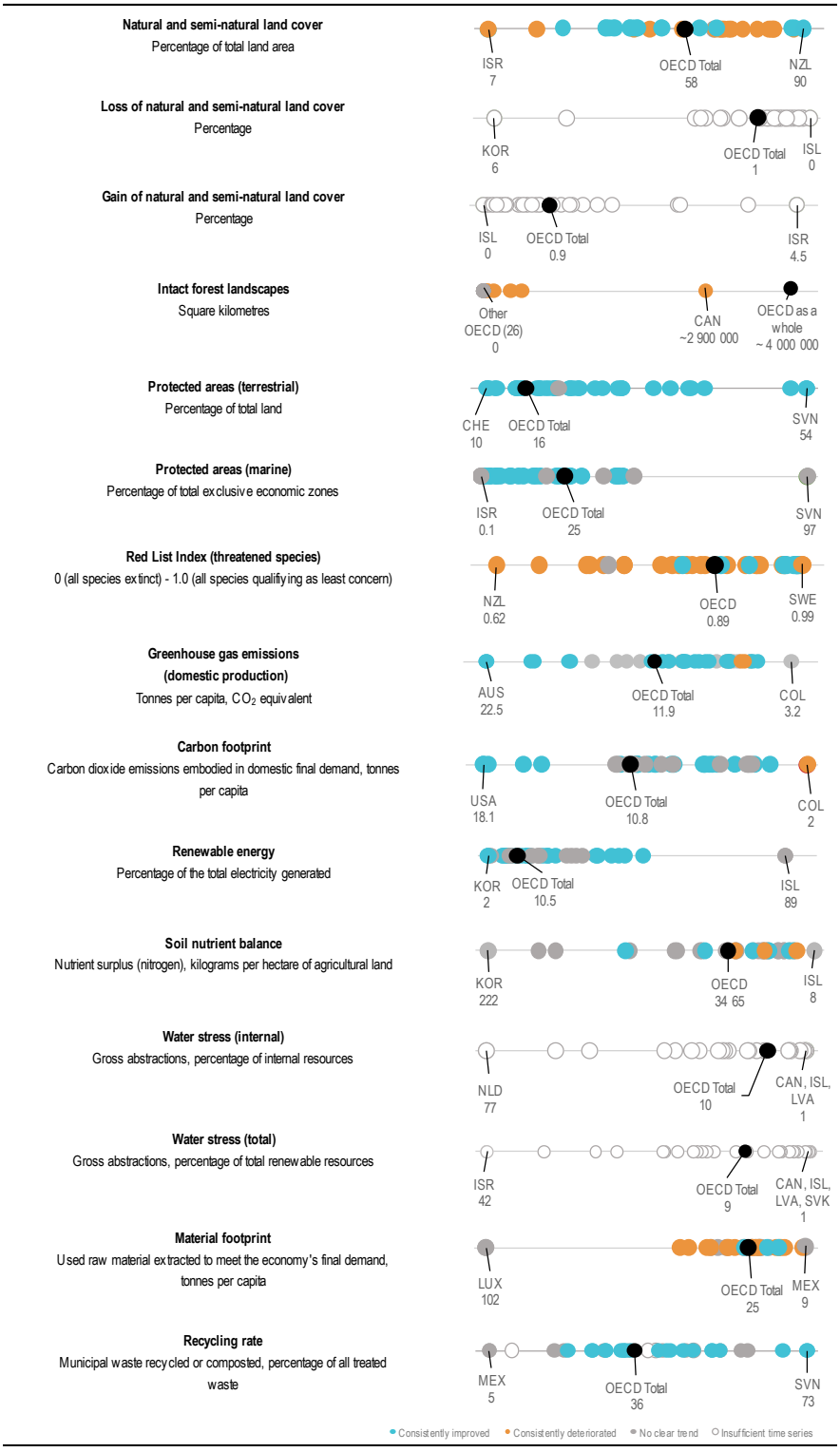
14 Natural Capital

Natural Capital concerns both natural assets (e.g. natural land cover, biodiversity) and ecosystems and their services (e.g. oceans, forests, soil and the atmosphere). This chapter examines stocks and flows into and out of these natural systems, as well as risk and resilience factors affecting them. The share of land covered by natural vegetation ranges from 6% to 90% across OECD countries, and those with the lowest stocks are experiencing some of the greatest losses. More marine and land areas in OECD countries have been given protected status since 2010, but species diversity (measured by the Red List Index) is under greater threat. Total OECD greenhouse gas emissions from production have fallen by 4% since 2010, but on a global level they have increased 1.5 fold since 1990. Renewables play a minor role in most OECD countries' energy mix, and material footprints per capita have increased since 2010.

Figure 14.1. Natural Capital snapshot: current levels, and direction of change since 2010



Note: The snapshot depicts data for 2019, or the latest available year, for each indicator. The colour of the circle indicates the direction of change, relative to 2010, or the closest available year: improvement is shown in blue, deterioration in orange, and no clear or consistent change in grey, and insufficient time series to determine trends in white. For each indicator, the OECD country with the lowest (on the left) and highest (on the right) well-being level are labelled, along with the OECD average. For full details of the methodology, see the Reader's Guide.

Source: *OECD Environment Database*, https://data.oecd.org/environment.htm; *OECD Structural Analysis (STAN) Databases*, https://stats.oecd.org/Index.aspx?DataSetCode=STANI4_2016; *OECD Agriculture Database*, https://data.oecd.org/fr/agriculture.htm; *UN DESA Global SDG Indicator Database*, indicator 15.5.1, http://unstats-undesa.opendata.arcgis.com/datasets/indicator-15-5-1-red-list-index-2/data?orderBy=seriesCode.

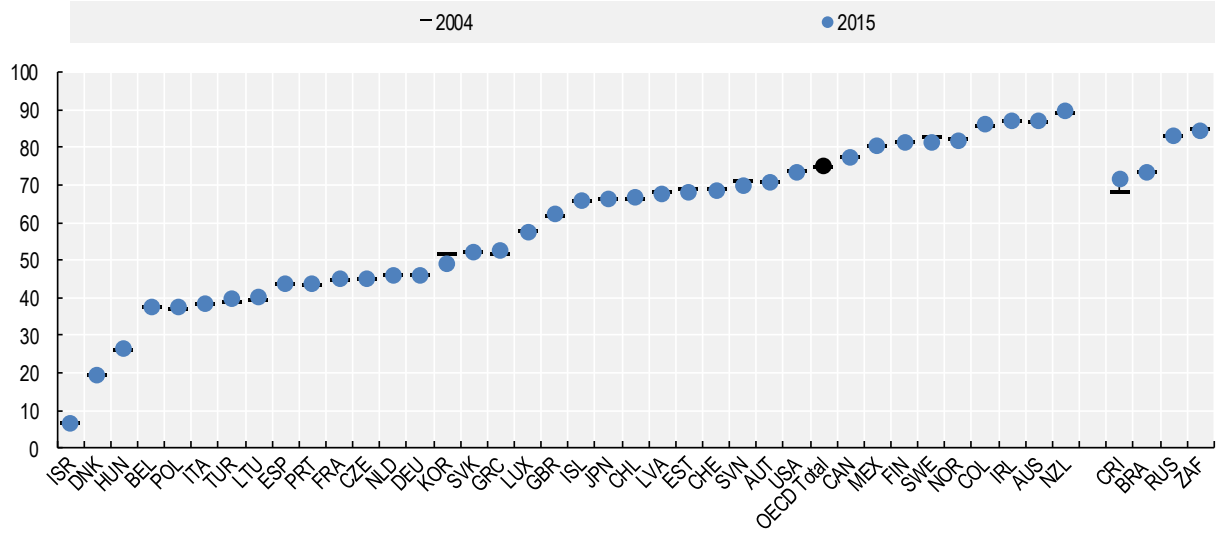
Biological resources and biodiversity

Loss of biodiversity and pressures on ecosystem services are among the most pressing global environmental challenges, with changes in land cover and land use as leading contributors. Worldwide, 2.7% of natural or semi-natural vegetated land (i.e. tree-covered areas, grassland, wetland, shrubland and sparse vegetation) has been lost to other land cover types since 1992. This represents an area twice the size of Spain. OECD and G20 countries account for over half of this loss, which occurred primarily in Brazil, the People's Republic of China, the Russian Federation, the United States and Indonesia (OECD, 2019[1]).

Across the OECD, 75% of land in 2015 was covered by natural or semi-natural vegetation. This share ranges from below 30% in Israel, Denmark and Hungary to above 85% in Colombia, Ireland, Australia and New Zealand (Figure 14.2). Between 2004 and 2015, the total land covered by natural and semi-natural vegetation in OECD countries remained stable. Nevertheless, in addition to changes in the net stock of natural land cover, it is also important to consider losses and gains separately, as losses can involve damage to habitats rich in biodiversity (e.g. loss of primary or old-growth forest) that may not be compensated by gains in semi-natural areas that are poor in biodiversity. Korea, Israel, Portugal and Slovenia have experienced natural land cover losses of more than 2% since 2004 (Figure 14.3). With the exception of Slovenia, these are all countries where stocks are already below the OECD average.

Figure 14.2. The stock of natural land cover in OECD countries ranges from 6% to 90%

Natural and semi-natural vegetated land cover as a percentage of total land area



Note: The OECD Total excludes Colombia, as it was published prior to Colombia joining the OECD.
Source: *OECD Land cover in countries and regions* (database), https://stats.oecd.org/Index.aspx?DataSetCode=LAND_COVER.

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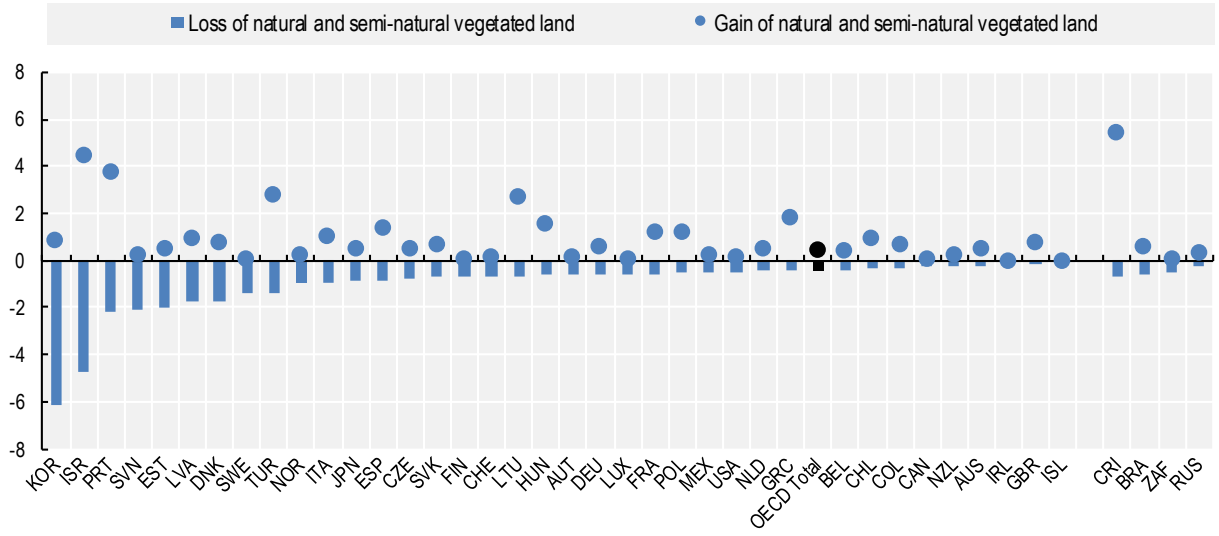
Figure 14.3. Natural land losses have been largest in Korea, Israel, Portugal, Slovenia and Estonia

Intensity of conversion to and from natural and semi-natural vegetated land, percentage, 2004-2015



Note: The OECD Total excludes Colombia, as it was published prior to Colombia joining the OECD.
Source: *OECD Land cover change in countries and regions* (database), https://stats.oecd.org/Index.aspx?DataSetCode=LAND_COVER_CHANGE.

StatLink https://doi.org/10.1787/888934082632

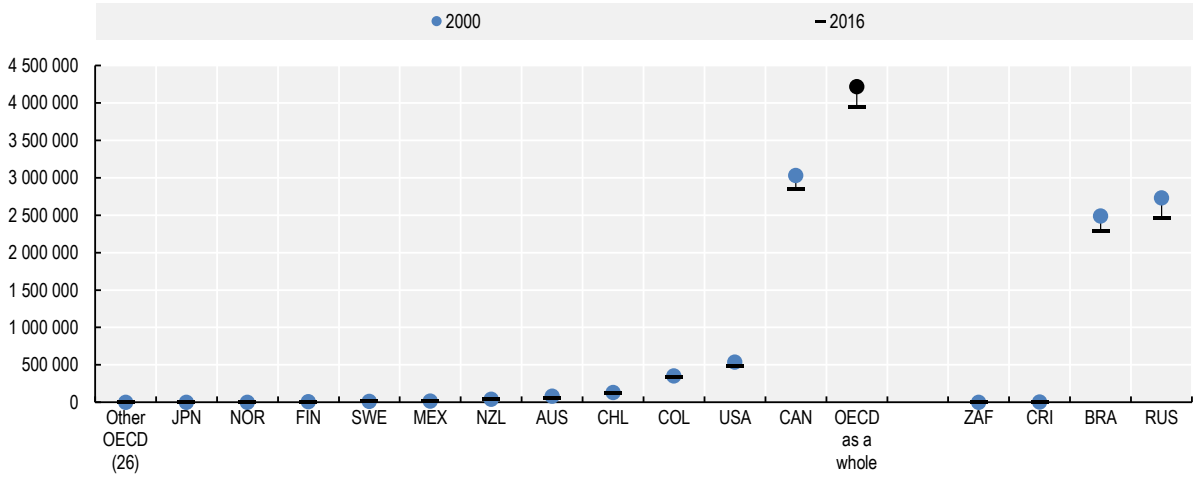
High-level indicators of land cover do not provide information about the specific biodiversity value of areas lost and gained. Intact forest landscapes represent one example of a very high-value ecosystem: unbroken expanses of natural ecosystems with no remotely detected signs of human activity, and large enough that all native biodiversity could be maintained (see Box 14.1). Only 11 OECD countries have any intact forest landscapes remaining – and just 3 of the countries shown in Figure 14.4 (Russian Federation, Brazil and Canada) accounted for nearly two-thirds of the world's intact forest landscape area in 2000 (Potapov et al., 2017[2]).

Between 2000 and 2016 the OECD total intact forest area fell (i.e. was degraded) by 6%. This represents a degradation of 263 600 square kilometres – an area larger than the size of the United Kingdom (Figure 14.4). Among OECD countries, the greatest degradation (in percentage terms) in that period occurred in Australia (-34.4%), the United States (-9.1%), Canada (-5.8%) and Mexico (-4.6%). By contrast, losses were 1% or less in Norway and Finland, and zero in Japan. Since 2010, the intact forest area also fell by 10% in the Russian Federation, 8% in Brazil, and 3.1% in Costa Rica.

Policy efforts to conserve biodiversity include establishing protected areas. On land, these range from strict natural reserves and wilderness areas to national parks, protected landscapes/seascapes and habitat or species management areas; at sea, they range from strict marine reserves and no-take zones (marine "sanctuaries") to looser marine protected area networks. Protected areas today cover on average 16% of land (Figure 14.5) and 25% of marine areas in the OECD (Figure 14.6), up from 13.5% in 2010 for both indicators. Between 2010 and 2019, the share of protected marine areas has doubled in 10 OECD countries (Canada, Portugal, Spain, Sweden, Mexico, Lithuania, the United Kingdom, Chile, Australia and France) and 2 partner countries (South Africa and Brazil). Over the same time period, the share of protected terrestrial areas increased by at least 1 percentage point in nine OECD countries (Canada, Colombia, New Zealand, Belgium, Germany, Slovak Republic, Norway, Australia and Luxembourg).

Figure 14.4. Only 11 OECD countries have intact forest landscapes, with a 6% total degradation since 2000

Intact forest landscapes, square kilometres



Note: "Other OECD (26)" refers to the 26 OECD countries that have no intact forest landscapes. The OECD Total excludes Colombia, as it was published prior to Colombia joining the OECD.
Source: *OECD Intact Forest Landscapes* (database), based on (Potapov et al., 2017[2]), https://stats.oecd.org/Index.aspx?DataSetCode=INTACT_FOREST_LANDSCAPES.

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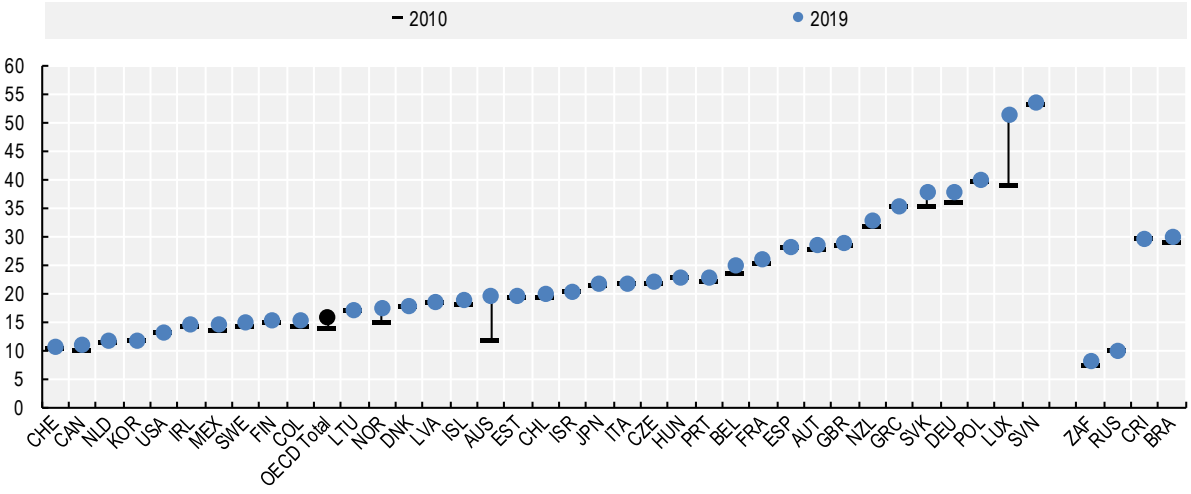
Figure 14.5. 16% of OECD countries' terrestrial area is designated as protected land

Terrestrial protected areas, as a share of total land area



Note: The OECD Total excludes Turkey, as no data are available, and Colombia, as it was published prior to Colombia joining the OECD.
Source: *OECD Protected areas* (database), https://stats.oecd.org/Index.aspx?DataSetCode=PROTECTED_AREAS.

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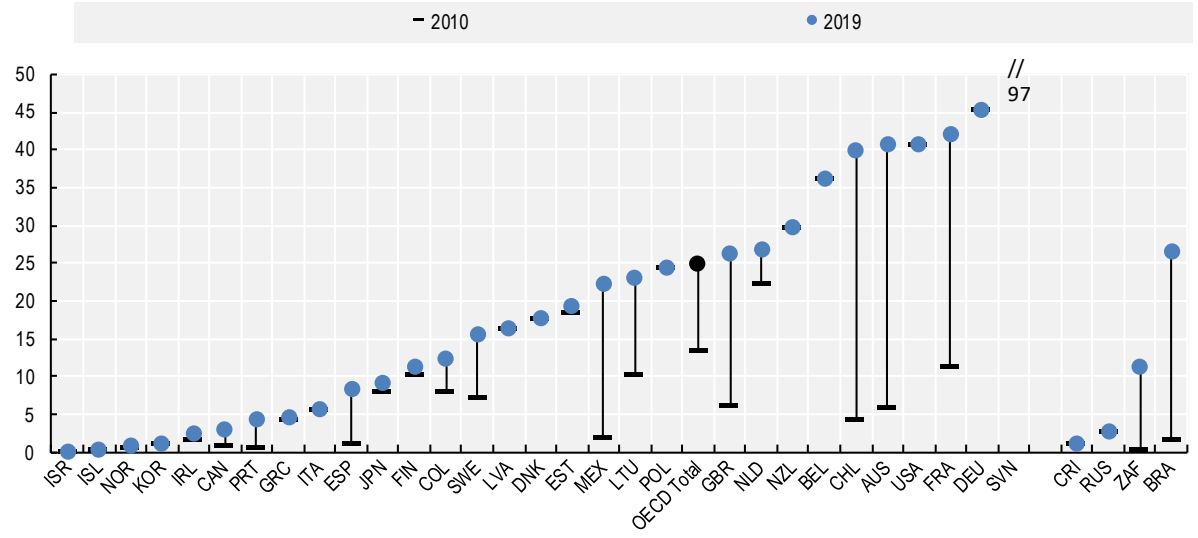
Figure 14.6. Ten OECD countries have doubled their share of protected marine areas since 2010

Marine protected areas, as a share of each country's exclusive economic zone



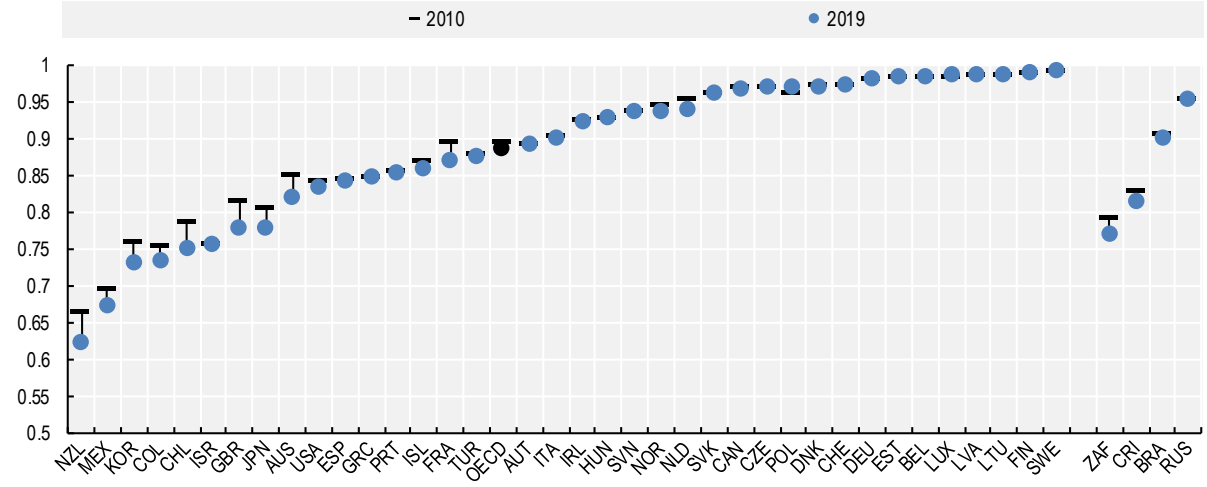
Note: The OECD Total excludes Colombia, as it was published prior to Colombia joining the OECD.
Source: Source: *OECD Protected areas* (database), https://stats.oecd.org/Index.aspx?DataSetCode=PROTECTED_AREAS.

StatLink https://doi.org/10.1787/888934082689

Threatened species provide another insight into biodiversity risks. The Red List Index (which considers the combined extinction risk for birds, mammals, amphibians, cycads and corals) for OECD countries has declined marginally, on average, since 2010 (Figure 14.7). The largest declines have generally occurred in countries with already high "at-risk" rates – including New Zealand, Mexico, Korea, Colombia, Chile, the United Kingdom, Japan, Australia and France.

Figure 14.7. The Red List Index has worsened in countries with the greatest biodiversity pressures

Red List Index, where 1.0 = all species qualifying as "Least Concern"; 0 = all species having gone extinct



Note: The Red List Index is a combined indicator of extinction risk for birds, mammals, amphibians, cycads and corals. An RLI value of 1.0 equates to all species qualifying as Least Concern (i.e. not expected to become extinct in the near future). An RLI value of 0 equates to all species having gone extinct.
Source: *UN DESA Global SDG Indicator Database*, indicator 15.5.1, http://unstats-undesa.opendata.arcgis.com/datasets/indicator-15-5-1-red-list-index-2/data?orderBy=seriesCode.

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Climate change

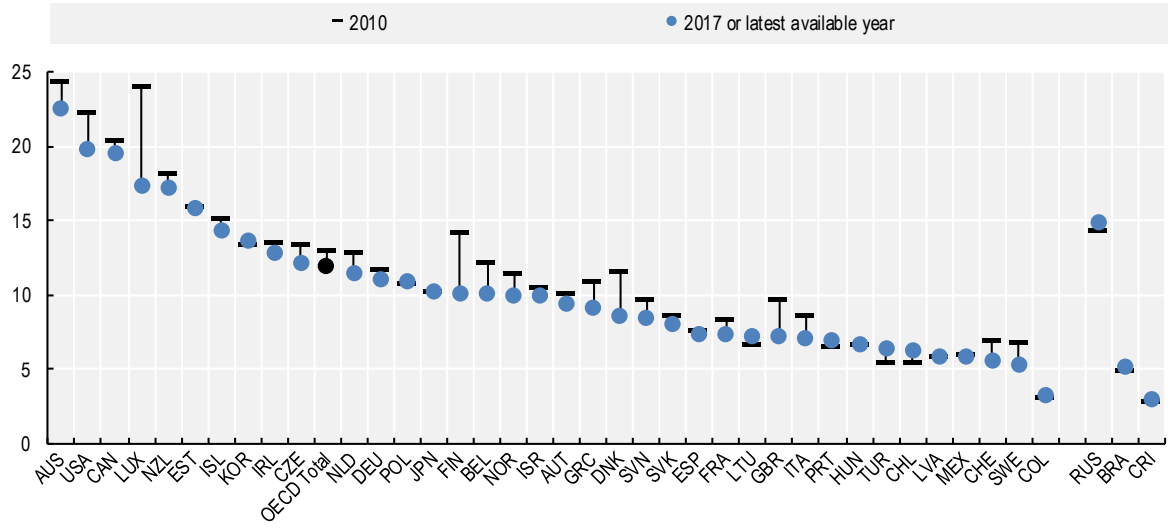
Climate change poses a formidable threat to future well-being. Global greenhouse gas (GHG) emissions have increased 1.5 fold since 1990 (OECD, 2019[1]). A recent acceleration in global energy consumption caused CO_2 emissions from energy use to rise by 1.7% in 2018, hitting a new record (IEA, 2019[3]). Total greenhouse gas concentrations in the atmosphere have risen from 427 parts per million (ppm) CO_2 equivalent in 2010, to 449 ppm in 2016 (European Environment Agency, 2019[4]), a nearly 30% increase since 1980. To have a 50% probability of limiting the increase in global mean temperature to 1.5°C above pre-industrial levels, it is estimated that peak concentration levels should not exceed 478 ppm, a level that (based on current trends) could be reached within the next 5 to 16 years (European Environment Agency, 2019[4]). Ocean acidification is a further risk associated with carbon emissions: the ocean absorbs around 30% of the CO_2 that is released in the atmosphere, and in the last 200 years or so, the acidity of the ocean is estimated to have risen by 30% (National Oceanic and Atmospheric Administration, 2019[5]).

Total OECD GHG emissions from domestic production fell by 4.3% between 2010 and 2017 – though they have stabilised in recent years, and could rise again in future due to recent increases in energy use and CO_2-related emissions (OECD, 2019[1]). On a per capita basis, OECD average GHG emissions have fallen by around one tonne, from 12.9 in 2010, to 11.9 in 2017. Nevertheless, the rate of progress in reducing emissions varies significantly across individual OECD countries (Figure 14.8). Some countries with relatively high GHG emissions per capita have reduced these substantially since 2010 (e.g. by 28% in Luxembourg, 11% in the United States, 7% in Australia), but some countries with more moderate emissions also experienced substantial falls (e.g. by more than 25% in Finland, the United Kingdom, Denmark and Sweden). Per capita GHG emissions increased in two countries where their levels are already high (by 2.6% in Korea and 3.3% in the Russian Federation), as well as in Portugal (5.7%), Lithuania (8.1%), Chile (14%) and Turkey (18%) - where per capita emissions still remain among the lowest in the OECD.

The carbon footprint of a country reflects CO_2 embodied in its external trade, and focuses on the emissions associated with final demand for goods and services in the domestic economy (which, due to imports and exports, can differ from production-based emissions, shown above). The per capita carbon footprint in OECD countries has fallen from 11.8 tonnes in 2010 to 10.8 tonnes in 2015 (Figure 14.9). Here again, some of the largest falls have occurred in countries with the largest initial footprints, but some countries with more moderate carbon footprints have also achieved substantial falls.

Figure 14.8. Per capita greenhouse gas emissions have fallen since 2010 for the OECD on average

Total emissions from domestic production, excluding emissions from land use, land-use change and forestry (LULUCF), tonnes per capita, CO_2 equivalent



Note: Latest available year is 2016 for Chile, Israel and Korea, 2015 for Mexico, 2014 for Colombia and 2012 for Brazil and Costa Rica. The OECD Total excludes Colombia, as it was published prior to Colombia joining the OECD.
Source: *OECD Greenhouse gas emissions* (database), https://stats.oecd.org/Index.aspx?DataSetCode=AIR_GHG.

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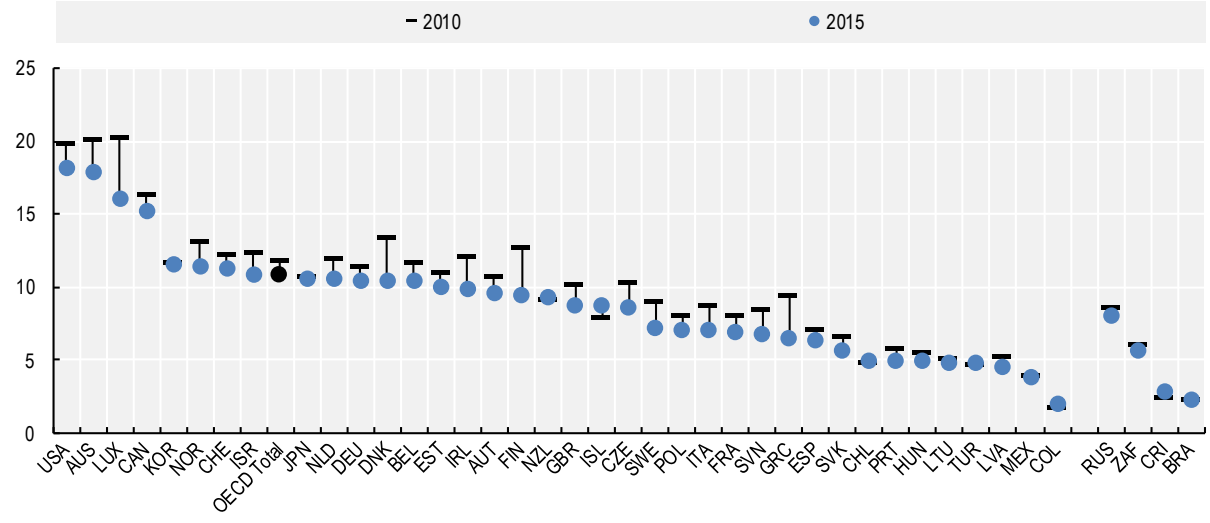
Figure 14.9. The OECD average carbon footprint per capita has fallen since 2010

Carbon dioxide emissions embodied in final domestic demand, tonnes per capita



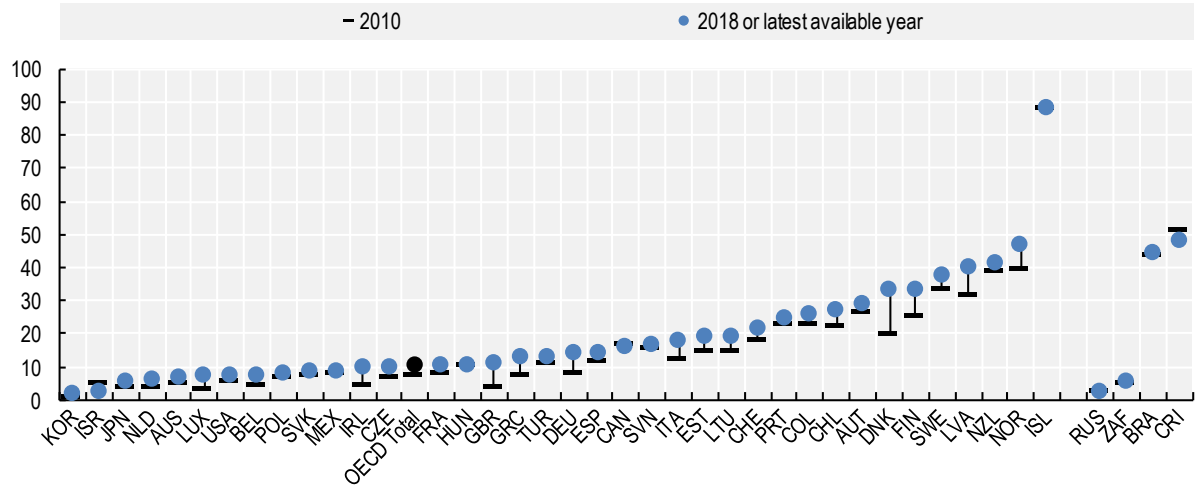
Note: The OECD Total excludes Colombia, as it was published prior to Colombia joining the OECD.
Source: *OECD Carbon dioxide emissions embodied in international trade* (database), https://stats.oecd.org/Index.aspx?DataSetCode=IO_GHG_2019.

StatLink https://doi.org/10.1787/888934082746

Reducing carbon emissions from burning fossil fuels requires a change in energy production. Across OECD countries, only 10.5% of the total primary energy supply comes from renewable sources (Figure 14.10). For some of the OECD's smaller countries such as Iceland, Norway, Latvia and New Zealand, renewables make up around 40% or more. Between 2010 and 2018 the share of renewables in the OECD energy mix increased by 2.6 percentage points. Gains of more than 7 percentage points were observed in Denmark, Finland, Latvia, the United Kingdom and Norway – several of which had a comparatively high share of renewable energy already in 2010. By contrast, in the 15 OECD countries where renewables constitute less than 10% of the energy supply, there has been a mix of improvement, stability and, in one case, a fall in the share of renewables in the energy mix.

Figure 14.10. Renewables still play only a minor role in most OECD energy mixes

Renewable energy, as a share of the total primary energy supply



Note: The latest available year is 2017 for Colombia, Costa Rica, the Russian Federation and South Africa. The OECD Total excludes Colombia, as it was published prior to Colombia joining the OECD.
Source: *OECD Green Growth Indicators: Environmental and resource productivity* (database), https://stats.oecd.org/index.aspx?queryid=77867.

StatLink https://doi.org/10.1787/888934082765

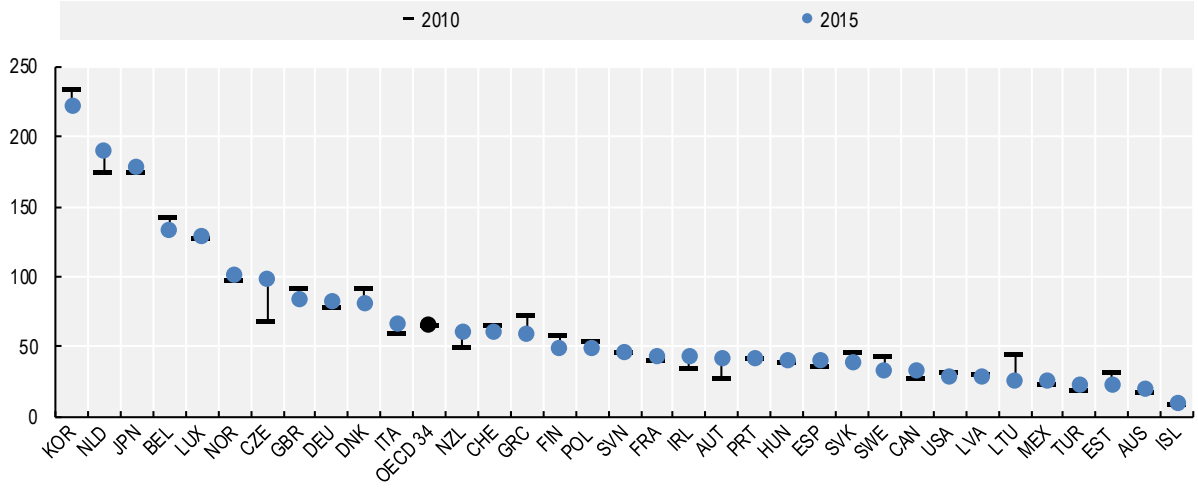
Soil quality and freshwater resources

A surplus of nitrogen inputs from agriculture adds to pollution pressures on water, soil and air. Despite an overall reduction between 1990 and 2009 (OECD, 2013[6]), the annual soil nitrogen balance of agricultural land has increased since 2010 in several OECD countries (Figure 14.11). Nearly two-thirds of OECD countries had an annual national nitrogen surplus in excess of 40 kgN/ha in 2015. Values are particularly high in several northern European countries, as well as Korea and Japan.

Water use is placing resources under stress in several OECD countries. Annual water use represents more than 20% of internal water resources in close to one-third of OECD countries; in several cases, water use as a share of total renewable resources (including inflows from neighbouring countries) is not far behind (Figure 14.12).

Figure 14.11. A surplus of nitrogen risks adding to pollution pressures on water, soil and air

Soil nitrogen balance per hectare of agricultural land, kilograms

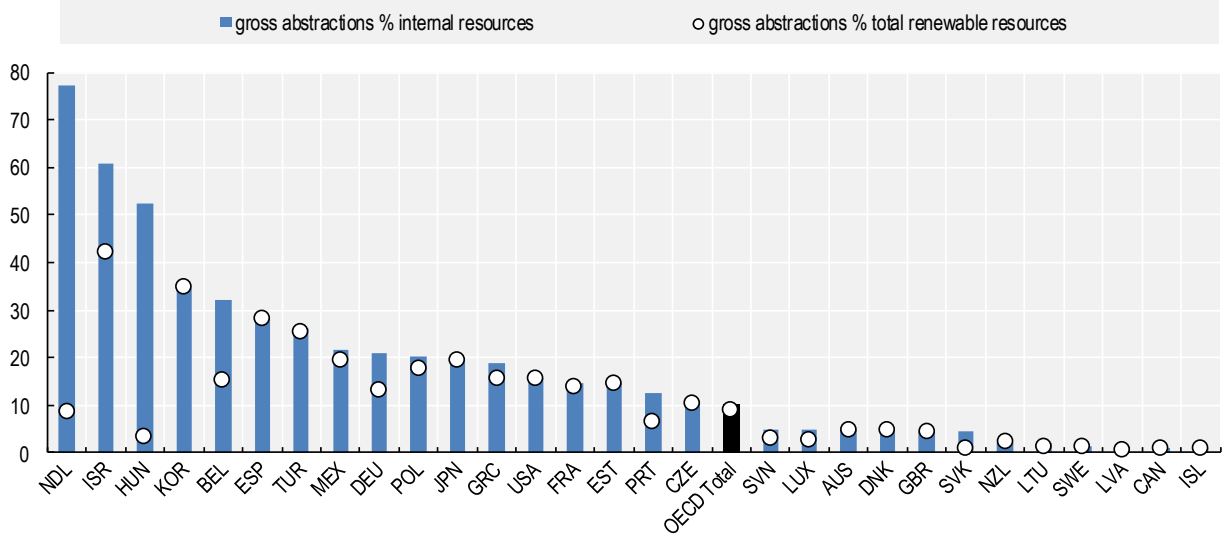


Note: The gross nitrogen balance (surplus or deficit) is the difference between the nitrogen inputs entering a farming system (i.e. mainly livestock manure and fertilisers) and the nitrogen outputs leaving the system (i.e. the uptake of nitrogen for crop and pasture production). The OECD average excludes Chile, Colombia and Israel, due to a lack of available data.
Source: *OECD Agri-Environmental indicators: Nutrients* (database), https://stats-2.oecd.org/Index.aspx?DataSetCode=AEI_NUTRIENTS.

StatLink https://doi.org/10.1787/888934082784

Figure 14.12. One-third of OECD countries use more than 20% of their internal water resources

Annual gross abstraction rates, as a percentage of resources, 2016 or latest available year



Note: Definitions and estimation methods employed by countries may vary considerably; see figure source for further details. The latest available year is 2016 for Germany, Denmark, Spain, France, Greece, Hungary, Israel, Korea, Luxembourg, the Netherlands and Turkey; 2015 for Belgium, Canada, Japan, Sweden and the United States; and 2014 for the United Kingdom (which refers to England and Wales only), Iceland, and New Zealand. The OECD Total is an OECD Secretariat estimate and excludes Chile and Colombia.
Source: *OECD Freshwater abstractions (million m^3)* (database), https://stats.oecd.org/Index.aspx?DataSetCode=WATER_ABSTRACT.

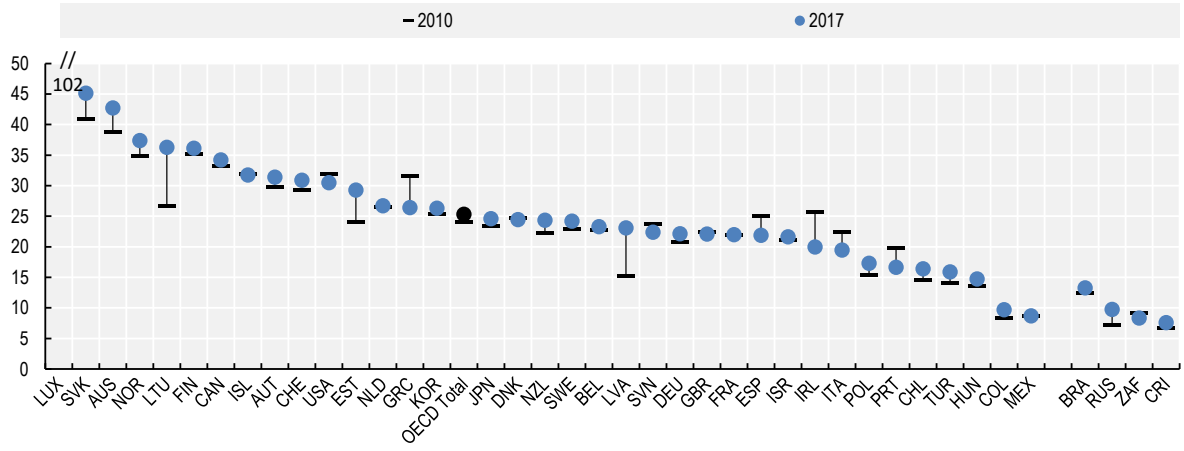
StatLink https://doi.org/10.1787/888934082803

Waste and materials

Material footprint refers to the total volume of raw materials extracted to meet domestic demand. On a per capita basis, this footprint has increased in two-thirds of OECD countries between 2010 and 2017 (Figure 14.13). The largest increases (of 3 tonnes or more) were recorded in Lithuania, Latvia, Estonia, the Slovak Republic and Australia – countries with footprints above the OECD average. By contrast, several OECD countries with below-average footprints bucked the overall trend: this includes Italy, Spain, Portugal, Greece and Ireland, where material footprints fell by more than 3 tonnes per capita since 2010.

Figure 14.13. Material footprint per capita continues to rise in most OECD countries

Material footprint per capita, tonnes



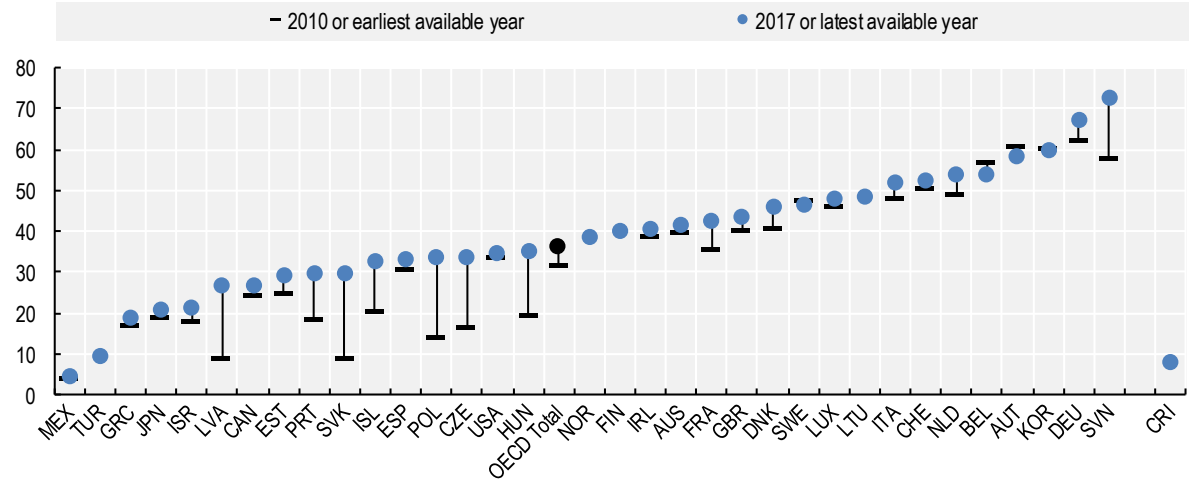
Note: The material footprint refers to the global allocation of used raw material extracted to meet the final demand of the economy. The OECD Total excludes the Czech Republic, as no data are available, and Colombia, as it was published prior to Colombia joining the OECD.
Source: *OECD Material resources* (database), https://stats.oecd.org/Index.aspx?DataSetCode=MATERIAL_RESOURCES.

StatLink https://doi.org/10.1787/888934082822

Waste also adds to pressure on the natural environment. Municipal waste recycling and composting rates improved for the majority of OECD countries between 2010 and 2017 (Figure 14.14). In around one-third of members, this rate increased by 5 percentage points or more. However, recycling rates declined by more than 2 percentage points in Belgium and Austria – although both countries are still ranked among the top 5.

Figure 14.14. Municipal waste material recovery rates have improved since 2010 in over half of all OECD countries

Municipal waste recycled or composted, as a share of treated waste



Note: Latest available year refers to 2016 for Canada, Iceland, Ireland, Japan and Korea; 2015 for Australia; and 2012 for Mexico. Earliest available year refers to 2015 in Italy. The OECD Total is an OECD Secretariat estimate based on incomplete data.
Source: *OECD Municipal waste, Generation and Treatment* (database), https://stats.oecd.org/Index.aspx?DataSetCode=MUNW.

StatLink https://doi.org/10.1787/888934082841

Box 14.1. Measurement and the statistical agenda ahead

Natural Capital consists of naturally occurring assets and ecosystems, from tradable items such as minerals and timber through to oceans and the atmosphere. The scope of Natural Capital is vast: indicators selected for this chapter represent a small headline set of all the possible stocks, flows, and risk and resilience factors of relevance (Exton and Fleischer, 2020[7]). The indicators shown here (Table 14.1) reflect several categories of environmental assets identified in the System of Environmental and Economic Accounting (SEEA) Core Framework: land, soil resources, water resources, mineral and energy resources. In addition, they feature data on emissions into the air (which impact on climate regulation through atmospheric concentrations of greenhouse gases) as well as aspects of ecosystems and biodiversity, key indicators from the OECD's *Green Growth Strategy* (OECD, 2017[8]) and a selection of data from *Environment at a Glance* (OECD, 2019[1]).

Table 14.1. Natural Capital indicators considered in this chapter

Indicator	Unit of Measurement	Stock	Flow	Risk factor	Resilience factor
Biological resources and biodiversity					
Natural and semi-natural land cover (losses and gains reported separately)	Natural and semi-natural vegetated land cover (tree-covered area, grassland, wetland, shrubland and sparse vegetation) as a percentage of total land area	✓			
Intact forest landscapes	Square kilometres	✓			
Protected áreas – terrestrial	Percentage of total land that has been designated as protected	✓			
Protected areas – marine	Percentage of total exclusive economic zones that have been designated as protected	✓			
Threatened species (Red List Index)	Combined indicator of extinction risk for birds, mammals, amphibians, cycads and corals. A value of 1.0 equates to all species qualifying as Least Concern (i.e. not expected to become extinct in the near future). A value of 0 equates to all species having gone extinct.			✓	
Climate change					
Greenhouse gas emissions from domestic production	Total greenhouse gas emissions from domestic production, excluding those from land use, land-use change and forestry (LULUCF), tonnes per capita, CO_2 equivalent			✓	
Carbon footprint	Carbon dioxide emissions embodied in domestic final demand, tonnes per capita			✓	
Renewable energy	Renewable energy as a percentage of total primary energy supply				✓
Soil quality and freshwater resources					
Soil nutrient balance	Nutrient surplus (nitrogen), kilograms per hectare of agricultural land			✓	
Water stress (internal resources)	Gross abstractions as a percentage of internal resources			✓	
Water stress (total renewable resources)	Gross abstractions as a percentage of total renewable resources			✓	
Waste and materials					
Material footprint per capita	Used raw material extracted to meet the final demand of the economy, tonnes per capita		✓		
Municipal waste recycled or composted	Municipal waste recycled or composted as a percentage of all treated waste				✓

Natural and semi-natural land cover is defined as the percentage of total land area composed of tree cover, grassland, wetland, shrubland and sparse vegetation. **Loss (gain) of natural and semi-natural vegetated land** is the percentage of tree cover, grassland, wetland, shrubland and sparse vegetation converted to (from) any other land cover type (e.g. agricultural, built-up area). The denominator used is the "stock" of natural and semi-natural land at the start of the reference period. Land cover change data are obtained from the Land Cover Change in Countries and Regions dataset of the *OECD Environment Database*. For full details of the methodology, see (Haščič and Mackie, 2018[9]).

Intact forest landscape refers to an unbroken expanse of natural ecosystem within the current forest extent, with no remotely detected signs of human activity, and large enough that all native biodiversity, including viable populations of wide-ranging species, could be maintained (Potapov et al., 2017[2]). These forests are defined as larger than 500 km^2 and wider than 10 km, and must be free of settlements or infrastructure and unaffected by industrial activity, agricultural clearing or other anthropogenic disturbance in the last 70 years. Treeless areas within these forests such as lakes, ice or patches of grassland are included. Identification of intact forest landscapes is based on a map of global forests, with all the forest patches that do not meet the criteria above excluded through visual identification of disturbance using satellite images and other sources of information like thematic maps (roads, settlements, etc.). Data are sourced from the *OECD Environment Statistics Database*: Land Resources, and based on (Potapov et al., 2017[2]).

Protected areas refer to the share of total land (in the case terrestrial areas) and of total exclusive economic zones (in the case of marine areas) that have been designated as protected using national, regional (e.g. the European Natura 2000 networks) or international frameworks (e.g. Wetlands of International Importance, known as Ramsar sites). They include strict natural reserves, wilderness areas, national parks, natural monuments, habitat/species management areas, protected landscapes/ seascapes, and protected areas with sustainable use of natural resources. Data are drawn from the *OECD Environment Statistics Database*: Biodiversity. Calculations are based on the *World Database on Protected Areas (WDPA)*, which is maintained by the International Union for Conservation of Nature and UNEP's World Conservation Monitoring Centre. For full details of the methodology, see (Mackie et al., 2017[10]).

Threatened species – The Red List Index shows trends in the overall extinction risk of species within a country. It is a combined indicator of extinction risk for birds, mammals, amphibians, cycads and corals. A value of 1.0 implies that all species qualify as Least Concern (i.e. not expected to become extinct in the near future), while a value of 0 equates to all species having gone extinct. Data are sourced from the *UN DESA Global SDG Indicator Database*, and are based on IUCN Red List of Threatened Species data.

Greenhouse gas emissions from domestic production are total per capita greenhouse gas emissions (GHG) from domestic production, excluding those from land use, land-use change and forestry (LULUCF), in tonnes per capita, CO_2 equivalent. This indicator concerns man-made emissions of six different gases: carbon dioxide (CO_2, including emissions from energy use and industrial processes, e.g. cement production); methane (CH_4, including methane emissions from solid waste, livestock, mining of hard coal and lignite, rice paddies, agriculture and leaks from natural gas pipelines); nitrous oxide (N_2O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); and sulphur hexafluoride (SF_6). Emissions of each type of gas are weighted by their "warming potential" and expressed in tonnes per capita of CO_2 equivalent. The data, which form part of the *OECD Environment Statistics Database,* are compiled on the basis of National Inventory Submissions 2014 to the *United Nations Framework Convention on Climate Change* (UNFCCC) and of replies to the OECD State of the Environment Questionnaire.

Carbon footprint is an estimate of the total per capita emissions of carbon dioxide (CO_2) associated with domestic consumption, including both CO_2 emitted and consumed domestically and CO_2 emitted abroad and embodied in imports. Emissions embodied in the domestic consumption of a country increase global GHG concentrations even when there are no increases in emissions from domestic production. This indicator is derived from the 2015 edition of the *OECD Inter-Country Input-Output (ICIO) database*, combined with IEA statistics on CO_2 emissions from fuel combustion and other industry statistics. The data, which form part of the *OECD Structural Analysis Databases,* are compiled according to the methodology detailed in (Wiebe and Yamano, 2016[11]).

Renewable energy supply refers to the percentage of the total primary energy supply (TPES) from renewable sources. Renewables include hydro, geothermal, solar (thermal and PV), wind and tide/wave/ocean energy, as well as renewables from the combustion of solid biomass, liquid biomass, biogas and renewable municipal waste. TPES comprises production, plus imports, less exports, less energy in international marine bunkers and international aviation bunkers, plus changes in energy stocks. The underlying data on "renewables and waste energy supply" are obtained from the World - Renewable and Waste Energy Statistics dataset of the *IEA Renewables Information Statistics Database*. Data on Total Primary Energy Supply (TPES) are obtained from the *IEA database on World Energy Statistics and Balances*. The estimates shown here are drawn from the *OECD Environment Statistics Database*: Green Growth.

Nitrogen balance per hectare 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 indicator is 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: Nutrients balance dataset of the *OECD Agriculture and Fisheries Database*.

Water stress is expressed as the ratio of total gross abstractions of freshwater as a percentage of two different measures of the stock of available water resources: *total internal renewable freshwater resources* (precipitation net of evapotranspiration) and *total available renewable freshwater resources* (including inflows from neighbouring countries). Water stress is categorised as either "low" (less than 10%), implying no major stress on the available resources; "moderate" (10-20%), when water availability is becoming a constraint on development and significant investment is needed to provide adequate supplies; "medium-high" (20-40%), requiring management of both supply and demand, and a need to resolve conflicts among competing uses of water; and "high" (more than 40%), indicating serious scarcity and (usually) unsustainable water use, which can become a limiting factor in social and economic development. Data on freshwater abstractions are obtained from the Freshwater Abstractions Dataset from the *OECD Environment Database*. Note that data for the United Kingdom include freshwater abstractions only in England and Wales.

Material footprint is expressed in tonnes per capita, and refers to the global allocation of used raw material extracted to meet the final demand of an economy, thus including materials used in the production of imported products. These data refer to material resources, i.e. materials originating from natural resources that form the material basis of the economy: metals (ferrous, non-ferrous) non-metallic minerals (construction minerals, industrial minerals), biomass (wood, food) and fossil energy carriers. Data on material footprints for OECD countries are sourced from the Material Resources dataset included in the *OECD Environment Database*, which is in turn based on the *UNEP "Environment Live" database*.

Table 14.2. Each of the Natural Capital indicators contribute to the overall picture

Bivariate correlation coefficients among the Natural Capital indicators

	Natural land cover	Loss of natural land	Gain of natural land	Intact forest landscapes	Protected areas – terrestrial	Protected areas – marine	Threatened species	GHG emission from production	Carbon footprint	Renewable energy	Soil nutrient balance	Water stress (internal)	Water stress (renewable)	Material footprint
Loss of natural land	**-0.39****													
	(41)													
Gain of natural land	**-0.49*****	**0.33****												
	(41)	(41)												
Intact forest landscapes	**0.28***	-0.17	-0.18											
	(41)	(41)	(41)											
Protected areas – terrestrial	-0.21	-0.08	0.10	-0.21										
	(40)	(40)	(40)	(40)										
Protected areas – marine	0.03	-0.13	-0.26	-0.13	**0.57*****									
	(34)	(34)	(34)	(34)	(34)									
Threatened species	-0.24	-0.13	-0.15	0.16	0.08	0.04								
	(41)	(41)	(41)	(41)	(40)	(34)								
GHG emissions from production	0.24	-0.04	**-0.40****	**0.30***	-0.09	0.05	0.04							
	(40)	(40)	(40)	(40)	(39)	(33)	(40)							
Carbon footprint	0.08	0.06	**-0.37****	0.07	-0.09	0.07	0.11	**0.83*****						
	(41)	(41)	(41)	(41)	(40)	(34)	(41)	(40)						
Renewable energy	**0.28***	-0.18	-0.01	-0.00	-0.05	-0.20	0.04	-0.20	-0.23					
	(41)	(41)	(41)	(41)	(40)	(34)	(41)	(40)	(41)					
Soil nutrient balance	-0.22	**0.40****	-0.15	-0.14	-0.02	-0.11	-0.16	0.10	0.28	**-0.32***				
	(34)	(34)	(34)	(34)	(33)	(27)	(34)	(34)	(34)	(34)				
Water stress (internal)	**-0.57*****	0.23	0.19	-0.16	-0.16	-0.09	-0.08	-0.07	0.01	**-0.40****	**0.44****			
	(33)	(33)	(33)	(33)	(32)	(27)	(33)	(33)	(33)	(33)	(30)			
Water stress (renewable)	**-0.51*****	**0.49*****	0.26	-0.25	-0.09	-0.19	-0.31*	-0.08	0.07	**-0.41****	**0.32***	**0.61*****		
	(34)	(34)	(34)	(34)	(33)	(28)	(34)	(34)	(34)	(34)	(30)	(32)		
Material footprint	-0.00	-0.04	**-0.27***	-0.11	**0.35****	0.07	**0.31****	**0.45*****	**0.60*****	-0.04	0.17	-0.20	-0.19	
	(40)	(40)	(40)	(40)	(39)	(34)	(40)	(39)	(40)	(40)	(33)	(32)	(33)	
Recycling rate	-0.04	0.09	**-0.45*****	-0.13	0.20	**0.55*****	**0.31***	0.17	0.32*	-0.09	**0.33***	0.11	-0.05	0.25
	(35)	(35)	(35)	(35)	(34)	(28)	(35)	(35)	(35)	(35)	(33)	(31)	(31)	(34)

Note: Table shows the bivariate Pearson's correlation coefficient; values in parentheses refer to the number of observations (countries). * Indicates that correlations are significant at the p<0.10 level; ** indicates they are significant at the p<0.05 level, and *** at the p<0.01 level.

Municipal waste material recovery refers to waste recycled or composted, 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. It includes reprocessing both as the same type of product and for different purposes. 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 Municipal waste – Generation and Treatment dataset of the *OECD Environment Database*.

Correlations among the Natural Capital indicators

The strongest correlations among the Natural Capital indicators are found between greenhouse gas emissions from domestic production, and the carbon footprint (0.8) (Table 14.2). The two measures of protected areas (terrestrial and marine) are also strongly related to one another (0.6), and also to recycling rates (0.6). The two measures of water stress are related (0.6), and countries with a higher share of natural land cover tend to suffer lower rates of water stress (-0.6). Countries with a higher carbon footprint also have a higher material footprint (0.6).

Statistical agenda ahead

More complete country coverage, time series and timely data are needed for several of the indicators in Table 14.1. Other key indicators are missing entirely. Data on the benefits of ecosystem services for human well-being, as well as on species diversity, are particularly poorly covered. Other important gaps include water quality, in terms of both pollution in rivers and lakes and ocean acidification, as well as information about whether resources are being managed sustainably (e.g. fish stocks). In other cases, the existing indicators would benefit from further refinement or complementary information. For example, data on the share of the total primary energy supply from renewables should be complemented with information on the total share of energy from all zero carbon sources. Protected areas are not necessarily sited optimally with respect to biodiversity conservation objectives, and the indicator presented here does not provide any indication of whether protected areas are effectively managed or enforced. An ideal data set on GHG emissions into the air would show the breakdown of different greenhouse gases separately, rather than summing them together in weighted carbon-equivalent terms, since performing this aggregation is challenging when each gas has different atmospheric effects. Total fertiliser inputs should be used to complement data on soil nutrient (nitrogen) balance. Recycling and composting would ideally cover all households and industries, not just material recovery of treated municipal waste. Data on natural disasters may also be relevant for inclusion.

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