Environment at a Glance in the EU Eastern Partnership Countries

MEASURING PROGRESS TOWARDS A GREEN TRANSFORMATION

OECD

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Foreword

The five Eastern Partnership (EaP) countries – Armenia, Azerbaijan, Georgia, the Republic of Moldova (hereinafter Moldova) and Ukraine – are at the strategically important crossroads of Western Asia and Europe. They host a variety of geographic and climatic profiles and possess rich endowments of natural resources. This includes endemic biodiversity and ecosystems crucial for the region's development and the population's well-being. With its untapped potential in renewable energy, including solar, wind, and hydropower, the region holds a promising future. Despite some countries being among the world's most water-stressed, the potential for sustainable energy production is a beacon of hope.

The EaP countries continue to face challenges stemming from the legacy of the Soviet era. Oversized and outdated infrastructure, inefficient water management practices, and obsolete technologies, especially in the mining and metallurgical sectors, consume excessive amounts of materials and energy, resulting in significant unabated pollution. These challenges are combined with new pressures from intensified transport, increased household waste, and extensive use of fertilisers and pesticides in agriculture.

Despite these challenges, the five EaP countries have demonstrated commendable commitment and progress in advancing the transition to a green economy. They have adopted national green growth and sustainable development strategies, enhanced relevant policy instruments, and strengthened the institutional framework to decouple economic growth from environmental degradation. This ongoing effort is a testament to their determination and should serve as a motivation for further action.

Advancing towards greener growth is one of the key goals within the Eastern Partnership. Launched in 2009, the EaP is a strategic and ambitious partnership based on common values and rules, mutual interests and commitments, and shared ownership and responsibility. It aims to strengthen and deepen the political and economic relations between the EU, its Member States and the partner countries, as well as support sustainable reform processes in the Eastern Partnership countries. Climate and environmental resilience are among the five priority goals identified for the post-2020 EaP agenda (European Commission, European External Action Service, 2020). The Economic and Investment Plan (EIP), a crucial component of our collective efforts, is primarily based on flagship initiatives for each partner country. This plan supports the recovery process and signifies the shared commitment to the transition to a green economy in the Eastern Partnership.

This publication aims to respond to this growing interest in green growth indicators and comparable environmental data in the EaP region by offering an innovative and interactive tool to policymakers and experts to monitor the green transition and increase the visibility of the EaP countries in the OECD-wide work. It can facilitate benchmarking with countries with similar environmental pressures, monitor progress and inspire policy reform. Furthermore, it can facilitate progress on the path of European integration, especially in the countries with EU candidate status.

EU4Environment stands in solidarity with the people of Ukraine. Data used in this publication does not consider the severe impact of the Russian full-scale invasion of Ukraine since 2022. Therefore, the data for Ukraine provided herein dates from 2021.

In line with the Council Conclusions of 12 October 2020 and in light of Belarus's involvement in the launch of Russia's full-scale invasion of Ukraine, recognised in the European Council Conclusions of February 2022, the EU has stopped engaging with representatives of Belarus public bodies and state-owned enterprises. The data provided in this webbook, therefore, does not include Belarus.

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Executive Summary

This webbook builds on indicators available in the OECD and other international databases to monitor progress towards green growth and environmental performance in the European Union's Eastern Partnership (EaP) countries – Armenia, Azerbaijan, Georgia, Moldova, and Ukraine. It combines some central elements of the OECD Green Growth Indicators framework and the OECD Core Set of Environmental Indicators. This report is a first step in presenting available indicators for EaP countries to support the monitoring and progress towards the green transition. It will be improved and complemented as more data and indicators become available.

The green growth indicators framework, developed by the OECD in 2011 to support the implementation of its Green Growth Strategy, has been rapidly adopted by the EaP countries as an internationally recognised benchmark for monitoring green transition. Green growth indicators help track progress towards a green economy, facilitate informed decision-making, demonstrate accountability, raise public awareness of the links between economic growth and the environment, and compare progress between countries.

This publication covers indicators across five areas – the socio-economic context, the natural asset base, environmental resource productivity, environmental quality of life, economic opportunities, and policy responses. The publication aims to respond to the growing interest in green growth indicators and comparable environmental data in the EaP region by offering an innovative and interactive tool to policymakers and experts to monitor the green transition and increase the visibility of the EaP countries in the OECD-wide work. It can facilitate benchmarking with countries with similar environmental pressures, monitor progress and inspire policy reform. Furthermore, it can facilitate progress on the path of European integration, especially in the countries with EU candidate status.

While challenges remain, there are clear signs of progress across various indicators for countries in the region. There is also clear value in providing a basis for data sharing and comparability for benchmarking. However, a key meta-challenge in the publication is the gaps in the existing data, both in terms of indicator availability and the frequency with which data is updated.

1 The EaP region at a glance

Beginning in 1991, the EaP countries enjoyed years of strong economic growth. Energy efficiency measures and reduction in the share of oil in energy have contributed to reducing greenhouse gas emissions per unit of GDP. More efficient water use has resulted in lower abstraction levels per person and less wastewater discharge. However, growth slowed after the economic crisis of 2008-09. The EaP economies faced repeated downturns, which included energy shortages, political uncertainty, and trade obstacles that challenged regional economic development and environmental improvement.

In 2022, the EaP countries plunged into a new wave of geopolitical crisis as a result of Russia's full-scale invasion of Ukraine. The Russian invasion has inflicted tremendous human losses and damage to the Ukrainian economy. The associated humanitarian crisis has led to a large number of displaced people both within Ukraine and abroad. The latest estimation of the reconstruction cost in Ukraine, released by the Word Bank in February 2024, amounts to USD 486 billion (World Bank, 2024[1]). The war also affected the EaP countries' economic development and trade relations.

The war against Ukraine has not spared the environment, natural resource-based assets, or infrastructure. The shelling of forests, land and marine ecosystems, industrial facilities, transport infrastructures and houses, as well as water, sanitation, and waste management infrastructures, has caused widespread and severe damage, already estimated by the Ukrainian authorities to be over USD 56 billion (Ministry of Ecology and Natural Resources of Ukraine, 2024[2]), with immediate and long-term consequences for human health and ecosystems.

This webbook builds on indicators available in the OECD and other international databases to monitor progress towards green growth and environmental performance in the EaP countries. It combines some central elements of the OECD Green Growth Indicators framework and the OECD Core Set of Environmental Indicators. The report also builds on the previous work on applying the OECD set of indicators in the EaP countries. In particular, it builds on the work from the report "Monitoring Ukraine's Progress towards Green Economy using Green Growth Indicators" and a web platform "Towards Green Transformation of the Republic of Moldova: Monitoring progress based on the OECD green growth indicators that were developed as part of the EU-funded EU4Environment: Green Economy Programme.

This report is a first step in presenting available indicators for EaP countries to support the monitoring and progress towards the green transition. It will be improved and complemented as more data and indicators become available.

Economic Development

As part of an ambitious economic liberalisation effort in the 1990s and early 2000s, the EaP countries allowed prices to rise more freely, stopped issuing preferential credits to state enterprises, pursued land privatisation, removed export controls, and exerted less control on interest rates. Their economies grew steadily in the 2000s due mainly to structural and market reforms that improved the business environment, strengthened public finance systems, upgraded infrastructure and liberalised trade. However, growth slowed after the economic crisis of 2008-09. Subsequent repeated downturns, which included energy

shortages, political uncertainty and trade obstacles, challenged regional economic development and environmental improvement.

Agriculture continues to be an important sector in the region, and most EaP countries depend on natural resource extraction, including mining and fossil fuels, for a significant portion of their economy. The share of value added in the services sector has been increasing over the years. However, agriculture still accounts for 12% of value added in Armenia and Ukraine and over 11% in Moldova, compared to the EU/OECD average of about 2%. The significance of agriculture in Moldova and Ukraine is reflected in land use patterns, with both countries showing nearly 60% of the overall area dedicated to permanent crops and arable land.

The EaP countries are highly dependent on remittances (accounting for over 10% of GDP in Armenia and Georgia and up to 16% in Moldova) and with a large informal economic sector (about 50% in Armenia and Georgia and about 30% in Moldova). Despite strong growth in GDP per person since the mid-2000s and some progress in reducing poverty, the EaP countries remain among the poorest in Europe (Figure 2.2).

Following the European Council's decision in 2023 to grant Moldova and Ukraine candidate status to join the European Union, Georgia's European perspective status and Ukraine's application for OECD membership, these countries accelerated the alignment of their legal framework with the EU acquis.

Measurement framework to track progress

The green growth indicators framework, developed by the OECD in 2011 to support the implementation of its Green Growth Strategy, has been rapidly adopted by the EaP countries as an internationally recognised benchmark for monitoring green transition. Green growth indicators help track progress towards a green economy, facilitate informed decision-making, demonstrate accountability, raise public awareness of the links between economic growth and the environment, and compare progress between countries (Box 1.1).

Box 1.1. The OECD Green Growth Indicators and OECD Core Set of Environmental Indicators

The **OECD green growth indicators** are a measurement framework to track progress towards greening the economies and decoupling economic growth from environmental degradation. It captures four areas of green growth:

- **Natural asset base**
- **Environmental and resource productivity**
- **Environmental quality of life**
- **Economic opportunities and policy responses**

The four main areas of green growth are complemented by indicators of socio-economic context, which provide important background information.

The **OECD Core Set of Environmental Indicators** is essential for monitoring environmental progress, evaluating policies, informing the public, and tracking the course towards sustainable development. The OECD pioneered the development of international environmental indicators and used them regularly in its Country's Environmental Performance Reviews and analysis work.

Source: OECD (2014), *Green Growth Indicators 2014*, OECD Green Growth Studies, OECD Publishing, Paris, https://doi.org/10.1787/9789264202030-en. OECD green growth indicators highlights (2017). OECD key environmental indicators, https://www.oecd.org/env/indicators-modelling-outlooks/37551205.pdf.

Overview of selected indicators

The table below lists the selected indicators available in the OECD database for the EaP countries and is presented in this webbook.

Table 1.1. List of Indicators

Section	Indicator	Unit
Socio-economic context	Real GDP per person	USD
	Value added by sector (agriculture, industry, services)	% of total value added
	Population by age group	% of total
	Land use	% of land area
Natural asset base	Land cover by type	% of land area
	Net change of natural vegetated land	% of natural land
	Built-up area per person	Square metres per person
	Gain of artificial surfaces	% of artificial surfaces
	Total freshwater: Gross abstractions	% of internal resources
	Total freshwater: Gross abstractions (water stress)	% of total renewable resources
Environmental and resource productivity	Production-based CO_2 productivity	GDP per unit of energy-related CO_2 emissions, US dollars per unit of CO_2
	Energy productivity	GDP per unit of TES
	Energy consumption, breakdown by sector	% of total
	Renewable energy by source	
	Renewable energy supply	% of total energy supply
	Renewable electricity	% total electricity generation
	Non-energy material productivity	GDP per unit of DMC
	Material footprint and domestic material consumption per person	Tonnes per person
	Municipal waste generated per person	
	Municipal waste treatment, by type of treatment	
Environmental quality of life	Mean population exposure to PM2.5	
	Mortality from exposure to selected pollutants	per one million inhabitants
	Welfare costs of premature mortalities from exposure to selected pollutants	% of GDP
	Annual surface temperature change	Degrees Celsius
	Population exposure to hot days	% of population, by weeks
	Population exposure to icing days	% of population, by weeks
	Population exposure to river flooding	% of population
	Forest area exposure to wildfire danger	% of tree-covered areas exposed
	Population with access to improved drinking water sources	% of total population
	Population with access to improved sanitation	% of total population
Economic opportunities and policy responses	Development of environment-related technologies	Inventions per 1 000 000 inhabitants
	FFS by fuel	
	FFS by beneficiary	
	Terrestrial protected areas, by IUCN category	

Data availability

The indicators shown reflect data availability in the EaP countries, highlighting remaining data gaps and the need for higher quality data at the environment-economy nexus, expanding the number of available indicators and ensuring regular data collection. The report shows that efforts remain for EaP countries to improve their environmental information systems and produce reliable and coherent indicators. As a result, some sections only present a reduced set of indicators that do not allow a complete overview of the green transition, particularly for biodiversity and circular economy indicators, as well as on economic opportunities and policy responses. Due to Russia's invasion of Ukraine since 2022, it is important to note that the cut-off date for Ukraine's data included in this report is 2021.

The underlying data are sourced from OECD and IEA databases and are available on the OECD Explorer platform. They build on data available from official OECD and international sources (e.g. Eurostat, FAO, IAE, UNFCCC, EMEP, UNEP-IRP, UNEP-WCMC). In particular, the report builds on close co-operation with the work of the UNECE Joint Task Force on Environmental Statistics and Indicators. Some data are produced by the OECD Secretariat using earth observation and geospatial data sources, and calculation methods developed in consultation with countries through their participation in the Working Party on Environmental Information (WPEI) (e.g. exposure to air pollution, changes and conversions in land cover, protected areas).

Updating frequency and timeliness

The updating frequency and timeliness vary from one dataset to another and, hence, from one indicator and graphic to another. The graphics are updated automatically as new data become available in OECD.stat. The updating frequency and timeliness of the OECD Data Explorer datasets depend, in turn, on the availability of updates in the primary data sources. Work in countries and at the international level to improve the timeliness of major environmental data continues.

Comparability and interpretation

The indicators used in this webbook are of varying significance for different countries. Care should be taken when interpreting the indicators and when making international comparisons. Issues to be considered include:

- National averages can mask variations within countries (in scale across countries, in paths of economic development and available resources).
- There is a level of uncertainty associated with the data sources and measurement methods on which the indicators rely. Differences between two countries' indicators are thus not always statistically significant. When countries are clustered around a relatively narrow range of outcomes, it may be misleading to establish an order of ranking.
- For some indicators, showing the direction and magnitude of change over time for a given country is more meaningful than cross-country comparisons, and trends in the indicators' value are more important than their absolute value.

Different denominators are used parallel to balance the message conveyed. Many indicators are expressed on a per-person and per-unit-of-GDP basis. The population estimates used include persons who have been residents of a country for one year or more, regardless of their citizenship. The GDP figures are expressed in USD, at 2015 prices and purchasing power parities (PPPs). Definitions and metadata can be found in the glossary at the end of this report.

EU support towards a green transition in Eastern Partnership countries

The EaP Economic and Investment Plan (EIP) aims to mobilise EUR 2.3 billion, leveraging up to EUR 17 billion to stimulate jobs and growth, connectivity, and the green and digital transition, thus directly contributing to the objectives of the European Green Deal and EU's Global Gateway Strategy (European Economic and Social Committee, 2021[3]). The EIP foresees leveraging at least EUR 750 million to upgrade water supply and sanitation, implement measures identified in the river basin management plans, and at least EUR 100 million to speed up circular economy uptake and support decarbonisation efforts. Improving waste management, including prevention, reuse and recycling, will help create new decent jobs and reduce imports of raw materials. The plan will focus on plastic, construction, and electronic waste (European Commission, European Anti-Fraud Office, 2021[4]).

EU-funded regional initiatives, twinning, TAIEX, and bilateral portfolios have played a key role in enabling progress towards climate and environmental resilience. Also, the bilateral portfolios increasingly include measures in this area. Through the Neighbourhood Investment Platform, the Eastern Europe Energy Efficiency and Environment Partnership (E5P) and other blending and guarantee instruments, the EU is leveraging funding for green investments. The Ukraine Facility is a dedicated instrument allowing the European Union to provide Ukraine with up to €50 billion in stable and predictable financial support from 2024 to 2027.

The EU-funded *EU4Environment Programme* was launched in 2019 during a dynamic period of policy development in the five Eastern Partnership (EaP) countries. Since then, it has aimed to help these countries pursue a path of green economic transformation through two sister programmes - "EU4Environment – Green Economy" and "EU4Environment – Water and Data". These programmes have provided environmental, economic, and statistical expertise to help each country preserve its natural capital and increase well-being by supporting environment-related action. The programmes demonstrated and unlocked opportunities for greener growth, provided mechanisms to better manage environmental risks and impacts, and improved access to environmental data for sustainable water use. They integrate greener decision-making, circular economy, smart environmental regulations, ecosystem protection, regional knowledge sharing and integrated water resources management into a cohesive framework. The implementing partners of "EU4Environment – Green Economy" are the Organisation for Economic Co-operation and Development (OECD), the United Nations Economic Commission for Europe (UNECE), the United Nations Environment Programme (UNEP), the United Nations Industrial Development Organization (UNIDO), and the World Bank. The implementing partners of "EU4Environment – Water and Data" are the Austrian Development Agency (ADA), Environment Agency Austria (UBA), International Office for Water (OiEau) (France), the Organisation for Economic Co-operation and Development (OECD), and the United Nations Economic Commission for Europe (UNECE).

The EU4Environment programmes contribute to achieving the commitments set in the countries' Association Agreements or enhanced cooperation agreements where they exist and build into its activities the provisions of the EU Green Deal as a benchmark for national policy design. The programmes also support Ukraine by incorporating green principles into the Post-War Recovery and Development Plan, which the government is developing.

This webbook builds upon the collaboration between the two pillars of EU4Environment. It highlights the tangible progress achieved by the EaP countries in greening their economies over the past decade, as well as the remaining challenges. It is an innovative and interactive tool for decision-makers, experts, and the general public. It provides access to the latest available data to monitor key environmental and green growth indicators in the EaP countries. It can be used as an instrument for mainstream environmental reporting to international standards within EaP countries, tracking performance against similar countries, and identifying focus areas for policy reform.

2 Socio-economic context

Key messages

- Although GDP per person in EaP countries has steadily increased over the past decade, the regional average is less than a third of the OECD average.
- The agricultural sector remains a significant contributor to regional economies, accounting for over 12% of value added in Armenia and Ukraine and over 11% in Moldova, compared to the EU/OECD average of about 2%.
- Following the COVID-19 pandemic, Moldova experienced the steepest GDP increase (+13.9% compared to the anticipated 4.5%), followed by Georgia (+10.4% compared to the anticipated 3.5%).
- The Russian invasion of Ukraine in 2022 continues to have severe implications for the economy and trade of Ukraine and other countries of the Eastern Partnership, such as neighbouring Moldova, with inflation amounting to 35% (December 2022), growing energy bills, and an influx of refugees.

Context and policy challenges

Since the 1990s, the EaP countries have adopted an open market approach to their economic policies, allowing for land privatisation and price de-regularisation, reducing the issuance of preferential credits to state enterprises, and removing controls on exports and interest rates. Despite strong growth in GDP per person over the past ten years and some progress in reducing poverty, the EaP countries remain among the lowest income in Europe, with an average GDP of less than a third of OECD countries.

The GDP structure has not significantly changed over the last decade, though the share of agriculture and industry has slightly decreased with increased services.

The mining sector plays an important role in most countries, except Moldova, contributing to export earnings, employment and economic growth. This is based on important aluminium deposits, molybdenum, titanium, copper, iron, lead and limestone. According to the 2022 International Council of Mines and Metals Mining Contribution Index, which measures the significance of the mining sector's contribution to national economies, Ukraine and Armenia are in the top 20, with Armenia's mineral rents constituting 3% of GDP, while ores and metal exports contributing 44% and 16% of total merchandise exports in Armenia and Georgia, respectively.

Azerbaijan's oil and gas sector accounts for about one-third of the country's GDP and nearly all exports. Oil production accelerated after independence from the Soviet Union: in 2014, Azerbaijan was the 21st largest producer of oil in the world and the 32nd largest producer of indigenous gas. Azerbaijan became a strategic transit corridor once new production capacities and pipelines were operational in the early 2000s. Even though Azerbaijan's exports are dominated by crude oil and natural gas, the country produces a range of minerals and metals, including aluminium, iron ore, bromine and iodine.

However, in 2021, agriculture still accounted for over 12% of value added in Armenia and Ukraine and over 11% in Moldova, compared to the EU/OECD average of about 2%. The significance of agriculture in Moldova and Ukraine is reflected in land use patterns, with both countries showing nearly 60% of the overall area dedicated to permanent crops and arable land.

Like other regions, from early 2020 to 2021, the COVID-19 pandemic posed unprecedented global health, social and economic challenges for the EaP region. After an initial period of dramatic economic downturn in 2020, GDP returned to growth in all countries in the EaP region, surpassing the earlier forecasts in 2021. Moldova experienced the steepest increase (+13.9% compared to the anticipated 4.5%), followed by Georgia (+10.4% compared to the anticipated 3.5%). The pandemic shifted the priorities from environmental measures to immediate socio-economic needs.

Nevertheless, since 2022, the war against Ukraine has had serious implications for other countries of the Eastern Partnership region, such as neighbouring Moldova, with inflation amounting to 35% in December 2022, growing energy bills, and an influx of refugees.

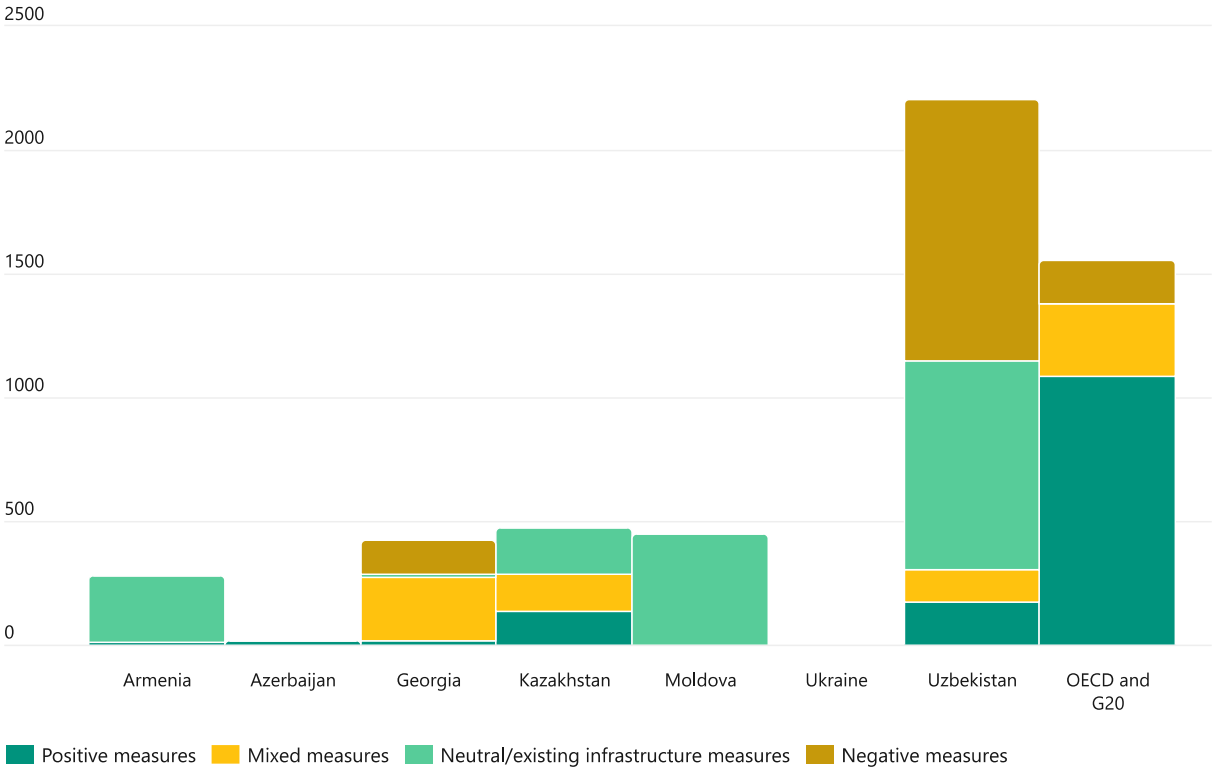
Main trends and recent developments

EaP country governments' responses to the COVID-19 pandemic initially focused on containing the virus and limiting economic damage. As vaccines were progressively rolled out, governments- in some cases with support from international cooperation partners- drew up ambitious recovery plans with the aim of restarting their economies. Furthermore, several governments issued pledges to 'build back better' and adopted net-zero targets by mid-century, e.g. Ukraine (Neuweg, 2021[5]). Exploring the likely environmental implications of these stimulus and recovery measures is important to understand whether the significant sums allocated aligned with the aim of a green recovery and whether they set the stage to "build back better" after the crisis.

Data shows that the total funding volume allocated to measures with a mixed or negative environmental impact was almost five times larger than funding for measures with an environmentally positive impact. Only approximately USD 360 million went to recovery measures with a positive environmental impact from the beginning of the COVID-19 crisis in 2020 to February 2022. Almost USD 1.7 billion was allocated to measures with a mixed or negative environmental impact (Neuweg, 2021[5]). Almost USD 1.8 billion was allocated to existing infrastructure or to measures unlikely to have a sizeable environmental impact (ibid.). These trends show that stimulus packages overall leaned heavily towards business-as-usual type activities rather than the transformational investments required for a green economy transition in the EaP region.

Figure 2.1. Environmental effects of COVID-19 related recovery measures

USD millions



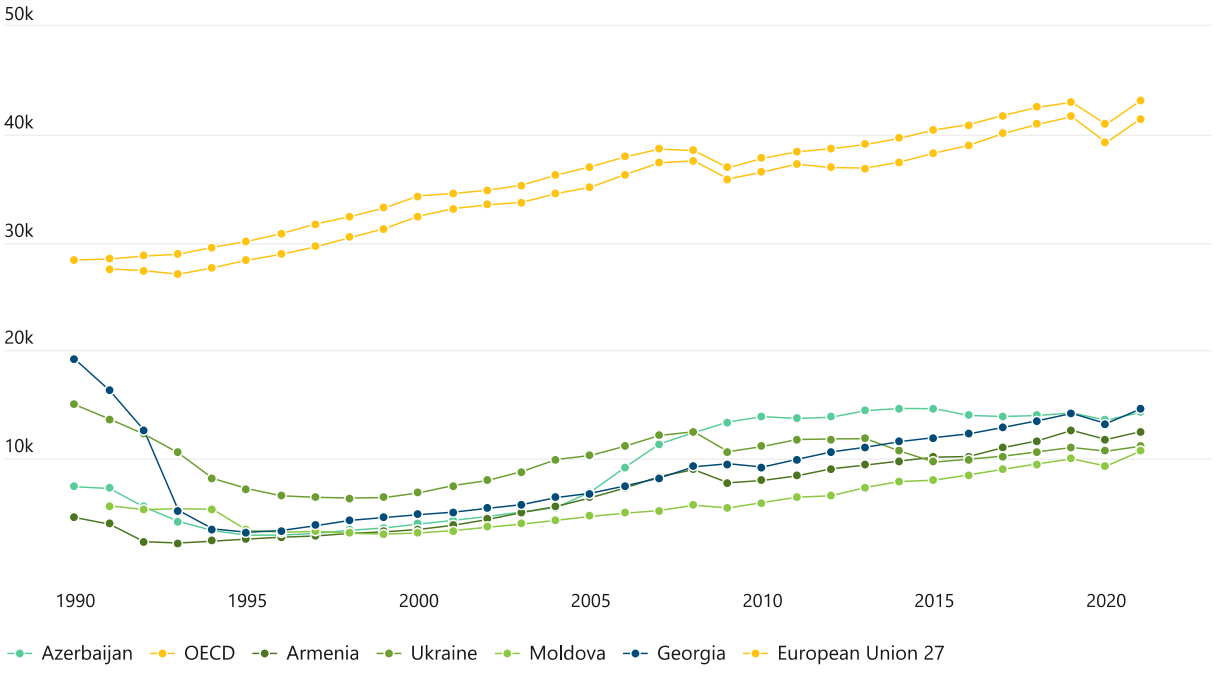
Source: OECD, "Green Recovery Database"; Neuweg and Michalak, "The environmental effects of COVID-19 related recovery measures in the EECCA region.", Green Action Task Force Paper.

Available indicators

- GDP per person
- Value added by sector
- Population by age
- Land use

Figure 2.2. Real Gross Domestic Product per person

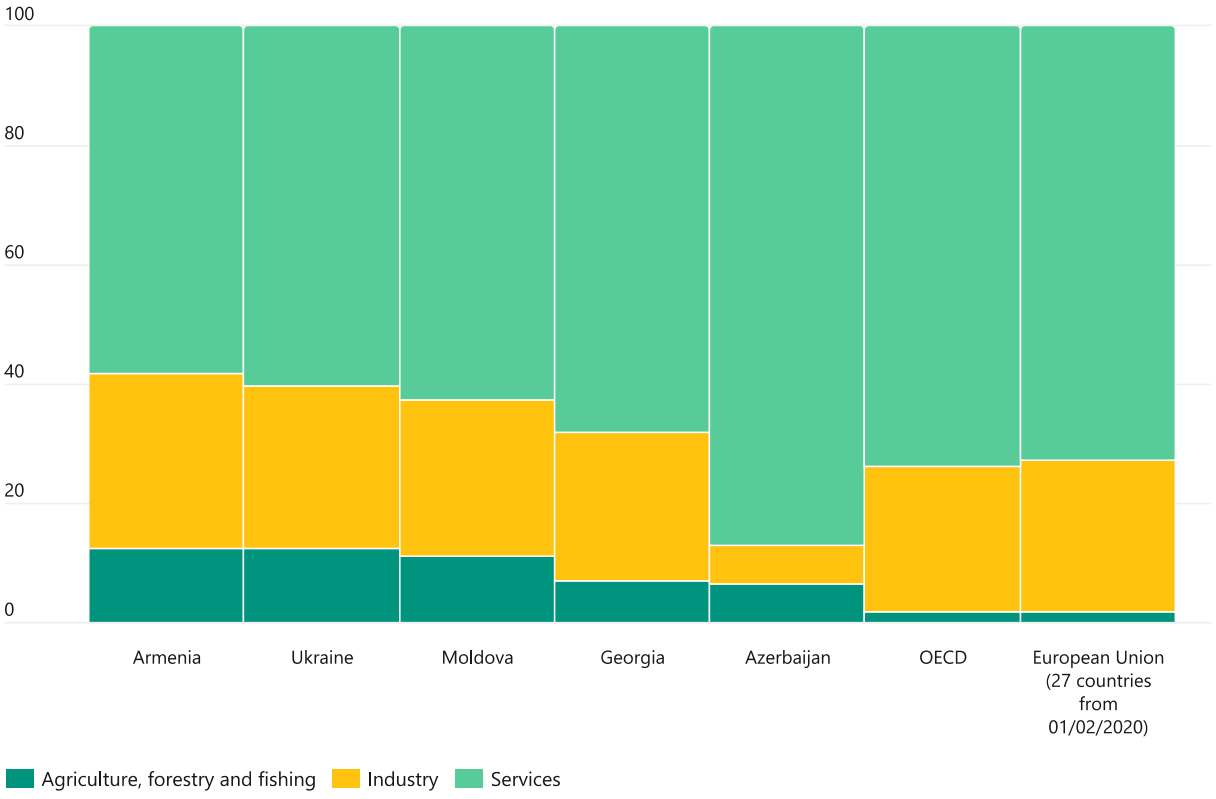
In USD per person, 2021



Compare: Link to the dashboard
Note: In USD per capita at 2015 prices and PPPs
Source: OECD, "Green growth indicators", OECD Environment Statistics (database), https://doi.org/10.1787/data-00665-en

Figure 2.3. Value added in agriculture, industry and services

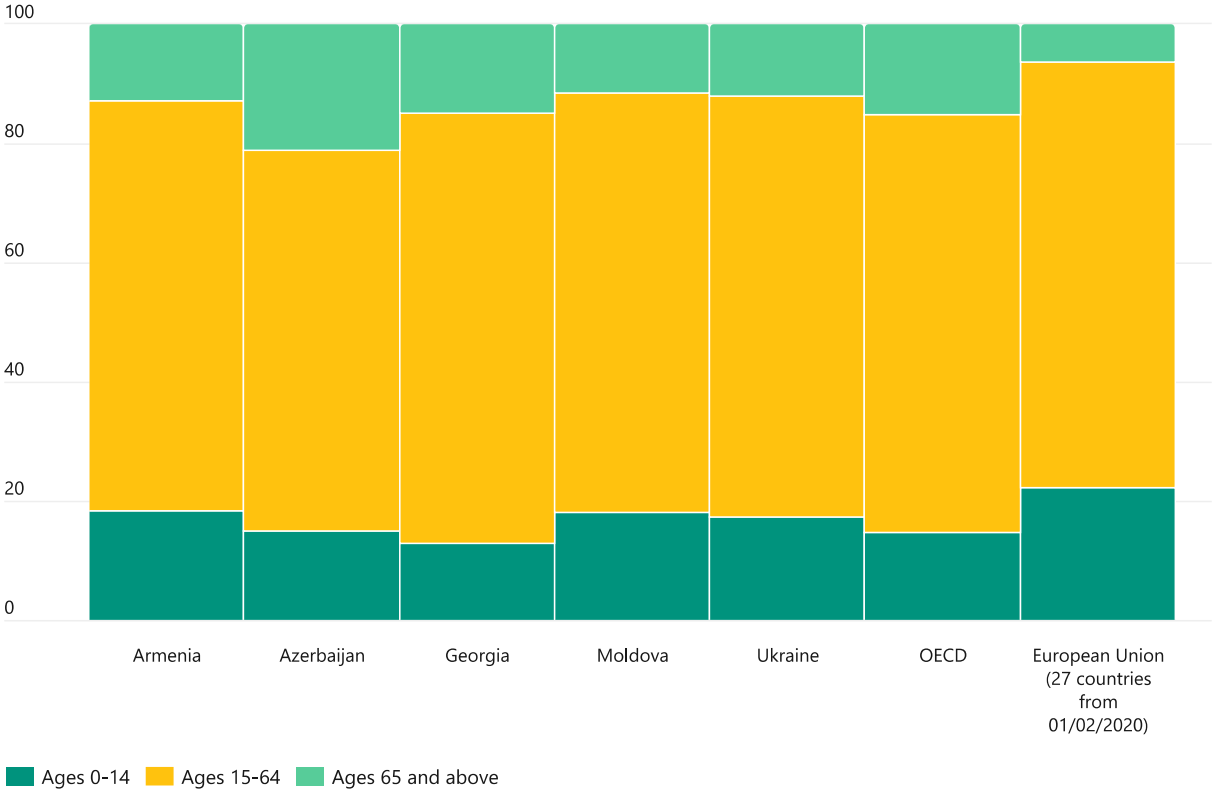
Percentage of total value added



Compare: Link to the dashboard
Source: OECD, "Green growth indicators", OECD Environment Statistics (database), https://doi.org/10.1787/data-00665-en

Figure 2.4 Population by age group

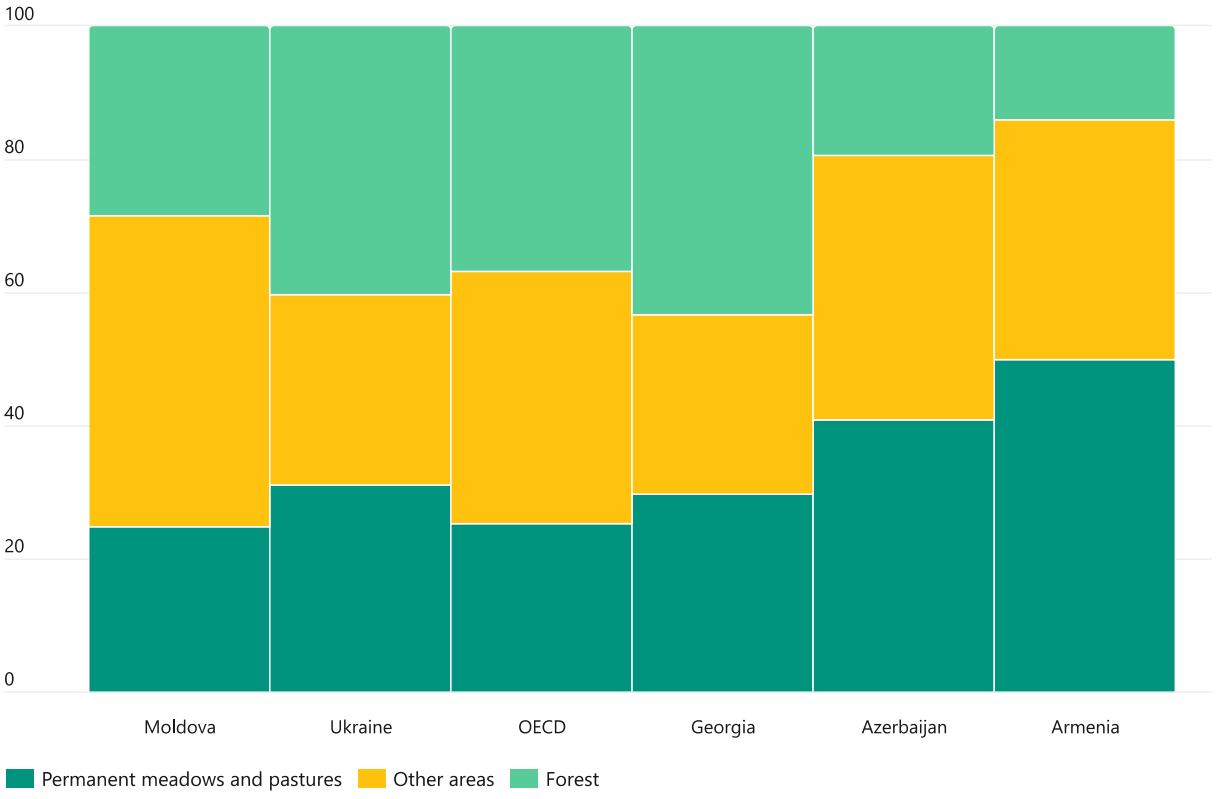
Percentage of total population, 2021



Compare: Link to the dashboard
Source: OECD, "Green growth indicators", OECD Environment Statistics (database), https://doi.org/10.1787/data-00665-en

Figure 2.5 Land use

Percentage of land area, 2021



Compare: Link to the dashboard.
Source: OECD, "Land resources: Land use", OECD Environment Statistics (database), https://doi.org/10.1787/8ecc9c9c-en

3 Natural asset base

Key messages

- The mining sector is critical for most EaP countries. All countries except Moldova possess important mineral resources, including aluminium deposits, molybdenum, titanium, copper, iron, gold, lead and limestone.
- Hydrocarbons are also regionally important - Azerbaijan's oil and gas sector accounts for about one-third of the country's GDP and nearly all exports. Ukraine and, to a lesser extent, Georgia have substantial coal production.
- Forest coverage varies from about 45% of Georgia's area to only about 7% in Azerbaijan and Moldova. On average, forest areas cover a lower share of EaP countries' areas than in the OECD and EU, with predominantly deciduous types of trees.
- Armenia and Georgia have the highest level of naturally regenerating forests (94% and 97%, respectively), exceeding the EU and OECD average, while Moldova and Ukraine remain under 50%.
- Armenia and Azerbaijan are the most water-stressed countries among the EaP, with over 40% freshwater abstraction of total renewable resources, compared to the OECD average of 8%.
- Azerbaijan and Moldova also witness extremely high intensities per person, with freshwater abstraction rates of 126% and 143%, respectively, compared to the OECD average of about 12%. Such excessive abstraction puts them at serious risk of exacerbating existing water stress, particularly at the subnational level.

Context and policy challenges

Though renewable and non-renewable natural resources are integral to any economy, the overall pressure on them remains high in EaP countries and requires close monitoring.

Despite the varying challenges faced by each country, sustainable resource management, environmental conservation and diversification of resource-dependent economies are common priorities. The EaP countries have made considerable progress over the past decade in improving water efficiency and modernising water management regulations. This includes updating water codes in Armenia and Georgia, preparing the national water strategy in Azerbaijan, and aligning it with the United Nations Water Framework Directive in Moldova and Ukraine. The EaP countries also continue strengthening transboundary cooperation around several river basins and the marine protection of the Black Sea.

Due to their rich biodiversity and unique landscapes, all EaP countries are important contributors to the *Emerald Network*, a pan-European network of protected areas established under the Bern Convention, aiming at protecting the countries' biodiversity, conservation of forests, natural habitats, and species in line with the European conservation standards. The Caucauses Ecoregion, for example, is one of the World Wildlife Fund's global priority areas due to its high degree of biodiversity. Key species include the Caucasian leopard, the goitered gazelle, and the red deer. Balancing the importance of the extractive

sector with conservation and biodiversity goals is a key policy challenge for the EaP countries. The extractive sector, including mining and hydrocarbons, has long historical roots in EaP countries, but a legacy of pollution from the Soviet era remains to be addressed.

This group of indicators aims to reflect whether the natural asset base is being kept intact and within sustainable thresholds regarding quantity, quality, or value. The indicators presented help identify risks to future growth arising from a declining or degraded natural asset base. Progress can be monitored by tracking stocks of natural resources and other environmental assets along with flows of environmental services: renewable resources (freshwater, forest, and fish), non-renewable resources (minerals), and biodiversity and ecosystems (threatened species).

Main trends and recent developments

The natural asset base in the EaP countries is a critical component of their economies. Environmental reform efforts are ongoing, with all countries implementing or planning policy and regulatory changes. However, the EaP countries host a variety of geographic and climatic profiles with a wide range of natural resources and face various and specific challenges in managing their natural resources efficiently.

For instance, as a mountainous country, Armenia is rich in mineral resources such as copper, molybdenum and gold, the extraction of which plays a crucial role in its economy. It hosts the largest freshwater lake in the Caucasus – Lake Sevan. It has untapped potential in renewable energy like hydropower and solar energy, but it is also one of the most water-stressed countries among the EaP, with over 40% freshwater abstraction of total renewable resources.

Azerbaijan's oil and gas sector accounts for about one-third of the country's GDP and nearly all exports. Oil production accelerated after independence from the Soviet Union: in 2014, Azerbaijan was the 21st largest producer of oil in the world and the 32nd largest producer of indigenous gas. Azerbaijan became a strategic transit corridor once new production capacities and pipelines were operational in the early 2000s. The shift in energy use patterns driven by Russia's war in Ukraine has also increased demand for Azerbaijan's gas. Even though Azerbaijan's exports are dominated by crude oil and natural gas, the country produces a range of minerals and metals, including aluminium, iron ore, bromine and iodine.

Agriculture also plays an important role. In Moldova and Ukraine, cropland comprises most countries' respective areas, reflecting their agriculture-centric economies. Azerbaijan and Armenia also have significant crop cover, with only Georgia having less than the EU average, offset by more significant forest coverage.

Forest coverage varies from about 45% of Georgia's area to only about 7% in Azerbaijan and Moldova. On average, forest areas cover a lower share of EaP countries' areas than in the OECD and EU, with predominantly deciduous types of trees. Armenia and Georgia have the highest level of naturally regenerating forests (94% and 97%, respectively), exceeding the EU and OECD average, while Moldova and Ukraine remain under 50% barre.

The rapid increase in artificial land areas shows the region's ongoing development. Although the overall level of built-up areas varies widely across the five countries, with the OECD average in the middle of the range, the increase in built-up areas has been massive—between 2000 and 2020, a range of 50% to 125%, illustrating the catching up that the region is doing compared to the EU and the OECD member states, where change has been negligible.

Between 2000 and 2020, Moldova and Ukraine saw significant net increases in natural and semi-natural land cover. However, losses are occurring that can have significant impacts on ecosystems and natural habitats. Although some of the losses are compensated with new natural and semi-natural vegetated land elsewhere, this likely does not compensate for the deterioration and destruction of natural habitats and

ecosystems, especially considering that natural habitats and ecosystems can take many years to recover from these pressures on biodiversity.

Georgia has significant hydropower potential due to its mountainous landscape, which contributes to its energy generation, and its fertile grounds provide wine and food production as notable exports. However, as these resources are unequally distributed, certain areas of the country are prone to the growing risks of flood and drought, which are heightened by the effects of climate change (see Chapter 4). Moldova has large rivers and abundant arable land, making the agriculture sector vital for its economy. On the other hand, it is also particularly exposed to water stress, including the risk of freshwater abstraction shortages.

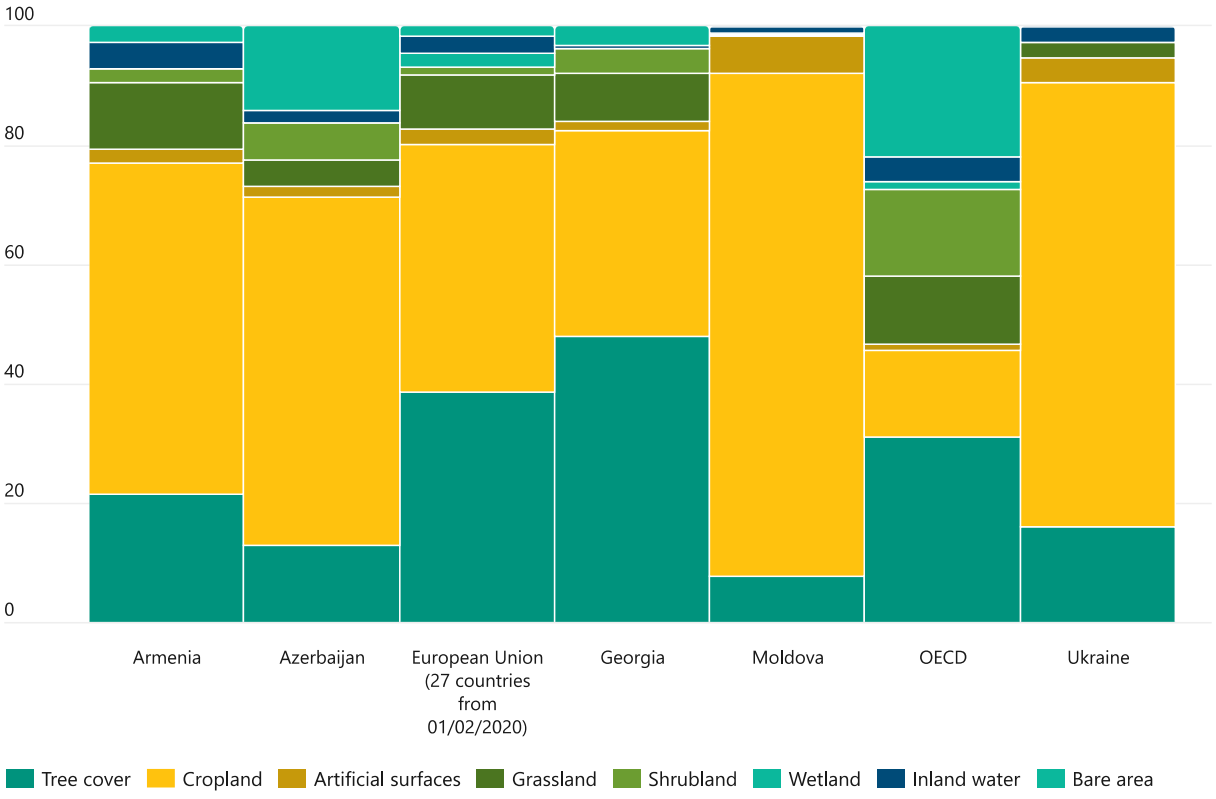
Ukraine comprises one of the largest titanium and uranium reserves in Europe and the second-largest coal reserve in the continent. Divided into nine river basins, the country's freshwater sources are mostly transboundary, but its largest and most important river basin, the Dnipro, covers approximately 65% of the country. Its fertile soil, supporting extensive grain production, is another important resource and contributor to the economy. However, despite being the largest territory in Europe, its renewable freshwater resources are only half as large as the European average, adding extra pressure on the water distribution in Ukraine's southern and eastern regions. The Russian invasion of Ukraine has heavily impacted the country's transboundary water sources and rivers, but due to data availability (2021), that is not reflected in this report.

Available indicators

- Land cover
- Net change of natural and semi-natural vegetated land
- Built-up area per person
- Gain of artificial surfaces since 2000
- The intensity of use of natural freshwater resources (water stress)
- Freshwater abstractions as percentage of internal resources
- Freshwater abstractions as percentage of total renewable resources

Figure 3.1. Land cover by type

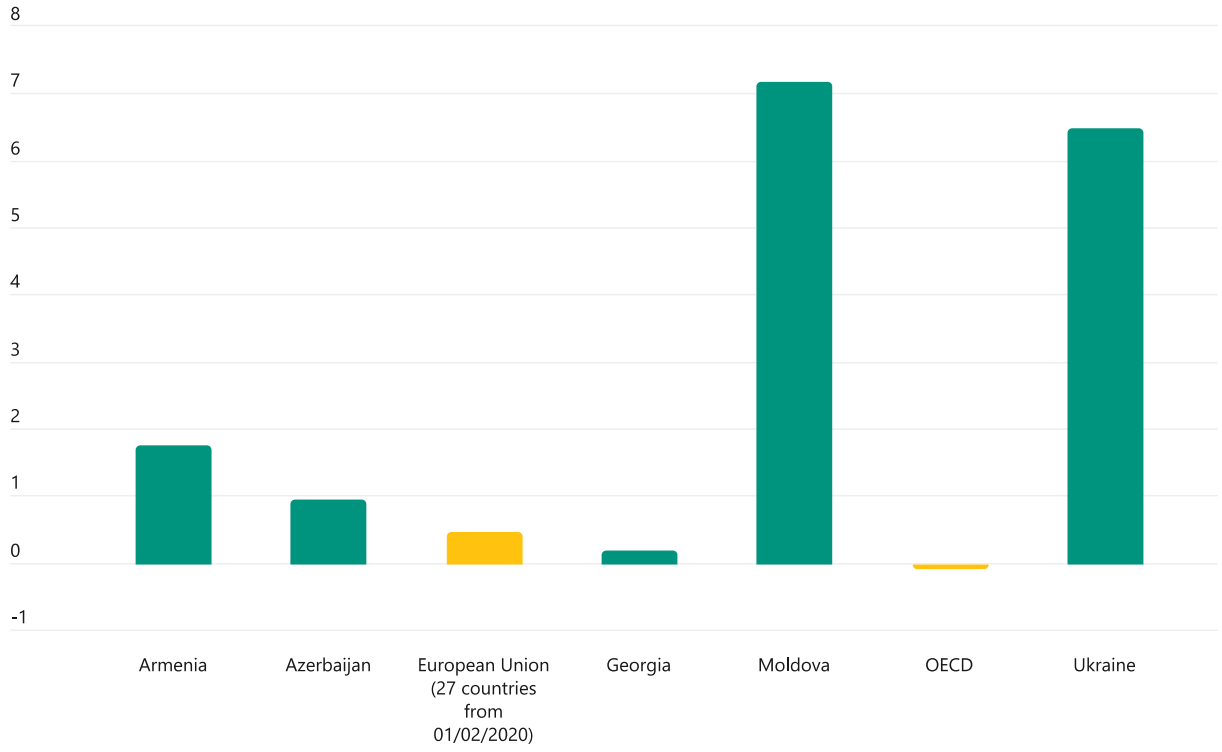
Percentage of land area, 2020



Compare: Link to the dashboard
Source: OECD, "Land cover and land cover change", Environment Statistics (database), https://doi.org/10.1787/c9c5f666-en

Figure 3.2. Net change of natural and semi-natural vegetated land

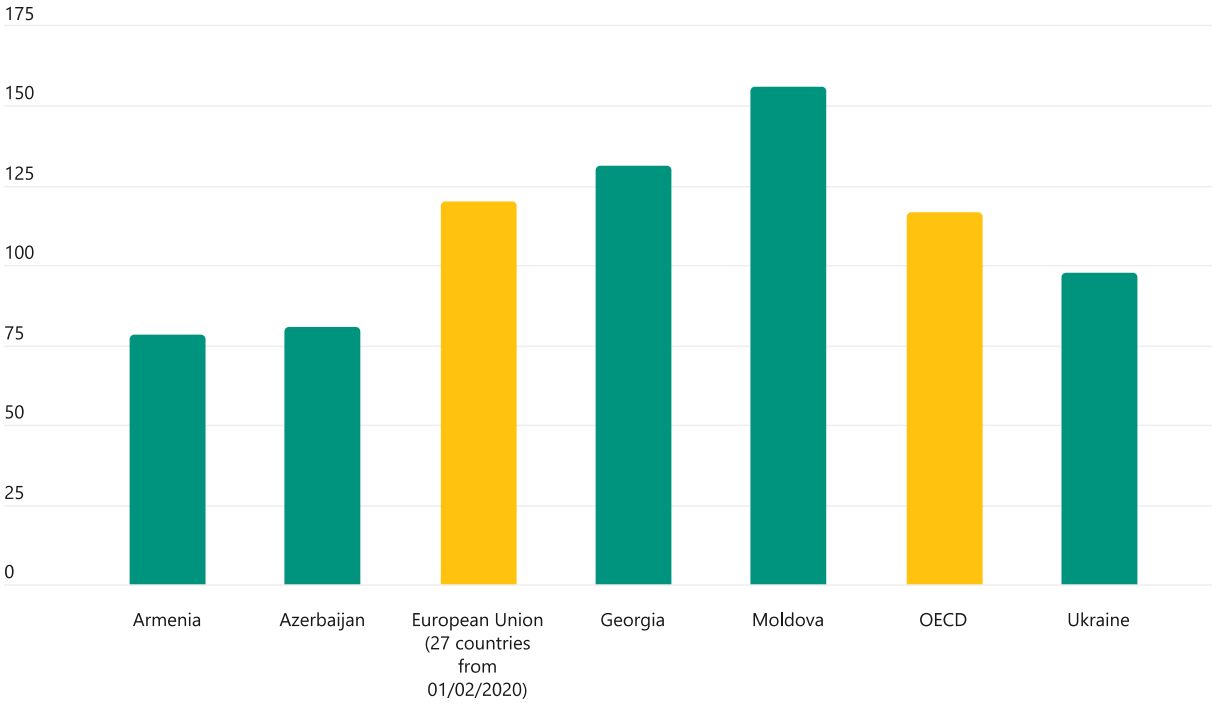
Percentage change of natural and semi-natural land, 2000-2020 change



Compare: Link to the dashboard
Note: Natural and semi-natural vegetated land consists of the classes tree-covered area, grassland, wetland, shrubland and sparse vegetation.
Source: OECD, "Land cover and land cover change", Environment Statistics (database), https://doi.org/10.1787/c9c5f666-en

Figure 3.3. Built-up area per person

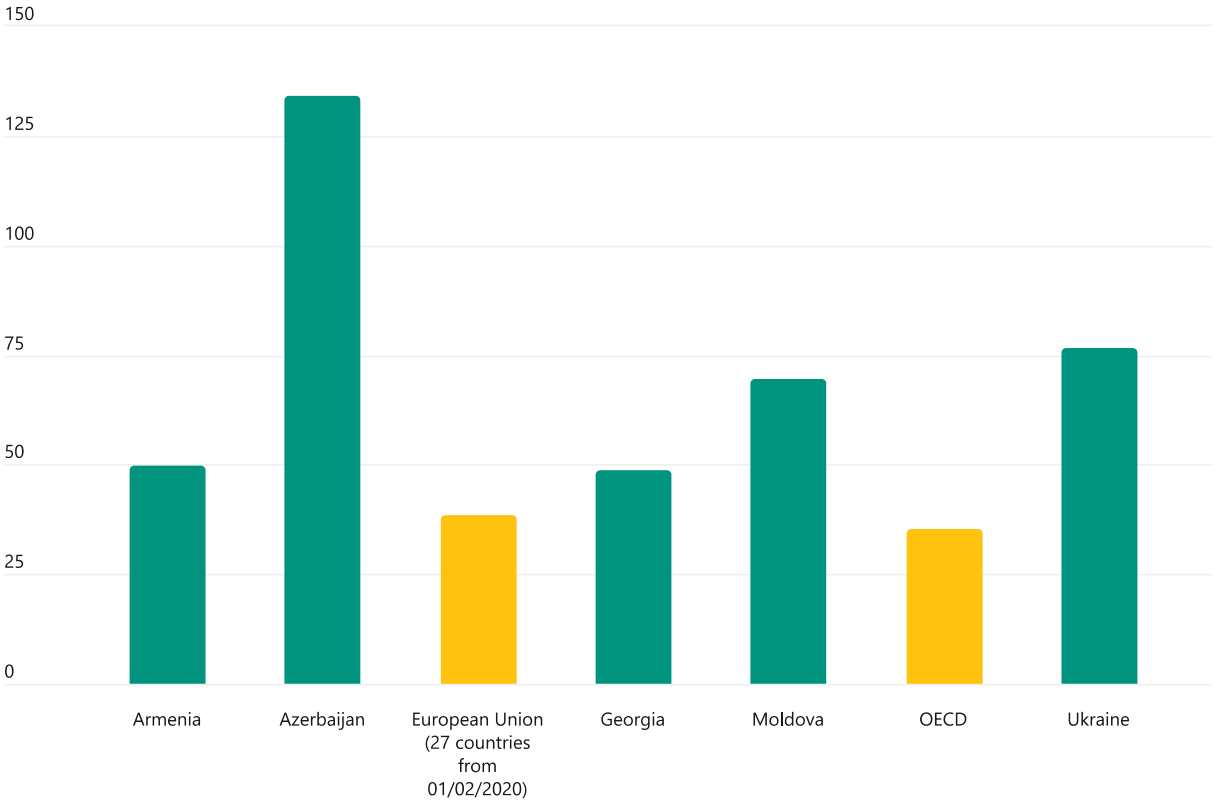
Square metres per person, 2020



Compare: Link to the dashboard
Note: Built-up refers only to buildings defined as 'any roofed structure erected above ground for any use', excluding other parts of the urban environment such as paved surfaces, commercial and industrial sites, or urban green spaces. This indicator does not account for the potential unequal distribution of built-up area between a country's citizens, which may lead to disproportionately less built-up surface available for poorer communities.
Source: OECD, "Land cover and land cover change", Environment Statistics (database), https://doi.org/10.1787/c9c5f666-en

Figure 3.4. Gain of artificial surfaces since 2000

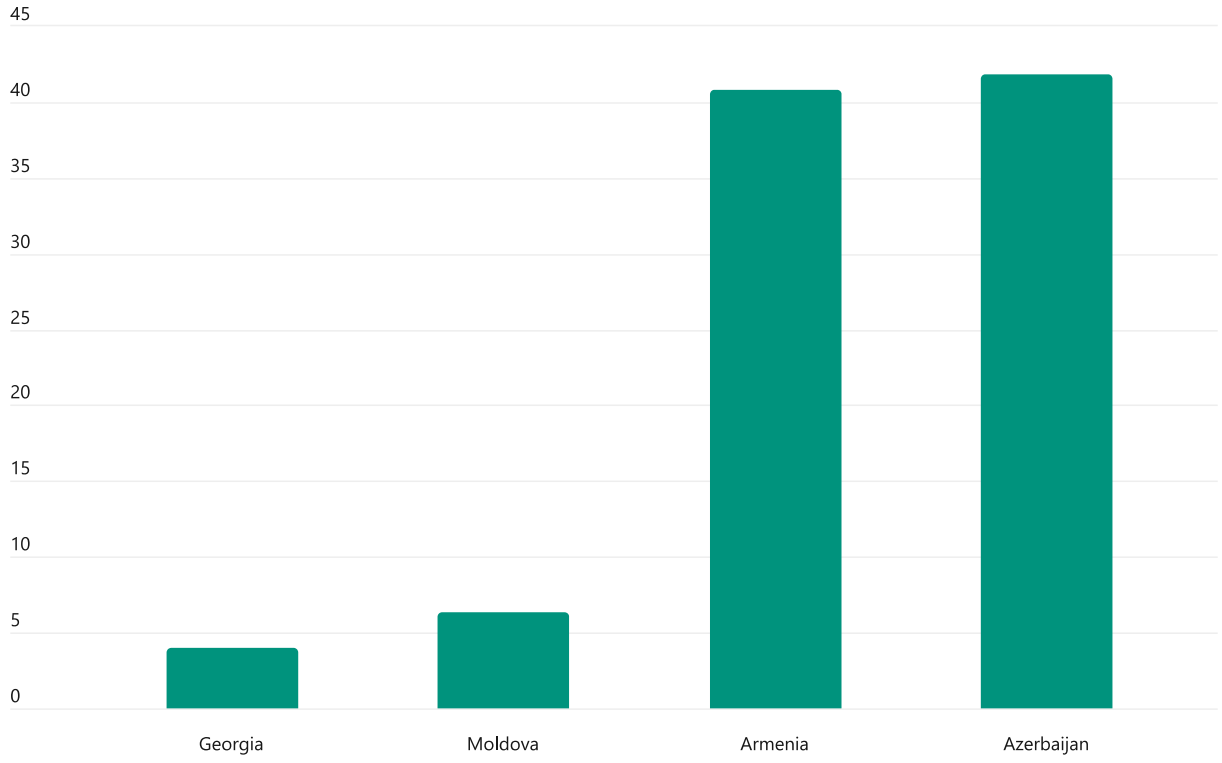
Percentage gain of artificial surfaces, 2020



Compare: Link to the dashboard
Source: OECD, "Land cover and land cover change", Environment Statistics (database), https://doi.org/10.1787/c9c5f666-en

Figure 3.5. Freshwater abstractions as percentage of total renewable resources

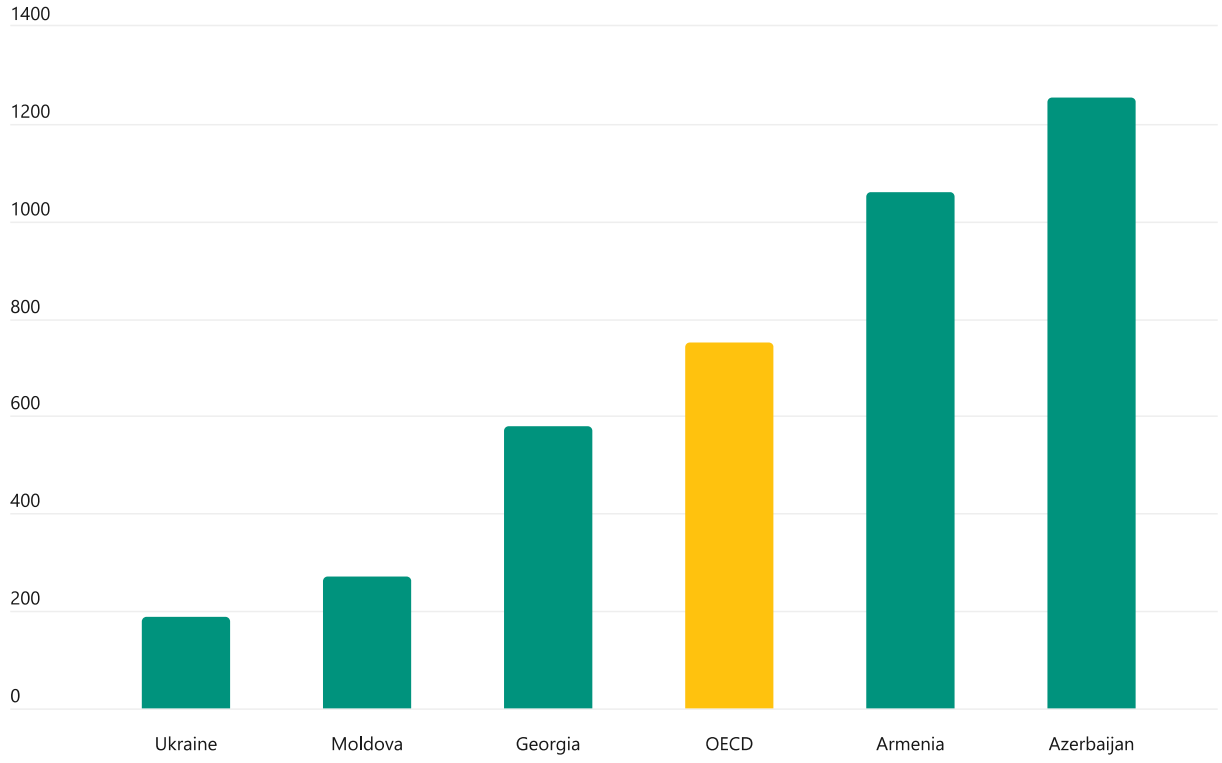
Percentage, 2021



Compare: Link to the dashboard
Source: OECD, "Water: Freshwater resources", OECD Environment Statistics (database), https://doi.org/10.1787/data-00603-en
Based on: UNSD, Country Files from the UNSD/UNEP data collection on environment statistics (available at: https://unstats.un.org/unsd/envstats/country_files)

Figure 3.6. Freshwater abstractions, intensities per person

Cubic metre per person, 2021



Compare: Link to the dashboard
Source: OECD, "Water: Freshwater resources", OECD Environment Statistics (database), https://doi.org/10.1787/767e425c-en. Based on UNSD, Country Files from the UNSD/UNEP data collection on environment statistics (available at: https://unstats.un.org/unsd/envstats/country_files)

4 Environmental resource productivity

Key messages

- EaP countries have progressively improved their carbon, energy, and material productivity. It has been achieved by implementing various policies and instruments to increase industry efficiency, greening SMEs, cleaning public transport, upgrading infrastructure, launching energy sector reforms, diversifying energy sources, and reducing energy subsidies.
- Despite the progressive improvement in carbon, energy and material productivity within the EaP region since the 1990s, there is significant room for improvement compared to EU and OECD averages.
- In terms of energy productivity, the three Caucasus countries—Armenia, Azerbaijan, and Georgia—are relatively close to the OECD average, while Moldova and Ukraine are lagging behind. The productivity gap in Ukraine is mostly due to its industrial base, and in Moldova, it is due to its significant agricultural sector (a traditionally low-productivity sector).
- The transport sector uses the most energy in all five EaP countries, partly due to a lack of public transport.
- Renewables are important in Georgia's (up to 80%), Armenia's (over 60%), and Azerbaijan's (about 50%) energy mix. However, regular droughts from climate change will likely affect the hydropower sector. In Moldova and Ukraine, biofuels and waste hold the largest share of the renewable energy mix. However, compared to EU and OECD averages, solar and wind energy remain underdeveloped.
- The pre-independence development patterns in the EaP countries led to a lower material footprint per person compared to the EU and OECD averages. Moldova performs best, with the lowest material footprint of 3.41 tonnes per person.
- On average, EaP countries generate about half municipal waste than a person living in the OECD. This partly reflects lower income and consumption levels. However, municipal waste is mostly deposited in landfills. There is room for improving municipal waste management through increased recycling and composting.

Context and policy challenges

The EaP countries have a complex legacy from the Soviet era related to environmental resource productivity. A lack of public transport drives significant energy consumption in the transportation sector, but overall consumption by different sectors is not far off of the levels that the EU and OECD member states have. The exception to this rule is Ukraine, where a still significant industrial sector represents a higher-than-average portion of energy. Georgia, with its mountainous landscape, hydropower is already a major contributor to the electricity generation mix, while in Azerbaijan, renewables remain negligible,

reflecting the domestic fossil fuel sector. Non-energy material productivity remains low compared to OECD averages. At the same time, while material footprints are also much lower than OECD averages, they will likely rise as economic development in the region continues. A major challenge will be ensuring that economic development is accompanied by more effective resource use and better waste disposal practices.

The indicators in this section capture the efficiency with which economic activities use energy, other natural resources, and environmental services and provide insight into the transition to a low-carbon, resource-efficient economy. This includes information on:

- **Carbon and energy productivity** – economic output generated per unit of CO_2 emitted or total primary energy supplied.
- **Resource productivity** – economic output generated per unit of natural resources or materials used.
- **Multifactor productivity** – is a macroeconomic indicator that informs on economy-wide productivity. It considers beneficial and harmful environmental outputs, such as using natural assets, ecosystem services, and air emissions. Enhanced productivity can create new markets and job opportunities.

Main trends and recent developments

Even though the EaP economies have made progress in increasing carbon, energy, and material productivity through various policies and instruments during the past decade, all five are lagging behind the EU and OECD averages in terms of CO_2 productivity, generating more CO_2 emissions per unit of output/economic value created due in part to a relative lack of energy efficiency measures for heating and industry, lack of efficient rail networks for public transit, relatively cold climates, and the stronger role for industry and agriculture compared to services in the economic mix.

Productivity varies among the EaP countries due to differences in their economic structures, energy sources, and abundance of natural resources. Some countries, such as Ukraine, face particular challenges due to their large industrial and extractive sectors, obsolete technologies, and dependence on fossil fuels. Moldova's significant agricultural sector is also a source of lower resource productivity. However, Moldova performs best in terms of material footprint, with the lowest material footprint of 3.41 tonnes per person.

On average, EaP countries generate about half municipal waste than a person living in the OECD. This partly reflects lower income and consumption levels. There is, however, room for improving municipal waste treatment through recycling and composting, as currently, in the EaP countries, this waste is mostly deposited in landfills. The exception is Azerbaijan, which, despite having very little recycling, has a relatively high level of incineration – on par with OECD averages. In Armenia and Georgia, there is no recycling at all. Progress is expected as most countries in the region are exploring extended producer responsibility approaches.

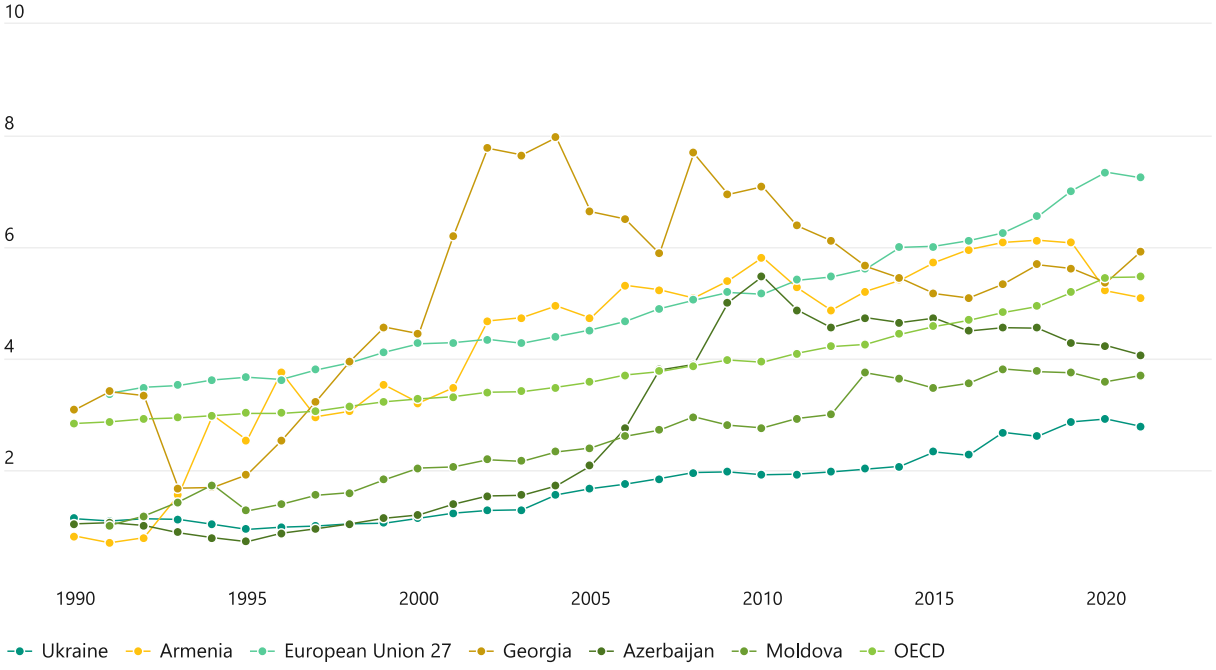
Progress with the deployment of renewable energy is mixed in the region. While Moldova, Georgia and Armenia approach or surpass the EU average, Azerbaijan and Ukraine lag significantly behind. Though solar and wind are growing in importance in the region, and deployment has neared EU averages in a few countries in the region, hydropower remains the most important source in the renewable electricity mix, especially in Georgia (up to nearly 80%), in Armenia (over 60%) and Azerbaijan (about 50%). In Moldova and Ukraine, biofuels hold the largest share of renewables in overall energy production, with a significant amount used for heating.

Available indicators

- Production-based CO_2 productivity
- Share of renewables
- Renewable energy mix
- Energy productivity
- Energy consumption by sector
- Non-energy material productivity
- Material footprint
- Municipal waste generated
- Municipal waste treatment

Figure 4.1. Production-based CO_2 productivity

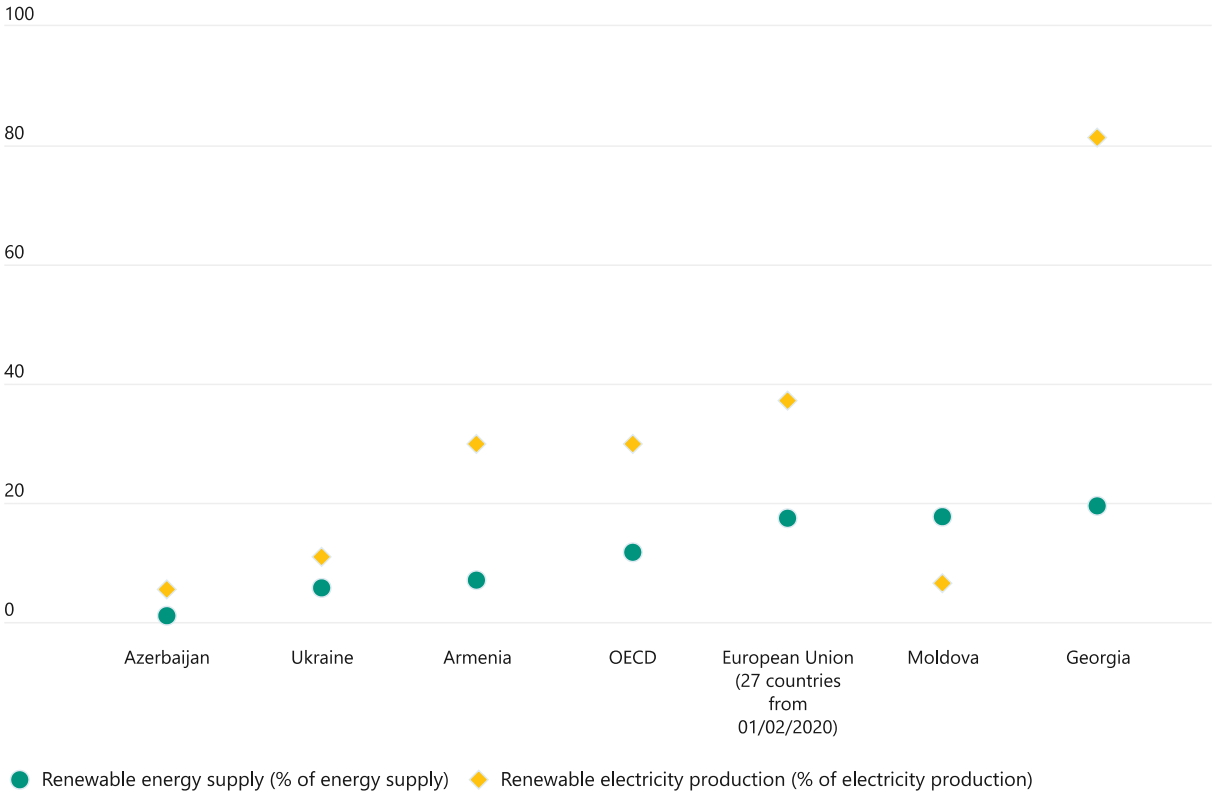
USD per kilogramme, 2021



Compare: Link to the dashboard.
Note: GDP per unit of energy-related CO2 emissions, in USD at 2015 prices per kilogramme
Source: OECD, "Green growth indicators", OECD Environment Statistics (database), https://doi.org/10.1787/data-00665-en

Figure 4.2. Share of renewables in energy supply and electricity production

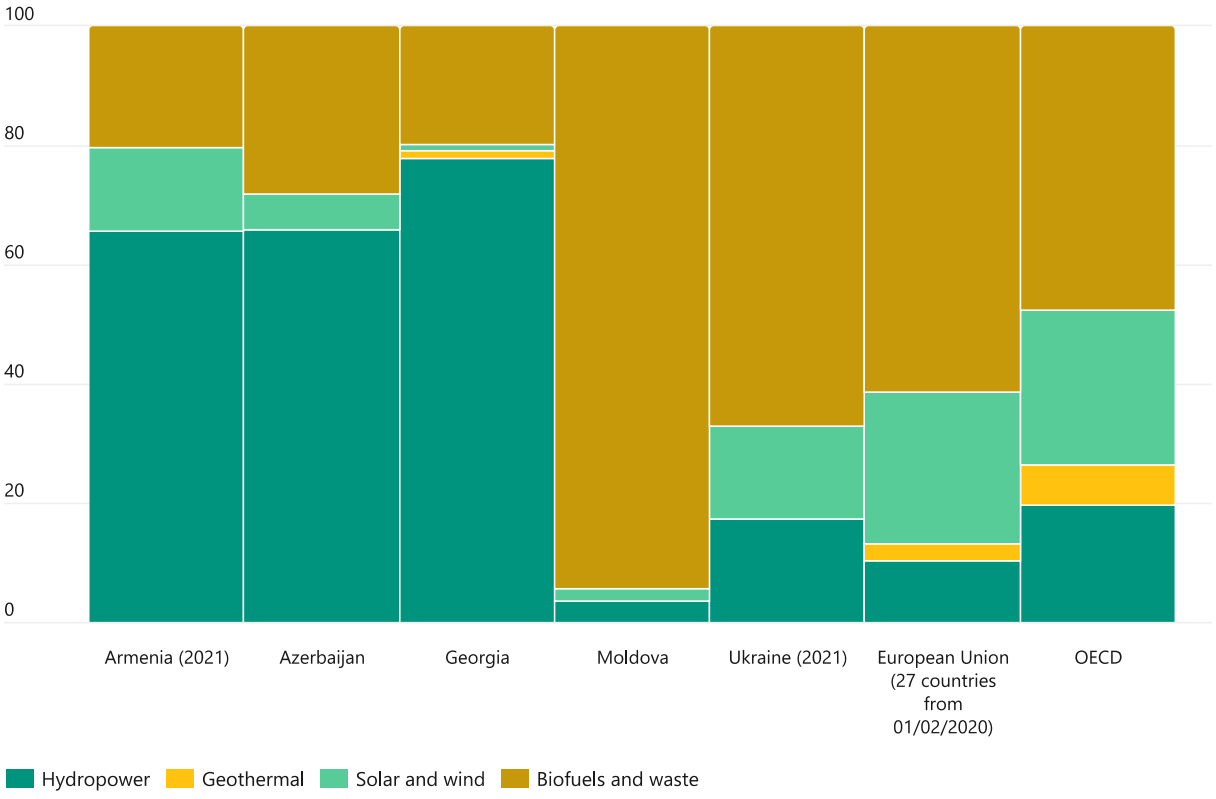
Percentage, 2021



Source: IEA, "World energy balances", IEA World Energy Statistics and Balances (database), https://doi.org/10.1787/data-00512-en

Figure 4.3. Renewable energy supply by source

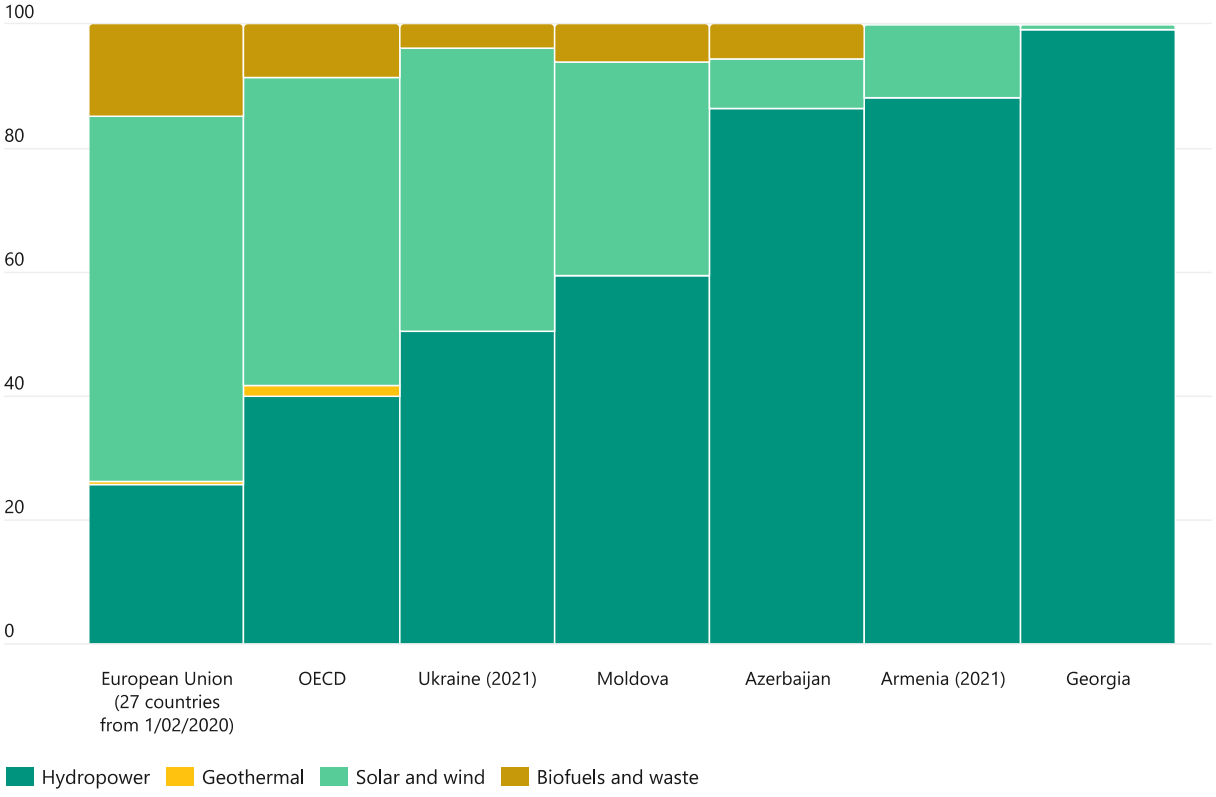
Percentage, 2022



Compare: Link to the dashboard.
Source: IEA, "World energy balances", IEA World Energy Statistics and Balances (database), https://doi.org/10.1787/data-00512-en

Figure 4.4. Renewable electricity in electricity production by source

Percentage



Compare: Link to the dashboard
Source: IEA, "World energy balances", IEA World Energy Statistics and Balances (database), https://doi.org/10.1787/data-00512-en

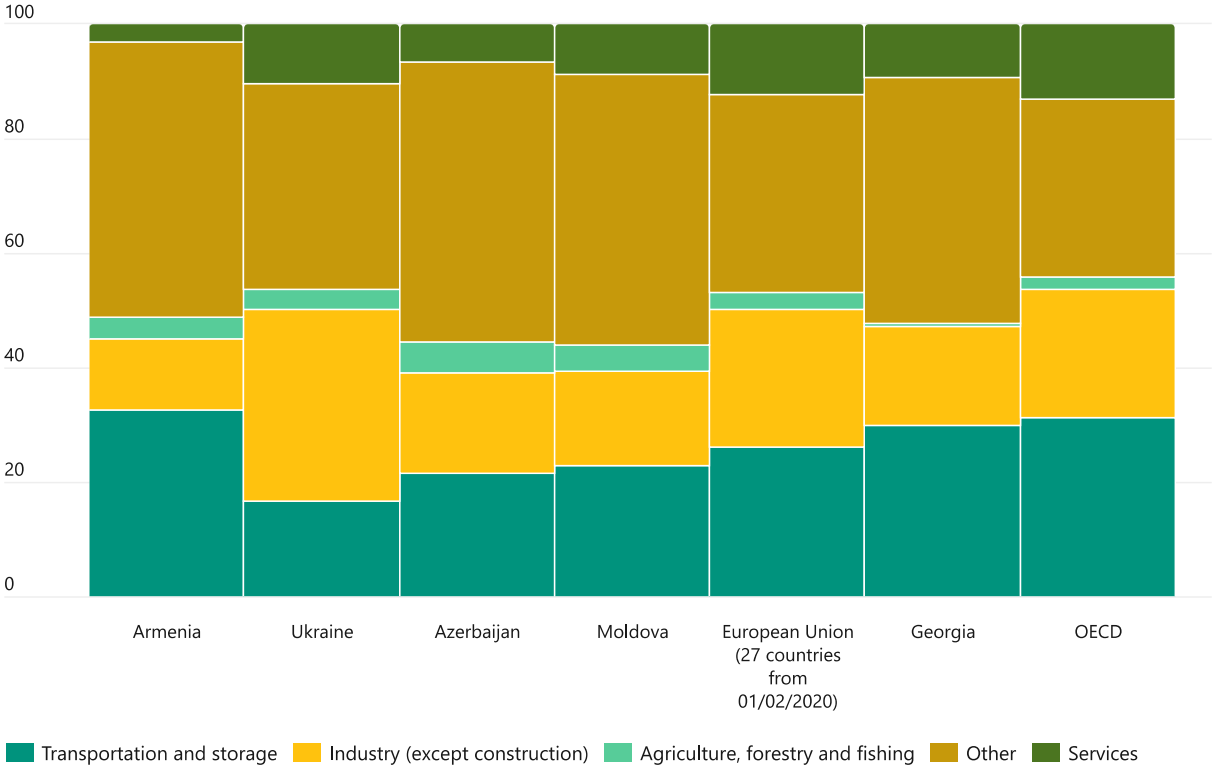
Figure 4.5. Energy productivity

GDP per unit of total energy supply, 2020

Compare: Link to the dashboard.
Note: USD per tonne of oil equivalent
Source: OECD, "Green growth indicators", OECD Environment Statistics (database), https://doi.org/10.1787/data-00665-en based on OECD and IEA data

Figure 4.6. Energy consumption by sector

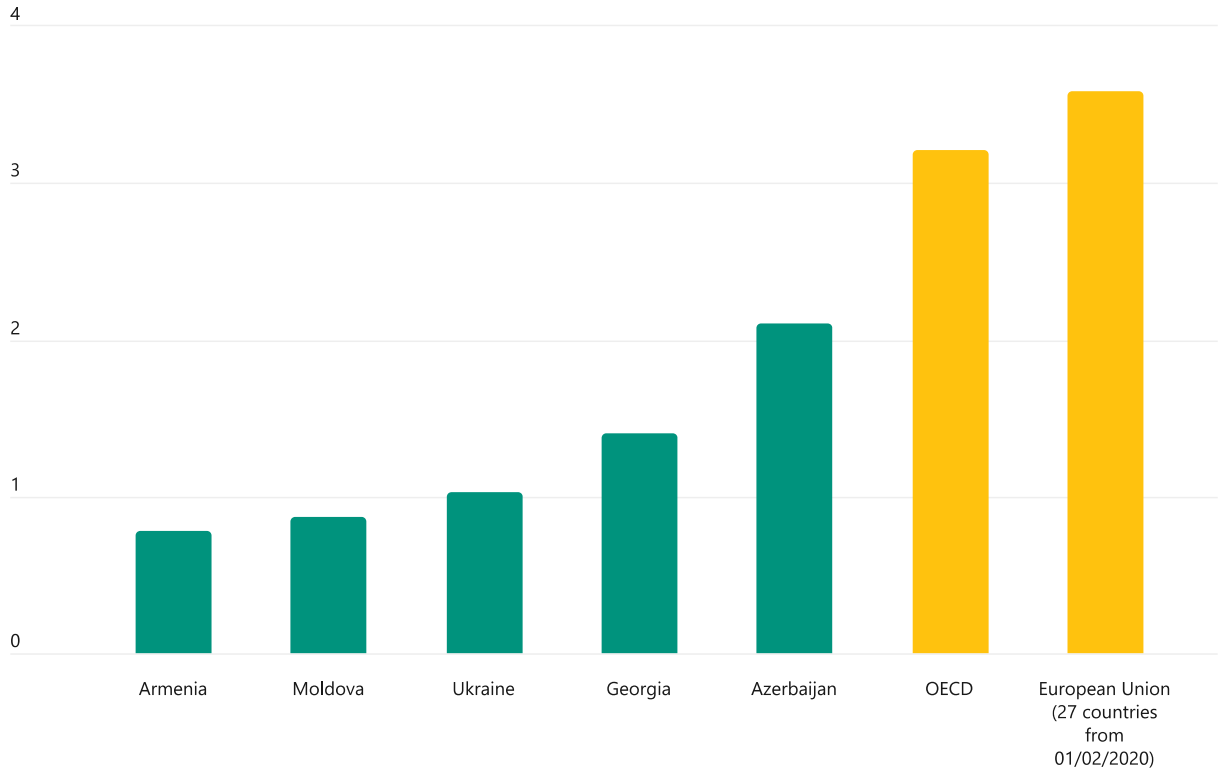
Percentage of energy consumption, 2020



Source: OECD, "Green growth indicators", OECD Environment Statistics (database), https://doi.org/10.1787/data-00665-en, based on OECD and IEA data

Figure 4.7. Non-energy material productivity

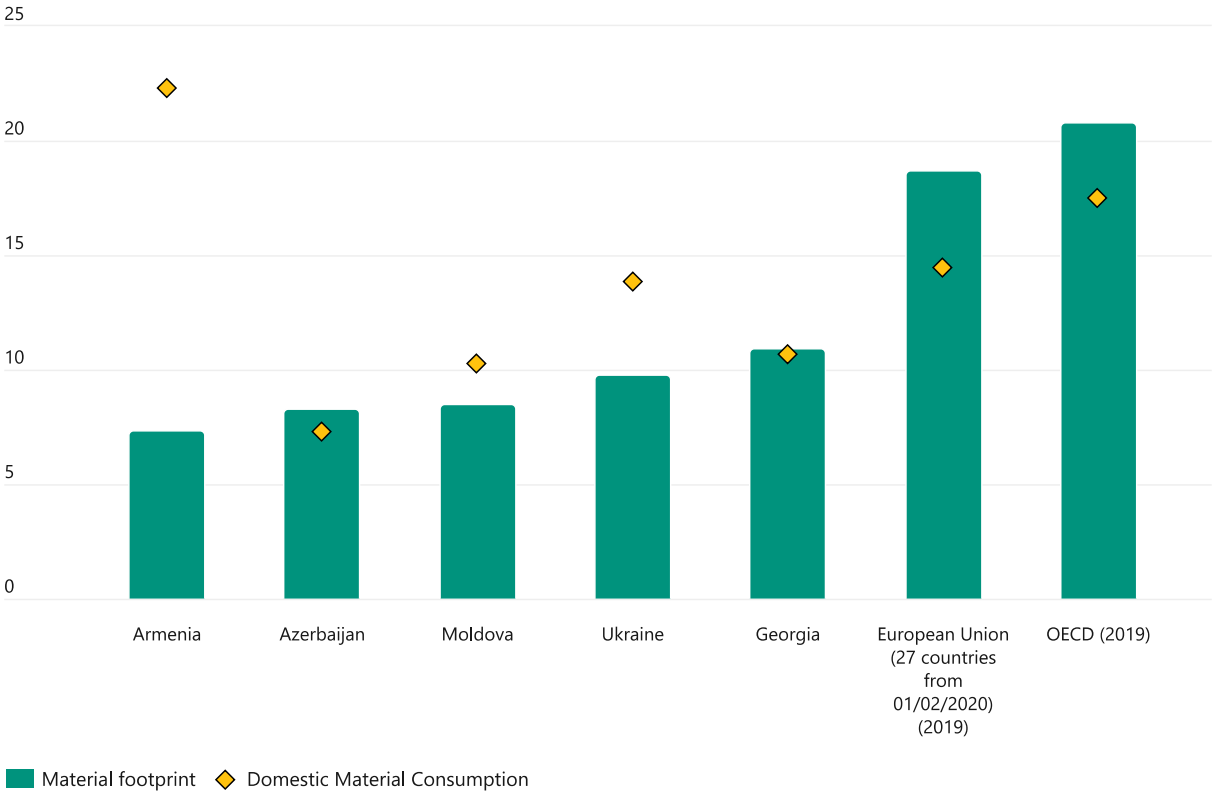
USD per kilogramme, 2019



Compare: Link to the dashboard.
Note: GDP per unit of domestic material consumption, in USD at 2015 prices per kilogramme
Source: OECD, "Green growth indicators", OECD Environment Statistics (database), https://doi.org/10.1787/data-00665-en

Figure 4.8. Material footprint and domestic material consumption intensity

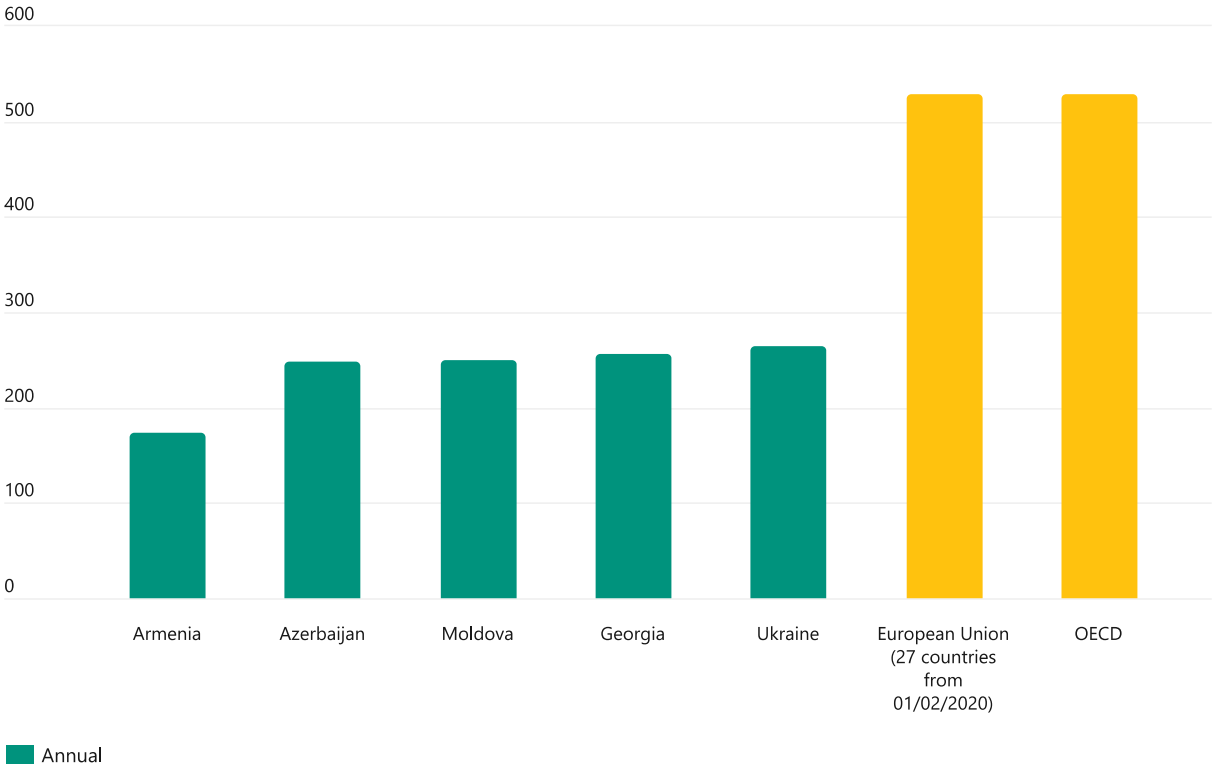
Tonnes per person, 2022



Compare: Link to the dashboard.
Source: OECD, "Material resources", OECD Environment Statistics (database), https://doi.org/10.1787/data-00695-en

Figure 4.9. Municipal waste generated per person

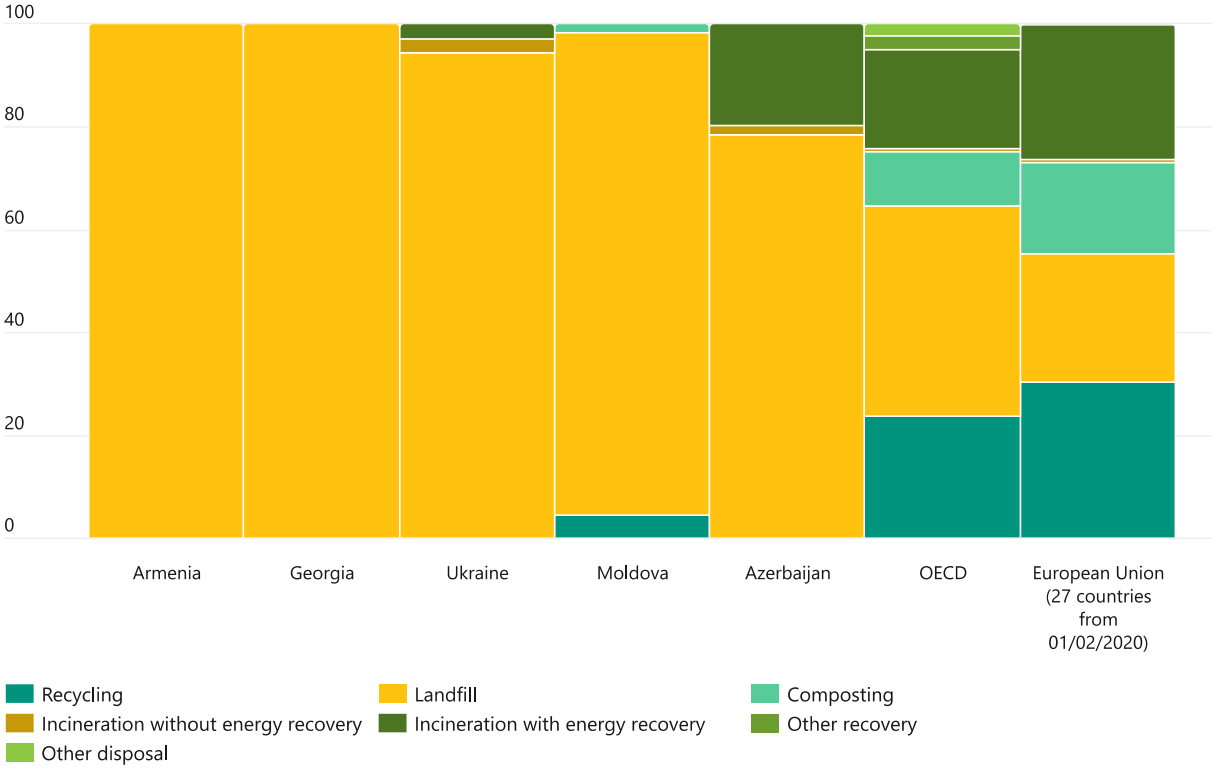
Kilogramme per person, 2021



Compare: Link to the dashboard
Source: OECD, "Waste: Municipal waste", OECD Environment Statistics (database), https://doi.org/10.1787/data-00601-en based on UNSD, Country Files from the UNSD/UNEP data collection on environment statistics and definitions.

Figure 4.10. Municipal waste by treatment operation

Percentage, 2020



Compare: Link to the dashboard
Source: OECD, "Waste: Municipal waste", OECD Environment Statistics (database), https://doi.org/10.1787/data-00601-en based on UNSD, Country Files from the UNSD/UNEP data collection on environment statistics and definitions.

5 Environmental quality of life

Key messages

- Exposure to ambient PM2.5 and mortality rates from PM2.5 and other ambient air pollutants in EaP countries largely exceed the OECD and EU averages. Exposure in Azerbaijan and mortality in Armenia and Ukraine are the highest.
- Due to challenges around health infrastructure, cost of care, and other factors, the welfare cost of premature mortalities in EaP countries dramatically exceeds OECD and EU averages. Georgia, Ukraine, Armenia, and Azerbaijan are two to three times the OECD average, with the highest—Armenia—amounting to approximately 14% of GDP in 2020.
- EaP countries are relatively exposed to extreme temperatures with significant variance due to their diverse landscapes. Among the EaP countries, Azerbaijan is the most exposed to hot summer days, with nearly 13% of the population exposed over eight weeks of hot summer days (maximum temperature is greater than 35°C). About one-third of the population in Ukraine is exposed from 6 to 8 weeks of icing days (maximum temperature less than 0°C), while only over 8% of the Armenian population is exposed to over eight weeks of icing days.
- Among the EaP countries, Georgia is the most exposed to river flooding risks, with over 13% of the population at risk of a flood event within ten years and over 14% at risk of a flood event within 20 years.
- Wildfires are also a threat in EaP countries, with Moldova having the highest risk, as over 73% of its tree-covered area is exposed to this risk.

Context and policy challenges

The exposure to pollution and environmental risks in the EaP countries combines factors such as industrialisation, urbanisation, geographical location, and environmental policies. The EaP countries are particularly exposed to air pollution from vehicle emissions and industrial sources. Water is affected by untreated sewage, industrial discharges, and outdated water infrastructures.

Due to its location and geographical features, such as mountains and arid regions, temperature variation changes in the EaP region tend to be higher than in OECD countries and have increased in the last forty years. This has led to a proportional increase in climate-related hazards requiring close monitoring, though these hazards vary by country. Ukraine, Georgia, and Moldova are particularly at risk from flooding, while Armenia and Azerbaijan's relative aridity leads to elevated temperature exposure and drought. Limited resources and the legacy of past industrial practices make addressing these issues in the EaP region complex and require long-term processes.

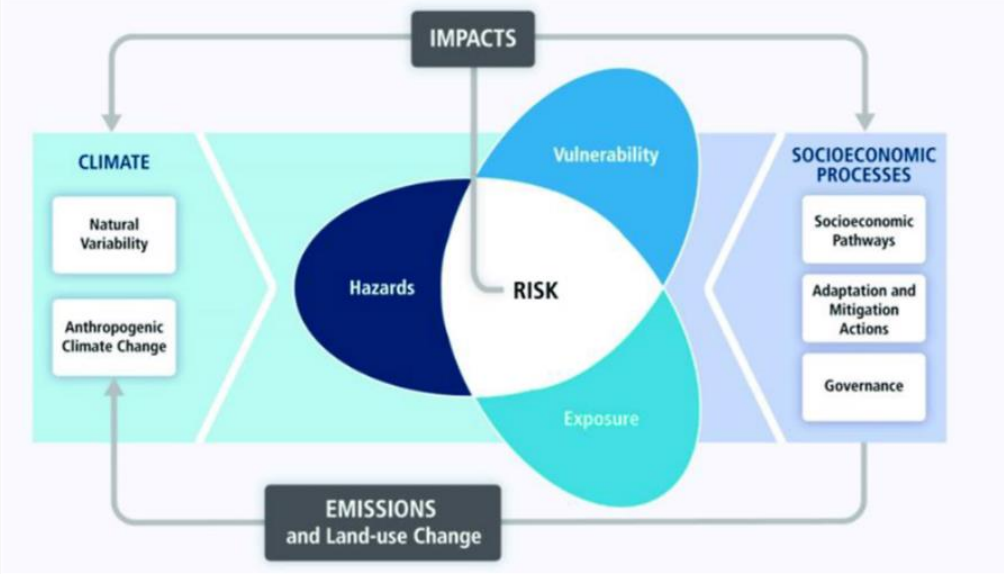
A deteriorated environment reduces the quality of life for inhabitants and increases the related costs for governments (shorter life expectancy, higher healthcare costs, and lower labour productivity). Air and water pollution, exposure to hazardous substances and noise, and indirect factors such as climate change and biodiversity loss are some environmental conditions that affect the quality of human life. Air pollution poses

the greatest environmental health risk worldwide. Fine particulate matter (PM2.5) is the most serious pollutant from a human health perspective. Reducing risks to human health from degraded air quality is central to improving people's well-being.

The indicators in this section reflect how environmental conditions and environmental risks interact with people's quality of life and well-being. They show the extent to which income growth is accompanied (or not) by a rise in overall well-being. Human exposure to pollution and environmental risks (natural disasters, technological and chemical risks), the associated effects on human health and quality of life, and related health costs and impacts on human capital and labour productivity. They also show access to environmental services and amenities (clean water, sanitation, green space, public transport).

Box 5.1. OECD measurement framework for risks, associated with the climate change.

The quality of human life is also affected by indirect factors such as climate change. To track the most significant impacts of climate change and inform adaptation policies, the OECD has developed a database and a first set of indicators to monitor climate-related hazards and exposure to these hazards (Maes et al., 2022[39]). The indicator set is based on the IPCC conceptualisation of climate risk, which considers climate-related hazard, exposure, and vulnerability as the key dimensions.



Source: IPCC (2014), Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Intergovernmental Panel on Climate Change, Cambridge.

Main trends and recent developments

Currently, exposure to ambient PM2.5 and mortality rates from exposure in EaP countries largely exceed the OECD and EU averages, with exposure in Azerbaijan and mortality in Armenia and Ukraine notably being the highest. Elevated exposure risks come from various sources, including emissions from older motor vehicles, pollution from power generation, hydrocarbon production (Azerbaijan) and heavy industry

(Ukraine). Rising GDP levels and economic diversification should hopefully drive these trends downwards over time.

In addition to significant exposure and mortality rates, the welfare cost of premature mortalities from exposure is also far above EU and OECD averages. As exposure and mortality rates are addressed, welfare costs should also begin to fall, pointing to economic, environmental, and health benefits.

EaP countries are relatively exposed to temperature extremes with significant variance due to their diverse landscapes. Azerbaijan is the most exposed to hot summer days, with nearly 13% of the population exposed over eight weeks of hot summer days (maximum temperature is greater than 35°C). Ukraine has significant variation across the country due to its size, with about one-third of the population exposed from 6 to 8 weeks of icing days (maximum temperature less than 0°C). By contrast, only over 8% of the Armenian population is exposed to over eight weeks of icing days.

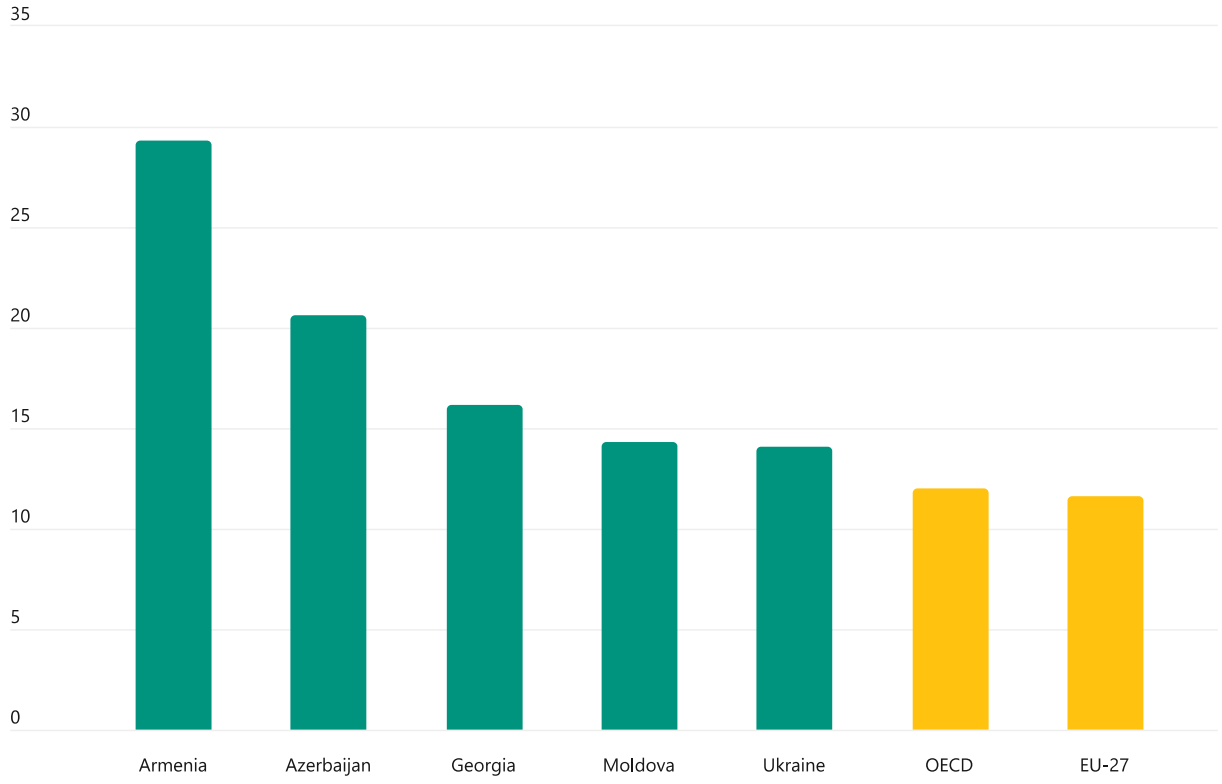
Exposure to climate-related risks also differs widely - among the EaP countries, Georgia is the most exposed to river flooding risks, with over 13% of the population at risk of a flood event within ten years and over 14% of the population at risk of a flood event within 20 years. Wildfires are also a threat in EaP countries, with Moldova having the highest risk as over 73% of its tree-covered area is exposed to this risk. Nevertheless, the EaP countries continue to address environmental risks and pollution through various means, including environmental regulations, investments in cleaner technologies, upgrading water treatment facilities and international cooperation, such as the principles outlined in the Strategy of State Environmental Policy of Ukraine 2030, which aims to reduce environmental risks to minimise their impact on public health.

Available indicators

- Mean population exposure to PM2.5 and other selected outdoor pollutants, related premature mortality and associated welfare costs
- Population with access to improved drinking water sources and sanitation
- Temperature change
- Population exposure to hot days, river flooding, icing days and forest exposure to wildfire danger

Figure 5.1. Mean population exposure to fine particulates (PM2.5)

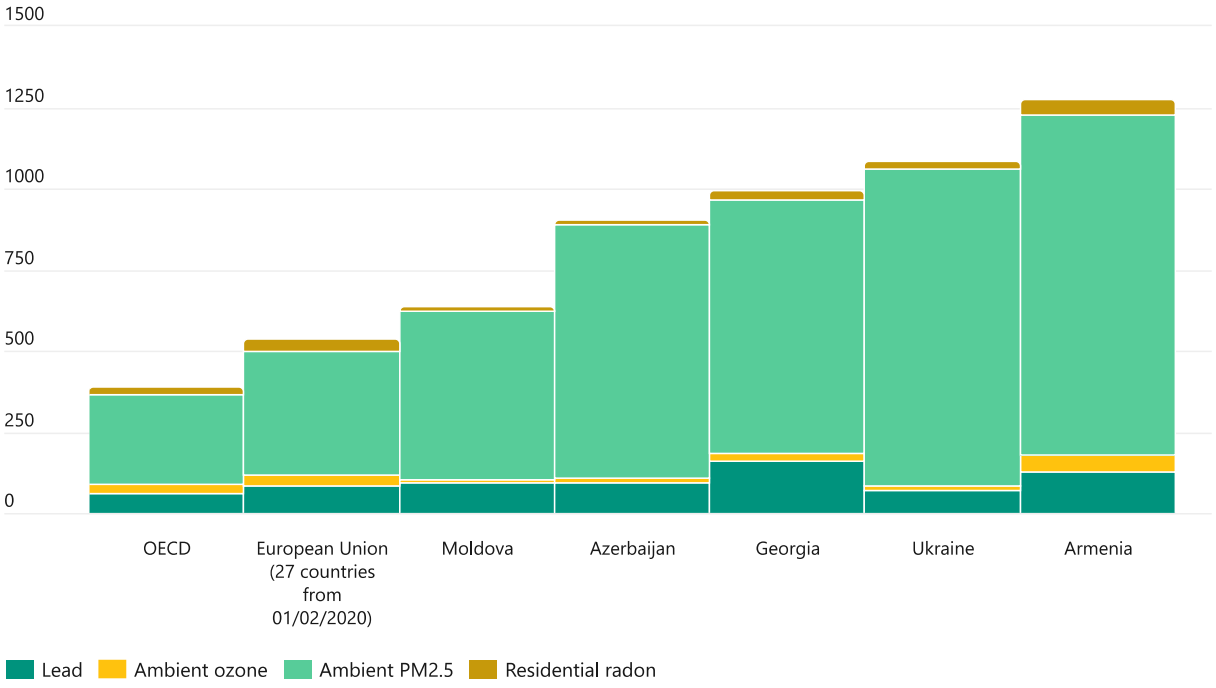
Micrograms per cubic metre



Compare: Link to the dashboard
Source: OECD, "Air quality and health: Exposure to PM2.5 fine particles - countries and regions", OECD Environment Statistics (database), https://doi.org/10.1787/96171c76-en

Figure 5.2. Mortality from exposure to selected pollutants

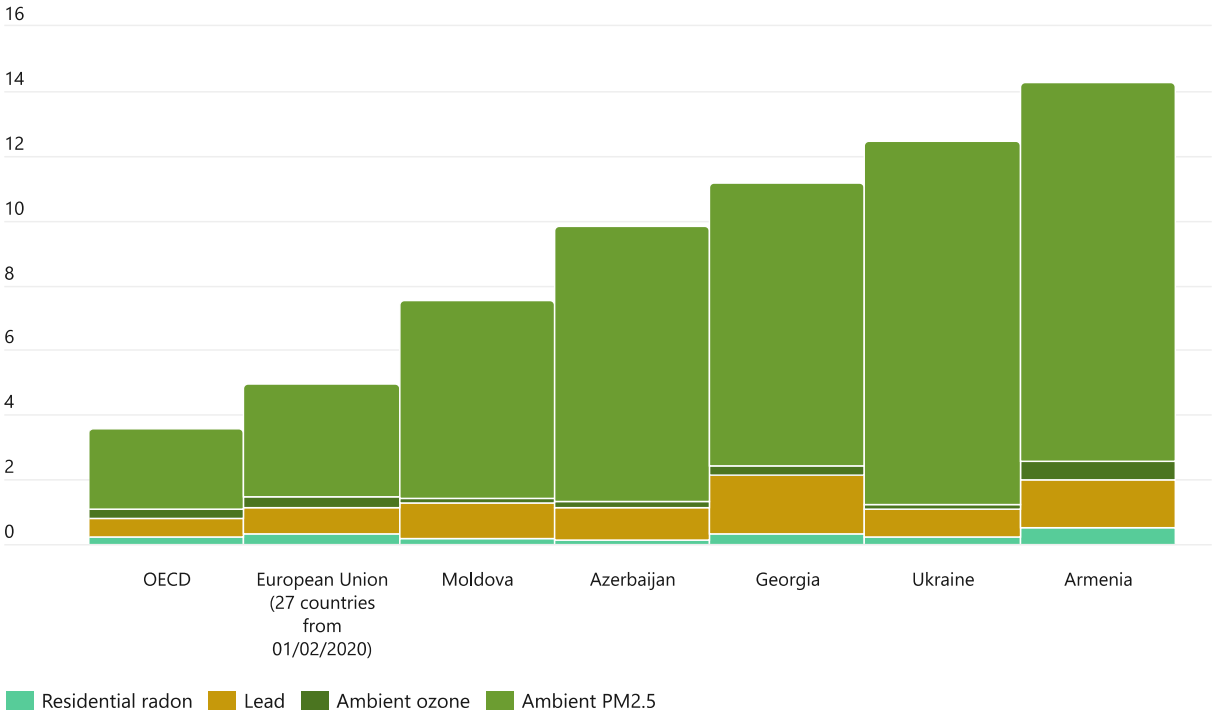
Annual deaths per one million inhabitants, 2019



Compare: Link to the dashboard.
Data on mortality and DALYs from exposure to environmental risks are taken from GBD (2019), Global Burden of Disease Study 2019 Results, Institute for Health Metrics and Evaluation, Seattle, United States, http://ghdx.healthdata.org/gbd-results-tool.
All related definitions are explained in the OECD Documentation.
Source: OECD, "Air quality and health: Mortality and welfare cost from exposure to air pollution", OECD Environment Statistics (database), https://doi.org/10.1787/c14fb169-en

Figure 5.3. Welfare costs from exposure to selected pollutants

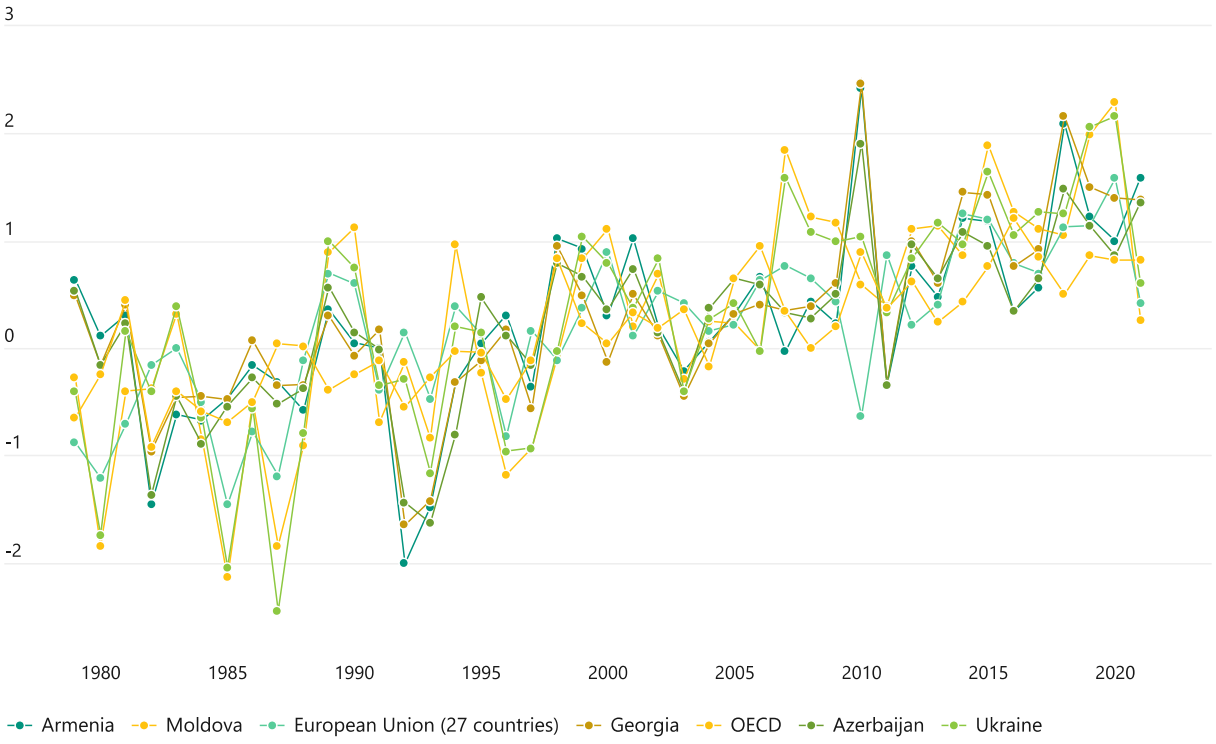
Percentage of GDP for welfare costs of premature mortalities, 2019



Compare: Link to the dashboard.
Note: Welfare costs are calculated using a methodology adapted by OECD (2017), The Rising Cost of Ambient Air Pollution thus far in the 21st Century: Results from the BRIICS and the OECD Countries, OECD Publishing, Paris. http://dx.doi.org/10.1787/d1b2b844-en
Source: OECD, "Air quality and health: Mortality and welfare cost from exposure to air pollution", OECD Environment Statistics (database), https://doi.org/10.1787/c14fb169-en

Figure 5.4. Annual temperature change

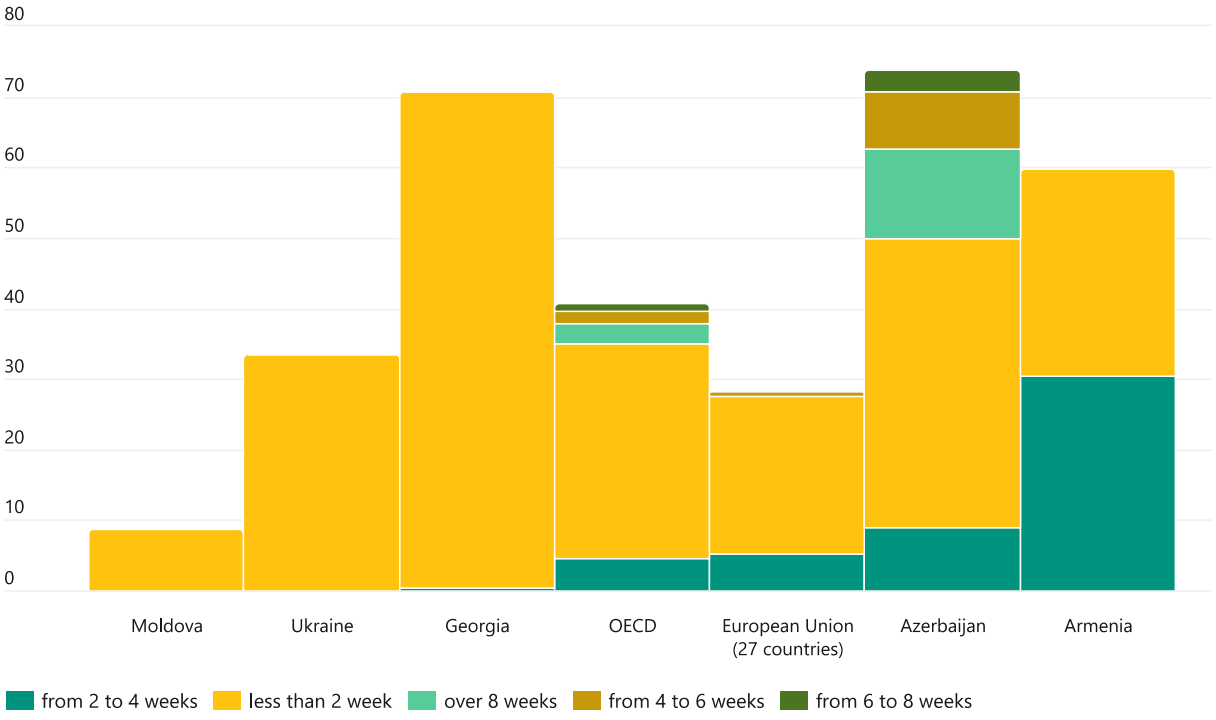
In degrees Celsius



Note: Annual surface temperature change with respect to the baseline climatology (1981-2010), in degrees Celsius
Source: IEA/OECD, "Climate-related hazards: Exposure to extreme temperature", Environment Statistics (database), https://oe.cd/dx/58r

Figure 5.5. Population exposure to hot summer days

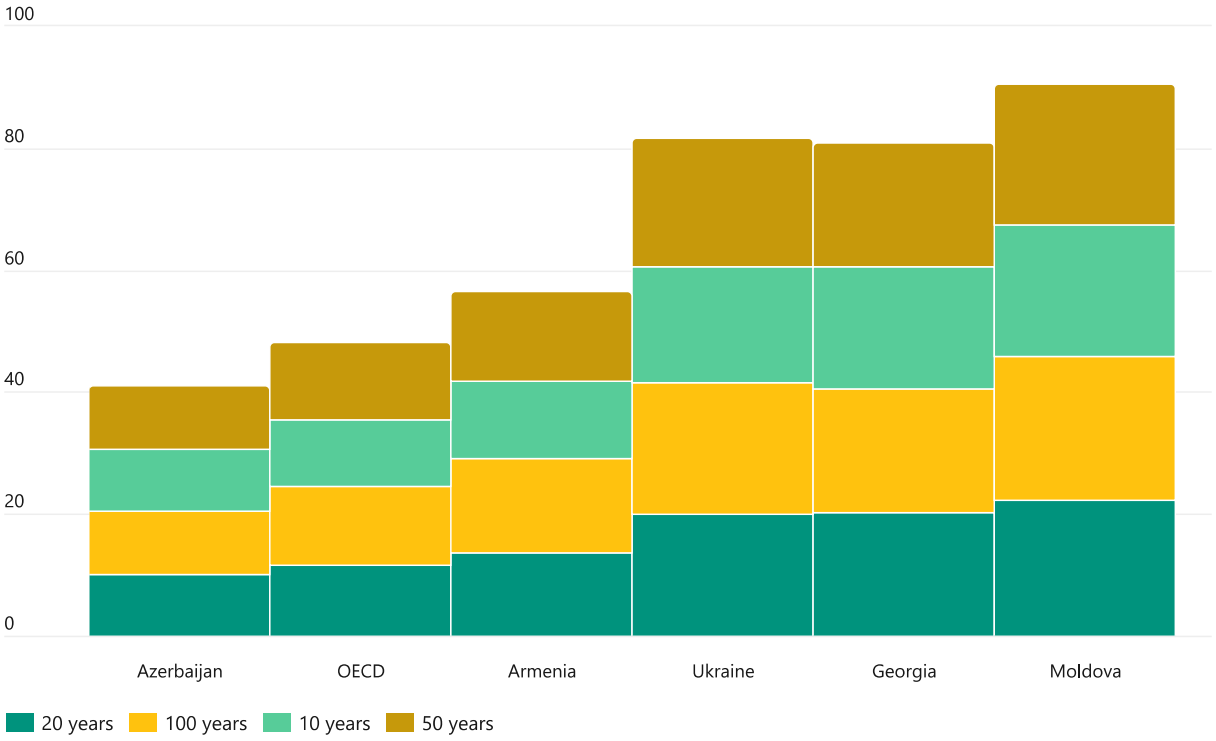
Percentage of population exposed, 2021



Compare: Link to the dashboard.
Note: Population exposure to hot summer days can show considerable differences between countries depending on a country's geographical location.
Source: IEA/OECD, "Climate-related hazards: Exposure to extreme temperature", Environment Statistics (database), https://oe.cd/dx/58r

Figure 5.6. Population exposure to river flooding

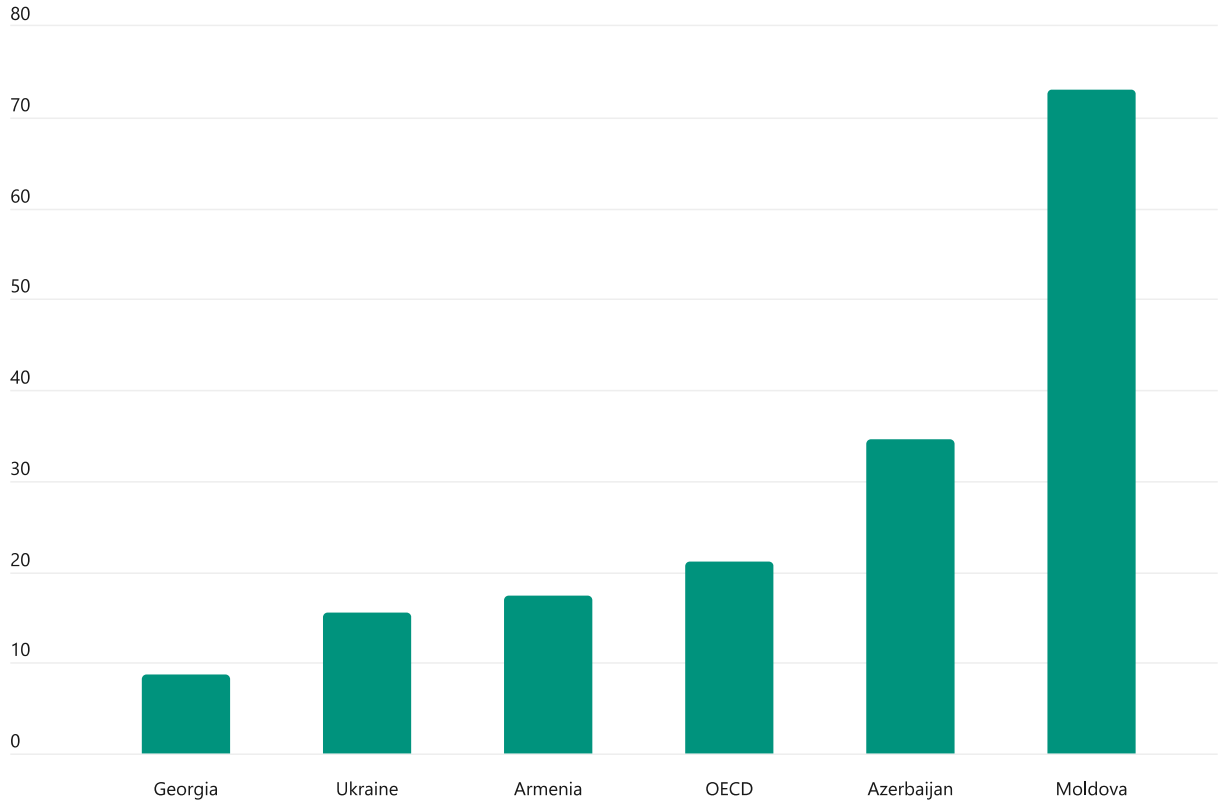
Percentage of population exposed, 2020



Compare: Link to the dashboard.
Note: Legend shows return periods. A return period is the average or estimated time that a flood event is likely to recur.
Source: OECD, "Climate-related hazards: Exposure to river flooding", Environment Statistics (database), https://oe.cd/dx/58w

Figure 5.7. Forest exposure to wildfire danger

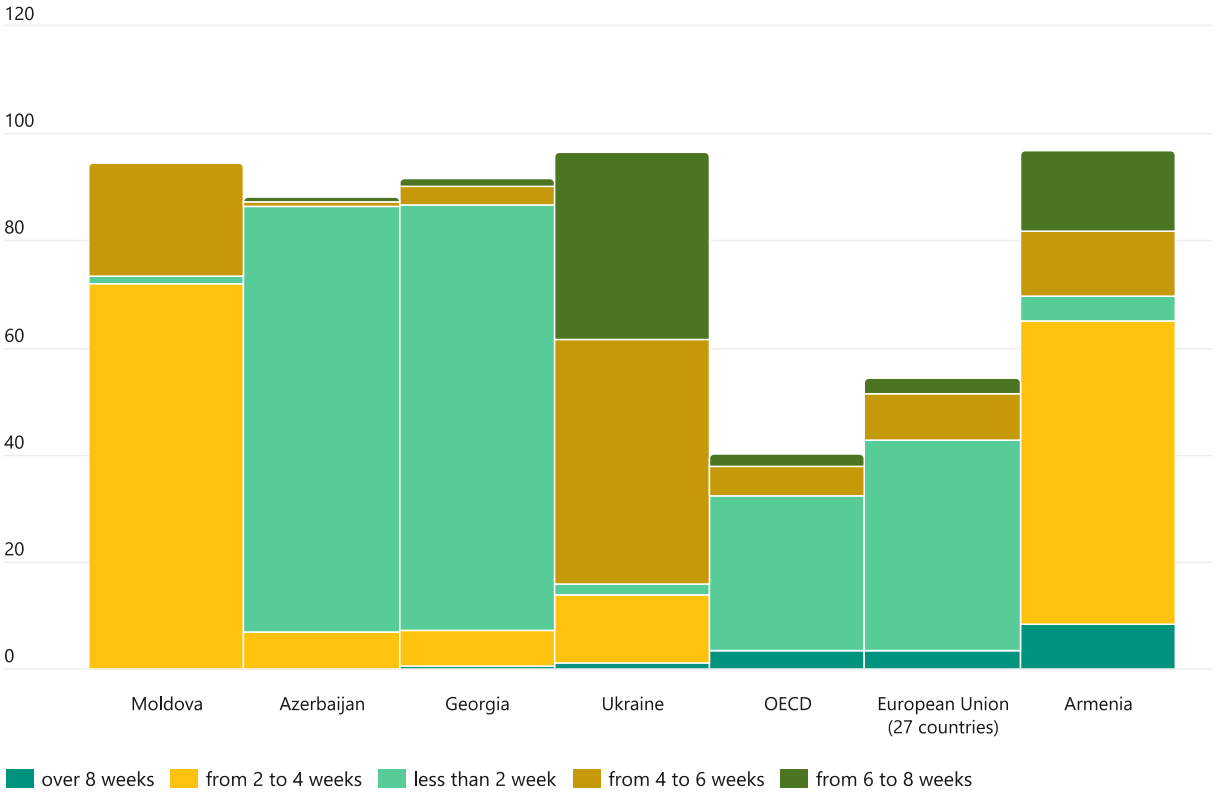
Percentage of tree-covered areas exposed, 2020



Compare: Link to the dashboard.
Source: OECD, "Climate-related hazards: Exposure to wildfire", Environment Statistics (database), https://oe.cd/dx/58u

Figure 5.8 Population exposure to icing days

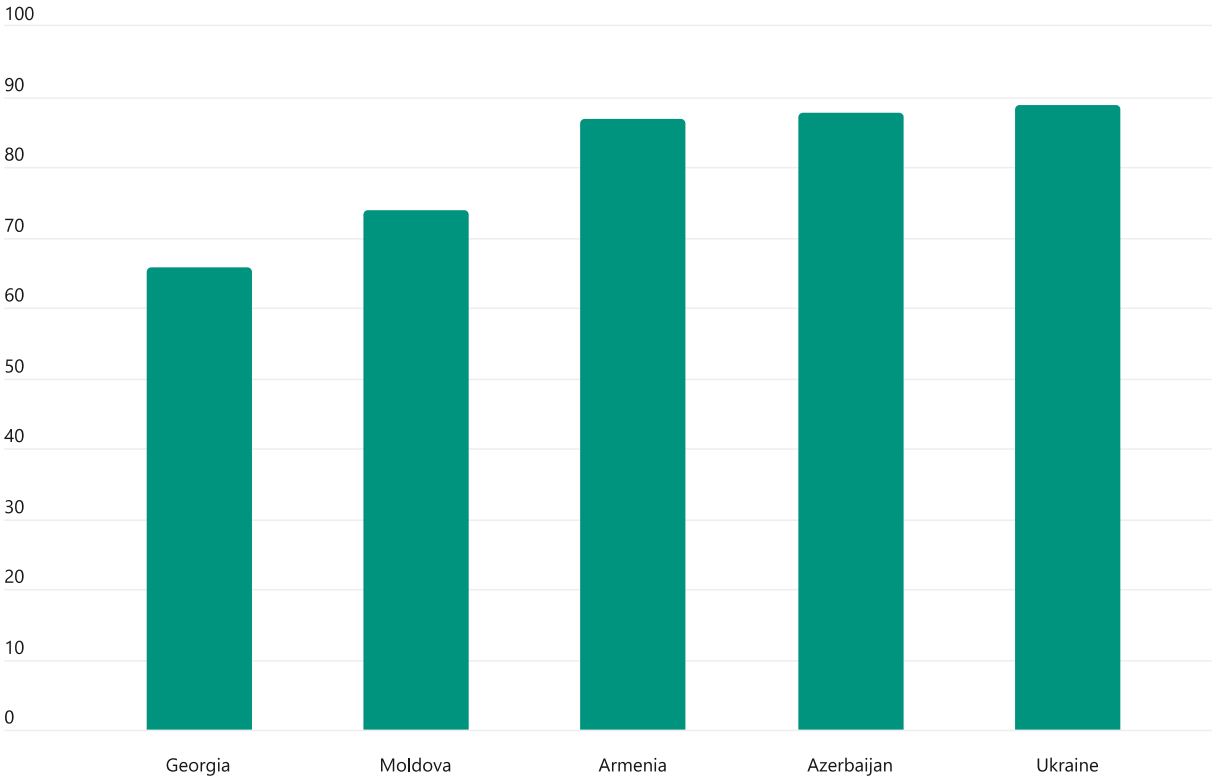
Percentage of population exposed, 2021



Compare: Link to the dashboard.
Source: OECD, "Climate-related hazards: Exposure to extreme temperature", Environment Statistics (database), https://oe.cd/dx/58r

Figure 5.9. Population with access to improved drinking water sources

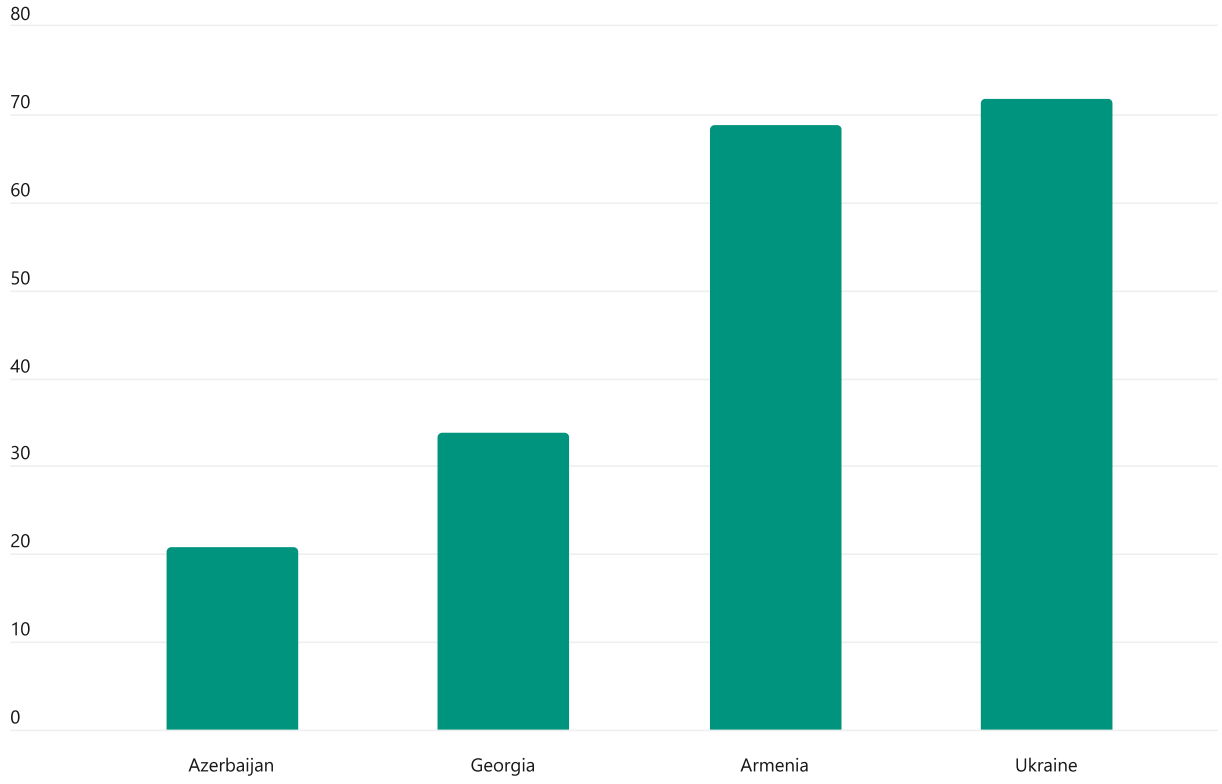
Percentage of total population, 2020



Compare: Link to the dashboard.
Source: OECD, "Green growth indicators", OECD Environment Statistics (database), https://doi.org/10.1787/data-00665-en. More information on access to improved water sanitation can be found on the UN Water website

Figure 5.10.Population access to improved water sanitation

Percentage of total population, 2020



Compare: Link to the dashboard.
Source: OECD, "Green growth indicators", OECD Environment Statistics (database), https://doi.org/10.1787/data-00665-en. More information on access to improved water sanitation can be found on the UN Water website.

6 Economic opportunities and policy responses

Key messages

- The share of patents in environment-related technologies is negligible compared to the EU/OECD averages, indicating low innovation activity in the EaP economies.
- In recent years, EaP countries have made efforts to increase information transparency about their respective fossil-fuel subsidies. Support in EaP countries is mainly provided to end users for natural gas consumption. Armenia has very limited support for fossil fuels, mainly in tax expenditures, while in Azerbaijan, Georgia and Moldova, support is mainly given out in direct transfers.
- The share of territories allocated to national parks in Armenia, Azerbaijan, and Georgia is comparable to that in the OECD countries. However, terrestrial area allocated to national parks is less than 2% in Moldova and less than 4% in Ukraine. Much less territory is strictly protected, and all countries in the region remain distant from the Global Biodiversity targets for protected land.

Context and policy challenges

As the limited available data illustrates, the EaP countries are at an early stage of producing indicators to monitor policies and other economic aspects. In particular, gaps exist for data on developing green technologies and innovations, associated budget spending, and environmental taxation. Nevertheless, the EaP countries continue to advance in several aspects, notably aligning their environmental taxation policies with international standards, particularly with European environmental taxation regulations (OECD, 2022).

The indicators in this section aim to capture the economic opportunities associated with green growth policies, such as technology and innovation, environmental goods and services, investment and financing, prices, taxes, transfers, education, training, and skills development.

Main trends and recent developments

The share of innovation (measured as the number of patents) in environment-related technologies is negligible compared to the EU/OECD averages, indicating low innovation activity in the EaP economies. However, most countries in the region are implementing programs to support green innovation in Small and Medium Enterprises and broader technology development, which could help drive forward environment-related innovation in the region.

In recent years, EaP countries have made efforts to increase information transparency about their respective fossil-fuel subsidies (FFS). Among them, Ukraine performs best regarding data transparency on FFS and is among the few EaP countries that regularly publish annual information on tax expenditure,

including in the energy sector. Information on all EaP countries' fossil fuel subsidies is now available in the *OECD Inventory of Support Measures to Fossil Fuels*. This is a major step towards increased transparency and disclosure of relevant information. Data show that support in EaP countries is mainly provided to end users for natural gas consumption. Armenia has very limited support for fossil fuels, mainly in tax expenditures, while in Azerbaijan, Georgia and Moldova, support is mainly given out in direct transfers. Considering the intensification of efforts to reach carbon neutrality worldwide and the EaP countries' commitment to contribute to the EU Green Deal ambition of making Europe the first neutral continent by 2050, there is a need to rethink the fossil-fuel subsidisation policy. Governments in EaP countries should resist introducing new subsidy schemes that could become a long-term structural feature of their economy.

The EaP countries have also made efforts to promote education and upskill civil servants and the public on the benefits of a green economy. Thus, through the support of the EU4Environment projects, over 750 civil servants have been trained on Strategic Environmental Assessment and Environmental Impact Assessment (SEA/EIA), 941 have been trained on green economy (including 227 on circular economy; 461 on Resource Efficient and Cleaner Production (RECP); 90 on Product Environmental Footprint (PEF); and 163 on gender sensitisation in greening the industry). Furthermore, 1 900 civil servants and experts have been trained in Sustainable Public Procurement (SPP), focusing on eco-labelling and Extended Producer Responsibility (EPR); 400 have trained on green public investment programmes and compliance, and 90 have been trained on the Emerald Network development. In addition, five training courses on green economy have been developed, and discussions are ongoing to incorporate them into the university's curriculum.

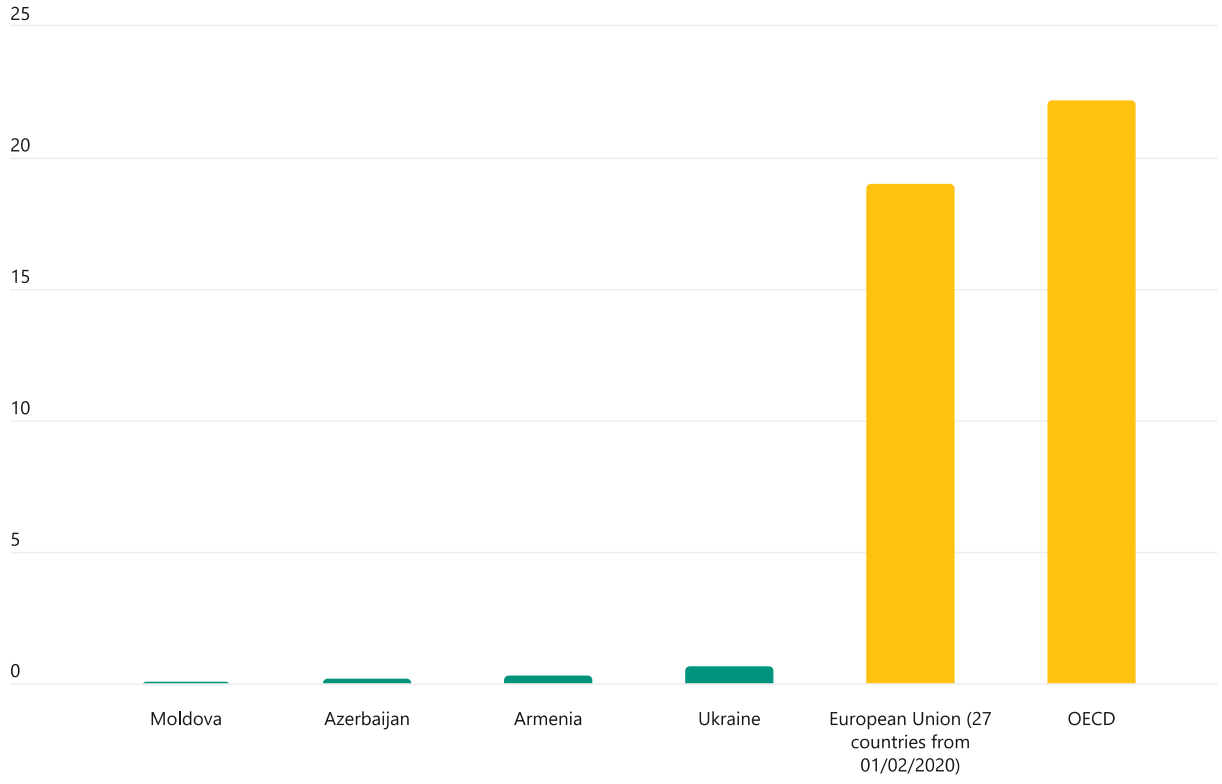
The share of territories allocated to national parks in Armenia, Azerbaijan, and Georgia is comparable to that in the OECD countries. However, there are significant variations among countries in the extent and management objectives of terrestrial protected areas. Protected areas allocated to national parks are less than 2% in Moldova and less than 4% in Ukraine. Much less territory is strictly protected, and all countries in the region remain distant from the Global Biodiversity (GBF) Target 3, to *'ensure and enable that by 2030 at least 30 per cent of terrestrial, inland water, and of coastal and marine areas, especially areas of particular important for biodiversity and ecosystem functions and services, are effectively conserved and managed'*. In addition, protected areas are not always representative of national biodiversity or sufficiently connected, and they do not reflect the effectiveness of the management of these areas.

Available indicators

- Development of environment-related technologies, inventions per person
- FFS by fuel
- FFS by beneficiary
- Share of terrestrial and marine protected areas by IUCN categories

Figure 6.1. Environment-related inventions

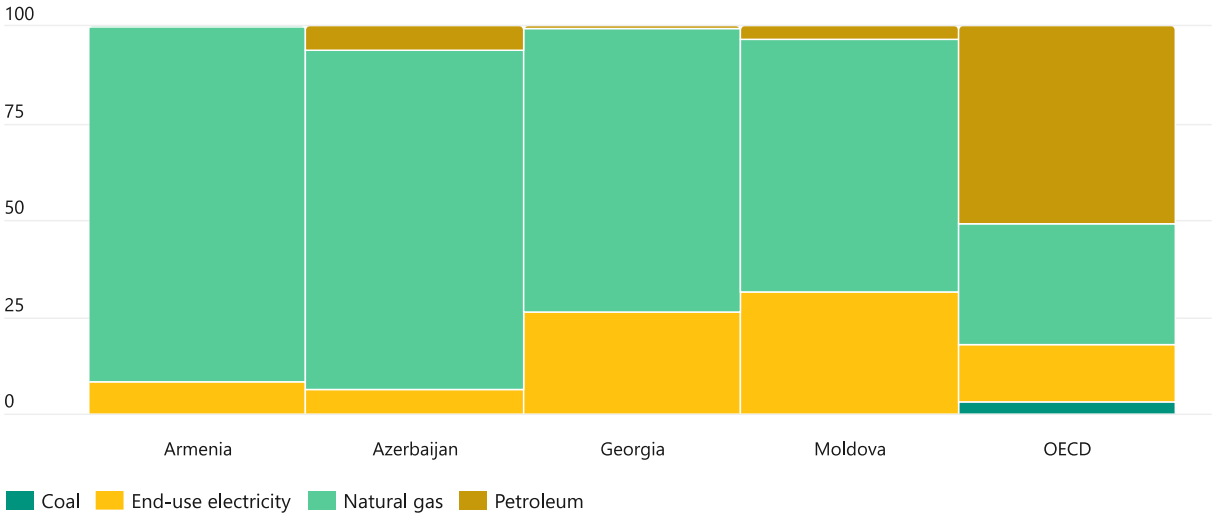
Number of inventions per 1 000 000 inhabitants, 2019



Compare: Link to the dashboard.
Source: OECD, "Patents in environment-related technologies: Technology development by inventor country", OECD Environment Statistics (database), https://doi.org/10.1787/data-00760-en

Figure 6.2. Fossil fuel support by energy product

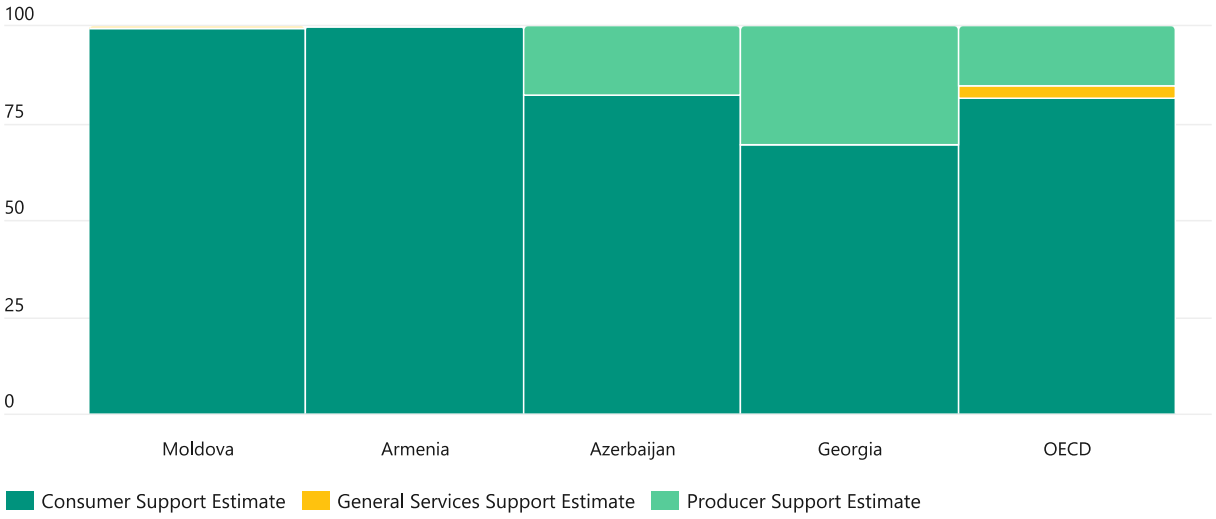
Percentage, 2022



Note: 1) Support measures refer to the sum of direct transfers and tax expenditures. Fiscal cost of support measures for fossil fuels are based on information reported by countries through official documentation (e.g. budget reports). Support measures for which such information is not available are excluded from the data shown. In addition, support measures in certain countries may not have been exhaustively identified.
2) Tax expenditures are estimates of revenue that is foregone due to a particular feature of the tax system that reduces or postpones tax payments (relative to a jurisdiction's benchmark tax system) to the benefit of fossil fuels' producers or users. Hence, (i) tax expenditures estimates can increase either because of greater concessions (relative to the benchmark tax system) or because of an increase in the benchmark itself; (ii) cross-country comparisons of tax expenditures can be misleading due to country-specific benchmark tax systems.
3) Support measures for fossil fuels are included in the Inventory without reference to their economic or environmental effects. No judgment is therefore made as to whether such measures are inefficient or ought to be reformed.
Source: OECD, "OECD Inventory of Support Measures for Fossil Fuels", OECD Environment Statistics (database)

Figure 6.3. Fossil fuel support by end beneficiary

Percentage, 2022



Note: 1) Support measures refer to the sum of direct transfers and tax expenditures. Fiscal cost of support measures for fossil fuels are based on information reported by countries through official documentation (e.g. budget reports). Support measures for which such information is not available are excluded from the data shown. In addition, support measures in certain countries may not have been exhaustively identified.
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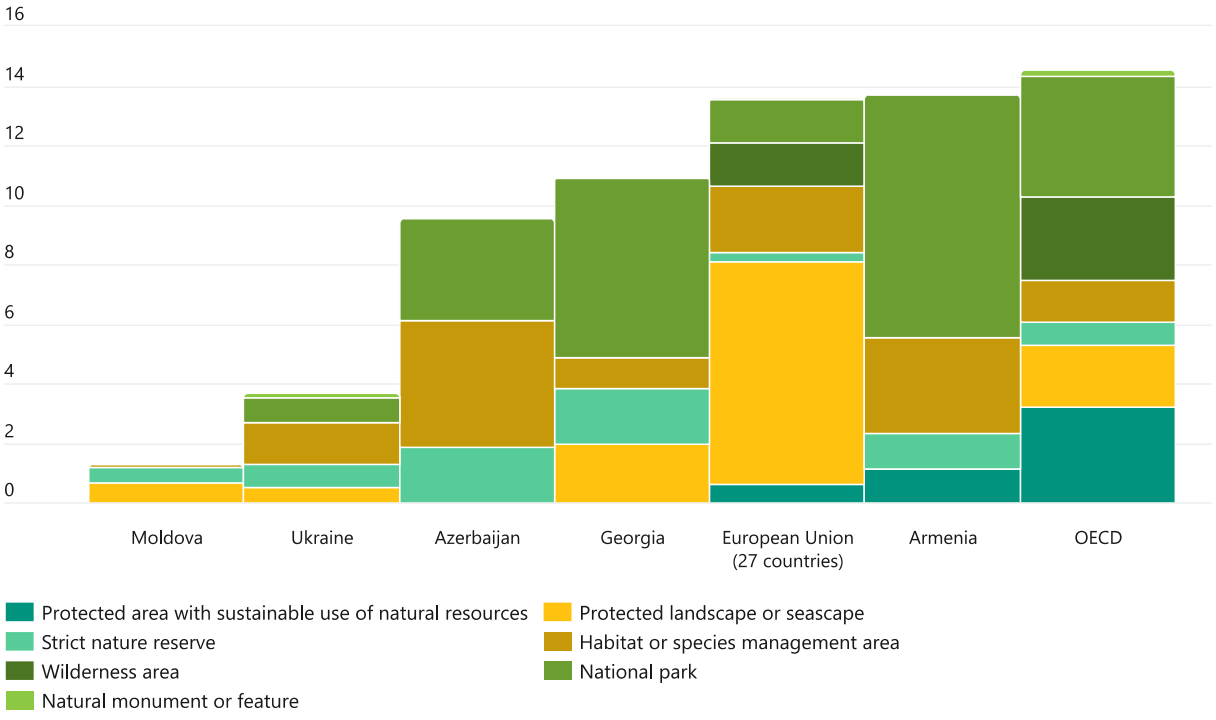
3) Support measures for fossil fuels are included in the Inventory without reference to their economic or environmental effects. No judgment is therefore made as to whether such measures are inefficient or ought to be reformed.
Source: OECD, "OECD Inventory of Support Measures for Fossil Fuels", OECD Environment Statistics (database)

Figure 6.4. Terrestrial protected areas

Percentage of land area, 2022



Compare: Link to the dashboard.
Note: Percentage of land area, by mutually exclusive IUCN categories. The Global Biodiversity Framework establishes the "30x30" conservation target, calling for 30% of the earth's land and sea to be conserved through the establishment of protected areas and other area-based conservation measures.
Source: OECD, "Biodiversity: Protected areas", OECD Environment Statistics (database), https://doi.org/10.1787/5fa661ce-en.

Glossary

Natural asset base

Land cover is the observed physical and biological cover of the Earth's surface, including natural vegetation, abiotic (non-living) surfaces, and inland waters. Note that land cover is different from land use, which refers to the economic activities or institutional arrangements in a given area (e.g., wild prairie, pasture, and golf course are different uses of grassland areas).

Natural and semi-natural land: Designates land covered by natural or seminatural vegetation with a limited anthropogenic footprint as a proxy for land that is important for maintaining biodiversity and providing higher-value ecosystem services at the global scale.

Loss of natural and semi-natural vegetated land is defined as the diminution of vegetated land in natural and semi-natural state expressed as a percentage of the 'stock' in the previous time period (i.e., intensity of loss). The indicator is currently measured as the percentage of tree-covered area, grassland, wetland, shrubland, and sparse vegetation converted to any other land cover type.

Gain of natural and semi-natural vegetated land, defined similarly as above. It is a new addition to land covered by natural and semi-natural vegetation converted from other land cover types. Both the losses and the gains (**net change**) are expressed in relation to the same denominator, measuring the inflows and outflows from the same stock of (semi-)natural land.

A built-up area is defined as an area with buildings (roofed structures). This definition largely 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 areas may differ from other urban data that use alternative definitions.

Artificial surfaces as defined by the EEA (2018): Continuous and discontinuous urban fabric (housing areas), industrial, commercial and transport units, road and rail networks, dump sites and extraction sites, but also green urban areas. The SEEA Central Framework defines them as any urban or related feature, including urban parks, industrial areas, waste dump deposits, and extraction sites.

Water abstraction refers to water taken from ground or surface water sources and conveyed to the place of use. If the water is returned to a surface water source, the downstream user's abstraction of the same water is counted again when compiling the total withdrawal.

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

The **intensity of use of natural freshwater resources** (or water stress) is expressed as gross freshwater abstraction in % of total available renewable freshwater resources (including inflows from neighbouring countries) or in % of internal freshwater resources (i.e. precipitation - evapotranspiration). Water used for

hydroelectricity generation (considered an in situ use) is excluded. Freshwater resources: the data refer to long-term annual averages over a minimum period of 30 consecutive years.

The following stress levels can be distinguished:

Low (less than 10%): generally, no major stress exists on the available resources.

Moderate (10% to 20%): indicates that water availability issues are becoming a constraint on development, and significant investments are needed to provide adequate supplies.

Medium-high (20% to 40%) implies managing both supply and demand, and conflicts among competing uses need to be resolved.

High (more than 40%): indicates serious scarcity and usually shows unsustainable water use, which can become a limiting factor in social and economic development.

Environmental resource productivity

Carbon dioxide (CO_2) emissions from energy use (production-based CO_2 emissions): Refer to gross direct CO_2 emissions from fossil fuel combustion emitted within the national territory. Human-caused emissions from other sources are not included. Emissions from oil held in international marine and aviation bunkers are excluded. CO_2 removal by sinks, indirect emissions from land use changes and indirect effects through interactions in the atmosphere are not taken into account.

Total energy supply: Total energy supply (TES) is made up of production + imports – exports – international marine bunkers – international aviation bunkers ± stock changes. Primary energy comprises coal, peat and peat products, oil shale, natural gas, crude oil and oil products, nuclear, and renewable energy (bioenergy, geothermal, hydropower, ocean, solar and wind). Electricity trade is included in the total primary energy supply but excluded from the calculation of the breakdown by source.

The share of renewables in the production of electricity. The main renewable forms are hydro, geothermal, wind, biomass, waste and solar energy.

Electricity production is the sum of electricity produced by the main electricity producers, those for whom it is the main economic activity, and the auto-producers, those for whom it is, at best, a second economic purpose.

Domestic Material Consumption refers to the amount of materials directly used in an economy, which refers to the apparent consumption of materials.

Material Footprint refers to the global allocation of used raw materials extracted to meet an economy's final demand.

Recycling is defined as any reprocessing of material in a production process that diverts it from the waste stream, except for reuse as fuel. Both reprocessing are the same type of product and should be included for different purposes. Direct recycling within industrial plants at the place of generation should be excluded.

Composting is defined as a biological process that submits biodegradable waste to anaerobic or aerobic decomposition, resulting in a product (compost) that is added to soil to improve fertility.

Incinerating is the thermal treatment of waste during which chemically fixed energy of combusted matters is transformed into thermal energy. Combustible compounds are transformed into combustion gases, leaving the system as flue gases. Incombustible inorganic matters remain in the form of slag and fly ash. Incinerating includes incinerating with or without energy recovery.

Landfilling is defined as depositing waste into or onto land in a controlled manner. It includes specially engineered landfills and temporary storage of over one year on permanent sites. The definition covers both landfills in internal sites (i.e. where a generator of waste disposes of its own waste at the place of generation) and in external sites. Landfill waste includes all amounts going to landfill, either directly or after sorting and/or treatment. Controlled landfilling requires submission to a permit system and technical control procedures in compliance with the national legislation in force.

Municipal waste: 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.

Environmental quality of life

Mean population exposure to fine particulates (PM2.5): Expressed as the mass of PM2.5 per cubic meter, it is calculated as the mean annual outdoor PM2.5 concentration weighted by the population living in the relevant area, that is, the concentration level, expressed in µg/m3, to which a typical resident is exposed throughout a year.

The World Health Organization (WHO) guideline for PM2.5 is that annual mean concentrations should not exceed ten micrograms per cubic meter, representing the lower range over which adverse health effects have been observed. The WHO has also recommended guidelines for the emission of PM2.5 from household burning fuels.

Mortality here is based on premature deaths**.**

Premature deaths are calculated as the number of premature deaths attributed to exposure to environmental risks, expressed in absolute value per million inhabitants of the same age group and sex (mortality), and as a percentage of total attributable premature deaths. Total attributable premature deaths include premature deaths due to environmental and occupational risks, behavioural risks, and metabolic risks.

The welfare costs of premature deaths from exposure to environment-related risks are expressed in millions constant 2015 USD using PPP, compared to GDP as percentage points of GDP equivalent per person (total population across age groups and sex) and as a percentage of the welfare cost of total attributable premature deaths.

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 environment-related risks is thus greater than the cost of mortalities presented in this chapter. Yet the available evidence suggests that mortality costs account for the bulk of the total costs to society. Finally, VSL also captures nonmarket 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.

Value of a statistical life (VSL) is derived from aggregating individuals' willingness-to-pay (WTP) to secure a marginal reduction in the risk of premature death. Therefore, the welfare cost is evaluated in terms of what the population at large would be "willing to pay" to avoid the mortalities due to exposure to environment-related risks.

Annual **surface temperature change** is with respect to the baseline climatology (1981-2010). The calculation is based on the Copernicus CDS temperature data (ERA5) is a global gridded product with a 0.25° spatial resolution (~ 27.75 km) containing per pixel information of daily minimum and maximum air temperature at 2 m above the land's surface from 1979 to present.

Annual percentage of **population exposed to hot summer days**, measured as days where the maximum daily temperature exceeds 35°C. Data are expressed in percentages.

River flooding occurs when excessive rainfall results in the river exceeding the channel capacity and spilling into the adjacent areas. **Population exposure to river floods** at different territorial levels was computed using the Global Human Settlement Layer Population grid linearly interpolated to 2020 based on 2000 and 2015.

Population exposure to wildfire danger assesses locations where populations are exposed to a very high 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) fire danger based on the FWI index.

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 for at least one and a maximum of fourteen days per year.

Improved drinking-water sources are defined as those that are likely to be protected from outside contamination and from faecal matter in particular. Improved water sources include household connections, public standpipes, boreholes, protected dug wells, protected springs and rainwater collection. Unimproved water sources include unprotected wells, unprotected springs, surface water (e.g. river, dam or lake), vendor-provided water, bottled water (unless water for other uses is available from an improved source) and tanker truck-provided water.

Improved sanitation facilities are defined as those that hygienically separate human waste from human contact. Improved sanitation includes flush or pour-flush to piped sewer system, septic tank pit latrines, ventilated-improved pit latrines, or pit latrines with slab or composting toilets. Shared or public-use sanitation facilities are not considered to be improved. Also, flush or pour-flush to elsewhere, pit latrines without slabs or open pits, bucket latrines, hanging latrines or open defecation are not considered to be improved sanitation.

Economic opportunities and policy responses

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.

Terrestrial protected areas are areas of land especially dedicated to the protection and maintenance of biological diversity and of natural and associated cultural resources and managed through legal or other effective means. The data refer to the World Conservation Union (IUCN) management categories I-VI. National classifications may differ.

Socio-economic context

GDP per person: GDP per person 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 the depletion of natural assets. GDP per person 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.

Informal economic sector: the part of the economy that is neither taxed nor monitored by any form of government.

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.

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Environment at a Glance in the EU Eastern Partnership Countries

MEASURING PROGRESS TOWARDS A GREEN TRANSFORMATION

The five Eastern Partnership (EaP) countries—Armenia, Azerbaijan, Georgia, the Republic of Moldova, and Ukraine—are at the strategically important crossroads of Western Asia and Europe. They host a variety of geographic and climatic profiles and possess rich endowments of natural resources. These include endemic biodiversity and ecosystems crucial for the region's development and the population's well-being. While there is untapped potential in the region for renewable energy, including solar, wind and hydropower, some countries are among the world's most water-stressed.

This report draws on indicators available in OECD and other international databases on green growth and environmental performance in the EaP countries. It combines selected central elements of the OECD Green Growth Indicators Framework and the OECD Core Set of Environmental Indicators. This report is a first step in presenting available indicators for EaP countries to support the monitoring and progress towards a green transition. It will be updated and enriched as new data and indicators become available.

EU4Environment
Green Economy in Eastern Partner Countries

EU4Environment
Water and Data in Eastern Partner Countries

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