OECD Green Growth Indicators

Database documentation

The OECD Green Growth database contains selected indicators for monitoring progress towards green growth to support policy making and inform the public at large. The database synthesises data and indicators across a wide range of domains. It draws on a range of OECD databases as well as external data sources. The database covers OECD member and accession countries, key partners (including Brazil, China, India, Indonesia and South Africa) and other selected non-OECD countries. The EU27_2020 aggregate reflects the EU membership as of 1st February 2020.

The indicators have been selected according to well-specified criteria and embedded in a conceptual framework, which is structured around four groups to capture the main features of green growth:

- **Environmental and resource productivity:** indicate whether economic growth is becoming greener with more efficient use of natural capital and to capture aspects of production which are rarely quantified in economic models and accounting frameworks;

- **The natural asset base**: indicate the risks to growth from a declining natural asset base;

- **Environmental dimension of quality of life**: indicate how environmental conditions affect the quality of life and wellbeing of people;

- **Economic opportunities and policy responses**: indicate the effectiveness of policies in delivering green growth and describe the societal responses needed to secure business and employment opportunities.

For further details on the methodology, please consult:

OECD (2017), Green Growth Indicators 2017

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OECD Green Growth Indicators 1

Environmental and resource productivity 6

GHG productivity 6

Production-based CO2 productivity, GDP per unit of energy-related CO2 emissions 6

Production-based CO2 intensity, energy-related CO2 per capita 6

Production-based CO2 emissions 6

Demand-based CO2 productivity, GDP per unit of energy-related CO2 emissions 6

Demand-based CO2 intensity, energy-related CO2 emissions per capita 7

Demand-based CO2 emissions 7

Demand-based CO2 productivity, disposable income per unit of energy-related CO2 emissions 8

CO2 emissions from air transport per unit of GDP 9

CO2 emissions from air transport per capita 9

Production-based GHG productivity, GDP per unit of energy-related GHG emissions 10

Production-based GHG intensity, energy-related GHG per capita 10

Production-based GHG emissions 11

Demand-based GHG productivity, GDP per unit of energy-related GHG emissions 11

Demand-based GHG intensity, energy-related GHG emissions per capita 11

Demand-based GHG emissions 12

Demand-based GHG productivity, disposable income per unit of energy-related GHG emissions 12

Energy productivity 13

Energy productivity, GDP per unit of TES 13

Energy intensity, TES per capita 13

Total energy supply 13

Renewable energy supply, % TES 14

Renewable energy supply (excluding solid biofuels), % TES 14

Renewable electricity, % total electricity generation 14

Energy consumption in agriculture, % total energy consumption 15

Energy consumption in services, % total energy consumption 15

Energy consumption in transport, % total energy consumption 15

Energy consumption in industry, % total energy consumption 15

Energy consumption in other sectors, % total energy consumption 16

Non-energy material productivity 17

Non-energy material productivity, GDP per unit of DMC 17

Biomass, % of DMC 17

Non-metallic minerals, % of DMC 17

Metals, % of DMC 17

Municipal waste generated, kg per capita 18

Municipal waste recycled or composted, % waste treated 18

Municipal waste incinerated, % waste treated 18

Municipal waste disposed to landfills, % waste treated 18

Nitrogen balance per hectare 19

Phosphorus balance per hectare 19

Environmentally adjusted multifactor productivity 19

Environmentally adjusted multifactor productivity (EAMFP) growth 19

Contribution of natural capital 20

Adjustment for pollution abatement 20

Natural asset base 21
Land resources 21
Irrigated land, % agricultural land 21
Natural and semi-natural vegetated land, % total 21
Bare land, % total 21
Cropland, % total 22
Artificial surfaces, % total 22
Water, % total 22
Loss of natural and semi-natural vegetated land, % since reference year 23
Gain of natural and semi-natural vegetated land, % since reference year 23
Built-up area, % total land 23
Built-up area per capita 24
Forest resources 25
Forest resource stocks 25
Intensity of use of forest resources 25
Forest with a long-term management plan, % total forest area 25
Naturally regenerating forests, % total forest area 25
Intact forest landscape, km2 25
Intact forest landscape loss, % since 2000 26
Water resources 26
Total renewable freshwater per capita 26
Total freshwater abstraction per capita 26
Water stress, total freshwater abstraction as % total available renewable resources 27
Water stress, total freshwater abstraction as % total internal renewable resources 27
Permanent surface water, % total area 28
Seasonal surface water, % total area 28
Conversion of permanent water to not-water surface, % permanent water, since 1984 28
Conversion of permanent to seasonal water, % permanent water, since 1984 28
Conversion of not-water to permanent water, % permanent water, since 1984 29
Conversion of seasonal to permanent water, % permanent water, since 1984 29
Wildlife resources 30
Threatened mammal species, % total known species 30
Threatened bird species, % total known species 30
Threatened vascular plant species, % total known species 30
Farmland Birds Index, 2000=100 31
Forest Birds Index, 2000=100 31
Sales of pesticides per unit of agricultural land 31

Environmental dimension of quality of life 33
Exposure to air and water pollution 33
Mean population exposure to $PM_{2.5}$ 33
Percentage of population exposed to more than 10 µg/m^3 33
Percentage of population exposed to more than 35 µg/m^3 33
Mortality from exposure to ambient $PM_{2.5}$ 34
Welfare cost of premature deaths from exposure to ambient $PM_{2.5}$, GDP equivalent 34
Mortality from exposure to ambient ozone 34
Welfare cost of premature deaths from exposure to ambient ozone, GDP equivalent 35
Mortality from exposure to lead 35
Welfare cost of premature deaths from exposure to lead, GDP equivalent 35
Mortality from exposure to residential radon 36

Welfare cost of premature deaths from exposure to residential radon, GDP equivalent 36
Exposure to climate-related hazards 37
Percentage of population exposed to hot days 37
Percentage of population exposed to icing days 37
Percentage of population exposed to wildfire 37
Percentage of population exposed to river flooding 38
Access to drinking water and sewage treatment 39
Population with access to improved drinking water sources, % total population 39
Population with access to improved sanitation, % total population 39
Population connected to public sewerage, % total population 39
Population connected to sewerage with primary treatment, % total population 39
Population connected to sewerage with secondary treatment, % total population 40
Population connected to sewerage with tertiary treatment, % total population 40

Economic opportunities and policy responses 41
Technology and innovation: R&D 41
Environment-related government R&D budget, % total government R&D 41
Environment-related R&D expenditure, % GDP 41
Renewable energy public RD&D budget, % total energy public RD&D 42
Fossil fuel public RD&D budget, % total energy public RD&D 42
Energy RD&D public budget, % GDP 43
Technology and innovation: Patents 45
Development of environment-related technologies, % all technologies 45
Relative advantage in environment-related technologies 45
Development of environment-related technologies, % inventions worldwide 45
Development of environment-related technologies, inventions per capita 46
Environmental goods and services 47
National expenditure on environmental protection, % GDP 47
International financial flows: Official Development Assistance 48
Environmentally related ODA, % total allocable ODA 48
ODA – all sectors – biodiversity, % total allocable ODA 49
ODA – all sectors – climate change mitigation, % total allocable ODA 49
ODA – all sectors – climate change adaptation, % total allocable ODA 49
ODA – all sectors – desertification, % total allocable ODA 50
ODA – environment sector, % total allocable ODA 50
ODA – renewable energy sector, % total allocable ODA 50
ODA – water supply and sanitation sector, % total allocable ODA 51
Net ODA provided, % GNI 51
Environmental taxes and transfers 53
Environmentally related tax revenue, % GDP 53
Environmentally related tax revenue, % total tax revenue 53
Energy-related tax revenue, % total environmental tax revenue 53
Road transport-related tax revenue, % total environmental tax revenue 53
Emissions priced above EUR 30 per tonne of CO_2, % total emissions 54
Emissions priced above EUR 60 per tonne of CO_2, % total emissions 54
Emissions priced above EUR 120 per tonne of CO_2, % total emissions 55
Petrol tax, USD per litre 55
Petrol end-use price, USD per litre 55
Diesel tax, USD per litre 55
Diesel end-use price, USD per litre 56

Residential electricity price, USD per kWh 56
Industry electricity price, USD per kWh 56
Mean feed-in tariffs for solar PV electricity generation, USD per kWh 56
Mean feed-in tariffs for wind electricity generation, USD per kWh 56
Fossil fuel consumer support, % energy-related tax revenue 57
Fossil fuel consumer support, % total tax revenue 57
Fossil fuel consumer support, % total fossil fuel support 58
Fossil fuel producer support, % total fossil fuel support 58
Fossil fuel general services support, % total fossil fuel support 59
Petroleum support, % total fossil fuel support 60
Coal support, % total fossil fuel support 60
Gas support, % total fossil fuel support 61
Electricity support, % total fossil fuel support 61
Total fossil fuel support, % total tax revenue 62
Regulations and management 63
Terrestrial protected area, % land area 63
Marine protected area, % total exclusive economic zone 63

Socio-economic context 64

Economic context 64
Real GDP, index 2000=100 64
Real GDP 64
Value added in agriculture, % of total value added 64
Value added in industry, % of total value added 64
Value added in services, % of total value added 65
Real GDP per capita 65
Labour tax revenue, % GDP 65
Labour tax revenue, % total tax revenue 65
Nominal exchange rate 66
Purchasing power parity 66
GDP deflator 66
Social context 66
Population 66
Population by age-groups, % total 67
Women, % total population 67
Total fertility rate, children per woman 67
Life expectancy at birth 67
Net migration 67
Population density, inhabitants per km2 68

Observation Status 69

Environmental and resource productivity

GHG productivity

Production-based CO2 productivity, GDP per unit of energy-related CO2 emissions

Production-based CO_2 productivity is calculated as real GDP generated per unit of CO_2 emitted (USD/kg). Included are CO_2 emissions from combustion of coal, oil, natural gas and other fuels.

The estimates of CO_2 emissions are obtained from the IEA's database of CO_2 emissions from fuel combustion. Default methods and emission factors are given in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*.

Gross Domestic Product (GDP) is expressed at constant 2020 USD using PPP. For more details on the underlying GDP data, see the metadata for *Real GDP*.

Production-based CO2 intensity, energy-related CO2 per capita

Production-based CO_2 intensity is calculated as CO_2 emissions per capita (tonnes/person). Included are CO_2 emissions from combustion of coal, oil, natural gas and other fuels.

The estimates of CO_2 emissions are obtained from the IEA's database of CO_2 emissions from fuel combustion. Default methods and emission factors are given in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*.

Population is the de facto population in a country, area or region as of 1 July of the year indicated. The main source of population data is the *World Population Prospects database* from the *United Nations*, complemented with data from the World Development Indicators of the World Bank. For more details on the underlying population data, see the metadata for *Population*.

Production-based CO2 emissions

Production-based CO_2 emissions are expressed in million metric tonnes. *Production-based CO_2 emissions* are also expressed as an index with values in 2000 normalised to equal 100. Included are CO_2 emissions from combustion of coal, oil, natural gas and other fuels.

The estimates of CO_2 emissions are obtained from the IEA's database on CO2 emissions from fuel combustion. The estimates are based on territorial emissions. Default methods and emission factors are given in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*.

Demand-based CO2 productivity, GDP per unit of energy-related CO2 emissions

Demand-based CO_2 productivity is calculated as GDP generated per unit of CO_2 emitted from final demand (USD/kg).

Demand-based emissions reflect the CO_2 from energy use emitted during the various stages of production of goods and services consumed in final domestic demand,

irrespective of where the stages of production occurred. Trends in emissions on this basis thus complement the more conventional production-based measures.

The estimates of CO_2 emissions embodied in final domestic demand are obtained from the OECD dataset on *Carbon Dioxide Embodied in International Trade (2021 edition)*, derived from the OECD Input-Output Database and the International Energy Agency (IEA) CO2 emissions from fuel combustion statistics (Edition 2021). The estimates are calculated for 66 economies, with an input-output table modelled for the "rest of the world". The methodology allocates territorial emissions to production-based emissions using the resident principle (industries and households). The calculated production-based emission intensities for each industry in each country are then multiplied with the Leontief inverse of the ICIO system to get emission multipliers for final demand. This is used to allocate the flows of CO_2 emitted in producing a product to the final purchaser of the product, irrespective of how many intermediate processes and countries the product passes through before its final destination.

Gross Domestic Product (GDP) is expressed at constant 2015 USD using PPP. For more details on the underlying GDP data, see the metadata for *Real GDP*.

Demand-based CO2 intensity, energy-related CO2 emissions per capita

Demand-based CO_2 intensity is expressed as CO_2 emissions per capita (tonnes/person). Demand-based emissions reflect the CO_2 from energy use emitted during the various stages of production of goods and services consumed in final domestic demand, irrespective of where the stages of production occurred. Trends in emissions on this basis thus complement the more conventional production-based measures.

The estimates of CO_2 emissions embodied in final domestic demand are obtained from the OECD dataset on *Carbon Dioxide Embodied in International Trade (2021 edition)*, derived from the OECD Input-Output Database and the International Energy Agency (IEA) CO2 emissions from fuel combustion statistics (Edition 2021). The estimates are calculated for 66 economies, with an input-output table modelled for the "rest of the world". The methodology allocates territorial emissions to production-based emissions using the resident principle (industries and households). The calculated production-based emission intensities for each industry in each country are then multiplied with the Leontief inverse of the ICIO system to get emission multipliers for final demand. This is used to allocate the flows of CO_2 emitted in producing a product; irrespective of how many intermediate processes and countries the product passes through before arriving to its final purchaser.

Population is the de facto population in a country, area or region as of 1 July of the year indicated. The main source of population data is the *World Population Prospects database* from the *United Nations*, complemented with data from the World Development Indicators of the World Bank. For more details on the underlying population data, see the metadata for *Population*.

Demand-based CO2 emissions

Demand-based CO_2 emissions are expressed in million metric tonnes. Demand-based emissions reflect the CO_2 from energy use emitted during the various stages of

production of goods and services consumed in final domestic demand, irrespective of where the stages of production occurred. Trends in emissions on this basis thus complement the more conventional production-based measures.

The estimates of CO_2 emissions embodied in final domestic demand are obtained from the OECD dataset on *Carbon Dioxide Embodied in International Trade (2021 edition)*, derived from the OECD Input-Output Database and the International Energy Agency (IEA) CO2 emissions from fuel combustion statistics (Edition 2021). The estimates are calculated for 66 economies, with an input-output table modelled for the "rest of the world". The methodology allocates territorial emissions to production-based emissions using the resident principle (industries and households). The calculated production-based emission intensities for each industry in each country are then multiplied with the Leontief inverse of the ICIO system to get emission multipliers for final demand. This is used to allocate the flows of CO_2 emitted in producing a product to the final purchaser of the product, irrespective of how many intermediate processes and countries the product passes through before its final destination.

Demand-based CO2 productivity, disposable income per unit of energy-related CO2 emissions

Demand-based CO_2 productivity is calculated as the Net National Disposable Income available per unit of CO_2 emitted from final demand (USD/kg).

Demand-based emissions reflect the CO_2 from energy use emitted during the various stages of production of goods and services consumed in final domestic demand, irrespective of where the stages of production occurred. Trends in emissions on this basis thus complement the more conventional production-based measures.

The estimates of CO_2 emissions embodied in final domestic demand are obtained from the OECD dataset on *Carbon Dioxide Embodied in International Trade (2021 edition)*, derived from the OECD Input-Output Database and the International Energy Agency (IEA) CO2 emissions from fuel combustion statistics (Edition 2021). The estimates are calculated for 66 economies, with an input-output table modelled for the "rest of the world". The methodology allocates territorial emissions to production-based emissions using the resident principle (industries and households). The calculated production-based emission intensities for each industry in each country are then multiplied with the Leontief inverse of the ICIO system to get emission multipliers for final demand. This is used to allocate the flows of CO_2 emitted in producing a product to the final purchaser of the product, irrespective of how many intermediate processes and countries the product passes through before its final destination.

Net National Disposable Income (NNDI) is expressed in real terms at constant 2020 USD using PPPs, and is obtained from the *OECD Disposable income and net lending/borrowing dataset* of Aggregate National Accounts. National disposable income includes the national income plus international transfers concerning taxes, social contributions and benefits from and to the rest of the world. National income includes international transfers associated with the compensation of employees, taxes on production and imports, subsidies on products and production, and property income. National disposable income is presented in net terms (i.e. net of depreciation).

CO2 emissions from air transport per unit of GDP

Air transport CO_2 intensity of GDP is calculated as CO_2 emitted per unit of real GDP generated (kg/USD). Included are CO_2 emissions from all commercial passenger and freight flight schedules around the world.

Emissions are attributed to a country on a residence basis (i.e. the approach used to measure GDP) using the national aviation authority granting the official air operator's certificate. The level of emissions is estimated using aircraft and engine characteristics, fuel use and distance to travel, based on data from the International Civil Aviation Organisation (ICAO) and Eurocontrol. For a more detailed description of the methodology please consult: Clarke, D., et al. (2022), "CO2 Emissions from air transport: A near-real-time global database for policy analysis", OECD Statistics Working Papers, No. 2022/04, OECD Publishing, Paris, https://doi.org/10.1787/ecc9f16b-en.

CO_2 emissions are obtained from the OECD Air Emissions Accounts dataset. Gross Domestic Product (GDP) is expressed at constant 2020 USD using PPP. For more details on the underlying GDP data, see the metadata for *Real GDP*.

CO2 emissions from air transport per capita

This indicator is calculated as CO_2 emissions per capita (tonnes/person). Included are CO_2 emissions from all commercial passenger and freight flight schedules around the world.

Emissions are attributed to a country on a residence basis (i.e. the approach used to measure GDP) using the national aviation authority granting the official air operator's certificate. The level of emissions is estimated using aircraft and engine characteristics, fuel use and distance to travel based on data from the International Civil Aviation Organisation (ICAO) and Eurocontrol. For a more detailed description of the methodology please consult: Clarke, D., et al. (2022), "CO2 Emissions from air transport: A near-real-time global database for policy analysis", OECD Statistics Working Papers, No. 2022/04, OECD Publishing, Paris, https://doi.org/10.1787/ecc9f16b-en.

The estimates of CO_2 emissions are obtained from the OECD Air Emissions Accounts dataset. Population is the de facto population in a country, area or region as of 1st July of the year indicated. The main source of population data is the *World Population Prospects database* from the *United Nations*, complemented with data from the World Development Indicators of the World Bank. For more details on the underlying population data, see the metadata for *Population*.

Production-based GHG productivity, GDP per unit of energy-related GHG emissions

Production-based GHG productivity is estimated as real GDP generated per unit of *GHG* emitted (USD/kg). They are estimated using the residence principle, encompassing GHG emitted from the industries and households within the same economy, including international bunkers. It also includes direct emissions from both fuel combustion and non-fuel combustion sources (e.g., feedstocks, reductants, non-energy products).

Emissions are derived from the OECD dataset on Greenhouse Gas Footprint Indicators (GHGFP), combining the 2023 edition of the OECD Inter-Country Input-Output (ICIO) Tables with other sources like Air Emissions Accounts. The estimates cover 75 economic activities, aggregated into 45 ICIO industries. The methodology follows the National Accounting Matrices including Environmental Accounts (NAMEA) and System of Environmental-Economic Accounting (SEEA) frameworks, tracking emissions from both domestic and international production networks based on a purchaser's price perspective. The *reference area* corresponds to the origin country of the emissions (i.e. the country of production) and the *activity* to the origin industry of the emissions (i.e. the economic activity of production).

Gross Domestic Product (GDP) is expressed at constant 2020 USD using PPP. For more details on the underlying GDP data, see the metadata for *Real GDP*.

Production-based GHG intensity, energy-related GHG per capita

Production-based GHG intensity refer to the average amount of GHG emitted per person (tonnes/person) within the observed economy. They are estimate using the residence principle, encompassing GHG emitted from the industries and households within the same economy, including international bunkers. It also includes direct emissions from both fuel combustion and non-fuel combustion sources (e.g., feedstocks, reductants, non-energy products).

Emissions are derived from the OECD dataset on Greenhouse Gas Footprint Indicators (GHGFP), combining the 2023 edition of the OECD Inter-Country Input-Output (ICIO) Tables with other sources like Air Emissions Accounts. The estimates cover 75 economic activities, aggregated into 45 ICIO industries. The methodology follows the National Accounting Matrices including Environmental Accounts (NAMEA) and System of Environmental-Economic Accounting (SEEA) frameworks, tracking emissions from both domestic and international production networks based on a purchaser's price perspective. The *reference area* corresponds to the origin country of the emissions (i.e. the country of production) and the *activity* to the origin industry of the emissions (i.e. the economic activity of production).

Population is the de facto population in a country, area or region as of 1 July of the year indicated. The main source of population data is the *World Population Prospects database* from the *United Nations*, complemented with data from the World Development Indicators of the World Bank. For more details on the underlying population data, see the metadata for *Population*.

Production-based GHG emissions

Production-based GHG emissions are expressed in million metric tonnes and are also expressed as an index with values in 2000 normalised to equal 100. They are estimate using the residence principle, encompassing GHG emitted from the resident economic activities and household of a country, including international bunkers. It also includes direct emissions from both fuel combustion and non-fuel combustion sources (e.g., feedstocks, reductants, non-energy products).

Emissions are derived from the OECD dataset on Greenhouse Gas Footprint Indicators (GHGFP), combining the 2023 edition of the OECD Inter-Country Input-Output (ICIO) Tables with other sources like Air Emissions Accounts. The estimates cover 75 economic activities, aggregated into 45 ICIO industries. The methodology follows the National Accounting Matrices including Environmental Accounts (NAMEA) and System of Environmental-Economic Accounting (SEEA) frameworks, tracking emissions from both domestic and international production networks based on a purchaser's price perspective. The *reference area* corresponds to the origin country of the emissions (i.e. the country of production) and the *activity* to the origin industry of the emissions (i.e. the economic activity of production).

Demand-based GHG productivity, GDP per unit of energy-related GHG emissions

Demand-based GHG productivity is estimated as GDP generated per unit of *GHG* emitted (USD/kg). They reflect the GHG from energy use emitted during various stages of production of goods and services consumed in final domestic demand, irrespective of where the stages of production occurred.

Emissions are derived from the OECD dataset on Greenhouse Gas Footprint Indicators (GHGFP), combining the 2023 edition of the OECD Inter-Country Input-Output (ICIO) Tables with other sources like Air Emissions Accounts. The estimates cover 75 economic activities, aggregated into 45 ICIO industries. The methodology follows the National Accounting Matrices including Environmental Accounts (NAMEA) and System of Environmental-Economic Accounting (SEEA) frameworks, tracking emissions from both domestic and international production networks based on a purchaser's price perspective. The *reference area* corresponds to the country of final demand (i.e. country of consumption) and the *activity* to the origin industry of the emissions (i.e. the economic activity of production).

Gross Domestic Product (GDP) is expressed at constant 2020 USD using PPP. For more details on the underlying GDP data, see the metadata for *Real GDP*.

Demand-based GHG intensity, energy-related GHG emissions per capita

Demand-based GHG intensity is expressed as GHG emissions per capita (tonnes/person). Demand-based emissions reflect the GHG from energy use associated with the final demand for goods and services in a specific economy, divided by its population. It includes emissions from the entire supply chain, irrespective on where the stages of production occurred.

Emissions are derived from the OECD dataset on Greenhouse Gas Footprint Indicators (GHGFP), combining the 2023 edition of the OECD Inter-Country Input-

Output (ICIO) Tables with other sources like Air Emissions Accounts. The estimates cover 75 economic activities, aggregated into 45 ICIO industries. The methodology follows the National Accounting Matrices including Environmental Accounts (NAMEA) and System of Environmental-Economic Accounting (SEEA) frameworks, tracking emissions from both domestic and international production networks based on a purchaser's price perspective. The *reference area* corresponds to the country of final demand (i.e. country of consumption) and the *activity* to the origin industry of the emissions (i.e. the economic activity of production).

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Demand-based GHG emissions

Demand-based GHG emissions are expressed in million metric tonnes. Demand-based emissions are also expressed as an index with values in 2000 normalised to equal 100. It encompasses GHG emissions from both fuel combustion and non-fuel combustion sources (e.g. feedstocks, reductants, and non-energy products).

Emissions are derived from the OECD dataset on Greenhouse Gas Footprint Indicators (GHGFP), combining the 2023 edition of the OECD Inter-Country Input-Output (ICIO) Tables with other sources like Air Emissions Accounts. The estimates cover 75 economic activities, aggregated into 45 ICIO industries. The methodology follows the National Accounting Matrices including Environmental Accounts (NAMEA) and System of Environmental-Economic Accounting (SEEA) frameworks, tracking emissions from both domestic and international production networks based on a purchaser's price perspective. The *reference area* corresponds to the country of final demand (i.e. country of consumption) and the *activity* to the origin industry of the emissions (i.e. the economic activity of production).

Demand-based GHG productivity, disposable income per unit of energy-related GHG emissions

Demand-based GHG productivity is calculated as the Net National Disposable Income available per unit of *GHG* emitted from final demand (USD/kg). They reflect the *GHG* from energy use emitted during the various stages of production of goods and services consumed in final domestic demand, irrespective of where the stages of production occurred.

Emissions are derived from the OECD dataset on Greenhouse Gas Footprint Indicators (GHGFP), combining the 2023 edition of the OECD Inter-Country Input-Output (ICIO) Tables with other sources like Air Emissions Accounts. The estimates cover 75 economic activities, aggregated into 45 ICIO industries. The methodology follows the National Accounting Matrices including Environmental Accounts (NAMEA) and System of Environmental-Economic Accounting (SEEA) frameworks, tracking emissions from both domestic and international production networks based on a purchaser's price perspective. The *reference area* corresponds to the country of final demand (i.e. country of consumption) and the *activity* to the origin industry of the emissions (i.e. the economic activity of production).

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Energy productivity

Energy productivity, GDP per unit of TES

Energy productivity is calculated as GDP per unit of TES (USD/toe). It reflects, at least partly, efforts to improve energy efficiency and to reduce carbon and other atmospheric emissions. Together with *energy intensity*, these indicators also reflect structural and climatic factors.

TES comprises production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes.

Gross Domestic Product (GDP) is expressed at constant 2020 USD using PPP. For more details on the underlying GDP data, see the metadata for *Real GDP*.

Data on Total Energy Supply (TES) are obtained from the *World Energy Statistics Dataset* in the *IEA World Energy Statistics and Balances Database*.

Energy intensity, TES per capita

Energy intensity is calculated as TES per capita (toe/person). It reflects, at least partly, efforts to improve energy efficiency and to reduce carbon and other atmospheric emissions. Together with *Energy productivity*, these indicators also reflect structural and climatic factors.

TES comprises production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes.

Data on Total Energy Supply (TES) are obtained from the *World Energy Statistics Dataset* in the *IEA World Energy Statistics and Balances Database*.

Population is the de facto population in a country, area or region as of 1 July of the year indicated. The main source of population data is the *World Population Prospects database* from the *United Nations*, complemented with data from the World Development Indicators of the World Bank. For more details on the underlying population data, see the metadata for *Population*.

Total energy supply

Total energy supply (TES) is expressed in million tonnes of oil equivalent. *TES* is also expressed as an index with values in 2000 normalised to equal 100. TES comprises

production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes.

Data on TES are obtained from the *World Energy Statistics Dataset* in the *IEA World Energy Statistics and Balances Database*.

Note that in 2020 the concept of Total Primary Energy Supply (TPES) was renamed to Total Energy Supply without modifications to the underlying definition or scope.

Renewable energy supply, % TES

Renewable energy supply is calculated as a share of renewable sources in TES (expressed as percentage).

Renewables include hydro, geothermal, solar (thermal and PV), wind and tide/wave/ocean energy, as well as combustible renewables (solid biomass, liquid biomass, biogas) and waste (renewable municipal waste).

TES comprises production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes.

The underlying data on "renewables and waste energy supply (ktoe)" and total Energy Supply (TES) *World Energy Statistics Dataset* in the *IEA World Energy Statistics and Balances Database.*

Renewable energy supply (excluding solid biofuels), % TES

Renewable energy supply is calculated as a share of renewable sources excluding solid biofuels in TES (expressed as percentage).

Renewables include hydro, geothermal, solar (thermal and PV), wind and tide/wave/ocean energy, as well as combustible renewables (liquid biomass, biogas) and waste (renewable municipal waste). The indicator excludes solid biomass (primary solid biofuels and charcoal) to avoid distortions due to the traditional use of biomass for cooking, and due to the potential environmental risks associated to its unsustainable sourcing.

TES comprises production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes.

The underlying data on "renewables and waste energy supply (ktoe)" and total Energy Supply (TES) *World Energy Statistics Dataset* in the *IEA World Energy Statistics and Balances Database.*

Renewable electricity, % total electricity generation

Renewable electricity is calculated as a share of renewables in electricity production (%).

Renewables include hydro, geothermal, solar (thermal and PV), wind and tide/wave/ocean energy, as well as combustible renewables (solid biomass, liquid biomass, biogas) and waste (renewable municipal waste).

The underlying data on renewable electricity and total electricity generation are obtained from the *World Energy Statistics Dataset* in the *IEA World Energy Statistics and Balances Database.*

Energy consumption in agriculture, % total energy consumption

Energy consumption in agriculture is expressed as a share of total energy consumption (%). Final consumption reflects for the most part deliveries to consumers. It excludes energy used for transformation processes and for own use of the energy-producing industries.

Energy consumption in agriculture includes deliveries to users classified as agriculture, hunting and forestry by the International Standard Industrial Classification (ISIC). Therefore, it includes energy consumed by such users whether for traction (excluding agricultural highway use), power or heating (agricultural and domestic) [ISIC Rev.4 Divisions 01 and 02].

The underlying data on energy consumption are obtained the *World Energy Statistics Dataset* in the *IEA World Energy Statistics and Balances Database.*

Energy consumption in services, % total energy consumption

Energy consumption in services is expressed as a share of total energy consumption (%). Final consumption reflects for the most part deliveries to consumers. It excludes energy used for transformation processes and for own use of the energy-producing industries.

Energy consumption in services includes both commercial and public services [ISIC Rev.4 Divisions 33, 36-39, 45-47, 52, 53, 55-56, 58-66, 68-75, 77-82, 84 (excluding Class 8422), 85-88, 90-96 and 99].

The underlying data on energy consumption are obtained the *World Energy Statistics Dataset* in the *IEA World Energy Statistics and Balances Database.*

Energy consumption in transport, % total energy consumption

Energy consumption in transport is expressed as a share of total energy consumption (%). Final consumption reflects for the most part deliveries to consumers. It excludes energy used for transformation processes and for own use of the energy-producing industries.

Energy consumption in transport covers all transport activity (in mobile engines) regardless of the economic sector to which it is contributing [ISIC Rev.4 Divisions 49 to 51].

The underlying data on energy consumption are obtained the *World Energy Statistics Dataset* in the *IEA World Energy Statistics and Balances Database.*

Energy consumption in industry, % total energy consumption

Energy consumption in industry is expressed as a share of total energy consumption (%). Final consumption reflects for the most part deliveries to consumers. It excludes

energy used for transformation processes and for own use of the energy-producing industries.

Energy consumption in industry includes the following sub-sectors: iron and steel, chemical and petrochemical, non-ferrous metals, non-metallic minerals, transport equipment, machinery, mining and quarrying, food and tobacco, paper, pulp and print, wood and wood products, construction, textile and leather together with any manufacturing industry not included above.

The underlying data on energy consumption are obtained the *World Energy Statistics Dataset* in the *IEA World Energy Statistics and Balances Database.*

Energy consumption in other sectors, % total energy consumption

Energy consumption in other sectors is expressed as a share of total energy consumption (%). Final consumption reflects for the most part deliveries to consumers. It excludes energy used for transformation processes and for own use of the energy-producing industries.

Energy consumption in other sectors includes residential consumption and all fuel use not elsewhere specified.

The underlying data on energy consumption are obtained the *World Energy Statistics Dataset* in the *IEA World Energy Statistics and Balances Database.*

Non-energy material productivity

Non-energy material productivity, GDP per unit of DMC

Non-energy material productivity is calculated as GDP generated per unit of materials consumed (USD/kg).

Domestic Material Consumption (DMC) refers to the apparent consumption of materials; it is calculated as the sum of domestic consumption of biomass for food and feed, construction minerals, industrial minerals, metals and wood. Data on DMC are obtained from the *OECD Material flow accounts* dataset.

Gross Domestic Product (GDP) is expressed at constant 2020 USD using PPP. For more details on the underlying GDP data, see the metadata for *Real GDP*.

Biomass, % of DMC

Consumption of Biomass is expressed as a percentage of Domestic Material Consumption (DMC). Biomass materials include biomass for food and wood. Food materials include crops (e.g. cereals, roots, sugar and oil bearing crops, fruits, vegetables), fodder crops (including grazing), wild animals (essentially marine catches), small amounts of non-edible biomass (e.g. fibres, rubber), and related products including livestock. Wood includes harvested wood and traded products made of wood (e.g. paper, furniture, etc.)

Total domestic material consumption refers to the apparent consumption of materials; it is calculated as the sum of domestic consumption of biomass for food and feed, construction minerals, industrial minerals, metals and wood. Data on DMC are obtained from the *OECD Material flow accounts* dataset.

Non-metallic minerals, % of DMC

Consumption of non-metallic materials is expressed as a percentage of Domestic Material Consumption (DMC). Non-metallic minerals include construction and industrial minerals. Construction minerals include primary (e.g. sand, gravel, stones, limestone, excavated soil if used) or processed (e.g. glass, cement, concrete) minerals. Industrial minerals include primary or processed non-metallic minerals (e.g. salts, arsenic, potash, phosphate rocks, sulphates and asbestos).

Total domestic material consumption refers to the apparent consumption of materials; it is calculated as the sum of domestic consumption of biomass for food and feed, construction minerals, industrial minerals, metals and wood. Data on DMC are obtained from the *OECD Material flow accounts* dataset.

Metals, % of DMC

Consumption of metals is expressed as a percentage of Domestic Material Consumption (DMC). Metals include metal ores, metals and products make of metals.

Total domestic material consumption refers to the apparent consumption of materials; it is calculated as the sum of domestic consumption of biomass for food

and feed, construction minerals, industrial minerals, metals and wood. Data on DMC are obtained from the *OECD Material flow accounts* dataset.

Municipal waste generated, kg per capita

Municipal waste generated in expressed in kg per person. Municipal waste is waste collected by or on behalf of municipalities. It includes household waste originating from households (i.e. waste generated by the domestic activity of households) and similar waste from small commercial activities, office buildings, institutions such as schools and government buildings, and small businesses that treat or dispose of waste at the same facilities used for municipally collected waste.

Waste treatment data are obtained from the *OECD Municipal waste: generation and treatment* dataset.

Population is the de facto population in a country, area or region as of 1 July of the year indicated. The main source of population data is the *World Population Prospects database* from the *United Nations*, complemented with data from the World Development Indicators of the World Bank.

Municipal waste recycled or composted, % waste treated

Municipal waste recycled or composted is expressed as a percentage of all waste treated. Recycling is defined as any reprocessing of material in a production process that diverts it from the waste stream, except reuse as fuel. Both reprocessing as the same type of product, and for different purposes are included. Direct recycling within industrial plants at the place of generation is excluded. Composting is defined as a biological process that submits biodegradable waste to anaerobic or aerobic decomposition, and that results in a product that is recovered. Waste treated includes recycling, composting, incineration and landfill disposal.

Waste treatment data are obtained from the *OECD Municipal waste: generation and treatment* dataset.

Municipal waste incinerated, % waste treated

Municipal waste incinerated is expressed as a percentage of all waste treated. Incineration with and without energy recovery is included. Waste treated includes recycling, composting, incineration and landfill disposal.

Waste treatment data are obtained from the *OECD Municipal waste: generation and treatment* dataset.

Municipal waste disposed to landfills, % waste treated

Municipal waste disposed to landfills is expressed as a percentage of all waste treated. Landfill is defined as a deposit of waste into or onto land, including specially engineered landfill, and temporary storage of over one year on permanent sites. The definition covers both landfill in internal sites (i.e. where a generator of waste is

carrying out its own waste disposal at the place of generation) and in external sites. Waste treated includes recycling, composting, incineration and landfill disposal.

Waste treatment data are obtained from the *OECD Municipal waste: generation and treatment* dataset.

Nitrogen balance per hectare

Nitrogen balance is calculated as the difference between the total quantity of nitrogen inputs entering an agricultural system (mainly fertilisers, livestock manure), and the quantity of nitrogen outputs leaving the system (mainly uptake of nutrients by crops and grassland). Gross nitrogen balances are expressed in kg of nutrient surplus (when positive) or deficit (when negative) per hectare of agricultural land. This calculation can be used as a proxy to reveal the status of environmental pressures, such as declining soil fertility in the case of a nutrient deficit, or the risk of polluting soil, water and air in the case of a nutrient surplus.

Nutrient balances are obtained from the Agri-Environmental indicators: *OECD Nutrients balance* dataset.

Phosphorus balance per hectare

Phosphorus balance is calculated as the difference between the total quantity of phosphorus inputs entering an agricultural system (mainly fertilisers, livestock manure), and the quantity of phosphorus outputs leaving the system (mainly uptake of nutrients by crops and grassland). Gross phosphorus balances are expressed in kg of nutrient surplus (when positive) or deficit (when negative) per hectare of agricultural land. This calculation can be used as a proxy to reveal the status of environmental pressures, such as declining soil fertility in the case of a nutrient deficit, or the risk of polluting soil, water and air in the case of a nutrient surplus

Nutrient balances are obtained from the Agri-Environmental indicators: *OECD Nutrients balance* dataset.

Environmentally adjusted multifactor productivity

Environmentally adjusted multifactor productivity (EAMFP) growth

EAMFP growth measures the change in productivity at the macroeconomic (country) level encompassing e.g. technological change, institutional and organisational improvements. EAMFP growth is presented in percentage points of output growth. It is calculated using a growth accounting approach as the residual growth in the joint production of both the desirable and the undesirable outputs that cannot be explained by changes in the consumption of factor inputs (including labour, produced capital and natural capital). Therefore, for a given growth of input use, EAMFP increases when GDP increases or when pollution decreases.

EAMFP data are obtained from the *OECD Environmentally adjusted multifactor productivity* dataset. For further details on the methodology please consult: Environmentally adjusted multifactor productivity: accounting for renewable resources and ecosystem services.

Contribution of natural capital

The contribution of natural capital to output growth is presented in percentage points. It measures to what extent a country's growth in output is attributable to natural resource use.

EAMFP data are obtained from the *OECD Environmentally adjusted multifactor productivity* dataset. For further details on the methodology please consult: Environmentally adjusted multifactor productivity: accounting for renewable resources and ecosystem services.

Adjustment for pollution abatement

The adjustment of output growth for pollution abatement is presented in percentage points. It measures to what extent a country's GDP growth should be scaled up or down reflecting its pollution abatement efforts, adding what has been undervalued due to resources being diverted to pollution abatement, or deducing the 'excess' growth which is generated at the expense of environmental quality.

EAMFP data are obtained from the *OECD Environmentally adjusted multifactor productivity* dataset. For further details on the methodology please consult: Environmentally adjusted multifactor productivity: accounting for renewable resources and ecosystem services.

Natural asset base

Land resources

Irrigated land, % agricultural land

Irrigated land is expressed as a share of total agricultural land (%). Irrigation management plays an important role in achieving water resource sustainability. Higher shares of irrigated agricultural land can contribute to national water stress. For a detailed discussion of the trends of agricultural water abstraction and changes in irrigated areas, please consult: OECD (2019), *Trends and Drivers of Agri-environmental Performance in OECD Countries*, OECD Publishing, Paris.

Data are obtained from the dataset on *OECD Agri-environmental indicators*.

Natural and semi-natural vegetated land, % total

Natural and semi-natural vegetated land is expressed as a percentage of total area (natural and semi-natural vegetated land + bare area + cropland + artificial surface + inland water).

Natural and semi-natural vegetated land comprises tree-covered areas, grassland, wetland and shrubland. It designates land covered by natural or semi-natural vegetation, with limited anthropogenic footprint, as a proxy for land important for maintaining biodiversity and provides higher-value ecosystem services at the global scale. This definition includes “semi-natural” vegetation due to the difficulty of reliably identifying the degree of 'naturalness' of some land cover types. The ecological value of these lands may vary with their use (e.g. natural forests vs planted forests; grasslands as wild meadows versus those used as pasture) however this use is difficult to discern from the methodology adopted for the computation of this indicator.

Land cover data are obtained from the *OECD Land cover and land cover change* dataset. For further details on the methodology please consult:

Tesnière, V., M. Maes and I. Haščič (2024), “Monitoring land cover change to understand biodiversity pressures: Indicator methodology and key findings”, *OECD Environment Working Papers*, No. 254, OECD Publishing, Paris, https://doi.org/10.1787/441a7a6c-en Land cover change and conversions: methodology and results for OECD and G20.

Bare land, % total

Bare land is expressed as a percentage of total area (natural and semi-natural vegetated land + bare land + cropland + artificial surfaces + inland water).

Bare areas comprise the following land covers: lichens and mosses, sparse vegetation (< 15%), bare areas, and permanent snow and ice.

Land cover data are obtained from the *OECD Land cover and land cover change* dataset. For further details on the methodology, please consult:

Tesnière, V., M. Maes and I. Haščič (2024), "Monitoring land cover change to understand biodiversity pressures: Indicator methodology and key findings", *OECD Environment Working Papers*, No. 254, OECD Publishing, Paris, https://doi.org/10.1787/441a7a6c-en Land cover change and conversions: methodology and results for OECD and G20.

Cropland, % total

Cropland is expressed as a percentage of total area (natural and semi-natural vegetated land + bare area + cropland + artificial surface + inland water).

Cropland comprises rainfed and irrigated cropland, and a mosaic of cropland and natural vegetation.

Land cover data are obtained from the *OECD Land cover and land cover change* dataset. For further details on the methodology, please consult:

Tesnière, V., M. Maes and I. Haščič (2024), "Monitoring land cover change to understand biodiversity pressures: Indicator methodology and key findings", *OECD Environment Working Papers*, No. 254, OECD Publishing, Paris, https://doi.org/10.1787/441a7a6c-en Land cover change and conversions: methodology and results for OECD and G20.

Artificial surfaces, % total

Artificial surfaces are expressed as a percentage of total area (natural and semi-natural vegetated land + bare area + cropland + artificial surface + inland water).

Land cover data are obtained from the *OECD Land cover and land cover change* dataset. For further details on the methodology, please consult:

Tesnière, V., M. Maes and I. Haščič (2024), "Monitoring land cover change to understand biodiversity pressures: Indicator methodology and key findings", *OECD Environment Working Papers*, No. 254, OECD Publishing, Paris, https://doi.org/10.1787/441a7a6c-en Land cover change and conversions: methodology and results for OECD and G20.

For users interested specifically in urbanisation, there are indicators based on higher-resolution datasets of built-up area that are likely to be more suitable for focused applications. See variables on *Built-up area**, % total land***.

Water, % total

Water is expressed as a percentage of total area (natural and semi-natural vegetated land + bare area + cropland + artificial surface + inland water).

Land cover data are obtained from the *OECD Land cover and land cover change* dataset. For further details on the methodology, please consult:

Tesnière, V., M. Maes and I. Haščič (2024), "Monitoring land cover change to understand biodiversity pressures: Indicator methodology and key findings", *OECD*

Environment Working Papers, No. 254, OECD Publishing, Paris, https://doi.org/10.1787/441a7a6c-en Land cover change and conversions: methodology and results for OECD and G20.

For users interested specifically in surface water changes, there are indicators based on higher-resolution datasets of surface water that are likely to be more suitable for focused applications. See variables on *Permanent surface water**, % total area*** the end of the section on water resources.

Loss of natural and semi-natural vegetated land, % since reference year

Loss of natural and semi-natural vegetated land is presented as a proxy for pressures on biodiversity and ecosystems. The indicator is defined as the percentage of tree cover, grassland, wetland, and shrubland converted to any other land cover type. The denominator used is the 'stock' of natural and semi-natural land at the start of the reference period (i.e. 2000).

Land cover data are obtained from the *OECD Land cover and land cover change* dataset. For further details on the methodology, please consult:

Tesnière, V., M. Maes and I. Haščič (2024), "Monitoring land cover change to understand biodiversity pressures: Indicator methodology and key findings", *OECD Environment Working Papers*, No. 254, OECD Publishing, Paris, https://doi.org/10.1787/441a7a6c-en Land cover change and conversions: methodology and results for OECD and G20.

Gain of natural and semi-natural vegetated land, % since reference year

Gain of natural and semi-natural vegetated land are conversions from bare area, cropland, artificial surface and water into natural and semi-natural vegetated land. The denominator used is the 'stock' of natural and semi-natural land at the start of the reference period (i.e. 2000).

Land cover data are obtained from the *OECD Land cover and land cover change* dataset. For further details on the methodology, please consult:

Tesnière, V., M. Maes and I. Haščič (2024), "Monitoring land cover change to understand biodiversity pressures: Indicator methodology and key findings", *OECD Environment Working Papers*, No. 254, OECD Publishing, Paris, https://doi.org/10.1787/441a7a6c-en Land cover change and conversions: methodology and results for OECD and G20.

Built-up area, % total land

Built-up area is expressed as a percentage of total land area.

Built-up area is defined as the presence of buildings (roofed structures). This definition excludes other parts of urban environments and the human footprint such as paved surfaces (roads, parking lots), commercial and industrial sites (ports, landfills, quarries, runways) and urban green spaces (parks, gardens). Consequently, such built-up area may be quite different from other urban area data that use alternative definitions.

Built-up area data are obtained from the *OECD Land cover and land cover change* dataset. For further details on the methodology please consult:

Tesnière, V., M. Maes and I. Haščič (2024), "Monitoring land cover change to understand biodiversity pressures: Indicator methodology and key findings", *OECD Environment Working Papers*, No. 254, OECD Publishing, Paris, https://doi.org/10.1787/441a7a6c-en Land cover change and conversions: methodology and results for OECD and G20.

Built-up area per capita

Built-up area per capita is the number of square meters of built-up area per inhabitant (m^2/person).

Built-up is defined as the presence of buildings (roofed structures). This definition excludes other parts of urban environments and the human footprint such as paved surfaces (roads, parking lots), commercial and industrial sites (ports, landfills, quarries, runways) and urban green spaces (parks, gardens). Consequently, such built-up area may be quite different from other urban area data that use alternative definitions.

Built-up area data are obtained from the *OECD Land cover and land cover change* dataset.

The main source of population data for this indicator is the GHSL population grids developed by the European Commission Joint Research Centre (JRC). This data source allows for the estimation of the number of persons in a country, area or region. The GHSL population grids are updated each epoch and are produced for every five years from 1975 to 2030. For more details on the underlying population data, see the new working paper:

Tesnière, V., M. Maes and I. Haščič (2024), "Monitoring land cover change to understand biodiversity pressures: Indicator methodology and key findings", *OECD Environment Working Papers*, No. 254, OECD Publishing, Paris, https://doi.org/10.1787/441a7a6c-en Land cover change and conversions: methodology and results for OECD and G20.

Forest resources

Forest resource stocks

Forest resource stocks are expressed in million m^3. Stocks are measured as the growing stock of standing trees. It is defined as the volume over bark of all living trees with a minimum diameter of 10 cm at breast height and including the stem from ground level up to a top diameter of 0 cm (excluding branches).

Data are obtained from the *Global Forest Resource Assessment 2020* of the *Food and Agricultural Organisation.*

Intensity of use of forest resources

Intensity of use of forest resources is measured as the ratio of actual fellings over annual productive capacity (i.e. gross increment).

Comparing resource abstraction to renewal of stocks is a central question concerning sustainable forest resource management. This indicator gives insights into the quantitative aspects of forest resources; however, no account is taken of the quality of the resource, moreover, national averages can conceal important variations among forests.

Data are obtained from the *OECD Intensity of use of forest resources* dataset.

Forest with a long-term management plan, % total forest area

The share of forest area with a long-long term management plan is expressed as percentage of total forest area. This indicator includes management plans of 20-40 years (or more), which are documented and revised every 5-10 years. Long-term management plans are an indicator of the intention to sustainably manage forest resources.

Data are obtained from the *Global Forest Resource Assessment 2020* of the *Food and Agricultural Organisation.*

Naturally regenerating forests, % total forest area

The share of naturally regenerating forest is expressed as percentage of total forest area. This indicator includes forest areas where human activities have been of such low impact that the ecological processes have not been visibly disturbed. This includes activities where the structure and species composition are different from the original intact forest (i.e. primary forest), but all major goods and services are maintained. Total forest area is the sum of naturally regenerating forests and planted forests.

Data are obtained from the *Global Forest Resource Assessment 2020* of the *Food and Agricultural Organisation.*

Intact forest landscape, km2

Intact forest landscape extent is measured in squared kilometres. Intact forest landscape is defined as the forest areas that are larger than 500km2, wider than 10km,

free of settlements or infrastructure and unaffected by industrial activity, agricultural clearing or other anthropogenic disturbance in the last 70 years. Treeless areas within forests such as lakes, ice or patches of grassland are included.

Data are obtained from the *OECD Intact Forest Landscapes dataset*.

Intact forest landscape loss, % since 2000

Intact forest landscape loss is expressed as the percentage of intact forest in 2000 that no longer meets the conditions of an intact forest landscape. Intact forest landscape is defined as the forest areas that are larger than 500km2, wider than 10km, free of settlements or infrastructure and unaffected by industrial activity, agricultural clearing or other anthropogenic disturbance in the last 70 years. Treeless areas within forests such as lakes, ice or patches of grassland are included.

Data are obtained from the *OECD Intact Forest Landscapes dataset*.

Water resources

Total renewable freshwater per capita

Total renewable freshwater per capita refers to the available stocks per capita (m^3/person). Total available renewable freshwater resources comprise total internal flows and actual external inflows. Internal flow is the total volume of river run-off and groundwater generated, in natural conditions, exclusively by precipitation into a territory. The internal flow is equal to precipitation less actual evapotranspiration and can be calculated or measured. If the river run-off and groundwater generation are measured separately, transfers between surface and groundwater should be netted out to avoid double counting. Actual external inflow is the total volume of actual flow of rivers and groundwater, coming from neighbouring territories. Whereas this indicator shows data for year 2020, the data refer to the long-term average availability for every country.

Data on freshwater resources are obtained from the *OECD Freshwater resources* dataset. For more details on the underlying population data, see the metadata for *Population*.

Population is the de facto population in a country, area or region as of 1 July of the year indicated. The main source of population data is the *World Population Prospects database* from the *United Nations*, complemented with data from the World Development Indicators of the World Bank.

Total freshwater abstraction per capita

Total freshwater abstraction per capita is calculated as gross freshwater abstraction per capita (m3/person). Freshwater abstraction – particularly for public water supply, irrigation, industrial processes, and for cooling in electric power plants – exerts enormous pressure on the quantity and quality of freshwater resources.

Data on freshwater abstraction are obtained from the *OECD Freshwater Abstractions* dataset. Note that data for the United Kingdom include freshwater abstractions only in England and Wales.

Population is the de facto population in a country, area or region as of 1 July of the year indicated. The main source of population data is the *World Population Prospects database* from the *United Nations*, complemented with data from the World Development Indicators of the World Bank. For more details on the underlying population data, see the metadata for *Population*.

Water stress, total freshwater abstraction as % total available renewable resources

Water stress from available resources measures the total gross abstractions of freshwater expressed as a percentage of total available renewable freshwater resources (including inflows from neighbouring countries).

Water stress can be categorised as:

- low (less than 10%): generally no major stress on the available resources
- moderate (10-20%): water availability is becoming a constraint on development and significant investment is needed to provide adequate supplies
- medium-high (20-40%): implies management of both supply and demand, and a need for conflict resolution among competing uses of water.
- high (more than 40%): indicates serious scarcity and usually shows unsustainable water use, which can become a limiting factor in social and economic development.

Data on freshwater abstractions are obtained from the *OECD Freshwater Abstractions Dataset*. Note that data for the United Kingdom include freshwater abstractions only in England and Wales.

Water stress, total freshwater abstraction as % total internal renewable resources

Water stress from internal resources measures the total gross abstractions of freshwater expressed as a percentage of total internal renewable freshwater resources (precipitation net of evapotranspiration).

Water stress can be categorised as:

- low (less than 10%): generally no major stress on the available resources
- moderate (10-20%): water availability is becoming a constraint on development and significant investment is needed to provide adequate supplies
- medium-high (20-40%): implies management of both supply and demand, and a need for conflict resolution among competing uses of water.
- high (more than 40%): indicates serious scarcity and usually shows unsustainable water use, which can become a limiting factor in social and economic development.

Data on freshwater abstractions are obtained from the *OECD Freshwater Abstractions Dataset*. Note that data for the United Kingdom include freshwater abstractions only in England and Wales.

Permanent surface water, % total area

Permanent surface water is expressed as a percentage of total country area.

Permanent surface water is defined as areas that were water for every month of the reference year. Note that these data refer only to water surface, they do not account for the volume of water. Total area refers to land and inland water bodies (including permanent and seasonal water).

Surface water data are obtained from the *OECD Surface water and surface water change dataset (2022 edition).* For further details on the methodology, please consult Land cover change and conversions: methodology and results for OECD and G20.

Seasonal surface water, % total area

Seasonal surface water is expressed as a percentage of total country area.

Seasonal surface water is defined as areas that were water for 1 to 11 months of the reference year. Note that these data refer only to water surface, they do not account for the volume of water. Total area refers to land and inland water bodies (including permanent and seasonal water).

Surface water data are obtained from the *OECD Surface water and surface water change dataset (2022 edition).* For further details on the methodology, please consult Land cover change and conversions: methodology and results for OECD and G20.

Conversion of permanent water to not-water surface, % permanent water, since 1984

Conversion of permanent water to not-water surface is defined as the percentage of permanent water area lost. The denominator used is the available permanent water surface in 1984.

Permanent surface water is defined as areas that were water for every month of the reference year. Note that these data refer only to water surface, they do not account for the volume of water.

Surface water data are obtained from the *Surface water and surface water change dataset (2022 edition).* For further details on the methodology, please consult Land cover change and conversions: methodology and results for OECD and G20.

Conversion of permanent to seasonal water, % permanent water, since 1984

Conversion of permanent to seasonal water is defined as the percentage of permanent water area that became seasonal water. The denominator used is the available permanent water surface in 1984.

Permanent surface water is defined as areas that were water for every month of the reference year. *Seasonal surface water* is defined as areas that were water for 1 to 11 months of the reference year. Note that these data refer only to water surface, they do not account for the volume of water.

Surface water data are obtained from the *OECD Surface water and surface water change dataset (2022 edition).* For further details on the methodology, please consult Land cover change and conversions: methodology and results for OECD and G20.

Conversion of not-water to permanent water, % permanent water, since 1984

Conversion of not-water to permanent water measures how much land was inundated since 1984, expressed as percentage of permanent water. The denominator used is the available permanent water surface in 1984.

Permanent surface water is defined as areas that were water for every month of the reference year. Note that these data refer only to water surface, they do not account for the volume of water.

Surface water data are obtained from the *OECD Surface water and surface water change dataset (2022 edition).* For further details on the methodology, please consult Land cover change and conversions: methodology and results for OECD and G20.

Conversion of seasonal to permanent water, % permanent water, since 1984

This variable measures how much permanent water was gained due to changes from seasonal waters. The denominator used is the available permanent water surface in 1984.

Seasonal surface water is defined as areas that were water for 1 to 11 months of the reference year. *Permanent surface water* is defined as areas that were water for every month of the reference year. Note that these data refer only to water surface, they do not account for the volume of water.

Surface water data are obtained from the *OECD Surface water and surface water change dataset (2022 edition).* For further details on the methodology, please consult Land cover change and conversions: methodology and results for OECD and G20.

Wildlife resources

Threatened mammal species, % total known species

Number of threatened mammal species expressed as percentage of total known species.

The *threatened* category refers to critically endangered, endangered and vulnerable species, that is those plants and animals that are in danger of extinction or likely soon to be (for further information, see the *IUCN Red List Categories and Criteria: Version 3.1, Second edition*).

Whereas this indicator shows data for year 2024, the data refer to the latest information available for every country. Note that due to measurement difficulties national data on threatened species mostly reflect averages over long periods of time.

Data on threatened species are obtained from the *OECD Threatened Species* dataset. Country-specific information is available in the *Countries metadata* document of this dataset.

Threatened bird species, % total known species

Number of threatened bird species expressed as percentage of total known species.

The *threatened* category refers to critically endangered, endangered and vulnerable species, that is those plants and animals that are in danger of extinction or likely soon to be (for further information, see the *IUCN Red List Categories and Criteria: Version 3.1, Second edition*).

Whereas this indicator shows data for year 2024, the data refer to the latest information available for every country. Note that due to measurement difficulties national data on threatened species mostly reflect averages over long periods of time.

Data on threatened species are obtained from the *OECD Threatened Species* dataset. Country-specific information is available in the *Countries metadata* document of this dataset.

Threatened vascular plant species, % total known species

Number of threatened vascular plant species expressed as percentage of total known species.

The *threatened* category refers to critically endangered, endangered and vulnerable species, that is those plants and animals that are in danger of extinction or soon likely to be (for further information, see the *IUCN Red List Categories and Criteria: Version 3.1, Second edition*).

Whereas this indicator shows data for year 2024, the data refer to the latest information available for every country. Note that due to measurement difficulties national data on threatened species mostly reflect averages over long periods of time.

Data on threatened species are obtained from the *OECD Threatened Species* dataset. Country-specific information is available in the *Countries metadata* document of this dataset.

Farmland Birds Index, 2000=100

The *farmland bird index* is an aggregated index, with values in 2000[1] normalised to equal 100, of population trend estimates of a selected group of breeding bird species that are dependent on agricultural land for nesting or breeding. Indices are first calculated for each species independently at the national level, then national-level indices are aggregated to generate a single index. These national indices vary significantly in the number and type of species they include (ranging from 8 to 39 bird species), to reflect varying national situations. A decrease of the index means that the population abundance of bird species is declining, representing biodiversity loss. Some countries may have different index year depending on data availability. For a detailed discussion of the index, please consult: OECD (2019), *Trends and Drivers of Agri-environmental Performance in OECD Countries*, OECD Publishing, Paris.

Data are obtained from the OECD dataset on *Agri-environmental indicators*.

Forest Birds Index, 2000=100

The *forest bird index* is an aggregated index, with values in 2000 normalised to equal 100, of population trend estimates of a selected group of breeding bird species that are dependent on forest lands for nesting or breeding. Indices are first calculated for each species independently at the national level, then national-level indices are aggregated to generate a single index. These national indices vary significantly in the number and type of species they include (ranging from 8 to 39 bird species), to reflect varying national situations. A decrease of the index means that the population abundance of bird species is declining, representing biodiversity loss. Some countries may have different index year depending on data availability. For a detailed discussion of the index, please consult the metadata of the source dataset.

Data are obtained from the OECD dataset on *Agri-environmental indicators*.

Sales of pesticides per unit of agricultural land

Sales of pesticides per unit of agricultural is calculated as the ratio of kilograms of pesticides sold in a given year per hectare of agricultural land (kg/ha). Pesticides include primarily fungicides, herbicides, insecticides, and to a lower extent molluscicides and other substances. From a biodiversity-conservation perspective, the use of pesticides is considered a key driver in the decline of farmland bird populations, a common indicator which suggests negative impacts on farmland biodiversity more broadly; of particular concern is the use of insecticides and herbicides. For a detailed discussion of the interactions between pesticide use and

[1] The following countries use a different base year for their index (Index = 100): Greece (2007), Austria (1998), and Luxembourg (2010).

biodiversity, please consult: OECD (2019), *Trends and Drivers of Agri-environmental Performance in OECD Countries*, OECD Publishing, Paris.

Data are obtained from the OECD dataset on Pesticide Use.

Environmental dimension of quality of life

Exposure to air and water pollution

Mean population exposure to $PM_{2.5}$

Mean population exposure to fine particulate matter is calculated as the mean annual outdoor PM2.5 concentration weighted by population living in the area. It is the concentration level, expressed in micrograms per cubic meter ($\mu g/m^3$), to which a typical resident is exposed throughout a year.

Data on exposure to air pollution are obtained from the *OECD Exposure air pollution dataset*. Please consult the following working paper for detailed information on the methodology and underlying data sources used to compute exposure to air pollution:

Mackie, A., I. Haščič and M. Cárdenas Rodríguez (2016), "Population Exposure to Fine Particles: Methodology and Results for OECD and G20 Countries", *OECD Green Growth Papers*, No. 2016/02, OECD Publishing, Paris, https://doi.org/10.1787/5jlsqs8g1t9r-en.

Percentage of population exposed to more than 10 $\mu g/m^3$

Proportion of people living in areas with annual concentrations exceeding the WHO Air Quality Guideline (AQG) interim target value of 10 micrograms per cubic meter.

Data on exposure to air pollution are obtained from the *OECD Exposure air pollution dataset*. Please consult the following working paper for detailed information on the methodology and underlying data sources used to compute exposure to air pollution:

Mackie, A., I. Haščič and M. Cárdenas Rodríguez (2016), "Population Exposure to Fine Particles: Methodology and Results for OECD and G20 Countries", *OECD Green Growth Papers*, No. 2016/02, OECD Publishing, Paris, https://doi.org/10.1787/5jlsqs8g1t9r-en.

See below the WHO document outlining the new AQG and interim targets:

World Health Organization. (2021). WHO global air quality guidelines: particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide. World Health Organization. https://iris.who.int/handle/10665/345329.

Percentage of population exposed to more than 35 $\mu g/m^3$

Proportion of people living in areas with annual concentrations exceeding the WHO Interim Target value of 35 micrograms per cubic meter.

Data on exposure to air pollution are obtained from the *OECD Exposure air pollution dataset*. Please consult the following working paper for detailed information on the methodology and underlying data sources used to compute exposure to air pollution:

Mackie, A., I. Haščič and M. Cárdenas Rodríguez (2016), "Population Exposure to Fine Particles: Methodology and Results for OECD and G20 Countries", *OECD Green*

Growth Papers, No. 2016/02, OECD Publishing, Paris, https://doi.org/10.1787/5jlsqs8g1t9r-en.

Mortality from exposure to ambient $PM_{2.5}$

Mortality from exposure to ambient $PM_{2.5}$ is expressed in deaths per million inhabitants.

According to the World Health Organisation (WHO), exposure to fine particulate matter ($PM_{2.5}$) has potentially the most significant adverse effects on health compared to other air pollutants. Particulate matter ($PM_{2.5}$) can be inhaled and cause serious health problems including both respiratory and cardiovascular disease, having its most severe effects on children and elderly people.

Data and further details on the methodology can be obtained from GBD (2019), *Global Burden of Disease Study 2019 Results*, and the OECD dataset of *Mortality, morbidity and welfare cost from exposure to environment-related risks*.

Welfare cost of premature deaths from exposure to ambient $PM_{2.5}$, GDP equivalent

Welfare costs of premature deaths from exposure to environmental risks are compared to GDP as percentage points of GDP equivalent.

Cost estimates represent only the cost of premature mortalities. They are calculated using estimates of the "Value of a Statistical Life" (VSL) and the number of premature deaths attributable to each environmental risk. They exclude any morbidity impacts (labour productivity losses, treatment costs and willingness to pay to avoid pain and suffering from illness). They also exclude impacts other than those on human health (e.g. on built structures, agricultural productivity, ecosystem health). The social cost of the exposure to these environmental risks is thus greater than the cost of mortalities presented here. Yet the available evidence suggests that mortality costs account for the bulk of the total costs to society. Finally, VSL also captures non-market values that are unrelated to expenditures and therefore not an integral part of the calculation of GDP. Consequently, the cost estimates are compared with GDP only for illustration.

Data and further details on the methodology can be obtained from GBD (2019), *Global Burden of Disease Study 2019 Results*, and the OECD dataset of *Mortality, morbidity and welfare cost from exposure to environment-related risks*.

Mortality from exposure to ambient ozone

Mortality from exposure to ambient ozone is expressed in deaths per million inhabitants.

Ambient (or ground-level) ozone (O3) has serious consequences for human health, contributing to, or triggering, respiratory diseases. These include breathing problems, asthma and reduced lung function (WHO). Ozone exposure is highest in emission-dense countries with warm and sunny summers. The most important determinants are background atmospheric chemistry, climate, anthropogenic and biogenic emissions of ozone precursors such as volatile organic compounds, and the ratios between different emitted chemicals.

Data and further details on the methodology can be obtained from GBD (2019), *Global Burden of Disease Study 2019 Results*, and the OECD dataset of *Mortality, morbidity and welfare cost from exposure to environment-related risks*.

Welfare cost of premature deaths from exposure to ambient ozone, GDP equivalent

Welfare costs of premature deaths from exposure to ambient ozone are compared to GDP as percentage points of GDP equivalent.

Cost estimates represent only the cost of premature mortalities. They are calculated using estimates of the "Value of a Statistical Life" (VSL) and the number of premature deaths attributable to each environmental risk. They exclude any morbidity impacts (labour productivity losses, treatment costs and willingness to pay to avoid pain and suffering from illness). They also exclude impacts other than those on human health (e.g. on built structures, agricultural productivity, ecosystem health). The social cost of the exposure to these environmental risks is thus greater than the cost of mortalities presented here. Yet the available evidence suggests that mortality costs account for the bulk of the total costs to society. Finally, VSL also captures non-market values that are unrelated to expenditures and therefore not an integral part of the calculation of GDP. Consequently, the cost estimates are compared with GDP only for illustration.

Data on premature deaths can be obtained from GBD (2019), *Global Burden of Disease Study 2019 Results* . Data and further details on the methodology to derive the VSL estimates can be obtained from the OECD dataset of *Mortality, morbidity and welfare cost from exposure to environment-related risks*.

Mortality from exposure to lead

Mortality from exposure to lead is expressed in deaths per million inhabitants.

Lead (Pb) is a toxic metal found in the Earth's crust. Its widespread use has resulted in extensive environmental contamination, human exposure and significant public health problems in many parts of the world. Important sources of environmental contamination include mining, smelting, manufacturing and recycling activities, and, in some countries, the continued use of leaded paint, leaded gasoline, and leaded aviation fuel.

Data and further details on the methodology to derive premature deaths from exposure to lead can be obtained from GBD (2019), *Global Burden of Disease Study 2019 Results*, and the OECD dataset of *Mortality, morbidity and welfare cost from exposure to environment-related risks*.

Welfare cost of premature deaths from exposure to lead, GDP equivalent

Welfare costs of premature deaths from exposure to lead are compared to GDP as percentage points of GDP equivalent.

Cost estimates represent only the cost of premature mortalities. They are calculated using estimates of the "Value of a Statistical Life" (VSL) and the number of premature deaths attributable to each environmental risk. They exclude any morbidity impacts (labour productivity losses, treatment costs and willingness to pay to avoid pain and

suffering from illness). They also exclude impacts other than those on human health (e.g. on built structures, agricultural productivity, ecosystem health). The social cost of the exposure to these environmental risks is thus greater than the cost of mortalities presented here. Yet the available evidence suggests that mortality costs account for the bulk of the total costs to society. Finally, VSL also captures non-market values that are unrelated to expenditures and therefore not an integral part of the calculation of GDP. Consequently, the cost estimates are compared with GDP only for illustration.

Data on premature deaths can be obtained from GBD (2019), *Global Burden of Disease Study 2019 Results*. Data and further details on the methodology to derive the VSL estimates can be obtained from the OECD dataset of *Mortality, morbidity and welfare cost from exposure to environment-related risks*.

Mortality from exposure to residential radon

Mortality from exposure to residential radon is expressed in deaths per million inhabitants.

Radon (Rn) is a radioactive gas that arises as a by-product of the decay chain of uranium, occurring naturally within the Earth's crust. Some fraction of this natural radon escapes into the atmosphere, where it forms at low concentration unless build-up is caused by enclosed spaces like homes, mines or caves. Soil gas infiltration is recognized as the most important source of residential radon. Other sources, including building materials and water extracted from wells, are of less importance in most circumstances. Radon is a major contributor to the ionizing radiation dose received by the general population, and is the second cause of lung cancer, after smoking. Epidemiological studies have provided convincing evidence of an association between indoor radon exposure and lung cancer, even at the relatively low radon levels commonly found in residential buildings.

Data and further details on the methodology to derive premature deaths from exposure to residential radon can be obtained from GBD (2019), *Global Burden of Disease Study 2019 Results*, and the OECD dataset of *Mortality, morbidity and welfare cost from exposure to environment-related risks*.

Welfare cost of premature deaths from exposure to residential radon, GDP equivalent

Welfare costs of premature deaths from exposure to residential radon are compared to GDP as percentage points of GDP equivalent.

Cost estimates represent only the cost of premature mortalities. They are calculated using estimates of the "Value of a Statistical Life" (VSL) and the number of premature deaths attributable to each environmental risk. They exclude any morbidity impacts (labour productivity losses, treatment costs and willingness to pay to avoid pain and suffering from illness). They also exclude impacts other than those on human health (e.g. on built structures, agricultural productivity, ecosystem health). The social cost of the exposure to these environmental risks is thus greater than the cost of mortalities presented here. Yet the available evidence suggests that mortality costs account for the bulk of the total costs to society. Finally, VSL also captures non-market values that are unrelated to expenditures and therefore not an integral part of the

calculation of GDP. Consequently, the cost estimates are compared with GDP only for illustration.

Data on premature deaths can be obtained from GBD (2019), *Global Burden of Disease Study 2019 Results*. Data and further details on the methodology to derive the VSL estimates can be obtained from the OECD dataset of *Mortality, morbidity and welfare cost from exposure to environment-related risks*.

Exposure to climate-related hazards

Percentage of population exposed to hot days

Hot days are defined as days when the daily maximum temperature exceeds 35° Celsius. The population exposure is the share of the population exposed to such climate hazards between at least one to maximum fourteen days per year.

Data on population exposure to hot days can be obtained from *OECD Exposure to Extreme Temperature* dataset. The methodology is accessible through the reference paper Maes, M et al. (2022), *Monitoring exposure to climate-related hazards: Indicator methodology and key results,* OECD Environment Working Papers, No. 201, OECD Publishing, Paris, https://doi.org/10.1787/da074cb6-en.

Percentage of population exposed to icing days

Icing days are defined as days when the daily maximum temperature is below 0° Celsius. The population exposure is the share of the population exposed to such climate hazards between at least one and maximum fourteen days per year.

Data on population exposure to icing days can be obtained from *OECD Exposure to Extreme Temperature* dataset. The methodology is accessible through the reference paper Maes, M et al. (2022), *Monitoring exposure to climate-related hazards: Indicator methodology and key results,* OECD Environment Working Papers, No. 201, OECD Publishing, Paris, https://doi.org/10.1787/da074cb6-en

Percentage of population exposed to wildfire

Population exposure to wildfire danger assesses locations where populations are exposed to a very high or extreme wildfire danger and accounts for vegetation biomass as well as historical fire events and burned area data. The Global Human Settlement Layer (GHSL) population grids developed by the European Commission's JRC allow for the estimation of the population count present in areas with a very high (> 5) or extreme (> 6) wildfire danger based on the Fire Weather Index.

Data on population exposure to wildfires can be obtained from *OECD Exposure to Extreme Temperature* dataset. The methodology is accessible through the reference paper Maes, M et al. (2022), *Monitoring exposure to climate-related hazards:*

Indicator methodology and key results, OECD Environment Working Papers, No. 201, OECD Publishing, Paris, https://doi.org/10.1787/da074cb6-en.

Percentage of population exposed to river flooding

River flooding occurs when excessive rainfall results in the river exceeding the channel capacity and spilling into the adjacent areas. This indicator presents the annual percentage of the population exposed to river flooding with a 10-year return period. Population exposure to river floods at different territorial levels was computed using the Global Human Settlement Layer Population grid

Data on population exposure to river flooding can be obtained from *OECD Exposure to River Flooding* dataset. The methodology is accessible through the reference paper Maes, M et al. (2022), *Monitoring exposure to climate-related hazards: Indicator methodology and key results,* OECD Environment Working Papers, No. 201, OECD Publishing, Paris, https://doi.org/10.1787/da074cb6-en.

Access to drinking water and sewage treatment

Population with access to improved drinking water sources, % total population

Percentage of population using improved drinking water sources. Improved sources of drinking water include: piped water into dwelling, yard or plot, public taps or standpipes, boreholes or tubewells, protected dug wells, protected springs, packaged water, delivered water and rainwater. Improved water sources should be located on premises and available when needed and free of faecal (and priority chemical) contamination.

Data on access to improved drinking water sources are obtained from the *Sustainable Development Goals indicators dataset* from the *United Nations*.

Population with access to improved sanitation, % total population

Percentage of population using improved sanitation and a basic handwashing facility. Improved sanitation facilities include: flush or pour flush toilets to sewer systems, septic tanks or pit latrines, ventilated improved pit latrines, pit latrines with a slab, and composting toilets. Sanitation facilities should not be shared with other households and where excreta is safely disposed in situ or treated off-site. Population with a basic handwashing facility: a device to contain, transport or regulate the flow of water to facilitate handwashing with soap and water in the household.

Data on access to improved sanitation are obtained from the *Sustainable Development Goals indicators dataset* from the *United Nations*.

Population connected to public sewerage, % total population

Percentage of the national resident population connected to an urban wastewater collecting system. “Connected” means physically connected to a wastewater treatment plant through a public sewerage network (incl. primary, secondary, tertiary or other treatment). Individual private treatment facilities such as septic tanks are not covered.

Data on access to public sewerage are obtained from the *OECD Wastewater - Connection rates to treatment* dataset.

Population connected to sewerage with primary treatment, % total population

Percentage of the national resident population connected to public sewerage with primary treatment. “Connected” means physically connected to a wastewater treatment plant through a public sewerage network (incl. primary, secondary, tertiary or other treatment).

“Primary treatment” refers to a physical and/or chemical process involving settlement of suspended solids, or other process in which the BOD5 (the amount of dissolved oxygen consumed in five days by biological processes breaking down organic matter) of the incoming wastewater is reduced by at least 20% before discharge and the total suspended solids are reduced by at least 50%.

Data on access to public sewerage are obtained from the *OECD Wastewater - Connection rates to treatment* dataset.

Population connected to sewerage with secondary treatment, % total population

Percentage of the national resident population connected to public sewerage with secondary treatment. "Connected" means physically connected to a wastewater treatment plant through a public sewerage network (incl. primary, secondary, tertiary or other treatment).

"Secondary treatment" refers to a process generally involving biological treatment with secondary settlement or another process, resulting in reductions in biochemical oxygen demand of at least 70% and chemical oxygen demand of at least 75%.

Data on access to public sewerage are obtained from the *OECD Wastewater - Connection rates to treatment* dataset.

Population connected to sewerage with tertiary treatment, % total population

Percentage of the national resident population connected to public sewerage with tertiary treatment. "Connected" means physically connected to a wastewater treatment plant through a public sewerage network (incl. primary, secondary, tertiary or other treatment).

"Tertiary treatment" refers to treatment of nitrogen and/or phosphorus and/or any other pollutant affecting the quality or specific use of water; microbiological pollution, colour, etc.

Data on access to public sewerage are obtained from the *OECD Wastewater - Connection rates to treatment* dataset.

Economic opportunities and policy responses

Technology and innovation: R&D

Environment-related government R&D budget, % total government R&D

Government budget for R&D refers to *Government Budget Allocations for Research and Development* (GBARD), that measure the funds that government allocate to R&D to meet various socio-economic objectives. These objectives are defined using the *Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets* (NABS 2007) classification. Estimates of environment-related government RD&D are reported from the funder perspective as budget (rather than as expenditure from the performer perspective).[2] This indicator is based on the socio-economic objective "environment" which includes research directed at the control of pollution and on developing monitoring facilities to measure, eliminate and prevent pollution. It is expressed as a percentage of all-purpose GBARD.

Data on government expenditure regarding environment-related R&D are obtained from the OECD dataset on *Government budget allocations for R&D (GBARD)*. Additional information on the methodology for internationally harmonised collection and use of R&D statistics can be found in the *Frascati Manual*. OECD aggregate does not include Costa Rica.

Environment-related R&D expenditure, % GDP

R&D expenditure refers to *Gross domestic Expenditure on Research and Development (GERD)* measured as total intramural (= business enterprise + government + higher education + private non-profit) R&D expenditure in various socio-economic objectives. These objectives are defined using the *Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets* (NABS 2007) classification. Estimates of R&D are reported from the performer perspective as expenditure (rather than as budget from the funder perspective).[3] This indicator is based on the socio-economic objective "environment" which includes research directed at the control of pollution and on developing monitoring facilities to measure, eliminate and prevent pollution. It is expressed as percentage of GDP in PPP current prices (2020).

Data on environment-related R&D expenditure is obtained from the OECD dataset on *Gross domestic expenditure on R&D by sector of performance and socio-economic objectives*. Additional information on the methodology for internationally harmonised collection and use of R&D statistics can be found in the *Frascati Manual*.

For more details on the underlying GDP data, see the metadata for *Real GDP*.

[2] Estimated budgets and actual expenditures by governments often differ because projected amounts of R&D at the appropriations stage vary from what is actually measured by the performers. It may also be due to an imprecision in the budget appropriations impeding separate identification of appropriations that are specifically targeted to R&D.

[3] Estimated budgets and actual expenditures by governments often differ because projected amounts of R&D at the appropriations stage vary from what is actually measured by the performers. It may also be due to imprecise budget appropriations impeding separate identification of appropriations that are specifically targeted to R&D.

Renewable energy public RD&D budget, % total energy public RD&D

Public budget directed at research, development and demonstration (RD&D) related to renewable energy, including hydro, geothermal, solar (thermal and PV), wind and tide/wave/ocean energy, as well as combustible renewables (solid biomass, liquid biomass, biogas) and other renewable energy technologies (all supporting measuring, monitoring and verifying technologies in renewable energies). It is expressed as a percentage of total energy RD&D public budget (directed at all forms of energy).

RD&D budgets of public entities (government, public agencies and state-owned enterprises, as defined by the IEA) cover research, development and demonstration related to the production, storage, transportation, distribution and rational use of all forms of energy. This covers basic research (oriented towards the development of energy-related technologies), applied research, experimental development and demonstration. Deployment is excluded from IEA Energy RD&D. Estimates of RD&D are reported from the funder perspective as budget (rather than as expenditure from the performer perspective).[4]

Public energy RD&D includes all programmes that focus on: (i) sourcing energy; (ii) transporting energy; (iii) using energy; and (iv) enhancing energy efficiency. As collected by the IEA, these programmes concern one of the following seven main branches of energy-related developments: (i) energy efficiency; (ii) fossil fuels (oil, gas and coal); (iii) renewables; (iv) nuclear fission and fusion; (v) hydrogen and fuel cells; (vi) other power and storage techniques; and (vii) other cross-cutting technologies or research.

Data on public RD&D are obtained from the *Public energy technology RD&D Budgets dataset* from the *IEA Energy Technology RD&D Budgets Database*.

The energy RD&D data collected by the IEA should not be confused with the data on *government budget appropriations or outlays on R&D (GBARD)* collected by the OECD Directorate for Science, Technology and Industry for the socio-economic objective "Production, distribution and rational utilisation of energy", as defined in the Frascati Manual, which is a narrower concept.

For this indicator, the EU27_2020 aggregate is the budget of the European Commission and does not reflect the sum of the individual budgets of the 27 members of the EU.

Fossil fuel public RD&D budget, % total energy public RD&D

Public budget directed at research, development and demonstration (RD&D) related to fossil fuels, including oil, gas and coal and excluding RD&D related to CO_2 capture and storage (CCS). They are expressed as a percentage of total energy RD&D public budgets (directed at all forms of energy).

RD&D budgets of public entities (government, public agencies and state-owned enterprises, as defined by the IEA) cover research, development and demonstration

[4] Estimated budgets and actual expenditures by governments often differ because projected amounts of RD&D at the appropriations stage are different than what is actually measured by the performers. It may also be due to imprecise budget appropriations impeding separate identification of appropriations that are specifically targeted to RD&D.

related to the production, storage, transportation, distribution and rational use of all forms of energy. This covers basic research (oriented towards the development of energy-related technologies), applied research, experimental development and demonstration. Deployment is excluded from IEA Energy RD&D. Estimates of RD&D are reported from the funder perspective as budget (rather than as expenditure from the performer perspective).[5]

Public energy RD&D includes all programmes that focus on: (i) sourcing energy; (ii) transporting energy; (iii) using energy; and (iv) enhancing energy efficiency. As collected by the IEA, these programmes concern one of the following seven main branches of energy-related developments: (i) energy efficiency; (ii) fossil fuels (oil, gas and coal); (iii) renewables; (iv) nuclear fission and fusion; (v) hydrogen and fuel cells; (vi) other power and storage techniques; and (vii) other cross-cutting technologies or research.

Data on public RD&D are obtained from the *Public energy technology* RD&D Budget*s d*ataset from the *IEA Energy Technology RD&D Budgets Database*.

The energy RD&D data collected by the IEA should not be confused with the data on *government budget appropriations or outlays on R&D (GBARD)* collected by the OECD Directorate for Science, Technology and Industry for the socio-economic objective "Production, distribution and rational utilisation of energy", as defined in the Frascati Manual, which is a narrower concept.

For this indicator, the EU27_2020 aggregate is the budget of the European Commission and does not reflect the sum of the individual budgets of the 27 members of the EU.

Energy RD&D public budget, % GDP

Energy RD&D public budget is expressed as a percentage of GDP. This indicator allows the *Renewable energy public RD&D budget* (see above) to be put into a broader context.

IEA Energy RD&D from public bodies (government, public agencies and state-owned enterprises, as defined by the IEA) covers research, development and demonstration related to the production, storage, transportation, distribution and rational use of all forms of energy. It covers basic research (oriented towards the development of energy-related technologies), applied research, experimental development and demonstration. Deployment is excluded from IEA Energy RD&D. It is expressed as percentage of total (all energy-related developments) public RD&D. Estimates of RD&D are reported from the funder perspective as budget (rather than as expenditure from the performer perspective).[6]

[5] Estimated budgets and actual expenditures by governments often differ because projected amounts of RD&D at the appropriations stage are different than what is actually measured by the performers. It may also be due to imprecise budget appropriations impeding separate identification of appropriations that are specifically targeted to RD&D.
[6] Estimated budgets and actual expenditures by governments often differ because projected amounts of RD&D at the appropriations stage are different than what is actually measured by the performers. It may also be due to imprecise budget appropriations that impede separate identification of appropriations that are specifically targeted to RD&D.

Energy RD&D includes all programmes that focus on: (i) sourcing energy; (ii) transporting energy; (iii) using energy; and (iv) enhancing energy efficiency. As collected by the IEA, these programmes concern one of the following seven main branches of energy-related developments: (i) energy efficiency; (ii) fossil fuels (oil, gas and coal); (iii) renewables; (iv) nuclear fission and fusion; (v) hydrogen and fuel cells; (vi) other power and storage techniques; and (vii) other cross-cutting technologies or research.

The energy RD&D data collected by the IEA should not be confused with the data on government budget appropriations or outlays on R&D (GBARD) collected by the OECD Directorate for Science, Technology and Industry for the socio-economic objective "Production, distribution and rational utilisation of energy", as defined in the Frascati Manual, which is a narrower concept.

Data on energy public RD&D budget are obtained from the *Public energy technology RD&D Budgets dataset* from the *IEA Energy Technology RD&D Budgets Database*.

For more details on the underlying GDP data, see the metadata for *Real GDP*.

For this indicator, the EU27_2020 aggregate is the budget of the European Commission and does not reflect the sum of the individual budgets of the 27 members of the EU.

Technology and innovation: Patents

Development of environment-related technologies, % all technologies

The number of environment-related inventions is expressed as a percentage of all domestic inventions (in all technologies). Changes in 'environmental' technological innovation can then be interpreted in relation to innovation in general.

Indicators of technology development are constructed by measuring inventive activity using patent data across a wide range of environment-related technological domains (ENVTECH), including environmental management, water-related adaptation, and climate change mitigation technologies. The counts used here include only higher-value inventions (with patent family[7] size ≥ 2).

Data are obtained from the *OECD Patents: Indicators* *dataset* Detailed information on the methodology used to compute the patent counts is in the associated metadata.

Relative advantage in environment-related technologies

The relative advantage in environment-related technologies is an index of the specialisation in environmental innovation of a given country relative to the world average. It is calculated as the ratio of 1) the share of environment-related inventions on all inventions (in all technologies) at home and 2) the share of environment-related inventions on all inventions (in all technologies) in the world. Hence, an index equal to one means that a country innovates as much in 'green' technologies as the world on average; an index above 1 indicates a relative technological advantage (RTA), or specialisation, in environment-related technologies compared to the world average.

Indicators of technology development are constructed by measuring inventive activity using patent data across a wide range of environment-related technological domains (ENVTECH), including environmental management, water-related adaptation, and climate change mitigation technologies. The counts used here include only higher-value inventions (with patent family[8] size ≥ 2).

Data are obtained from the *OECD Patents: Indicators* *dataset.* Detailed information on the methodology used to compute the patent counts is in the associated metadata.

Development of environment-related technologies, % inventions worldwide

The number of environment-related inventions is expressed as a percentage of environment-related inventions worldwide. This indicator allows the importance of inventive activity in a given country to be assessed in terms of its contribution to the global pool of inventions.

Indicators of technology development are constructed by measuring inventive activity using patent data across a wide range of environment-related technological domains (ENVTECH), including environmental management, water-related adaptation, and

[7] A patent family is defined as the set of all patent applications protecting the same 'priority' (as defined by the *Paris Convention*), also referred to as 'simple patent family' (see *Martinez 2010*).
[8] A patent family is defined as the set of all patent applications protecting the same 'priority' (as defined by the *Paris Convention*), also referred to as 'simple patent family' (see *Martinez 2010*).

climate change mitigation technologies. The counts used here include only higher-value inventions (with patent family[9] size ≥ 2).

Data are obtained from the *OECD Patents: Indicators dataset.* Detailed information on the methodology used to compute the patent counts is in the associated metadata.

Development of environment-related technologies, inventions per capita

The number of environment-related inventions is expressed per million residents (higher-value inventions/million persons).

Indicators of technology development are constructed by measuring inventive activity using patent data across a wide range of environment-related technological domains (ENVTECH), including environmental management, water-related adaptation, and climate change mitigation technologies. The counts used here include only higher-value inventions (with patent family[10] size ≥ 2).

Data are obtained from the *OECD Patents: Indicators dataset.* Detailed information on the methodology used to compute the patent counts is in the associated metadata.

[9] A patent family is defined as the set of all patent applications protecting the same 'priority' (as defined by the *Paris Convention*), also referred to as 'simple patent family' (see *Martinez 2010*).
[10] A patent family is defined as the set of all patent applications protecting the same 'priority' (as defined by the *Paris Convention*), also referred to as 'simple patent family' (see *Martinez 2010*).

Environmental goods and services

National expenditure on environmental protection, % GDP

National expenditure on environmental protection is expressed as a percentage of Gross Domestic Product in current prices. Environmental Protection (EP) includes all activities and actions which have as their main purpose the prevention, reduction and elimination of pollution as well as any other degradation of the environment. The scope of environmental protection expenditure is defined according to the Classification of Environmental Protection Activities (CEPA 2000). The expenditure accounts presented here are in accordance with the System of Environmental-Economic Accounting (SEEA). National expenditure on EP covers the expenditure on EP products by resident units, expenditure related to the production of EP products (including the gross capital formation), and transactions related to the financing of EP expenditure.

Data and further details can be obtained from the *OECD Environmental Protection Expenditure Accounts (EPEA)* dataset.

For more details on the underlying GDP data, see the metadata for *Real GDP*.

International financial flows: Official Development Assistance

Environmentally related ODA, % total allocable ODA

Environmentally related Official Development Assistance (ODA) is expressed as a percentage of total sector-allocable ODA. Environmentally related ODA is identified using marker "Environment" and the set of “Rio Markers”. The Rio Markers specifically screen for policy objectives of a cross-sectorial nature, including climate change, biodiversity and desertification. This variable includes only data on bilateral commitments and is calculated by aggregating up from the level of the individual projects in order to avoid double-counting.

ODA commitments identified using the "Environment" marker (principal or significant objective) include activities that are intended to produce an improvement in the physical and/or biological environment of the recipient country, area or target group concerned or include specific action to integrate environmental concerns with a range of development objectives through institution building and/or capacity development. The “Environment” marker was introduced in 1992.

ODA commitments identified using the “Rio markers” (principal or significant objective) include:

- **Biodiversity-related aid** is defined as activities that promote conservation of biodiversity, sustainable use of its components, or fair and equitable sharing of the benefits of the use of genetic resources. The biodiversity marker was introduced in 1998.
- **Desertification-related aid** is defined as activities that tackle desertification or mitigate the effects of drought. The desertification marker was introduced in 1998.
- **Climate change mitigation-related aid** is defined as activities that strengthen the resilience of countries to climate change and that contribute to stabilisation of GHG concentrations by promoting reduction of emissions or enhancement of GHG sequestration. The climate change mitigation marker was introduced in 1998.
- **Climate change adaptation-related aid**, approved by OECD-DAC members in December 2009, is defined as aid in support of climate change adaptation and complements the climate change mitigation marker, thus allowing presentation of a more complete picture of aid in support of developing countries’ efforts to address climate change. The climate change adaptation marker was introduced in 2010.

Sector-allocable ODA comprises aid commitments attributable to a sector such as education, water supply, energy, transport, agriculture, industry, or trade. It excludes especially from total ODA the aid targeted for general budget, humanitarian aid and actions related to debt. The complete list of sectors, from 100 to 400 or purpose codes 11110 to 43082, is accessible on the OECD Development finance classifications. OECD aggregate excludes Chile, Colombia, Mexico, and Costa Rica.

ODA data are obtained from the *OECD Credit Reporting System* dataset.

ODA – all sectors – biodiversity, % total allocable ODA

Official Development Assistance (ODA) targeting biodiversity is expressed as a percentage of total sector-allocable ODA. ODA targeting the objectives of the Rio conventions is identified using the "Rio Markers" (principal or significant objective), which screen for policy objectives of a cross-sectoral nature, including climate change, biodiversity and desertification (see E*nvironmentally related ODA, % total ODA* for more details on the Rio Markers).

Sector-allocable ODA comprises aid commitments attributable to a sector such as education, water supply, energy, transport, agriculture, industry, or trade. It excludes especially from total ODA the aid targeted for general budget, humanitarian aid and actions related to debt. The complete list of sectors, from 100 to 400 or purpose codes 11110 to 43082, is accessible on the OECD Development finance classifications. OECD aggregate excludes Chile, Colombia, Mexico, and Costa Rica.

ODA data are obtained from the *OECD Credit Reporting System* dataset.

ODA – all sectors – climate change mitigation, % total allocable ODA

Official Development Assistance (ODA) targeting climate change mitigation is expressed as a percentage of total sector-allocable ODA. ODA targeting the objectives of the Rio conventions is identified using the "Rio Markers" (principal + significant objective), which screen for policy objectives of a cross-sectoral nature, including climate change, biodiversity and desertification (see E*nvironmentally related ODA, % total ODA* for more details on the Rio Markers).

Sector-allocable ODA comprises aid commitments attributable to a sector such as education, water supply, energy, transport, agriculture, industry, or trade. It excludes especially from total ODA the aid targeted for general budget, humanitarian aid and actions related to debt. The complete list of sectors, from 100 to 400 or purpose codes 11110 to 43082, is accessible on the OECD Development finance classifications. OECD aggregate excludes Chile, Colombia, Mexico, and Costa Rica.

ODA data are obtained from the *OECD Credit Reporting System* dataset.

ODA – all sectors – climate change adaptation, % total allocable ODA

Official Development Assistance (ODA) targeting climate change adaptation is expressed as a percentage of total sector-allocable ODA. ODA targeting the objectives of the Rio conventions is identified using the "Rio Markers" (principal + significant objective), which screen for policy objectives of a cross-sectoral nature, including climate change, biodiversity and desertification (see E*nvironmentally related ODA, % total ODA* for more details on the Rio Markers).

Sector-allocable ODA comprises aid commitments attributable to a sector such as education, water supply, energy, transport, agriculture, industry, or trade. It excludes especially from total ODA the aid targeted for general budget, humanitarian aid and actions related to debt. The complete list of sectors, from 100 to 400 or purpose codes 11110 to 43082, is accessible on the OECD Development finance classifications. OECD aggregate excludes Chile, Colombia, Mexico, and Costa Rica.

ODA data are obtained from the *OECD Credit Reporting System* dataset.

ODA – all sectors – desertification, % total allocable ODA

Official Development Assistance (ODA) targeting desertification is expressed as a percentage of total sector-allocable ODA. ODA targeting the objectives of the Rio conventions is identified using the "Rio Markers" (principal + significant objective), which screen for policy objectives of a cross-sectoral nature, including climate change, biodiversity and desertification (see E*nvironmentally related ODA, % total ODA* for more details on the Rio Markers).

Sector-allocable ODA comprises aid commitments attributable to a sector such as education, water supply, energy, transport, agriculture, industry, or trade. It excludes especially from total ODA the aid targeted for general budget, humanitarian aid and actions related to debt. The complete list of sectors, from 100 to 400 or purpose codes 11110 to 43082, is accessible on the OECD Development finance classifications. OECD aggregate excludes Chile, Colombia, Mexico, and Costa Rica.

ODA data are obtained from the *OECD Credit Reporting System* dataset.

ODA – environment sector, % total allocable ODA

Official Development Assistance allocated to environmental protection activities is expressed as a percentage of total sector-allocable ODA. Environment sector refers to general environmental protection activities, i.e. environmental policy and administrative management, biosphere protection, biodiversity, site preservation, flood prevention/control, environmental education/training and environmental research. This indicator is based on commitment data (not actual disbursements), which best reflect current policies by donors.

Sector-allocable ODA comprises aid commitments attributable to a sector such as education, water supply, energy, transport, agriculture, industry, or trade. It excludes especially from total ODA the aid targeted for general budget, humanitarian aid and actions related to debt. The complete list of sectors, from 100 to 400 or purpose codes 11110 to 43082, is accessible on the OECD Development finance classifications. OECD aggregate excludes Chile, Colombia, Mexico, and Costa Rica.

ODA data are obtained from the *OECD Credit Reporting System* dataset.

ODA – renewable energy sector, % total allocable ODA

Official Development Assistance allocated to renewable energy is expressed as a percentage of total sector-allocable ODA. Renewable energy-related aid is defined as activities that promote the development and deployment of energy generation facilities with reduced pressure on the environment. The renewable energy sector includes hydro-electric power plants, geothermal energy, solar energy, wind power, ocean power and biomass. This indicator is based on commitment data (not actual disbursements), which best reflect current policies by donors.

Sector-allocable ODA comprises aid commitments attributable to a sector such as education, water supply, energy, transport, agriculture, industry, or trade. It excludes especially from total ODA the aid targeted for general budget, humanitarian aid and

actions related to debt. The complete list of sectors, from 100 to 400 or purpose codes 11110 to 43082, is accessible on the OECD Development finance classifications. OECD aggregate excludes Chile, Colombia, Mexico, and Costa Rica.

ODA data are obtained from the *OECD Credit Reporting System* dataset.

ODA – water supply and sanitation sector, % total allocable ODA

Official Development Assistance allocated to the water supply and sanitation sector is expressed as a percentage of total sector-allocable ODA. The water supply and sanitation sector refers to water sector policy and administrative management, water resources conservation, water supply and sanitation, basic drinking water supply and basic sanitation, river basin' development, waste management / disposal, education and training in water supply and sanitation. This indicator is based on commitment data (not actual disbursements), which best reflect current policies by donors.

Sector-allocable ODA comprises aid commitments attributable to a sector such as education, water supply, energy, transport, agriculture, industry, or trade. It excludes especially from total ODA the aid targeted for general budget, humanitarian aid and actions related to debt. The complete list of sectors, from 100 to 400 or purpose codes 11110 to 43082, is accessible on the OECD Development finance classifications. OECD aggregate excludes Chile, Colombia, Mexico, and Costa Rica.

ODA data are obtained from the *OECD Credit Reporting System* dataset.

Net ODA provided, % GNI

Net official development assistance (ODA) provided is expressed as a percentage of Gross National Income.

Official development assistance (ODA) is defined as government aid designed to promote the economic development and welfare of developing countries. Loans and credits for military purposes are excluded. The OECD maintains a list of developing countries and territories; only aid to these countries counts as ODA.

Until 2017, net ODA provided consists of disbursements of loans made on concessional terms (net of repayments of principal) and grants by official agencies of the members of the Development Assistance Committee (DAC), and by non-DAC countries to promote economic development and welfare in countries and territories in the DAC list of ODA recipients. It includes loans with a grant element of at least 25 percent (calculated at a rate of discount of 10 percent).

After 2017, net ODA is based on the grant equivalent methodology. The grant equivalent methodology reflects the changes that have been happening in the development cooperation sector where other actors than official donors, such as the private sector and philanthropic foundations have had growing importance. It also take into account the diversification of financial instruments that serve development purposes such as soft loans in addition to grant only. For more information, consult the web page dedicated to the modernisation of the DAC statistical system.

As a result, breaks in time series may occur after 2017.

A long-standing ODA target is that developed countries should devote 0.7% of their gross national income to ODA. This indicator is measured as a percentage of gross national income.

Net ODA disbursements as percentage of GNI are obtained from the *OECD DAC1: Flows by donor* dataset.

Environmental taxes and transfers

Environmentally related tax revenue, % GDP

Environmentally related tax revenue is expressed as a percentage of GDP. Environmentally related taxes include (i) energy products for transport purposes (petrol and diesel) and for stationary purposes (fossil fuels and electricity); (ii) motor vehicles and transport (one-off import or sales taxes, recurrent taxes on registration or road use and other transport taxes); (iii) waste management (final disposal, packaging and other waste-related product taxes); (iv) ozone-depleting substances and (v) other environmentally related taxes.

Tax data is obtained from the *OECD Environmentally related tax revenue dataset*.

For more details on the underlying GDP data, see the metadata for *Real GDP*.

Environmentally related tax revenue, % total tax revenue

Environmentally related tax revenue is expressed as a percentage of total tax revenue. Environmentally related taxes include taxes to (i) energy products for transport purposes (petrol and diesel) and for stationary purposes (fossil fuels and electricity); (ii) motor vehicles and transport (one-off import or sales taxes, recurrent taxes on registration or road use and other transport taxes); (iii) waste management (final disposal, packaging and other waste-related product taxes); (iv) ozone-depleting substances and (v) other environmentally related taxes.

Tax data is obtained from the *OECD Environmentally related tax revenue dataset*.

Total tax revenue data is obtained from the *Detailed Tax Revenue Tables* of individual countries in the *OECD Global Tax Revenue database,* complemented with information from the *Main National Accounts Tax Aggregates* dataset from EUROSTAT, the Government Finance indicators of the Asian Development Bank, and the *International Financial Statistics* dataset from the International Monetary Fund.

Energy-related tax revenue, % total environmental tax revenue

Energy related tax revenue is expressed as a percentage of environmentally related tax revenue. Environmentally related taxes include (i) energy products for transport purposes (petrol and diesel) and for stationary purposes (fossil fuels and electricity); (ii) motor vehicles and transport (one-off import or sales taxes, recurrent taxes on registration or road use and other transport taxes); (iii) waste management (final disposal, packaging and other waste-related product taxes); (iv) ozone-depleting substances and (v) other environmentally related taxes.

Tax data is obtained from the *OECD Environmentally related tax revenue dataset*.

Road transport-related tax revenue, % total environmental tax revenue

Tax revenue related to motor vehicles used in road transport is expressed as a percentage of all environmentally related tax revenue. Environmentally related taxes include (i) energy products for transport purposes (petrol and diesel) and for stationary purposes (fossil fuels and electricity); (ii) motor vehicles and transport (one-

off import or sales taxes, recurrent taxes on registration or road use and other transport taxes); (iii) waste management (final disposal, packaging and other waste-related product taxes); (iv) ozone-depleting substances and (v) other environmentally related taxes.

Tax data is obtained from the *OECD Environmentally related tax revenue dataset*.

Emissions priced above EUR 30 per tonne of CO_2, % total emissions

Emissions priced above EUR 30 per tonne of CO_2 are expressed as a percentage of total CO_2 emissions. The complement of this share shows the pricing gap, a summary measure of the difference between the actual and the benchmark rate of EUR 30. The actual (or effective) rates on CO_2 include carbon taxes, specific taxes on energy use (primarily excise taxes), and tradable emission permit prices (regardless of the permit allocation method).

The benchmark rate of EUR 30 is a historic low-end estimate of the damage that carbon emissions currently cause. Pricing emissions above EUR 30 does not guarantee that polluters pay for the full damage they cause, or that prices are sufficiently high to decarbonise economies. A price below EUR 30 does mean, however, that emitters are not directly confronted with the cost of emissions to society and that incentives for cost-effective abatement are too weak. For a more detailed description of the methodology please consult: http://oe.cd/ECR2021 and http://oe.cd/TEU2019

Data on effective carbon rates and the carbon pricing gap are obtained from OECD (2021), *Effective Carbon Rates 2021: Pricing Carbon Emissions Through Taxes and Emissions Trading*, OECD Publishing, Paris, https://doi.org/10.1787/0e8e24f5-en

Emissions priced above EUR 60 per tonne of CO_2, % total emissions

Emissions priced above EUR 60 per tonne of CO_2 are expressed as a percentage of total CO_2 emissions. The complement of this share shows the pricing gap, a summary measure of the difference between the actual and the benchmark rate of EUR 60. The actual (or effective) rates on CO_2 include carbon taxes, specific taxes on energy use (primarily excise taxes), and tradable emission permit prices (regardless of the permit allocation method)

EUR 60 per tonne of CO2 is a midpoint estimate of carbon costs in 2020, as well as a forward-looking low-end estimate of carbon costs in 2030. The distance between 100% and the value of this indicator shows if the country is on good track to reach the goal of the Paris Agreement to decarbonise by mid-century economically. Rising benchmark values over time for carbon costs reflect that the marginal damage caused by one tonne of CO2 increases with the accumulation of CO2 in the atmosphere. For a more detailed description of the methodology please consult: http://oe.cd/ECR2021 and http://oe.cd/TEU2019.

Data on effective carbon rates and the carbon pricing gap are obtained from OECD (2021), *Effective Carbon Rates 2021: Pricing Carbon Emissions Through Taxes and Emissions Trading*, OECD Publishing, Paris, https://doi.org/10.1787/0e8e24f5-en

Emissions priced above EUR 120 per tonne of CO_2, % total emissions

Emissions priced above EUR 120 per tonne of CO_2 are expressed as a percentage of total CO_2 emissions. The complement of this share shows the pricing gap, a summary measure of the difference between the actual and the benchmark rate of EUR 120. The actual (or effective) rates on CO_2 include carbon taxes, specific taxes on energy use (primarily excise taxes), and tradable emission permit prices (regardless of the permit allocation method).

EUR 120 per tonne of CO2 is mid-point estimate of carbon costs in 2030. Rising benchmark values over time for carbon costs reflect that the marginal damage caused by one tonne of CO2 increases with the accumulation of CO2 in the atmosphere. For a more detailed description of the methodology please consult: http://oe.cd/ECR2021 and http://oe.cd/TEU2019.

Data on effective carbon rates and the carbon pricing gap are obtained from OECD (2021), *Effective Carbon Rates 2021: Pricing Carbon Emissions Through Taxes and Emissions Trading*, OECD Publishing, Paris, https://doi.org/10.1787/0e8e24f5-en

Petrol tax, USD per litre

Tax rates per litre of petrol are expressed at constant 2020 USD using PPP. They are calculated as the arithmetic average of the excise tax for regular motor gasoline, mid-grade motor gasoline, high-grade motor gasoline, and are deflated using the Consumer Price Index.

Data on tax rates are obtained from the *Energy Prices and Taxes dataset* of the *IEA Energy Prices database*.

Petrol end-use price, USD per litre

End-use price per litre of petrol is expressed at constant 2020 USD using PPP. It is calculated as the arithmetic average of the end-use price for regular motor gasoline, mid-grade motor gasoline, high-grade motor gasoline, and is deflated using the Consumer Price Index.

Data on end-use prices are obtained from the *Energy Prices and Taxes dataset* of the *IEA Energy Prices database*.

Diesel tax, USD per litre

Tax rates per litre of diesel fuel are expressed at constant 2020 USD using PPP. They are the excise tax rates for non-commercial transportation deflated by the Consumer Price Index.

Data on tax rates are obtained from the *Energy Prices and Taxes dataset* of the *IEA Energy Prices database*.

Diesel end-use price, USD per litre

End-use price per litre of diesel is expressed at constant 2020 USD using PPP. It is calculated as the arithmetic average of the end-use price for non-commercial transportation and is deflated using the Consumer Price Index.

Data on end-use prices are obtained from the *Energy Prices and Taxes dataset* of the *IEA Energy Prices database*

Residential electricity price, USD per kWh

Residential electricity prices are expressed at constant 2020 USD using PPP per kilowatt-hour. They are the annual average of end-use prices for residences. The price is deflated by the GDP deflator to facilitate comparison with the industry electricity price.

Data on end-use prices are obtained from the *Energy Prices and Taxes dataset* of the *IEA Energy Prices database*

Industry electricity price, USD per kWh

Industry electricity prices are expressed at constant 2020 USD using PPP per kilowatt-hour. To ensure better comparability with data on residential prices, the price is deflated by the GDP deflator and includes VAT.

Data on end-use prices are obtained from the *Energy Prices and Taxes dataset* of the *IEA Energy Prices database*

Mean feed-in tariffs for solar PV electricity generation, USD per kWh

Feed-in tariffs (FITs) for solar photovoltaic are expressed at current USD per kWh.

Feed-in tariffs (FITs) are prevalent support policies for scaling up renewable electricity capacity. They are market-based economic instruments, which typically offer long-term contracts that guarantee a price to be paid to a producer of a pre-determined source of electricity per kWh fed into the electricity grid. The country-level values presented here are often aggregated at the sub-sector level as a mean value over many data points. For further details on this aggregation, please consult the source dataset metadata.

Data on feed-in tariffs are obtained from the *OECD Renewable energy feed-in tariffs dataset*.

Mean feed-in tariffs for wind electricity generation, USD per kWh

Feed-in tariffs (FITs) for wind are expressed at current USD per kWh.

Feed-in tariffs (FITs) are prevalent support policies for scaling up renewable electricity capacity. They are market-based economic instruments, which typically offer long-term contracts that guarantee a price to be paid to a producer of a pre-determined source of electricity per kWh fed into the electricity grid. The country-level values presented here are often aggregated at the sub-sector level as a mean value over

many data points. For further details on this aggregation, please consult the source dataset metadata.

Data on feed-in tariffs are obtained from the *OECD Renewable energy feed-in tariffs dataset*.

Fossil fuel consumer support, % energy-related tax revenue

Support for the consumption of fossil fuels is expressed as a percentage of energy-related tax revenue. The consumer support estimate (CSE) includes both direct budgetary transfers and tax expenditure that provide a benefit or preference for fossil fuel consumption relative to other alternatives. This broad definition encompasses policies that can induce changes in the relative prices of fossil fuels in the support estimate level. The information is collected from official government documents (e.g. budget statements, public accounts, budget statistics, programme announcements or official government web sites) and compiled in the *Inventory of Support Measures for Fossil Fuels Database*[11]. For further information, see: OECD (2021), OECD Companion to the Inventory of Support Measures to Fossil Fuels 2021, OECD Publishing, Paris, https://doi.org/10.1787/e670c620-en.The OECD weighted average excludes Iceland.

Energy-related tax revenue refers to the revenue derived from taxes on energy products used for transport purposes (gasoline and diesel fuel) and for stationary purposes (e.g. power generation). Energy-tax revenue data are obtained from the *OECD Environmentally related tax revenue dataset*.

Fossil fuel consumer support, % total tax revenue

Support for the consumption of fossil fuels is expressed as a percentage of total tax revenue. The consumer support estimate (CSE) includes both direct budgetary transfers and tax expenditure that provide a benefit or preference for fossil fuel consumption relative to other alternatives. This broad definition encompasses policies that can induce changes in the relative prices of fossil fuels in the support estimate level. The information is collected from official government documents (e.g. budget statements, public accounts, budget statistics, programme announcements or official government web sites) and compiled in the *Inventory of Support Measures for Fossil Fuels Database*[12]. For further information, see: OECD (2021), OECD Companion to the Inventory of Support Measures to Fossil Fuels 2021, OECD Publishing, Paris, https://doi.org/10.1787/e670c620-en. The OECD weighted average excludes Iceland.

Total tax revenue data is obtained from the *Detailed Tax Revenue Tables* of individual countries in the *OECD Global Tax Revenue database*, complemented with information from the *Main National Accounts Tax Aggregates* dataset from EUROSTAT, the

[11] Inventory published on *OECD Data Explorer > Trade > Trade policy > Subsidies and government support > Fossil fuel support*

[12] Inventory published on *OECD Data Explorer > Trade > Trade policy > Subsidies and government support > Fossil fuel support*

Government Finance indicators of the Asian Development Bank, and the *International Financial Statistics* dataset from the International Monetary Fund.

Fossil fuel consumer support, % total fossil fuel support

Support for the consumption of fossil fuels is expressed as a percentage of total fossil fuel support. The consumer support estimate (CSE) includes both direct budgetary transfers and tax expenditure that provide a benefit or preference for fossil fuel consumption relative to other alternatives.

Total fossil fuel support comprises: Consumer Support Estimates (CSE), Producer Support Estimates (PSE) and General Services Support Estimate (GSSE), for petroleum, coal, natural gas and electricity. Support benefitting electricity is derived from the fossil-fuel component of measures providing electricity tariffs below cost recovery or annual average-cost pricing for electricity end-users. Support amounts benefitting fossil fuels as power generation inputs are aggregated under their respective fuel type, i.e. petroleum, coal or natural gas.

Measures that benefit individual producers are classified under the PSE, while those that benefit individual consumers are classified under the CSE. Measures benefitting producers or consumers collectively are classified under the GSSE, as are measures that do not increase current production or consumption of fossil fuels but that may do so in the future. The definition of *support* encompasses policies that can induce changes in the relative prices of fossil fuels in the support estimate level.

The information is collected from official government documents (e.g. budget statements, public accounts, budget statistics, programme announcements or official government web sites) and compiled in the *OECD Fossil Fuel Support dataset*. For further information, see: OECD (2021) *OECD Companion to the Inventory of Support Measures for Fossil Fuels 2021*. The OECD weighted average excludes Iceland.

Fossil fuel producer support, % total fossil fuel support

Support for the production of fossil fuels is expressed as a percentage of total fossil fuel support. The producer support estimate (PSE) includes both direct budgetary transfers and tax expenditure that provide a benefit or preference to individual producers for fossil fuel production relative to other alternatives.

Total fossil fuel support comprises: Consumer Support Estimates (CSE), Producer Support Estimates (PSE) and General Services Support Estimate (GSSE), for petroleum, coal, natural gas and electricity. Support benefitting electricity is derived from the fossil-fuel component of measures providing electricity tariffs below cost recovery or annual average-cost pricing for electricity end-users. Support amounts benefitting fossil fuels as power generation inputs are aggregated under their respective fuel type, i.e. petroleum, coal or natural gas.

Measures that benefit individual producers are classified under the PSE, while those that benefit individual consumers are classified under the CSE. Measures benefitting

producers or consumers collectively are classified under the GSSE, as are measures that do not increase current production or consumption of fossil fuels but that may do so in the future. The definition of *support* encompasses policies that can induce changes in the relative prices of fossil fuels in the support estimate level.

The information is collected from official government documents (e.g. budget statements, public accounts, budget statistics, programme announcements or official government web sites) and compiled in the *OECD Fossil Fuel Support* dataset. For further information, see: OECD (2021), OECD Companion to the Inventory of Support Measures to Fossil Fuels 2021, OECD Publishing, Paris, https://doi.org/10.1787/e670c620-en.. The OECD weighted average excludes Iceland.

Fossil fuel general services support, % total fossil fuel support

General services support is expressed as a percentage of total fossil fuel support. The general services support estimate (GSSE) includes both direct budgetary transfers and tax expenditure that provide a benefit or preference that benefit collectively producers and consumers, and other measures that do not increase current production or consumption relative to other alternatives, but that may do so in the future (i.e. public support for the construction of coal or natural-gas terminals, and government funding for sector-wide R&D in relation to fossil-fuel exploration and transformation).

Total fossil fuel support comprises: Consumer Support Estimates (CSE), Producer Support Estimates (PSE) and General Services Support Estimate (GSSE), for petroleum, coal, natural gas and electricity. Support benefitting electricity is derived from the fossil-fuel component of measures providing electricity tariffs below cost recovery or annual average-cost pricing for electricity end-users. Support amounts benefitting fossil fuels as power generation inputs are aggregated under their respective fuel type, i.e. petroleum, coal or natural gas.

Measures that benefit individual producers are classified under the PSE, while those that benefit individual consumers are classified under the CSE. Measures benefitting producers or consumers collectively are classified under the GSSE, as are measures that do not increase current production or consumption of fossil fuels but that may do so in the future. The definition of *support* encompasses policies that can induce changes in the relative prices of fossil fuels in the support estimate level.

The information is collected from official government documents (e.g. budget statements, public accounts, budget statistics, programme announcements or official government web sites) and compiled in the *OECD Fossil Fuel Support* dataset. For further information, see: OECD (2021), OECD Companion to the Inventory of Support Measures to Fossil Fuels 2021, OECD Publishing, Paris, https://doi.org/10.1787/e670c620-en. The OECD weighted average excludes Iceland.

Petroleum support, % total fossil fuel support

Petroleum support is expressed as a percentage of total fossil fuel support.

Total fossil fuel support comprises: Consumer Support Estimates (CSE), Producer Support Estimates (PSE) and General Services Support Estimate (GSSE), for petroleum, coal, natural gas and electricity. Support benefitting electricity is derived from the fossil-fuel component of measures providing electricity tariffs below cost recovery or annual average-cost pricing for electricity end-users. Support amounts benefitting fossil fuels as power generation inputs are aggregated under their respective fuel type, i.e. petroleum, coal or natural gas.

Measures that benefit individual producers are classified under the PSE, while those that benefit individual consumers are classified under the CSE. Measures benefitting producers or consumers collectively are classified under the GSSE, as are measures that do not increase current production or consumption of fossil fuels but that may do so in the future. The definition of *support* encompasses policies that can induce changes in the relative prices of fossil fuels in the support estimate level.

The information is collected from official government documents (e.g. budget statements, public accounts, budget statistics, programme announcements or official government web sites) and compiled in compiled in the *OECD Fossil Fuel Support* dataset. For further information, see: OECD (2021) *OECD Companion to the Inventory of Support Measures for Fossil Fuels 2021*. The OECD weighted average excludes Iceland.

Coal support, % total fossil fuel support

Coal support is expressed as a percentage of total fossil fuel support.

Total fossil fuel support comprises: Consumer Support Estimates (CSE), Producer Support Estimates (PSE) and General Services Support Estimate (GSSE), for petroleum, coal, natural gas and electricity. Support benefitting electricity is derived from the fossil-fuel component of measures providing electricity tariffs below cost recovery or annual average-cost pricing for electricity end-users. Support amounts benefitting fossil fuels as power generation inputs are aggregated under their respective fuel type, i.e. petroleum, coal or natural gas.

Measures that benefit individual producers are classified under the PSE, while those that benefit individual consumers are classified under the CSE. Measures benefitting producers or consumers collectively are classified under the GSSE, as are measures that do not increase current production or consumption of fossil fuels but that may do so in the future. The definition of *support* encompasses policies that can induce changes in the relative prices of fossil fuels in the support estimate level.

The information is collected from official government documents (e.g. budget statements, public accounts, budget statistics, programme announcements or official government web sites) and compiled in compiled in the *OECD Fossil Fuel Support*

dataset. For further information, see: OECD (2021), OECD Companion to the Inventory of Support Measures to Fossil Fuels 2021, OECD Publishing, Paris, https://doi.org/10.1787/e670c620-en.The OECD weighted average excludes Iceland.

Gas support, % total fossil fuel support

Natural gas support is expressed as a percentage of total fossil fuel support.

Total fossil fuel support comprises: Consumer Support Estimates (CSE), Producer Support Estimates (PSE) and General Services Support Estimate (GSSE), for petroleum, coal, natural gas and electricity. Support benefitting electricity is derived from the fossil-fuel component of measures providing electricity tariffs below cost recovery or annual average-cost pricing for electricity end-users. Support amounts benefitting fossil fuels as power generation inputs are aggregated under their respective fuel type, i.e. petroleum, coal or natural gas.

Measures that benefit individual producers are classified under the PSE, while those that benefit individual consumers are classified under the CSE. Measures benefitting producers or consumers collectively are classified under the GSSE, as are measures that do not increase current production or consumption of fossil fuels but that may do so in the future. The definition of *support* encompasses policies that can induce changes in the relative prices of fossil fuels in the support estimate level.

The information is collected from official government documents (e.g. budget statements, public accounts, budget statistics, programme announcements or official government web sites) and compiled in compiled in the *OECD Fossil Fuel Support* dataset. For further information, see: OECD (2021), OECD Companion to the Inventory of Support Measures to Fossil Fuels 2021, OECD Publishing, Paris, https://doi.org/10.1787/e670c620-en.The OECD weighted average excludes Iceland.

Electricity support, % total fossil fuel support

Electricity support is expressed as a percentage of total fossil fuel support.

Total fossil fuel support comprises: Consumer Support Estimates (CSE), Producer Support Estimates (PSE) and General Services Support Estimate (GSSE), for petroleum, coal, natural gas and electricity. Support benefitting electricity is derived from the fossil-fuel component of measures providing electricity tariffs below cost recovery or annual average-cost pricing for electricity end-users. Support amounts benefitting fossil fuels as power generation inputs are aggregated under their respective fuel type, i.e. petroleum, coal or natural gas.

Measures that benefit individual producers are classified under the PSE, while those that benefit individual consumers are classified under the CSE. Measures benefitting producers or consumers collectively are classified under the GSSE, as are measures that do not increase current production or consumption of fossil fuels but that may do so in the future. The definition of *support* encompasses policies that can induce changes in the relative prices of fossil fuels in the support estimate level.

The information is collected from official government documents (e.g. budget statements, public accounts, budget statistics, programme announcements or official government web sites) and compiled in the compiled in the *OECD Fossil Fuel Support* dataset. For further information, see: OECD (2021), OECD Companion to the Inventory of Support Measures to Fossil Fuels 2021, OECD Publishing, Paris, https://doi.org/10.1787/e670c620-en.The OECD weighted average excludes Iceland.

Total fossil fuel support, % total tax revenue

Total fossil fuel support is expressed as percentage of total tax revenue.

Total fossil fuel support comprises: Consumer Support Estimates (CSE), Producer Support Estimates (PSE) and General Services Support Estimate (GSSE), for petroleum, coal and natural gas. Measures that benefit individual producers are classified under the PSE, while those that benefit individual consumers are classified under the CSE. Measures benefitting producers or consumers collectively are classified under the GSSE, as are measures that do not increase current production or consumption of fossil fuels but that may do so in the future. The definition of *support* encompasses policies that can induce changes in the relative prices of fossil fuels in the support estimate level.

The information is collected from official government documents (e.g. budget statements, public accounts, budget statistics, programme announcements or official government web sites) and compiled in the compiled in the *OECD Fossil Fuel Support* dataset. For further information, see: OECD (2021), OECD Companion to the Inventory of Support Measures to Fossil Fuels 2021, OECD Publishing, Paris, https://doi.org/10.1787/e670c620-en.The OECD weighted average excludes Iceland.

Total tax revenue data is obtained from the *Detailed Tax Revenue Tables* of individual countries in the *OECD Global Tax Revenue database*, complemented with information from the *Main National Accounts Tax Aggregates* dataset from EUROSTAT, the Government Finance indicators of the Asian Development Bank, and the *International Financial Statistics* dataset from the International Monetary Fund.

Regulations and management

Terrestrial protected area, % land area

Terrestrial protected area is expressed as a percentage of total land area. Protected areas include all areas with a management category by the International Union for Conservation of Nature (IUCN). Areas with overlapping management categories are only included once to avoid double-counting. However, some countries report some protected areas as points (i.e. without the properly georeferenced location details), in these cases the overlaps cannot be identified or resolved. The total protected area presented here includes these areas reported as points. For further details on the methodology please consult Indicators on Terrestrial and Marine Protected Areas: Methodology and Results for OECD and G20 countries.

Data on protected areas are obtained from the *OECD Protected Areas dataset*.

Marine protected area, % total exclusive economic zone

Marine protected area is expressed as a percentage of total exclusive economic zone. Protected areas include all areas with a management category by the International Union for Conservation of Nature (IUCN). Areas with overlapping management categories are only included once to avoid double-counting. However, some countries report some protected areas as points (i.e. without the properly georeferenced location details), in these cases the overlaps cannot be identified or resolved. The total protected area presented here includes these areas reported as points. The exclusive economic zone (EEZ) of a country includes, under the 1982 UN Convention on the Law of the Sea, 200 nautical miles from the coastline, or to the mid-point between coastlines where the EEZ of different countries would otherwise overlap. Some marine areas are shared between countries in joint regimes or there are unresolved overlapping claims to an area. In these cases, the entire relevant area (and protected areas therein) are attributed to all countries concerned. For further details on the methodology please consult Indicators on Terrestrial and Marine Protected Areas: Methodology and Results for OECD and G20 countries.

Data on protected areas are obtained from the *OECD Protected Areas dataset*.

Socio-economic context

Economic context

Real GDP, index 2000=100

The Gross Domestic Product is expressed as an index 2000=100. GDP measures market and government production and the associated economic activity. However, as a 'gross' measure, no account is taken of the depreciation neither of produced assets nor of the depletion of natural assets.

The main sources for GDP data are the *OECD Gross domestic product dataset* of Aggregate National Accounts. OECD data are complemented with data from the *World Development Indicators* of the World Bank, reference series of the International Energy Agency, and data from the International Monetary Fund.

Real GDP

Real Gross Domestic Product is expressed in millions USD using constant 2020 prices and constant 2020purchasing power parity rates. Real GDP measures government production and the associated economic activity. However, as a 'gross' measure, no account is taken of the depreciation neither of produced assets nor of the depletion of natural assets.

The main sources for GDP data are the *OECD Gross domestic product dataset* of Aggregate National Accounts. OECD data are complemented with data from the *World Development Indicators* of the World Bank, reference series of the International Energy Agency, and data from the International Monetary Fund.

Value added in agriculture, % of total value added

Value added in agriculture is expressed as a percentage of total value added. Agriculture corresponds to ISIC v3 divisions 1-5 and includes forestry, hunting as well as cultivation of crops and livestock production.

The main source for the value added series is the *OECD Gross domestic product dataset* of Aggregate National Accounts. OECD Data are complemented using the value added data taken from the World Development Indicators of the World Bank.

Value added in industry, % of total value added

Value added in industry is expressed as a percentage of total value added. Industry corresponds to ISIC v3 divisions 10-45 and includes value added in mining, manufacturing, construction, electricity, water, and gas.

The main source for the value added series is the *OECD Gross domestic product dataset* of Aggregate National Accounts. OECD Data are complemented using the value added data taken from the World Development Indicators of the World Bank.

Value added in services, % of total value added

Value added in services is expressed as a percentage of total value added. Services correspond to ISIC v3 divisions 50-99 and includes value added in wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, and personal services such as education, health care, real estate services as well as financial intermediation.

The main source for the value added series is the *OECD Gross domestic product dataset* of Aggregate National Accounts. OECD Data are complemented using the value added data taken from the World Development Indicators of the World Bank.

Real GDP per capita

The Gross Domestic Product per capita (USD/person) is expressed at constant 2020 USD PPP prices. GDP per capita measures a country's economic wealth of the population of a nation. However, as a mean value it does not reflect income distribution. Moreover, it is a 'gross' measure of income and no account is taken of the depreciation neither of produced assets nor of the depletion of natural assets.

For more details on the underlying GDP data, see the metadata (above) for *Real GDP*

Population is the de facto population in a country, area or region as of 1 July of the year indicated. The main source of population data is *World Population Prospects database* from the *United Nations,* complemented with data from the World Development Indicators of the World Bank.

Labour tax revenue, % GDP

Labour tax revenues are expressed as a percentage of GDP. Labour tax revenues include total (i.e. supranational + federal/central government + state/regional + local government) revenue from taxes on (i) income, profits and capital gains of individuals, (ii) social security contributions (i.e. taxes to employees, employers, self-employed or non-employed and other social security contributions that could not be allocated among these fields) and (iii) taxes on payroll and workforce.

Tax revenue data is obtained from the *Detailed Tax Revenue Tables* of individual countries in the *OECD Global Tax Revenue database* complemented with information from the *Main National Accounts Tax Aggregates* dataset from EUROSTAT, and the *International Financial Statistics* dataset from the International Monetary Fund.

For more details on the underlying GDP data, see the metadata for *Real GDP*.

Labour tax revenue, % total tax revenue

Labour tax revenues are expressed as a percentage of total tax revenue. Labour tax revenues include total (i.e. supranational + federal/central government + state/regional + local government) revenue from taxes on (i) income, profits and capital gains of individuals, (ii) social security contributions (i.e. taxes to employees, employers, self-employed or non-employed and other social security contributions

that could not be allocated among these fields) and (iii) taxes on payroll and workforce.

Tax revenue data is obtained from the *Detailed Tax Revenue Tables* of individual countries in the *OECD Global Tax Revenue database*, complemented with information from the *Main National Accounts Tax Aggregates* dataset from EUROSTAT, and the *International Financial Statistics* dataset from the International Monetary Fund.

Nominal exchange rate

Nominal exchange rates are expressed in USD. They measure value of the countries' official currency per one United States dollar (USD).

The main sources for exchange rates are the *PPPs and exchange rate dataset* of the *OECD National Accounts Statistics Database* and the most recent *OECD Economic Outlook*. OECD data are complemented with data from the *World Development Indicators* of the World Bank, reference series of the International Energy Agency, and data from the International Monetary Fund.

Purchasing power parity

Purchasing power parity (PPP) is expressed in USD. PPPs measure the difference in prices of a basket of goods and services in a country's official currency, relative to the purchasing power of one USD of the same basket of goods and services in the United States.

The main sources for PPP data are the *PPPs and exchange rate dataset* of the *OECD National Accounts Statistics Database* and the most recent *OECD Economic Outlook.* OECD data are complemented with data from the *World Development Indicators* of the World Bank, reference series of the International Energy Agency, and data from the International Monetary Fund.

GDP deflator

The GDP deflator is expressed as an index 2020=100. The GDP deflator measures the changes in prices for all the goods and services produced in an economy relative to a base year.

The main sources for GDP deflator data are the *Gross domestic product dataset* of Aggregate National Accounts. OECD data are complemented with data from the *World Development Indicators* of the World Bank, reference series of the International Energy Agency, and data from the International Monetary Fund.

Social context

Population

Population is expressed in thousand inhabitants. Population is defined here as all nationals present in or temporarily absent from a country, and foreign nationals permanently settled in the country.

Population is the de facto population in a country, area or region as of 1 July of the year indicated. The main source of population data is the *OECD Population Statistics database*, data gaps are filled (in order) with the *World Population Prospects database* from the United Nations, the *World Development Indicators* of the World Bank, and with data from the *World Economic Outlook* from the International Monetary Fund.

Population by age-groups, % total

Population is presented by the age groups 0-14, 15-64 and 65+, as a percentage of total population. Population is defined here as all nationals present in or temporarily absent from a country, and foreign nationals permanently settled in the country.

Population is the de facto population in a country, area or region as of 1 July of the year indicated. The main source of population data is the *World Population Prospects database* from the United Nations, complemented with data from the World Development Indicators of the World Bank.

Women, % total population

This indicator refers to the percentage of women from total population. Population is defined here as all nationals present in or temporarily absent from a country, and foreign nationals permanently settled in the country. Total population is the sum of men and women.

Population is the de facto population in a country, area or region as of 1 July of the year indicated. The main source of population data is the *World Population Prospects database* from the United Nations, complemented with data from the World Development Indicators of the World Bank.

Total fertility rate, children per woman

Total fertility rate is expressed as live births per woman. It represents the average number of live births a hypothetical cohort of women would have at the end of their reproductive period if they were subject during their whole lives to the fertility rates of a given period and if they were not subject to premature mortality.

The main data source is the *World Population Prospects database* from the *United Nations*, complemented with World Bank data.

Life expectancy at birth

Life expectancy at birth is expressed in years. It represents the average number of years of life expected by a hypothetical cohort of individuals who would be subject during all their lives to the mortality rates of a given period.

The main data source is the the *World Population Prospects database* from the United Nations, complemented with World Bank data.

Net migration

Net migration is expressed in thousand individuals. It represents the number of immigrants minus the number of emigrants.

The data source is the *World Population Prospects database* from the United Nations.

Population density, inhabitants per km2

Population density is the number of inhabitants per square kilometre of total country area (persons/km^2). Population is defined here as all nationals present in or temporarily absent from a country, and foreign nationals permanently settled in the country.

Population is the de facto population in a country, area or region as of 1 July of the year indicated. The main source of population data is the Population Statistics database from the Organisation for Economic Co-operation and Development, complemented with the *World Population Prospects database* from the United Nations,, then with data from the World Development Indicators of the World Bank as a third source, and with data from the World Economic Outlook from the International Monetary Fund as a fourth source. Total area data are obtained from the *OECD Land Use* dataset.

Observation Status

B: Break in time series. Observations are characterised as such when different content exists or a different methodology has been applied to this observation as compared with the preceding one (the one given for the previous period).

E: Estimated - Observation obtained through an estimation methodology (e.g. to produce back-casts) or based on the use of a limited amount of data or ad hoc sampling and through additional calculations (e.g. to produce a value at an early stage of the production stage while not all data are available).

I: Imputed - Observation imputed by a receiving agency to replace or fill gaps in reported data series. This code is intended to cover all cases where a receiving agency publishes data about a sending agency that do not come from an official source in the sender agency's reporting framework. When the estimation is done by the sender agency, the flag to use is E "Estimated value".

U: Low reliability - This indicates existing observations, but for which the user should also be aware of the low quality assigned.

O: This code is to be used when no breakdown is made between the reasons why data are missing. Data can be missing due to many reasons: data cannot exist, data exist but are not collected (e.g. because they are below a certain threshold).