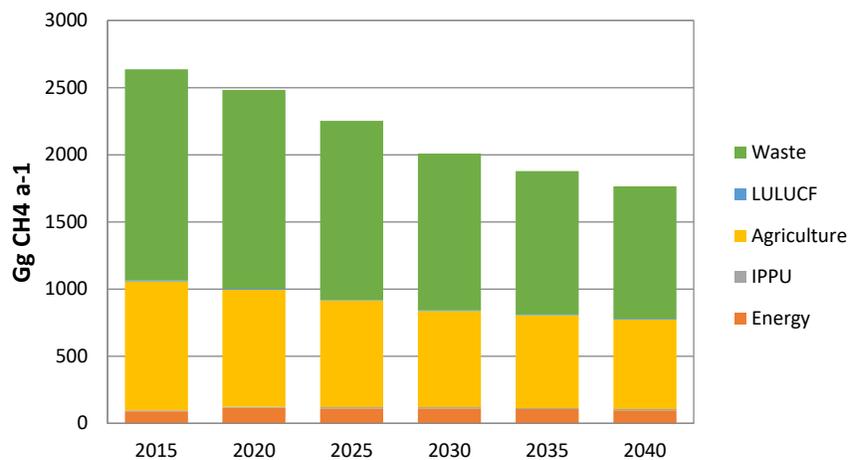


Figure 3. Methane emissions in 2015 (UNFCCC emission inventory) and projection of methane emissions for 2020-2040 following the WaM scenario of Integrated National Energy and Climate Plan (PNIEC).

## 4 National strategies and action plans

### 4.1 Short overview on governance structure regarding BC and methane

The Air Convention on Long-Range Transboundary Air Pollution (CLRTAP) was signed in Geneva in 1979, within the framework of the United Nations Economic Commission for Europe (UNECE), and entered into force in 1983. The Convention establishes a framework for intergovernmental cooperation to protect human health and the environment from air pollution that may affect several countries. Such cooperation concerns the development of appropriate policies, the exchange of information, the conduct of research and the implementation and development of a cooperative programme for monitoring and evaluation of the long range transmission or air pollutants in Europe. Signatory Parties undertake to limit, prevent and gradually reduce emissions of air pollutants, thus tackling transboundary air pollution.

The Gothenburg Protocol is one of the eight protocols under the CLRTAP and it aims to control and reduce emissions of SO<sub>2</sub>, NO<sub>x</sub>, NMVOC, NH<sub>3</sub> and particulate matter PM<sub>2.5</sub> including black carbon (PM<sub>2.5</sub> including black carbon were included after the Protocol revision in 2012). Spain ratified the CLRTAP in 1982 and the Gothenburg Protocol in 2005. The revised protocol was ratified by the European Union in 2017 by Council Decision (EU) 2017/1757 of 17 July and also ratified by Spain in December 2017, entering into force on 7 October 2019.

The Spanish National Focal Point for CLRTAP is the Ministry for Ecological Transition and Demographic Challenge (MITERD). Main obligations under the Gothenburg Protocol and the subsequent EU legislation<sup>1</sup> include commitments on national emission ceilings, emission limit values for large installations, limit values for pollutant content in products and compliance with emission control measures. These obligations are promoted, monitored and assessed by the General Sub-Directorate of Clean Air and Industrial Sustainability of the MITERD.

Governance Structure regarding BC and Methane:

- The calculation of the BC inventories is annually performed by the Single national entity for emission inventories at the Spanish Ministry for Ecological Transition and Demographic Challenge (MITERD):

<https://www.miteco.gob.es/es/calidad-y-evaluacion-ambiental/temas/sistema-espanol-de-inventario-sei/>

- Spanish National Air Pollution Control Programme (PNCCA)

#### 4.2 National action plans

Royal Decree 818/2018 transposed EU Directive 2016/2284 on the reduction of national emissions of certain air pollutants (Ceilings Directive) into the Spanish legal system. According to it, main instruments for governance are national air pollution control programmes (NAPCC). These programmes aim to ensure that emission reduction commitments for 2020 and 2030 are met.

The first National Air Pollution Control Programme in Spain was approved in September 2019 and it establishes packages of measures aiming to achieve reduction commitments for SO<sub>2</sub>, NO<sub>x</sub>, NH<sub>3</sub>, NMVOC and PM<sub>2.5</sub> in Spain. NAPCC does not include specific measures for black carbon but it contains packages of measures to control and reduce PM<sub>2.5</sub> emissions.

It has been estimated that a 50% reduction of PM<sub>2.5</sub> by 2030 compared to base year 2005 could be achieved with additional measures contained in the NAPCC (compared to “with existing measures” scenery). One of the current challenges Spain is facing is the conjugation of commitments for PM<sub>2.5</sub> reduction with renewable energies commitments, in which biomass burning may imply an increase of PM<sub>2.5</sub>.

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<sup>1</sup>EU Directive 2016/2284 of 14 December 2016 on the reduction of national emissions of certain air pollutants (Ceilings Directive), transposes the 2020 reduction commitments made by the EU and its Member States under the Gothenburg Protocol and sets out more ambitious reduction commitments from 2030.

Spanish main mitigation measures and policies are those considered in the Integrated National Energy and Climate Plan, (PNIEC). This Plan deals with those actions required to contribute to the European objective with a reduction in greenhouse gases of at least 23% by 2030 compared to 1990 levels.

#### **BC emissions:**

Regarding BC, the main measures contained in PNIEC aiming at its reduction, are the following:

**i. Agriculture:** Measures aimed at reducing stubble burning will be adopted with the aim of reducing the harmful health effects of particulate emissions. First of all, the use of woody pruning waste as biomass planned at PNIEC involves the use of this material as biomass by cogeneration companies (electricity uses) or in the production of pellets (thermal uses), which will both substitute the use of fossil fuels. In this way, BC, CH<sub>4</sub> and N<sub>2</sub>O emissions caused by burning woody pruning waste will be reduced. As olive oil and wine production are the most extended in Spain, olive and vineyards are being given prime consideration, considering the large size of their growing areas and the size and volume of pruning waste they produce. The extension of this measure to other crops will also be examined, taking into account their different uses, as soil organic carbon amendments or for its use as biomass. Besides, the contribution of this measure to a significant reduction in air particulates will be a solid input to the National Air Pollution Control Programme.

Another measure that has been included in PNIEC related to agriculture is the improve in energy efficiency in farms, irrigation communities and agricultural machinery: The measure aims to reduce the consumption of energy on farms, in irrigation communities and agricultural machinery through the modernisation of existing facilities and upgrading of machinery and/or replacement of tractors and seeding machines. The measures will be implemented in synergy with those aimed at the promotion of renewables in this sector — in this last case, giving continuity to the PIMA TIERRA Plan, launched in 2014, which has enabled improvement in the energy ratings of tractors and agricultural machinery (following the methodology developed by the Agricultural Mechanics Section and the IDAE).

**ii. Residential stationary combustion:** The measure included at the PNIEC consists on an improve in energy efficiency in existing buildings in the residential sector. First, this measure will contribute to reduce the energy consumption of existing residential buildings used for housing through energy upgrade activities. The upgrade should enable the building's energy rating to be improved. This measure must be entirely consistent with the Long-term building renovation strategy, developed by the Ministry of Transport, Mobility and Urban Agenda, MITMA and the State Housing Plan, which is the basic tool for promoting urban and rural regeneration and renewal that has been implemented in collaboration with the autonomous communities. This Plan prioritises investment in the thermal envelope (facades, roofs and walls) with regard to improving the thermal installations, considering that the reduction in thermal demand should first be addressed in order to avoid heating and/or air-conditioning oversized equipments.

Services sector buildings are also targeted by this measure, that aims to reduce the energy consumption in existing buildings used for services, owned publicly or privately, through energy upgrade activities that will improve their energy rating.

As fossil fuels are the most commonly used nowadays, all this efficiency gains will bring a solid BC reduction.

**iii. Transport/mobility** will make a decisive contribution to the decarbonisation of the economy envisaged in PNIEC. This sector, after the electricity sector, will mitigate greenhouse gas emissions to the greatest extent, as well as BC. As a consequence of the generalised implementation from 2023 of central zones ('almendras' or 'almonds') in Spanish cities with more than 50,000 inhabitants – access to which will be restricted for the most polluting vehicles – it is intended to achieve a modal shift affecting 35% of the passenger-kilometres currently travelled in conventional vehicles.

The BC emissions decrease will be brought by the combination of low-emission zones and modal shift measures, a more efficient use of the means of transport, the renewal of the vehicle fleet and the promotion of electric vehicles.

#### **Methane:**

By 2030, Spain must reduce its greenhouse gas emissions in non-ETS sectors by 26% compared to 2005. The non ETS sectors will have to contribute a reduction of approximately 39% compared to 2005 levels through the measures proposed in PNIEC. Within this group, those related to methane emissions as waste management and farming sectors (non-energy non-ETS) will contribute with reductions of approximately 28% and 18% respectively, compared to 2005 levels, by the implementation of the following measures contained in PNIEC:

##### **i. Cattle:**

***Frequent emptying of slurry from pig housing.*** This measure involves frequently emptying the pits under the pens at pig facilities. Frequent emptying means emptying them at least once a month. The technique referred to involves clearing the pits at the end of the period or when they are full. This measure reduces NH<sub>3</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions. These improvements in the management of manure and slurry at housing for different categories of pigs and cattle will reduce the emissions produced inside the housing.

***Covering slurry ponds.*** This measure involves covering slurry ponds at new pig and cattle facilities. The quantity of methane generated by a specific manure management system is affected by the degree to which anaerobic conditions are present, the temperature of the system and the time that the organic matter is kept.

***Solid-liquid separation of slurry:*** In this case, the measure proposed involves the solid-liquid separation of slurry, with the solids being stored and the liquid fraction being emptied into uncovered anaerobic ponds in areas with a high concentration of livestock (pig and cattle). This liquid part will be used for irrigation, making use of its value as a fertiliser. In addition to enabling better management of manure, solid-liquid separation will facilitate subsequent processing and reduce greenhouse gas emissions. Storing the solid fraction has a lower methane conversion factor (MCF) than storing the liquid slurry, and the liquid fraction obtained has a lower volatile solids content compared with the original material which means that methane emissions are reduced.

**ii. Waste management:** There are several actions identified for the waste sector, the one mainly affecting methane emissions consists on the management of biogas leaks from enclosed landfill: For a significant part of its history, waste management in Spain has consisted of landfilling. Consequently, there is a significant inventory of landfill sites that have been enclosed in accordance with legislation, but at which there are still a considerable number of biogas leaks. In these cases, the plan is to cover the surface of the landfill sites with an oxidising layer that contains methanotrophic bacteria able to oxidise the methane

that passes through the layer. There are currently several methods that can be adapted to the characteristics of the targeted landfill sites. This measure involves applying oxidising layers to the surface of the landfill sites, with the oxidation ratio by area estimated, conservatively, on the basis of studies and projects on the subject.

## 5 International work

The Gothenburg Protocol is being currently under review. Potential elements of the Gothenburg Protocol review regarding black carbon that could be considered is the evaluation of mitigation measures for BC emissions.

## 6 Sector based plans and projects

The national air pollution control programme (NAPCC) establishes packages of measures with sector based measures. It has been estimated that, some of these packages shall imply reductions in PM<sub>2.5</sub> emissions by 2030 compared to 2005 emissions when comparing “With Additional Measures” scenery with “With Existing Measures” scenery. Measures contained in these packages are listed hereafter.

### 6.1 Mobile and stationary sources

#### 6.1.1 Specific national strategies

NAPCC measures for mobile and stationary sources with joint estimations of reductions in PM<sub>2.5</sub>:

Measure code	Name of measure
T.1.1.	Introduction of advanced biofuels in transport
T.1.2	Modal change (promotion of more efficient modes)
T.1.3	More efficient use of transport modes
T.1.4.	Car fleet renovation
T.1.5	Promotion of the electric vehicle
T.1.6	Recharge points for alternative fuels

## 6.2 Residential combustion (3a -3c)

NAPCC measures for residential combustion with joint estimations of reductions in PM<sub>2.5</sub>:

Measure code	Name of measure
EE.1.1	Promotion of the integration of thermal renewables in the building sector
EE.1.2	Support programs for installations in buildings or heating networks
EE.1.3	Promotion of energy efficiency in the residential sector
EE.1.4.	Residential equipment renovation
EE.1.5	Promotion of energy efficiency in the building of the tertiary and public sector
EE.1.6	Improvement of energy efficiency in large installations in the tertiary sector and public infrastructure
EE.1.7	Improvement of energy efficiency in farms, irrigation communities and agricultural machinery

The PNCAA also contains the following measure whose expected reductions of PM<sub>2.5</sub> have not been quantified:

Measure code	Name of measure
O.1.1.	Fine particle emission reduction from wood burning in fireplaces and stoves in rural areas

## 6.3 Agriculture and animal husbandry (5a-5c)

Measures contained in the NAPCC in the agricultural sector and also related to wildfire management with joint expected reductions of PM<sub>2.5</sub> are:

Measure code	Name of measure
A.2.1.	Reduction of the burning of pruning remains in the field: Reduce burning pruning remains that would be incorporated into the soil / recovery in vineyards and fruit trees
A.2.2.	Reduction of the burning of pruning remains: Reduce the burning of pruning remains in olive groves

## 7 Annexes

### Annex 1: Black carbon emission tables

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
A_PublicPower	0.27	0.25	0.29	0.34	0.34	0.36	0.28	0.31	0.17	0.16	0.11	0.14	0.14	0.18	0.17	0.16	0.13	0.16	0.13
B_Industry	2.86	2.87	3.05	3.27	3.13	2.98	2.78	2.79	2.83	2.30	2.23	2.38	2.35	1.48	1.01	1.49	1.42	1.62	1.65
C_OtherStationaryComb	7.13	7.12	7.13	6.89	6.99	7.01	7.06	7.07	7.16	8.56	8.45	8.46	8.57	8.62	8.67	8.61	8.68	8.74	8.77
D_Fugitive	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E_Solvents	0.27	0.51	0.52	0.70	1.28	1.29	1.18	1.43	1.33	1.57	0.97	1.64	0.61	1.02	1.02	0.90	0.78	0.82	0.94
F_RoadTransport	13.62	13.76	13.45	13.83	13.83	13.68	13.27	13.03	11.71	10.74	9.87	8.76	7.49	6.70	6.13	5.45	4.79	4.13	3.58
G_Shipping	0.55	0.54	0.55	0.61	0.54	0.49	0.60	0.51	0.46	0.38	0.35	0.28	0.28	0.19	0.12	0.15	0.24	0.44	0.45
H_Aviation	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.03
I_Offroad	5.43	5.42	5.32	5.13	5.01	4.88	4.74	4.48	4.03	3.63	3.35	3.07	2.76	2.22	2.17	2.03	1.92	1.78	1.75
J_Waste	15.59	18.09	14.65	20.12	15.75	13.74	16.98	16.96	15.87	18.05	18.67	19.48	12.79	22.49	14.66	18.78	18.51	17.50	17.50
L_AgriOther	1.64	0.55	0.60	0.60	0.26	0.23	0.11	0.10	0.06	0.06	0.07	0.13	0.11	0.09	0.17	0.17	0.12	0.14	0.14
<b>Grand Total</b>	<b>47.37</b>	<b>49.14</b>	<b>45.58</b>	<b>51.53</b>	<b>47.15</b>	<b>44.70</b>	<b>47.03</b>	<b>46.70</b>	<b>43.64</b>	<b>45.47</b>	<b>44.11</b>	<b>44.37</b>	<b>35.13</b>	<b>43.00</b>	<b>34.14</b>	<b>37.78</b>	<b>36.62</b>	<b>35.35</b>	<b>34.94</b>

### Annex 2: Methane emission table

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2020 (WaM)	2030 (WaM)
Energy	116.9	109.0	111.1	109.0	97.0	90.4	87.9	95.7	103.4	115.0	111.9
Industrial Processes	5.1	5.0	4.4	4.2	5.1	5.4	5.4	5.4	5.4	7.7	7.8
Agriculture	979.6	969.4	933.2	905.4	934.6	960.0	977.5	995.5	996.6	871.9	715.6
Land Use, Land-Use Change and Forestry	3.5	6.4	13.9	4.0	3.1	7.2	11.7	6.6	6.6	6.5	6.5
Waste	519.5	542.1	529.0	521.0	479.6	511.8	495.1	486.8	483.5	480.8	325.5
<b>Total</b>	<b>1621.0</b>	<b>1625.6</b>	<b>1577.7</b>	<b>1539.6</b>	<b>1516.3</b>	<b>1567.6</b>	<b>1566.0</b>	<b>1583.4</b>	<b>1588.9</b>	<b>1481.9</b>	<b>1167.2</b>
<b>Total (without LULUCF)</b>	<b>1624.5</b>	<b>1632.0</b>	<b>1591.5</b>	<b>1543.6</b>	<b>1519.5</b>	<b>1574.8</b>	<b>1577.7</b>	<b>1590.0</b>	<b>1590.0</b>	<b>1475.4</b>	<b>1160.7</b>