Emissions trends and drivers: sectoral trends

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# Summary

This document provides an overview and breakdown of emissions trends by IPCC chapter. We have compiled a consistent allocation of emissions categories to sectors using the EDGAR emissions database. We propose to use this allocation and the following figures across the main sectoral chapters of AR6.

The following supporting information is available online:

* our code in R
* the sector categorisations
* the figure files
* the data files for each figure
* this document and any updates

Please find these at: <https://github.com/mcc-apsis/AR6-Emissions-trends-and-drivers>

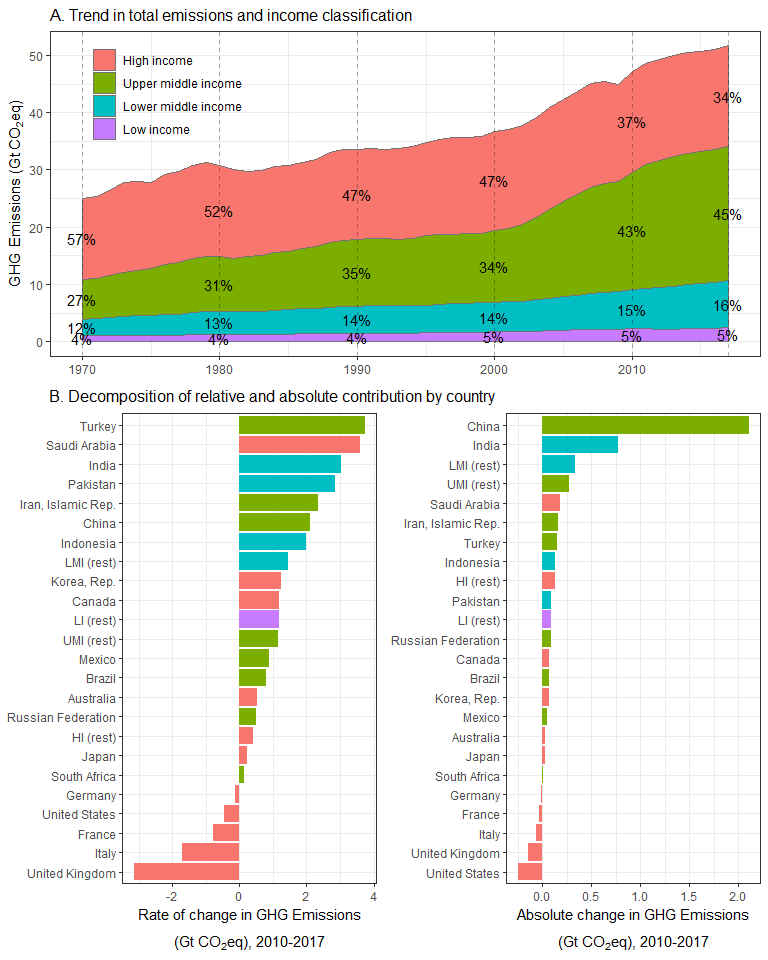
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**Author information**

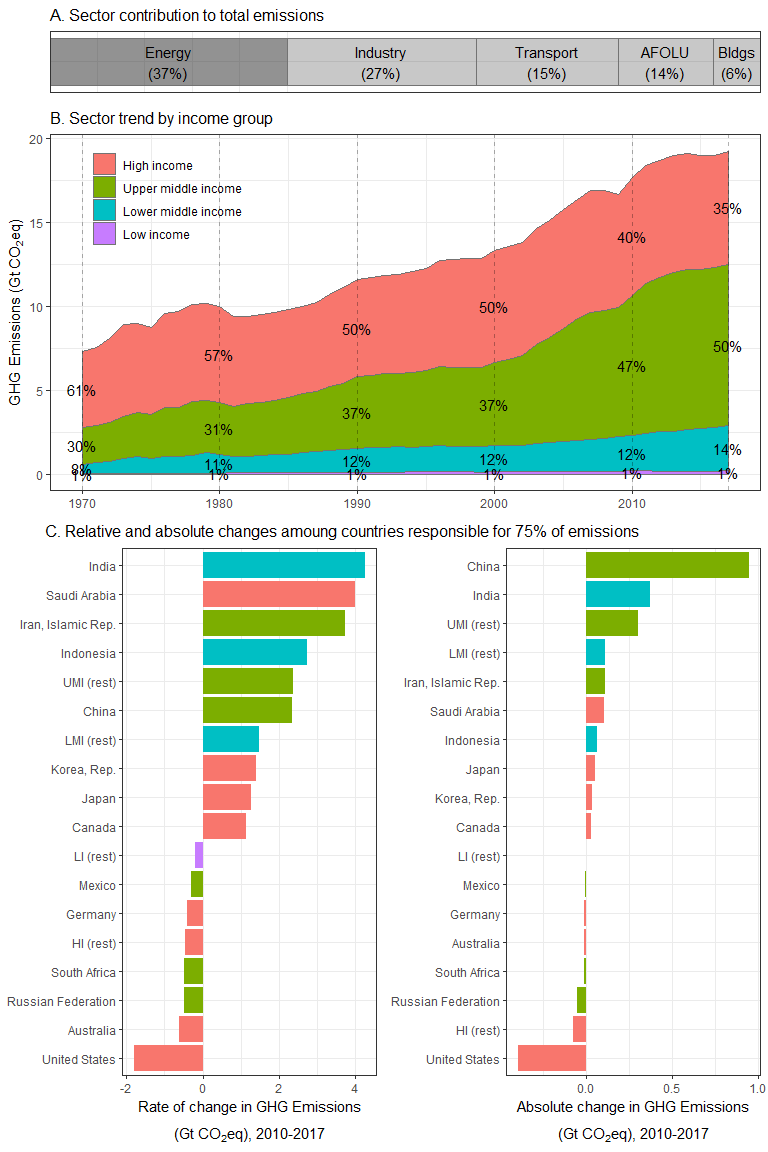
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# 1. All sectors



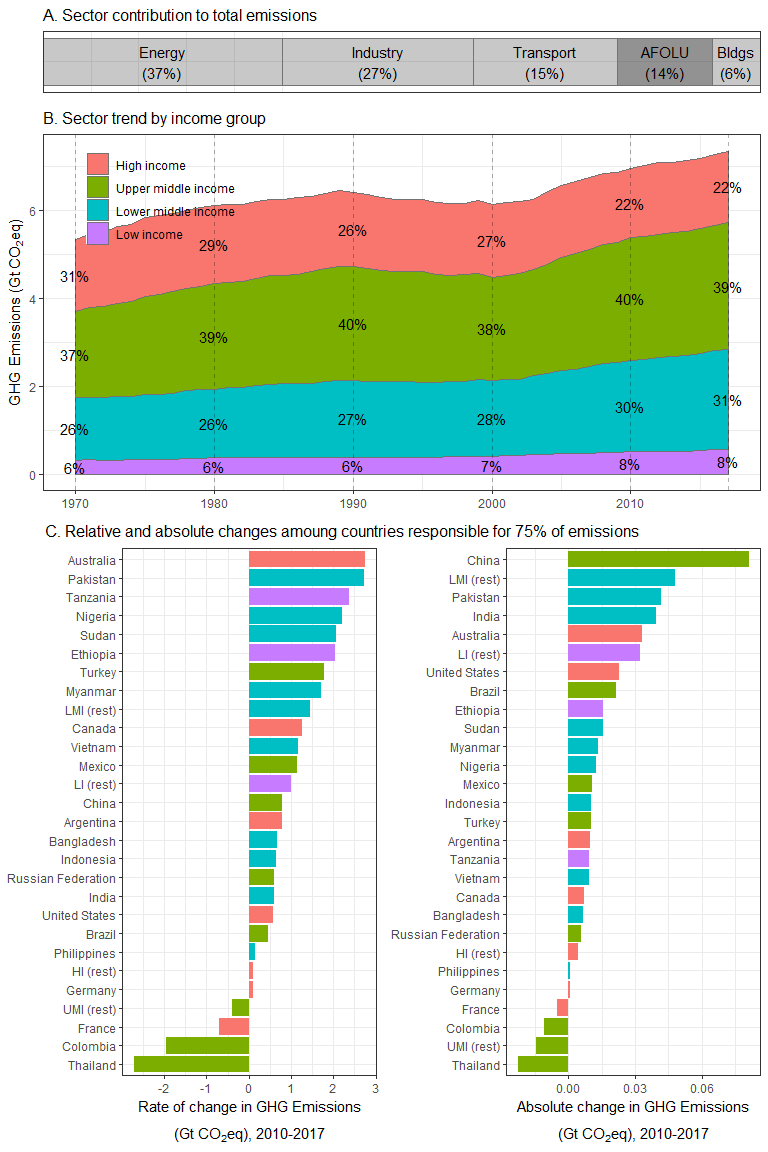
# 2. Energy systems (Ch.6)



Energy systems emissions were 19.28Gt CO2 in 2017, 37.33% of total GHG emissions from all sectors. Energy systems emissions have grown by 163.62% between 1970 and 2017.

| chapter | sector\_code | description |
| --- | --- | --- |
| 6 | 1A1a1 | Public Electricity Generation |
| 6 | 1A1a2 | Public Combined Heat and Power gen. |
| 6 | 1A1a3 | Public Heat Plants |
| 6 | 1A1a4 | Public Electricity Generation (own use) |
| 6 | 1A1a5 | Electricity Generation (autoproducers) |
| 6 | 1A1a6 | Combined Heat and Power gen. (autoprod.) |
| 6 | 1A1a7 | Heat Plants (autoproducers) |
| 6 | 1A1b | Refineries |
| 6 | 1A1c3 | Gas works |
| 6 | 1A1c5 | Other transformation sector (BKB, etc.) |
| 6 | 1B1b2 | Fuel transformation in gas works |
| 6 | 1B1b4 | Fuel transformation of solid fuels (BKB Plants, coal liquefaction, patent fuel plants) |
| 6 | 1B2a1 | Oil production |
| 6 | 1B2a2 | Oil transmission |
| 6 | 1B2a4-t | Transport by oil trucks |
| 6 | 1B2b5 | Fuel transformation of gaseous fuels (GTL, Blend, (re-)gasif./Liquef., NSF) |
| 6 | 1B2c | Venting and flaring during oil and gas production |
| 6 | 7A1 | Coal fires (underground) |
| 6 | 7A2 | Oil fires (Kuwait) |
| 6 | 1A1ax1 | Public Electricity Generation (biomass) |
| 6 | 1A1ax2 | Public Combined Heat and Power gen. (biom.) |
| 6 | 1A1ax3 | Public Heat Plants (biomass) |
| 6 | 1A1ax4 | Public Electricity Gen. (own use) (biom.) |
| 6 | 1A1ax5 | Electricity Generation (autoproducers) (biom.) |
| 6 | 1A1ax6 | Combined Heat and Power gen. (autopr.) (biom.) |
| 6 | 1A1ax7 | Heat Plants (autoproducers) (biomass) |
| 6 | 1A1bx | Refineries (biomass) |
| 6 | 1A1cx3 | Gas works (biom.) |
| 6 | 1A1cx4 | Fuel comb. charcoal production (biom.) |
| 6 | 1A1cx5 | Other transf. sector (BKB, etc.) (biom.) |
| 6 | 1B1a1 | Hard coal mining (gross) |
| 6 | 1B1a1r | Methane recovery from coal mining |
| 6 | 1B1a2 | Abandoned mines |
| 6 | 1B1a3 | Brown coal mining |
| 6 | 1B1b3x | Fuel transformation charcoal production |
| 6 | 1B2a1x | Oil production |
| 6 | 1B2a3-l | Tanker loading |
| 6 | 1B2a4-l | Tanker oil transport (crude and NGL) |
| 6 | 1B2a5(e) | Oil refineries (evaporation) |
| 6 | 1B2b1 | Gas production |
| 6 | 1B2b3 | Gas transmission |
| 6 | 1B2b4 | Gas distribution |
| 6 | 7B1 | Indirect N2O from NOx emitted in cat. 1A |
| 6 | 7C1 | Indirect N2O from NH3 emitted in cat. 1A |
| 6 | 2F8b | Electrical Equipment Use (incl. site inst.) |

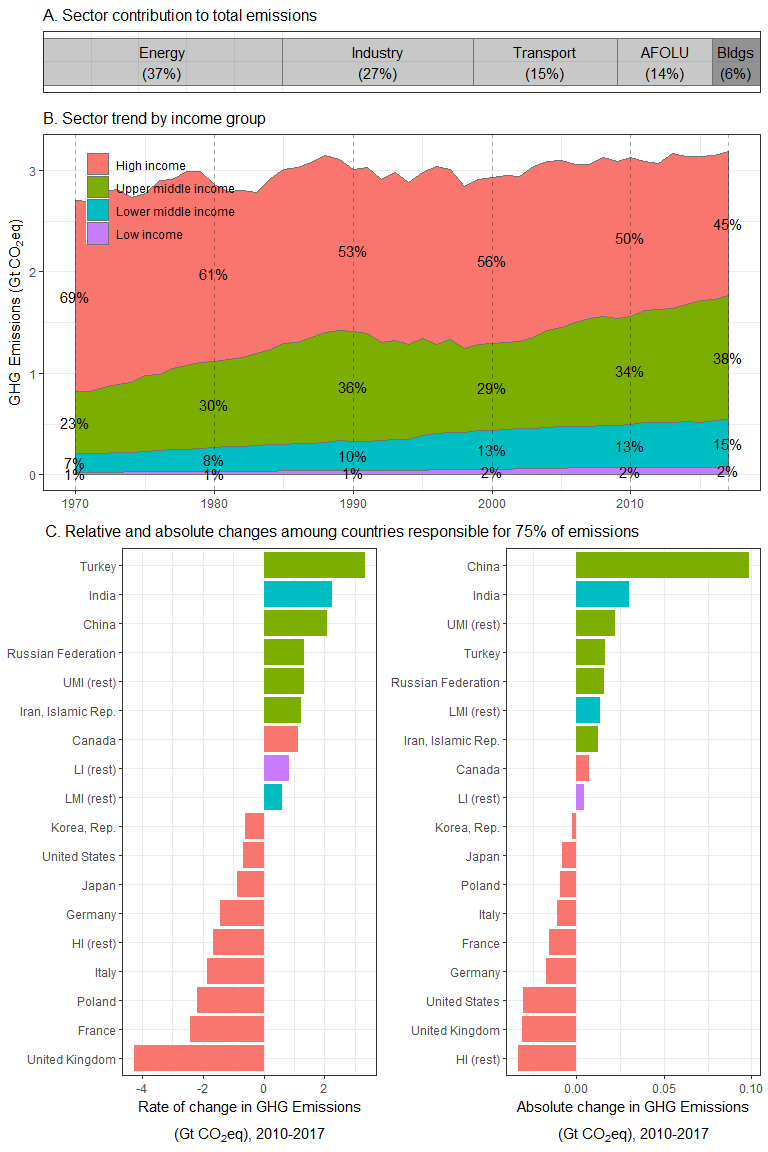
# 2. AFOLU (Ch.7)



AFOLU emissions were 7.36Gt CO2 in 2017, 14.25% of total GHG emissions from all sectors. AFOLU emissions have grown by 37.34% between 1970 and 2017.

| chapter | sector\_code | description |
| --- | --- | --- |
| 7 | 1A4c1 | Agriculture and forestry (fos.) |
| 7 | 1A4c2 | Off-road machinery: agric./for. (diesel) |
| 7 | 1A4c3 | Fishing (fos.) |
| 7 | 1A4d | Non-specified other (fos.) |
| 7 | 1A5b1 | Off-road machinery: mining (diesel) |
| 7 | 4D4a | CO2 from urea application |
| 7 | 4D4b | CO2 from agricultural lime application |
| 7 | 1A4c1x | Agriculture and forestry (biom.) |
| 7 | 1A4c3x | Fishing (biom.) |
| 7 | 1A4dx | Non-specified other (biom.) |
| 7 | 4A1-d | Dairy cattle |
| 7 | 4A1-n | Non-dairy cattle |
| 7 | 4A2 | Buffalo |
| 7 | 4A3 | Sheep |
| 7 | 4A4 | Goats |
| 7 | 4A5 | Camels and Lamas |
| 7 | 4A6 | Horses |
| 7 | 4A7 | Mules and asses |
| 7 | 4A8 | Swine |
| 7 | 4B1-d | Manure Man.: Dairy Cattle (confined) |
| 7 | 4B1-n | Manure Man.: Non-Dairy Cattle (confined) |
| 7 | 4B2 | Manure Man.: Buffalo (confined) |
| 7 | 4B3 | Manure Man.: Sheep (confined) |
| 7 | 4B4 | Manure Man.: Goats (confined) |
| 7 | 4B5 | Manure Man.: Camels and llamas (confined) |
| 7 | 4B6 | Manure Man.: Horses (confined) |
| 7 | 4B7 | Manure Man.: Mules and asses (confined) |
| 7 | 4B8 | Manure Man.: Swine (confined) |
| 7 | 4B9 | Manure Man.: Poultry (confined) |
| 7 | 4C | Rice cultivation |
| 7 | 4E | Savannah fires |
| 7 | 4F1 | Field burning of agric. res.: cereals |
| 7 | 4F2 | Field burning of agric. res.: pulses |
| 7 | 4F3 | Field burning of agric. res.: tuber and roots |
| 7 | 4F4 | Field burning of agric. res.: sugar cane |
| 7 | 4F5 | Field burning of agric. res.: other |
| 7 | 4D11 | Synthetic Fertilizers |
| 7 | 4D12 | Animal Manure Applied to Soils |
| 7 | 4D13 | N-fixing crops |
| 7 | 4D14 | Crop Residue |
| 7 | 4D15 | Cultivation of Histosols |
| 7 | 4D2 | Pasture, Range and Paddock Manure |
| 7 | 4D3a | Indirect N2O: Atm. Depos. - agricult. (4D) |
| 7 | 4D3b | Indirect N2O: Leaching and Run-Off - agri. |

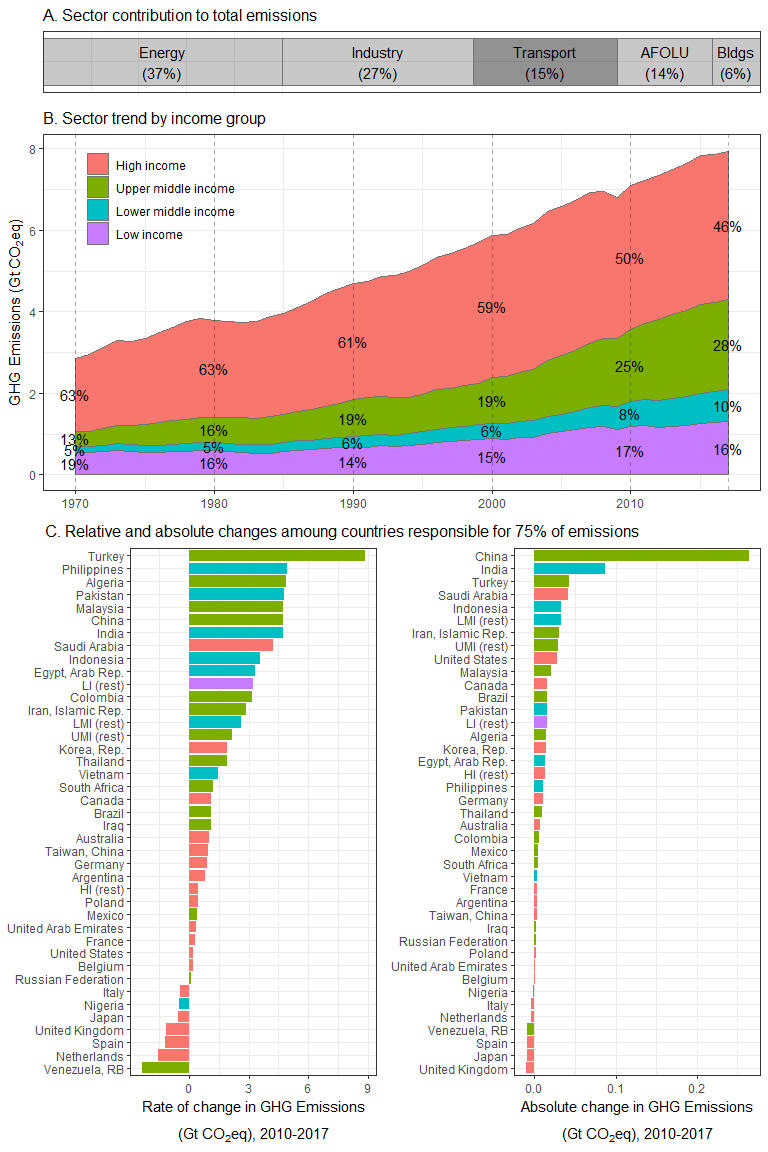
# 4. Buildings (Ch.9)



Buildings emissions were 3.19Gt CO2 in 2017, 6.18% of total GHG emissions from all sectors. Buildings emissions have grown by 18.23% between 1970 and 2017.

| chapter | sector\_code | description |
| --- | --- | --- |
| 9 | 1A4a | Commercial and public services (fos.) |
| 9 | 1A4b | Residential (fos.) |
| 9 | 1A4ax | Commercial and public services (biom.) |
| 9 | 1A4bx | Residential (biom.) |
| 9 | 2F4 | Aerosols |
| 9 | 2F3 | Fire Extinguishers |
| 9 | 2F9a | Adiabatic prop.: shoes and others |
| 9 | 2F9c | Soundproof windows |

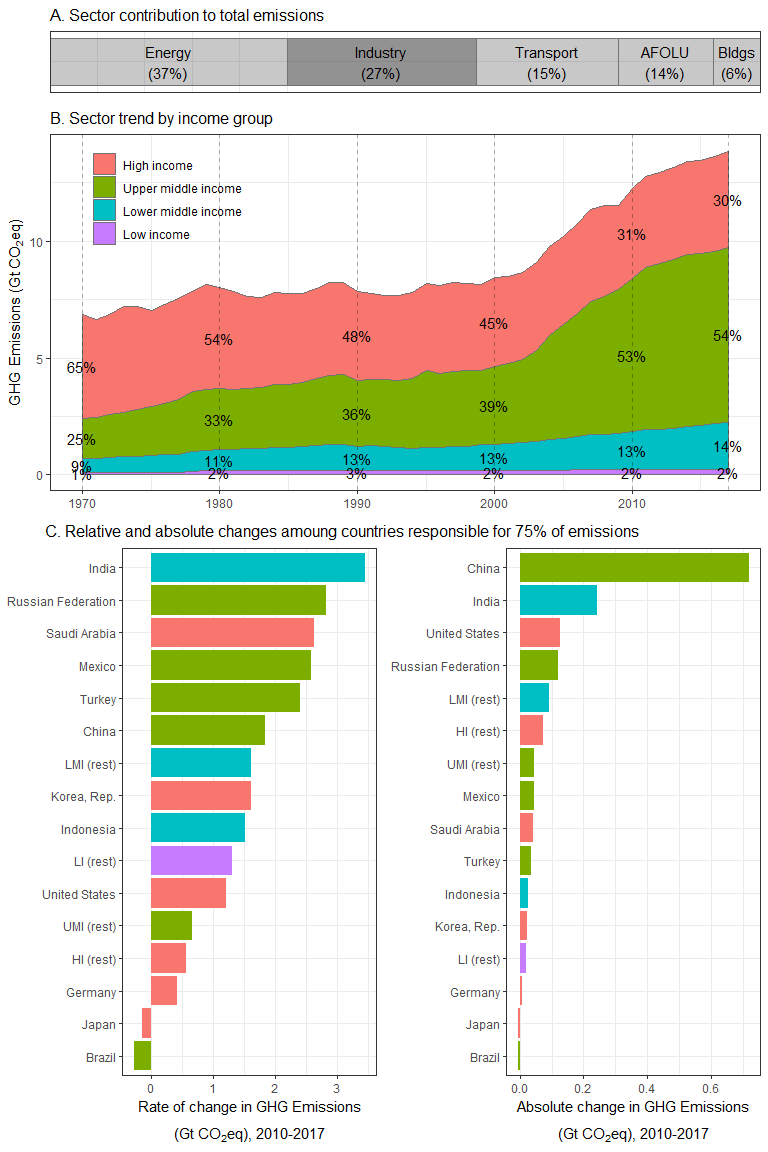
# 5. Transport (Ch.10)



Transport emissions were 7.95Gt CO2 in 2017, 15.39% of total GHG emissions from all sectors. Transport emissions have grown by 177.25% between 1970 and 2017.

| chapter | sector\_code | description |
| --- | --- | --- |
| 10 | 1A3a | Domestic air transport |
| 10 | 1A3b | Road transport (incl. evap.) (foss.) |
| 10 | 1A3c | Non-road transport (rail, etc.) (fos.) |
| 10 | 1A3d | Inland shipping (fos.) |
| 10 | 1A3e | Non-road transport (fos.) |
| 10 | 1C1 | International air transport |
| 10 | 1C2 | International marine transport (bunkers) |
| 10 | 1A3bx | Road transport (incl. evap.) (biom.) |
| 10 | 1A3cx | Non-road transport (rail, etc.)(biom.) |
| 10 | 1A3dx | Inland shipping (biom.) |
| 10 | 1A3ex | Non-road transport (biom.) |
| 10 | 1C2x | International marine transport (biom.) |
| 10 | 2F9b | Adiabatic prop.: tyres |

# 6. Industry (Ch.11)



Industry emissions were 13.87Gt CO2 in 2017, 26.85% of total GHG emissions from all sectors. Industry emissions have grown by 102.09% between 1970 and 2017.

| chapter | sector\_code | description |
| --- | --- | --- |
| 11 | 1A1c1 | Fuel combustion coke ovens |
| 11 | 1A1c2 | Blast furnaces (pig iron prod.) |
| 11 | 1A2a | Iron and steel |
| 11 | 1A2b | Non-ferrous metals |
| 11 | 1A2c | Chemicals |
| 11 | 1A2d | Pulp and paper |
| 11 | 1A2e | Food and tobacco |
| 11 | 1A2f | Other industries (stationary) (fos.) |
| 11 | 1A2f1 | Off-road machinery: construction (diesel) |
| 11 | 1A2f2 | Off-road machinery: mining (diesel) |
| 11 | 1B1b1 | Fuel transformation coke ovens |
| 11 | 2A1 | Cement production |
| 11 | 2A2 | Lime production |
| 11 | 2A3 | Limestone and Dolomite Use |
| 11 | 2A4a | Soda ash production |
| 11 | 2A4b | Soda ash use |
| 11 | 2A7a | Glass production |
| 11 | 2B1g | Ammonia production (gross CO2) |
| 11 | 2B1s | CO2-ammonia stored in urea |
| 11 | 2B4a | Silicon carbide production |
| 11 | 2B4b | Calcium carbide production |
| 11 | 2B5a | Carbon black production |
| 11 | 2B5b | Ethylene production |
| 11 | 2B5e | Methanol production |
| 11 | 2B5g | Other bulk chemicals production |
| 11 | 2B5g1 | Urea production |
| 11 | 2B5g2 | Vinyl chloride production |
| 11 | 2C1a | Crude steel production total |
| 11 | 2C1b | Blast furnaces |
| 11 | 2C2 | Ferroy Alloy production |
| 11 | 2C3a | Aluminium production (primary) |
| 11 | 2C3b | Aluminium production (secondary) |
| 11 | 2C5lp | Lead production (primary) |
| 11 | 2C5mp | Magnesium production (primary) |
| 11 | 2C5zp | Zinc production (primary) |
| 11 | 2G1 | Non-energy use of lubricants/waxes (CO2) |
| 11 | 3A | Solvents in paint |
| 11 | 3B | Degreasing and dry cleaning |
| 11 | 3C | Chemical products |
| 11 | 3D | Other product use |
| 11 | 6Cb1 | Waste incineration - uncontrolled MSW burning |
| 11 | 6Cb2 | Waste incineration - other non-biogenic |
| 11 | 1A2ax | Iron and steel (biomass) |
| 11 | 1A2bx | Non-ferrous metals (biomass) |
| 11 | 1A2cx | Chemicals (biomass) |
| 11 | 1A2dx | Pulp and paper (biomass) |
| 11 | 1A2ex | Food and tobacco (biomass) |
| 11 | 1A2fx | Other industries (stationary) (biom.) |
| 11 | 2B5d | Styrene production |
| 11 | 6A1 | Managed waste disposal on land |
| 11 | 6B1 | Industrial wastewater |
| 11 | 6B2 | Domestic and commercial wastewater |
| 11 | 6C | Waste incineration - hazardous |
| 11 | 6Cax | Waste incineration - biogenic |
| 11 | 6D | Other waste |
| 11 | 2B2 | Nitric acid production |
| 11 | 2B3 | Adipic acid production |
| 11 | 2B5f | Caprolactam production |
| 11 | 2B5h1 | Glyoxal production |
| 11 | 3D1 | Use of N2O as anaesthesia |
| 11 | 3D3 | Use of N2O in aerosol spray cans |
| 11 | 7B2 | Indirect N2O from NOx emitted in cat. 2-3 |
| 11 | 7C2 | Indirect N2O from NH3 emitted in cat. 2-3 |
| 11 | 2F1a | Refrigeration and Air Conditioning |
| 11 | 2F2 | Foam Blowing |
| 11 | 2F9 | F-gas/ODP consumption |
| 11 | 2E1 | Production of halocarbons |
| 11 | 2F9d | Accelerators/HEP |
| 11 | 2C4a | Magnesium foundries: SF6 use |
| 11 | 2F5 | F-gas as Solvent |
| 11 | 2F7a | Semiconductor Manufacture |
| 11 | 2F7c | Photo Voltaic (PV) Cell Manufacture |
| 11 | 2F9e | Misc. (AWACS, other military and misc.) |
| 11 | 2C4b | Aluminium foundries: SF6 use |
| 11 | 2F8a | Electrical Equipment Manufacture |
| 11 | 2F9f | Unknown SF6 use |
| 11 | 2F7b | Flat Panel Display (FPD) Manufacture |