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Towards green transformation of Ukraine: State of Play in 2021

Monitoring progress based on the OECD green growth indicators

Action implemented by:

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Foreword

I am delighted to present the latest outcomes of the monitoring of Ukraine's progress towards green growth.

Our strategy should be continuously updated and based on assessment and monitoring growth indicators. In this context, green growth indicators developed by the Organisation of Economic Cooperation and Development offer an important source of information about the "green" dimension of national development: efficiency in the use of main resources, a natural assets base, the environmental quality of people's lives, economic instruments, and input by science and innovations.

As supported by the findings of this report, Ukraine has taken many steps towards green growth in recent years:

- carbon productivity is rising, meaning less greenhouse gas emissions while GDP continues to grow;
- energy productivity has grown to USD 6 000 (PPP 2017)/t.o.e, which is 14% higher than in 2015;
- the share of protected areas is rising and reached 6.8% of the total country area.

Despite progress in some areas, much work lies ahead to overcome serious challenges:

- agricultural lands continue to degrade;
- a critical lack of data on the population of certain species, including that of endangered species;
- high mortality caused by air pollution and huge associated economic losses;
- green R&D expenses remain low.

I am convinced that Ukraine's economic growth can be distinguished from the increase of environmental pressures, and that this is a prerequisite for sustainable development in our country. Recent international and national efforts in climate change mitigation are an excellent example. The Green Deal for Ukraine should become our national paradigm, uniting citizens, business and the government.

Ruslan Strilets
Acting Minister of Environmental Protection and Natural Resources of Ukraine
Deputy Minister of Environmental Protection and Natural Resources of Ukraine for Digital Development, Digital Transformations and Digitisation

Background and acknowledgement

Background

Monitoring and assessment of progress in moving towards green economy is important for improving government policies and their implementation. The use of green growth indicators can help in this context. Green growth indicators (GGIs) can help track and communicate progress in greening economic growth, inform decisions, demonstrate accountability to national and international stakeholders, raise public awareness about the links between economic growth and the environment, and compare progress between countries.

There are several processes related to monitoring sustainable development and environmental protection in Ukraine. Monitoring of Sustainable Development Goals (SDGs) is well established. It is complemented by monitoring of progress on greening the economic growth, and monitoring and evaluation of the implementation of national environmental policies. These include regular reports on the state of the environment and achieving Ukraine's policy objectives.

National indicators of SDGs, the measurement of progress on the Strategy of State Environmental Policy till 2030, and green growth indicators partially overlap. Therefore, the development of green growth indicators has to ensure maximum added value and efficient use of resources.

This publication is the third monitoring report that uses a set of green growth indicators in Ukraine that corresponds to the indicators framework developed by the Organisation for Economic Cooperation and Development (OECD). The report presents a snapshot of Ukraine's progress towards green transformation in 2021. It unveils green growth trends for a period of five years between 2015 and 2020. It also aims to contribute to strengthening the national monitoring system on green economy by signalling data gaps and the needs for information collection and analysis.

This report builds on two previous reports: the first monitoring report "Towards Green Growth: Monitoring Progress in Ukraine" published in 2014[1] and the second monitoring report "Green Transformation in Ukraine published in 2016[2].

This report is also a contribution to the implementation of the EU-Ukraine Association Agreement towards the long-term objective of sustainable development and green economy (Article 360). It also aims to support green and inclusive recovery from the unprecedented challenge brought by the COVID-19 pandemic, with its severe socio-economic consequences. Ukraine's readiness to contribute to the European Green Deal initiative launched by the European Commission in December 2019 creates a unique opportunity to strengthen a framework for monitoring progress towards green growth, including its potential for decarbonisation and pollution mitigation, to be presented to policy-makers and the public in Ukraine and worldwide.

This report, as the two previous reports, are the outcomes of joint efforts by the Ukrainian professionals from the Ministry of Economy, Ministry of Environment, State Statistics Service, State Agency for Energy Efficiency and Energy-Saving, several research institutions and non-governmental organizations who work together to modernize sustainable development indicators and improve monitoring system towards green economy.

This report is divided into two parts. The first "Monitoring green growth in Ukraine using the OECD-based green growth indicators". The second part "Monitoring implementation of the national environmental policy of Ukraine" is an attempt to carry pilot monitoring of the implementation of the Law of Ukraine "On Main Foundations (Strategy) of the State Environmental Policy of Ukraine for the Period till 2030".

Acknowledgement

This report was prepared by the expert team from Resource & Analysis Center "Society and Environment", including Andriy Andrusevych, Nataliya Andrusevych, Tetyana Kvasha, Zoryana Kozak, Lyudmyla Musina, and Oleksii Khabatiuk, under supervision of Krzysztof Michalak and Irina Belkahia from the OECD Environment Directorate.

The authors are grateful for useful comments and advice by State Statistics Service of Ukraine and personally Oleg Prokopenko, Director of Agricultural and Environmental Statistics Department, Ministry of Environmental Protection and Natural Resources of Ukraine and personally Iryna Stavchuk, Vice

[1] The report is available in Ukrainian at: https://bit.ly/racseGG2014.

[2] Electronic version is available at: https://bit.ly/EaPGREEN2016 and at http://www.uintei.kiev.ua.

Minister for European Integration. The authors also are grateful for all comments provided during the kick-off event on 29 March 2021 and public consultations on draft monitoring reports. Jonathan Wright, OECD, edited the selected parts of the English version of the report.

This report has been developed within the framework of the "European Union for Environment Action" (EU4Environment) Programme funded by the European Union and implemented by the OECD, UNECE, UNEP, UNIDO, and the World Bank.

The report is available on the EU4Environment web site and web sites of Resource & Analysis Center "Society and Environment" and the Ministry of Environmental Protection and Natural Resources of Ukraine.

Disclaimers

Please cite this publication as: EU4Environment (2021), Towards green transformation of Ukraine: State of Play in 2021. Monitoring progress based on the OECD green growth indicators.

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Acronyms and abbreviations

ARC – Autonomous Republic of Crimea

CETT – classification of economic activities types (“KVED”)

CMU – Cabinet of Ministers of Ukraine

GGIs – green growth indicators

GVA – gross value added

IDA – international development assistance

IMF – International Monetary Fund

MFP – multi factor productivity

NBU – National Bank of Ukraine

NPP – nuclear power plant

OECD – Organization for Economic Cooperation and Development

RES – renewable energy sources

SDGs – Sustainable Development Goals

SSU -State Security Service of Ukraine

TFP – total factor productivity

TOT – temporary occupied territories

TPP - thermal power plant

Ukrstats – State Statistics Service of Ukraine

UNECE – United Nations Economic Commission for Europe

UNEP – United Nations Environment Program (UN Environment)

UNGA – United Nations General Assembly

UNIDO – United Nations Industrial Development Organization

Main findings

Is Ukraine becoming more efficient in using natural resources and environmental services?

- Over the past ten years, there has been an increase in the energy productivity of Ukraine's economy. In the period 2010-2018, the carbon productivity of the economy increased by 36%.
- The share of renewable energy sources has been growing rapidly over the last five years. In particular, renewables provided 12.4% of electricity production in 2020, therefore doubling since 2016.
- However, material intensity of GDP has remained stable over the last five years.
- The generation of household and similar waste in Ukraine does not tend to decrease and remains at the level of 280.6 kg per capita.
- The use of mineral fertilisers in Ukraine in the last ten years increased 2.5 times and reached 2.3 t/ha, but the balance of nutrients is negative.
- Over the last ten years, water productivity in Ukraine has increased significantly by 28%.
- In 2018-2019, multifactor productivity became the most influential factor in economic growth in Ukraine.

Is the natural asset base of the Ukrainian economy being maintained?

- Over the last ten years, the pressure on freshwater resources has decreased. In 2019, water abstraction amounted to 11.1 billion m^3/year, which is 3.7 billion m^3 less than in 2010.
- Ukraine's forest cover has decreased over the last ten years to 14.8%.
- Fishing for fish and other aquatic bioresources has declined due to the occupation of Crimea and continues to decline. In 2020, the total extraction of aquatic bioresources was 76 508 tons, which is 5 times less than in 1996, 3 times less than in 2013, and 20% less than in 2019.
- Ukraine has significant world reserves of manganese and significant reserves of cobalt, but the latter is not mined. Ukraine ranks second in the world in total manganese reserves, estimated at 2.2 billion tons of ore.
- Agricultural lands comprise two-thirds of total Ukraine's land resources, but the share of built-up lands is very high and continues to grow. As of 2019, 79% of all agricultural lands are arable lands.
- The area of built-up land in Ukraine is the highest in Europe and among OECD countries and continues to grow. Built-up land area in Ukraine is 897 m^2/capita, while the average in OECD countries - 290 m^2.
- In Ukraine, there is a further degradation of agricultural land, in particular a decrease in humus content. The use of organic fertilizers has been steadily declining throughout the years (except for 2018-2020) from 6 200 kg/ha in 1990 to 275 kg/ha in 2020.
- The dynamics of the populations of hunted and Red Book species indicates their excessive capture. In particular, the population of brown bears over the past 10 years has decreased by 25%, and in the last 5 years - by 9%.
- Ukraine critically lacks systematic accounting of animal populations, including protected ones.
- Despite the positive dynamics, the share of protected areas in Ukraine remains low and currently is 6.8% of the country's territory.

Does greening growth generate benefits for people in Ukraine?

- Emissions of all pollutants have decreased over the last ten years, but their levels remain high. Given the steady growth of Ukraine's GDP since 2015, declining emissions in the same period indicate the decoupling of economic growth and the burden on the environment.
- Mortality caused by air pollution is high, and in terms of mortality caused by indoor air pollution, Ukraine ranks high among European countries and neighboring countries. Death rate caused by air pollution is 64 people per year per 100 thousand population (a total of 54 932 per year).
- The negative economic consequences of premature deaths from air pollution are unacceptably high for Ukraine. The total economic value of premature deaths from air pollution in Ukraine reaches USD 94 billion per year, which is 27% of GDP (PPP).
- Ukraine critically lacks data on the state (quality) of atmospheric air and its impact on public health.
- The share of households equipped with sewerage has been growing steadily in Ukraine over the last ten years, especially in rural areas. The share of households equipped with sewerage in rural areas has doubled from 29.8% in 2010 to 64.2% in 2020.

- Access to centralised water supply and sewerage is low, especially in rural areas. 19 059 villages remain without centralized water supply.
- Mortality from diarrhea caused by inadequate water, sanitation or hygiene is the highest in Ukraine among all neighboring countries. Every year in Ukraine, 116 people die from diarrhea caused by poor water, sanitation or hygiene, including 101 children.
- Ukraine critically lacks reliable national data on public access to water supply and sanitation and the impact of inadequate access to water supply and sanitation on public health.

How does greening growth generate economic opportunities in Ukraine?

- Research and development expenditures in Ukraine are very low, having almost halved in the last ten years, and investment and spending on environmental R&D are negligible. Total expenditures on all R&D in Ukraine (not only environmental) fell from 0.75% of GDP in 2010 to 0.41% of GDP in 2020.
- The number of patents in areas that promote green growth has declined sharply over the past five years, indicating low innovation activity among Ukrainian residents. In areas that promote green growth, the number of applications for inventions from residents of Ukrain has decreased 9 times, and in recent years is about 50 applications per year.
- The renewables sector provides about 52 000 jobs in Ukraine, which is quite a lot compared to other countries.
- International development assistance in areas directly related to green growth accounts for a small share of the total IDA. The share of projects in “Energy efficiency” sector was only 5% of total IDA in 2019.
- In 2018-2019, there was a sharp increase in foreign direct investment in RES, which is a consequence of favorable public investment policy. Foreign direct investment in RES 2019 accounted for 40% of all direct investment in Ukraine (USD 2.4 billion).
- Revenues from environmental payments and taxes, despite the actual increase during 2014-2020, reduced their share in the overall budget. Their share in the state budget decreased from 11% to 6% (from 8% to 5% when local budgets are included).
- Average prices for motor fuel in recent years reflect prices in world markets.
- Over the last ten years, the rate of the CO_2 tax has changed significantly only once and was about 29 eurocents per ton in 2019.
- Ukraine continues to provide substantial subsidies for fossil fuels. Coal subsidies reached the highest level in 2020 (UAH 1 014 per ton).
- In recent years, state support for agriculture has increased sharply compared to 2011-2016. The largest increase in state support for agriculture is observed in 2017: the total amount of budget support amounted to UAH 5 billion (0.6% of the state budget).

PART I.

Monitoring green growth with OECD indicators

Chapter 1.

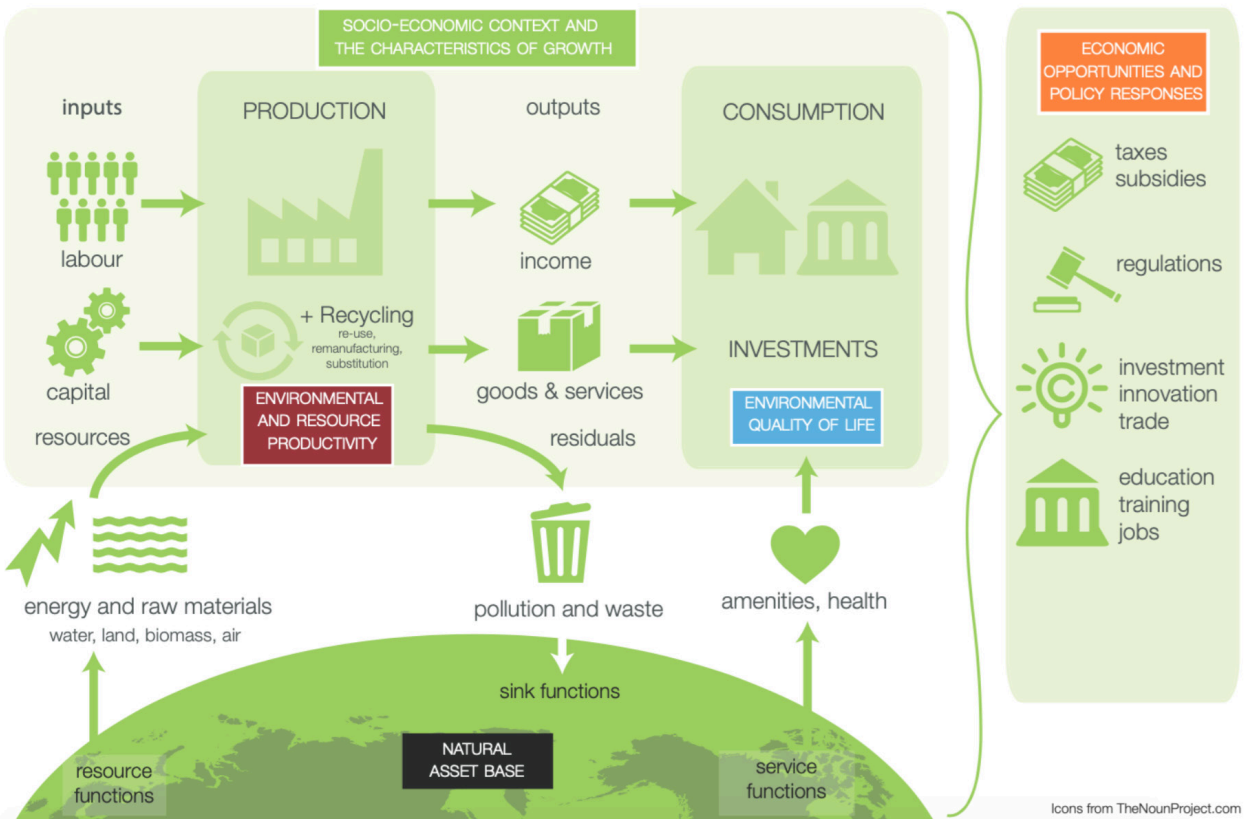
Methodology and OECD green growth indicators framework

Green growth concept and indicators are based on the analysis of the factors and results of the interaction of the economic system with the environment, their impact on productivity of the economy and supporting life of the population. It also reflects analysis of the outcomes of the state policies aimed at supporting growth (Figure 1).

To monitor progress towards green growth, the OECD proposes to use 5 groups of indicators, four of which cover different elements of the green economy, and the fifth - general macroeconomic indicators of national development and their causal links:

- Environmental and resources productivity of the economy
- Natural asset base
- Environmental quality of life
- Environmental opportunities and policy responses
- Socio-economic context.

Figure 1.1. Conceptual framework of measuring green growth



Source: OECD (2017), Green Growth Indicators 2017, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264268586-en

In general, the set of green growth indicators is not rigidly defined and is constantly updated and can be adapted to the needs of a particular country. The general set of indicators is presented in Table 1.

Table 1. OECD green growth indicators

Group	Subgroup	OECD indicator	Included into this report (identical or similar)
The environmental and resource productivity of the economy	Carbon and energy productivity	GDP per unit of energy-related CO_2 emitted, \$/kgCO_2	✓
		Real income per unit of energy-related CO_2 embodied in final demand	
		GDP per unit of TPES, USD/t.o.e	✓
		Share of renewable energy sources in TPES, %	✓
		Share of renewable energy sources in electricity production, %	✓
	Resource productivity	GDP per unit of materials consumed (abiotic and biotic)	✓
		Waste generation by sector, per unit of GDP or value added, per capita	✓
		Nutrient balances in agriculture (N, P) per agricultural land area and change in agricultural output	✓
		Material productivity of final consumption (real income per materials unit embodied in final consumption	
		Value added per unit of water consumed, by sector (for agriculture: irrigation water per hectare irrigated)	✓
	Multifactor productivity	Environmentally adjusted multifactor productivity	✓
The natural asset base	Natural resource stocks	Comprehensive measure expressed in monetary terms	
	Renewable stocks	Available renewable natural resources (groundwater, surface water) and related abstraction rates (national, territorial)	✓
		Forest resource stock, mln m^3	
		Forest area to total area, %	✓
		Intensity of use of forest resources, measured as fellings in percentage of gross increment, %	✓
		Fish production, world trends in marine stocks, etc.	✓
	Non-renewable stocks	_	✓
	Biodiversity and ecosystems	Land cover proportions, %	✓
		Land cover conversion, km^2	✓
		Built-up area, % (built-up area growth, %; built-up area per capita, m^2 per inhabitant)	✓
		Soil quality	✓
		Threatened amphibian species, % of amphibian threatened	✓
		Wild bird population, population index	✓
		Fish stocks within safe biological limits, %	✓
		Terrestrial protected areas, %, marine protected areas, %	✓
The environmental dimension of quality of life	Environmental health and risks	Population exposure to outdoor $PM_{2,5}$, micrograms per m^3 / % of population	✓
		Population exposure to ground-level ozone, micrograms per m^3	
		NO_2 concentrations, micrograms per m^3	

		Mortality from outdoor air pollution, deaths per million inhabitants	✓
		Cost of premature death from outdoor air pollution, % (GDP equivalent)	✓
		Mortality from indoor air pollution, deaths per million inhabitants	✓
	Environmental services and amenities	Public access to sewage treatment services, %	✓
		Public access to basic sanitation and to improved sources of drinking water	✓
		Disability -adjusted life years from unsafe water, sanitation and hang washing, DALY per 1000 inhabitants	✓
Economic opportunities and policy responses	Technology and innovation	Environmental R&D, % of total GBAOR	✓
		Public energy technology RD&D expenditures (% renewable energy, % fossil fuel energy)	
		Total R&D, % of GDP	✓
		A number of inventions	✓
		International collaboration in technology development	
		A number of registered inventions	✓
	Environmental goods and services	Trade in environmentally related products	
		National accounts with the SEEA accounts on air emissions, by industry	
		Environmentally sustainable practices	
		Employment and value added in selected environmental protection activities	✓
		Employment and value added in EGS sector	
	International financial flows	Official development assistance, % ODA	✓
		Clean Development Mechanism (CDM), number of projects; mln USD	
		Investment in renewable energy projects	✓
		Green-labelled bonds, bln USD	
	Prices and Transfers	Environmentally related tax revenue, % of total tax revenue	✓
		Road fuel taxes and prices	✓
		Effective carbon rates, EUR per tons	✓
		Support for fossil fuels	✓
		Support for agriculture	✓
The socio-economic context and characteristics of growth	Economic growth, productivity and competitiveness	GDP/capita, (2000-2015); 2010 USD PPP/capita	✓
		Composition of GDP: added value of agriculture, industry, services; %	✓
		Net disposable income (or net national income), $	✓
		Labour productivity	✓
		Environmentally adjusted multifactor productivity (EAMFP) growth, %; environmentally adjusted GDP growth, %	✓
		Trade weighted unit labour costs	
		Relative importance of trade, exports+imports/GDP	✓
		Consumer prices index, %	✓

	Labour market, education and income	Labour force participation	✓
		Unemployment rate, %	✓
		Population growth, structure and density	✓
		Life expectancy: years of healthy life at birth (DALYs)	✓
		GINI index, N	✓
		Educational attainment: level of and access to education	✓

Source: OECD (2017), Green Growth Indicators 2017, OECD Publishing, Paris.

Benefits of monitoring progress toward green economy

Green growth policies need to be supported with appropriate indicators to monitor progress. Green growth indicators can help:

- track and communicate progress in greening economic growth,
- inform decisions,
- demonstrate accountability to national and international stakeholders,
- raise public awareness about the links between economic growth and the environment, and
- compare progress between countries.

Sustainable development and green growth monitoring in Ukraine

There are several processes related to monitoring sustainable development and environmental protection in Ukraine. Monitoring Sustainable Development Goals (SDGs) is a major one, complemented by OECD GGI monitoring, and national environmental policy implementation (including regular reports on the state of the environment).

SDGs are systemically monitored since 2019 (in line with the Decree of the President of Ukraine No.722/2019 of Sep 30, 2019 and the Decision of the Government of Ukraine No.686r of Aug 21, 2019), though the first national report was prepared back in 2017. SDGs monitoring includes preparation of annual and quinquennial monitoring reports assessing the progress towards achieving national SDGs in Ukraine. This monitoring framework includes 110 indicators grouped in line with 17 SDGs global goals. Annual monitoring data are available in Excel format at Ukrstats web-site.

The SDGs monitoring is complemented by monitoring of progress on greening the economic growth, and monitoring and evaluation of the implementation of national environmental policies. These include regular reports on the state of the environment and achieving Ukraine's policy objectives. In particular, the Strategy of State Environmental Policy until 2030 includes thirty indicators for assessing its implementation with target values set for 2020, 2025, and 2030.

National indicators of SDGs, the measurement of progress on the Strategy of State Environmental Policy till 2030, and green growth indicators partially overlap. Therefore, the development of green growth indicators has to ensure maximum added value and efficient use of resources.

Some SDG indicators can be used for the purpose of OECD green growth monitoring methodology or are closely related. For example, they include share of protected areas, share of renewable energy sources, material intensity of GDP (identical indicators), carbon intensity of GDP, water intensity of GDP (indicators inverted from/to productivity). Similarly, some SDGs are part of the framework for assessing the effectiveness of the Strategy of State Environmental Policy until 2030.

The peculiarity of monitoring the SDGs and the indicators of effectiveness of the Strategy of State Environmental Policy until 2030 is the presence of target values, the achievement of which is the object of monitoring.

On the contrary, the evaluation of greening the economic growth using indicators does not necessitate the existence of established targets. The green growth indicators show the general trends or the current state of selected parameters which can be used for the evaluation purposes and for informing decision-making. The use of the OECD set of green growth indicators can also provide an opportunity to compare the situation in Ukraine with that in the OECD member countries.

Table 2 presents a comparative analysis of indicators that are used by these three processes.

Table 2. Comparative table of GGIs, SDGs and national environmental strategy indicators

GGIs included into this report	Similar or identical indicator in:	
	SDG monitoring	State environmental strategy till 2030 assessment framework
The environmental and resource productivity of the economy		
Carbon productivity, GDP UAH thsd./CO_2 t (only fossil fuels combustion, GDP in constant prices 2016)	✓	✓
GDP per unit of TPES, USD/t.o.e (2017 PPP)	✓	✓
Share of renewable energy sources in TPES, %	✓	✓
Share of RES in electricity balance of united energy system of Ukraine, %		
Material intensity of GDP index, %	✓	✓
Generation of municipal wastes, kg/capita	✓	
Mineral fertilizers, t per ha of agricultural lands		
Nutrient balances (N and P), kg/ha		
Water productivity, UAH GDP (2016 constant prices)/m^3	✓	✓
Multifactor productivity		
The natural asset base		
Use of water resources, annual, total, UAH/m^3		
Forest area in total area, %	✓	✓
Forest resources use intensity; logging area/forest rehabilitation area, %	✓	
Water bioresources use, by fishing areas, tones	✓	
Lithium, manganese and cobalt ores stocks and extraction, tones		
Land fund structure, %	✓	
Land fund changes, %	✓	
Built-up areas, thsd ha, %, m^2/capita		
Humus balance, t/ha	✓	
Some wild species in hunting areas/Number of birds and mammals included into Red Book and taken under protection by land-users		
Hunted species populations		
Share of protected areas in total country area, %	✓	✓
Share of marine protected areas in Azov and Black seas, %	✓	
The environmental dimension of quality of life		
Total emissions per area, t/km^2	✓	✓
Ambient air pollution attributed mortality		
Cost of premature deaths from outdoor air pollution, % (GDP equivalent)		
Number of deaths from indoor air pollution		
Share of households with sewage systems, %	✓	✓
Share of urban/rural population with access to centralized water service, %	✓	✓
Number of diarrhea deaths from inadequate water, sanitation and hygiene		

Economic opportunities and policy responses		
Expenses on environment-related R&D, thousand UAH, % of GDP	✓	
Patents and inventions relevant to green growth, n		
Employment in RES, thsd.		
Share of green projects in IDA (international development assistance), %		
Foreign direct investment into RES, total foreign direct investments , mln. USD.		
Environmental revenues n consolidated budget, bn.UAH		
Average retail prices on petrol, diesel and LNG, UAH/l		
CO_2 tax rate, UAH/t		
Coal mining subsidies, UAH/t		
State budget subsidies to agricultural production, UAH mln		
GINI index, N		
Access to tertiary education		
The socio-economic context and characteristics of growth		
GDP in constant prices (2016) per capita, UAH/capita	✓	
Gross added value of main sectors in GDP, %		
Net national income (constant prices), UAH mln		
Labour productivity (GDP in constant prices/employed person), UAH/employed person		
Foreign trade (export-import balance) in GDP, %		
Consumer prices index, % to December of previous year	✓	
Labour force participation, %		
Unemployment rates, %		
Population, total		
Life expectancy and HALE at birth, years		
GINI index, N	✓	
Access to tertiary education	✓	

Chapter 2.

Environmental and resource productivity of the economy

Is Ukraine becoming more efficient in using natural resources and environmental services?

The indicators in this section capture the efficiency with which economic activities – both production and consumption – use energy, other natural resources and environmental services. The indicators in this group reflect key aspects of the transition to a low-carbon, resource-efficient economy: carbon and energy productivity, resource productivity, and multifactor productivity.

2.1 Carbon and energy productivity of the economy

Climate change and the risks associated with it are among the top five global risks (WEF, 2021). The acceleration of climate change and the associated increase in the frequency and intensity of extreme weather events in recent decades is the result of an increase in anthropogenic greenhouse gas emissions (IPCC, 2021).

Carbon and energy productivity characterize, inter alia, the interaction with climate change, the global carbon cycle, and the environmental and economic efficiency of energy use in production and consumption, and the results of policies that promote low-carbon technologies and green energy (OECD, 2014). It is this group of indicators that is key to identifying the so-called decoupling between economic growth and environmental pressures, although they do not demonstrate the specificities and importance of local environmental problems, such as emissions of other pollutants from coal-fired power plants or the consequences of ash and slag wastes mishandling.

Carbon and energy productivity are important indicators of green growth, so understanding the trends and reasons for their dynamics is a necessary component of green growth policy development. In terms of content, productivity is the inverse of carbon and energy intensity (or "capacity"), an indicator traditionally used in strategic planning documents in Ukraine. Productivity, as an indicator, emphasizes the amount of economic benefits produced per unit of energy consumed or greenhouse gas emissions. In other words, it demonstrates how efficiently we use natural resources.

Carbon dioxide emissions from the combustion of fossil fuels and biomass account for a significant share of all greenhouse gas emissions (OECD, 2017). In Ukraine, emissions from fossil fuel combustion account for about 53% of all greenhouse gas emissions. Therefore, this indicator is important for understanding the country's efforts to decarbonize the economy in terms of the use of fossil fuels. In addition, climate externalities, including greenhouse gas emissions, have become an integral part of many countries' priorities and instruments of national policy (carbon pricing) and the activities of international financial institutions that refuse to finance fossil fuel projects.

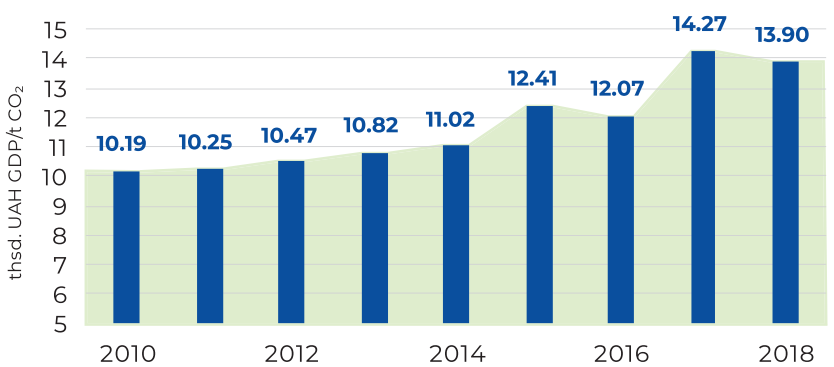
Greenhouse gas emissions are also a key indicator of the European Green Deal, as climate change is a central element of it: from achieving climate neutrality by 2050, reducing emissions in industry and energy, an efficient carbon pricing system to changing consumption and behavioral habits of ordinary citizens (Society and Environment, 2021).

Most indicators in this subgroup are related to production, although consumption productivity (or the "environmental footprint" of the national economy) should also be taken into account (OECD, 2017). At the same time, the use of such indicators in Ukraine is somewhat complicated due to lack of data.

Indicators:

- Carbon productivity of the economy
- Energy productivity of the economy
- The share of RES in the total primary energy supply
- The share of RES in electricity generation.

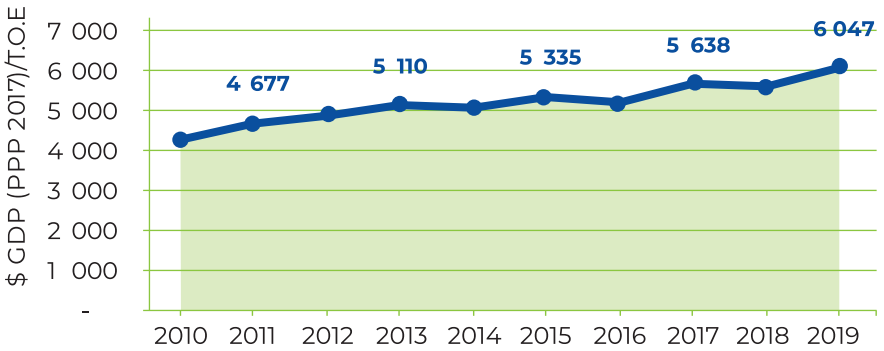
Figure 2.1. Carbon productivity



GDP in 2016 constant prices.
CO_2-fossil fuels combustion.

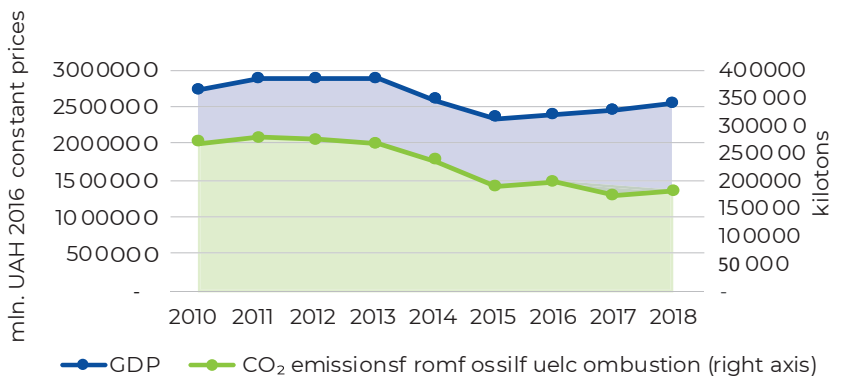
Source: Ukrstats (2021), IEA (2020), CO_2 Emissions from Fuel. Combustion, own calculations.

Figure 2.2 Energy productivity



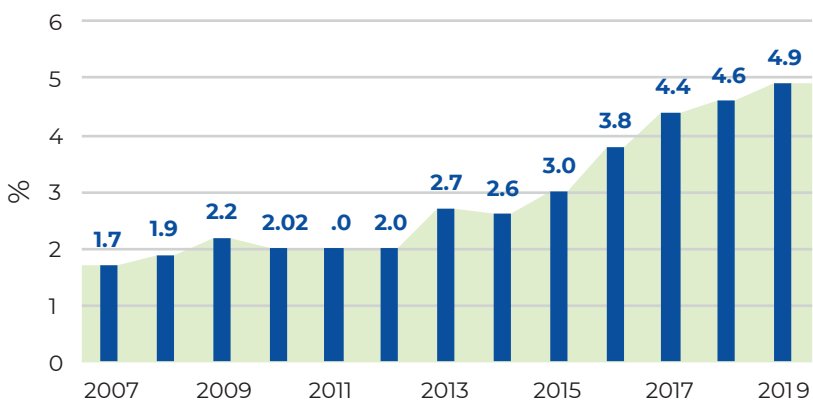
Source: Ukrstats, World Bank, own calculations (2021).

Figure 2.3. GDP and CO_2 emissions from fossil fuels combustion



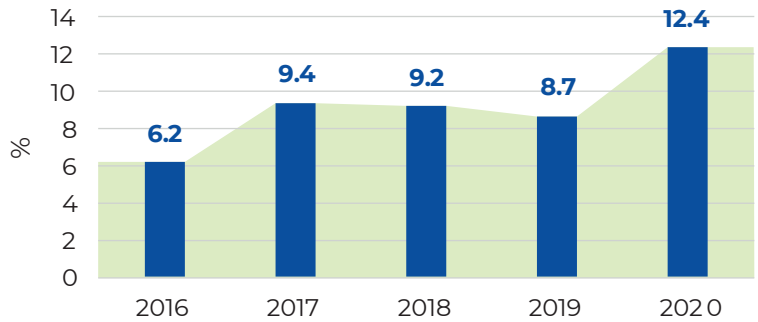
Source: Ukrstats (2021), IEA (2020), CO_2 Emissions from Fuel Combustion, own calculations.

Figure 2.4. Renewables share in TPES



Source: Ukrstats (2021).

Figure 2.5. Renewables share in electricity production



Source: Ministry of Energy of Ukraine (2020).

Main trends

In Ukraine, over the past ten years, there has been an increase in the carbon productivity of the economy.

In the period 2010-2018, the carbon productivity of the economy increased by 36% and had a steady upward trend, which increased in the period 2014-2018[3]. When explaining the trend of carbon productivity, it should be borne in mind that this indicator takes into account only CO_2 emissions from fuel combustion, which in different years of the analyzed period ranged from 53% to 65% of national greenhouse gas emissions. Accordingly, it does not take into account greenhouse gas emissions in other sectors and categories.

The increase in carbon productivity has been particularly noticeable since 2014, although it took place against a very significant background - more than 15% over the period 2014-2015 fall in GDP due to the annexation of the ARC, occupation of parts of Donetsk and Luhansk regions, and the associated reorientation of significant trade flows from traditional markets to new markets. In general, this has led to a significant reduction in the production of carbon-intensive products, which traditionally accounted for a significant share in CO_2 emissions, in particular, iron and steel - almost 1.5 times (in physical terms in 2018-2019 compared to 2010-2013), ammonia - more than 2 times. There has also been a significant reduction in coal consumption (almost 1.5 times) for electricity generation both due to reduced demand and due to an increase in the share of electricity generated by NPPs and RES.

In addition, throughout the analyzed period there was an increase in energy efficiency in industry, caused by a significant rise in natural gas prices after the "second gas war" with Russia in 2009, as well as the replacement of natural gas with biomass, particularly in the food processing industry.

It should be noted that since 2014, a significant role in increasing carbon productivity has been played by reducing gas consumption in the households (2 times) and central district heating (almost 2 times) both by increasing energy efficiency and replacement by biomass due to significant increase in prices for these categories of consumers, as well as a number of reforms in these areas.

The increase in carbon productivity was also a result of both the overall reduction in motor fuel consumption and the very significant replacement of gasoline with liquefied petroleum gas (LPG), which has a lower specific carbon content. The latter is due to simplified rules for retrofitting vehicles into LPG use and stable price factors in the retail market for motor fuels, which are both market-based in nature and associated with lower tax rates for LPG.

At the same time, all these processes took place against the background of relatively slow but steady growth of the GDP from 2015 to the end of the analyzed period, which is mainly caused by the growth of non-carbon-intensive industries.

These factors helped decoupling of CO_2 emissions from fossil fuel combustion and GDP. This is especially evident in the period after 2015, in which GDP grew steadily against the background of declining CO_2 emissions.

At the same time, it should be noted that the state climate policy gives insufficient signals for reducing CO_2 emissions; in post-2014 crisis conditions this led to business decisions by economic agents without

[3] It should be borne in mind that in Ukraine a significant part of CO_2 emissions from fossil fuel combustion is associated with meeting energy needs for heating and air conditioning of both residential and commercial real estate. This leads to a significant impact of weather factors, especially ambient temperature during the heating period, on indicators of carbon and energy productivity.

taking into account the climate agenda. For example, this happened in ferrous metallurgy and cement production, where after a significant rise in the price of natural gas it was replaced by coal, and the replacement itself required significant capital investment in both coal management infrastructure (unloading, storage, preparation and grinding) and coal dust injection in blast furnaces and technological furnaces.

Energy productivity in Ukraine has increased over the last 10 years.

As of 2019, energy productivity in Ukraine was USD 6 047 (PPP 2017) per ton of oil equivalent. This is 14% more than in 2015. At the same time, in 2010-2014 the growth of energy productivity was 19%. The average energy productivity in OECD countries is twice as high as in Ukraine, and in the EU - 2.5 times (OECD, 2021).

Several policy documents in Ukraine (including Energy Strategy till 2035) indicate the ambitions for a reduction of energy intensity of GDP by 29% in the period 2015-2020. However, in reality energy intensity decreased by only 12% over the 2015-2019 period.

As noted above, a significant role in this was played by the reduction of the share of energy-intensive industries (ferrous metallurgy and large-scale chemical production) in GDP and the reduction of absolute production of iron and steel, ammonia. In addition, there was an increase in energy efficiency in industry, caused by a significant rise in price of natural gas after the "second gas war" with Russia in 2009, as well as increased energy productivity due to a significant reduction in household gas consumption and district heating due to its significant rising prices for these categories of consumers since 2014, as well as a number of reforms in these areas.

The share of renewable energy sources (RES) has been growing rapidly over the last five years.

The share of RES in the total primary energy supply increased from 1.7% in 2007 to 4.9% in 2019 (almost 3 times). Growth in the period from 2015 to 2019 was especially fast. This growth was due to an increased use of biofuel and energy generated from waste, as well as the increased capacity from wind and solar energy. The share of hydropower has not changed over the review period.

The increase in the share of RES, except for electricity from RES, was primarily due to a significant increase in the market price of natural gas for industrial consumers, as well as an increase in de facto regulated natural gas prices for households and heat producers in district and home heat supply systems. In addition, the state has recently created special conditions for the formation of tariffs for thermal energy, which stimulated the development of heat production from RES (mostly from biomass).

In 2020, RES accounted for 12.4% of electricity production, which is twice as much as in 2016. In 2019 alone, solar power plants generated almost three times more electricity than in 2018 (2 932 million kWh and 1 098 million kWh, respectively). The key stimulus for growth was the state policy to support the production of electricity from RES by providing guarantees for the purchase of such electricity at a special rate (feed-in tariffs).

Even though, the share of RES in final energy consumption is 8.1% in 2020 it is still over twice less than the EU average (18.9%). Ukraine's current target under the Energy Strategy 2035 is 17% by 2030 (Society and Environment, 2021).

Technical comments on measurability and interpretation

Carbon productivity of an economy is the economic value of goods and services produced per unit of carbon dioxide emissions from the combustion of fossil fuels. Calculated as the ratio of gross domestic product (at constant prices) to CO_2 emissions from fossil fuel combustion (including its use in the chemical and metallurgical industries, in which they are used as raw materials and reducing agents). Data on GDP and CO_2 emissions for 2010-2019 do not include TOT. Data on CO_2 emissions from fossil fuel combustion are estimated (International Energy Agency). Data sources - National Accounts of Ukraine (Ukrstats) and the International Energy Agency (IEA).

It should be noted that this method of calculating carbon productivity is not based on total national greenhouse gas emissions, but only from fossil fuel combustion (though its share is relatively large - from 53 to 65% in the period under analysis). This may lead to limited applicability of this indicator for trend analysis and interpretation of results. Particular attention should be paid to this when analyzing long-term trends, as well as significant structural changes in the economy, in particular in sectors and categories that are not significant consumers of fossil fuels but are significant sources of non-CO_2 greenhouse gas emissions (in particular agriculture).

Energy productivity of the economy is the economic value of goods and services produced per unit of total primary energy supply (TPES). Calculated as the ratio of gross domestic product, expressed in international dollars, taking into account the purchasing power parity, to TPES. For the purposes of monitoring green growth, it is calculated as the value inverse of the energy intensity of GDP.

Data for 2014-2019 - excluding TOT. The source of data is the statistical report "Statistical Yearbook of Ukraine" (Ukrstats), own calculations.

GDP PPP is published by the State Statistics Service according to the data by World Bank, which, starting in 2019, introduced the publication of data on PPP GDP in 2017 prices in international dollars and revised the relevant data for previous years. It should be noted that GDP PPP 2017 estimates for Ukraine, provided by the World Bank, in the period 2010-2019 do not include ARC and Sevastopol city, and in addition since 2014 do not include TOT in Donetsk and Lugansk oblasts. At the same time TPES data until 2014 include both TOTs (ARC and Eastern Ukraine). For this reason, energy intensity and energy productivity estimates in the period of 2010-2013 were adjusted (relative to Ukrstats data) to ensure that GDP and TPES data have the same geographical coverage.

The share of renewable energy sources in TPES is the share of energy from RES in the total primary energy supply. The source of data is the statistical collection "Fuel and Energy Resources of Ukraine" (Ukrstats).

The share of renewable energy sources in electricity generation is the share of renewable energy in total electricity generation. Data source - regular information on the operation of the power complex (Ministry of Energy of Ukraine).

Definitions

GDP at constant prices is the gross domestic product calculated at constant prices of the reference/base year by deflation using price indices and extrapolation based on volume indices. For the purposes of this study, the base year is 2016.

GDP PPP (purchasing power parity) is an indicator used for international comparisons and is calculated to take into account the difference in price levels that exists between countries. PPP reflects the number of currency units required to purchase a certain standard set of services that can be purchased for one currency of the country (Ukrstats, 2018). In other words, the PPP allows to convert different national currencies into a common one - the international dollar - and in the process of conversion to equalize their purchasing power, eliminating the difference in prices between economies. In fact, the PPP shows the value of a standard basket of goods and services compared to the base economy (the United States).

CO_2 emissions from fossil fuel combustion - carbon dioxide emissions from the combustion of fossil fuels such as coal, natural gas, petroleum products, etc. (including their use in the chemical and metallurgical industries as raw materials and reducing agents). Possible calculation errors are estimated at 5% for OECD countries and 10% for non-OECD countries (IEA, 2020b).

RES (renewable energy sources) - renewable non-fossil energy sources, namely solar, wind, aerothermal, geothermal, hydrothermal, wave and tidal energy, hydropower, biomass energy, gas from organic waste, gas from sewage treatment plants, biogas.

TPES (total primary energy supply) covers the internal inflow of primary energy, as well as changes in stocks and imports (exports) of both primary and secondary energy. Equal to the production (extraction) of primary energy (fuels), plus revenues from other sources, plus imports, minus exports, minus international marine and aviation bunkering, plus a decrease or minus an increase in stocks.

Electricity generation is an activity related to the conversion of energy from energy resources of any origin into electricity by technical means. Electricity generation is based on the combustion of coal, fuel oil, natural gas, peat, the use of nuclear energy, wind energy, water, biomass, solar and geothermal energy.

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2.2 Resource productivity of the economy

Resource productivity characterizes the environmental and economic efficiency of the use of natural resources and materials in production and consumption, and reflects the results of policies and measures that promote resource productivity and sustainable use of materials in all sectors.

The main challenge for the state is to ensure the efficient use of material resources at all stages of their life cycle and to reduce the burden on primary natural resources (OECD, 2017). This means, among other things, the internalization of the cost of waste management and, in general, the reduction of its volume, in particular in the household sector.

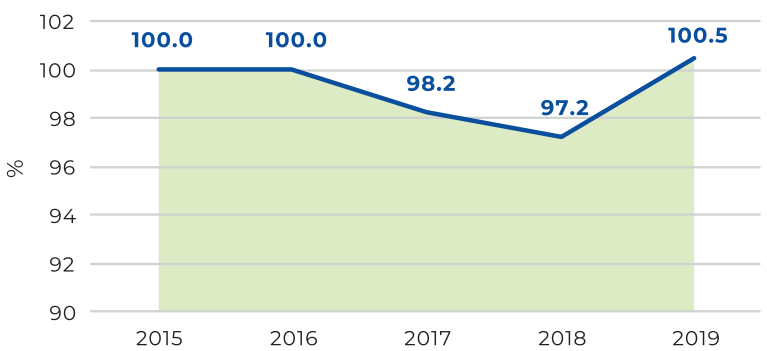
The use of agricultural lands can also be inefficient, contributing to their degradation, and thus reducing the natural resource base of the national economy. Agriculture in Ukraine provides up to 10% of GDP, so this aspect of resource productivity is important.

The country's water deficit has been growing over the years (except in the western regions of Ukraine) (National Academy of Agrarian Sciences of Ukraine, 2020), and in 2020 the restriction of water users' rights was considered for the first time due to abnormally dry autumn and winter 2019-2020. Therefore, the efficient use of water resources is an important indicator of the development of the national economy.

Indicators:

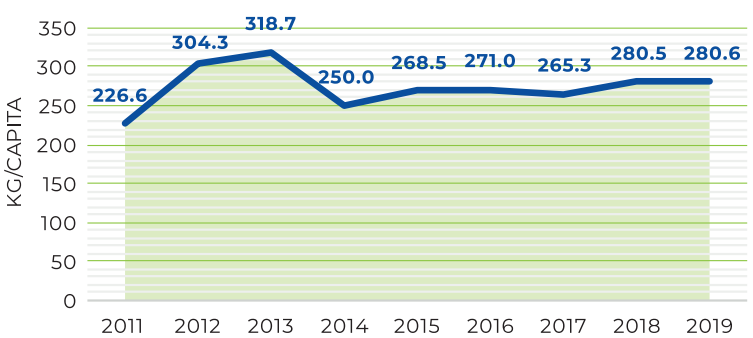
- Index of material intensity of GDP
- Municipal (household and similar) wastes generation
- Use of mineral fertilizers
- Balance of nutrients
- Water productivity of GDP.

Figure 2.6. GDP material intensity index



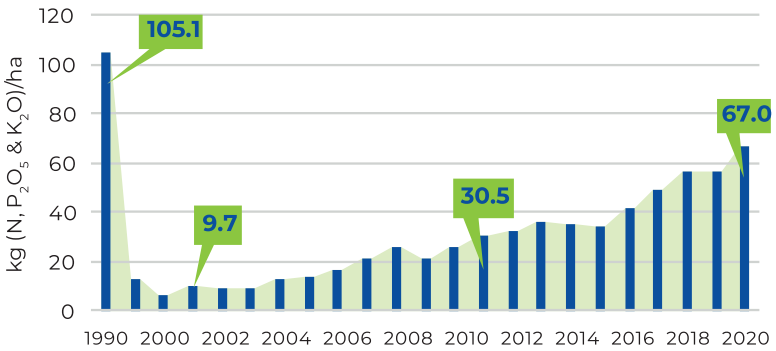
Source: Ukrstats (SDGs).

Figure 2.7. Municipal waste generation



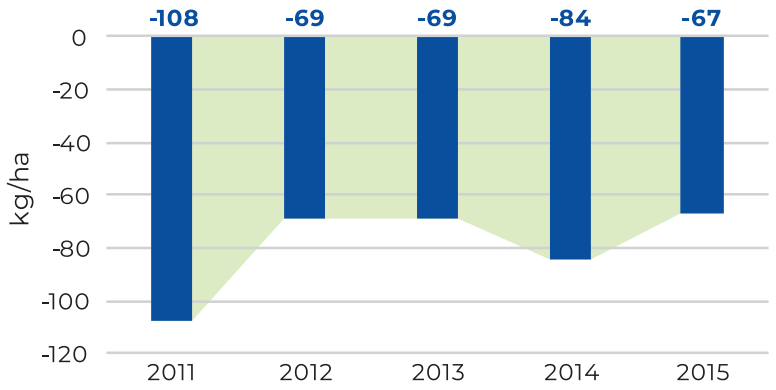
Source: Ukrstats.

Figure 2.8. Use of fertilisers



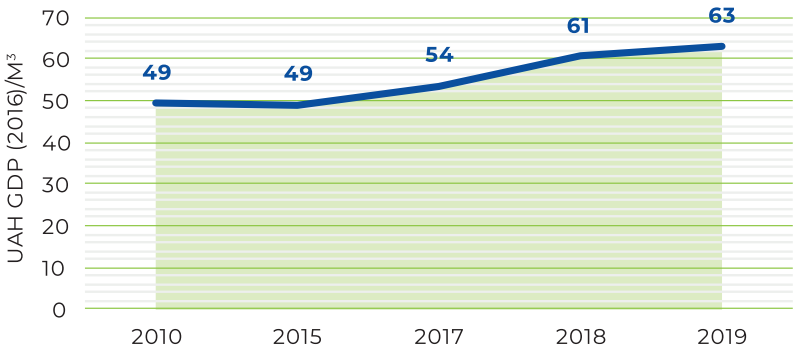
Source: Ukrstats.

Figure 2.9. Nutrients balance



Source: Soil Protection Institute of Ukraine (2018).

Figure 2.10. Water productivity



Source: Ukrstats, own calculations.

Main trends

The material intensity of GDP has hardly changed over the last five years.

The material intensity of GDP is part of the monitoring of the Sustainable Development Goals according to the indicator "GDP resource intensity" (Goal 12.1). The corresponding national target (12.1.1) envisages a 10% reduction in the resource intensity of GDP every five years (reaching 60% of the 2015 level in 2030). Currently, this goal is not achieved for material consumption (in 2019 - 105%). This means that the material productivity of the national economy does not change.

The generation of household and similar waste in Ukraine does not tend to decrease.

The dynamics of municipal waste generation shows its growth per capita, including in the last five years. Thus, at present we cannot talk about decoupling with economic growth. At the same time, this indicator in Ukraine (280.6 kg/capita) is lower than the European average - 493 kg/capita (OECD, 2021).

If no policy changes are in this area in Ukraine, we should expect further growth in the volume of household waste in accordance with the dynamics of GDP growth.

A significant problem is the management of household and similar waste: according to the State Statistics Service in 2020, only 0.04% of the total volume of such waste was recycled, and 1.3% was incinerated.

The use of mineral fertilizers in Ukraine per unit of area is gradually increasing, but the balance of nutrients is negative.

The use of mineral fertilizers has increased 2.5 times over the last 10 years and today is 2.3 t/ha. This is twice less than the EU average (Society and Environment, 2021). Due to excessive plowing, insufficient application of mineral and organic fertilizers, the soil continues to degrade. This is evidenced, in particular, by the negative balance of nutrients since 1996 (Society and Environment, 2014). At the same time, over the last five years, the negative balance of nutrients has decreased from -108 kg/ha to -67 kg/ha, which is directly related to the increase in the use of mineral fertilizers.

Over the last ten years, water productivity in Ukraine has increased significantly.

The use of fresh water has decreased statistically over the last 10 years due to the temporary occupation of part of Ukraine. At the same time, from 2015 to 2019, the use of fresh water has not changed, but the recycled water use has significantly decreased. As a result, the total amount of water used has decreased over the last five years. Combined with GDP growth over the past five years, this has led to a 28% increase in the water productivity of the national economy over the last ten years.

Improving the efficiency of water use is the task 6.1 of the national SDG 6 "Clean water and proper sanitation": by 2030, the current water intensity of GDP (inverse to water productivity) should decrease to 70% compared to 2015. In 2019, this target has already been reached - the water intensity of GDP was 43.19% by 2015 (Ukrstats, 2021).

Technical comments on measurability and interpretation

GDP material intensity index - an indicator of the ratio of the volume of materials/raw materials used by sectors of the economy (volume of domestic consumption of materials) in the period for which the calculation is made, to GDP in the same period at reference/base year prices, % to base year (base year = 100%). Material consumption of GDP is calculated by the Ministry of Economy as part of the calculation of resource intensity of Ukraine's economy for monitoring SDG 12 in accordance with the Guidelines for calculating resource intensity of gross domestic product at the national economy level by main groups of resources, labor productivity at the national economy level, regional level and economic activity coefficient return on fixed assets at the level of the national economy and by type of economic activity, approved by the Order of the Ministry of Economic Development and Trade of Ukraine dated 06 June 2019 N 965. Index is published by the State Statistics Service in the annual SDG monitoring reports.

The generation of household and similar waste is the amount of waste collected per person. This indicator currently takes into account data on collected waste, but it should be taken into account that only 79% of the population of Ukraine is covered by household waste disposal services. Data source - statistical report "Environment of Ukraine" (Ukrstats).

Use of mineral fertilizers per hectare - application of mineral fertilizers per unit area of agricultural land. Data source - statistical report "Environment of Ukraine" (Ukrstats).

The balance of nutrients is calculated as the ratio between the total supply of nutrients (nitrogen, phosphorus, potassium) and their removal per unit area of agricultural land. The balance is compiled based on the results of periodic agrochemical land surveys, which are carried out every five years and published in the periodic report on the state of soils. The results of the 10th round of the survey (2011-2015)

are currently available. Data source - Institute of Soil Protection of Ukraine.

Water productivity of GDP is the ratio of annual GDP to annual volumes of water used. Water productivity of GDP is calculated as the ratio of annual GDP at constant prices to the sum of annual volumes of fresh water use and recycled and repeatable-sequential water-supply . Data source - State Statistics Service and State Water Agency.

Definitions

Material intensity at the level of the national economy is calculated as the ratio of the volume of materials/raw materials consumed by the sectors of the economy (volume of domestic consumption of materials) in the period for which the calculation is made to GDP in the same period at base year prices.

Domestic consumption of materials/raw materials includes consumption of three main groups of materials/raw materials (biotic materials, metallic minerals and construction-industrial minerals). The indicator of the volume of domestic consumption of materials estimates the total amount of materials used by the economy and is calculated as the sum of the volumes of extraction/production and imports of materials excluding the volumes of their exports.

Household and similar wastes are wastes that are generated in the process of human life and activity in residential and non-residential buildings and are not used at the place of their accumulation. According to the European Statistical Classification of Waste (EWC-Stat) they belong to the category of waste 10.1.

Mineral (artificial) fertilizers - products of one of the branches of the chemical industry that contain nutrients needed for agriculture. Include nitrogen, phosphorus, potassium fertilizers.

Agricultural land - land that is systematically used to obtain agricultural products.

Nutrients balance - the ratio between the total supply of nutrients (nitrogen, phosphorus, potassium) and their removal per unit area of agricultural land.

Use of fresh water - the amount of water taken from natural sources or obtained from the water supply system of other water users, which is used to meet different needs of water users. Water use does not include volumes of water in recycled and re-water supply systems (except for water received to replenish losses in these systems).

Water abstraction from natural water bodies - permanent or temporary abstraction of water from any source, including used mine, quarry and drainage water.

Recycled and re-supplying water is the total volume of water that would be necessary to during the year in the absence of systems of recycled and reusable water supply (the amount of savings taken or received from other water users through the use of recycled and re-water supply systems).

Gross domestic product (GDP) is an integrated indicator of economic development of the country, which characterizes the result of production activities of residents within the economic territory of the country and is measured by the total value of goods and services, made by them for end use.

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2.3 Multifactor productivity of the economy

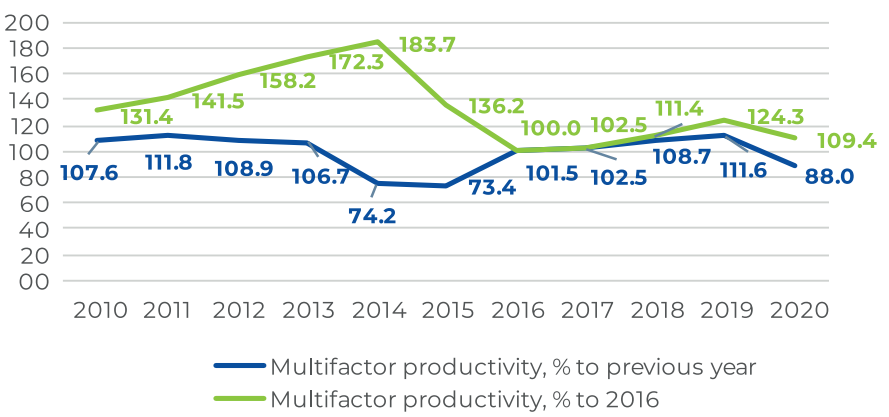
Today, one of the most common indicators of the impact of scientific, technological and technological progress on the economic development of countries is total factor productivity (TFP) or "multifactor productivity" (MFP). TFP is recognized by experts as an important factor influencing both long-term economic growth trends and its short-term fluctuations.

Researchers at the International Monetary Fund (IMF) in their report (IMF, 2017) concluded that the growth of the TFP is the most important long-term driving force for improving living standards. In recent years, the TFP has slowed to no more than 0.2% per year in both developed and developing countries. The slow growth of the IMF's productivity is described as a threat to progress, especially in terms of improving global living standards, the viability of social protection systems and the ability of economic policy to respond to future shocks. Therefore, the IMF and scientists from different countries over the past few years have been analyzing in detail the reasons for the slowdown in total factor productivity and the factors influencing it.

The main factors influencing the TFP in the world are innovation activities, which are facilitated by: international transfer of knowledge and technology; activities of small innovative fast-growing firms (Kvasha, 2019); models of organization of production of goods and services; the level and dynamics of energy and resource prices; improving the level and quality of education; workforce qualification; institutional quality of the innovation environment, increasing spending on science and innovation, especially in the business sector; increase investment in intangible assets; activation of patent activity, etc.

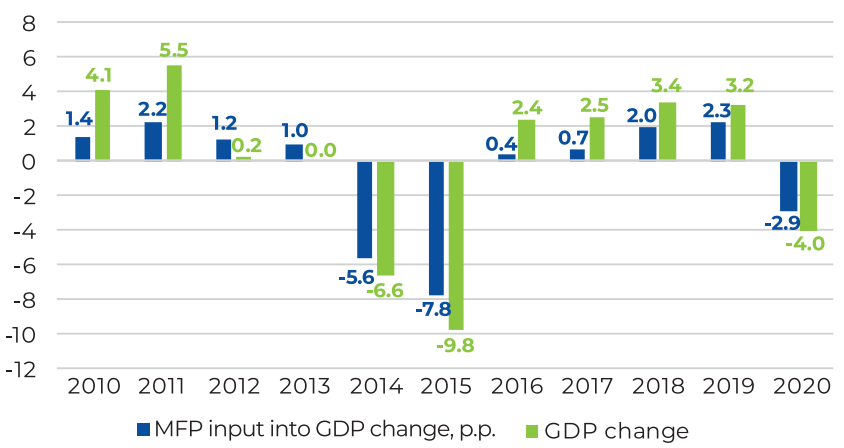
The OECD today offers an improved approach to taking into account multifactor productivity - environmentally adjusted multifactor productivity (EAMFP). It allows to take into account the environmentally harmful side effects of economic activity (OECD, 2017).

Figure 2.11. MFP change



Source: MFP – own calculations; GDP – Ukrstats.

Figure 2.12. MFP input into GDP change, p.p.



Source: MFP – own calculations; GDP – Ukrstats.

Main trends

In 2018-2019, the TFP became the most influential factor in economic growth in Ukraine.

During 2001-2013, the growth rate of TFP in Ukraine was quite significant and steadily growing (except for 2005), and since 2014, as in the rest of the world, the dynamics of its growth has slowed down. The contribution of the TFP to GDP growth rates during 2001-2019 (except for the crisis years of 2008, 2014-2015 and 2020) was positive and often the highest. TFP in 2018-2019 became the most influential factor of economic growth in Ukraine and added 2.0-2.3 percentage points to the GDP index, which is higher than in any OECD country and shows the effectiveness of innovation in our country.

In OECD countries in 2018, this indicator ranged from 0.6 percentage points in Finland and Sweden to 1.8-2.0 percentage points in Switzerland, Denmark, South Korea. In general, in developed countries there is a slowdown in productivity and TFP, which is explained by the "pause" between the radical new digital technologies that are being developed and their inclusion in production processes; insufficient demand; reducing the contribution of technological progress. But there is no generally accepted reason.

In the crisis years, the negative contribution of TFP was also the highest, because in such periods, business thinks about the survival of its enterprise, not about innovation.

The slowdown in TFP growth and productivity is a concern, as productivity growth is a major source of long-term per capita income growth, which in turn is a major driver of poverty reduction and GDP growth.

One of the influential factors in this slowdown is the decline in capital investment, which, according to IMF research, leads to a constant loss of production and total factor productivity (IMF Working Papers, 2021).

The growth of TFP in Ukraine during 2018-2019 was facilitated by the following factors:

- increase in the share of GVA in the output of high- and medium-high-tech industrial sectors (from 36.5% and 22.6% in 2015 to 41.3% and 29.1% in 2019, respectively);
- increase in the share of added value in the costs of small business production in the total amount of the country's value added from 19.4% in 2015 to 26.6% in 2019.

In turn, the latter factor is a consequence of:

- increase in the share of SMEs in such economic activities as "Information and telecommunications", in particular in the CETT "publishing of computer games" by 5.7%, "telecommunications (telecommunications, computer programming)" - by 13.6%, "computer programming" - by 0.9%, the provision of "other information services" - by 1.9%. As well as for CETT "activities in the fields of architecture and engineering, technical consulting services" - by 2.9% and "activities in the field of engineering, geology and geodesy, technical consulting services in these areas" - by 4.5% (all - technological innovations);
- provision of SME support services and modernization of SME support infrastructure (organizational innovations);
- growth in exports of high-tech services: according to the NBU, the positive balance of telecommunications, computer and information services increased 2.5 times during 2016-2019 (from USD 1.5 billion in 2015 to USD 3.6 billion in 2019), and the share of these services in exports increased from 16.9% in 2015 to 25% in 2019 (Ministry of Economy, 2020).

In sum, the growth of TFP is largely due to organizational innovations (in terms of supporting small businesses to implement the SME Development Strategy and the Innovation Development Strategy) and marketing innovations and external demand for ICT services.

At the same time, the following factors slowed down the growth of TFP:

- reduction of funding for research - from 0.55% of GDP in 2015 to 0.43% of GDP in 2019. TFP, according to OECD research (Westmore, 2013), directly depends on the volume of spending on science and innovation compared to GDP, especially, from the costs of the business sector;
- low share of industrial enterprises implementing innovations, which in 2019 was 13.8% against 17.3% in 2015;
- small amount of sales of innovative products in the total volume of sold industrial products, which in 2019 amounted to 1.3% (2.5% in 2015);
- reduction of the share of exports of goods with the use of high and medium-high technologies in the production of total exports of goods from 19.2% in 2015 to 16.4% in 2019;
- a significant share of the transfer of research and technology results without registration of intellectual property rights;

- reduced number of transferred technologies created with budget funds;
- small volumes of capital investments (only in 2018 in relation to GDP they reached 16% of GDP, in other years during 2014-2020 capital investments were at the level of 12-15% of GDP, which for Ukraine is extremely small volumes, because the degree of depreciation of tangible assets in Ukraine is 56.9%).

Negative trends include a decrease in the contribution of education or the quality of human capital into the TFP.

There is an urgent need for targeted policies to stimulate capital investment, in particular in infrastructure and human capital. A targeted reform agenda is needed to restore productivity growth, especially in light of the possible sustained impact of COVID-19 on productivity and TFP. In particular, policies are needed to address key barriers, such as educational gaps, increasing the quality of the workforce and investment.

Macroeconomic stability encourages investment, while open trade and investment in research support innovation. Promoting investment in digitalization can expand access to high-quality online learning and education. More targeted social protection systems could prevent the outflow of children from schools, which is linked to long-term incomes and future productivity growth.

Technical comments on measurability and interpretation

Currently, the calculation of multifactor productivity is not carried out on a regular basis by government agencies in Ukraine.

The methodology for calculating the dynamics of TFP is based on the Solow model, which is used by foreign and domestic researchers in its original or elaborated form (Kvasha, 2019).

Traditionally, the assessment of multifactor productivity involves determining the part of the productivity indicator that does not depend on changes in capital and labor, but is explained by other factors and is calculated as the "Solow balance". The following approaches were used for the purposes of this study.

In general, the function of the dependence of output, gross domestic product (GDP) or gross value added (GVA) of the country on the resources of capital and living labor is represented as follows:

$Y_t = Ft(K_t, L_t, A_t)$, (1)

where Y – output of products (GDP, GVA), measured in value terms at constant prices; K – fixed capital used in the production process and measured in value terms; L - labor resource, which is measured by the number of employees, the number of man-hours worked or the amount of labor costs in value terms; A – structural parameters of the production function or parameters of scientific and technological progress. All terms of equation (1) are considered as variables in time t.

While the parameters Y, K and L are statistically observed, the parameter A is estimated on a residual basis. One common approach is to use the Cobb-Douglas production function for equation (1):

$Y = A^{1-a-ß} L^{a} K^{ß}$ (2),

where a – coefficient characterizing the contribution of labor to the change in output (GDP), ß – contribution of capital to the change in output (GDP). As a rule, a - coefficient of elasticity of output (GDP) in relation to labor, ß - in relation to capital (Suvorov 2008, Kasych 2013 at al.). Some authors suggest measuring the a ratio by the share of labor costs in total economic expenditures (or individual industries), the amount of wages of employees and the part of gross mixed income that corresponds to the labor contribution of self-employed persons in value added of households in output (GDP). In relation to capital, its contribution ratio (ß) is measured by the share of capital expenditures in output (GDP).

Logarithmic differentiation (2) allows to bring this equation to the following:

$$(1-\alpha-\beta)\frac{d\ln A}{dt} = \frac{d\ln Y}{dt} - \alpha\frac{d\ln L}{dt} - \beta\frac{d\ln K}{dt} \quad (3),$$

or $$M\dot{F}P = \frac{\dot{Y} - \alpha\dot{L} - \beta\dot{K}}{1-\alpha-\beta} \quad (4),$$

where:

$M\dot{F}P = \frac{d\ln A}{dt}$ – growth rate of multifactor productivity in the year t,

$\dot{Y} = \frac{d\ln Y}{dt}$ – output growth rate (GDP) in real prices in year t,

$\dot{L} = \frac{d \ln L}{dt}$ – growth rate of labor in year t,

$\dot{K} = \frac{d \ln K}{dt}$ – capital growth rate in year t.

Definitions

The multifactor productivity index is the difference between the physical output index and the labor and capital productivity indices. The contribution of these factors is weighted by the share of their costs in the cost of production or GDP.

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Chapter 3.

Natural asset base

Is the natural asset base of the Ukrainian economy being maintained?

The indicators in this section reflect whether the natural asset base is being kept intact and within sustainable thresholds in terms of quantity, quality or value. Progress can be monitored by tracking stocks of natural resources and other environmental assets along with flows of environmental services: renewable resources, non-renewable resources, biodiversity and eco-systems.

3.1 Renewable natural resources

Renewable natural resources are an integral part of any economy. At the same time, the overall pressure on renewable resources remains high, a third of fish resources are over-harvested, and much of the world's forests are threatened by degradation, fragmentation and destruction (OECD, 2017).

Freshwater resources are of great ecological and economic importance. The pressure on water resources is created by their excessive intake and deterioration of their ecological condition. Water quality is affected by water abstraction, pollution caused by human activities (agriculture, industry, households), climate change and climatic conditions. The main problems concern the inefficient use of water and the environmental and socio-economic consequences of such use. The main task is to ensure sustainable water management, avoid overproduction and deterioration, maintain an adequate level of fresh water of adequate quality for economic activity and human consumption, and support aquatic and other ecosystems. Water efficiency is a key factor in balancing supply and demand. Loss reduction, the use of more efficient technologies and reuse are part of the solution, but crucial elements of sustainable management and, consequently, green growth policy are the application of the "user pays" principle and an integrated approach to freshwater management on a basin basis.

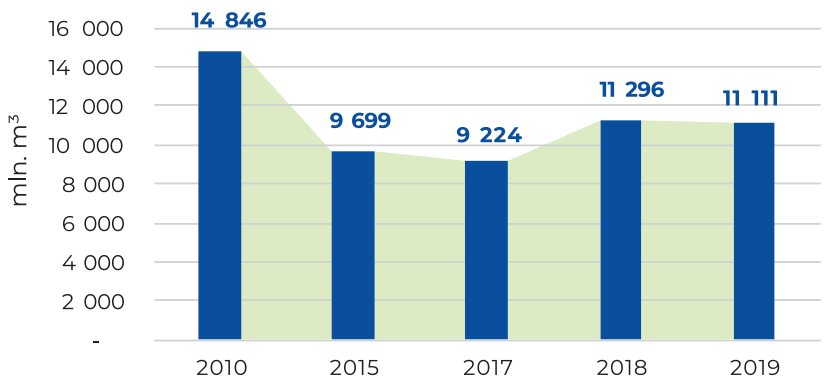
Forests are one of the most diverse and widespread ecosystems on Earth, performing many functions: they are a source of wood and other products, perform recreational functions, provide a number of important ecosystem services, including soil formation, greenhouse gas deposition, air and water chemistry, they are the habitat many species. Human activities can have an impact on forest biodiversity, their natural growth and regeneration. This raises concerns about the consequences of such impacts in terms of the economic, environmental and social functions of forests. The main challenge today is to ensure the sustainable management of forest resources in order to preserve them as a source of valuable raw materials, a provider of ecosystem services and as a center and base for biological diversity.

Fishery resources play an important role in ensuring food security and preserving aquatic ecosystems. The pressure on fishery resources is created by fishing, coastal development and pollution from human activities, maritime transport and dumping of waste into the sea. From an economic point of view, sustainable fisheries are important for achieving not only the recovery of fish stocks and the conservation of biodiversity, but also the improvement of livelihoods, trade, safe fisheries products and economic growth. Sustainable ecosystem management of fishery resources must be ensured so that production does not exceed recovery and does not disrupt the sustainability of ecosystems.

Indicators:

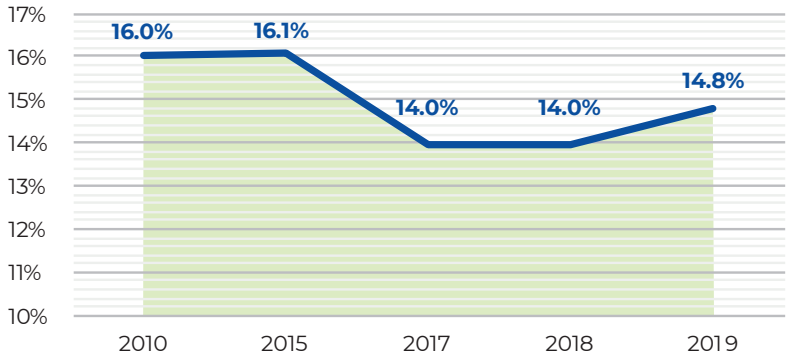
- Use of water resources
- Forest cover share in the territory of Ukraine
- Intensity of use of forest resources
- Extraction of aquatic bioresources.

Figure 3.1. Water intake from natural water bodies



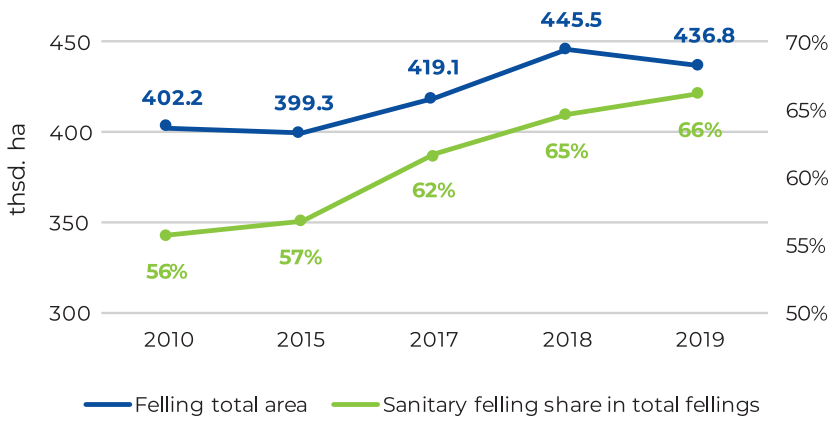
Source: Ukrstats.

Figure 3.2. Forests cover share in total territory



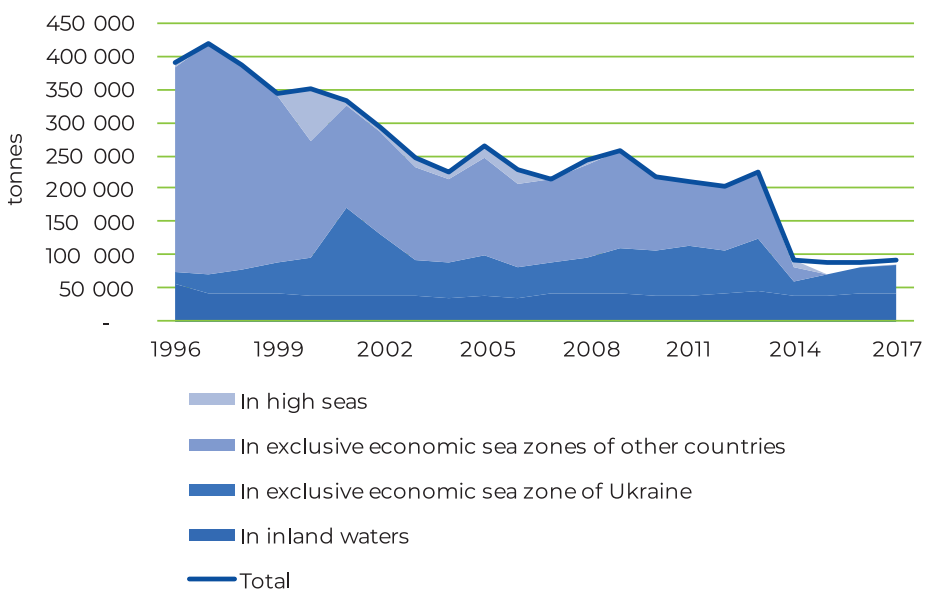
Source: Ukrstats.

Figure 3.3. Intensity of forest resources use



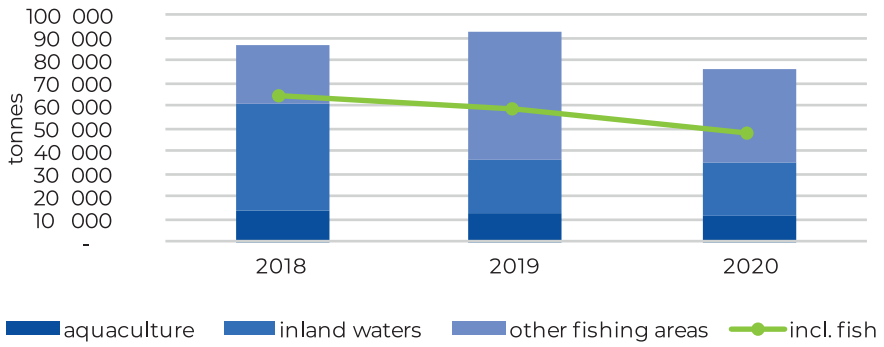
Source: Ukrstats.

Figure 3.4. Water bioresources exploitation (1996-2017)



Source: Ukrstats.

Figure 3.5. Water bioresources exploitation (2018-2020)



Source: Ukrstats.

Main trends

Over the last ten years, the pressure on freshwater resources has decreased.

In 2019, water abstraction from natural water bodies amounted to 11.1 billion m^3, which is 3.7 billion m^3 less than in 2010. This reduction is explained not only by the temporary occupation of Crimea (1.5 billion m^3 in 2010), but also by a significant reduction in water intake in most regions of Ukraine. The Kherson region, on the other hand, has increased its water intake by almost 2.5 times due to an increase in irrigation areas.

Ukraine's forest cover has decreased over the last ten years.

The area of forests and other areas covered with forest vegetation has decreased by 749 thousand hectares since 2010, which is not related to the temporary occupation of the territories of Ukraine. This sharp decline (by 8%) has occurred over the last five years and is partly due to changes in land use and forest accounting. Total area of felling increased by 9% over 2015-2019 period, while sanitary felling share is large and increased from 56% in 2010 to 66% in 2019.

In 2021, new regional standards for optimal forest cover of the territory of Ukraine were approved, but the overall figure has not changed: 20% of the territory of Ukraine (Ministry of Environment, 2021).

By the Decree of the President of Ukraine, the implementation of the environmental initiative "Large-scale afforestation of Ukraine" was launched. During the Ukraine 30. Ecology Forum (2021), it was announced that this initiative envisages an increase in forest area by 1 million hectares over 10 years and the planting of 1 billion trees over three years.

Fishing for fish and other aquatic bioresources has declined due to the occupation of Crimea and continues to decline.

The total extraction of aquatic bioresources in 2020 amounted to 76 508 tons, which is 5 times less than in 1996, 3 times less than in 2013, and 20% less than in 2019. The main reduction in the extraction of bioresources was due to the cessation of their extraction in the exclusive economic zones of other states and, to some extent, in the exclusive marine economic zone of Ukraine. Inland waterway production has halved in the last two years. Aquaculture volumes also decreased in 2018-2020 by 12%.

Technical comments on measurability and interpretation

Water resources use - the amount of water taken from natural water bodies. The source of data is the State Water Agency of Ukraine. The data are also published in the statistical report "Environment of Ukraine". It should be noted that water resources and their use vary significantly by region, which complicates the interpretation and application of national indicators.

Forest cover is an indicator that reflects the share of land covered with forest vegetation to the total area of the country, %. Forest cover is calculated as the ratio of the area of land covered with forest vegetation (numerator) to the total area of the state (denominator) and is displayed as a percentage. Data on forests area are collected by the State Service of Ukraine for Geodesy, Cartography and Cadastre in the form of the State Land Cadastre and published by the State Statistics Committee in the collection "Statistical Yearbook of Ukraine". Since 2016, the forms of administrative reporting on the quantitative accounting of land have been changed, which affects the comparability of data. The state land cadastre is not made

public, but information is available upon request. The State Agency of Forest Resources of Ukraine carries out its own calculation of forest cover on the basis of forest accounting data. During the Ukraine 30. Ecology Forum, an inventory of Ukraine's forests was announced to be carried out, which will provide much more reliable data on the area and composition of Ukraine's forests.

The intensity of use of forest resources includes two indicators: total area of felling of all types of felling (thsd. ha) and share of sanitary felling in total felling (since sanitary felling has biggest share among all types of felling in total area of felling). It is calculated as the ratio of the area of sanitary felling (numerator, thousand hectares) to the total area of felling (denominator, thousand hectares) in the reporting year and is expressed as a percentage. Areas of felling by felling types are presented in the annual statistical report "Environment of Ukraine". The corresponding OECD indicator is calculated as felling percentage of gross increment. However, such information is not collected with sufficient frequency in Ukraine, which makes it impossible to use this OECD indicator and compare it with other countries.

Extraction of aquatic bioresources - catch of aquatic biological resources by fishing areas. The source of data is the annual statistical report "Environment of Ukraine". From 2018, the data are presented in a different way, in particular without the allocation of exclusive economic zones.

Definitions

Water abstraction from natural water bodies - permanent or temporary abstraction of water from any source, including used mine, quarry and drainage water.

Lands covered with forest vegetation are forest lands on which closed stands grow. This indicator should be distinguished from the area of "forests and covered areas", which, in addition to lands covered with forest vegetation, also includes unforested lands, shrubs and other forest lands.

Areas of felling include areas of felling for general use and felling of forest formation and rehabilitation and other felling (including sanitary).

Sanitary felling includes selective and solid (clear-cutting) felling carried out to improve sanitary conditions of forests.

Aquatic bioresources (aquatic biological resources) - aquatic organisms, whose life is impossible without being in the water. Aquatic bioresources include freshwater, marine, anadromous and catadromous fish at all stages of development, round-mouthed, aquatic invertebrates, including mollusks, crustaceans, worms, echinoderms, sponges, intestinal, terrestrial invertebrates in the aquatic stage and other algae.

Extraction (catch) - the extraction of aquatic bioresources from their environment.

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3.2 Non-renewable resources

The mineral resource base is an important component of the national economy. The extractive industry provides about 6% of Ukraine's GDP in recent years. This report focuses on minerals, which are critical materials for the production of lithium-ion batteries, whose role will increase significantly with the share of RES and electric vehicles.

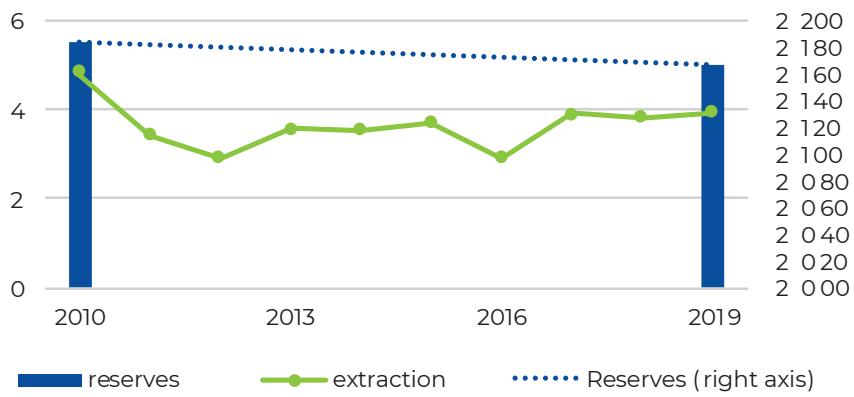
The production of lithium-ion batteries primarily requires such primary resources as lithium, manganese and cobalt. Their consumption on world markets will obviously only increase.

In Ukraine, stocks of lithium, the main material for the production of lithium-ion batteries, are a state secret. According to the State Service of Geology and Subsoil of Ukraine, there are three lithium deposits in Ukraine, two of which are being prepared for development (Shevchenkivske, Polokhivske and Dilyanka Dobra) (Geoinform, 2020).

Indicators:

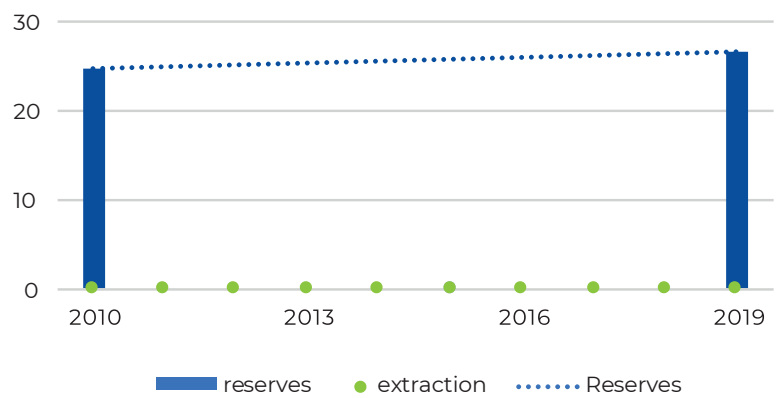
- Mineral reserves important for the production of lithium-ion batteries.

Figure 3.6. Magnesium (ore, mln. t)



Source: Geoinform of Ukraine.

Figure 3.7. Cobalt (ore, mln. t)



Source: Geoinform of Ukraine.

Main trends

Ukraine has significant world reserves of manganese and significant reserves of cobalt, but the latter is not mined.

Ukraine ranks second in the world in total manganese reserves, estimated at 2.2 billion tons of ore (Geoinform, 2020). In 2019, production in Ukraine amounted to only 3.9 million tons of ore (according to the US Geological Survey - 500 tons of manganese).

Cobalt reserves in Ukraine amount to 26.7 million tons of ore or 8.8 thousand tons of cobalt, but there is no extraction. In the global context, cobalt reserves are estimated at about 7.1 million tons, of which 3.6 million tons of cobalt - in Congo (US State Geological Survey, 2021).

In Ukraine, one deposit is being prepared for cobalt ore mining, but all cobalt reserves are part of complex deposits due to the peculiarity of cobalt metallogeny (close connection with copper and nickel) (Geoinform, 2020).

Technical comments on measurability and interpretation

Mineral reserves important for the production of lithium-ion batteries is an integrated indicator that includes reserves of ores and mining of lithium, cobalt and manganese - metals important for the production of lithium-ion batteries, thousand tons (million tons). For the purposes of monitoring ore reserves, the indicator "balance reserves" (total, A + B + C1) is used. The source of data on cobalt and manganese reserves, their extraction, as well as general information on lithium deposits is the yearbook "Mineral Resources of Ukraine", published by the State Research and Production Enterprise "State Information Geological Fund of Ukraine". Information on lithium balance stocks is a state secret (degree of secrecy - "secret"), SSU Order №383 of 23 December 2020.

References

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3.3 Biodiversity and ecosystems

Land and soil resources are an important component of the natural environment and the natural resource base of the economy. They are important for food production, biodiversity conservation and ecosystem productivity. How land is used and managed affects land cover and soil quality, water and air quality, erosion risks and plays an important role in flood protection.

Integrated land management and spatial planning, coherence with sectoral policies, and good governance are needed to ensure sustainable land and soil management.

Land use change is one of the main factors in the loss of biological diversity, in particular as a result of the conversion of land in its natural or semi-natural state into agricultural or built-up land (OECD, 2017).

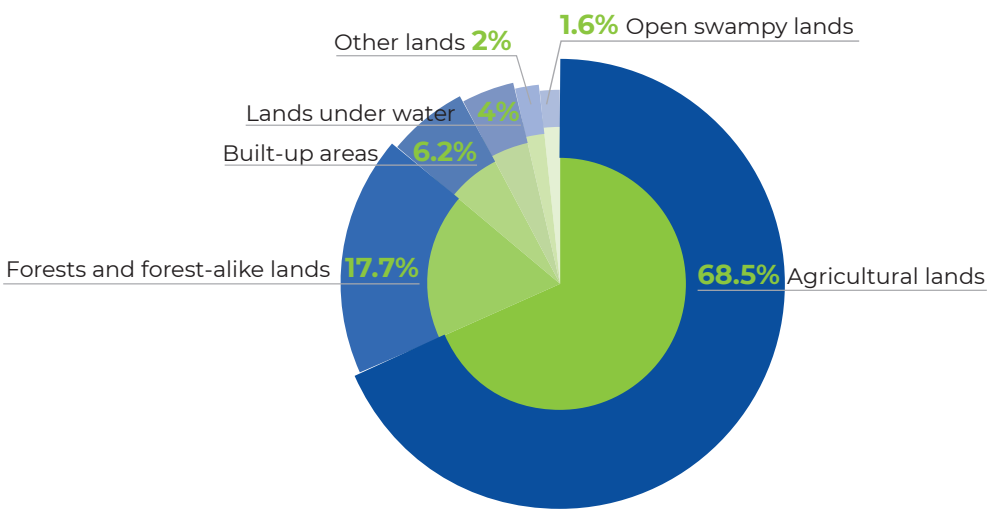
Biological resources provide raw materials for production and guarantee sustainable economic development. Maintaining ecosystems in their natural state creates conditions for the sustainable provision of ecosystem services to the environment. The protected areas and wildlife protection are necessary tools for the conservation of biological diversity in Ukraine, Europe, and the world. In turn, biodiversity plays an important role in ensuring the vital functions of the Earth's ecosystem. More than half of global GDP is heavily dependent on nature (WEF, 2020).

Nature-oriented solutions have a significant economic effect (UNEP estimates that one dollar invested in such solutions has an economic effect of USD 9). Therefore, they are at the center of efforts to address many global challenges, including climate change and recovery from the economic consequences of the COVID-19 pandemic (UNEP, 2020).

Indicators:

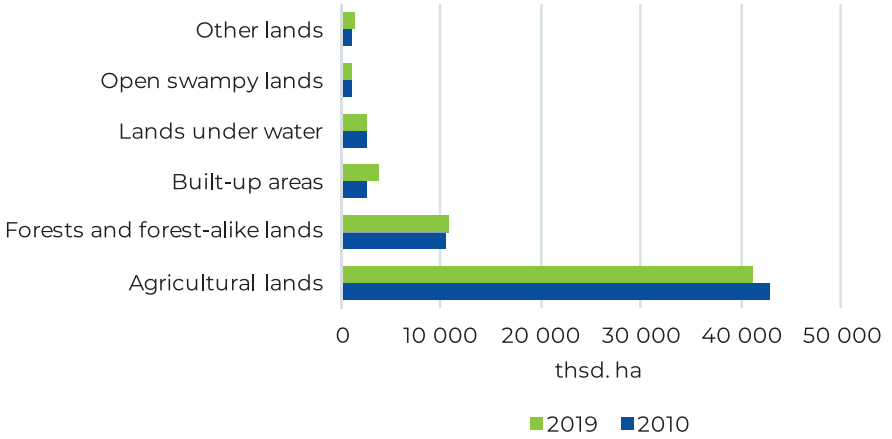
- The structure of the land fund of Ukraine and its dynamics
- Balance of humus
- The number of selected species listed in the Red Book of Ukraine in hunting farms
- The populations of hunted animals (game)
- The share of protected areas in the country total area.

Figure 3.8. Land structure (2019)



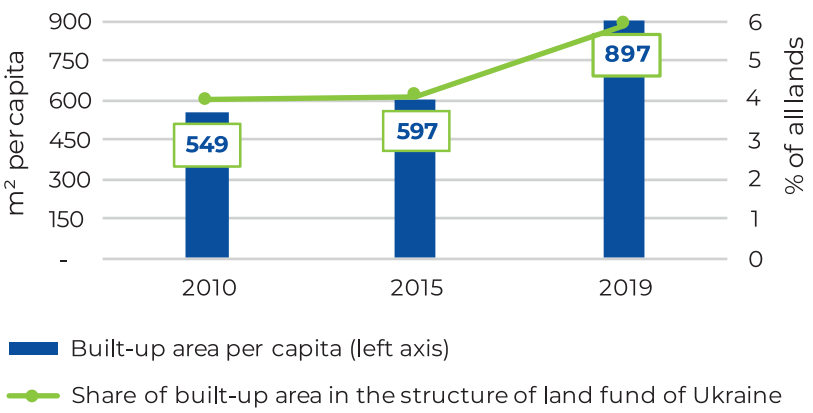
Source: Ukrstats (2020).

Figure 3.9. Land structure dynamics



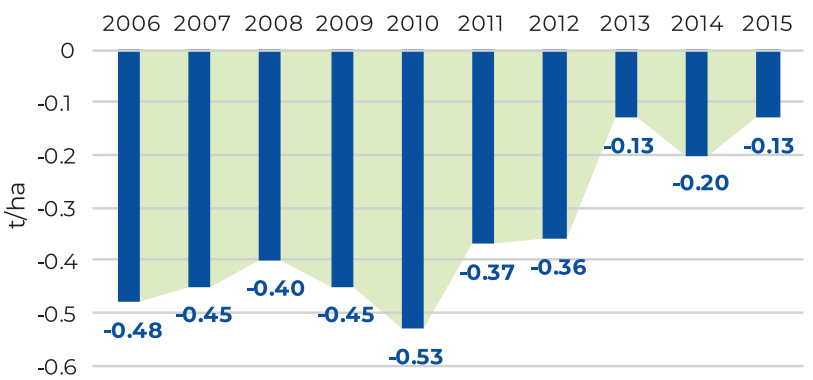
Source: Ukrstats.

Figure 3.10. Built-up area



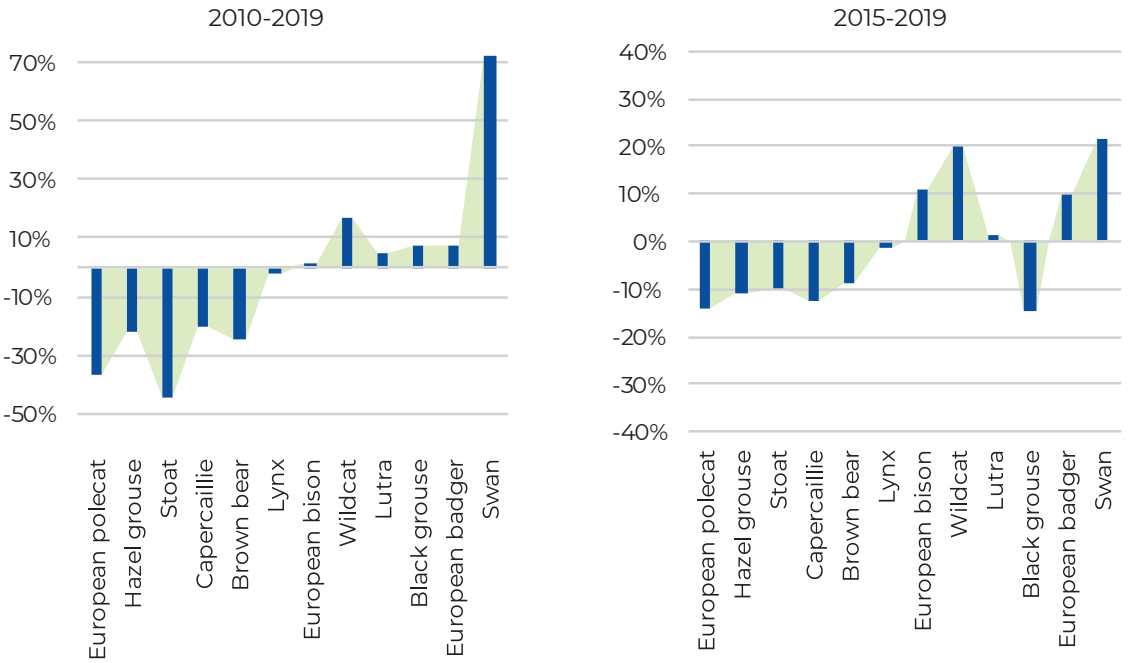
Source: Ukrstats.

Figure 3.11. Humus balance



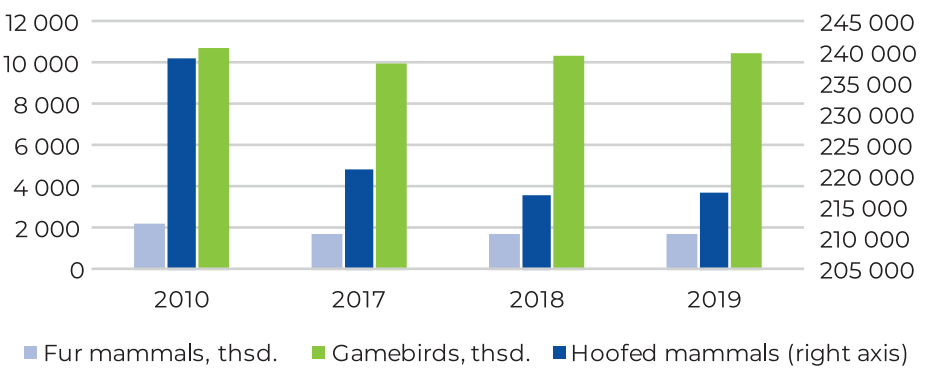
Source: Institute of Soils Protection of Ukraine (2015, 2020).

Figure 3.12. Populations change of some Red Book species in hunting farms 2010-2019 and 2015-2019



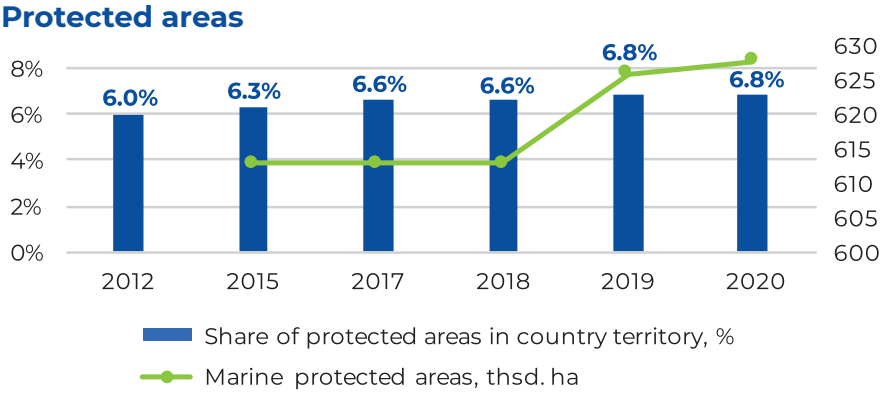
Source: Ukrstats.

Figure 3.13. Populations of some hunted species



Source: Ukrstats.

Figure 3.14. Protected areas



Source: Ukrstats (2021).

Main trends

Agricultural lands comprise two-thirds of total Ukraine's land resources, but the share of built-up lands is very high and growing.

Land area of Ukraine is one of the largest in Europe, and in its composition the largest share is occupied by agricultural land (68.5%). The plowing of these lands remains very high (as of 2019 - 79% of all agricultural lands are arable land). Over the last ten years, the structure of the lands has undergone slow changes in the direction of reducing the area of agricultural land and increasing the area of built-up land.

The area of built-up land in Ukraine is the highest in Europe and among OECD countries and continues to grow.

Per capita, the area of built-up land in Ukraine is 897 m^2, the average in OECD countries - 290 m^2, and in Belgium (the highest in the EU) - 417 m^2. In the period 2010-2015, this figure in Ukraine increased from 549 to 597 m^2/capita, which indicates an upward trend. The sharp change in the period 2015-2019 from 597 to 897 m^2/capita, apparently caused by changes in the methodology of formation of primary data on the composition of the land fund. At the same time, even the 2010 figure is the highest in Europe. Built-up land is the main location of sources of pollution and, in general, has a devastating effect on biological diversity.

In Ukraine, there is a further degradation of agricultural land, in particular a decrease in humus content.

In the last ten years, the balance of humus in the soils of Ukraine has remained negative, although its dynamics has improved somewhat in recent years. As of 2015, the balance of humus in Ukraine was -130 kg/ha, and the average for the period 2011-2015 - 210 kg/ha. In some regions of Ukraine it is positive (Poltava, Rivne, Ternopil, Cherkasy and Chernihiv), and the largest negative balance was observed in Dnipropetrovsk, Zaporizhia, Kherson and Odessa regions. The main reasons for the loss of organic matter in the soil are high plowing, catastrophic reduction of organic fertilizers use, unbalanced use of mineral fertilizers, violation of the structure of sown areas, high intensity of tillage. Thus, the application of organic fertilizers has been steadily declining throughout the years (except for 2018-2020) from 6 200 kg/ha in 1990 to 275 kg/ha in 2020.

The dynamics of the populations of hunted and Red Book species indicates their excessive capture. Ukraine critically lacks systematic accounting of animal populations, including protected ones.

The dynamics of the populations of some species listed in the Red Book, which are accounted by hunting farms, indicates that some species are losing their populations by 10-40%. For example, the population of brown bears over the past 10 years has decreased by 25%, and in the last 5 years - by 9%, stoat by 44% over the past 10 years. The growth of the forest cat populations by 20% over the last five years is positive. Populations of hunted animals in hunting farms in general have decreased, especially fur and hoofed mammals. For example, the population of hoofed animals decreased by 21.5 thousand heads. This negative trend is a consequence of excessive hunting and is not associated with the temporary occupation of certain areas. Thus, from 2010 to 2019 the number of harvested roe deer doubled and in 2019 reached 10 thousand heads, deer - 1.5 times and in 2019 reached 705 heads. In 2015-2018, more than 300 moose were harvested (banned in 2018).

Despite the positive dynamics, share of protected areas in Ukraine remain low.

Since 2012, the share of protected areas has increased by 12% and is 6.8% of the country's territory today. This figure is much lower than in most European countries. The protected areas in the Black and Azov Seas cover 627.6 thousand hectares (2020), comprising 16.6% of marine waters of Ukraine (marine internal waters and territorial sea). This is rather high figure though it dynamics is slow.

Ukraine plans to increase the share of protected areas to 15% of the country's territory by 2030, but achieving EU indicators is unrealistic (current level protected areas share in the EU - 23%, target - 30% of both land and marine by 2030) (Society and Environment, 2021).

Technical comments on measurability and interpretation

The structure of the land (so called "structure of the land fund of Ukraine") - the composition of the lands of Ukraine according to the results of quantitative accounting of land by type of main land and economic activity, as of the end of the year, thousand hectares and %. Types of main land and economic activities are: "Agricultural land", "Forests and other forested areas", "Built-up land", "Underwater land", "Open wetlands" and "Other lands". To monitor the dynamics of the structure of the land fund of Ukraine, 2010 is taken as the base year and compared with the latter.

The primary source of data on the composition of the land fund of Ukraine is the State Land Cadastre of Ukraine, but it is not made public, however, information from it can be provided upon request. Generalized data by types of main lands use and economic activity are calculated by the State Statistics

Service and published in the report "Statistical Yearbook of Ukraine". As with the forest cover indicator, the changes that have taken place in the formation of primary and generalized data since 2016 should be taken into account. The data available in Ukraine do not fully correlate with the results of observations based on satellite monitoring carried out by the Copernicus Land Monitoring Service (https://lcviewer.vito.be). Thus, according to this service, the area of agricultural land is 60.81%, and forests - 23.79% of the land area (including the ARC).

Humus balance is an indicator of the difference between the income and outcome of humus in the soil for the same period of time. Measured in tons per hectare. The source of data are periodic reports on the state of soils on agricultural lands of Ukraine, prepared by the Institute of Soil Protection of Ukraine. The availability of data is limited to a five-year soil survey cycle in Ukraine.

The humus balance can be deficit-free when losses are replenished by neoplasms, or positive when profits are greater than losses and deficit (negative) when humus losses are greater than its neoplasms. The main items of income that are taken into account in the calculation of the balance of humus are applied organic and mineral fertilizers, plowed crop residues (post-harvest) residues, non-commodity (side) part of the crop, green crops, land reclamation, revenues. The item of losses includes: removal of nutrients by harvest, erosion losses, leaching with filtration water and weathering in the atmosphere.

The number of mammals and game birds listed in the Red Book of Ukraine taken under the protection of the user of hunting farms in their places of residence - the number of certain species of mammals (European bison, brown bear, European badger, European polecat, lutra, wildcat, lynx) and birds (hazel grouse, stoat, capercaillie, black grouse, swan) on the territory of hunting farms, which are listed in the Red Book of Ukraine. The data source is the statistical report "Environment of Ukraine".

The number of individual species of animals in hunting farms - the number of heads of wild ungulates, fur-bearing animals and game birds in hunting farms. Hoofed animals include the following species: bison, elk, deer, fallow deer, roe deer, mouflon, wild boar, kulan. Fur-bearing animals include the following species: hares, wild rabbits, squirrels, muskrats, beavers, marmots, foxes, wolves, raccoon dogs, minks, badgers, otters, martens, forest ferrets, forest cats, lynxes, brown bears, ermines, jackals. Birds include the following species: geese, waders, pigeons, pheasants, partridges, quails, capercaillies, black grouse, grouse, ducks, swans, coots, waterfowl, mink. The source of data is the statistical report "Environment of Ukraine".

Wild fauna species monitoring is mostly carried out for hunting and fishing purposes in Ukraine. In particular, it is carried out for certain species in hunting farms and within protected areas for scientific purposes (the results of the latter do not allow for a comprehensive assessment of species in Ukraine). Stocks assessment of aquatic resources in inland waters, Black Sea and Azov Sea is carried out on an annual basis by relevant scientific institutions as part of the scientific assessment for approving so called limits for special use of water bio resources. Ukraine participates in international migratory birds inventorying on annual basis. There is no systemic monitoring of threatened or invasive flora and fauna species in Ukraine.

The protected areas share (so-called "share of the area of territories and objects of the nature reserve fund") in the total territory of the country is the percentage of the actual area of protected areas in relation to the total area of Ukraine. The source of data is the statistical report "Environment of Ukraine" and monitoring of the Sustainable Development Goals.

Area of marine protected areas in the Black and Azov Seas (so-called "area of territories and objects of the nature reserve fund in the waters of the Black and Azov Seas") - area of marine protected areas in the waters of the Black and Azov Seas. The only source of data is the monitoring of the Sustainable Development Goals, but the Ministry of Environment plans to make appropriate changes to the protected areas registry, which will allow having primary and reliable data on the water area of such protected territories.

Definitions

Agricultural lands - land plots that are systematically used to obtain agricultural products. They include arable land, fallow land, perennials, hayfields and pastures.

Forests and forested areas - land covered with forest vegetation, as well as non-forested land, shrubs and other forest lands.

Open wetlands - lands that are partially, temporarily or permanently flooded with water and which in the un flooded state is a moist, spongy substrate.

Built-up land - all land occupied by industrial facilities, built-up houses, roads, mines, opencast mining and any other structures designed to carry out various human activities, including areas for their maintenance.

Humus is an organic part of the soil, which is formed as a result of decomposition of plant and animal remains and products of life of organisms (humification).

The Red Book of Ukraine is an official state document that contains a list of rare and endangered species of fauna and flora within the territory of Ukraine, its continental shelf and exclusive (marine) economic zone, as well as generalized information on the current state of these species of fauna and flora and measures for their conservation and reproduction.

Hunting is an industry whose task is to use, protect and reproduce hunted animals, provide services to hunters for hunting, development of hunting sports and hunting dog breeding.

Hunting farms - areas of land and water space, which have hunting animals that can be used for hunting.

Number of wild animals - the number of wild ungulates, fur animals and game birds in hunting farms, which is determined on the basis of accounting materials conducted in the reporting year.

The protected areas (so-called "nature reserve fund") consists of land and water areas, natural complexes and objects of which have special environmental, scientific, aesthetic, recreational and other value and are allocated to preserve the natural diversity of landscapes, gene pool of fauna and flora, maintaining the overall ecological balance and providing background monitoring of the natural environment.

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Chapter 4.

Environmental quality of life

Does greening growth generate benefits for people in Ukraine?

The indicators in this section reflect how environmental conditions and environmental risks interact with the quality of life and well-being of people. They also point out how the amenity services of natural capital support well-being. Further, they can show the extent to which income growth is accompanied (or not) by a rise in overall well-being: exposure to pollution and environmental risks, access to environmental services and amenities.

4.1 Environmental health and risks

The state of the environment has a direct impact on the health of the population. In turn, deteriorating human health (chronic diseases, reduced life expectancy, premature death, etc.) reduces the quality of human life and increases the related costs for the government. Environmental conditions affect the quality of human life in different ways: through air and water pollution, exposure to hazardous substances and noise, as well as through indirect factors such as climate change, biodiversity loss and more.

The growth of production and income may not always be accompanied by an increase in the welfare of the population. Declining environmental quality of life can be a consequence and cause of unsustainable economic practices, as well as have significant negative socio-economic consequences: from health care expenditures to reduced productivity.

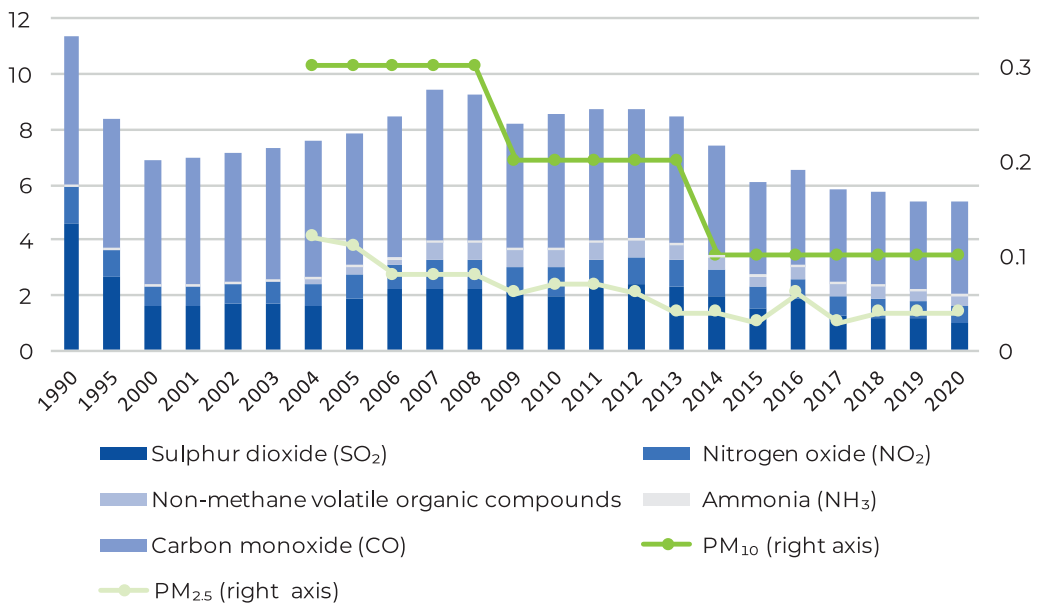
Air pollution poses the greatest environmental risk to human health (WHO, 2016). Reducing environmental risks in order to minimize their impact on public health is one of the goals of the Strategy of State Environmental Policy of Ukraine until 2030. Significant environmental pollution due to man-made loads creates a high level of risks to natural ecosystems and public health (NSDC, 2021).

Dust pollution ($PM_{2.5}$ and PM_{10}) is one of the most important factors affecting human health. This indicator is the basis of modern calculations of morbidity and mortality caused by air pollution. In some countries, the effects of indoor air pollution remain relevant, mainly due to the use of firewood and coal for heating and cooking. The use of solid fuels by the population is often associated with energy poverty as well as additional strain on natural resources. In addition, it is one of the factors that negatively affects the condition of vulnerable groups, including women, who are traditionally responsible for collecting firewood or cooking (UNEP, 2020). In Ukraine, it can also contribute to the illegal use of child labor, including coal mining.

Indicators:

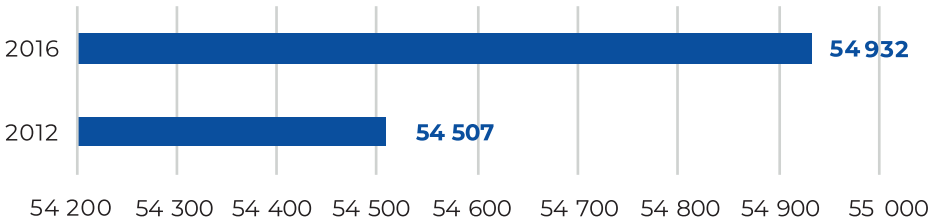
- Emissions of pollutants into the atmosphere
- Mortality attributable to ambient air pollution
- Cost of premature deaths from outdoor air pollution
- Household air pollution attributable death rate.

Figure 4.1. Air emissions, t/km²



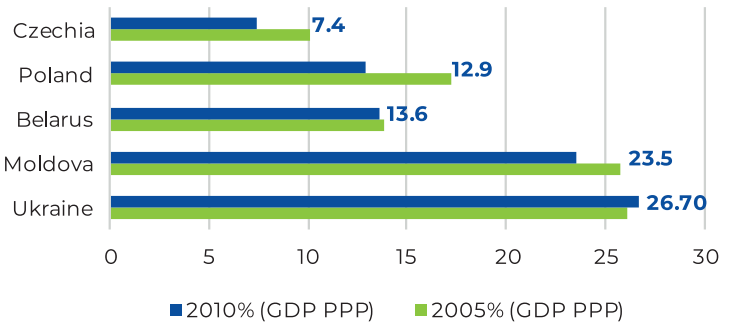
Source: Ukrstats.

Figure 4.2. Mortality attributable to ambient air pollution, deaths



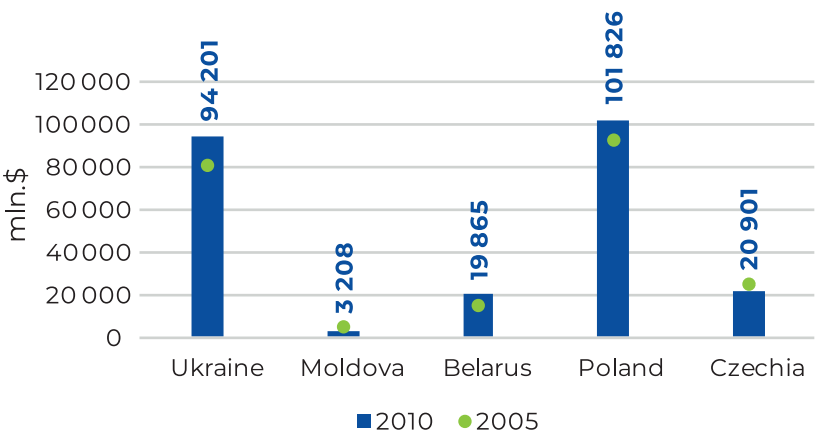
Source: WHO

Figure 4.3. Cost of premature deaths from outdoor air pollution



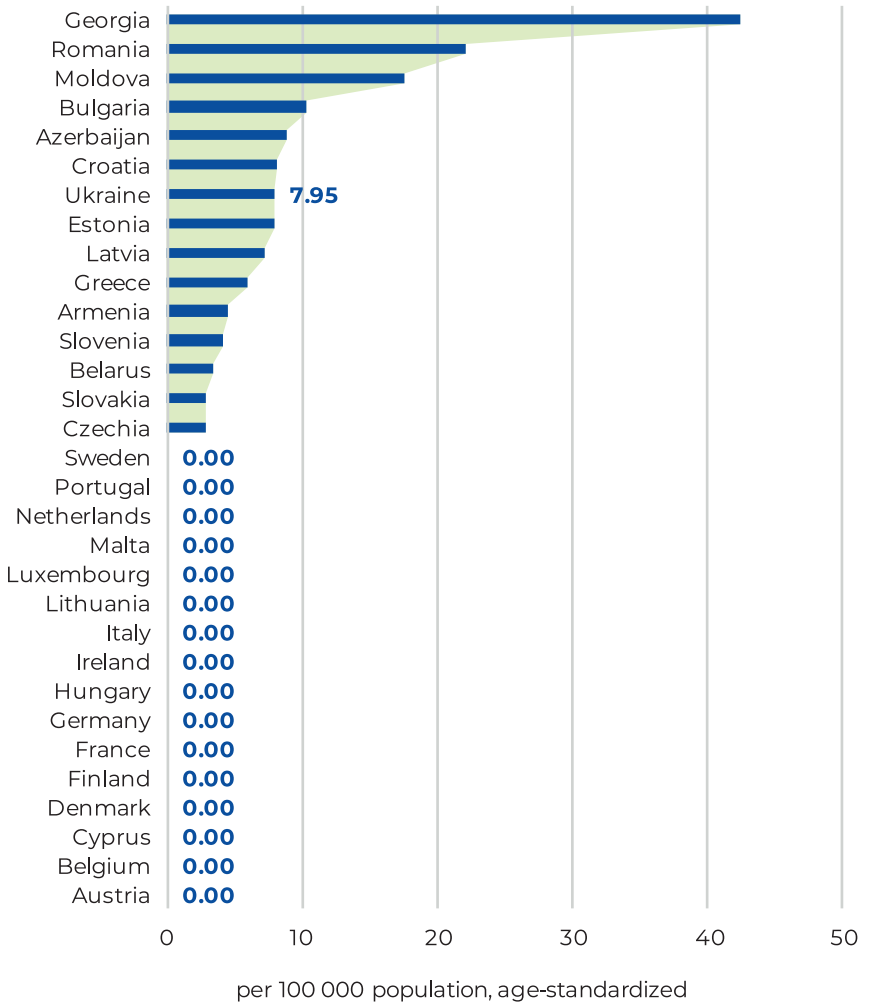
Source: WHO/OECD (2015).

Figure 4.4. Cost of premature deaths from outdoor air pollution



Source: WHO/OECD (2015).

Figure 4.5. Household air pollution attributable death rate



Source: WHO (2018).

Main trends

Emissions of all pollutants have decreased over the last ten years, but their levels remain high.

Compared to 1990, emissions of sulphur dioxide decreased 4.5 times, nitrogen oxide 2 times, ammonia and carbon monoxide 1.5 times, and dust emissions 2 times (compared to 2010). In part, the reduction in pollutant emissions since 2014 is due to the temporary occupation of parts of Donetsk and Luhansk oblasts. At the same time, this is not the only reason for such a decrease, as the number of enterprises that carried out emissions into the air increased (from 10 446 in 2009 to 11 295 in 2017), but their average emissions decreased significantly from 376 tons per enterprise to 228.9 tons, in particular in the energy sector, where emissions on average decreased from 259.3 t/year to 152 t/year (Ukrstats, Environment of Ukraine, 2009, 2017).

The reduction of sulphur dioxide emissions is primarily due to a significant reduction in coal consumption in 1990-2019 by more than 3 times (Energy Balance, Ukrstats) and almost complete disappearance of fuel oil from the fuel balance. It should be noted that coal, especially energy-type, which is mined in Ukraine, has a very high sulphur content, and its main consumers - thermal power plants were not equipped with desulfurization systems in the 1990s, and practically do not have them in 2019. In addition, compared to the 1990s, imported coal, which has a significantly lower sulphur content, has an increasing share in the balance in recent years. The same applies to fuel oil, which in the early 90's was burned at TPPs in huge quantities (in 1990, TPP burned about 13 million tons of fuel oil, which was mostly of high sulphur content), and in the 2000s is practically not used at TPPs (the volume of consumption at TPPs for the last 20 years is generally less than 0.1 million tons per year).

Thus, the anthropogenic pressure caused by air pollution is reducing.

Given the steady growth of Ukraine's GDP since 2015, declining emissions in the same period indicate the decoupling of economic growth and the burden on the environment. At the same time, in the last

five years there has been little change in pollutant emissions. This may indicate that further reductions in such emissions require new political and financial incentives.

In general, pollutant emissions are high, which affects air quality. According to the World Bank, the concentration of $PM_{2.5}$ in Ukraine is 20.31 micrograms/m^3, with an average value of 15 in OECD countries (World Bank Group, 2021).

Mortality caused by air pollution is high, and in terms of mortality caused by indoor air pollution, Ukraine ranks high among European countries and neighboring countries.

High mortality from air pollution is due to a large proportion of the urban population, the concentration of industrial zones and inadequate access to health care. According to the WHO (2018), in European countries this figure is much lower: per 100 thousand population (standardized by age) in Ukraine, the death rate caused by air pollution is 64 people per year, while in Poland - 38 , Latvia - 35, Hungary - 39, Belarus - 58. This figure is the highest in Europe (excluding the Caucasus). Of the post-Soviet countries, only Georgia (66), Uzbekistan (69), Kyrgyzstan (74), Turkmenistan (78) and Tajikistan (94) have worse results.

Indoor air pollution is an important indicator of the negative impact of burning solid fuels (firewood, peat, coal) for cooking, which is still common in some countries. Mortality caused by indoor air pollution in Ukraine is comparable to the countries of Eastern Europe and is 7.95 per 100 thousand population, which means almost 3.5 thousand people per year. It should be noted that in most Western European countries (for example, Sweden, Portugal, Italy, Germany, France, Denmark, Belgium, etc.) this figure is zero.

The negative economic consequences of premature deaths from air pollution are unacceptably high for Ukraine.

The total economic value of premature deaths from air pollution in Ukraine reaches USD 94 billion per year, which is 27% of GDP (PPP), and does not show a downward trend. One of the main indicators influencing this is the high mortality rate due to air pollution. In addition, economic losses are also caused by environmental diseases.

In total, the economic cost of air pollution-related premature deaths (7 million premature deaths per year) is more than USD 3.5 trillion worldwide and USD 1.5 trillion in Europe (including the economic cost of morbidity) (WHO/OECD, 2015).

Technical comments on measurability and interpretation

Ukraine critically lacks data on the state (quality) of atmospheric air and its impact on public health.

The amount of emissions of pollutants into the atmosphere per unit area is an indicator that characterizes the density of emissions of pollutants that enter the atmosphere from stationary and mobile sources of pollution. The calculation is carried out in Ukraine as a whole annually by the State Statistics Service of Ukraine and published annually on its web-site. For 1990-2002, data on road transport are displayed; since 2003 - on road, rail, air, water transport; since 2007 - on automobile, railway, aviation, water transport and production equipment, since 2016 - on motor transport, 2020 - preliminary data. More complete calculations of pollutants and greenhouse gases emissions (taking into account the data of the Inventory of Greenhouse Gas Emissions) are published by the State Statistics Service on its web-site (air emissions accounts) in line with timeframes set by the EU Regulation 691/2011.

Mortality attributable to ambient air pollution is an indicator that calculates the number of deaths caused by air pollution from all sources (except indoor pollution), persons / year. The calculation is made every four years of the WHO (2008, 2012, 2016, etc.): "Ambient air pollution attributable deaths". For the purposes of international comparisons, calculations per 100,000 population are taken and adjusted for the age structure of the population ("per 100 000 population, age-standardized"). The source of the data is the WHO Global Health Observatory.

Economic cost of premature mortality from air pollution - an indicator that reflects the assessment of economic losses from premature mortality caused by air pollution, million US dollars, % of GDP. The calculation is not carried out on a regular basis. The latest available attempts have been made jointly by the WHO, the OECD and the EU. A number of baseline indicators are used for the calculation, in particular: premature mortality caused by ambient particulate matter pollution (APMP) and indoor air pollution (HAP); value of a person's statistical life (VSL) and others. The data source is the report of the WHO Regional Office for Europe, OECD (2015). Economic cost of the health impact of air pollution in Europe: Clean air, health and wealth. Copenhagen: WHO Regional Office for Europe.

Household air pollution attributable death rate is an indicator that calculates the number of deaths caused by indoor pollution, persons/'000 population/year. The calculation is made on a regular basis by the WHO "Household air pollution attributable death rate". For the purposes of international comparisons, calculations per 100 000 population are taken and adjusted for the age structure of the population ("per 100 000 population, age-standardized"). The source of the data is the WHO Global Health Observatory.

Definitions

Air emissions - the entry of gaseous and solid suspended particles into the atmosphere, formed as a result of human economic activity. Emissions of pollutants include greenhouse gases and other pollutants. Main pollutants: sulphur dioxide (SO_2), nitrogen oxides (NO_2), non-methane volatile organic compounds (NMVOC), ammonia (NH_3), carbon monoxide (CO), total volume of suspended solids, PM_{10}, $PM_{2.5}$.

Indoor air pollution is pollution that results from the burning of solid fuels for cooking (coal, firewood, etc.).

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4.2 Environmental services and sanitation

Inadequate access to safe sources of water and sanitation is a significant negative factor in economic growth and welfare, affecting public health, increasing mortality and morbidity (OECD, 2017). The availability of water of adequate quality and in sufficient quantities is a prerequisite for strengthening human health and sustainable development (Society and Environment, 2014).

The right to sanitation is a fundamental human right (UNGA, 2010). Clean water and good sanitation represent Goal 6 of the global Sustainable Development Goals.

In countries with economies in transition, the main challenge is to increase the coverage of the rural population with water supply and sewerage, as well as the poor (OECD, 2017).

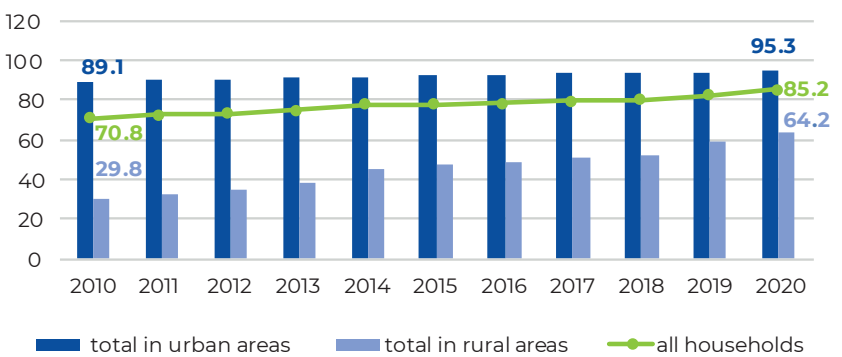
In Ukraine, the supply of drinking water to certain regions, including rural settlements, the emergence of water deficit regions of Ukraine, water scarcity in wells, as well as adaptation to climate change in the context of fresh water scarcity (Ministry of Regional Development, 2020). In 2020, for the first time in 120 years, Ukraine found itself in a situation where restricting the rights of water users was under consideration by the government (which was associated with the abnormally dry autumn and winter of 2019-2020).

Inadequate access to quality sources of drinking water, water supply, sewerage can be the cause of the spread of infectious diseases, premature mortality, especially among children.

Indicators:

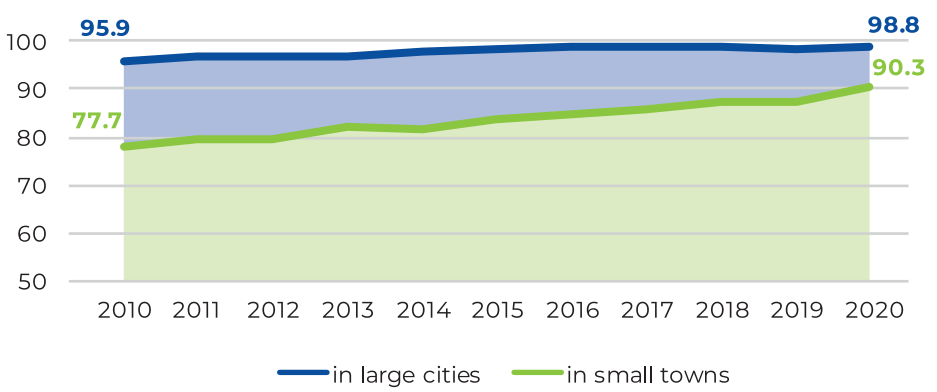
- Share of households equipped with sewerage
- The share of the population that has access to centralized water supply and sewerage
- Mortality from diarrhea caused by inadequate water, sanitation or hygiene.

Figure 4.6. Number of households with sewage systems, %



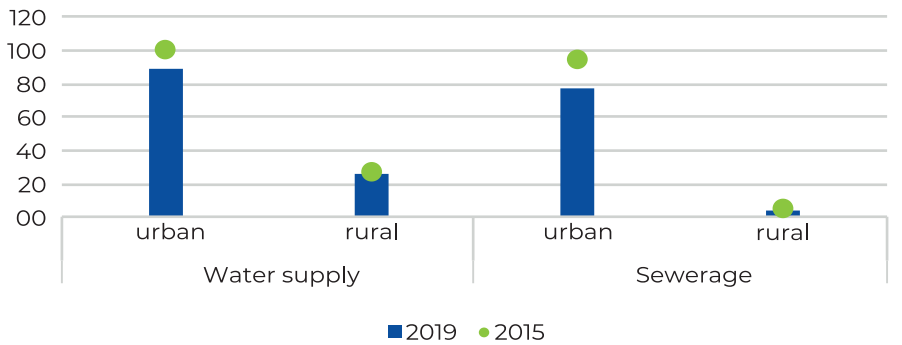
Source: Ukrstats.

Figure 4.7. Number of households with sewage systems, %



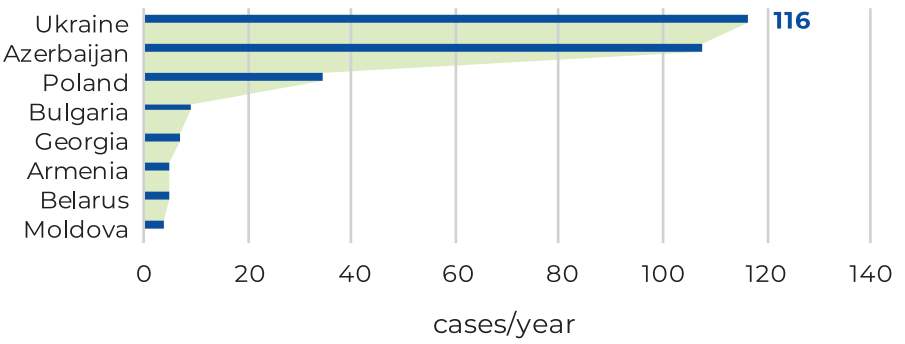
Source: Ukrstats.

Figure 4.8. Share of population with access to central water supply and sewerage, %



Source: Ukrstats (SGDs).

Figure 4.9. Number of diarrhea deaths from inadequate water, sanitation and hygiene (2016)



Source: WHO (2018).

Main trends

The share of households equipped with sewerage has been growing steadily in Ukraine over the last ten years, especially in rural areas.

The share of households equipped with sewerage is 85.2% (2020). In urban areas it is high (95.3%), and in rural areas it remains low (64.2%). Over the last ten years, the share of households equipped with sewerage in rural areas has doubled: from 29.8% in 2010 to 64.2% in 2020. There is a significant difference between small and large cities. Thus, as of 2020, 10% of households in small towns did not have sewerage.

Discharge of polluted municipal water directly into water bodies and through the municipal sewerage system is one of the main causes of surface water pollution (Ministry of Regional Development, 2020). In general, 95% of wastewater in Ukraine is treated. Urban wastewater treatment does not meet the requirements of the legislation, and the requirements themselves do not meet European requirements (Directive 91/271 / EEC) (Ministry of Regional Development, 2020).

Access to centralized water supply and sewerage is low, especially in rural areas.

According to the Sustainable Development Goals monitoring in Ukraine, the share of the population with access to centralized water supply and sewerage has fallen, except for a slight improvement in sewerage in rural areas. In particular, in 2015-2019 the share of cities with centralized water supply decreased from 99% to 89.5%, and with centralized drainage - from 92% to 77%.

Particularly critical is the indicator of centralized drainage in villages, which in 2019 was only 3.4%.

In general, in Ukraine there is no centralized water supply in four cities, and no centralized drainage in 14 cities. 19 059 villages remain without centralized water supply. 60 urban-type settlements do not have centralized water supply. There are significant differences in the provision of centralized water supply and sewerage between the regions. For example, in the Lviv region 1 639 villages do not have centralized water supply (as opposed to 17 in Kherson, 388 in Transcarpathia) (Ministry of Regional Development, 2020).

In terms of regional indicators of population access (rather than the availability of centralized water supply or sewerage in cities as such, as shown in the diagram), it is only in Kyiv and Kherson regions, and the city of Kyiv where 100% of the population has access to water supply and sewerage. The lowest rate of access of the population to centralized water supply in cities is observed in Zhytomyr region (64.5% of the population), and in villages - in Ternopil region (only 1.7% of the population has access to centralized water supply) (Ministry of Regional Development, 2020).

Most water supply companies are not able to provide drinking water in accordance with modern requirements (Order of the Ministry of Health №400 of 12 May 2010), so such requirements have been postponed until 2022.

Mortality from diarrhea caused by inadequate water, sanitation or hygiene is the highest in Ukraine among all neighboring countries.

Every year in Ukraine, 116 people die from diarrhea caused by poor water, sanitation or hygiene, including 101 children. The very fact of such mortality is socially unacceptable. Obviously, this indicator is influenced by the low level of access of the population of Ukraine to water supply, sewerage and sewerage.

Technical comments on measurability and interpretation

Ukraine critically lacks reliable national data on public access to water supply and sanitation and the impact of inadequate access to water supply and sanitation on public health.

The share of households equipped with sewerage means the percentage of households (total, in large cities, in small towns, in urban areas, in rural areas) that are equipped with sewerage. Data source - statistical report "Socio-demographic characteristics of households in Ukraine" (2010-2020). The data are obtained through a sample survey of living conditions of households in Ukraine, which is important to consider when interpreting the data.

The share of urban/rural population that has access to centralized water supply is determined by the total population that has access to centralized water supply.

Data on water supply and sewerage are submitted by the Ministry of Community and Territorial Development as part of the monitoring of the Sustainable Development Goals in Ukraine and are published by the State Statistics Service. In practice, the data are calculated as the share of cities (villages) equipped with centralized water supply/sewerage systems. The actual proportion of the population that has access to these services can vary considerably. Thus, according to the National Report on Drinking Water Quality and the State of Drinking Water Supply in Ukraine in 2019, cities in most oblasts have 100% access to centralized water supply and sewerage. Instead, the share of the population of these oblasts that has access to these services is mostly 75-95%, and in the villages the share of such population is even lower. In addition, according to the National Report on Drinking Water Quality and Drinking Water Supply in Ukraine in 2015, some of the data provided by regional state administrations were of low quality, which reduces the reliability of the total data in the country as a whole.

Mortality from diarrhea caused by inadequate water, sanitation or hygiene is an indicator that estimates the number of deaths from diarrhea caused by poor water consumption, poor sanitation or hygiene (deaths/year). The calculation is made on a regular basis by the WHO "Number of diarrhea deaths from inadequate water, sanitation and hygiene". The source of the data is the WHO Global Health Observatory.

Definitions

Large cities - 100 thousand people and more.

Small towns - with a population of less than 100 thousand.

Sewerage - a set of networks and engineering structures, as well as technical and sanitary measures that provide organized reception, discharge and treatment of wastewater with their subsequent use or release into water bodies, as well as processing of sewage waste for further disposal.

Centralized drinking water supply - economic activity to provide consumers with drinking water through a complex of facilities, structures, distribution water supply networks, connected by a single technological process of production and transportation of drinking water.

Centralized drainage - economic activity of drainage and wastewater treatment using a centralized drainage system.

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Chapter 5.

Economic opportunities and policy responses

How does greening growth generate economic opportunities in Ukraine?

The indicators in this section aim at capturing the economic opportunities associated with green growth and can help assess the effectiveness of policy in delivering green growth: technology and innovation, environmental goods and services, investment and financing, prices, taxes and transfers.

5.1 Technology and innovations

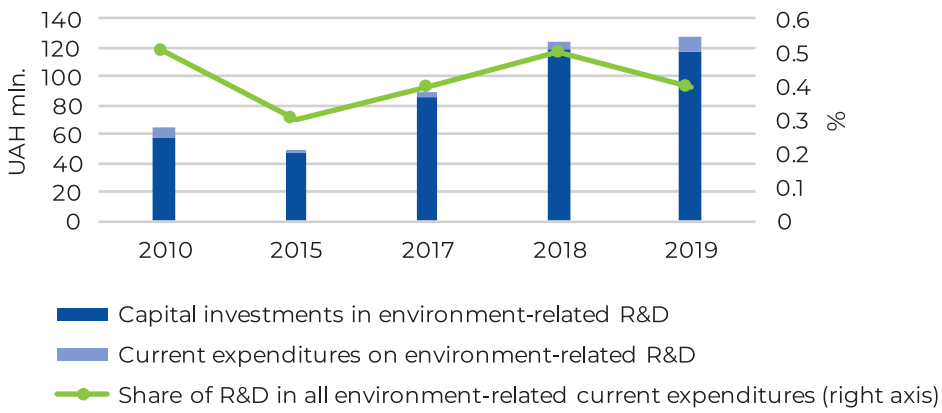
Technological development and innovations are significant stimuli for economic growth and productivity. It is also an important prerequisite for the efficient use of energy and materials, and support for green technologies and innovation must be an integral part of decarbonisation policy and environmental policy in general.

Progress in green growth can be assessed by analysing government and business action to support innovation and new technologies, as well as innovation activity in terms of the number of intellectual property patents.

Indicators:

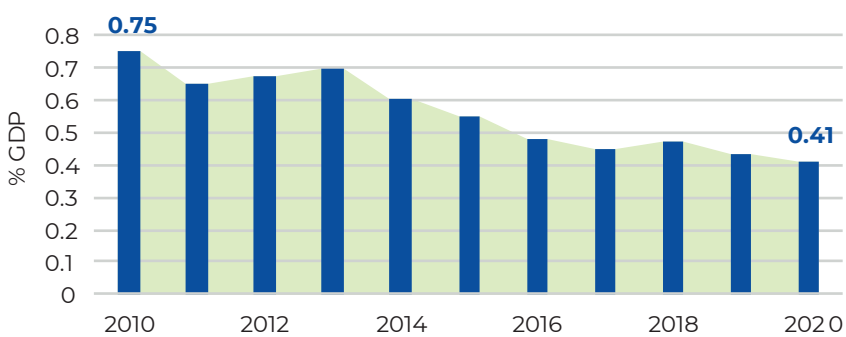
- Capital investments in environmental protection measures and costs for research work in the field of environmental protection
- The number of applications for inventions in areas that promote green growth.

Figure 5.1. Research and development expenditures and investment (environment-related)



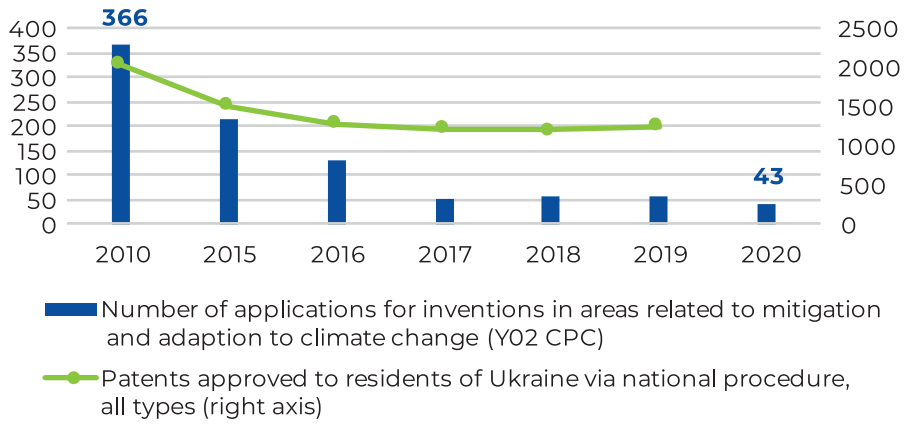
Source: Ukrstats.

Figure 5.2. Research and development expenditures (all types)



Source: Ukrstats.

Figure 5.3. Patents and inventions relevant to green growth



Source: EPC, UIIP, own calculations.

Main trends

Research and development expenditures in Ukraine are very low, almost halved in the last ten years, and investment and spending on environmental R&D are negligible.

In 2019, total investments and expenditures on environmental research amounted to only UAH 127 million. A slight increase in this indicator (taking into account inflation) cannot provide the appropriate level of innovation component of the national economy.

Total expenditures on all research in Ukraine (not only environmental) fell from 0.75% of GDP in 2010 to 0.41% of GDP in 2020.

The number of patents in areas that promote green growth has declined sharply over the past five years, indicating low innovation activity among Ukrainian residents.

The total number of all patents for inventions issued to residents in Ukraine has decreased significantly since 2010, and in recent years is about 1 200 patents per year. In areas that promote green growth, the number of applications from residents of Ukraine for inventions has decreased 9 times, and in recent years is about 50 applications per year according to the European Patent Office. For comparison, in 2020 in Poland this figure was 703, in Germany - more than 10 000, in the Czech Republic - 276.

Technical comments on measurability and interpretation

Environmental research expenditures - capital investment costs and current environmental research costs at current prices and the share of such costs in total investment/environmental expenditures. The source of data is the statistical report "Environment of Ukraine".

Number of applications for inventions in areas that contribute to climate change mitigation or adaptation to its consequences - the total number of applications for inventions submitted by residents of Ukraine in areas that contribute to combating or adapting to climate change (category Y02 according to CPC classification), applications/year. The calculation is made by searching the database of the European Patent Office under code Y02 and the applicant [UA] for the relevant year. The source of data for applications in category Y02 is the European Patent Office.

The source of data for issued patents in Ukraine is the annual reports of the Ukrainian Institute of Intellectual Property. The International Renewable Energy Agency also carries out its own assessment of the number of patents and applications for inventions for many countries, including Ukraine. According to that, the total number of patents in Ukraine in the green sphere is also declining, but their data are cumulative, which makes it difficult to understand the annual changes in innovation.

Definitions

Environmental protection - any activity aimed at preserving and restoring the quality of the environment by preventing emissions or reducing the content of pollutants in the environment.

Capital investments in environmental protection - investments in acquisition of new and used ones, or production by own forces for own use of tangible and intangible assets, costs of capital repairs and modernization, carried out in order to protect the environment.

Current expenditures for environmental protection - costs that carried out to support (maintenance and operation) of the object environmental protection) in working condition, and are part of the costs of the current period.

Inventions in areas that contribute to climate change mitigation or adaptation to its consequences are inventions classified in the end-to-end category Y02 "Technologies or applications for mitigation or adaptation to climate change" according to the CPC (Cooperative Patent Classification). This category includes a number of technologies that can help control, reduce or prevent greenhouse gas emissions and adapt to climate change, including the production, transmission and distribution of energy from renewable sources, energy storage (thermal, hydro, batteries) and more.

References

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Statistical report *"Environment of Ukraine"*.

Statistical report *"Scientific and innovation activity of Ukraine"*.

5.2 Environmental goods and services

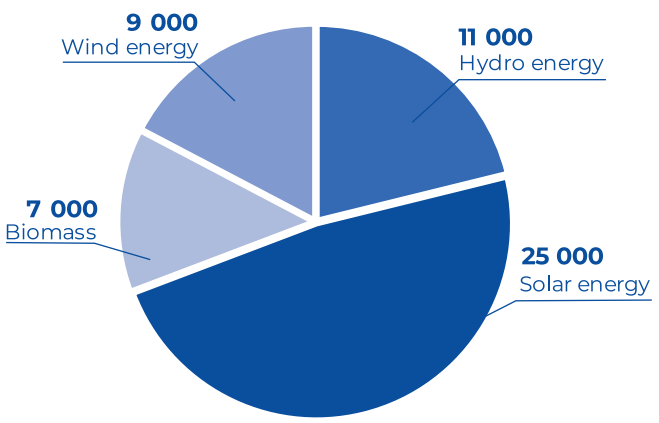
The transition to a green economy, which is a central element of the concept of green growth, involves increasing the market for green goods and production processes (OECD, 2017). It also means employment in these areas, value added and trade in such services and goods.

Within the OECD, such goods and services constitute the so-called "environmental goods and services sector" (EGS). That is why the key indicators for monitoring green growth in this subgroup should be trade in environmental goods and services, national environmental and economic accounts (UN, 2014), employment and value added in the EEC sector. Given the complete lack of data that would allow the use of such indicators, this section includes only one indicator, the calculation of which is carried out for Ukraine.

Indicators:

- Employment in renewable energy sector.

Figure 5.4. Employment in renewable energy sector (2019), jobs



Source: IRENA (2021)

Main trends

The RES sector provides about 52 000 jobs in Ukraine, which is quite a lot compared to other countries.

The lack of data does not allow us to trace the trends in employment in the field of RES in Ukraine. The International Renewable Energy Agency estimates that the sector creates 52,000 jobs in Ukraine. For comparison: in France - 110 000, in Germany - 310 000, in Poland - 84 000, in Austria - 25 000 jobs.

The largest number of jobs is created by solar energy (25 000), followed by hydropower - 11 000. This can be explained by the rapid development of solar energy in Ukraine in recent years.

Technical comments on measurability and interpretation

Jobs in the RES sector are the actual number of employees in the renewable energy sector, by different technologies. The source of data is the International Renewable Energy Agency (IRENA).

Definitions

Renewable energy sources (RES) - renewable non-fossil energy sources, namely solar, wind, aerothermal, geothermal, hydrothermal, wave and tidal energy, hydropower, biomass energy, gas from organic waste, gas from sewage treatment plants, biogas.

References

IRENA jobs database, 2021.

OECD (2017), *Green Growth Indicators 2017*, OECD Publishing, Paris.

UN (2014), *System of Environmental-Economic Accounting 2012*, The World Bank.

5.3 International financial flows

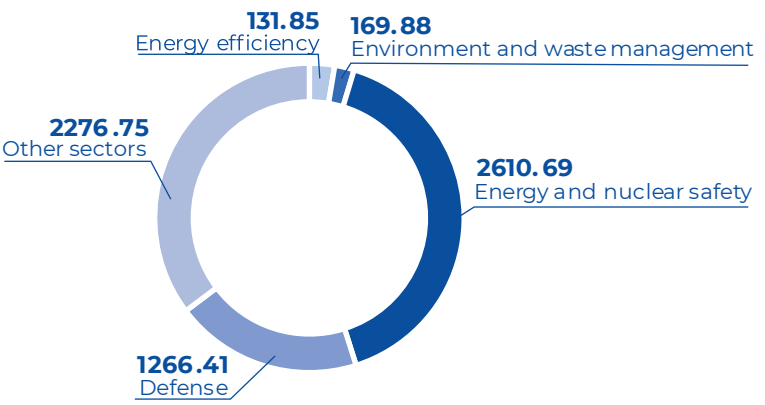
Public and private sources of international financial flows are important for stimulating green technologies and markets, act as a catalyst for domestic private investment.

Attracting foreign investment and international technical assistance has been one of the priorities of the Ukrainian government for many years. This is due to lack of internal financial resources. International development assistance can significantly facilitate and maintain access to international financial resources, including loans from international financial institutions (World Bank, EBRD, European Investment Bank, etc.).

Indicators:

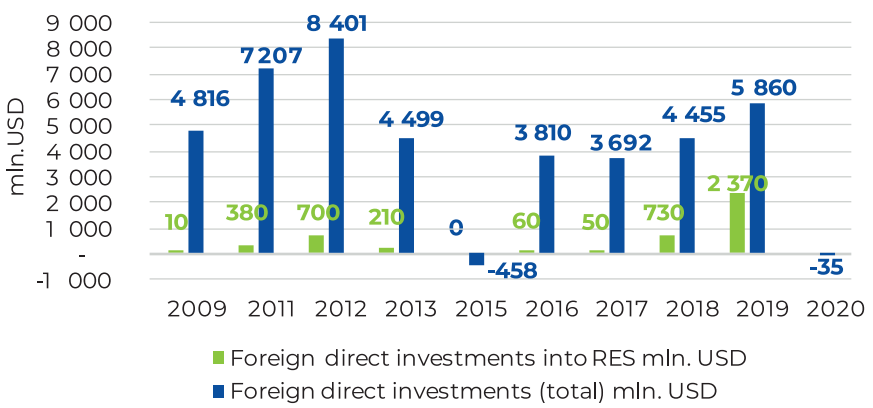
- International development assistance in areas related to green growth
- Foreign direct investment in RES.

Figure 5.5. International development assistance in areas relevant to green growth, USD mln. (2019)



Source: CMU (2020).

Figure 5.6. Foreign direct investments in Ukraine



Source: National Bank of Ukraine (2009 – 2021).

Main trends

International development assistance in areas directly related to green growth accounts for a small share of the total IDA.

The lack of systematic monitoring of the use of IDA in Ukraine does not allow to fully monitor both the volume and trends of IDA provision in specific areas. In the framework of the current monitoring of the IDA carried out by the Secretariat of the Cabinet of Ministers of Ukraine, in our opinion, two areas are directly related to green growth: "Energy Efficiency" and "Environment and Waste Management". The share of such projects was only 5% in 2019, and the sector "Environment and Waste Management" - 2%, which shows a reduction compared to 2013, when the share of this sector was 5% (Society and Environment, 2014). The Energy and Nuclear Safety Sector might also be included indirectly in the IDA in the green areas, but a significant amount of funds in this area cannot be attributed to green projects.

In 2018-2019, there was a sharp increase in foreign direct investment in RES, which is a consequence of favourable public investment policy.

Foreign direct investment in Ukraine tended to increase, but the crisis of 2013-2015 had a negative impact on the inflow of direct investment in general. In 2016-2019, there was a recovery of pre-crisis trends in foreign investment, which is associated with economic recovery. During the same period, there was a sharp increase in foreign direct investment in RES, which in 2019 accounted for 40% of all direct investment in Ukraine (USD 2.4 billion). This can be attributed to a favourable investment climate (high guaranteed green tariff).

At the same time, in 2020, the NBU estimates the balance of direct investment was negative (USD 35 million). This is primarily caused by economic stagnation in the world due to the COVID-19 pandemic. Although data on RES investments for 2020 are not currently available, they should be expected to decline sharply mainly due to changes in the investment climate in 2020 (the government's refusal to provide a guaranteed tariff and debts to green electricity producers).

Technical comments on measurability and interpretation

In Ukraine, in 2002 a single system for attracting, using and monitoring the IDA (called "international technical assistance") was established. The IDA is monitored by the CMU Secretariat. In recent years, several attempts have been made to introduce systematic and transparent IDA monitoring in Ukraine. In particular, two government portals were launched, but none of them is operational today. The results of the DIA monitoring published by the CMU Secretariat do not allow for a reliable analysis of the IDA.

Foreign direct investment in RES is non-resident direct investment in Ukraine in the production of electricity from renewable sources (solar, wind, biomass and waste), USD billion. The source of data on foreign direct investment in RES is the market assessment CLIMATESCOPE conducted by BloombergNEF. Data are available on the CLIMATESCOPE website global-climatescope.org (since 2009).

For comparison with the total volume of direct investments, the NBU data on net direct investments (direct investments in Ukraine according to the principle of orientation (flows)) are used.

Statistics on direct investment are calculated and published by the National Bank of Ukraine, including by type of economic activity. However, the lack of detail of such data by sections (groups, subgroups) of economic activities does not allow to fully identify FDI related to green growth (except for the section "Water; sewerage, waste management").

Definitions

International Development Assistance ("international technical assistance") - financial and other resources and services provided, in accordance with international agreements of Ukraine, by development partners on a gratuitous and non-refundable basis, in order to support Ukraine. IDA can be provided in the form of financial resources (grants), works and services, intellectual property rights, property, etc.

Foreign direct investment (direct investment into Ukraine) is a category of international activity that reflects the desire of an institutional unit - a resident of a foreign country to control or exert a lasting influence on the activities of an enterprise resident in Ukraine, achieved through equity participation.

Renewable energy sources (RES) - renewable non-fossil energy sources, namely solar, wind, aerothermal, geothermal, hydrothermal, wave and tidal energy, hydropower, biomass energy, gas from organic waste, gas from sewage treatment plants, biogas.

References

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Statistical report *"Environment of Ukraine"* (Ukrstats).

5.4 Prices and transfers

Stable market signals are the key to influencing the behavior of producers and consumers, and include taxes, investments, subsidies. Compared to regulatory instruments (such as emission limits or mandatory technology standards), environmental taxation encourages the most cost-effective eco-modernization among polluters and, importantly, encourages a reduction in the environmental burden per unit of output (OECD, 2012).

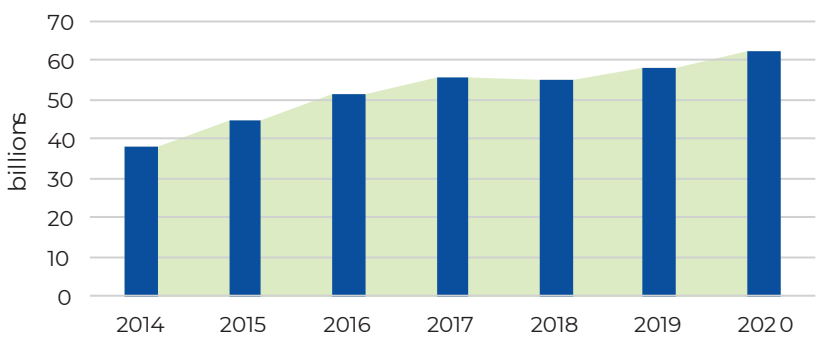
In Ukraine, environmental taxes currently perform mainly a fiscal function (providing budget revenues). However, improving environmental taxation can have a significant impact on the environmental performance of consumers and producers in the future. In addition, the revenues from such taxation can be a source of support for innovation, energy efficiency and more.

Government subsidies and grants to "dirty" or environmentally unsustainable sectors and practices can negatively affect progress towards environmental policy and environmental modernization goals. In particular, fossil fuel subsidies and environmental requirements for agricultural subsidies are important indicators of the sustainability of state support for domestic producers.

Indicators:

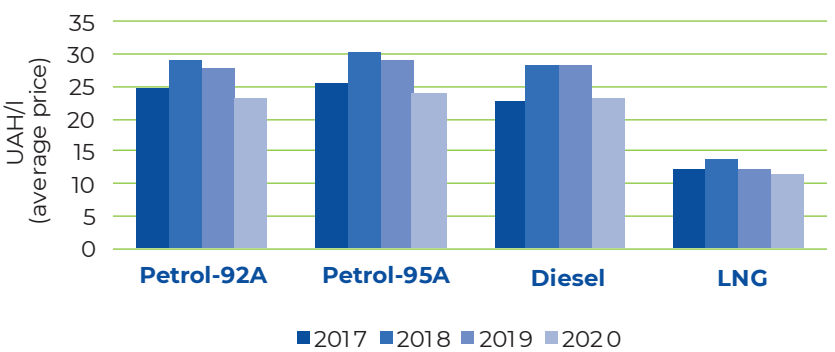
- Environmental payments in the consolidated budget
- Average consumer prices for motor fuels
- CO_2 emissions tax rate
- Subsidies for coal mining
- Support of agricultural producers from the state budget.

Figure 5.7. Environmental payments in consolidated country budget (revenues), UAH



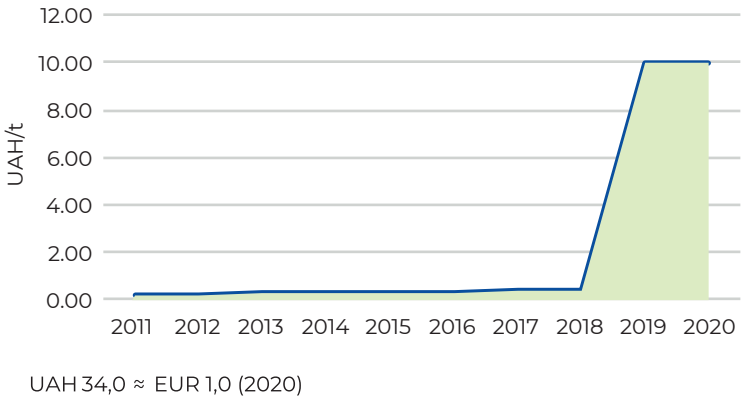
Source: State Treasury Service of Ukraine.

Figure 5.8. Average motor fuel retail prices



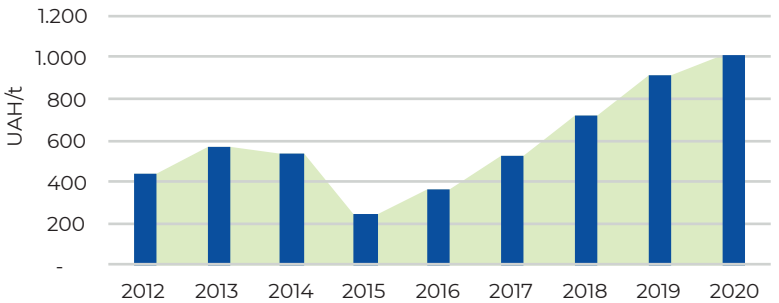
Source: Ukrstats.

Figure 5.9. CO_2 tax rate



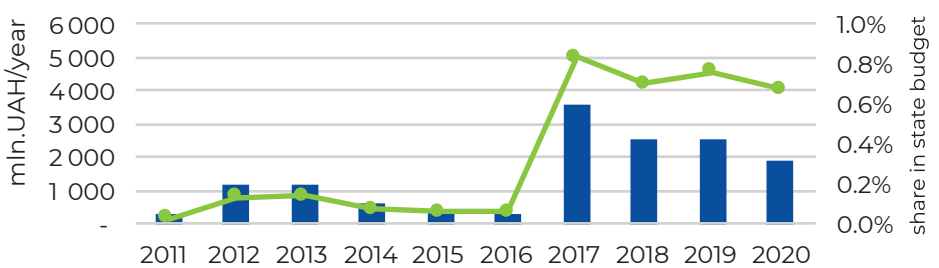
Source: Tax code, special laws.

Figure 5.10. Coal mining subsidies



Source: Ministry of Environment of Ukraine (2020).

Figure 5.11. Support to agriculture from state budget



Source: State Treasury Service of Ukraine, own calculations

Main trends

Revenues from environmental payments and taxes, despite the actual increase during 2014-2020, reduced their share in the consolidated budget.

In 2014-2020, revenues from environmental taxes and payments increased from UAH 38 billion to UAH 62 billion in actual prices. At the same time, their share decreased significantly in both the state (from 11% to 6%) and in the consolidated budget, which includes local budgets (from 8% to 5%).

Average prices for motor fuel in recent years reflect prices in world markets.

The dynamics of weighted average prices for gasoline (A-95, A-92), diesel fuel and liquefied gas shows the dependence on world prices. Pricing has not changed in recent years in terms of environmental taxation.

Over the last ten years, the rate of the CO_2 tax has changed significantly only once and today is about 29 eurocents per ton.

From 2019, the CO_2 tax rate was increased to UAH 10 per ton (24 times). It should be noted that although the tax rate has increased significantly, it remains low, and the tax itself performs a fiscal rather than an incentive function (Society and Environment, 2020). Fluctuations in the tax rate expressed in euros (from 38 eurocents in 2019 to 29 eurocents in 2020) are due to changes in exchange rates.

Ukraine continues to provide substantial subsidies for fossil fuels.

According to the Ministry of Environment, subsidies for coal production have been steadily growing in the last six years, and in 2020 they reached the highest level - UAH 1 014 per ton, although total coal production is declining. The abolition of subsidies for coal mining is closely linked to the decarbonisation of energy and the just transition of coal regions.

At the same time, subsidies for coal mining companies account for only 5% of the main energy subsidies in Ukraine in 2014 (OECD, 2019). The total amount of all energy subsidies amounted to about UAH 202 billion or USD 17 billion. In 2014, the largest group of subsidies was direct measures to compensate energy companies for losses due to the supply of gas and heat to the population at regulated tariffs, which amounted to UAH 109 billion (USD 9.2 billion) in 2014 (Ibid.).

In recent years, state support for agriculture has increased sharply compared to 2011-2016.

The largest increase in state support for agriculture is observed in 2017: the total amount of budget support amounted to UAH 5 billion (0.6% of the state budget). Despite the reduction of this support both in actual prices (4 billion in 2020) and its share in the state budget (0.3% in 2020), the main problem is the virtually no environmental constraints, conditions or targets for the prevailing volume of this support.

In 2021, changes were made to the state policy of support for agricultural producers, which provides for the support of producers of organic products (CMU, 2021).

Technical comments on measurability and interpretation

Environmental payments in the budget - an indicator that reflects the amount of actual revenues to the state and local budgets from rent and payment for the use of natural resources, environmental tax and fee for environmental pollution, UAH. The calculation of the indicator involves summing up the annual actual revenues to the consolidated budget of Ukraine by the following codes and names:

Budget classification code	Classification title
13000000	Rent and payment for use of other natural resources
19010000	Environmental tax
19050000	Fee for environmental pollution

The source of data is the State Treasury Service of Ukraine, the Annual Report on the Execution of the State Budget of Ukraine.

Prices for motor fuels - average annual prices for automobile fuel: gasoline A-92, A-95, diesel fuel and liquefied gas, UAH/l. The calculation is carried out by the State Statistics Service. The source of data is the State Statistics Service, and since 2017 these data are regularly published on the website of the State Statistics Service in the section of economic statistics, "Average consumer prices for goods (services)".

The CO_2 tax rate is the amount of the obligatory payment paid by taxpayers for emissions of 1 ton of carbon dioxide and fully credited to the general fund of the state budget of Ukraine. The amount is set by the Verkhovna Rada of Ukraine in the Tax Code of Ukraine.

Coal subsidy - funds of state support of coal mining enterprises to partially cover the costs of commodity coal products per 1 ton of production. Statistics on subsidies for coal (per 1 ton) are not available on the

official websites of the State Statistics Service or the Ministry of Energy. Information on the amount of the subsidies for 2012-2020 was published on the official website of the Ministry of Environment (formerly the Ministry of Energy and Environment).

S*upport of the agriculture ("agro-industrial complex") from the state budget* - funds from the state budget (one million UAH per year), aimed at providing state support to the agricultural producers. Calculated as the sum of:

- expenditures according to the program classification of expenditures and crediting of the state budget:
  - financial support of measures in the agro-industrial complex by reducing the cost of loans
  - financial support of measures in the agro-industrial complex
  - financial support for the development of farms
  - state support for the development of hop growing, establishment of young orchards, vineyards and berries and supervision over them
  - state support of the livestock industry
  - financial support for agricultural producers
- lending according to the program classification of expenditures and lending to the state budget:
  - providing loans to farms
  - financial support of measures in the agro-industrial complex on the terms of financial leasing.

Data sources - National Accounts of Ukraine (State Statistics Service), reporting by the State Treasury Service of Ukraine on the implementation of the State Budget for 2007-2021 (State Treasury).

Definitions

Environmental tax - mandatory payments paid for emissions, discharges, disposal of waste (including radioactive).

Rent - a tax paid for the use of natural resources (forest, water, subsoil (including oil and gas), wildlife, fish resources, etc.).

Environmental pollution tax - environmental tax until 2011.

Tax - a mandatory, unconditional payment to the relevant budget or to a single account, which is collected from taxpayers in accordance with the Tax Code of Ukraine.

Tax rate - the amount of tax accruals per unit of measurement of the tax base.

Average prices are the primary basis for calculating consumer price indices.

State subsidy - financial assistance from the state provided from the state budget to an economic entity on an interest-free, non-refundable basis to fully or partially cover its costs.

The cost of products (works, services) is the costs of the enterprise associated with the production and sale of products, performance of works and provision of services.

State support of agriculture is a component of state policy in the budget, credit, price, regulatory and other areas of public administration to stimulate agricultural production and development of the agricultural market, as well as ensuring food security.

References

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Chapter 6.

Socio-economic context

The indicators in this section provide important background information. They help track the effects of green growth policies and measures on growth and development, linking the green growth indicators to social goals: economic growth, productivity and competitiveness; labour market, education and income.

Green growth is monitored in relation to indicators of socio-economic development in general. Such indicators provide an important context for understanding and interpreting specific indicators of green growth (environmental and resource productivity of the economy, natural resource base, environmental quality of life, economic opportunities and policy responses).

The macroeconomic context is reflected in such indicators as the size of GDP, its structure, labor productivity, foreign trade, inflation, etc. Employment and labor market development are at the heart of the green growth strategy. The connection between environmental factors, the labor market, education, training and advanced training is well-established. Such data can be used for economic modelling. Therefore, these indicators are also important.

Many green growth indicators rely directly on the interaction of the environment and economic development. To reasonably explain the results of such interaction, it is necessary to evaluate them in comparison with socio-economic indicators of development. In addition, the detailed information needed for green growth indicators is sometimes limited, so information on the socio-economic context of a country can be an imperfect but important substitute.

This section has a slightly different structure than the previous ones, as its purpose is to assist in the interpretation of green growth indicators. It contains two subgroups of indicators of socio-economic development:

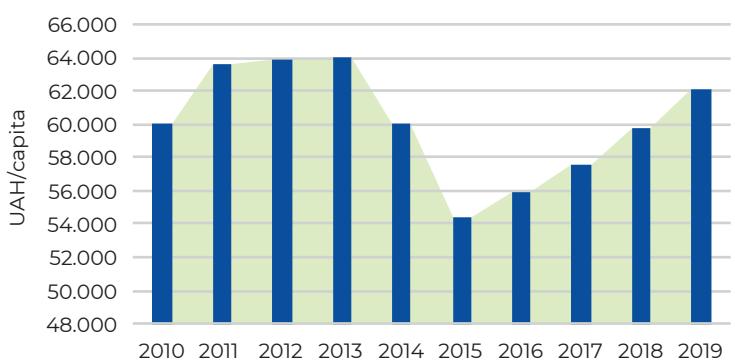
- Economic growth, productivity and competitiveness
- Labor market, education and income.

6.1 Economic growth, productivity and competitiveness

Indicators:

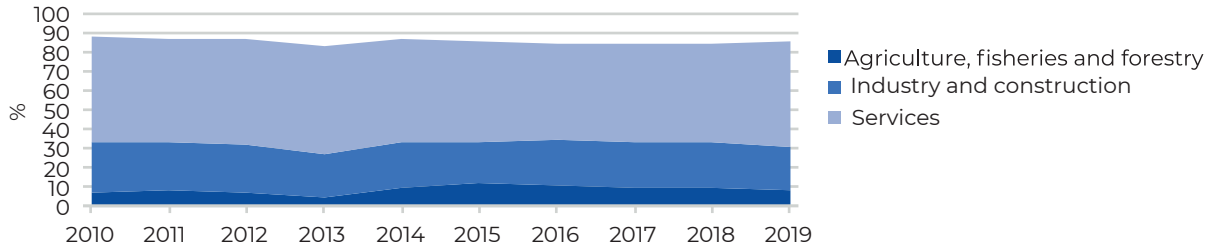
- GDP per capita
- The structure of GDP by main types of economic activity
- Net national income
- Labour productivity
- Foreign trade in GDP
- Consumer prices index.

Figure 6.1. GDP per capita in 2016 constant prices



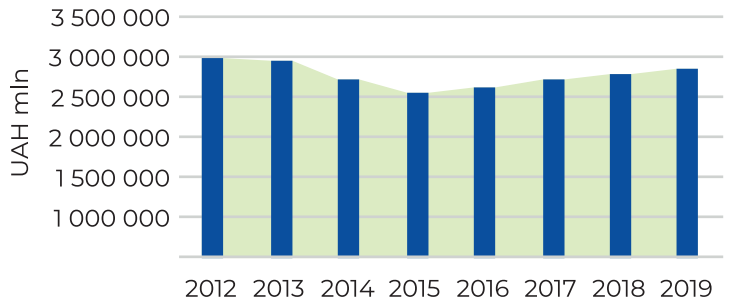
Source: Ukrstats (2021).

Figure 6.2. Share of main sectors by their added value in GDP



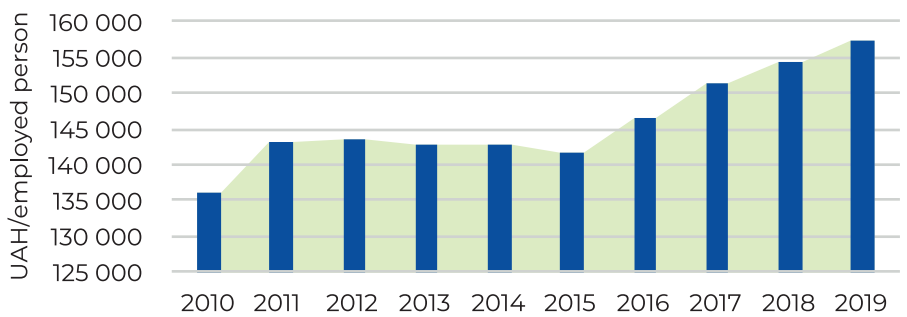
Source: Ukrstats, own calculations (2021).

Figure 6.3. Net national income (2016 constant prices)



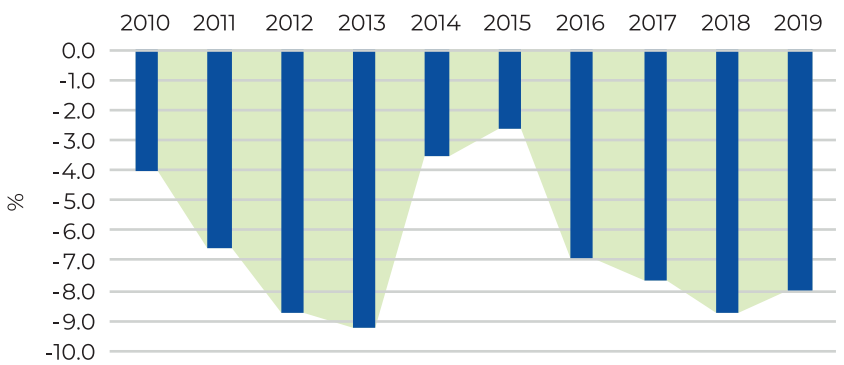
Source: Ukrstats, own calculations (2021).

Figure 6.4. Labour productivity (GDP in 2016 constant prices per employed person)



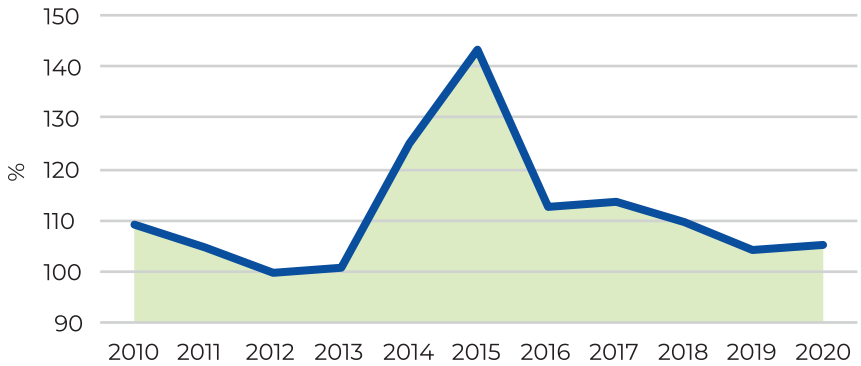
Source: Ukrstats (2021).

Figure 6.5. Trade in GDP



Source: Ukrstats (2021).

Figure 6.6. Consumer prices index



Source: Ukrstats (2021).

Main trends

The impact of the crisis caused by armed aggression and occupation of part of the territory of Ukraine in 2014 is obvious, which led to a 10% drop in GDP per capita. At the same time, since 2015 there has been a steady increase in this indicator, although as of 2019 the level of 2011-2013 was not reached. Over the last ten years, there have been no significant changes in the structure of GDP, although the share of agriculture, forestry and fisheries increased slightly from 7.4% in 2010 to 9% in 2019, and the share of industry decreased from 25.9% to 22.6%. Net national income shows the same trends as GDP.

Labor productivity (calculated as GDP per employee in constant prices in 2016) has been growing steadily for the past five years, and has increased by 15% compared to 2010. The role of foreign trade in GDP is currently negative: the external balance of goods and services in GDP has been negative for the last ten years and increased from -4% in 2010 to -10% in 2019. Inflation processes have also been affected by armed aggression and occupation, especially in 2015, where the consumer price index reached 143% (by December of the previous year), but has stabilized at 104-105% in the last few years.

Technical comments on measurability and interpretation

Gross domestic product (GDP) per capita - the ratio of gross domestic product at constant prices in 2016 to the average annual population, 2010-2019, UAH / person. The source of data is the National Accounts of Ukraine (Ukrstats).

The structure of gross domestic product by main types of economic activity - the share of main types of economic activity ("agriculture, forestry and fisheries", "industry and construction" and "services") by their gross value added in GDP 2010-2019,%. The share of gross value added of the main sectors of the economy is calculated on the basis of data from the National Accounts "Gross Domestic Product (B.1 * g) and gross value added (B.1g) for 2010-2019".

Net national income in 2012 - 2019, at constant prices in 2016, UAH million, is calculated on the basis of indicators of net national income, adjusted for the GDP deflator index (2016 = 100%). The source of data is the State Statistics Service.

Labor productivity - the ratio of gross domestic product at constant prices to the number of employed population. The data are contained in the National Accounts, but are not reported as "labor productivity". At the same time, the calculations are identical to the methodology "Interim guidelines for calculating labor productivity in general in the economy and by type of economic activity", approved by the order of the Ministry of Economy of Ukraine from 26 December 2008 №916, except for GDP (for the purpose of GGI monitoring GDP in constant prices of 2016 was used).

Foreign trade in GDP - external balance of goods and services in GDP (%). The data are contained in the National Accounts. It should be noted that differences in methodological approaches and the degree of coverage of foreign trade statistics lead to differences between the data of the National Bank of Ukraine and the State Statistics Service on foreign trade indicators. State Statistics data are adjusted by the National Bank of Ukraine taking into account such factors as informal trade, the volume of goods for processing and estimating the costs of travelers. Thus, in 2019, the balance of informal trade was estimated by the NBU at USD 2.8 billion, and the balance of travel expenses at USD 6.9 billion (NBU, 2020). Balance of payments (NBU) data are used for national accounts purposes.

The consumer prices index (CPI) is an indicator that characterizes changes over time in the general level of prices for goods and services purchased by the population for non-productive consumption. Displays changes in the value of a fixed set of consumer goods and services in the current period compared to the baseline. For monitoring purposes, data in % up to December of the previous year are used. The source of data is the State Statistics Service.

Definitions

GDP at constant prices is the gross domestic product calculated at constant prices of the reference/base year by deflation using price indices and extrapolation based on volume indices. For the purposes of this study, the base year is 2016.

The average annual population is calculated as the arithmetic mean of the number at the beginning and end of the reporting period.

The sectors of GDP by production method and by income categories are calculated at the level of 19 sections of the Classification of Economic Activities using a functional approach, which provides for the generalization of these entities by homogeneous activities.

Gross value added is equal to the difference between output and intermediate consumption. It is also defined as the sum of the primary income received from participation in the production process: wages of employees, other taxes excluding other subsidies related to production, and gross profit, mixed income.

The grouping of economic activities into three sectors is carried out in accordance with EU Regulation 549/2013.

Gross national income (B.5 * g) is the sum of the gross balance of primary income received by resident institutional units. It differs from GDP by the amount of primary income received by resident units from the rest of the world, except for primary income paid by resident institutional units in favor of non-resident units.

Net national income (NNI, B.5 * n) - gross national income less consumption of fixed capital.

The GDP deflator index is a set of price indices that provide a generalized description of their changes in the reporting period compared to the prices of the period accepted for comparison. The use of the GDP deflator to re-value the NNI makes the result approximate.

Employed (according to a sample survey of the population (households) on economic activity) are persons aged 15-70 years, who: worked for hire for a fee, independently, in individual citizens or in their own (family) enterprise; worked for free in an enterprise, in a business owned by any member of the household, or in a personal farm for the purpose of selling products produced as a result of this activity.

Imports of goods and services (P.7) consist of transactions of sale, transfer on barter terms and gifts of goods and services from non-residents to residents.

Exports of goods and services (P.6) consist of sales, barter and gifts of goods and services from residents to non-residents.

The external balance of goods and services in GDP (B.11) is calculated as the difference between exports and imports of goods and services. Balance of payments data are used for national accounts purposes. This indicator is reflected in the calculations of gross domestic product by categories of end use in actual prices and percentages.

CPI calculations are based on price data obtained by registering prices (tariffs) in the consumer market and national accounts data on household final consumption expenditures in the country as a whole at the level of sections, groups and classes according to the Classification of Individual Consumption by Purpose. For further distribution, detailed information on household consumption expenditures of households based on the results of household living conditions surveys is used.

References

NBU (2020), Factors of differences in foreign trade indicators (according to the NBU and Ukrstats), National Bank of Ukraine.

Statistical report *"Consumer price indices"*, State Statistics Service of Ukraine.

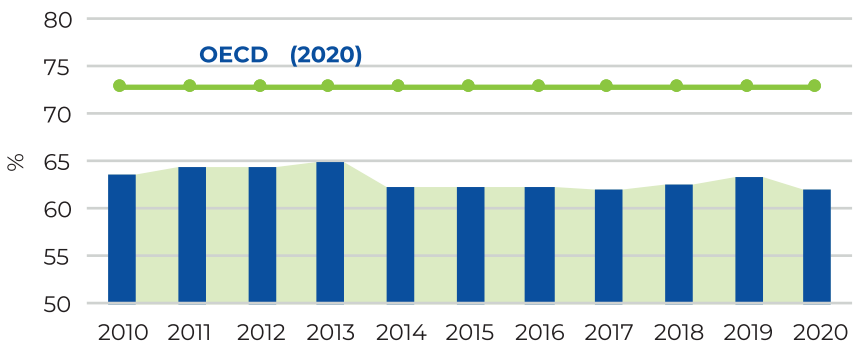
Statistical report *"National Accounts of Ukraine"*, State Statistics Service of Ukraine.

6.2 Labor market, education and income

Indicators:

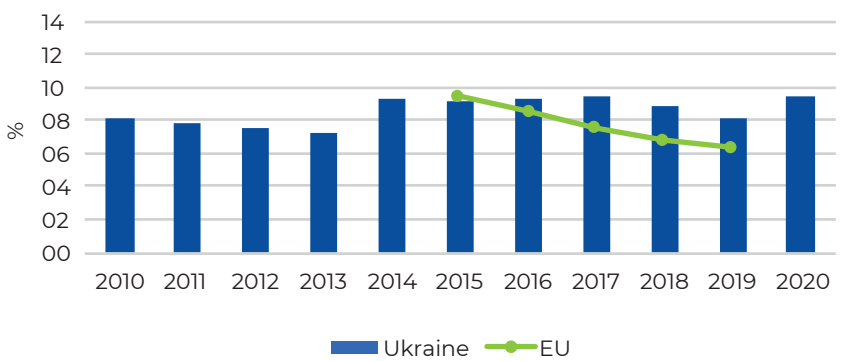
- Labor force participation
- Unemployment rate
- Population
- Life expectancy
- Gini index
- Access to tertiary education.

Figure 6.7. Labor force participation



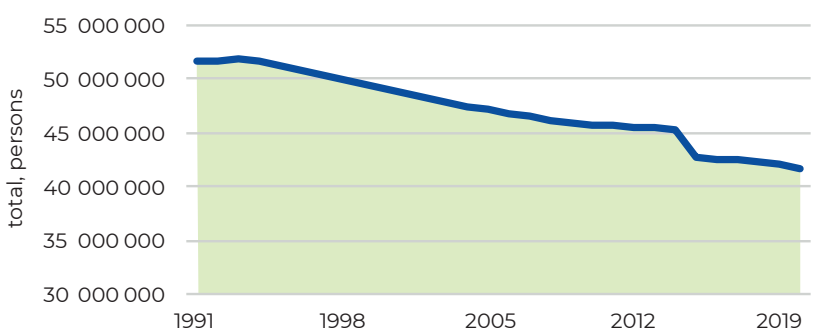
Source: Ukrstats (2010 – 2021), OECD (2020).

Figure 6.8. Unemployment rate



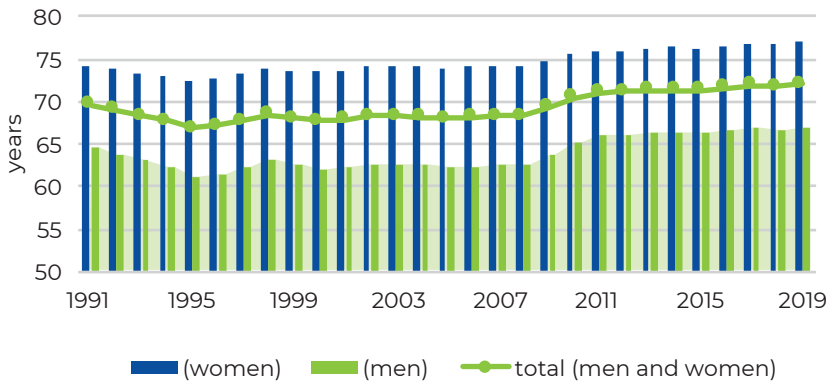
Source: Ukrstats (2010 – 2021), OECD (2020).

Figure 6.9. Constant population



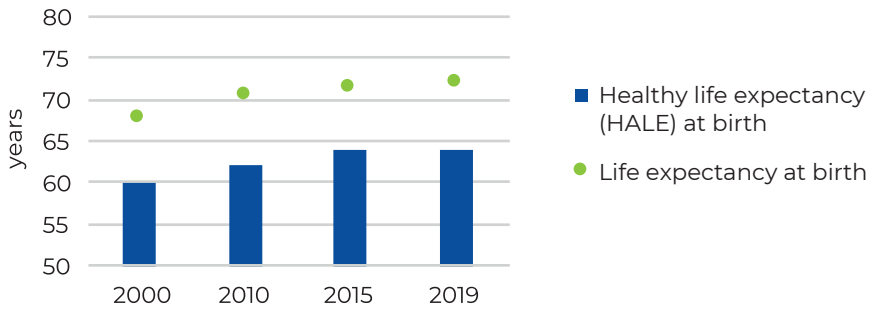
Source: Ukrstats (2021).

Figure 6.10. Life expectancy at birth



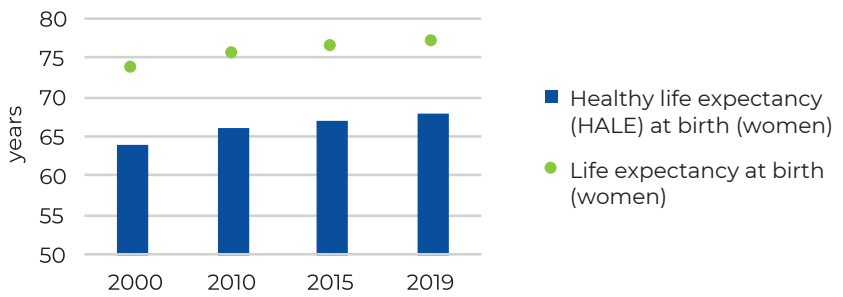
Source: Ukrstats (2020).

Figure 6.11. Healthy life expectancy (HALE) at birth



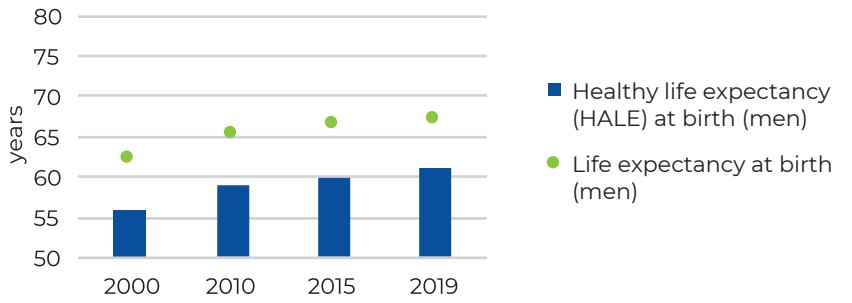
Source: Ukrstats (2020), WHO (2020).

Figure 6.12. Healthy life expectancy (HALE) at birth (women)



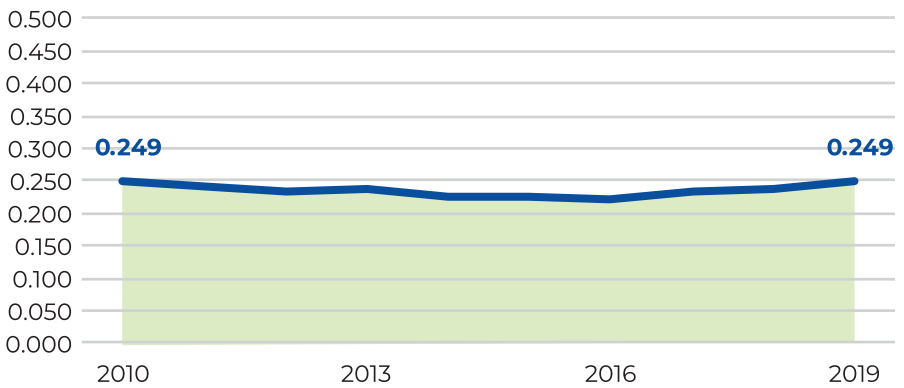
Source: Ukrstats (2020), WHO (2020).

Figure 6.13. Healthy life expectancy (HALE) at birth (men)



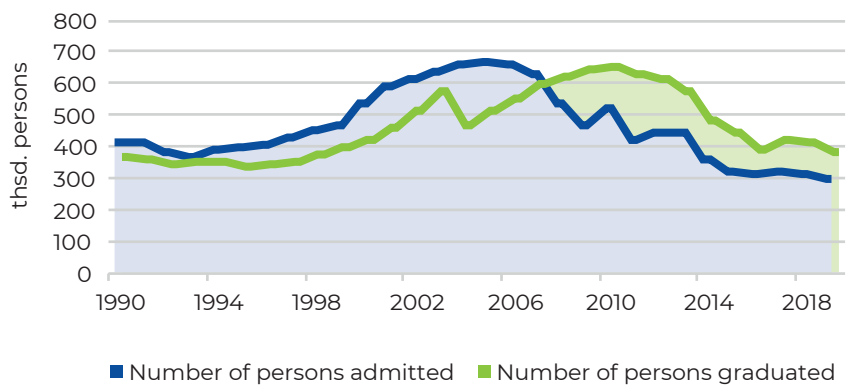
Source: Ukrstats (2020), WHO (2020).

Figure 6.14. GINI index



Source: Ukrstats.

Figure 6.15. Access to tertiary education (1990 – 2019)



Source: Ukrstats.

Main trends

Ukraine's permanent population is steadily declining, and the impact of armed aggression and occupation has exacerbated the problem. Due to the occupation of Crimea, the total population in 2014-2015 decreased statistically by 2.5 million people. The level of participation of the population in the labor force remains low and in 2020 was 62.1% (the average for OECD countries - 72.8% as of 2019). The official unemployment rate in 2015-2020 is higher than in 2010-2013 and is 8-10% (in the EU - 6.3% as of 2019).

Average life expectancy at birth has been steadily rising for the last 30 years, but since 2011 this growth has slowed. There is a significant difference between women and men: as of 2019, the difference in life expectancy was 10 years. Although healthy life expectancy is increasing, there is a large gap between healthy life expectancy and life expectancy in general. Thus, as of 2019, the average healthy life expectancy was 64 years, which is 8 years less than life expectancy. It should be noted the disparity between men and women: the life expectancy of healthy women is 9 years less than the total life expectancy of men, and men - 6 years.

The Gini index (concentration ratio) has not changed significantly in the last ten years. As of 2019, it is 0.249, the same as in 2010.

In Ukraine, there is a decrease in the number of people receiving higher education. Since 2008, there has also been a negative trend of the number of people graduating from higher education institutions exceeding those entering. This can be explained by changes in the age structure of the population.

Technical comments on measurability and interpretation

The level of population participation in the labor force (until 2019 - the level of economic activity of the population) is defined as the ratio (as a percentage) of the labor force (until 2019 - economically active population) of a certain age (until 2019 - 15-70 years, from 2019 - 15 years and older) to the total population of the appropriate age or the population of the relevant socio-demographic group. Data source - statistical reports "Labor Force of Ukraine" (until 2019 - "Economic activity of the population of Ukraine") (Ukrstasts).

Unemployment rate (according to the ILO methodology) - the ratio of the number of unemployed (until 2019 - 15-70 years, from 2019 - 15 years and older) to the labor force (until 2019 - the economically active population) of the specified age or the corresponding socio-demographic groups, %. Data sources - statistical reports "Labor of Ukraine" (until 2019 - "Economic activity of the population of Ukraine" (Ukrstats).

Permanent population - the population that permanently resides in a certain area at the time of the census, taking into account the temporarily absent, if their absence at the place of residence did not exceed 12 months. Data source - demographic yearbook "Population of Ukraine" (Ukrstats).

Life expectancy combines two indicators: life expectancy at birth and healthy life expectancy at birth. Average life expectancy at birth is the average number of years that newborns will live, provided that the age mortality rates remain the same as they were at the time of calculation.

Healthy life expectancy at birth (WHO definition) is the average number of years a person can expect to live "completely healthy", calculated by taking into account the number of years lived not completely healthy due to illness and/or injury (calculated by WHO). Data sources are the Demographic Yearbook of the Population of Ukraine (Ukrstats) and the WHO Global Health Observatory.

Gini index (coefficient of inequality of distribution of total incomes among the population or coefficient of concentration of incomes) - reflects the degree of deviation of the actual distribution of income by numerically equal groups of the population from the line of their equal distribution. The statistical measure of income equality ranges from 0 to 1, with a value of 0 reflecting full income equality in all population groups, 1 - complete inequality, when all income belongs to one person. Data source - statistical report "Expenditures and resources of households in Ukraine" (Ukrstats).

The education of the population is calculated as the number of persons admitted to study in higher education institutions and the number of persons graduated (thousand people). Data source - Statistical report "Higher Education in Ukraine", Ukrstats.

Definitions

The labor force (until 2019 - the economically active population) - is the population of both sexes of a certain age (until 2019 - 15-70 years, from 2019 - 15 years and older), which during a certain short accounting period (week) provides labor supply forces in the labor market. Employed and unemployed in total make up the labor force.

Unemployed (according to the ILO methodology) - persons aged 15 and older - until 2019 - 15-70 years), which simultaneously meet three main conditions:

- did not have a job (profitable occupation);
- actively sought work or tried to organize their own business during the last 4 weeks preceding the survey, i.e., took specific steps during the specified period in order to find a paid job for hire or in their own company;
- were ready to start work within the next two weeks, i.e. to start working for hire or in their own company in order to receive payment or income.

The category of unemployed also includes people who start work within the next two weeks, have found a job, are waiting for answers, and so on.

The unemployment rate (according to the ILO methodology) is calculated as the ratio (as a percentage) of the number of unemployed aged 15 and over (until 2019 - 15-70 years) to the labor force of the specified age or the relevant socio-demographic group.

Permanent population - the population that permanently resides in a certain area at the time of the census, taking into account the temporarily absent, if their absence at the place of residence did not exceed 12 months.

Calculation (estimation) of the population - an approximate determination of the population in the country or part of it without a census. Current calculations (estimates) of the population as of January 1 are based on the data of the last census, taking into account the natural and migratory movements of the population, as well as changes in the population due to administrative-territorial changes.

Higher education institution - a separate type of institution, which is a legal entity of private or public law, operates in accordance with the issued license to conduct educational activities at certain levels of higher education, conducts scientific, scientific, technical, innovative and/or methodological activities, ensures educational process and obtaining higher education, postgraduate education, taking into account their vocations, interests and abilities.

With the adoption in 2019 of the Law of Ukraine "On Professional Pre-Higher Education" from the 2020-2021 academic year, statistical information on the network and activities of higher education institutions is gathered without taking into account institutions of professional pre-higher education.

References

Demographic Yearbook "Population of Ukraine", Ukrstats.

OECD Employment Outlook 2020.

Statistical report *"Expenditures and resources of households in Ukraine"*, Ukrstats.

Statistical report *"Higher education in Ukraine"*, Ukrstats.

Statistical reports *"Labor Force of Ukraine"* and "Economic Activity of the Population of Ukraine", Ukrstats.

WHO Global Health Observatory.

PART 2.

Monitoring of indicators of the state environmental policy of Ukraine

The main principles (strategy) of the state environmental policy of Ukraine for the period up to 2030, approved by the Law of Ukraine № 2697-VIII of 28 February 2019 (hereinafter - the Strategy of the state environmental policy until 2030), determine one of the forms of monitoring the effectiveness of state environmental policy in Ukraine by providing for a separate section and appendix devoted to monitoring and evaluation of its implementation.

The results of monitoring and evaluation of state environmental policy should be reflected in:

- The National Report on the Implementation of the State Environmental Policy of Ukraine, which must be submitted by the Cabinet of Ministers of Ukraine to the Verkhovna Rada of Ukraine every five years.
- Regional and sectoral environmental reports, which must be submitted annually by central and local executive bodies, local self-governing to the Ministry of Environment.
- Report on the implementation of the state environmental policy of Ukraine and the implementation of the National Action Plan for the implementation of the Strategy of State Environmental Policy until 2030, which should be prepared and published annually by the Ministry of Environment.

The law does not contain clear requirements for the years of publication of such reports, but based on the target values of such reports, such reports should be prepared for 2015-2020, 2020-2025 and 2025-2030 in the year following the end of each five-year period. So far, such reports and reports have not been made public. Therefore, one of the key objectives of this study is to provide the first independent review of the monitoring of public environmental policy indicators in Ukraine and relevant information.

The basis of monitoring is a system of indicators for assessing the implementation of state environmental policy, aligned with indicators of sustainable development and the task of balanced environmental policy. The strategy of the state ecological policy till 2030 has defined thirty indicators of assessing implementation of the state environmental policy. Formally, such indicators are not targets, although they contain targets values for 2020, 2025, and 2030.

There is currently no methodological support for monitoring the implementation of the indicators envisaged by the strategy. Some of these indicators are identical or similar to both OECD green growth indicators and SDGs indicators. It is likely that the development of indicators for assessing the implementation of state environmental policy was influenced by the process of monitoring and developing SDGs indicators, which were developed in parallel at the same time in Ukraine. However, at the approval stage the final list of SDGs indicators were amended (compared to earlier proposals). In view of this, some indicators for assessing the implementation of state environmental policy is not based on available data (information) and requires special calculations.

The strategy of the state environmental policy till 2030 establishes thirty indicators which for the purposes of monitoring and an assessment can be provisionally grouped by the purposes of the state environmental policy of Ukraine (Table 3).

Table 3. Indicators of assessment of the implementation of the state environmental policy of Ukraine till 2030

Group	Indicators	Progress
1. Environmental intensity of the economy and promoting balanced (sustainable) development	Share of renewable energy sources (including hydro and thermal)	
	GDP water intensity	
	Energy intensity of GDP	
	Resource intensity of GDP	
	Primary raw materials use	
	Area of agricultural land of extensive use (hayfields, pastures)	
	Electrical transport	
2. Improving environmental quality of life	Access to improved sanitation by rural population	
	Urban population with access to central water drainage systems	
3. Preventing and mitigating negative impact on the environment and pollution	Discharge of polluted (polluted without treatment or insufficiently treated) wastewater into water bodies	
	Discharge of polluted (polluted without treatment or insufficiently treated) wastewater into sea waters	
	GHG emissions	
	Air emissions from stationary sources	
	Air emissions from stationary sources unified using relative toxicity index for each pollutant	
	Air emissions from transport sources unified using relative toxicity index for each pollutant	
	Share of waste landfilled	
4. Preserving the environment, ensuring its good state and development	Water bodies with good status	
	Cities where average daily pollution rates of main pollutants exceed established safety limits	
	Protected areas	
	State protected areas share	
	Protected areas share	
	Ecological network	
	Forests area	
5. Implementing an effective environmental policy and good environmental governance	River basins with approved RBMPs	
	Enterprises with chemicals management systems in accordance with international standards	
	Hromadas (local communities) which have development strategies and implementation plans, developed with public participation	
	Zones and agglomerations with air quality management plans	
	Environmental performance index	
	State and local plans and programs for which SEA was done	
	Report on implementation of the national environmental strategy.	

On track

Delayed

No data available

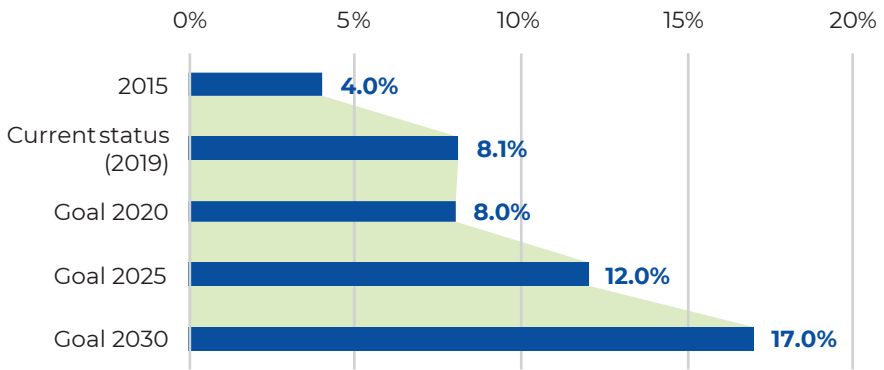
Chapter 7.

Environmental intensity of the economy and promoting balanced (sustainable) development

Indicator 1.

Share of renewable energy sources (including hydro and thermal).

Figure 7.1. Share of renewable energy sources (including hydro and thermal)



Source: Ukrstats, SDGs monitoring (2021).

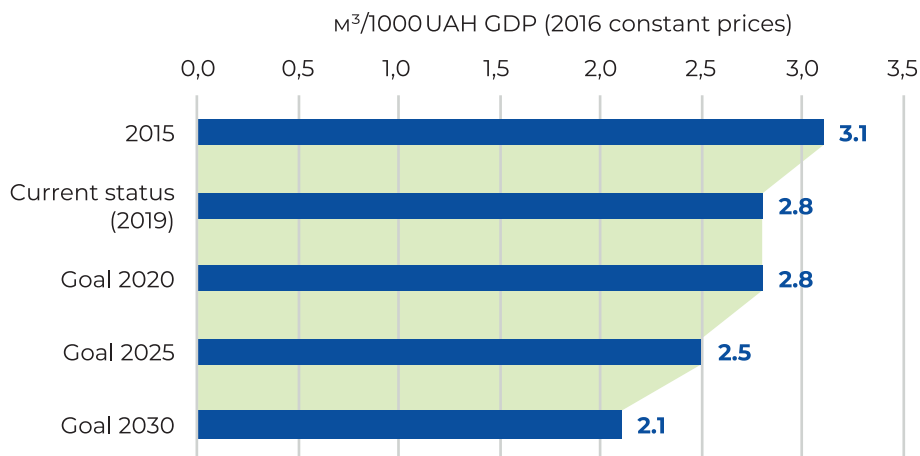
Assessment of progress: Ukraine reaches the target for 2020 - 8%. Already in 2019, the share of RES in total final energy consumption was 8.1%.

Measurability: Annual data are available, in particular in the framework of SDGs monitoring (Indicator 7.3.1). Data source: Ukrstats.

Indicator 2.

GDP water intensity, strategy's units: m^3 of fresh water (incl. sea water) per UAH 1 000 of GDP, actual prices.

Figure 7.2. GDP water intensity



Source: Ukstats, own calculations (2021).

Assessment of progress: Ukraine reaches the target for 2020 - 2.8 m^3 of used fresh water (including sea water) per UAH 1 000 GDP at constant 2016 prices. Already in 2019, the figure was 2.8 m^3/ UAH 1 000 GDP (2016).

Measurability: Requires own calculations as the ratio of the use of fresh water, including sea, (numerator, m^3) to gross domestic product (denominator, thousand UAH) for the year.

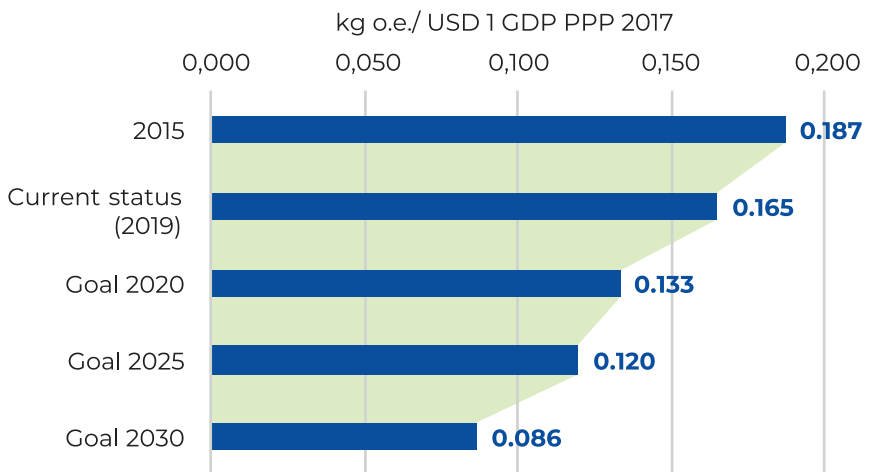
The strategy does not specify the types of water used for calculation. Our estimation of the target value of this indicator for 2015 indicates that the volumes of fresh water used (including seawater) are taken into account. At the same time, to calculate a similar indicator 6.4.1. for SDG6, monitoring framework takes into account both the use of fresh water and water from recirculating and re-sequential water supply.

For a correct comparison of the indicator in different years, it is advisable to calculate it using GDP at constant prices of the base year (currently the State Statistics Service calculates in 2016 prices). Targets were accordingly recalculated and evaluated using the ambition coefficient approved in the strategy (2015 = 100%, 2020 - 89%, 2025 - 81%, 2030 - 69%). Data source: Ukrstats.

Indicator 3.

Energy intensity of GDP, strategy's unit: the ratio of primary energy consumption per unit of GDP, kilograms of oil equivalent per 1 dollar at purchasing power parity (PPP) in 2011.

Figure 7.3. GDP energy intensity



Source: Ukstats, World Bank, own calculations (2021).

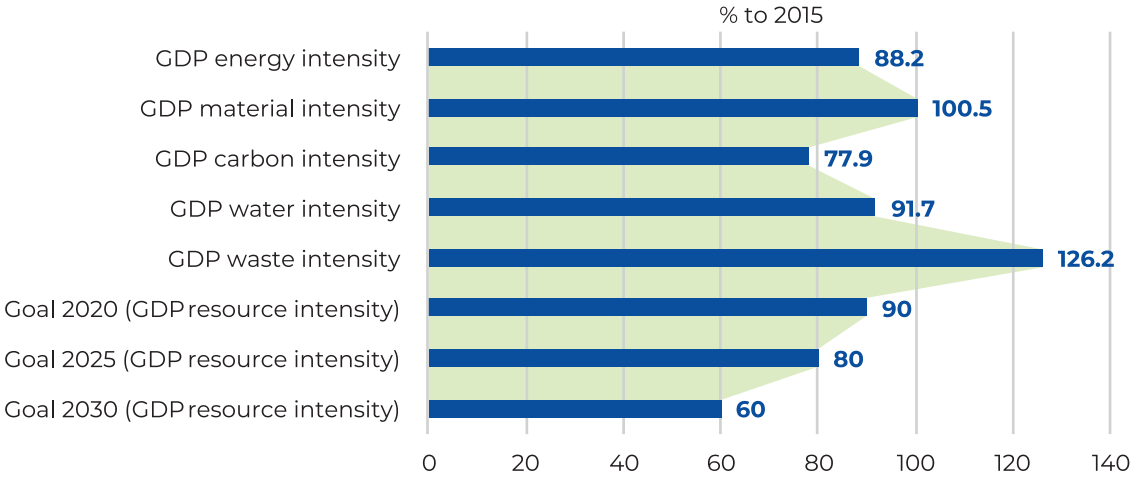
Assessment of progress: In 2019, the figure was 0.165 kg o.e/1 dollar (PPP 2017). Given the trends of 2016-2019, Ukraine does not reach the target for 2020 - 0.133 (at PPP 2017).

Measurability: Today, the State Statistics Service provides statistics based on the PPP in 2017. Therefore, the baseline and target values of this indicator, which are set for PPP 2011 were converted into PPP 2017 using the values of PPP 2011 (World Bank, 2011) and PPP 2017 (World Bank, 2020), as well as the consumer price index for relevant year based on index values of GDP deflator according to the State Statistics Service. Annual data are available. Data source and recalculation: State Statistics Committee; World Bank (2015), Purchasing Power Parities and the Real Size of World Economies. A comprehensive report of the 2011 international comparison program. 2015. Washington. International Bank for Reconstruction and Development / The World Bank; World Bank (2020), Purchasing Power Parities and the Size of World Economies. Results from the 2017 International Comparison Program. 2020. Washington. International Bank for Reconstruction and Development/The World Bank.

Indicator 4.

Resource intensity of GDP, strategy's unit: the percentage of the value of natural resources per unit of gross domestic product, in relation to 2015.

Figure 7.4. GDP resource intensity



Actual figures as of 2019.

Source: Ukstats, SDGs monitoring (2021).

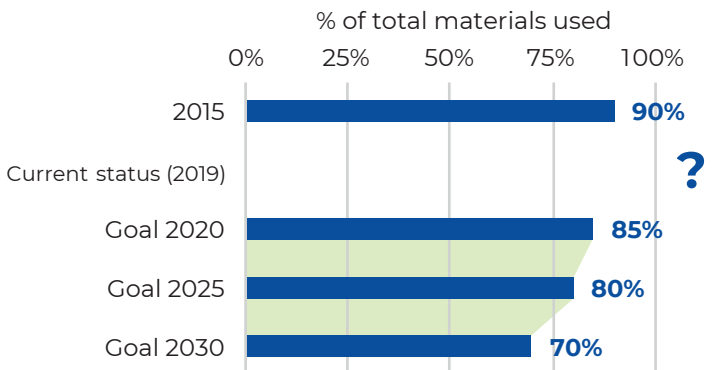
Assessment of progress: In 2019, Ukraine has over-reached the target for 2020 in terms of carbon and energy intensity, 77.9% and 88.2%, respectively, compared to the planned 90%. There is a slight excess of the target for water intensity - 91.7%. In 2019, there are significant exceedances of the target for 2020 in terms of material and waste, respectively, 100.5% and 126%. The latter exceed not only 2020, but baseline figures for 2015. This indicates a low probability that Ukraine will achieve the target of resource intensity of GDP in terms of material and waste consumption without significant political and economic incentives from the state.

Measurability: This indicator is not calculated and published in Ukraine. The strategy does not determine which natural resources are taken into account for the calculation, which makes it impossible both to calculate such an indicator and track its dynamics. To calculate the indicator, the methodology of a similar indicator is taken 12.1.1. for SDG12. SDG monitoring defines the resource intensity of GDP as an indicator of the efficiency of the use of the corresponding resource for the production of individual products. Resource consumption is calculated separately for each type of resource: primary energy; biotic and mineral resources; volume of water consumed; waste; emissions (CO_2). Resource consumption consists of indicators for: energy consumption, material consumption, water consumption, waste and carbon consumption. Annual data are available on such indicators, in particular within the framework of SDG monitoring (Indicator 12.1.1.). Data source: Ukrstats.

Indicator 5.

Amount of primary raw materials used, strategy's unit: % of total materials used.

Figure 7.5. Amount of primary raw materials used



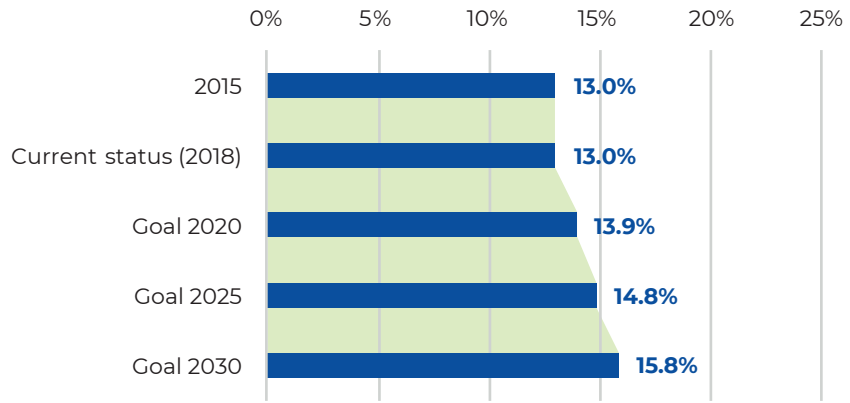
Assessment of progress: Unable to evaluate.

Measurability: No data available.

Indicator 6.

Area of agricultural land of extensive use (hayfields, pastures), strategy's unit: % of total territory of the country. The area of agricultural land of extensive use (hayfields, pastures) is the size of the land plot, which is used for cattle grazing and haymaking.

Figure 7.6. Area of agricultural land of extensive use (hayfields, pastures)



Source: Ukrstats, SDGs monitoring (2021).

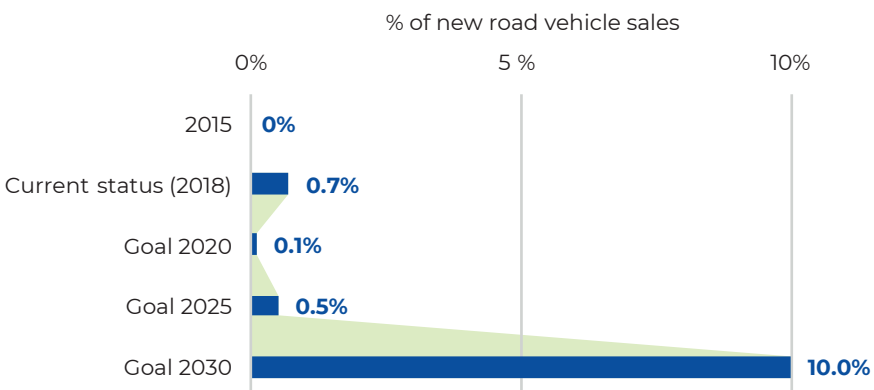
Assessment of progress: For 2020 Ukraine planned to increase the share of such agricultural land from 13 to 13.9%. However, during 2015-2019, this figure decreased and amounted to 12.5% in 2018.

Measurability: Annual data are available, in particular in the framework of SDGs monitoring (Indicator 15.6.3.). Data source: Ukrstats.

Indicator 7.

Electrical transport, % of new road vehicle sales.

Figure 7.7. Electrical transport



Source: Own calculations (2021).

Assessment of progress: Ukraine is meeting well the target for 2020. In 2018, the sales rate of electric vehicles in Ukraine was much higher than the targets provided by the strategy (0.1% for 2020 and 0.5% for 2025, respectively), but it was achieved through the purchase of used electric vehicles.

Measurability: The strategy does not specify which types of vehicles that use electric motors to drive are taken into account to calculate this indicator. In addition, statistics are not collected or published. The "Society and Environment" own calculations for 2018 of the share of the total number of new purchased vehicles, given in the study "Mapping the strategic goals of Ukraine and the EU in the context of the European green course: development vectors and flagship initiatives" were taken for this assessment. Data source: RAC "Society and Environment" (2021).

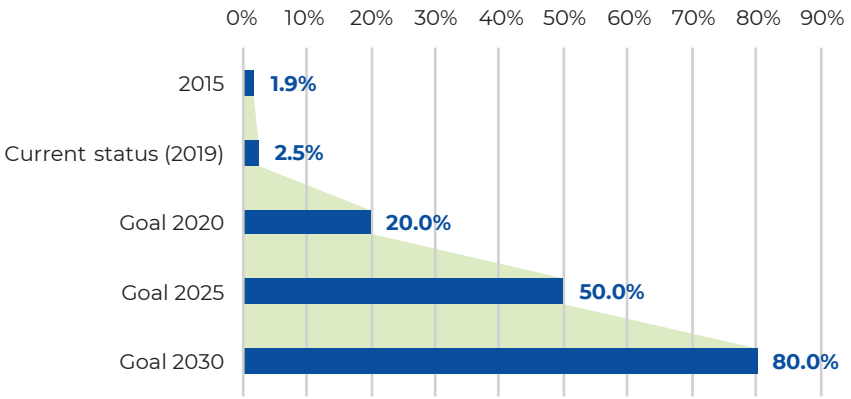
Chapter 8.

Improving environmental quality of life

Indicator 8.

Rural population with access to central water drainage systems, % of total rural population.

Figure 8.1. Access to improved sanitation by rural population, % of total rural population



Source: Ministry of Environment, Draft Water Strategy of Ukraine (2021).

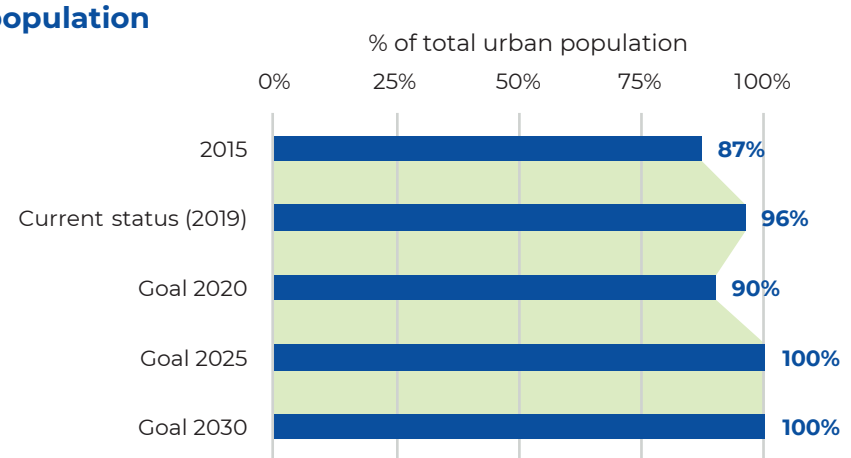
Assessment of progress: Ukraine has made little progress in achieving its goals. As of the beginning of 2019, only 2.5% of the rural population had access to centralized drainage, which is much less than the target for 2020 - 20%.

Measurability: Data on rural population access to improved sanitation are not statistically collected or published. Therefore, the data of experts of the Institute of Local Development (as of the beginning of 2019) on the access of the rural population to centralized drainage were used. Data source: Ministry of Environment (draft Water Strategy of Ukraine).

Indicator 9.

Urban population with access to central water drainage systems, % of total urban population.

Figure 8.2. Urban population with access to central water drainage systems, % of urban population



Source: Ministry of Environment, Draft Water Strategy of Ukraine.

Assessment of progress: Ukraine reaches the target for 2020 (90%): in 2019 it was 96%.

Measurability: Data on urban population access to centralized drainage systems are not provided correctly. In the annual National Reports on Drinking Water Quality and the State of Drinking Water Supply in Ukraine for the respective year, data are presented by region, but no data are available for the country as a whole. Therefore, the data of experts of the Institute of Local Development as of the beginning of 2019 on the access of the urban population to centralized drainage were used. Data source: Ministry of Regional Development, Ministry of Environment: draft Water Strategy of Ukraine.

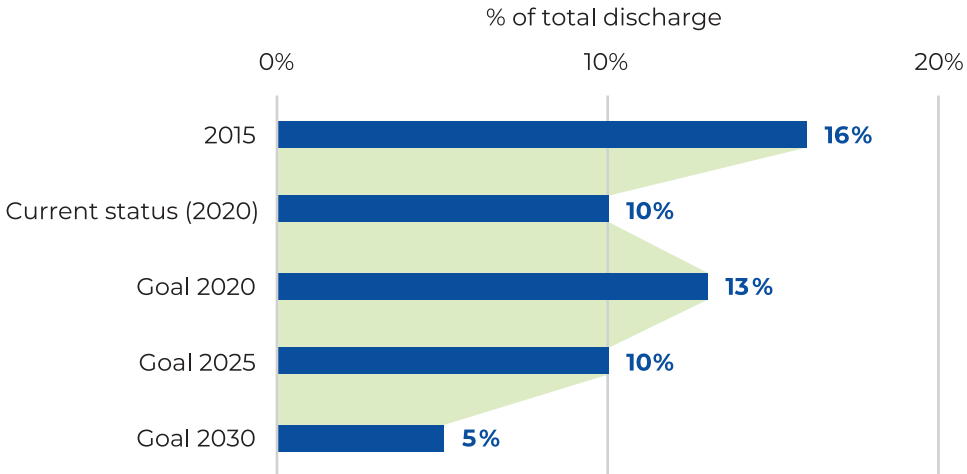
Chapter 9.

Preventing and mitigating negative impact on the environment and pollution

Indicator 10.

Discharge of polluted (polluted without treatment or insufficiently treated) wastewater into water bodies, % of total discharges.

Figure 9.1. Discharge of polluted wastewater into water bodies



Source: Ukrstats, Ministry of Regional Development (2021).

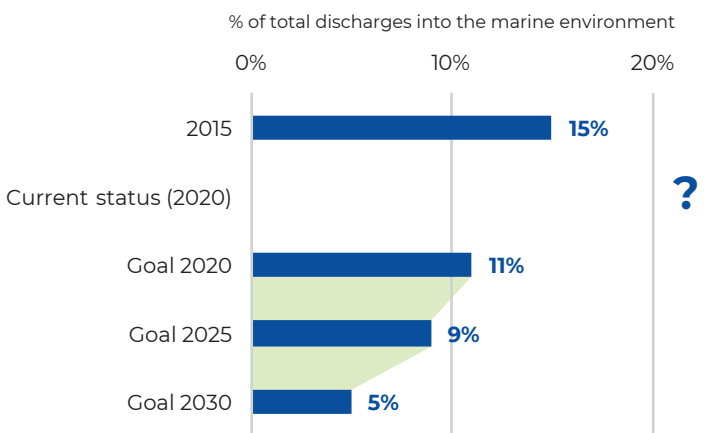
Assessment of progress: Ukraine is meeting well the target for 2020 - discharges of polluted water into water bodies were 10% compared to the planned 13%. According to the actual percentage of discharges in 2020, the target set for 2025 has been reached already.

Measurability: Annual data are available, in particular in the framework of SDG monitoring (Indicator 6.3.2.). The data (including those data that are necessary for the calculation) are provided in the National Reports on Drinking Water Quality and the State of Drinking Water Supply in Ukraine and the Statistical Report of the Environment of Ukraine. Data source: Ukrstats, Ministry of Regional Development.

Indicator 11.

Discharges of polluted wastewater into the marine environment, % of total discharges into the marine environment.

Figure 9.2. Discharges of polluted wastewater into the marine environment



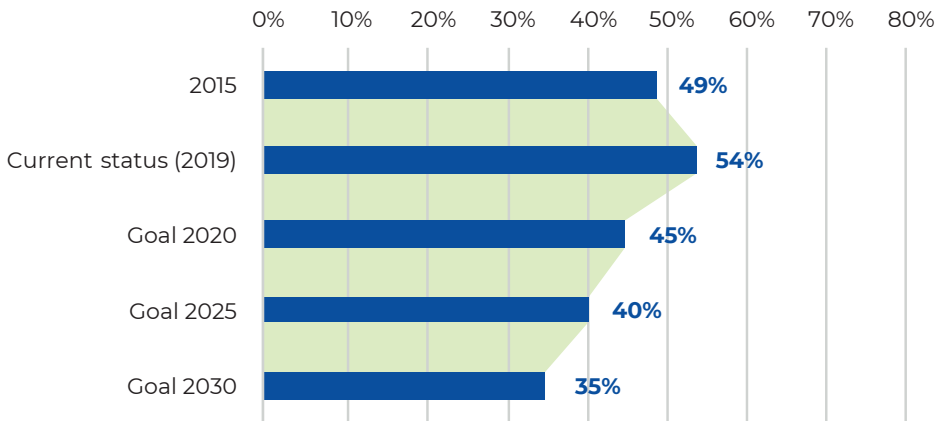
Assessment of progress: Unable to evaluate.

Measurability: There is no publicly available data on this indicator. As part of the monitoring of the SDGs, the indicator "Share of discharges of polluted wastewater in the total discharges to the marine environment" is assessed. In 2015-2018, this indicator was 29%, 28%, 30% and 27%, respectively. In 2019, it amounted to only 1%, due to the fact that it covered only the Sea of Azov. This makes any comparison over the years impossible. In addition, according to the SDG monitoring data, the baseline indicator for 2015 (29%) significantly exceeds the indicator set in the strategy for 2015 (15%). Thus, it is currently not possible to estimate this strategy indicator.

Indicator 12.

Share of waste landfilled, % of total waste generated.

Figure 9.3. Share of waste landfilled



Source: Ukstats, own calculations (2021).

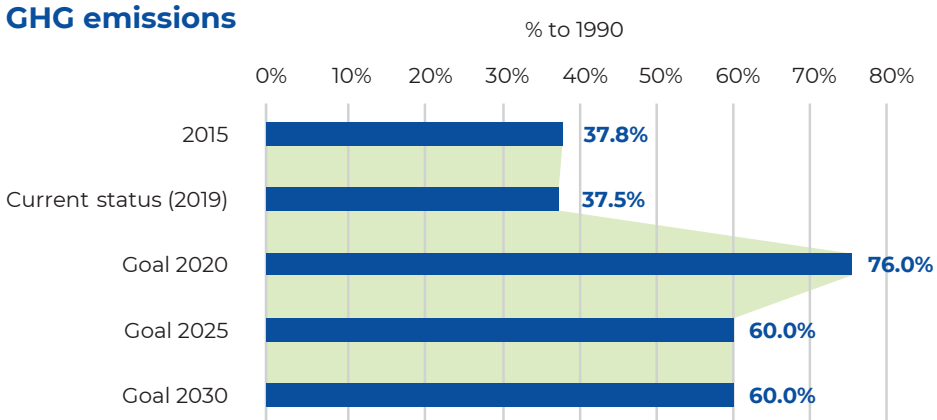
Assessment of progress: The share of landfilled waste in 2019 was 54%. The trend of waste landfilling during 2015-2019 (the lowest figure for this period was 46% in 2017), indicates that Ukraine will not reach the target for 2020 - 45%.

Measurability: Requires own calculations as a percentage of the ratio of the amount of waste landfilled of in designated places/facilities (numerator) to the total amount of waste generated (denominator). Annual data required for calculations are available. Data source: Ukrstats.

Indicator 13.

GHG emissions, % to GHG emissions in 1990.

Figure 9.4. GHG emissions



Source: National GHG inventory (2018), NDC-2 (2021).

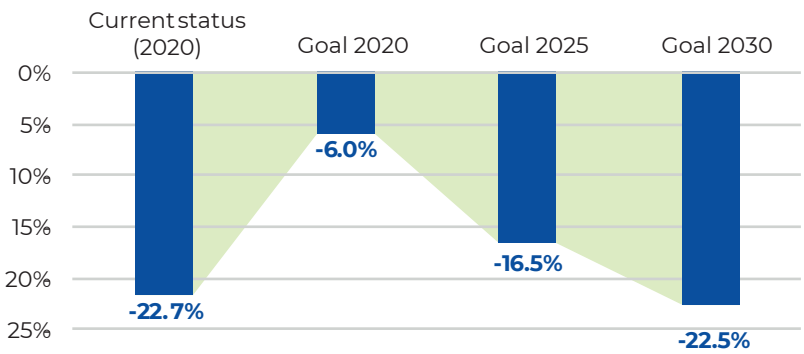
Assessment of progress[5]*:* Ukraine meets the target for 2020. In 2018, the total amount of greenhouse gas emissions was 38.7% of the 1990 level, and in 2019 - 37.5%.

Measurability: Annual data available. Data source: National inventory of anthropogenic emissions by sources and removals by sinks of greenhouse gases (1990-2018); Draft NDC-2.

Indicator 14.

Air emissions from stationary sources, % to 2015 emissions.

Figure 9.5. Air emissions from stationary sources (% to 2015)



Source: State Statistics: Air emissions from stationary sources (2008-2020); State Statistics, SDG 11.5.1.

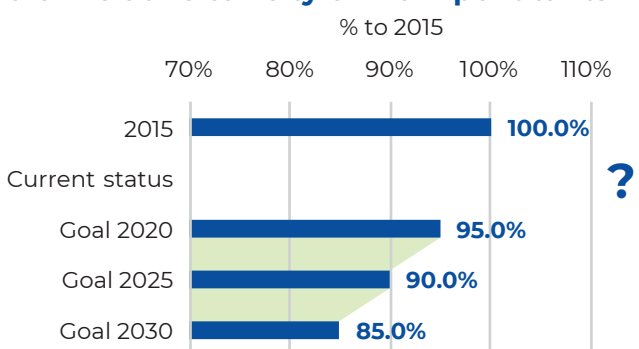
Assessment of progress: Ukraine is well meeting the target for 2020, emissions have decreased by 21.7% (planned reduction - 6%).

Measurability: Annual data available. Data source: Ukrstats.

Indicator 15.

Air emissions from stationary sources unified using relative toxicity index for each pollutant.

Figure 9.6. Air emissions from stationary sources conditionally equated to carbon dioxide based on relative toxicity of main pollutants



Assessment of progress: Unable to evaluate.

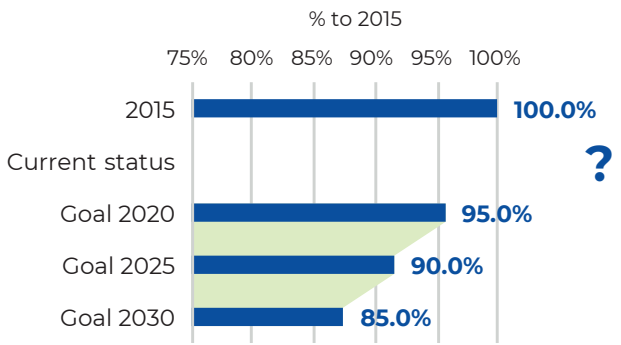
Measurability: No data available.

[5] On July 30, 2021, CMU approved Updated Nationally Determined Contribution of Ukraine, which set the target of economy-wide net domestic reduction of 65 % in GHG emissions by 2030 compared to 1990.

Indicator 16.

Air emissions from transport sources unified using relative toxicity index for each pollutant.

Figure 9.7. Air emissions from mobile sources conditionally equated to carbon dioxide based on relative toxicity of main pollutants



Assessment of progress: Unable to evaluate.

Measurability: No data available.

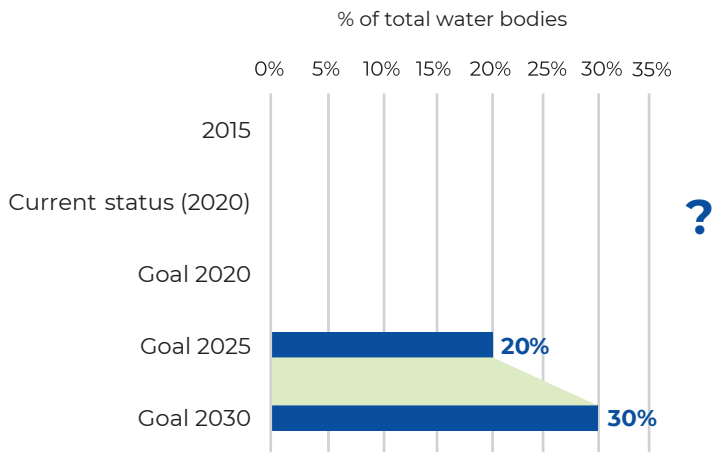
Chapter 10.

Preserving the environment, ensuring its good state and development

Indicator 17.

Water bodies with good status, % of total amount of water bodies. The status of a surface water body is "good" if its ecological status is "good" and its chemical status is "good".

Figure 10.1. Water bodies with good status



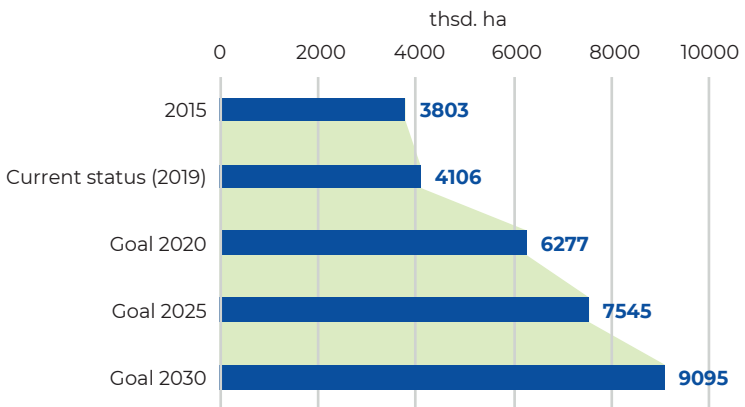
Assessment of progress: Unable to evaluate.

Measurability: No data available. In accordance with timelines established, 9 river basin management plans should be approved by 2024. Part of this process is determination and assessment of quantitative and qualitative stats of surface and ground waters. At this stage progress cannot be assessed due to unavailability of data, lack of 2015 baseline and 2020 target indicators in the strategy itself.

Indicator 18.

Protected areas, hectares

Figure 10.2. Protected areas



Source: Ukrstats (2021).

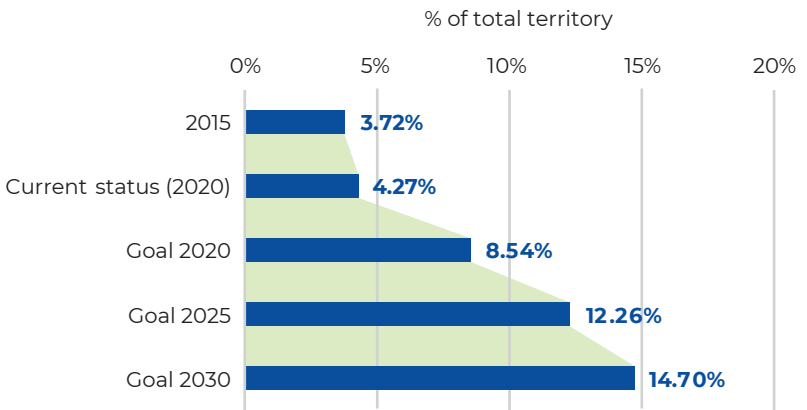
Assessment of progress: Ukraine did not meet the target for 2020 - instead of the planned 6 276.9 thousand hectares, the area of all protected territories in 2020 was 4 105.5 thousand hectares.

Measurability: Annual data are available, in particular in the annual statistical report "Environment of Ukraine" and in the framework of SDG monitoring (Indicator 15.1.1). Taking into account base year figure for 2015 the Strategy probably refers to protected areas territory (not land use by them). Data source: Ukrstats.

Indicator 19.

State protected areas share, % to total country territory

Figure 10.3. State protected areas share



Source: Ukrstats (2020), own calculations.

Assessment of progress: The percentage of the area of protected areas lands of national importance during 2015-2020 grew slowly. In 2020, it accounted for 4.27% of the country's territory. But this is not enough for Ukraine to reach the target value for 2020, neither originally stated in the strategy (5.14%), nor re-calculated for the correct display of data and progress of those indicator (8.54%) (see measurability).

Measurability: The area of protected areas lands ("the nature reserve fund") of national importance in the strategy is determined as a percentage of the total territory of the country. However, our calculation of the base value of the indicator for 2015, taking into account the land area of all protected areas of national importance, revealed its significant excess compared to the value stated in the strategy. Most likely, original indicators are calculated as the sum of the areas of only nature reserves, biosphere reserves and national nature parks. According to the State Statistics Service, their total area in 2015 was 1 769 thousand hectares (which was 2.93% of the state territory). At the same time, the strategy specifies a baseline of 2.24%, and its calculation or source is difficult to explain. This situation requires new calculations of baseline and target indicators. In addition, the Strategy likely refers to the territory of protected areas, not their land use.

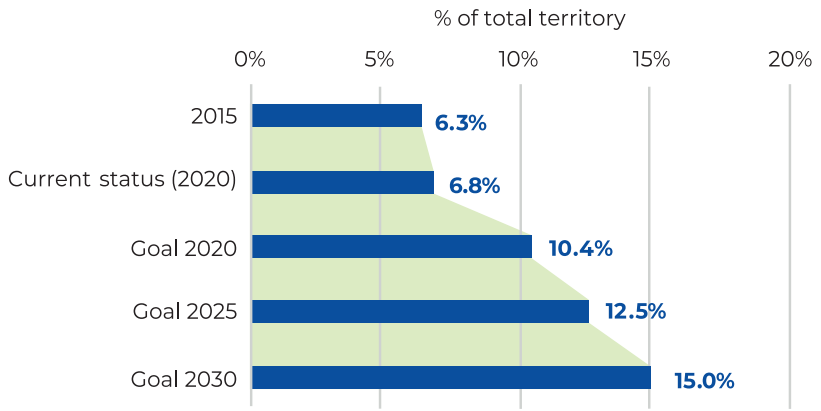
To calculate this indicator in the framework of this study we took the total area of all protected areas of national importance (the sum of areas of nature reserves, biosphere reserves and national parks, reserves, natural monuments, botanical gardens, zoological parks, dendrological parks, memorial parks of garden and park art), the share of which in the total territory of the state in 2015 was 3.7%. Relevant target values of this indicator are listed and re-evaluated using the ambition coefficient approved in the strategy (2015 = 100%, 2020 - 229%, 2025 - 329%, 2030 - 395%).

Annual data are available, in particular in the framework of SDG monitoring (Indicator 11.3.3.). The data required for the calculation are also available in the statistical reports "Environment of Ukraine". Data source: Ukrstats.

Indicator 20.

Protected areas share, % of total country territory

Figure 10.4. Protected areas share



Source: Ukstats (2021)

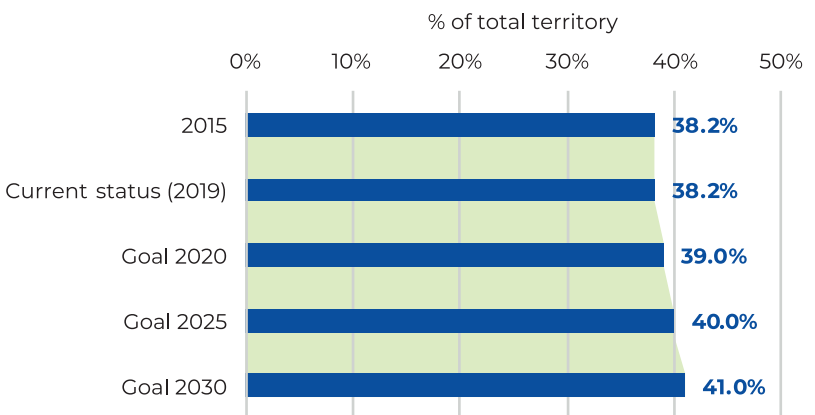
Assessment of progress: Ukraine did not meet the target for 2020: instead of the 10.4% of the total area of the country, the share of all protected areas in 2020 was 6.8%.

Measurability: Annual data are available, in particular in the annual statistical report "Environment of Ukraine" and in the framework of SDG monitoring (Indicator 15.1.2.). Taking into account base year figure, the Strategy probably refers to the territory of protected areas (not their land use). Data source: Ukrstats.

Indicator 21.

Ecological network area share, % of total country territory.

Figure 10.5. Ecological network share



Source: Ukstats (2019).

Eco-network is a single territorial system formed to improve the conditions for the formation and restoration of the environment, increase the natural resource potential of Ukraine, preserve landscape and biodiversity, habitats and growth of valuable species of fauna and flora, genetic fund, animal migration routes through a combination of various protected areas as well as other territories that have a special value for the protection of the natural environment and in accordance with the laws and international obligations of Ukraine are subject to special protection.

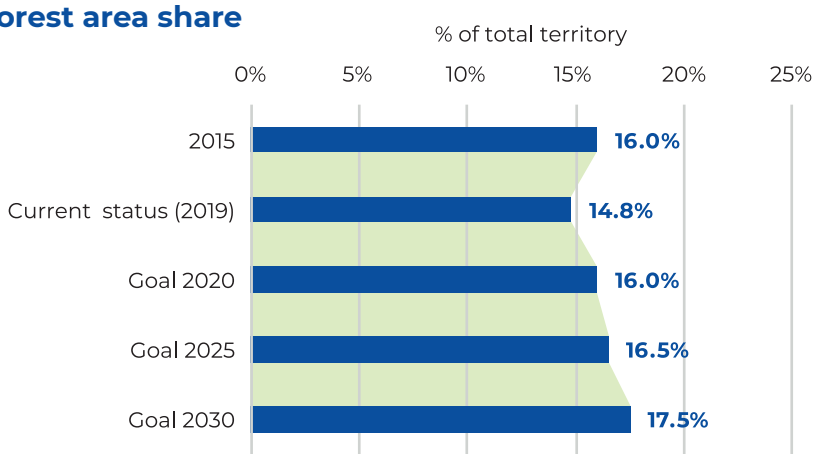
Assessment of progress: The percentage of territories of the national ecological network in 2019 was 38.2%. This percentage did not change during 2015-2019, which indicates that Ukraine will not reach the target for 2020 - 39%.

Measurability: Annual data are available, in particular in the framework of SDG monitoring (Indicator 15.1.3.). Data source: Ukrstats.

Indicator 22.

Forests area share, % of total country territory.

Figure 10.6. Forest area share



Source: Ukrstatas (2019); own calculations.

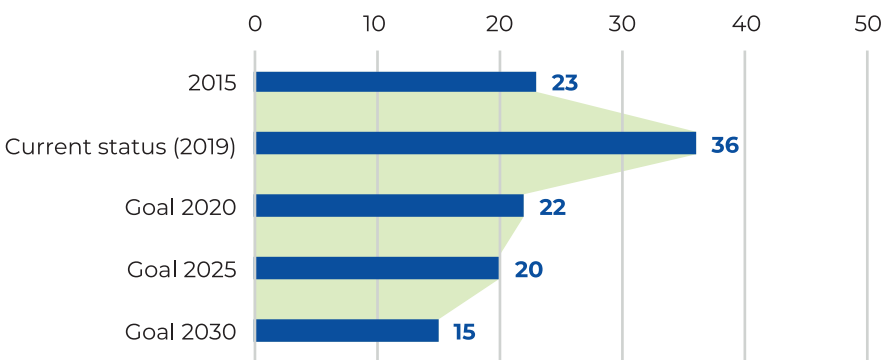
Assessment of progress: Ukraine will not reach the target for 2020 - 16.0%, because during 2015-2019 this indicator shows a decline. In 2019 it was 14.8%.

Measurability: The forest cover of the territory of the country is given by the strategy as a percentage of the total territory of the country. At the same time, it does not determine which area is considered "forested". It needs to be clarified in terms of accounting for the area that is actually covered by forests, forest vegetation, etc., and not in general forest lands, which also include lands not covered with forest vegetation, non-forest lands. International comparisons with OECD/EU countries should take into account that in these countries the forest cover is calculated per the land area of the country. Therefore, the indicator needs its own calculations as a percentage of the ratio of forest area and other forested areas covered with forest vegetation (numerator) to the territory of the country (denominator). The annual data required for calculations is available in the report "Statistical Yearbook of Ukraine" for the respective years. Data source: Ukrstats.

Indicator 23.

Cities where average daily pollution rates of main pollutants exceed established safety limits.

Figure 10.7. Cities where average daily pollution rates of main pollutants exceed established safety limits



Source: Ukrstats (2019).

Assessment of progress: Ukraine does not meet this target. According to the State Emergency Service, between 2015 and 2019 the number of cities where the average daily limit concentration was exceeded increased (by 2 cities).

Measurability: Annual data are available, in particular in the framework of SDG monitoring (Indicator 11.5.2). The strategy provides for a baseline 2015 figure of 23 cities. However, according to the State Emergency Service, in 2015 the number of such cities was 34. Data source: data are prepared by State Emergency Service of Ukraine and published by Ukrstats within SDGs monitoring.

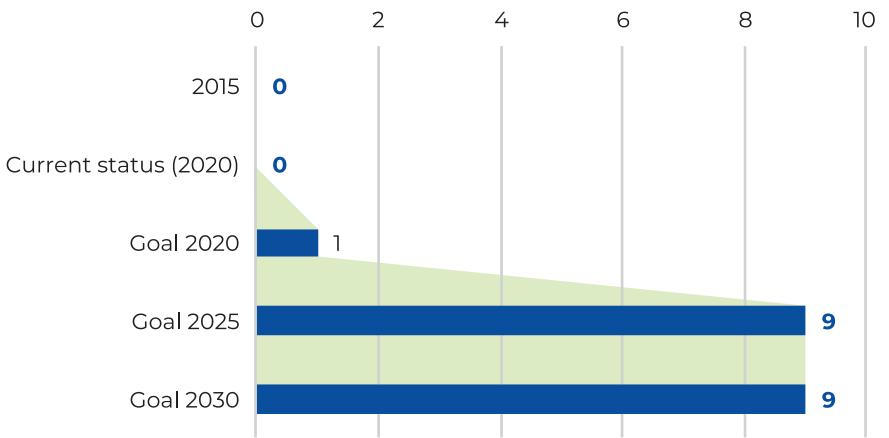
Chapter 11.

Implementing an effective environmental policy and good environmental governance

Indicator 24.

River basins with approved river basin management plans (RBMP). RBMPs are developed to achieve environmental targets established for each river basin region.

Figure 11.1. River basins with approved RBMPs



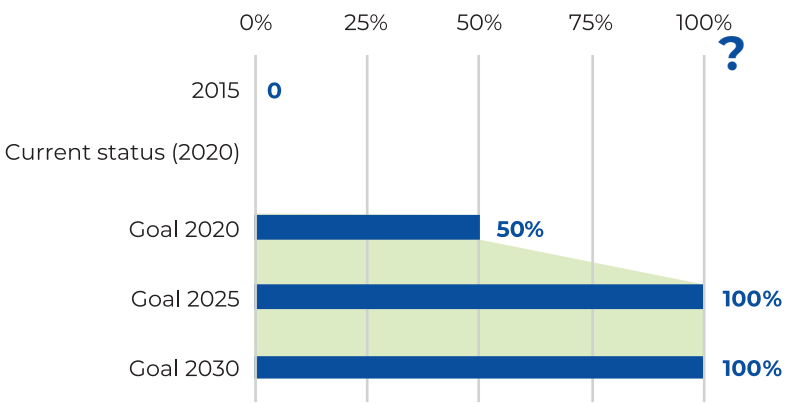
Assessment of progress: Ukraine has not reached the target for 2020 - the approval of one single river basin management plan. Work is currently underway to develop them. According to the time-schedules, it is planned to approve such plans in 2024.

Measurability: Plans were not approved. No data available.

Indicator 25.

Enterprises with chemicals management systems in accordance with international standards, % of all enterprises using hazardous chemicals.

Figure 11.2. Enterprises with chemicals management systems in accordance with international standards



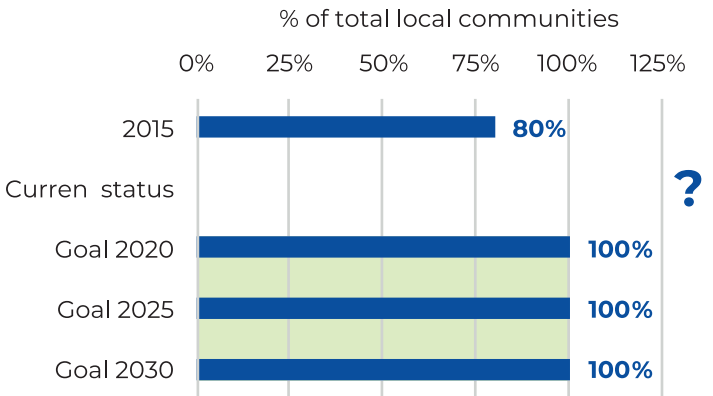
Assessment of progress: Ukraine has not met the target for 2020, as there is no necessary legal basis for the introduction of chemical management systems in accordance with international standards, Ukrainian legislation is not in line with EU regulations, including REACH.

Measurability: Statistics/data regarding such enterprises is not gathered, data are missing. Ukraine is currently in the process of developing and adopting relevant legislation - laws and regulations that take into account international standards, including Regulation (EU) № 1907/2006 of 18 December 2006 on the registration, evaluation, authorization and restriction of chemicals.

Indicator 26.

Hromadas (local communities) which have development strategies (and respective action plans) adopted and under implementation, developed with public participation, % of total number of hromadas.

Figure 11.3. Local communities which have development strategies (and respective action plans) adopted and under implementation, developed with public participation



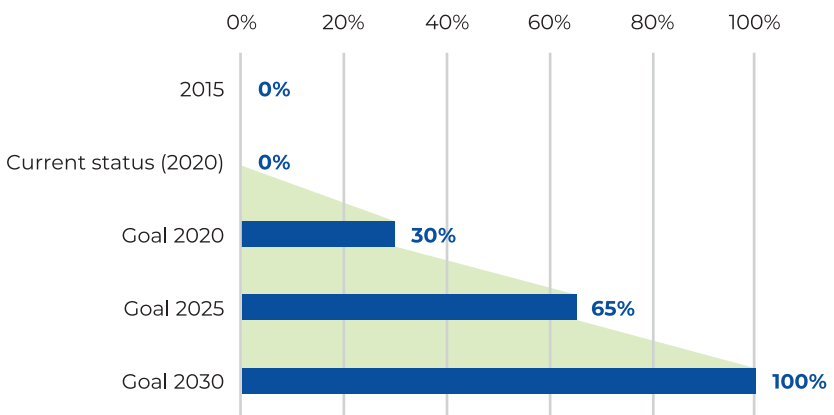
Assessment of progress: Unable to evaluate.

Measurability: No data available. The procedure for developing and approving plans to improve air quality should be determined by the Ministry of Environment (paragraph 16 of the Resolution of the Cabinet of Ministers of 14 August 2019 № 827). However, such a procedure has not been approved, which affects the (non-) adoption of relevant plans in practice.

Indicator 27.

Zones and agglomerations with air quality management plans, % of total. "Agglomeration" means an area with a population of more than 250 thousand people, defined for the purposes of monitoring and managing air quality. "Zone" means the part of the territory defined for the purposes of air quality monitoring and management.

Figure 11.4. Zones and agglomerations with air quality management plans



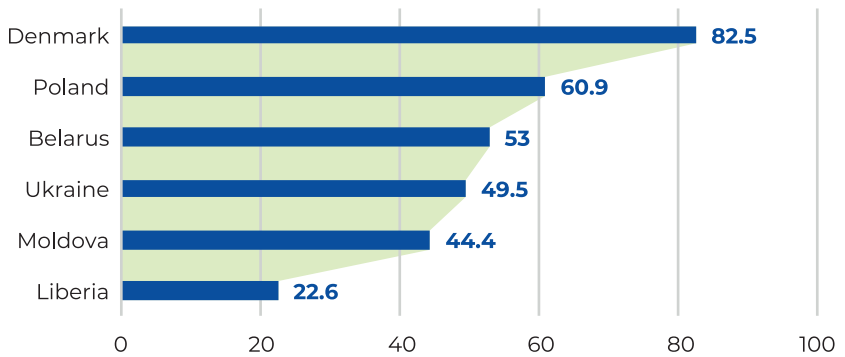
Assessment of progress: Unable to evaluate.

Measurability: No data available. The procedure for developing and approving plans to improve air quality should be determined by the Ministry of Environment (paragraph 16 of the Resolution of the Cabinet of Ministers of 14 August 2019 № 827). However, such a procedure has not been approved, which affects the (non-) adoption of relevant plans in practice.

Indicator 28.

Environmental performance index (EPI). It provides a brief description of the state, quantitative assessment and comparative analysis of state indicators on environmental protection and ecosystem viability. The index is based on a quantitative assessment of performance indicators, which are grouped into certain categories.

Figure 11.5. Environmental Performance Index



Source: Wendling, Z. A., Emerson, J. W., de Sherbinin, A., Esty, D. C., et al. (2020).

Assessment of progress: According to the results of EPI-2020, Ukraine ranks 60th among 180 countries, receiving 49.5 points, which is a much lower number of points than its 2015 baseline (79.69). Over the past 10 years, this indicator has improved by 0.7 points. At the same time, in this respect, Ukraine lags 33 points behind Denmark (82.5 points), which ranks the first, and is only 26.9 points ahead of Liberia (22.6 points), which ranks the last.

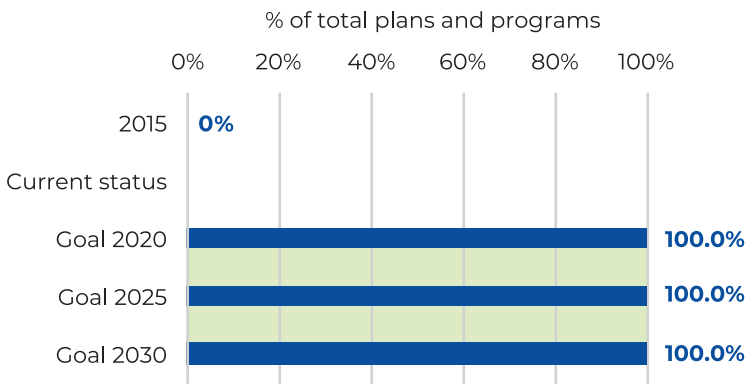
Measurability: The number of points and the rating of Ukraine in EPI changed during 2014-2020. The state's rating alternately improved and deteriorated. Among the main reasons are the changes in the EPI methodology that took place in 2014, 2018, 2020. The number of indicators and categories varied. For example, the rating of the Environmental Performance Index (2020) was based on 32 indicators, grouped into 11 categories, while in 2014 it included 20 indicators covered by 9 categories. Therefore, it is difficult to objectively assess the progress of this indicator (also, given that the strategy does not set a target for the EPI for 2020). EPI data are available, which were published every two years during 2008-2020. Data source: Environmental Performance Index (EPI).

Indicator 29.

State and local plans and programs for which SEA was done.

Strategic environmental assessment means a procedure for determining, describing and assessing the impact of state planning documents on the environment, including public health, justified alternatives, developing measures to prevent, reduce and mitigate possible adverse effects, which includes determining the scope of strategic environmental assessment, preparation of a report on strategic environmental assessment, conducting public discussions and consultations (if necessary - cross-border consultations), taking into account in the state planning document the report on strategic environmental assessment, results of public discussion and consultations, informing about approval of the state planning document.

Figure 11.6. State and local plans and programs for which SEA was done



Assessment of progress: Unable to evaluate.

Measurability: No data available. Information on the number and share of state and local plans and programs for which SEA has been conducted is not currently collected or disclosed for all plans and programs.

Indicator 30.

Report on implementation of the national environmental strategy

Assessment of progress: The target is not met. Reports are not available.

Measurability: No data available.

MOVING FORWARD TOGETHER

THIS PROJECT IS FUNDED BY THE EUROPEAN UNION

EU4Environment

Armenia, Azerbaijan, Belarus, Georgia, Republic of Moldova, Ukraine

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 is the third monitoring report that uses OECD green growth indicators in Ukraine, adapted to the national context. It presents a snapshot of Ukraine's progress towards green transformation, covering the 2015-2020 period. This is also a first attempt to evaluate the implementation of the State environmental strategy of Ukraine until 2030.

This report also identifies the remaining challenges and data gaps that contribute to strengthening the national monitoring system on green economy and environmental protection.

This report was developed within the framework of the "European Union for Environment Action" (EU4Environment) Programme funded by the European Union and implemented by the OECD, UNECE, UNEP, UNIDO, and the World Bank.

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