UNECE

The current status of production, sharing and use of UNECE environmental indicators

in the EU Eastern Partnership countries

Report of a desk study by the United Nations Economic Commission for Europe in the context of the EU-funded project *Support production and regular update of the regional set of indicators and strengthening environmental statistics and accounting in the six Eastern Partnership countries under the ENI SEIS II East project*

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Note

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Symbols of United Nations documents are composed of capital letters combined with figures. Mention of such a symbol indicates a reference to a United Nations document.

The authors of the study have primarily used information available online, in particular on the websites of national environmental and statistical authorities of the Eastern Partnership countries, as well as other materials provided by the United Nations Economic Commission for Europe (UNECE). In order to verify some of the observations and findings, communication was established with the National Focal Points of the ENI SEIS project, many of whom have provided valuable feedback.

The views expressed in this report may not represent the views of the United Nations or its Member States.

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INTRODUCTION

The process of developing a Shared Environmental Information System (SEIS) is based on a proposal by the European Environment Agency (EEA). The initial proposal by EEA was to develop SEIS within the European Union, to create a system that, with the support of modern technologies such as the Internet, would link all the existing data and information flows relevant at the country and international levels in support of a regular environmental assessment process. The EEA proposal on the development of SEIS was agreed and launched in the European Union, primarily to support the reporting related to EU environmental policies and legislation.

As an approach to link relevant data and information in support of integrated assessments, SEIS makes agreed data and information easily available and accessible online for analysis so that they can offer the basis for easily comprehensible, accessible and targeted recommendations to decision makers and the public or for reporting at the country level or internationally in accordance with legal obligations, policy commitments and mandates. For the pan-European region, the United Nations Economic Commission for Europe (UNECE) Working Group on Environmental Monitoring and Assessment is defining the data and information content to be made available and accessible.

Development of SEIS at the pan-European level

At the Seventh Environment for Europe Ministerial Conference (Astana, 21–23 September 2011) ministers decided to establish a regular process of environmental assessment and to develop SEIS across the region to keep the pan-European environment under review (ECE/ASTANA.CONF/2011/2/Add.1, para. 14). The ministers emphasized that SEIS should serve multiple policy purposes, taking into account the needs of the multilateral environmental agreements, and that the work on SEIS and its development should include support and capacity-building for countries in Eastern and South-Eastern Europe, the Caucasus and Central Asia.

EEA, in cooperation with its partners, was invited to develop an outline for SEIS activities and implement them under the auspices of the UNECE Committee on Environmental Policy. The Committee decided to set up a coordination mechanism for SEIS development across the entire UNECE region in the form of a Group of Friends of SEIS, which was established at its nineteenth session (Geneva, 22–25 October 2013) to support the development of SEIS in the pan-European region.

The UNECE Committee on Environmental Policy entrusted the Group to work on the preparation of clear targets and performance indicators to monitor and evaluate the development of SEIS in the pan-European region and on the organization and shaping of the regular environmental assessment process, taking into consideration the benefits of SEIS (ECE/CEP/2013/2, paras. 38–39). Accordingly, regarding the first issue, targets and performance indicators were adopted by the Committee on Environmental Policy at its twentieth session (Geneva, 28–31 October 2014). The targets and performance indicators aim to facilitate the monitoring, development and operation of the pan-European SEIS overseen by the UNECE Working Group on Environmental Monitoring and Assessment, which has been mandated with these tasks. Regarding the second issue, the Group of Friends of SEIS prepared a document to propose the organization and shape of the regular environmental assessment process to the Committee on Environmental Policy. The elaboration of the document was supported by the UNECE secretariat, the United Nations Environment Programme (UNEP) and EEA.

At its twentieth session, the UNECE Committee on Environmental Policy requested the Working Group to prepare an evaluation report on progress made in establishing SEIS for consideration at the Eighth Environment for Europe Ministerial Conference (ECE/CEP/2014/2, paras. 26 and 98 (ff) (iii)). The Working Group agreed at its sixteenth session (Istanbul, Turkey, 16–17 April 2015) that the data and information included in the report should allow the measurement of progress towards agreed global and regional priorities in line, as relevant, with global and regional multilateral environmental agreements. The Working Group further agreed on a first pan-European SEIS development milestone: 67 specific data sets that every country in the pan-European region should aim to make available and accessible online during 2015. It was furthermore discussed that the Working Group was expected to agree on additional data sets for implementation in subsequent years, with a target of 2020 for the pan-European SEIS to be fully operational, based on SEIS targets and performance indicators. For the pan-European SEIS, each specific data set should be accompanied by information explaining the data production methodology and how the data should be interpreted. The data sets also need to be up to date for the latest production period and indicate sources of additional information.

During the first assessment in 2015, full participation of all countries in the pan-European region could not be achieved and the assessment was not able to take into account internationally-accepted standards for data set production nor data quality, given the limited resources available. Therefore, it was suggested that these shortcomings should be rectified in the next review round. Furthermore, the report stated that building on experiences from the first review, continued efforts were needed in measuring progress on SEIS establishment. It was also highlighted that the next assessment would benefit from an adequate review of all the three main SEIS pillars — cooperation, content and infrastructure — and the expansion of the review criteria when assessing the establishment of SEIS in order to enhance data quality for environmental reporting.

The Eighth Environment for Europe Ministerial Conference took place in Batumi, Georgia, from 8 to 10 June 2016 and culminated in a Ministerial Declaration that stated that: “While welcoming progress in developing the Shared Environmental Information System (SEIS) to support a regular process of environmental assessment, we invite countries to continue their efforts and to further develop their national information systems to have SEIS in place in the countries of Europe and Central Asia by 2021” (ECE/BATUMI.CONF/2016/2/Add.1). Furthermore, the Committee on Environmental Policy was invited to convene a mid-term review in 2018 to assess progress in the implementation of the main outcomes of the Batumi Conference including on developing SEIS to support a regular process of environmental assessment.

At its eighteenth session (Geneva, 28–29 June 2016), the Working Group on Environmental Monitoring and Assessment made several decisions and recommendations regarding reporting on progress in establishing the SEIS (ECE/CEP/AC.10/2016/2, paras. 31-32). It was agreed that the secretariat would revise the review criteria and integrate a quality component as part of the SEIS assessment framework. The purpose of that continuing review of the assessment framework was to utilize the revised assessment framework in the preparation of the mid-term review that would be submitted to the Committee on Environmental Policy.

At its nineteenth session, the Working Group examined the results of the review of the SEIS assessment framework (ECE/CEP/AC.10/2017/5). The Working Group agreed that it would be necessary to pilot the assessment framework and its associated reporting application before moving on to data collection for the mid-term assessment. It was also noted that steps would need to be taken to ensure that the assessment framework was streamlined with other initiatives, such as the data quality assessment framework being developed by EEA. Armenia, Bosnia and Herzegovina, Kazakhstan, the Russian Federation and the former Yugoslav Republic of Macedonia agreed to

participate in piloting the SEIS assessment framework. UNEP and the EEA also took part in the process. It was further agreed that the secretariat would prepare a guidance document and clarify which of the ECE environmental indicators and underlying data flows from the core set could be used for the piloting. It was also agreed that the full list of questions would be converted into a paper-based questionnaire that could be shared with other relevant agencies on the national level. The Working Group noted that the SEIS mid-term assessment would be reviewed at the twentieth session of the Working Group (Geneva, 3–4 September 2018). The mid-term review will pilot the SEIS Assessment Framework across the whole pan-European region.

Implementation of the SEIS principles and practices in the European neighbourhood region

The EU-funded project *Implementation of the Shared Environmental Information System principles and practices in the European neighbourhood regions (ENI SEIS II East)*, led by EEA, represents the continuation of the UNECE-EEA cooperation on SEIS. The present analytical report will contribute to the efforts made by UNECE, EEA and UNEP in establishing SEIS by 2021. This report is the result of the desk study commissioned by the UNECE in the context of its activity *Support production and regular update of the regional set of indicators and strengthening environmental statistics and accounting in the six Eastern Partnership countries under the ENI SEIS II East project*. [1] The project addresses the challenge of organizing a vast array of environmental statistics, data and information necessary for regular environmental reporting, based on the SEIS principles and practices. It aims to improve national capacities for environmental monitoring (e.g., harmonization of methodologies for production of comparable environmental indicators) that underpin the science-policy interface for decision makers and the public. It also aims to strengthen the capacities of the countries for reporting at the national level, or internationally, in accordance with multilateral environmental agreements, policy commitments (such as the 2030 Agenda for Sustainable Development) and other priority areas.

The ENI SEIS II East project target countries – Armenia, Azerbaijan, Belarus, Georgia, the Republic of Moldova and Ukraine – are also active members of the UNECE Working Group on Environmental Monitoring and Assessment and the Joint Task Force on Environmental Statistics and Indicators (hereinafter also the Joint Task Force), within which many synergies are used with the aim of improving environmental monitoring and assessment and enhancing the comparability of environmental statistics in the pan-European region as a whole. This study contributes to achieve the objectives of the project *Support production and regular update of the regional set of indicators and strengthening environmental statistics and accounting in the six Eastern Partnership countries under the ENI SEIS East project*, which aims to:

- Help strengthen capacities of national environmental authorities and statistical agencies of the Eastern Partnership countries to collect and produce the required data sets, with quality assurance and quality control standards comparable with those of the EU and EEA, as input to the production and use of the UNECE set of environmental indicators in accordance with SEIS principles and practices;
- Support the regular updating and production of high-quality comparable environmental indicators within the framework of SEIS and the UNECE set of environmental indicators, so that the countries are better able to respond to international reporting obligations including progress towards monitoring the SDGs and SEIS regular reporting;

[1] The EU term "Eastern Partnership countries" refers to the six countries of Eastern Europe and the Caucasus as listed in the text.

- Improve capacities of the countries to prepare regular state-of-the-environment and thematic assessments using comparable indicators and methodologies in line with EU/EEA and UNECE best practice, and to further development the System of Environmental-Economic Accounting.

Capacity development activities will follow in the next project phase and will build on the analysis made in this study. It is also expected that the study will have an impact on the production, management and use of environmental indicators and information by providing inspiration and analytical base for capacity building in the wider Pan-European region.

OVERVIEW OF THE PRODUCTION, SHARING AND USE OF UNECE ENVIRONMENTAL INDICATORS IN EASTERN PARTNERSHIP COUNTRIES: EXTENDED EXECUTIVE SUMMARY

All Eastern Partnership countries – Armenia, Azerbaijan, Belarus, Georgia, the Republic of Moldova and Ukraine – have long traditions in the fields of environmental information, assessment and reporting. Since the establishment of the UNECE Working Group on Environmental Monitoring and Assessment and the Joint Task Force on Environmental Statistics and Indicators, the countries have benefitted from a gradually consolidating common vision of how to select, calculate, present and use environmental indicators in order to communicate the state of the environment, factors that define it, trends and the spatial distribution of environmental concerns. Regular discussions in these forums have helped define specific methodologies so that the indicators produced in the countries have a solid basis of data and methodologies, can well illustrate the issues they are designed to highlight, and can be used for decision-making both within the countries and – being easily comparable – regionally and internationally.

In 2015, in advance of the 8th Environment for Europe Ministerial Conference, UNECE organised a broad review of 23 selected key environmental indicators from the UNECE list of environmental indicators (see box 1) accessible online at the time in its member countries.

Box 1. Key indicators from the UNECE environmental set selected for the review in 2015

Emissions of pollutants into the atmospheric air (A1)
Ambient air quality in urban areas (A2)
Consumption of ozone-depleting substances (A3)
Air temperature (B1)
Atmospheric precipitation (B2)
Greenhouse gas emissions (B3)
Renewable freshwater resources (C1)
Freshwater abstraction (C2)
Total water use (C3)
Water supply industry and population connected to water supply industry (C5)
Biochemical oxygen demand (BOD) and concentration of ammonium in rivers (C10)
Nutrients in freshwater (C11)
Population connected to wastewater treatment (C14)
Wastewater treatment facilities (C15)
Polluted (non-treated) wastewaters (C16)
Protected areas (D1)
Forests and other wooded land (D3)
Threatened and protected species (D4)
Land uptake (E1)
Final energy consumption (G1)
Total primary energy supply (G2)
Waste generation (I1)
Management of hazardous waste (I2)

Source: extract from the list of UNECE environmental indicators in the *Guidelines for the Application of Environmental Indicators* www.unece.org/env/indicators.html

This study reviews the situation in the Eastern Partnership countries three years after, in early 2018. The results of the analysis are summarised below and are presented in more detail in the annex to this report.

UNECE environmental indicators online

Today, all Eastern Partnership countries **publish** UNECE environmental indicators online: from the websites of single (typically, though not only, statistical) agencies to integrated national platforms and the national open-data portal in **the Republic of Moldova** (see box 5). Some of these national websites (or their sections) where UNECE indicators can be found have been developed specifically within the context of SEIS and/or in cooperation with UNECE. **Armenia**, **Azerbaijan** and **Belarus** have created convenient single national entry points for all UNECE indicators, which are easy to access and use. The Armenian platform (see box 2) includes tools for the selection and the visualisation of indicators and for downloading the respective data.

Box 2. Online platform for environmental indicators in Armenia

Armenia's National Statistical Service operates an easily accessible, compact and informative online platform dedicated to environmental information.

The information, published in Armenian and English, is gathered and updated on a regular basis. Access is free and easy for both the national and European users. The content supports the needs of environmental conditions, design and implementation of environmental policies. The credibility of indicators is ensured by state organizations responsible for the collection and processing of information, and by the methodological compliance of procedures with national quality standards.

The system has been an important factor in Armenia's participation in the mid-term review of the progress of implementation of the outcomes of the Batumi Ministerial Conference. Along with four other countries from other parts of Europe, Armenia took part in the pilot project to appraise the quality of data supporting UNECE environmental indicators.

Source: ArmStatBank

Most countries publish indicators both in their national languages and in English, which makes information accessible for both foreign and the domestic users. **The Republic of Moldova** publishes some of its information in three languages including Russian.

Some of the UNECE indicators that are not yet directly found on the websites above are nonetheless included in statistical yearbooks that are often accessible online. Other indicators are accessible through international websites: for instance, national energy statistics are made available online by the International Energy Agency.

At the time of this study, the website of the Ministry of Environment Protection and Agriculture of Georgia was unavailable due to the administrative reform in the country; therefore, for **Georgia**, the analysis, which already shows interesting progress (see box 3), likely underestimates the actual achievements in the country.

However, merely publishing indicator entries online is not sufficient for them to be deemed truly and fully accessible: their content must satisfy the definitions and methodology discussed and commonly accepted within the UNECE Joint Task Force on Environmental Statistics and Indicators. That means that all data sets which are specified by these definitions need to be accessible online under the respective indicator headlines. Three years after the 2015 review, there is visible progress with the **content** of indicator-publishing websites: the number of accessible indicators has increased in almost all the countries. **All countries** publish data on greenhouse gas emissions, polluted wastewater, final energy consumption and protected areas. (Except in the case of wastewater, this improvement is, most likely, due to the countries' reporting obligations under international conventions, which shows the role international agreements can play when they set specific reporting requirements and control compliance with them.) New data have become accessible in **Azerbaijan**, **Belarus** and **Ukraine** since 2015.

The study also uncovered some issues that remain problematic. Of 402 data sets underpinning key UNECE indicators, 260 are already accessible online. However, others are still missing, either entirely, or due to not fully complying with the Joint Task Force's recommendations. For the six countries together, 20% of the key indicators are still lacking online including those for which compliance with recommendations is incomplete (see tables 1.1 and 1.3–1.8 in Annex A). Commonly

lacking are indicators of water supply and wastewater treatment, and the volume of processed water is often published instead of the population connected to water supply and wastewater treatment. None of the countries yet provide all the required data for emissions into the air and the management of hazardous waste. Often published, but not meeting methodological requirements, are emissions of particulate matter into the air (for which the concentration of total suspended particles is commonly used instead of the required PM_{10} and $PM_{2,5}$ values). Quite often indicators of ozone-depleting substances lack some of the seven different required data sets. While even partially complete information is nonetheless useful – and is indeed used for assessment and reporting both within the countries and internationally – deviation from the commonly-accepted methodology makes full-scale international comparisons difficult or impossible. An example of consistent methodological compliance is provided by **Georgia** (see box 3).

Box 3. Methodological approach to indicator development in Georgia

Following the 8th Environment for Europe Ministerial Conference in Batumi, an important contribution to the development of UNECE-compatible environmental indicators was made by Georgia. Georgia's indicators reflect environmental trends and their causes, useful both for environmental policy implementation and for monitoring its efficiency.

The National Statistics Office of Georgia operates a website with easily-accessible user-friendly information in Georgian and English, containing 14 indicators in the water, agriculture, energy and transport domains. The Office has paid particular attention to the international comparability of indicators by meticulously following the revised methodological *Guidelines for the Application of Environmental Indicators in countries of Eastern Europe, Caucasus, Central Asia and South-Eastern Europe*. As a result, the indicators are not only comparable, but the information is easy to use and undoubtedly credible.

Table C-4: Household water use per capita

	Unit	2015	2016
Households supplied by water supply industry			
Water supplied to households by water supply industry*	million m^3	243,3	207,9
Population connected to water supply industry	million	2,15	2,27
Water use per capita (water supply industry)*	m^3	113,3	91,7
Households supplied by self supply**			
Population not connected to water supply industry (self supply)	million	1,57	1,45
Estimated water use by households supplied by self supply per capita***	m^3	113,3	91,7
Water use in the country (self supply)	million m^3	178,2	133,0
Total household water use (water supply industry and self supply)			
Total water use by households*	million m^3	421,5	340,9
Total population	million	3,72	3,72
Total household water use (water supply industry and self supply) per capita*	m^3	113,3	91,7

Source: Survey on Water Supply Enterprises (Geostat).

Notes:

*Does not include volume of water used by enterprise employees for personal needs, outside the households.

**Includes households supplied by municipalities as well.

***Estimated based on an average per capita water useby households supplied by water supply industry.

The amount of Accrued water per person reduced in 2016.

When the temporarily off-line indicators from Georgia's Ministry of Environment Protection and Agriculture become available again, they will effectively complement information from the National Statistics Office with another set of UNECE core indicators developed on a solid and modern methodological basis.

Source: National Statistics Office of Georgia

Complementing the key part of the UNECE set of indicators, data also are becoming fully or partially accessible online for 17 additional indicators from the list (see table 1.2 in Annex A). In **all** six Eastern Partnership **countries** these include water losses, fertilizer consumption, energy intensity, renewable energy consumption, final electricity consumption, gross electricity production and passenger and freight transport demand. Unlike key indicators, some of these additional indicators were not yet reviewed by the Joint Task Force and a fully harmonised methodology for their production is not yet available. Yet countries already produce and publish such indicators, including some of the energy indicators above and – in **Armenia**, **Azerbaijan**, **Belarus** and **Ukraine** – indicators of irrigation and environment protection expenditures.

Box 4. In-depth quality assessment of selected UNECE indicators

The SEIS Assessment Framework developed by the UNECE, EEA and UNEP based on feedback from the Working Group on Environmental Monitoring and Assessment and the Joint Task Force on Environmental Statistics and Indicators offers a good opportunity to look much deeper into the quality of three selected UNECE indicators (with seven related data sets):

- ambient air quality in urban areas;
- BOD and concentration of ammonium in rivers;
- protected areas.

A cross-cutting analysis for all six Eastern Partnership countries was made as part of this study. In addition, four of the six countries (Armenia, Azerbaijan, Belarus and the Republic of Moldova) have also done a self-assessment exercise evaluating the three selected indicators against the criteria of the Assessment Framework:

(1) Relevance;
(2) Accuracy;
(3) Timeliness and punctuality;
(4) Accessibility;
(5) Clarity;
(6) Comparability;
(7) Institutional and organizational arrangements.

The results of this review (see table 2.1 in Annex A) have shown that in most cases (indicators and countries) *relevance* is high, although there are exceptions in terms of missing categories (commonly, O_3 and PM_{10} for air quality and minimum and maximum values for water quality). *Timeliness* is medium to high, with many data sets going to 2016, in a few cases with too large gaps between the end of the published data series and the date of updating them (*punctuality*). Almost all the sampled indicators are fully *accessible* online and presented with sufficient *clarity*. The latter includes publication in different languages, presence of metainformation and visualisation. Typically missing (except for Protected areas) are references to standards. For water quality, often missing are the periods when samples were taken, and in a few cases the number of samples taken. The data are published as fully (in a few cases, partially) *comparable* time series. For Protected areas, half of the countries adhere to IUCN international categories so that the data can be compared. (For other indicators, adherence to standards was not indicated.) *Accuracy* as well as *Institutional and organizational arrangements* could not be evaluated in the context of the study.

Self-assessments by Armenia, Azerbaijan, Belarus and the Republic of Moldova have produced 77% (good) to 96% (very good) cumulative performance scores per country. The underlying analysis of individual quality categories made by the countries themselves generally coincides with the findings from the direct assessment in this study, although some cumulative values may need to be revisited in the light of possible methodological gaps.

Source: analysis of selected indicators against criteria of the revised SEIS Assessment Framework, and the results of mid-term review self-assessment by Armenia, Azerbaijan and Belarus.

The ability to trace the origin of data and the methodology of the indicators' production significantly improves their credibility. Publishing specific elements of **metainformation** is among the agreed UNECE production requirements. In 70 to 100% of cases, **all** Eastern Neighbourhood **countries** do provide information about the providers of data and indicators. In **the Republic of Moldova** not only are data-providing organisations systematically indicated, but also responsible persons who can be contacted with questions or inquiries.

Less often, the countries indicate conformity with domestic or international standards for data production (sometimes such references are entirely lacking). References to international standards are nonetheless more common, with higher numbers of them provided by **Armenia** and **Belarus**. This is a welcome development in terms of improving comparability of indicators. At the moment, however, such references are mainly related to indicators used by countries in reporting to international agreements and organisations. (This shows the importance of such reporting frameworks for harmonising indicator development in thematic areas related to them.) Data acquisition techniques are shown only rarely, more often by **Belarus** and **the Republic of Moldova**.

As is common for statistical data, UNECE indicators are published in the countries as numerical data sets with supplementary information (see above), as required according to the indicator definitions. In principle this is sufficient for them being accessible online, and meets basic UNECE requirements. However, such a limited mode of publication sometimes requires major additional efforts, especially from unfamiliar users, to understand the patterns and issues the indicators shows, why such patterns are relevant and for what, and what can or should be done about them if they indicate a problem.

The first step to answering these questions is to **visualise** the numerical data by showing trends over time as graphs, data breakdowns into different categories as diagrams, and maps showing the spatial distribution and patterns. This is yet not always done but is improving. Especially in **Armenia**, (see box 2), **the Republic of Moldova** and **Belarus**, the published indicators are well illustrated. As a rule, and in line with the statistical tradition in the region, data that are only published in statistical yearbooks contain fewer illustrations. The same is true of data submitted to international organisations, although, for instance, the International Energy Agency uses its own formats to visualise country energy statistics.

The next level of interpretation is the narrative analytical **assessment** of indicator values, patterns and trends in the policy context by asking and answering policy questions, linking indicator patterns to: the root causes explaining their dynamics; the consequences of their values and behaviour; and, eventually, response actions that are already undertaken, planned, or are necessary. In some cases this can be done by explicitly putting indicators into the context of the DPSIR framework.[2]

[2] Driving forces – Pressures – State – Impact – Response analytical framework for environmental assessment.

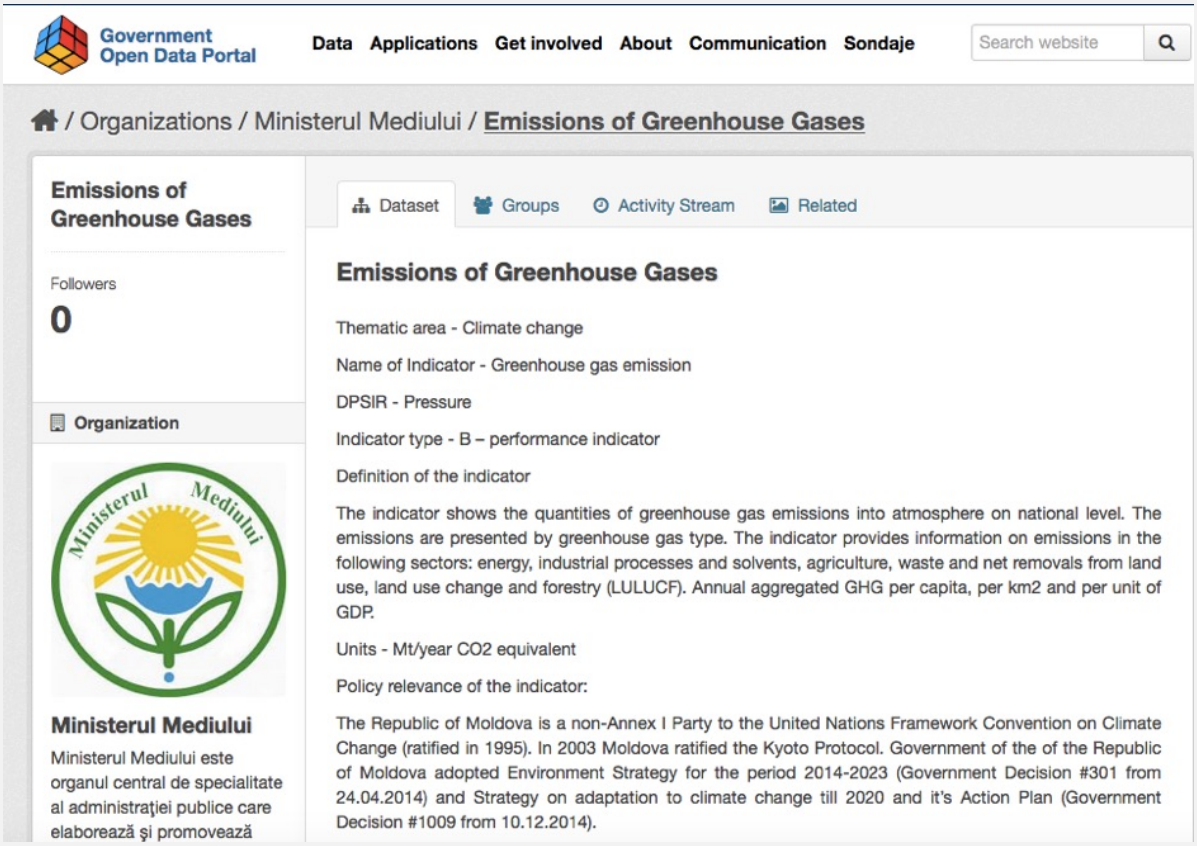
So far only selected indicators published in **Belarus** and **the Republic of Moldova** (see box 5) include their assessment in the policy context. In particular, indicators in the Republic of Moldova also include information about measures needed to improve the environmental situation. All in all, integrating environmental assessment with the publication of indicators is one of the main areas where future development is needed. Its potential is high both in terms of systematically including an assessment narrative when publishing indicators and in further improving the analytical quality of such narrative. Not least, encouragement is needed to build bridges between the environmental and statistical communities to overcome the common reluctance of the latter to get engaged in assessment in the first place.[3]

Important channels for contextualising indicators for policy and public use are also their increasing publication in other contexts – which is further explored below.

[3] On many occasions, statistical organisations in Eastern Partnership countries make a point that, by tradition or even by law, they have neither an obligation nor a mandate to assess data they publish. Overcoming this may require steady but gradual institutional, legal and not least cultural changes.

Box 5. Environmental information on the Governmental Open Data Portal of the Republic of Moldova

The Governmental Open Data Portal is the key element of the state programme of upgrading access to digital data. This platform is designed to make governmental data easily accessible for stakeholders and citizens. The architecture of the Government Open Data Portal allows finding, downloading and using the data.



This open data initiative confirms the Republic of Moldova's interest in transparent management and innovation and ensures that the Government becomes more sensitive to public opinion by allowing organisations and citizens to be more directly included in decision-making.

The environmental section of the Governmental Open Data Portal includes some of the UNECE environmental indicators accompanied by focussed assessments of their trends and links to policy. This enhances the transparency and accountability in the environmental sector, encouraging citizens' involvement in addressing environmental issues and contributing to the implementation of the national environmental policy.

Source: Governmental Open Data Portal of the Republic of Moldova

UNECE environmental indicators in policy frameworks

Policy processes lean on indicators to measure progress and to monitor the achievement and gaps in achieving internationally-agreed (or nationally-adopted) policy goals. For environmental indicators, among the two most important international policy frameworks are the Sustainable Development Goals and the concept of Green Economy or Green Growth.

The 2030 Agenda for Sustainable Development recommends all Member States to develop national programmes with objectives and indicators for monitoring the achievement of the **Sustainable Development Goals**, which cover all aspects of a transition to sustainable development. For monitoring implementation, the United Nations General Assembly adopted in 2017 a global system of indicators, and strongly urged countries to advance coordinated efforts for the development of data collection considering national priorities and recognising national responsibilities for the implementation of the 2030 Agenda. The General Assembly resolution allows for amending the list of global indicators by adding regional and national-level indicators developed by the countries.

Such work is currently being carried out in **all countries** of the Eastern Partnership, which are developing nationally-adapted SDG indicator frameworks and national SDG strategies and planning systems (see table 3.1 in Annex A). Most countries have issued selected SDG indicators in the form of national reports (**Belarus** and **Ukraine**; see box 6), statistical publications or voluntary national reviews.

Box 6. Monitoring Sustainable Development Goals in Ukraine

The SDGs approved by the United Nations Sustainable Development Summit were adopted by the Government of Ukraine already in 2015. The preliminary results of their monitoring were presented in the national report *Sustainable Development Goals: Ukraine* prepared in 2017 by the Ministry of Economic Development and Trade of Ukraine and approved by the High-Level Interagency Working Group for implementing SDGs in Ukraine.

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Ukraine's national SDG system consists of 86 national development targets and 172 indicators for

monitoring them, developed using a wide range of information, statistics and analytical materials. A review of the availability of information shows that state statistics currently capture information on 96 of these indicators. More specifically, information for 52 indicators is collected and processed in full compliance with international standards, while for the remaining 44 indicators compliance with such standards is only partial. The 35 qualitative global indicators can usually be directly produced by international organisations. The remaining indicators require further inter-agency work and consultations.

SDG consultations took place at the national and regional levels, involving more than 800 leading experts in a transparent process of defining national tasks. Consultations in 10 of Ukraine's regions included representatives of national authorities, regional administrations, local governments, international organisations, the expert community, the public and civil society organisations. This helped to ensure the objectivity of assessing indicator values and the coherence of their projections.

Source: Міністерство економічного розвитку і торгівлі України. Цілі сталого розвитку: Україна. Національна доповідь. 2017

In the UNECE region, indicators for SDG monitoring may, where possible, build on the UNECE set of environmental indicators. At least 20 indicators recommended by the United Nations General Assembly for monitoring SDGs 2, 6, 7, 9, 11, 12, 14 and 15 can be matched by UNECE environmental indicators, including indicators of water resources, waste, biodiversity, energy, agriculture, land use, transport, air pollution and climate change (see table 3.2 in Annex B).

Besides directly matching General Assembly indicator suggestions, UNECE indicators can help monitor specific SDGs with significant environmental content in a broader sense (see table 3.3 in Annex A). This is the case for the majority of key UNECE indicators described above, as well the additional indicators of energy production and supply, generation, utilization and treatment of waste, use of mineral and organic fertilizers and passenger transport. Other UNECE indicators that are methodologically advanced and are thus well fit for monitoring progress towards SDGs include drinking water quality, nutrients and pollutants in coastal sea water and sediments, trends in the number and distribution of selected common species, area affected by soil erosion and the age of road motor vehicles. However, their actual production in some of the Eastern Partnership countries is still relatively weak, and additional efforts are needed to close specific gaps.

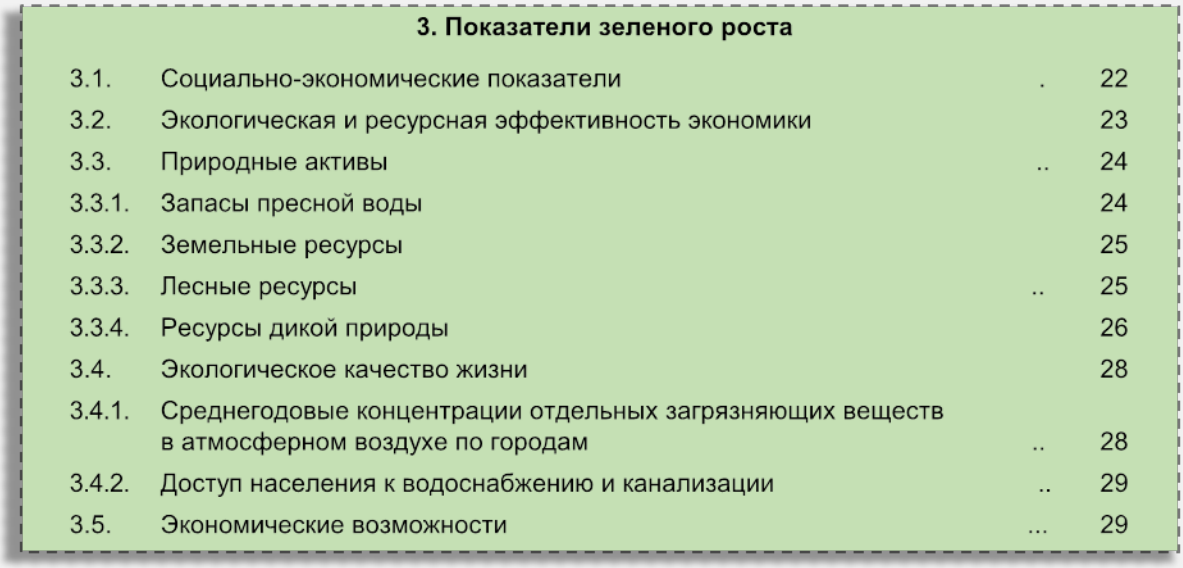
Some of the UNECE indicators that are potentially useful for monitoring SDGs are not yet sufficiently developed by the Joint Task Force on Environmental Statistics and Indicators. Although data may in fact already be available for them in Eastern Partnership countries, they first require concerted international action to harmonise definitions and methodology. Among such indicators are biosphere reserves and wetlands of international importance, invasive alien species, land irrigation, gross nitrogen balance, final electricity consumption and gross electricity production and environment protection expenditures.

All Eastern Partnership countries have stated adherence to the principles of **green economy** or **green growth**, and are taking specific steps in this direction. **Armenia**, **Azerbaijan**, **the Republic of Moldova** and **Ukraine** have started the development of their national green growth indicator frameworks. **The Republic of Moldova** and **Georgia** are already working on green economy strategies and action plans, while **Belarus** (see box 7) published its set of green growth indicators in 2017 as part of national environmental statistics and has adopted a national plan for green economy development for 2016–2020.

Box 7. Green growth indicators in Belarus

A set of green growth indicators has been produced in Belarus, compliant with the OECD Guide for "Measuring the Green Transformation of the Economy". The indicators are divided into five groups:

- Indicators of environmental and resource productivity that characterize the use of natural resources and materials in production and consumption. They include production-based carbon productivity, which represents gross domestic product (GDP) per unit of emitted CO_2 (carbon dioxide), and waste recovery ratios defined as the percentage of industrial waste used for the production of goods, energy, works and services;
- Natural asset indicators that characterize the efficiency of the management and use of natural resources. Resource efficiency measures help monitor whether renewable and non-renewable resources are available for economic activities and growth and if the extraction and processing of natural resources is properly managed to avoid their degradation and depletion;
- Indicators of environmental quality of life that help track whether growing production and income lead to a better quality of life. For instance, excessive concentration of economic activities may have a negative impact on the environment and the quality of life;
- Indicators reflecting economic opportunities characterize governmental support and the role of business as two key stakeholders of green growth;
- Ageing coefficient which is a ratio of the population aged 64 or more to the population under 15.



3. Показатели зеленого роста

Close links between UNECE environmental indicators and green growth indicators provide a solid basis for their future integration, both nationally and beyond.

Source: Национальный статистический комитет республики Беларусь. Охрана окружающей среды в Республике Беларусь. Статистический сборник. Минск, 2017

The regional workshop for the countries of Eastern Europe, the Caucasus and Central Asia at the OECD in Paris in 2015 agreed that green growth and green economy monitoring should be closely

coordinated with SEIS development. Discussions at the workshop identified 11 (out of 24) OECD green growth indicators which, to a varying degree, can be matched by 19 UNECE environmental indicators. The assessment of Eastern Partnership countries' capacities to produce these indicators shows that **all countries** can match green growth indicators of CO_2, energy and water productivity, nutrient flows and balances, freshwater and land resources. Many, though not all, countries have indicators for measuring waste generation, wildlife resources, health problems and related costs. However, no Eastern Partnership country yet publishes UNECE-compliant indicators of drinking water quality, soil erosion and trends, and the distribution of common species (see table 3.4 in Annex A).

The high potential for using UNECE environmental indicators in support of international policy frameworks such as the SDGs and green economy or green growth points to areas where cooperation among international processes and targeted capacity building can bring methodological (through indicator development) and operational synergies, by connecting SEIS networks with those of the international secretariats and their national partners. In the case of green growth, such needs and potential have already been acknowledged.

National environmental policy frameworks in Eastern Partnership countries increasingly set policy targets and make use of indicators to measure progress towards them – thus turning environmental indicators into true policy monitoring tools at the national level (see table 3.5 in Annex A). In **Belarus**, target values are part of the Environment Protection Strategy until 2015. Indicators on **the Republic of Moldova**'s governmental open-data portal (see box 5) are directly linked to the targets of the Environmental Strategy for the years 2014–2023. **Ukraine** prepared in 2017 a draft of the Key Directions (Strategy) of State Environmental Policy until 2020 which includes a set of 35 measurable targets against which progress is to be gauged, and which will eventually require the systematic collection of comparable data and indicators.

Out of about 40 indicators envisaged in these three countries for monitoring national targets, half can be related to the UNECE core set although not always precisely matching its definitions. Others are unique for individual countries, and many (especially in the case of Ukraine) are outside of the UNECE list. Collecting robust data for such indicators in the short-term may prove a challenge. However, in the longer term, some of them may show interesting new directions for the further development of the indicator methodology in the UNECE region as a whole.

Use of UNECE indicators in environmental assessments and reports

One of the subjects of this study has been the actual use of indicators for their end purpose: for keeping people and institutions aware of environmental trends and problems, helping them take right decisions and, eventually, making "trees feel the difference".

Apart from directly publishing indicators online and in the already-mentioned statistical yearbooks and similar publications, a common and powerful way of making use of environmental indicators is their integration in environmental assessments and other similar reports, both nationally, regionally and internationally. In addition to merely providing new channels for reaching policymakers and other users, such publications are also able to enhance the visual and narrative context of the indicators, thereby dramatically increasing their impact.

Unlike in the preceding analysis, the matching of indicators used in assessment reports against UNECE definitions was intentionally not precise. Its purpose was rather to explore and show the spirit of what information gets to be used, how and to what purpose. The actual occurrence of

environmental indicators in the reviewed publications can be supply-driven (data are simply available and easy to include) or driven by demand (the issue is seen as important). Especially in the latter case, indicators can point to the types of information that require priority attention from environmental managers and statisticians in order to further advance the respective methodology and the accessibility of data for decision-making. Some of the indicators commonly used in this way throughout the Eastern Partnership area are not in the UNECE set.

The review of selected recent national state-of-the-environment reports, reports to several multilateral agreements and the use of indicators for regional or global assessments reveals interesting **patterns**. Above all, indicators used in these publications are more numerous and more diverse than those published online per se. Some of the indicators that are not (fully) accessible online, for example due to incomplete data sets, feature perfectly well in national and international reports of the countries. This apparent contradiction is explained by the fact that often publication purposes are satisfied with only partial use of environmental indicators, for instance, with only a selection of the data sets that constitute them. Time series in the reports can be quite short, or data may even be shown for only a few selected years which, in a strict sense, would not comply with methodological requirements. Nonetheless, even such an incomplete or approximate presentation of UNECE indicators shows demand for them, and therefore their potential and the needs for further strengthening their development and production.

The most obvious contexts for the use of environmental indicators for both awareness-raising and decision-making are recent **state-of-the-environment** assessment reports of Eastern Partnership countries (see table 4.1 in Annex A). The most **widely used** UNECE indicators are those describing: emissions to air and the observed air quality in cities; climate change (emission of greenhouse gases and various climate parameters); surface water quality and use; protected areas; forests; and the generation of waste. All these indicators are traditionally common and well developed methodologically. Focus on climate reflects both the availability of data due to years of methodological efforts under international guidance, and the current political attention to climate change.

Also used, though less commonly, are indicators of the consumption of ozone-depleting substances, threatened and protected species, changes in land-use and energy supply. Outside of the narrow part of the UNECE set, often used are indicators of land use (though not necessarily land conversion), common species, the use of fertilisers and pesticides, soil erosion, waste management, passenger and freight transport, and environmental expenditures. Outside the wider UNECE set are commonly used indicators of soil and precipitation chemical quality, forest fires and other damage to forests, natural disasters, and environmental protection activities including the state and coverage of environmental monitoring. Rooted in the 1986 Chernobyl disaster and its heritage, almost all countries include in their reports indicators of the radiological situation. Many also present various sectoral trends, as well as GDP and population dynamics. Also used, but not common for all countries, are about 30 other indicators, many of which are outside the UNECE core set.

State-of-the-environment reports offer ample opportunities for **visual** presentation, which are indeed used. Many indicators are presented as graphs showing time-series, static diagrams, or their combinations. Quite often the same data are, however, still repeated in tables, while for indicators related to biological species, the generation and management of waste, energy balances and land use, the table format without visualization is the most common approach. Some of the reviewed reports make an impression of being over-saturated with visualised indicators, the choice of which may prioritise data that were available over those needed to make a point. On the other hand, the formats of presentation seem to relate to the capacities of editorial teams. For instance, maps are

used relatively less compared with other types of infographics, yet less frequently for showing statistical data – although interesting examples in this respect are reports of **Belarus** and **the Republic of Moldova**.

Linkages between indicators per se and the respective **assessment** narratives and messages are, typically, both strong and weak at the same time –in different ways. While at times indicator tables and visuals simply appear inside the text without being discussed much or at all, in other cases (quite often in sections presenting the results of environmental quality monitoring) the text literally describes tables and visuals point by point, without adding much value. Indicators are still relatively rarely used in an analytical manner by posing questions such as "why?", "so what?", or "what next?". One exception here is information about greenhouse gases, which is almost always put in an analytical context of sectoral responsibilities for emissions, their projections and mitigation measures. Coherent with the higher incidence of including assessment sections while presenting indicators online, more examples of the analytical use of indicators are present in the reports of **Belarus** as well as in **the Republic of Moldova**'s latest DPSIR-based assessment (which so far only covers a limited number of topics).

The use of indicators has also been analysed in the most recent reports to three **international conventions**: national communications to the United Nations Framework Convention on Climate Change (UNFCCC); national reports to the Convention on Biological Diversity (CBD); and the summary reports from the third reporting exercise under the Protocol on Water and Health to the UNECE Water Convention (see tables 4.2 – 4.4 in Annex A). All six Eastern Partnership countries are parties to these agreements. Predictably, the use of indicators in the reports reflects the nature of the agreements. National communications to UNFCCC contain detailed information about the impacts of climate change and greenhouse gas emissions over time, per economic sectors and in many and various forms of breakdown. National reports to CBD make broad use of biodiversity-related and other ecological indicators such as those of protected areas and endangered, protected, common and invasive biological species. Reports under the Protocol on Water and Health focus on drinking and surface water quality (although, strictly speaking, not in the terms of the UNECE set of environmental indicators), water supply, use and disposal.

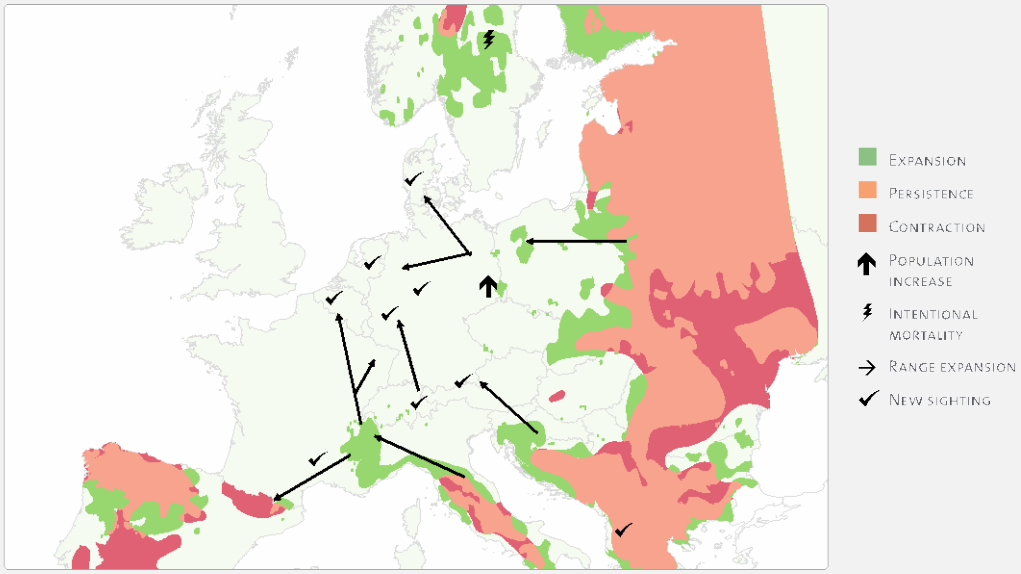
UNECE indicators are supplemented by **other** topic-specific indicators such as: surface flow, natural disasters and public health for UNFCCC; forest fires or other types of damage to forests, fish catch and afforestation for CBD; and ground water quality and water-related diseases for the Protocol on Water and Health. Response indicators typically include research, monitoring and environmental education, but also such convention-specific measures as the volume and number of climate-related projects, the status of seed collections and genetic banks, or the coverage of schools with water supply and sanitation services.

In reports to conventions, data tables are commonly used. To a varying degree, they are complemented by diagrams or visual time series. Countries make wide use of maps in reports to UNFCCC. Due to the explicit presence of policy targets, such reports typically show stronger **analytical** links between indicators and policy than do state-of-the-environment reports. In communications to UNFCCC, indicators are often interpreted in the context of future emissions, projected sectoral development and climate-change impacts, and of assessing vulnerability to climate change, for example, through natural disasters (**Armenia** and **Georgia** widely visualise vulnerability across their territories). Indicators in reports to CBD are often presented in direct relation to Aichi biodiversity targets, as globally agreed in the Strategic Plan for Biodiversity 2011–2020. Protocol on Water and Health indicators too assess progress vis-à-vis targets initially set by the countries and are expected to show how that progress has contributed to preventing, controlling or reducing water-related disease. In this way, reports to conventions are strong examples of using

indicators to monitor, illustrate and explain progress towards tangible targets and, as such, can be used to help guide indicator analysis and presentation in other contexts.

The use of country indicators in **international assessments** is illustrated through the analysis of the pan-European volume of the Sixth UNEP Global Environment Outlook (GEO-6) report (see table 4.5 in Annex A). Two thirds of the indicators that fully or partially match UNECE definitions are presented for both the Eastern Partnership countries and other parts of the pan-European region (see box 8). Of more than thirty other indicators, one third also cover the Eastern Partnership countries.

Box 8. Example of subregional data in the Sixth Global Environment Outlook (GEO-6) (expansion, persistence or contraction of the grey wolf (*Canis lupus*) in continental Europe)



Source in GEO-6: Deinet et al. 2013. Wildlife comeback in Europe: The recovery of selected mammal and bird species. ZSL, BirdLife International and the European Bird Census Council.

Particular gaps in covering the subregion are visible in water quality (both surface and marine waters) and for other information related to the marine environment. (While the Black Sea is well covered, information about the Sea of Azov and the Caspian Sea is practically absent.) Also lacking are indicators from the Eastern Partnership area concerning soils, public health and some aspects of waste management (e.g., for electronic waste). Some of these gaps are easily explained by the difficulty of accessing information to compile it on the regional scale: while on the country level many of the missing indicators exist and are accessible (see above), their formats or mode of access do not always allow for easy regional-scale compilation. Hence, whenever such compilations are not already available from research, international or regional organisations (e.g., the World Meteorological Organization or the Basel Convention secretariat), it may not be practical or economic to generate them for the purpose of a particular regional or global assessment.

This contrasts with the systematic compilation of indicators for the EU countries and other EEA Member States. The results of the EEA's systematic cross-country analysis are widely used throughout GEO-6 and show what can be achieved with an efficient institutional setup for systematic region-wide environmental assessment. However, such a setup requires a well-developed institutional infrastructure on the regional and the country levels and explains why the

SEIS ambition of attaining comparable environmental information throughout the entire pan-European region remains relevant.

Gaps also point to cases where indicators may simply not exist or may not yet be sufficiently advanced in the Eastern Partnership countries compared to the EU, thus showing avenues and paving way for methodological innovation and bringing country (and regional) capacities to an even level.

CONCLUSIONS AND RECOMMENDATIONS

The accessibility of environmental indicators in the Eastern Partnership countries is growing, and they are increasingly being published in compliance with UNECE requirements on the websites of national environmental authorities, statistical agencies and open data portals. Common environmental indicator platforms are already established in Belarus, Armenia and Azerbaijan, whereas the Republic of Moldova integrates its environmental indicators in the national Open Data Portal.

About 80% of the 23 key indicators from the UNECE set are now fully accessible online; the rest still require further work. Of the additional indicators from the UNECE set, which were not included in the 2015 review by UNECE, 17 are currently fully or partially accessible in the Eastern Partnership countries.

The in-depth quality evaluation of three selected indicators (ambient air quality in urban areas, biochemical oxygen demand, and concentration of ammonium in rivers and protected areas) against the criteria of the revised SEIS Assessment Framework confirms the good overall degree of quality, although with case-specific issues related to the criteria of relevance, timeliness or punctuality, clarity and comparability.

With plenty of good practices available within the countries, there are still ways to improve the communication of indicators in terms of their content, the completeness of metainformation, the visual representation of trends and patterns and, especially, the assessment of indicators in the context of environmental policy.

All Eastern Partnership countries are actively developing frameworks for monitoring and reporting the attainment of the Sustainable Development Goals. Many are also looking at green growth opportunities and the OECD indicator framework to measure progress. National environmental policies too increasingly use quantified targets and indicators.

UNECE environmental indicators are well suited to contribute to monitoring and reporting under such international and national policy frameworks, and countries can be encouraged to accelerate the production of the respective indicators from the entire UNECE set. However, some policy-relevant UNECE environmental indicators are not fully developed methodologically in the Joint Task Force context, or are even outside the UNECE set. Such indicators need further elaboration and methodological support for their development and eventual use in policy monitoring.

In Eastern Partnership countries, environmental indicators are widely used for national state-of-the-environment assessment and reporting, in country reports under multilateral environmental agreements and for international assessments. All these channels help make the related information used, useful and policy-relevant, and further contribute to the improved accessibility and quality of indicators. As with policy frameworks, such use in turn also helps define and stimulate demand for environmental indicators and guide further work for developing their common definitions and methodologies.

Eastern Partnership countries are well represented in the latest edition of the Global Environment Outlook (GEO-6). At the same time, the use of countries' indicators in this assessment shows that the region and the international community can benefit from increased support and capacity-building to further improve regional and cross-regional comparability and integration of

environmental data from the Eastern Partnership area for the sake of global and international audiences.

The table below summarises some of the specific gaps and experience in the Eastern Partnership countries that were identified through the current study.

Gaps to close and experience to share among the Eastern Partnership countries

	ARM	AZE	BLR	GEO*	MDA	UKR
UNECE environmental indicators online						
Online publication platforms	●	●	●	○	☯	
Data content and definitions	●		●	☯		○
Metainformation	☯	○	☯	○	☯	○
Visualisation	●	○	●	○	●	○
Assessment in the policy context	○	○	●	○	●	○
Accessibility and content of additional indicators	●		●			●
UNECE and other indicators for policy and assessment						
Use for SDG monitoring and reporting			●	○	○	☯
Use for assessing green growth			●	○		○
Use in national environmental policy frameworks	-	-	●	-	●	☯
Use for reporting to MEAs	●		●	●		●
Use in national state-of-the-environment reports	○	○	☯	☯	☯	☯
Integration for regional / international assessment	☯					

● cutting-edge experience to share; ○ gaps to close; ☯ both cutting-edge experience and gaps; – not assessed

* At the time of the study, Georgia's indicators were partially off-line due to ongoing administrative reform.

The recommendations below are directly related to the study's findings and aim at helping Eastern Partnership countries, UNECE and EEA build on the existing good practices, close some of the gaps in the production, communication and use of environmental indicators, and make further progress towards building the pan-European SEIS.[4]

I Further advancing the production and sharing of environmental indicators in compliance with methodological recommendations of the UNECE Joint Task Force on Environmental Statistics and Indicators

I.1 Discuss among indicator-producing organisations and experts in the countries the details of the study, the identified gaps, their reasons and the ways to close them.

I.2 Ensure targeted support in order to improve further the accessibility and quality of indicators where gaps have been identified and acknowledged. Focus cross-country support and capacity-building on common gaps such as integrated multi-language platforms, indicator definitions, the completeness and quality of metainformation, data visualisation and policy-relevant assessment.

[4] The recommendations below may also be relevant for countries beyond the Eastern Partnership area as some of them touch upon general patterns, also valid for other regions, as well as on cross-cutting methodological and capacity-building issues on the pan-European scale.

I.3 Promote the role of pioneer countries within the region, having cutting-edge experience in particular domains, to provide leadership through peer-to-peer exchanges of experience, targeted East-East twinning and other appropriate ways to share experience.

I.4 Review the results of applying the revised SEIS Assessment Framework for self-assessment of indicator quality, and ensure necessary support to improve its use on a continuous basis as a quality control and quality assurance tool for all UNECE (and, where applicable, other) environmental indicators.

II Further methodological work on existing and new environmental indicators for use within the various international and national policy contexts

II.1 Continue a systematic review and revision by the Joint Task Force on Environmental Statistics and Indicators of the UNECE set of environmental indicators, with particular attention to those meeting monitoring and reporting needs of SDGs, green growth and other existing or emerging policy frameworks, and of monitoring the implementation of national environmental policies and their targets.

II.2 Identify other commonly-used environmental indicators, even if these are positioned outside of the UNECE core set, that could benefit from cross-country methodological support through UNECE and other mechanisms and, as appropriate, make such support available to benefit the countries.

II.3 Maintain and strengthen partnerships with other indicator-oriented processes covering the Eastern Partnership countries, including United Nations Development Account funded capacity-building projects, OECD development of green growth indicators, UNEP capacity-building for assessment and reporting, and UNECE indicator development work outside of the purely environmental domain (e.g., energy, transport, other sectoral indicators and general statistics).

II.4 Strengthen interaction and, where appropriate, joint work on specific indicators of common interest with global and regional multilateral environmental agreements.

III. Strengthen the communication and policy impact of environmental indicators through statistical compendia, state-of-the-environment assessments, reports under MEAs and similar publications.

III.1 Promote and support joint consultations, training and other activities involving both indicator producers and the editorial teams of statistical, environmental and other relevant publications, in order to help them better understand and balance the supply and demand sides of environmental indicator production and use.

III.2 Through capacity-building and quality control, prioritise and encourage analytical rather than descriptive use of indicators in the assessment context. Train country experts in modern assessment and communication techniques in order to systematically connect indicators to policy targets and develop policy- and user-relevant assessment narratives around environmental indicators.

III.3 Provide targeted support and expertise for the production in Eastern Partnership countries of modern indicator-based assessments, building on cutting-edge European, international and regional

experiences, in order to help build sustainable national pipelines for such information products for the future.

III.4 Help promote and support systematic regional-scale integration of thematic indicators (e.g., of air, water, waste and biodiversity), in order to match the regionally-integrated information already available for the EU or EEA area and thus to strengthen the basis for regional and global assessments.

ANNEX A

DETAILED ASSESSMENT OF THE PRODUCTION, SHARING AND USE OF UNECE ENVIRONMENTAL INDICATORS IN EASTERN PARTNERSHIP COUNTRIES

1. State and trends of producing and sharing key indicators from the UNECE set of environmental indicators

In this first chapter of the annex, 67 data flows underlying 23 UNECE environmental indicators that were selected for this study from the 2014 revised UNECE guidelines[5] are analysed in detail based on the decision made by the Working Group on Environmental Monitoring and Assessment that agreed in 2015 on a first pan-European SEIS development milestone (67 specific data sets that every country in the pan-European region should aim to make available and accessible online). These are the same indicators and data sets that were reviewed in the report presented to the 8th Environment for Europe Ministerial Conference in Batumi, Georgia, in June 2016.[6] Consequently, this choice allows for assessing progress in data production and exchange within the Eastern Partnership countries in the period since the Batumi Conference.

The approach adopted by the UNECE Working Group– to limit the analysis to indicators available online – was maintained for this study too. The analysis was carried out on websites in each of the Eastern Partnership countries, and mainly indicators published there were considered for the analysis. Additional sources of information and clarifications on data accessibility were provided by the National Focal Points of the ENI SEIS II East project through direct correspondence. The authors have also consulted the analysis of EEA's own snapshot review of indicator accessibility in the Eastern Partnership countries[7] and the assessment of the efficiency and effectiveness of recent environmental assessments in the Eastern Partnership countries as perceived by the target user audiences there.[8]

Similarly to the 2015 review, to ensure the consistency of the analysis, the following criteria were used to assess the status of production and sharing of individual data sets: the availability of data for users; the timeliness of data preparation and dissemination; data comparability (the use of international methodological standards and recommendations); the indication of organizations and officials, responsible for the preparation and publication of the data set (data source); and the assessment of data vis-à-vis the environmental policy perspective (use of data).[9] The use of graphs,

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[5] UNECE. Guidelines for the Application of Environmental Indicators in Eastern Europe, Caucasus, Central Asia and South-Eastern Europe. 2014

[6] The UNECE Working Group on Environmental Monitoring and Assessment selected and approved 67 data sets, which were analysed in 2015. The summarized results of the analysis were presented in the Report on progress in establishing the Shared Environmental Information System in support of regular reporting in the pan-European region. Note by the Working Group on Environmental Monitoring and Assessment. United Nations Economic and Social Council, Economic Commission for Europe. Eighth Environment for Europe Ministerial Conference, Batumi, Georgia, 8–10 June 2016. ECE/BATUMI.CONF/2016/8.

[7] EEA. The UNECE core set of environmental Indicators: state of implementation. Note on the state of play. 2018.

[8] EEA. Efficiency and effectiveness of recent environmental assessments in the Eastern Partnership countries. 2017.

[9] Assessment is part of indicator presentation in only very few of the reviewed cases. It is thus described in the text but is not included in the summary tables. Chapter 4 provides additional information about the use of UNECE and other indicators in the context of various publications such as national and regional / global state-of-the-environment reports, national reports under multilateral international agreements, SDGs and country environmental strategies.

diagrams and figures to illustrate and interpret the indicators, and the languages of their publication, were assessed too. These criteria are also part of the revised SEIS Assessment Framework that is being tested in 2018 (see the introduction above and chapter 2 of this annex).

In addition to the review of the 67 data sets underpinning the 23 key UNECE indicators, an analysis was carried out of the production and publication by the Eastern Partnership countries of 26 indicators from the revised UNECE Guidelines not included in the list of indicators reviewed for the 8th Environment for Europe Ministerial Conference in Batumi. To access and evaluate these additional indicators, information was drawn not only from national environmental websites, environmental statistics yearbooks and national state-of-the-environment reports and reports to international organizations, but also from sectoral statistical sources and publications such as those related to agriculture, transport and healthcare. Here, less strict evaluation criteria were applied: an indicator was regarded accessible if at least one underlying data set has been found. It is important to note that 7 of the 26 additional indicators have not yet been considered by the UNECE Joint Task Force on Environmental Statistics and Indicators. However, if data sets relevant to these indicators were found, they were included in the study.

Regional trends and comparisons

The review performed by UNECE in advance of the 8th Environment for Europe Ministerial Conference of the 67 data sets underlying the selected 23 indicators from the UNECE environmental indicator set, confirmed 273 out of 402 data sets in total (67 per each of the six reviewed countries) to be accessible in the countries of Eastern Europe and the Caucasus. The current study, carried out in strict adherence with the requirements agreed by UNECE Working Group on Environmental Monitoring and Assessment, has confirmed the accessibility and full compliance with UNECE Guidelines of 260 data sets in the same countries. Similarly, 109 out of 138 possible indicators (23 indicators per each of the six countries) have been found accessible in 2018 against 105 indicators in 2015 (see table 1.1).

Against the background of the growing accessibility of indicators, a slight reduction in the available data sets is explained by several reasons, the main one being the incomplete fulfilment of UNECE methodological requirements when producing the indicators. For example, instead of using PM_{10} and $PM_{2,5}$ values for calculating the emissions of particulate matter into the atmosphere (indicator A1), in certain cases total suspended particulates (TSP) values are used. Similarly, a lower number of ozone-depleting substances is shown instead of 7 substances, marked as being used previously for indicator A3. Instead of population connected to the water supply or wastewater collection and treatment (indicators C5 and C14), the volumes of water supply industry and wastewater treatment are often shown. This explains why 14 data sets in Armenia (falling from 62 in 2015 to 48 in 2018), 6 in Georgia, 4 in Azerbaijan and 3 in the Republic of Moldova, all considered accessible in 2015, were evaluated as not accessible in this study. On the other hand, 7 new data sets became accessible in Ukraine, 5 in Belarus and 2 in Azerbaijan. The specific reasons for changes in accessibility scores for individual indicators are given in a greater detail within country sections below.

As yet, none of the countries fully calculate emissions of pollutants into the atmospheric air (14 data sets) and the management of hazardous waste (6 data sets). At the same time, all countries fully calculate greenhouse gas emissions (2 data sets), polluted (non-treated) wastewater (2 data sets), final energy consumption (2 data sets) and protected areas (1 data set). Except for wastewater, this is due to the countries' reporting obligations under international conventions (in particular UNFCCC and CBD).

Table 1.1 Summary of the state, trends and exchange of key UNECE environmental indicators in Eastern Partnership countries

	ARM	AZE	BLR	GEO	MDA	UKR
Comparative study for the period of 2015 – 2018						
Indicators available online in 2015 *	23	19	20	11	18	14
Indicators available online in 2018 *	22	19	21	13	18	16
Data sets available online in 2015 *	62	44	52	30	52	33
Data sets fully available online in 2018 *	48	42	57	22	49	40
As of January 2018						
Web resource **	Stat	Stat	Stat	Stat, Env	Stat, ODP	Stat, Env
One common national platform	Yes	Yes	Yes	No	No	No
Languages ***	Arm, Eng	Aze, Eng	Rus, Eng	Geo, Eng	Rom, Eng (Rus)	Ukr (Eng)
Indicators calculated incompletely	A1, A2, A3, C3, E1, G2, I2	A1, A2, A3, C11, I2	A1, E1, I2	A1, C2, C3, D4, E1	A1, A2, C2/C3, I2	A1, A2, C2, C3, I2
Indicators for which some previously available data sets are currently unavailable online	A1, A2, A3, C5, E1, G2, I2	A2, I2	A1, C5, C14, I2	A3, C1, C2, C3, D4	A1, A2, C3, E1, I2	
Indicators for which some previously unavailable data sets became available			A1, A3, E1	A1, C5, C14, C16, D3, E1, G1, G2	A1	B3, C2, C3, C15, D4
Indicators for which data sets are available online only in statistical yearbooks			E1	A1, C2, C3, C16, D1, D2, D4, E1	I1	C2, C3, C5, C15, D1, D4
Indicators for which data are available only externally			G1, G2	B3	G1, G2	B3
Quantity of indicators (of 23 reviewed), for which:						
Responsible organization / contact person is indicated	16	15	21	12	16	11
Update time is indicated	21	17	11	1	16	12
Conformity with domestic standards is indicated	1		7	2	5	5
Conformance with international standards is indicated	6	4	7	2	3	4
Information is illustrated	21	3	15	3	17	5
Assessment information is present			18 (Stat**)		6 (OD**)	

* Fully or partially ** Stat – statistical office, Env - environmental authority, OD – open data portal *** Only part of information is accessible in this language

The modes of publishing data and indicators vary among the countries, and gradually change towards more easily accessible and integrated solutions. In Armenia, Azerbaijan and Belarus the reviewed indicators and data sets are already located on single national platforms managed by national statistical authorities. In the Republic of Moldova the two sources of information are the Government Open Data Portal and the National Bureau of Statistics. In Georgia and Ukraine, information is partially published on websites of national statistical authorities. Published there too are statistical yearbooks that in certain cases were the sources of information for this study. The data of Ukraine are also partially published on the website of the Ministry of Ecology and Natural Resources. The website of the Ministry of Environment Protection and Agriculture of Georgia, used in the 2015 review, is currently unavailable due to an administrative reform in the country. (Therefore, for Georgia the smallest quantity of indicators and data sets was analysed in comparison with the other countries.)

Armenia, Azerbaijan, Belarus, Georgia and the Republic of Moldova publish information about their indicators both in their national languages and in English, which makes information accessible for both foreign and domestic users. Information in the Republic of Moldova is in addition partially available in Russian. In Ukraine, information from the State Statistics Service is available in Ukrainian and English, but only in Ukrainian on the website of the Ministry of Ecology and Natural Resources.

Countries to different degrees provide meta-information about organizations responsible for the production of indicators. The most complete information (for 23 indicators) was provided by Belarus, the least complete (for 11 indicators) by Ukraine. The Republic of Moldova indicated not only organizations but also responsible persons who can be contacted in the case of questions.

Indicators of Azerbaijan lack references to methodological standards used for producing the data sets. Armenia explicitly shows only one such reference, Georgia two. Seven indicators in Belarus and five in the Republic of Moldova and Ukraine contain references to domestic methodological standards. At the same time, there were overall 26 references to international standards (compared to 20 domestic ones). The highest number of them was provided by Belarus (7) and Armenia (6), and least by Georgia (2). The conformity of data sets with international standards allows countries to exchange the data. However, at the moment, references to international standards are mainly related to indicators and data sets already used by countries to report to international organizations.

Indicators of Armenia (21), the Republic of Moldova (17) and Belarus (15) are well illustrated with graphs, diagrams and maps. In contrast, there are only 3 examples of illustrating indicators in Azerbaijan and Georgia. Only in Belarus and the Republic of Moldova are indicators accompanied by the description of data acquisition techniques and, importantly, include an assessment in the policy context. Some indicators in the Republic of Moldova are also accompanied by the analysis of measures needed to improve the environmental situation.

This study also covered, in lesser detail and applying less rigorous criteria (see the introduction to this chapter), the 26 UNECE environmental indicators not included in the previous analysis in 2015. The countries use such additional indicators to a varying degree: from 10 in the Republic of Moldova to 14 in Ukraine. Overall, data are fully or partially available for 17 additional indicators (table 1.2).

Table 1.2 Availability of additional UNECE indicators in Eastern Partnership countries

	ARM	AZE	BLR	GEO	MDA	UKR
C4. Household water use per capita	2000-2016[2] 09.2017 Vis	2000-2016[2] 08.2017 Resp		2015-2016 09.2017 Vis		
C6. Connection of population to public water supply	1996-2015[2 3] 09.2017 Vis		2005-2016[2] 11.2017 Vis, Resp			
C7. Water losses	2011-2016[2] 09.2017 Vis, Resp	2000-2016[2] 08.2017 Resp	2005-2016[2] 11.2017 Resp	2015-2016[2] - Resp	2000-2016[2] 06.2017 Vis, Resp	2005-2016[2] - -
C8. Reuse and recycling of freshwater		1990-2016[2] 08.2017 Resp	2012-2016[2] - -		2001-2016[2] 06.2017 Vis, Resp	2005-2016[2] - -
F1. Irrigation[1]	2006-2016 09.2017 Vis, Resp	2000-2016[3] - Resp	2011-2017 - -			2005-2016[2] - Vis
F2. Fertilizer consumption	2006-2016[2] 09.2017 Vis	2007-2016[2] 07.2017 -	2000-2016[2 3] 11.2017 Vis, Resp	2006-2016[2 3] 06.2017 Vis, Resp	2006-2016[2] - -	1990-2016[2 3] - -
F4. Pesticide consumption	2006-2016[2] 09.2017 Vis			2006-2016[2] 06.2017 Vis, Resp	2010-2016[2] - -	2010-2016[2] - -
G3. Energy intensity	1990-2015[2] - -	2007-2016 08.2017 -	1990-2015[2] - -	1990-2015[2] - -	1990-2015[2] - -	2007-2016 01.2018 -
G4. Renewable energy consumption	2006-2016[2] 09.2017 Vis	2007-2016 08.2017 -	1990-2015[2] - -	1990-2015 - -	1990-2015 - -	2007-2016 01.2018 -
G5. Final electricity consumption[1]	2006-2016 09.2017 Vis	1990-2015 - -	1990-2015[2] - -	1990-2015 - -	1990-2015 - -	1990-2015 - -
G6. Gross electricity production[1]	2006-2016 09.2017 Vis	1990-2015 - -	1990-2015 - -	1990-2015 - -	1990-2015 - -	1990-2015 - -
H1. Passenger transport demand	1990-2016[2 3] 09.2017 Vis, Resp	2000-2016 05.2017 Vis	1990-2016[2 3] 11.2017 Vis, Resp	1990-2016[2 3] - Resp	1990-2016[2] 09.2017 Resp	1990-2015[3] 01.2018 Resp
H2. Freight transport demand	1990-2016[2 3] 09.2017 Vis, Resp	2000-2016 05.2017 -	2000-2016 11.2017 Vis, Resp	1990-2016[2 3] - Resp	1990-2016[2] 12.2017 Resp	2003-2017[2] 01.2018 Resp
H4. Age of road motor vehicle fleet		2008-2016[2 3] - -				
I3. Waste reuse and recycling						1994-2016[2 3] 01.2018 Resp
I4. Final waste disposal						2011-2016[2] 01.2018 Resp
J1. Environment protection expenditure[1]	2006-2016 09.2017 Vis	2008-2016[3] - -	1990-2016[3] 06.2017 -			2006-2016 - Resp

In cells, top to bottom: length of time series; date of updating; visualization and responsible organisations.

- information is not present (where energy indicators are taken from national energy balances, meta-information that may be provided in their separate sections is not reflected in the table)

1 methodology has not been reviewed by the UNECE Joint Task Force

2 not all the required data-sets are present

3 gaps in time-series

All six countries have data for water losses (C7), fertilizer consumption (F2), energy intensity (G3), renewable energy consumption (G4), final electricity consumption (G5), gross electricity production» (G6), passenger transport demand (H1) and freight transport demand (H2). The data for the majority of energy-related indicators are accessible through national energy balances submitted to the International Energy Agency. Four countries have available data on the reuse and recycling of freshwater (C8), irrigation (F1), pesticide consumption (F4) and environment protection expenditures (J1); three countries calculate household water use per capita (C4); Armenia and Belarus produce data on the connection of population to public water supply (C6); and only Azerbaijan has data on the age of road motor vehicle fleet (H4), while only Ukraine produces data on waste reuse and recycling (I3) and final waste disposal (I4).

The actually-available additional UNECE indicators include four out of seven indicators that were not yet considered by the UNECE Joint Task Force on Environmental Statistics and Indicators: irrigation (F1) and environment protection expenditure (J1) in Armenia, Azerbaijan, Belarus, Ukraine; and final electricity consumption (G5), gross electricity production (G6) in all countries as indicated above.

The majority of the additional indicators are published on the national websites developed within the SEIS context. As a rule, the indicators are published as long time series, include the organisations responsible for indicator production, graphs and diagrams. On the contrary, data sets that are published in environmental or sectoral statistical yearbooks or submitted to international organisations (e.g., the International Energy Agency) contain shorter time series and fewer illustrations.

Some of the additional indicators already comply fully with the revised UNECE Guidelines by containing all the required data sets and meeting the structure and content requirements. These include: C4 for Georgia; F2 for Armenia and Azerbaijan; G3 and H1 for Azerbaijan and Ukraine; G4 for Azerbaijan, Georgia, the Republic of Moldova and Ukraine; and H2 for Azerbaijan and Belarus.

The specific information about the 23 key indicators and the underlying data sets is provided in the country sections below. The findings for each country are summarized in tables in the country sections, where ratings are provided by the authors based on the criteria below:

Accessibility of data sets (relates to the Accessibility criterion of the revised SEIS Assessment Framework): the number of accessible data sets. The indicator "Emissions of pollutants into the atmospheric air" is an exception. This indicator includes appraisal of emissions of sulphur dioxide (SO_2), nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOCs), ammonia (NH_3), carbon monoxide (CO), TSP, particulate matter PM_{10} and $PM_{2.5}$ from both stationary and mobile sources. If this requirement is met, the rating is 1, if emissions from only one source type are demonstrated – 0.5. Emissions of any other substances are subdivided into emissions from neither stationary nor mobile sources (according to the indicator description), so that the score for each accessible data set is 1;

Indication of the organization responsible for producing an indicator (relates to the Clarity criterion of the revised SEIS Assessment Framework): 2 – the responsible organization and the responsible official are indicated; 1 – only the responsible organisation is indicated; 0 – neither is indicated;

Time of update (relates to the Timeliness and the Punctuality criteria of the revised SEIS Assessment Framework)*:* 2 – in or after 2016 and within 1 year from the date of the latest data point in the series; 1 – the same but before 2016; 0 – time of update is not indicated;

Conformity with methodological standards (relates to the Clarity and the Comparability criteria of the revised SEIS Assessment Framework)*:* 2 – conform with international standards; 1 – conform with national standards; 0 – conformity with standards not specified;

Presence of graphs, diagrams, maps (relates to the Clarity criterion of the revised SEIS Assessment Framework)*:* 1 – present, 0 – absent.

In the country tables, the data sets marked with an asterisk (*) are found in digests and reports published on the respective national websites. The data sets obtained from external sources (such as, e.g., national reports for international organizations) are marked with a double asterisk (**).

Armenia

All the produced environmental indicators are accessible on the website of the National Statistical Service of the Republic of Armenia on a single platform in the section Environment. The web portal is easily accessible. All the information is published in English and in Armenian, making the information easily accessible for both domestic and foreign users.

In the 2015 study 62 of 67 data sets, were accessible. Accessibility per February 2018 was confirmed for 48 data sets, which is 70 percent of their possible maximum number. Some reasons for changes compared with the 2015 review are given below.

Emissions of NH_3 and TSP are determined only from stationary sources, so it is impossible to define the total amount of corresponding emissions (inclusive of mobile sources A1).

The following sets of data, previously marked as accessible, have not been found:

- emissions of cadmium compounds, PM_{10} and $PM_{2.5}$ (A1);
- content of PM_{10} in the atmospheric air (A2) – only TSP are reported;
- consumption (or non-consumption) of halons, carbon tetrachloride, 1,1,1-trichloroethane (A3)[#];
- population connected to water supply (C5) – only water volumes supplied by the water supply industry are provided;
- total volume of polluted (non-treated) wastewaters (C16);
- land uptake (total amount) (E1) – reported are land resources with type / sectoral breakdown;
- energy supply broken down by resources used (coal, crude oil, oil products, natural gas) (G2) – data are only provided on energy production from renewable energy supply and nuclear power;
- amount of exported, imported hazardous waste; total amount of treated and disposed hazardous waste per year, total amount untreated hazardous waste at year end (I2).

Among the 23 examined indicators (see details in table 1.3),

- 16 indicators showed the organization responsible for indicator production;
- 21 indicators included the time of update;
- 6 indicators contained references to their conformity with international standards;
- 21 indicators included graphics or diagrams.

The indicators did not include an assessment in the environmental policy context.

Table 1.3 Assessment of environmental indicators and data sets of Armenia

Indicators (number of data sets underpinning them)	A	R	T	M	V
A1: Emissions of pollutants into the atmospheric air (14)	7	0	2	0	1
A2: Ambient air quality in urban areas (4)	3	1	2	0	1
A3: Consumption of ozone-depleting substances (7)	4	1	2	0	1
B1: Air temperature (1)	1	1	2	0	1
B2: Atmospheric precipitation (1)	1	1	2	0	1
B3: Greenhouse gas emissions (2)	2	1	1	2	1
C1: Renewable freshwater resources (1)	1	0	2	0	0
C2: Freshwater abstraction (3)	3	1	2	2	1
C3: Total water use (4)	3	1	2	2	1
C5: Water supply industry and population connected (1)	0	0	0	0	0
C10: BOD and concentration of ammonium in rivers (2)	2	1	2	0	1
C11: Nutrients in freshwater (5)	5	1	2	0	1
C14: Population connected to wastewater treatment (1)	1	0	2	0	1
C15: Wastewater treatment facilities (1)	1	0	2	0	1
C16: Polluted (non-treated) wastewater (2)	2	1	2	0	1
D1: Protected areas (1)	1	1	2	2	1
D3: Forests and other wooded land (1)	1	1	2	0	1
D4: Threatened and protected species (2)	2	1	0	1	1
E1: Land uptake (2)	1	1	2	0	1
G1: Final energy consumption (2)	2	0	2	0	1
G2: Total primary energy supply (2)	1	0	2	0	1
I1: Waste generation (2)	2	1	2	2	1
I2: Management of hazardous waste (6)	2	1	2	0	1

Columns: A – accessibility; R – responsibility; T - time of update; M – methodology; V – visualisation.
Colour: light – less than 33%; middle – 33 to 67%; dark – over 67% of the maximum possible number.
Scores in the cells are explained at the beginning of the chapter.

Azerbaijan

All the produced environmental indicators are accessible on the website of the State Statistical Committee of the Republic of Azerbaijan on a single platform in the section on Environment Protection, the subsection The key indicators of shared ecological information system. The web portal is easily accessible. All the information is published in Azeri and English, making the information easily accessible for both domestic and foreign users.

In the 2015 study 44 of 67 data sets, were accessible. As a result of this study, accessibility per 2018 was confirmed for 42 data sets, which is 63 percent of their possible maximum number. Some reasons for changes compared with the 2015 study are given below.

Emissions of CO, NMVOCs, NH_3 and TSP are determined only from stationary sources, thus it is impossible to define the total amount of corresponding emissions, inclusive of mobile sources (A1).

Table 1.4 Assessment of environmental indicators and data sets of Azerbaijan

Indicators (number of data sets underpinning them)	A	R	T	M	V
A1: Emissions of pollutants into the atmospheric air (15)	4	1	2	0	1
A2: Ambient air quality in urban areas (4)	2	1	2	0	0
A3: Consumption of ozone-depleting substances (7)	1	1	2	0	0
B1: Air temperature (1)	1	1	2	0	0
B2: Atmospheric precipitation (1)	1	1	2	0	0
B3: Greenhouse gas emissions (2)	2	1	2	2	0
C1: Renewable freshwater resources (1)	1	1	2	0	0
C2: Freshwater abstraction (3)	3	1	2	0	1
C3: Total water use (4)	4	1	2	0	1
C5: Water supply industry and population connected (1)	0	0	0	0	0
C10: BOD and concentration of ammonium in rivers (2)	2	1	2	0	0
C11: Nutrients in freshwater (5)	4	1	2	0	0
C14: Population connected to wastewater treatment (1)	0	0	0	0	0
C15: Wastewater treatment facilities (1)	0	0	0	0	0
C16: Polluted (non-treated) wastewater (2)	2	1	2	0	0
D1: Protected areas (1)	1	1	2	2	0
D3: Forests and other wooded land (1)	1	0	0	0	0
D4: Threatened and protected species (2)	0	0	0	0	0
E1: Land uptake (2)	2	1	0	0	0
G1: Final energy consumption (2)	2	0	2	2	0
G2: Total primary energy supply (2)	2	0	2	2	0
I1: Waste generation (2)	2	0	2	0	0
I2: Management of hazardous waste (6)	5	1	2	0	0

Columns: A – accessibility; R – responsibility; T - time of update; M – methodology; V – visualisation.
Colour: light – less than 33%; middle – 33 to 67%; dark – over 67% of the maximum possible number.
Scores in the cells are explained at the beginning of the chapter.

The previously marked as available data on methyl-bromide consumption (A3) have not been found. At the same time the previously unavailable data on the total consumption of ozone-depleting substances over a period of 2006-2016 were found.

The previously marked as available data on hazardous wastes treatment (I2) have not been found.

Among the 23 examined indicators (see details in table 1.4),

- 15 indicators showed the organization responsible for indicator production;
- 17 indicators included the time of update;
- 4 indicators contained references to their conformity with international standards;
- 3 indicators included graphics or diagrams.

The indicators did not include an assessment in the environmental policy context.

Belarus

All the environmental indicators are accessible on the website of the National Statistical Committee of the Republic of Belarus on a common platform in the section Environment, the subsection Shared Environmental Information System. The web portal is easily accessible. All the information is published in Russian and English, making the information easily accessible for both domestic and foreign users.

Table 1.5 Assessment of environmental indicators and data sets of Belarus

Indicators (number of data sets underpinning them)	A	R	T	M	V
A1: Emissions of pollutants into the atmospheric air (14)	9	1	0	1	1
A2: Ambient air quality in urban areas (4)	4	1	0	0	1
A3: Consumption of ozone-depleting substances (7)	7	1	0	0	1
B1: Air temperature (1)	1	1	2	2	1
B2: Atmospheric precipitation (1)	1	1	2	0	1
B3: Greenhouse gas emissions (2)	2	1	1	2	0
C1: Renewable freshwater resources (1)	1	1	2	0	1
C2: Freshwater abstraction (3)	3	1	2	2	1
C3: Total water use (4)	4	1	2	2	1
C5: Water supply industry and population connected (1)	0	0	0	0	0
C10: BOD and concentration of ammonium in rivers (2)	2	1	0	0	0
C11: Nutrients in freshwater (5)	5	1	0	0	1
C14: Population connected to wastewater treatment (1)	0	0	0	0	0
C15: Wastewater treatment facilities (1)	1	1	0	1	0
C16: Polluted (non-treated) wastewater (2)	2	1	2	1	1
D1: Protected areas (1)	1	1	0	1	1
D3: Forests and other wooded land (1)	1	1	2	1	1
D4: Threatened and protected species (2)	2	1	0	1	1
E1: Land uptake (2) *	1	1	2	0	0
G1: Final energy consumption (2) **	2	0	0	2	0
G2: Total primary energy supply (2) **	2	0	0	2	0
I1: Waste generation (2)	2	1	2	2	1
I2: Management of hazardous waste (6)	4	1	2	1	1

Columns: A – accessibility; R – responsibility; T - time of update; M – methodology; V – visualisation.
Colour: light – less than 33%; middle – 33 to 67%; dark – over 67% of the maximum possible number.
Scores in the cells are explained at the beginning of the chapter.

In the 2015 study 52 of 67 data sets, were accessible. Accessibility per February 2018 was confirmed for 57 data sets, which is 85 percent of their possible maximum number. This however does not mean that five more data sets have been added since 2015.

For example, emissions of NH_3 are determined only from stationary sources, thus it is impossible to define the total amount of corresponding emissions, inclusive of mobile sources (A1).

The following sets of data, previously marked as available, have not been found:

- emissions of PM_{10} (A1);
- the share of total population connected to water supply (C5);
- share of population connected to wastewater collecting systems and treatment (C14);
- the amount of hazardous waste (I2).

At the same time, the following data sets have been found in addition to those available before:

- total TSP emissions into the atmospheric air from stationary and mobile sources; emissions of lead (Pb), cadmium (Cd) and mercury (Hg) compounds from stationary sources (A1);
- the absence of consumption of carbon tetrachloride (A3);
- total land uptake (E1; this information is published online on the same website in the statistical yearbooks Environmental protection in the Republic of Belarus).

In addition, links from the website of the National Statistical Committee point to four sets of data for energy indicators G1 on the website of the International Energy Agency, where the energy balance of the Republic of Belarus is published.

Among the 23 examined indicators (see details in table 1.5),

- 23 indicators showed the organization responsible for indicator production;
- 11 indicators included the time of update;
- 14 indicators contained references to their conformity with 7 international and 7 domestic standards;
- 15 indicators included graphics and diagrams.

Most of the indicators come with short narrative description, information about the techniques of data acquisition, and an assessment in the environmental policy context.

Georgia

The produced environmental indicators are accessible on two websites:

- the website of The National Statistics Office of Georgia, section Key Statistics, subsection Environmental Indicators for five indicators covered in this report. The data sets for the majority of other indicators can be obtained from the statistical yearbooks Natural Resources of Georgia and Environmental Protection published on the same website. All the information is published in Georgian and English, making the information easily accessible for both domestic and foreign users;

- the website of the Ministry of Environment Protection and Agriculture of Georgia. Due to administrative restructuring in Georgia, the indicators are not currently available on this website.

In the 2015 study 30 of 67 data sets were accessible. During this study, accessibility per February 2018 was confirmed for 24 data sets, which is 36 percent of their possible maximum number. Such a low number is primarily due to the lack of access to the website of the Ministry of Environment Protection and Agriculture. Previously found data sets are currently accessible for the following indicators:

- ambient air quality in urban areas (A2);
- consumption of ozone-depleting substances (A3);
- renewable freshwater resources (C1);
- BOD and concentration of ammonium in rivers (C10);
- nutrients in freshwater (C11).

Once the respective data again become accessible online, the availability scores should be revised.

Table 1.6 Assessment of environmental indicators and data sets of Georgia

Indicators (number of data sets underpinning them)	A	R	T	M	V
A1: Emissions of pollutants into the atmospheric air (14) *	6	1	0	0	1
A2: Ambient air quality in urban areas (4)	0	0	0	0	0
A3: Consumption of ozone-depleting substances (7)	0	0	0	0	0
B1: Air temperature (1)	0	0	0	0	0
B2: Atmospheric precipitation (1)	0	0	0	0	0
B3: Greenhouse gas emissions (2) *	2	1	1	2	1
C1: Renewable freshwater resources (1)	0	0	0	0	0
C2: Freshwater abstraction (3) *	1	1	0	0	0
C3: Total water use (4) *	3	1	0	0	0
C5: Water supply industry and population connected (1)	1	1	0	1	0
C10: BOD and concentration of ammonium in rivers (2)	0	0	0	0	0
C11: Nutrients in freshwater (5)	0	0	0	0	0
C14: Population connected to wastewater treatment (1)	1	1	0	1	0
C15: Wastewater treatment facilities (1)	0	0	0	0	0
C16: Polluted (non-treated) wastewater (2) *	2	1	0	0	0
D1: Protected areas (1)	1	1	0	2	1
D3: Forests and other wooded land (1)	1	1	0	0	0
D4: Threatened and protected species (2)	1	1	0	0	0
E1: Land uptake (2) *	1	1	0	0	0
G1: Final energy consumption (2) *	2	1	0	0	0
G2: Total primary energy supply (2)	2	1	0	0	0
I1: Waste generation (2)	0	0	0	0	0
I2: Management of hazardous waste (6)	0	0	0	0	0

Columns: A – accessibility; R – responsibility; T - time of update; M – methodology; V – visualisation.
Colour: light – less than 33%; middle – 33 to 67%; dark – over 67% of the maximum possible number.
Scores in the cells are explained at the beginning of the chapter.

The emissions of NMVOCs, NH_3, PM_{10}, $PM_{2,5}$ are determined only from mobile sources, thus it is impossible to define the total amount of corresponding emissions, inclusive of stationary sources (A1);

Data for the following indicators, previously marked as available, have not been found:

- freshwater abstraction (C2), missing data on abstraction by industries broken down by economic activity and the calculations of water exploitation index;

- total water use (C3);
- threatened and protected species (D4), missing data in threatened species.

At the same time, news sets of data have been found for the following indicators in addition to those available previously:

- emissions into the atmospheric air (A1), new data on emissions of NH_3 from mobile sources;
- water supply industry and population connected to water supply (C5);
- population connected to wastewater treatment (C14);
- polluted (non-treated) wastewaters (C16);
- forests and other wooded land (D3);
- land uptake (E1);
- Final energy consumption (G1) and total primary energy supply (G2), four new data sets.

Among the 23 examined indicators (see details in table 1.6):

- 12 indicators showed organizations responsible for indicator production;
- 1 indicator included the time of update;
- 4 indicators contained references to their conformity with 2 international and 2 domestic standards;
- 3 indicators included graphics and diagrams.

The data which were only found in the statistical yearbook cannot be considered easily accessible, as working with yearbooks of several years is required in order to form each time series.

The Republic of Moldova

The environmental indicators are posted on two websites:

- the Government Open Data Portal of the Republic of Moldova in Romanian and English;

- the website of the National Bureau of Statistics of the Republic of Moldova in section Statistical databank, subsection Environment in Romanian, English and (partially) Russian. Sets of data related to some of the analysed indicators can be obtained from the statistical yearbooks Natural resources and environment in the Republic of Moldova.

Both websites are easily accessible. Publication in different languages makes the information convenient for both domestic and foreign users.

In the 2015 study 52 of 67 data sets, were accessible. During this study, accessibility per February 2018 was confirmed for 49 data sets, which is 73 percent of their possible maximum number. The reasons for changes compared with the 2015 review are given below.

Emissions of NH_3, TSP are determined only from stationary sources, thus it is impossible to define the total amount of corresponding emissions, inclusive of mobile sources (A1).

The following previously available data sets have not been found:

- emissions of PM_{10} and $PM_{2.5}$ (A1);

- ground-level ozone concentration in the atmospheric air and PM_{10} (A2) – the emissions of TSP are reported;
- total water use (C3) – only data on withdrawal water boreholes are reported;
- land uptake, broken down by sectors (E1);
- methods of hazardous waste treatment (I2).

At the same time, in addition to previously available data sets, data were also found for the total emissions of TSP from stationary sources, emissions of polycyclic aromatic hydrocarbons (PAHs), polychlorinated dibenzo dioxins/dibenzofurans (PCDD/F), polychlorinated biphenyls (PCBs) (A1).

Table 1.7 Assessment of environmental indicators and data sets of the Republic of Moldova

Indicators (number of data sets underpinning them)	A	R	T	M	V
A1: Emissions of pollutants into the atmospheric air (14)	8	2	2	0	1
A2: Ambient air quality in urban areas (4)	2	2	1	1	1
A3: Consumption of ozone-depleting substances (7)	7	2	1	2	1
B1: Air temperature (1)	0	0	0	0	0
B2: Atmospheric precipitation (1)	0	0	0	0	0
B3: Greenhouse gas emissions (2)	2	2	1	2	1
C1: Renewable freshwater resources (1)	1	2	1	0	0
C2: Freshwater abstraction (3)	2	2	2	0	1
C3: Total water use (4)	3	2	2	0	1
C5: Water supply industry and population connected (1)	0	0	0	0	0
C10: BOD and concentration of ammonium in rivers (2)	2	2	1	1	1
C11: Nutrients in freshwater (5)	5	2	1	2	1
C14: Population connected to wastewater treatment (1)	0	0	0	0	0
C15: Wastewater treatment facilities (1)	0	0	0	0	0
C16: Polluted (non-treated) wastewater (2)	2	2	2	0	1
D1: Protected areas (1)	1	2	1	1	1
D3: Forests and other wooded land (1)	1	2	2	0	1
D4: Threatened and protected species (2)	2	2	2	0	0
E1: Land uptake (2)	2	2	2	0	1
G1: Final energy consumption (2) **	2	0	0	1	0
G2: Total primary energy supply (2) **	2	0	0	1	0
I1: Waste generation (2) *	2	2	2	0	1
I2: Management of hazardous waste (6)	3	2	2	0	1

Columns: A – accessibility; R – responsibility; T - time of update; M – methodology; V – visualisation.
Colour: light – less than 33%; middle – 33 to 67%; dark – over 67% of the maximum possible number.
Scores in the cells are explained at the beginning of the chapter.

Among the 23 examined indicators (see details in table 1.7):

- 16 indicators showed organizations and contact persons responsible for indicator production;
- 16 indicators included the time of update;
- 8 indicators contained references to their conformity with the standards (3 international, 5 domestic);
- 17 indicators included graphics and diagrams.

Most of the indicators published on the Government Open Data Portal included their assessment in the context of environmental policy, as well as of measures necessary to improve the situation (see also chapter 4).

Ukraine

The produced environmental indicators are accessible on two websites:

- the website of the State Statistics Service of Ukraine, section "Environment", subsection Environmental Indicators Recommended by UNECE that are Produced by the State Statistical Bodies (5 indicators analysed in this report). Data sets for some indicators can also be obtained from the statistical yearbooks Environment of Ukraine. All the information is published in Ukrainian and English;

- the website of the Ministry of Ecology and Natural Resources of Ukraine. Information is published only in Ukrainian, which hinders access to indicators for foreign users.

In the 2015 study 33 of 67 data sets were accessed. Through this study, the accessibility per February 2018 was confirmed for 40 data sets data, which is 60 percent of their possible maximum number. However, this does not mean improved online access to 7 new data sets compared to 2015.

Table 1.8 Assessment of environmental indicators and data sets of Ukraine

Indicators (number of data sets underpinning them)	A	R	T	M	V
A1: Emissions of pollutants into the atmospheric air (14)	11	0	0	0	0
A2: Ambient air quality in urban areas (4)	2	1	1	0	1
A3: Consumption of ozone-depleting substances (7)	0	0	0	0	0
B1: Air temperature (1)	0	0	0	0	0
B2: Atmospheric precipitation (1)	0	0	0	0	0
B3: Greenhouse gas emissions (2) **	2	1	1	2	1
C1: Renewable freshwater resources (1)	0	0	0	0	0
C2: Freshwater abstraction (3) *	2	1	1	1	0
C3: Total water use (4) *	3	1	1	1	1
C5: Water supply industry and population connected (1) *	1	1	0	1	0
C10: BOD and concentration of ammonium in rivers (2)	2	1	1	0	1
C11: Nutrients in freshwater (5)	2	1	1	0	1
C14: Population connected to wastewater treatment (1)	0	0	0	0	0
C15: Wastewater treatment facilities (1)	1	1	0	0	0
C16: Polluted (non-treated) wastewater (2) *	2	1	1	0	0
D1: Protected areas (1) *	1	1	2	1	0
D3: Forests and other wooded land (1)	0	0	0	0	0
D4: Threatened and protected species (2) *	2	1	0	1	0
E1: Land uptake (2)	0	0	0	0	0
G1: Final energy consumption (2)	2	0	1	2	0
G2: Total primary energy supply (2)	2	0	1	2	0
I1: Waste generation (2)	2	0	1	2	0
I2: Management of hazardous waste (6)	3	0	2	0	0

Columns: A – accessibility; R – responsibility; T - time of update; M – methodology; V – visualisation.
Colour: light – less than 33%; middle – 33 to 67%; dark – over 67% of the maximum possible number.
Scores in the cells are explained at the beginning of the chapter.

The emissions of PM_{10} and $PM_{2,5}$ into the atmospheric air (A1) are determined only from stationary sources.

The following data sets were found in addition to those previously available (except for the first one, all on the website of the State Statistics Service of Ukraine):

- greenhouse gas emissions data (in total and broken down by substances), obtained from the 6th National Communication submitted to the secretariat of UNFCCC;
- freshwater abstraction (divided by nature of business) (C2) in statistical yearbooks;
- water use by industry broken down by main economic activities, and water losses (C3) in statistical yearbooks;
- the amount of wastewater from mechanical, biological and physical-and-chemical treatment (C15) in statistical yearbooks;
- plant and animal species included in the Red List of Ukraine (D4) in statistical yearbooks.

Among the 23 examined indicators (see details in table 1.8):

- 11 indicators showed organizations responsible for indicator production;
- 12 indicators included the time of update;
- 9 indicators contained references to their conformity with standards (4 international and 5 domestic);
- 5 indicators included graphics and diagrams.

The data which were only found in the statistical yearbook cannot be considered easily accessible, as working with yearbooks of several years is required in order to form each time series.

2. In-depth quality assessment of selected indicators

During the first assessment of SEIS establishment in 2015 it was noted that the assessment was not able to take into account internationally-accepted standards for data set production nor data quality, given the limited resources available. Therefore, it was suggested that these shortcomings should be rectified in the next review round. Furthermore, the report stated that building on experiences from the first review, continued efforts were needed in measuring progress on SEIS establishment to support regular environmental reporting. It was also highlighted that the next assessment would benefit from an adequate review of all the three main SEIS pillars — cooperation, content and infrastructure — and the expansion of the review criteria when assessing the establishment of SEIS in order to enhance data quality for environmental reporting.

During the eighth Environment for Europe Ministerial Conference in Batumi, Georgia, from 8 to 10 June 2016, the Minsters of the Environment invited countries "to continue their efforts and to further develop their national information systems to have SEIS in place in the countries of Europe and Central Asia by 2021" (ECE/BATUMI.CONF/2016/2/Add.1). The UNECE Committee on Environmental Policy was invited to convene a mid-term review in 2018 to assess progress in the implementation of the main outcomes of the Batumi Conference including on developing a SEIS to support a regular process of environmental assessment.

At its nineteenth session, the UNECE Working Group on Environmental Monitoring and Assessment examined the results of the review of the SEIS assessment framework (ECE/CEP/AC.10/2017/5) based on a first proposal prepared by the secretariat in cooperation with UNEP and EEA. The Working Group agreed that it would be necessary to pilot the SEIS Assessment Framework and its associated online reporting tool before moving on to the mid-term review.

In the second half of 2017 and based on the results of a pilot exercise with a few selected countries, the SEIS Assessment Framework was further developed and completed by the secretariat together with the EEA and UNEP as well as based on feedback provided by members of the Working Group and Joint Task Force.

This revised SEIS Assessment Framework will be used for the SEIS mid-term assessment and takes as a basis for data / indicator quality assessment the following criteria, aligned with quality criteria used by the UNECE Statistical Division as well as the EEA:

(1) Relevance;
(2) Accuracy;
(3) Timeliness and punctuality;
(4) Accessibility;
(5) Clarity;
(6) Comparability;
(7) Institutional and organizational arrangements.

The 7 data flows underpinning 3 UNECE indicators selected for the mid-term review across the pan-European region were selected based on their comparability among countries and due to the countries' own priorities[10]. These indicators and data sets have already been discussed in chapter 1

[10] [United Nations Economic and Social Council.] Economic Commission for Europe. Committee on Environmental Policy. Working Group on Environmental Monitoring and Assessment. Towards a Shared Environmental Information System: SEIS assessment framework for the mid-term review on assessing progress in establishing SEIS across the pan-European region. Draft of 9 November 2017.

above, whereas the truly detailed assessment of their quality is best made taking into account the countries' own responses. The results of the quality assessment through the mid-term review will be discussed at the twentieth session of the Working Group (Geneva, 3–4 September 2018). However, and taking into account the preceding generalised analysis, certain more detailed although only preliminary and yet incomplete conclusions can be made against some of the quality criteria above.

As the quality of indicators by SEIS criteria can primarily be assessed through individual data sets which constitute the indicator in question, the analysis below is focused both on that and on how indicators are presented as a whole. Quality criteria (1), (3), (4), (5) and (6) used for the analysis are indicated with their corresponding numbers in parentheses. Criteria (2) – Accuracy and (7) – Institutional and organizational arrangements were not accessed below due to the limitations of a desk study with respect to obtaining sufficiently detailed information.

The key points of the quality assessment are summarised in Table 2.1, the details are discussed below.

AMBIENT AIR QUALITY IN URBAN AREAS

Armenia

The concentrations of SO_2 and NO_2 were regularly measured in 3 cities (Erevan, Vanadzor, Alaverdi: 3 locations in each city) (1) in the periods (3) indicated below:

- annual average concentrations in 1990, 1995, 2000–2016;
- maximum daily average concentrations in 2011–2016;
- number of days exceeding MAC (maximum allowable concentrations) values in 2011–2016.

The concentration of ground-level ozone was measured in one city in the periods (3) indicated below:

- annual average concentrations in 1990, 2004-2016;
- maximum daily average concentrations in 2011-2016;
- number of days exceeding MAC values in 2011-2016.

There are no data on PM_{10} concentrations (1). The information on the website (4) is published in Armenian and English. The website refers to the organization responsible for generating the information – the Ministry of the Environment of the Republic of Armenia, as well as indicates the last update of the content – 06.09.2017. Graphs and diagrams characterize air pollution in these cities (5). However, there are no references to measuring methods and their conformity with international standards (5, 6).

Azerbaijan

Only the concentrations of SO_2 and NO_2 were regularly measured in 7 cities (1) in 2003–2016 (3). There are no required average data on the concentrations of PM_{10}[11] and ground-level ozone (1). The information on the website (4) is published in Azeri and English. The website has information on the

[11] PM_{10} data are in fact being produced through automated monitoring, but unlike other air quality data sets, are not processed to calculate average values required by UNECE indicator definitions.

organization responsible for the generation of data – the Ministry of Ecology and Nature Resources of the Republic of Azerbaijan, as well as reference to the last update of content – 11.05.2017. Visualisation of data (graphs, diagrams) is not included (5).[12] There are no references to measuring methods and their conformity with international standards (5, 6).

Belarus

The annual average concentration of NO_2, the exceedance of one-time maximum and daily maximum MAC values, and the number of days exceeding MAC values were regularly measured in 12 cities (1) in 2005–2016 (3). The annual average concentrations of SO_2, PM_{10} and ground-level ozone, the exceedance of their one-time and daily MAC values, the number of days exceeding MAC values were measured in 8 cities in different periods of time (1). The information on the website (4) is published in Russian and English. The website indicates the source of information – the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus, however there is no information update time. The indicator contains visualisation (5). There are no references to measuring methods and their conformity with international standards (5, 6).

Georgia

No data were accessible for this indicator.

The Republic of Moldova

The concentrations of SO_2 and NO_2 were measured in 3 cities (in Chisinau at 7 monitoring locations, in Balti at 3 locations, in Tiraspol at 4 locations) (1) on a regular basis in 2000–2014 (3). The daily average concentration of PM_{10} was measured in 2012–2014 (3) at one location in Chisinau (1). The data on ground-level ozone are absent (1). All the information on the website (4) is published in Romanian and English. The website refers to the State Hydrometeorological Service and the person responsible for producing the data, however the indicated date of the last update of content 02.06.2016 (5) is far away from the end of the time period represented by the data (3). Graphs show the changes of SO_2 and NO_2 concentrations over time. The analysis of pollutant concentration was carried out in accordance with techniques developed in the USSR in 1991 (5). The conformity with international standards is not indicated (6).

Ukraine

The only data set online is that of the annual average concentrations and maximum one-time concentrations of SO_2 and NO_2 in Kharkiv (1) in 2000–2014 (3). There are no data on PM_{10} concentration and ground-level ozone (1). The information on the website (4) is published only in Ukrainian. There is reference to the organization responsible for the data – the Ministry of Ecology and Natural Resources of Ukraine, as well as the indication of the last update time – 06.05.2015. The map of sampling locations in the city is presented too (5). There are no references to measuring methods and their conformity with the international standards (5, 6).

[12] Continuous monitoring data (not indicators) on air quality in Baku are however published on the website of the Ministry of Ecology and Natural Resources, and are presented in a graphical form.

BOD AND CONCENTRATION OF AMMONIUM IN RIVERS

Armenia

Data characterize the annual average, the maximum and the minimum of BOD_5 and the concentration of NH_4 in five rivers (1). The full series of observation – 1990, 1995, 2000–2016 (3) – exists for two rivers (the Debed and the Razdan) (1). For other rivers the time periods were different, but regular measurements in all of them started in 2006 (3). As a rule, observation data are shown at three locations per river (two on the river Megri). Information on the website (4) is published in Armenian and English. The website refers to the information source – the Ministry of the Environment of the Republic of Armenia, as well as indicates the last update of the content – 06.09.2017. There is information on the number of samples taken within a year and sampling locations, but no information about the hydrological periods when the samples were taken. The data are presented in graphs and diagrams, demonstrating the change of the annual average, the maximum and the minimum values of BOD_5 and NH_4 concentration in every river and at every sampling location (5). There are no references to measurement methods and their conformity with international standards (5, 6).

Azerbaijan

The data characterize only the annual averages of BOD_5 and NH_4 in two rivers – the Kura and the Araks (1) in the period 2000–2016 (3). The minimum and the maximum of BOD_5 and NH_4 values are not available (1). All information on the website (4) is published in Azeri and English. The website has information about the organization responsible for the data – the Ministry of Ecology and Nature Resources of the Republic of Azerbaijan, as well as reference to the last update of the content – 11.05.2017 (5). There are no data on the types and number of monitoring locations, the sampling periods and the number of samples taken. There is no visualisation of data (5). There are no references to measurement methods and to their conformity with international standards (5, 6).

Belarus

The data characterize annual averages of BOD_5 and the concentration of NH_4 averaged over ten rivers (1) in the period of 2005–2016 (3). Besides, there are annual averages of BOD_5 per each of the sampling location in the ten rivers (the number of locations varies from three on the Zapadnyi Bug to twelve on the Dnieper). There are no similar data for NH_4 concentration on the web-site, but they can be found in the Annual environmental bulletin published by the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus. The maximum and the minimum values of BOD_5 and NH_4 concentrations are not available (1). All information on the website (4) is published in Russian and English. The website includes a reference to the information source – the Ministry of Natural Resources and Environmental Protection. However, there is no date of the last update of the content, nor is there information about the number of samples which were analysed to calculate the annual averages, or about the periods of the sample collection. No data visualisation is present (5). There are no references to measurement methods and their conformity with international standards (5, 6).

Georgia

No data were accessible for this indicator.

The Republic of Moldova

The data characterize the annual averages, maximum and minimum of BOD_5 and the concentration of NH_4 in three rivers: samples were taken in the Dniester and the Prut at three locations each, and in the Danube at one location (1). BOD_5 data are shown for the periods of 1990, 1995 and 2000–2014. NH_4 data are shown for the periods of 1990, 1995, 2000–2003 and 2005–2014 (3). The trends over time are described in the narrative format, including in relation to actions required to improve water quality in the Republic of Moldova (1). All information on the website (4) is published in Moldovan and English. The website refers to the State Hydrometeorological Service and the person responsible for data production (5). The date of the last update of content 02.06.2016 (5) is far away from the time period represented by the data (3). The number of taken samples is shown for each year. The location of sampling is shown as distance from a nearby settlement. There is no information about sampling periods. There are graphs and diagrams of trends in BOD_5 and concentrations of NH_4 (5). There is reference to the iodometric method of BOD_5 measurement, but no information about its conformity with international standards. The method of measurement for NH_4 is not stated (5, 6).

Ukraine

The data characterize the annual averages of BOD_5 and the concentrations of NH_4 in the Dnieper, the Prut, the Siverskiy Donets and the Dniester rivers (1) in 1999–2013 without breaks in the time-series. In the Tisa and the Danube rivers there are breaks in observations (3). Data about the minimum and the maximum values of BOD_5 and NH_4 concentration are not available (1). Information on the website (4) is published only in Ukrainian. The website refers to the organization responsible for BOD_5 and NH_4 data – the State Water Agency of Ukraine (5). The date of the last update of content 05.05.2015 (5) is far away from the time period represented by the data (3). There is information about sampling locations and the number of taken samples, but no information about the periods of sampling. Some information is presented in graphs showing change of the BOD_5 and NH_4 concentrations in the Dnieper (5). There are no references to methods of analysis and their conformity to international standards (5, 6).

PROTECTED AREAS

Armenia

The data sets for 1990, 1995 and 2000–2016 (3) include data on the total territory of protected areas, their share in the total area of the country, as well as information on areas of different IUCN categories (wilderness, national parks, national monuments, special reserves) (1). All information on the website (4) is published in Armenian and English. The site refers to the information source – the Ministry of the Environment of the Republic of Armenia, and indicates the date of the last update of the content – 06.09.2017. Data are presented in graphs and diagrams, showing area change in total and per category. The method of indicator production is stated (5) and complies with IUCN recommendations (6).

Azerbaijan

The data sets for 1990, 1995 and 2000–2016 (3) include data on the total territory of protected areas, their share in the total area of the country, as well as information on areas of different IUCN categories (national parks, national and other reserves) (1). All information on the website (4) is published in Azeri and English. The website refers to the organization responsible for data production – the Ministry of Ecology and Nature Resources of the Republic of Azerbaijan (5), and indicates the date of the last update of the content – 26.04.2017. There is no visualisation (6). The method of indicator production is stated (6) and complies with IUCN recommendations (7).

Belarus

The data sets include data about the total territory of protected areas, their share in the total area of the country, as well as information on the areas of different national categories (1) in 2000–2016 (3). All information on the website (4) is published in Russian and English. The web-site refers to the source of information – the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus, however there is no date of the last update of content. Graphics show the change of the total territory of protected areas per year (5). National categories of protected areas do not comply with IUCN recommendations (6).

Georgia

Using statistical yearbooks for different years (2013–2016), one can form data sets for the same period which show the total territory of protected areas and territories of IUCN categories (strict nature reserves, other reserves, national parks, nature monuments, protected landscapes) (1). Access to the website is easy, however it is difficult to search information in statistical yearbooks posted there (4). The information is published in Georgian and English. The web-site refers to the source of information – the Protected Areas Agency of Georgia. There is no date of the last update of the content (3). A diagram shows the shares of different categories in the total territory of protected areas (5). Methods of indicator production are indicated and comply with IUCN standards (6).

The Republic of Moldova

The data sets include data on the total territory of protected areas, their share in the total area of the country, as well as information on areas of different national categories (national parks, nature reserves, nature monument, landscape territories and others – in total 12 categories) (1) in 2000–2014 (3). All information on the website (4) is published in Moldovan and English. The website refers to the Ministry of the Environment of the Republic of Moldova and the person responsible for data production, and indicates the date of the last update of content – 12.08.2015. Graphs and diagrams characterize the increase of the territory of protected areas (5). National categories of protected areas do not comply with IUCN categories (6).

Ukraine

Using the 2016 statistical yearbook, one can form the data sets on the total territory of protected areas, their share in the total area of the country, as well as areas of different national categories (nature and biosphere reserves, national parks, landscape parks, special reserves, nature

monuments) (1) in 2013-2016 (3). Information is posted on the website in Ukrainian, search for information is complicated (4). The statistical book refers to the information source – the Ministry of Ecology and Natural Resources of Ukraine, and indicates the date of the last update of the content – end of 2016. There is no visualisation of data (5). The national categories of protected areas do not comply with IUCN categories (6).

Table 2.1 Summary of quality assessment of selected indicators per SEIS Assessment Framework

	AZE	ARM	BLR	GEO	MDA	UKR
Ambient air quality in urban areas						
(1) relevance	7 cities SO_2 NO_2 O_3 PM_{10}	3 cities 9 locations SO_2 NO_2 O_3 PM_{10}	8–12 cities SO_2 NO_2 O_3 PM_{10}		3 cities 14 loc. SO_2 NO_2 O_3 PM_{10}	1 city SO_2 NO_2 O_3 PM_{10}
(3) timeliness	To 2016	To 2016	To 2016		To 2014*	To 2014
(4) accessibility	Online	Online	Online		Online	Online
(5) clarity	Aze, Eng Respons. Update Standards Visuals	Arm, Eng Respons. Update Standards Visuals	Rus, Eng Respons. Update Standards Visuals		Rom, Eng Respons. Update Standards Visuals	Ukr Respons. Update Standards Visuals
(6) comparability	Time series Standards	Time series Standards	Time series Standards		Time series Standards	Time series Standards
BOD and concentration of ammonium in rivers						
(1) relevance	2 rivers BOD_5 NH_4 Average Min Max	8 rivers x 2-3 loc. BOD_5 NH_4 Average Min Max	10 rivers x 3-12 loc. BOD_5 NH_4 Average Min Max		3 rivers x 1-3 loc. BOD_5 NH_4 Average Min Max	6 rivers BOD_5 NH_4 Average Min Max
(3) timeliness	To 2016	To 2016	To 2016		To 2014*	To 2015*
(4) accessibility	Online	Online	Online		Online	Online
(5) clarity	Aze, Eng Respons. Update Standards # samples Locations Periods Visuals	Arm, Eng Respons. Update Standards # samples Locations Periods Visuals	Rus, Eng Respons. Update Standards # samples Locations Periods Visuals		Rom, Eng Respons. Update Standards # samples Locations Periods Visuals	Ukr Respons. Update Standards # samples Locations Periods Visuals
(6) comparability	Time series Standards	Time series Standards	Time series Standards		Time series Standards	Time series Standards
Protected areas						
(1) relevance	% and area By type	% and area By type	% and area By type	% and area By type	% and area By type	% and area By type
(3) timeliness	To 2016	To 2016	To 2016	To 2016	To 2014	To 2016
(4) accessibility	Online	Online	Online	Online	Online	Online
(5) clarity	Aze, Eng Respons. Update Standards Visuals	Arm, Eng Respons. Update Standards Visuals	Rus, Eng Respons. Update Standards Visuals	Geo, Eng Respons. Update Standards Visuals	Rom, Eng Respons. Update Standards Visuals	Ukr Respons. Update Standards Visuals
(6) comparability	Time series IUCN	Time series IUCN	Time series IUCN	Time series IUCN	Time series IUCN	Time series IUCN

Colour: green – fully compliant; orange – partially compliant; red – not compliant or absent; blue – unknown.

A star * indicates that the indicated date of updating is far from the end-date of the time series (lack of punctuality). Please see detailed description and explanations in the text.

Self-assessment

Four Eastern Partnership countries (Armenia, Azerbaijan, Belarus and the Republic of Moldova) submitted their responses to the questionnaire on assessing progress in establishing SEIS across the pan-European region for mid-term review and piloting the SEIS Assessment Framework. The self-assessment was carried out on the same three indicators against the seven quality categories as were analysed above. The countries responded to the 24 questions.

Countries have reported long time series of continuous monitoring: 12 years in Belarus except for the data flows on protected areas (16 years); 15 to 28 years In Azerbaijan (exceptions are PM_{10} and O_3, both are two-years long); since 1977 up to present time in In Armenia, with interruptions in 1990–1999 due to the lack of funding. (It also should be noted that Armenia measures the concentrations of dust rather than the required PM_{10}.); 20 to 35 years in the Republic of Moldova, respectively, for protected areas and water quality. (The time series of air quality monitoring have been self-assessed by the country incorrectly since only one year 1995 has been indicated. The Republic of Moldova also reported that the time series of air quality get interrupted in cases of malfunction or inadequate performance of sampling and analysis equipment.) In Belarus, data on protected areas are classified by national, not IUCN, categories. The Republic of Moldova indicated that since 2015 data on protected areas have been reported by IUCN categories.

Except for protected areas, Azerbaijan, Armenia and the Republic of Moldova receive primary data for the indicators from the organizations responsible for their production. Belarus also uses other producers' data. The countries indicated ministries and agencies involved in responding to the questionnaire, as well as the responsible contact persons there.

Countries declared their procedures used for quality assurance, such as ISO 17025 in Belarus and the Republic of Moldova. Armenia, Azerbaijan and Belarus reported the availability of metadata for the collected data sets, including information about data sources, and temporal and spatial coverage. The Republic of Moldova indicated the use of all eleven metadata elements from the questionnaire. All countries reported the use of internationally agreed procedures for indicator production and pointed to the related regulatory documents, plans, programs and strategies. All countries reported the availability of mechanisms and agreements concerning the regular production and exchange of data at the national level. Belarus provided supporting documents in that respect.

Belarus and Azerbaijan release data annually. (Azerbaijan apparently referred to a continuous release of automated measurements of PM_{10} and O_3 rather than to the production of corresponding indicators, which requires data processing to calculate annual averages.) In Armenia, except for protected areas, the data are released on a monthly basis. The Republic of Moldova reported that air quality data are disseminated annually, data on protected areas continuously, water quality data on a ‘multi-annual’ basis.

It appears from the responses that data are usually released at the start of the year following the period of observations. The analysis of the actually accessible data shows that online information in Belarus and Azerbaijan indeed covers 2017 observations. (As noted above, in Azerbaijan PM_{10} and O_3 are however measured and published continuously without post-processing.) In Armenia online data so far only cover 2016 observations (except for data on protected areas which are more recent). The Republic of Moldova indicated that data were released in 2017, however only data on SO_2 and NO_2 in the atmospheric air and data on protected areas have been found. The most recent water quality currently available online are dated 2016.

The reported punctuality of data release in Armenia and Azerbaijan is less than 4 days, in Belarus and the Republic of Moldova between 4 days and 8 weeks (which appears to be more realistic). Azerbaijan and Belarus also reported delay in publishing data of less than 1 year, while Armenia and the Republic of Moldova more than 1 year for most of the indicators.

The published indicators are available for users on the respective national platforms, and so are raw data of government agencies in Armenia and Azerbaijan. Raw data are only partially available in Belarus for air quality indicators but not for others. In the Republic of Moldova raw data on air quality are not public, while data on water quality and protected areas are.

All countries prepare environmental reports and visual representation of the data. Azerbaijan, Belarus and the Republic of Moldova reported the use of SEIS templates. The Republic of Moldova also reported the use of EEA data flow format. The countries use the indicators for more than one purpose, including the shaping of environmental policy in Azerbaijan, reporting on SDGs in Belarus, preparing reports under intergovernmental agreements and for research and analytical purposes in the Republic of Moldova. Armenia, Belarus and the Republic of Moldova actively interact with users, the two latter countries regularly analyse user feedback collected through online questionnaires.

All in all, the countries appraised themselves as follows (weighted average among the different quality categories):

- 96,43% (very good performance) by Armenia. (Taking into account that dust rather than PM_{10} is measured in urban air, and the absence online of 2017 data, this score appears to be somewhat overestimated);
- 90,48% (good performance) in Azerbaijan;
- 84,29% (good performance) in Belarus. (This score could be higher if IUCN rather than national categories were used for presenting data on protected areas);
- 77.86% (good performance) in the Republic of Moldova (somewhat low due to a low self-assessment, in the range of 70 – 73%, of data flows on air quality and protected areas).

With some caveats mentioned above, the underlying analysis and the overall scores generally coincides with the findings of the direct assessment above (table 2.1) which had to rely on published information and thus may have lacked certain details the countries were able to provide through self-assessment. Also important to note is that the direct analysis above did not take into account 2017 data which were not yet available at the time; this difference however is unlikely to affect the big picture.

3. Environmental indicators for monitoring progress towards policy goals

The 2030 Agenda for Sustainable Development adopted by the UN, recommends all member-states to develop national programs with objectives and indicators for monitoring the achievement of the Sustainable Development Goals (SDGs) which cover all aspects of a transition to a sustainable development. Such work is currently being carried out in the countries of the Eastern Partnership as well (see table 3.1).

Table 3.1 Activities undertaken by Eastern Partnership countries in developing SDG indicators

	ARM	AZE	BLR	GEO	MDA	UKR
Assessing capacities and needs		(2)	(4 – 6)	(7, 8)	(9)	(10)
Analysing and choosing national indicators	(1)	(3)	(4 – 6)	(8)	(9)	(10)
Producing and publishing selected indicators	(1)	(3)	(4 – 6)	(8)		(11)

Numbers in the table point to the references in the list:

(1) National Statistical Service of the Republic of Armenia. Armenia SDG indicators (with data annex)
(2) UNDP country office on Azerbaijan. Building statistical capacity to monitor SDGs in Azerbaijan
(3) Voluntary national review of the Republic of Azerbaijan on the first steps in the implementation of the 2030 Agenda for Sustainable Development. Baku, 2017
(4) National Statistical Committee of the Republic of Belarus. National list of SDG indicators
(5) Дорожная карта Национального статистического комитета Республики Беларусь по разработке статистики по Целям устойчивого развития. Минск 2018
(6) Национальный доклад Республики Беларусь об осуществлении повестки дня в области устойчивого развития на период до 2030 года. Минск 2017
(7) Guntsadze, M. National SDG indicator frameworks in Georgia. Subregional Workshop on Data and Statistics for Sustainable Development Goals for High-Level Official Statisticians, May 2017, Baku,
(8) First voluntary national review on implementation of the sustainable development goals. Georgia
(9) Nationalization of indicators for sustainable development goals. Results of consultations on adjusting the indicators for the 2030 Agenda for Sustainable Development to the context of the Republic of Moldova. March 2017
(10) Кармазина, О. Имплементация индикаторов для Повестки дня в области устойчивого развития на период до 2030 года в Украине.
(11) Міністерство економічного розвитку і торгівлі України. Цілі сталого розвитку: Україна. Національна доповідь. 2017

In Armenia national indicators are being developed for each of the SDGs, and part of this work has already been completed.

In Belarus the national system of SDG indicators is completed, they will be included into the national planning system. At the moment the system contains 225 global SDG indicators (some are proxies) and 255 nationally-specific indicators. The national report on the implementation of the 2030 Agenda for Sustainable Development has been published.

Georgia conducted a capacity analysis for the development of SDG indicators, and defined midterm priorities. Overall 186 indicators were defined as base indicators. In five years national goals and objectives will be revised, and by 2030 will cover all 17 SDGs.

The Republic of Moldova has defined indicators for each of the 17 SDGs in the following categories: available (already existing); partially available; requiring development. While defining key national indicators, the Republic of Moldova takes into account their practical use, the availability of reliable data, the possibility of their collection and processing, consistency, and methodological support.

Analysis in Ukraine has shown that today the state statistical body has data for 96 SDG indicators. For 52 of these indicators data are already collected and produced in full accordance with international standards. For 44 indicators compliance is only partial.

For the purpose of monitoring the implementation of the global 2030 Agenda for Sustainable Development, on July 6, 2017 the United Nations General Assembly adopted resolution 71/313[13]. The document sets out the system of global sustainable development goals, objectives and indicators, and strongly urges countries to advance coordinated efforts for the development of data collection considering national priorities and recognising national responsibilities for the implementation of the Agenda. Article 1 of the above-mentioned UN resolution allows amending the list of global indicators by adding regional and national level-indicators developed by the UN member-countries. In the UNECE region, key indicators for SDG monitoring may where possible build on the UNECE core set of environmental indicators.

Table 3.2 shows the approximate matching of sustainable development indicators adopted by the UN General Assembly, and the UNECE environmental indicators which can be used as additional tools for monitoring the achievement of SDGs, or for temporarily substituting some of the globally recommended indicators not yet sufficiently developed at the country level.

Table 3.2 Matching selected SDG indicators with the UNECE set of environmental indicators

SDGs and their objectives (formulations shortened)	Recommended SDG indicators	UNECE Indicators
2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices	2.4.1 Proportion of agricultural area under productive and sustainable agriculture	F1 Fertilizer consumption F4. Pesticide consumption F3. Gross nitrogen balance
6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	6.1.1 Proportion of population using safely managed drinking water services	C5 Water supply industry and population connected to water supply industry

[13] [UN] General Assembly. Work of the Statistical Commission pertaining to the 2030 Agenda for Sustainable Development. Resolution 71/313 adopted by the General Assembly on 6 July 2017. //Seventy-first session Agenda items 13 and 117.

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	6.3.1 Proportion of wastewater safely treated 6.3.2 Proportion of bodies of water with good ambient water quality	C16 Polluted (non-treated) wastewaters C10 BOD and concentration of ammonium in rivers C11 Nutrients in freshwater
6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	6.4.1 Change in water-use efficiency over time 6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	C1 Renewable freshwater resources C2 Freshwater abstraction (water exploitation index) C4 Household water use per capita C7 Water losses
7.2 By 2030, increase substantially the share of renewable energy in the global energy mix	7.2.1 Renewable energy share in the total final energy consumption	G1 Final energy consumption G4 Renewable energy consumption
7.3 By 2030, double the global rate of improvement in energy efficiency	7.3.1 Energy intensity measured in terms of primary energy and GDP	G3 Energy intensity
9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure	9.1.2 Passenger and freight volumes, by mode of transport	H1 Passenger transport demand H2 Freight transport demand
9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable	9.4.1: CO2 emission per unit of value added	B3 Greenhouse gas emissions
11.3 By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable settlement planning and management	11.3.1 Ratio of land consumption rate to population growth rate	E1. Land uptake E2. Area affected by soil erosion
11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	11.6.1 Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities 11.6.2 Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted)	I1 Waste generation I3 Waste reuse and recycling I4a Final waste disposal: management of municipal waste A2 Ambient air quality in urban areas
12.2 By 2030, achieve the sustainable management and efficient use of natural	12.2.1 Material footprint, material footprint per capita, and material	C3 Total water use I1 Waste generation

resources	footprint per GDP	
12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, and significantly reduce their release to air, water and soil	12.4.2 Hazardous waste generated per capita and proportion of hazardous waste treated, by type of treatment	I2 Management of hazardous waste I3 Waste reuse and recycling
12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse	12.5.1 National recycling rate, tons of material recycled	I2 Management of hazardous waste I3 Waste reuse and recycling I4 Final waste disposal
14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution	14.1.1 Index of coastal eutrophication and floating plastic debris density	C12 Nutrients in coastal sea-waters
15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements	15.1.1 Forest area as a proportion of total land area 15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type	D3 Forests and other wooded land D1 Protected areas D2 Biosphere reserves and wetlands of international importance
15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity	15.5.1: Red List Index	D4 Threatened and protected species
15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts	15.9.1 Progress towards national targets established in accordance with Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011-2020	*Requires separate analysis*

Analysis of the table points to the in-principle possible direct use of UNECE environmental indicators in the system of the recommended global indicators of achieving specific SDGs: nine indicators of water resources; four indicators per waste and biodiversity; three indicators per energy and agriculture; two indicators per land and transport; and one indicator per atmospheric air pollution and climate change.

The following SDGs relate to the environment in the most direct and integrated way[14]:

- Goal 6 Clean Water and Sanitation» with the objective to Ensure availability and sustainable management of water and sanitation for all;
- Goal 7 Affordable and Clean Energy» with the objective to ensure access to affordable, reliable, sustainable and modern energy for all;
- Goal 11 Sustainable Cities and Communities» with the objective to make cities and human settlements inclusive, safe, resilient and sustainable;
- Goal 12 Responsible Consumption and Production with the objective to ensure sustainable consumption and production patterns;
- Goal 13 Climate Action with the objective to take urgent action to combat climate change and its impacts;
- Goal 14 Life below Water» with the objective to conserve and sustainably use the oceans, seas and marine resources for sustainable development;
- Goal 15 Life on Land with the objective to protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Table 3.3 provides a qualitative expert (author) assessment of the capacity of the Eastern Partnership countries to actually produce, according to UNECE guidelines, environmental indicators from the UNECE core set to support the monitoring of these specific SDGs and their underlying tasks.

This analysis includes not only UNECE indicators directly matching those adopted by the UN General Assembly, but also others that can additionally be used to facilitate the monitoring of specific SDGs tasks with significant environmental content.

First of all, these are indicators already analysed in detail in the previous chapters, as well as indicators of energy supply and production; the generation, utilization and treatment of waste; passenger turnover, and of the use of mineral and organic fertilizers.

Other methodologically advanced indicators developed by the UNECE Joint Task Force on Environmental Statistics and Indicators, which too are already fit for monitoring progress towards SDGs, include

- drinking water quality (C9);
- age of road motor vehicle fleet (H4);
- nutrients in coastal seawaters (C12);
- concentrations of pollutants in coastal seawater and sediments (C13;
- area affected by soil erosion (E2);
- trends in the number and distribution of selected species (D5).

[14] UN Statistics Division, Environment Statistics Section. Strengthening Environmental Statistics for Monitoring the SDGs. // Third meeting of the Expert Group on Environmental Statistics (New York, 20–22 April 2016).

Table 3.3 Assessment of Eastern Partnership countries' capacities to produce UNECE environmental indicators for monitoring SDGs

Tasks within the framework of the SDG (simplified)	**UNECE indicators**	**ARM**	**AZE**	**BLR**	**GEO**	**MDA**	**UKR**
SDG 6 CLEAN WATER AND SANITATION							
6.1 Achieve universal and equitable access to safe and affordable drinking water for all	C5 Water supply industry and population connected						
	C9 Drinking water quality *						
6.3 Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse	C10 BOD and concentration of ammonium in rivers						
	C11 Nutrients in freshwater						
	C16 Polluted (non-treated) wastewaters						
	A1 Emissions of pollutants into the atmospheric air						
6.4 Increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	C2 Freshwater abstraction						
	C3 Total water use						
	C4 Household water use per capita *						
	C5 Water supply industry and population connected						
	C7 Water losses						
SDG 7 AFFORDABLE AND CLEAN ENERGY							
7.1 Ensure universal access to affordable, reliable and modern energy services	G2 Total primary energy supply						
	G6 Gross electricity production **	-	-	-	-	-	-
7.2 Increase the share of renewable energy	G2 Total primary energy supply						
	G4 Renewable energy consumption *						
7.3 Double the (global) rate of improvement in energy efficiency	G3 Energy intensity *						
SDG 11 SUSTAINABLE CITIES AND COMMUNITIES							
11.3 Enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable settlement planning and management	E1 Land uptake						
	E2 Area affected by soil erosion *						
11.6 Reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	A1 Emissions of pollutants into the atmospheric air						
	A2 Ambient air quality in urban areas						
	I3 Waste reuse and recycling *						
	I4 Final waste disposal *						
SDG 12 RESPONSIBLE CONSUMPTION AND PRODUCTION							

12.2 Achieve the sustainable management and efficient use of natural resources	C2 Freshwater abstraction						
	C3 Total water use						
	D3 Forests and other wooded land						
	I1 Waste generation						
12.3 Halve per capita food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses	I4 Final waste disposal *						
12.4 Achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, and significantly reduce their release to air, water and soil	A3 Consumption of ozone-depleting substances						
	F2 Fertilizer consumption *						
	F4 Pesticide consumption *						
	I1 Waste generation						
	I2 Management of hazardous waste						
	I3 Waste reuse and recycling *						
12.5 Substantially reduce waste generation through prevention, reduction, recycling and reuse	I1 Waste generation						
	I2 Management of hazardous waste						
	I3 Waste reuse and recycling *						
	I4 Final waste disposal *						
SDG 13 CLIMATE ACTION							
13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters	B1 Air temperature						
	B2 Atmospheric precipitation						
13.2 Integrate climate change measures into national policies	B3 Greenhouse gas emissions						
SDG 14 LIFE BELOW WATER							
14.1 Prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution	C12 Nutrients in coastal seawaters *	-		-		-	
	C13 Pollutants in coastal seawater and sediments *	-		-		-	
	C16 Polluted (non-treated) wastewaters						
SDG 15 LIFE ON LAND							
15.1 Ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains	D1 Protected areas						
	D2 Biosphere reserves / international wetlands **	-	-	-	-	-	-
	D3 Forests and other wooded land						

and drylands, in line with obligations under international agreements	E2 Area affected by soil erosion *						
15.2 Promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation	D3 Forests and other wooded land						
15.3 Combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world	E2 Area affected by soil erosion *						
15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity, protect and prevent the extinction of threatened species	D1 Protected areas						
	D2 Biosphere reserves / international wetlands **	-	-	-	-	-	-
	D4 Threatened and protected species						
	D5 Number / distribution of selected species *						
15.8 Introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species	D6 Invasive alien species **	-	-	-	-	-	-

Colour: light – limited, middle – partial, dark – full capacity. Key: * additional well-developed indicators; ** not yet well developed indicators.; - n/a.

The establishment of SEIS by countries also contributes to the attainment of SDG 16, Target 16.10 *Ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements.*

Indicators in the third group are part of the UNECE extended core set but may not yet be sufficiently developed methodologically by the Joint Task Force. These include:

- biosphere reserves and wetlands of international importance (D2);
- invasive alien species (D6);
- irrigation (F1);
- gross nitrogen balance (F3);
- final electricity consumption (G5);
- gross electricity production (G6);
- environment protection expenditure (J1).

Green economy implies environmentally sustainable economic growth of countries and the provision of higher quality of life with the available environmental capacity. All Eastern Partnership countries stated adherence to these principles[15], and are taking specific steps in the green direction.

A quantitative assessment carried out in a number of the countries has demonstrated environmental, economic and social benefits of a transition to green economy. In all six countries an in-depth study has been carried out to identify and quantify state support to the producers and consumers of oil, natural gas and coal (as well as electricity and heat supply based on these energy sources). The state support of investment in energy efficiency and renewable energy sources is being analysed too.

Regulation and policy reforms have commenced aiming at small and medium enterprises, and the results of assessing ways to improve their environmental efficiency have been included into corporate development plans. Funding for green investments is becoming easier to access. Cleaner production and the respective market incentives also improve resource and energy efficiency, while energy subsidies are becoming more transparent due to reforms in the electricity-generating sector. Green economy and sustainable development have been integrated among core principles in a number of national development strategies.

Countries work on green growth indicators to measure baseline and progress. Armenia, Azerbaijan, the Republic of Moldova and Ukraine have started the development of their national green growth indicators. The Republic of Moldova and Georgia are working on national green economy strategies and action plans, while Belarus has already adopted the National plan for green economy development for 2016-2020.

Commitment to green economy is an essential component of international cooperation, and the international community supports discussions and exchange of best practices between countries in the field managing the related data (particularly, environmental data). Whereas there is no universal framework of green growth indicators in the pan-European region, a number of countries use indicators developed by the OECD[16]:

[15] http://www.eap-green.org/ru/resources/EaPGREEN_BR_UPDATE_2017_RUS_FINAL%206%20April%202017.pdf

[16] OECD, UNECE, EEA, UNEP. Shared Environmental Information System and Green Growth. Regional Workshop for the countries of Eastern Europe, the Caucasus and Central Asia 10-11 March 2015, OECD Headquarters, Paris, France. Summary of Discussion

Table 3.4 OECD green growth vs. UNECE set of indicators and their availability in Eastern Partnership countries

OECD SET OF GREEN GROWTH INDICATORS	CORRESPONDING UNECE ENVIRONMENTAL INDICATORS
1. CO2 productivity	
1.1 Production-based CO_2 productivity GDP per unit of energy-related CO_2 emitted	Greenhouse gas emissions (B3) ARM AZE BLR GEO MDA UKR
1.2 Demand-based CO_2 productivity	*No corresponding UNECE environmental indicators*
2. Energy productivity	
2.1 Energy productivity – GDP per unit of TPES	Total primary energy supply (G2) ARM AZE BLR GEO MDA UKR
2.2 Energy intensity by sector (manufacturing, transport, households, services)	Final energy consumption (G1) ARM AZE BLR GEO MDA UKR
2.3 Share of renewable energy sources in TPES, in electricity production	Renewable energy supply (G4) ARM AZE BLR GEO MDA UKR
3. Material productivity (non-energy)	
3.1 Demand-based material productivity	*No corresponding UNECE environmental indicators*
3.2 Production-based (domestic) material productivity	*No corresponding UNECE environmental indicators*
3.3 Waste generation intensity and recovery ratios by sector, per unit of GDP or value added, per capita	Waste generation (I1) ARM AZE BLR MDA UKR Waste reuse and recycling (I3) UKR
3.4 Nutrients flows and balances (N, P) - Nutrients balances in agriculture (N, P) per agricultural land area and change in agricultural output	Fertilizer consumption (F2) ARM AZE BLR GEO MDA UKR
4. Water productivity Value added per unit of water consumed by sector	Total water use (C3) ARM AZE BLR GEO MDA UKR Water losses (C7) ARM AZE BLR GEO MDA UKR
5. Multifactor productivity reflecting environmental services	*No corresponding UNECE environmental indicators*
6. Index of natural resources	*No corresponding UNECE environmental indicators**
7. Freshwater resources – Available renewable natural resources (groundwater, surface water) and related abstraction rates (national, territorial)	Renewable freshwater resources (C1) ARM AZE BLR MDA Freshwater abstraction (C2) ARM AZE BLR GEO MDA UKR
8. Forest resources – Area and volume of forests; stock changes	Forests and other wooded land (D3) ARM AZE BLR GEO MDA
9. Fish resources – Proportion of fish stocks within safe biological limits	*No corresponding UNECE environmental indicators*
10. Mineral resources: available (global) stocks or reserves	*No corresponding UNECE environmental indicators*

11. Land resources: land cover conversions and cover changes from natural state to artificial state – Land use: state changes	Land uptake (E1) ARM AZE BLR GEO MDA Fertilizer consumption (F2) ARM AZE BLR GEO MDA UKR
12. Soil resources: degree of topsoil losses on agricultural land, on other land – Agricultural land area affected by water erosion, by class of erosion	Area affected by soil erosion (E2)
13. Wildlife resources (to be further refined) - Trends in farmland or forest bird populations or in breeding bird populations - Species threat status, in % species assessed or known - Trends in species abundance	Threatened and protected species (D4) ARM BLR GEO MDA Trends in the number and distribution of selected species (D5)
14. Environmentally induced health problems and related costs – (e.g. years of healthy life lost from degraded conditions, exposure to air pollution)	Ambient air quality in urban areas (A2) ARM AZE BLR MDA
15. Exposure to natural or industrial risks and related economics losses	*No corresponding UNECE environmental indicators*
16. Access to sewage treatment and drinking water **16.1. Population connected to sewage treatment** **16.2. Population with sustainable access to safe drinking water**	Population connected to wastewater treatment (C14) ARM GEO Drinking water quality (C9)
17. R&D expenditure of importance to green growth	*No corresponding UNECE environmental indicators*
18. Patents of importance to green growth	*No corresponding UNECE environmental indicators*
19. Environment-related innovation in all sectors	*No corresponding UNECE environmental indicators*
20. Production of environmental goods and services (EGS)	*No corresponding UNECE environmental indicators*
21. International financial flows of importance to green growth	*No corresponding UNECE environmental indicators*
22. Environmentally related taxation	*No corresponding UNECE environmental indicators*
23. Energy pricing	*No corresponding UNECE environmental indicators*
24. Water pricing and cost recovery	*No corresponding UNECE environmental indicators*

Country names in green: given UNECE indicators are available in the respective countries

Note: The table is modified from the one included in Rieprich, Robin and Christin Thurow. The shared environmental information system and green growth. Mapping of UNECE environmental and OECD green growth indicators and their dataflows. Background paper presented at the OECD-UNECE-UNEP-EEA Regional Workshop on the Shared Environmental Information System and Green Growth for countries of Eastern Europe, the Caucasus and Central Asia on 10 - 11 March 2015 in Paris, France.

- Environmental and resource productivity (in order to assess whether production processes are becoming more efficient in terms of resource use and for preventing adverse impact on the environment);
- Economic and environmental assets (in order to assess whether the resource base is sustained or being depleted, and if so at what pace);
- Environmental quality of life (in order to capture how environmental conditions and amenities impact people's well-being);
- Economic opportunities and policy responses (in order to help discern the effectiveness of policies in delivering green growth).

A regional workshop for the countries of Eastern Europe, the Caucasus and Central Asia held at the OECD in Paris on 10-11 March 2015 agreed that green growth / green economy monitoring should be closely coordinated with SEIS development. Discussion at the workshop helped identify 11 (out of 24) OECD green growth indicators which can be to a varying degree be matched by 19 UNECE' environmental indicators as shown in table 3.4.

Based on the preceding analysis (chapter 1), the table also summarises the capacities of Eastern Partnership countries to produce the respective UNECE' indicators. Specifically, all countries have data to fully support the production of 8 UNECE indicators to match the green growth indicators of CO_2, energy and water productivity, nutrient flows and balances, freshwater and land resources. Many though not all countries have indicators for measuring waste generation, wildlife resources, and health problems and related costs. And no Eastern Partnership country publishes UNECE indicators of drinking water quality, soil erosion and trends and distribution of common species.

Environmental policy targets are also increasingly being set on the country level, thus also increasing the potential of turning environmental indicators into true policy monitoring tools[17]. In the case of Belarus[18], the target values, defined as "forecasts", are annexed to the Environment Protection Strategy until 2015. Similarly, indicators presented on the Republic of Moldova's governmental open-data portal (see chapter 1) are directly linked to the targets in the Environmental Strategy for the years 2014 – 2023[19]. Ukraine in late 2017 prepared a draft of the Key Directions (Strategy) of State Environmental Policy until 2020[20] which includes a set of 35 measurable targets, against which progress is to be gauged. Out of about 40 strategy targets in the three countries, only a third (marked bold in the table) is common for two or all three of them (although not necessarily precisely matching each other's definitions). Others are unique for individual countries. Many of the indicators required to monitor the targets (especially in Ukraine) are outside the UNECE set. In the short-term, collecting robust data for such indicators may prove a challenge. However, in the longer-term, if proven useful, some of them may show new and interesting directions for further developing indicator methodology in the UNECE region.

[17] Specific quantitative targets requiring indicators to measure their attainment are also part of some of the sectoral, sub-national and local-scale environmental strategies in Eastern Europe and the Caucasus. Such strategies were not reviewed for this study. Nor have been reviewed national environmental strategies for time periods that have ended by 2017.

[18] Стратегия в области охраны окружающей среды Республики Беларусь на период до 2025 года. Одобрена решением коллегии Министерства природных ресурсов и охраны окружающей среды 28.01.2011 г. № 8-Р. Прогнозные показатели охраны окружающей среды на период до 2025 года.

[19] Republic of Moldova. Environmental strategy for the years 2014-2023. Annex No 1 to the Government Decision No 301 of 24 April 2014. Official Monitor no. 104-109 of 06.05.2014, art no: 328.

[20] Основні засади (стратегія) державної екологічної політики України на період до 2030 року (проект).

Table 3.5 UNECE and other indicators in relation to environmental policy targets in Belarus, the Republic of Moldova and Ukraine

	BLR until 2025	MDA 2014 to 2023	UKR until 2025
UNECE environmental indicators fully or partially matching the targets			
A1: Emissions of pollutants into the atmospheric air	*	*	*
A2: Ambient air quality in urban areas			*
B3: Greenhouse gas emissions		*	*
C2: Freshwater abstraction	*		
C3: Total water use	*		*
C5: Water supply industry and population connected to water supply		*	
C8: Reuse and recycling of freshwater	*		
C10: BOD and concentration of ammonium in rivers		*	
C11: Nutrients in freshwater		*	
C14: Population connected to wastewater treatment		*	*
C16: Polluted wastewater	*		*
D1: Protected area	*	*	*
D3: Forests and other wooded land	*	*	*
E2: Area affected by soil erosion [land degraded / improved]	*	*	
G1: Final energy consumption			*
H3: Composition of road motor vehicle fleet by fuel type [electricity]			*
I1: Waste generation	*		
I3: Waste reuse and recycling		*	
I4: Final waste disposal	*	*	*
J1: Environment protection expenditure			*
Other indicators to monitor environmental policy targets			
Air quality management plans			*
Basins with good ecological status			*
Approved basin management plans			*
Groundwater supply	*		
Water preparation facilities	*		
Ecological network			*
Land resources	*		*
Land vulnerable to pollution			*
Organic agriculture			*
Management plans for hazardous chemicals			*
Use of raw materials			*
Renewable energy supply			*
Value of natural resources			*
Environmental awareness		*	
Regional sustainable development programmes / plans			*
Yale University's Environmental Performance Index			*
SEA of state and local programme and plans			*

Reports on the implementation of environmental policy			*
Institutional reform activities in the environmental field			*

Key: **bold** – similar / common target for two or three countries

4. Use of indicators in environmental assessments and similar reports

One of the most interesting subjects in this study, it is also the most challenging one, is the actual use of indicators to their end purpose – making people and institutions aware of environmental trends and problems, making the right decisions made, and making "trees feel the difference" – is extremely difficult to assess directly, like it is for the end impact of any environmental information in general[21]. In this study we have thus used a range of proxy measures to look at how indicators are incorporated into other contexts which are related to awareness, decision- and policy-making both nationally, regionally and internationally.

These include:

- the use of environmental indicators in national state-of-the-environment reports;
- their use in the countries' reports under international environmental agreements;
- the relation between indicators and targets of national environmental strategies; and
- the visibility of country indicators in regional / global environmental assessments.

Unlike the preceding chapters dedicated to a detailed analysis of indicators following their precise definitions, in this chapter the matching of indicators and data sets against the definitions in the UNECE set is not precise. The purpose is rather to show the spirit of what information gets to be used, how and to what purpose. Such actual use of environmental indicators in the reviewed contexts can be supply-driven (data are simply available and easy to include in the publication) or more driven by demand (the issue is seen as important). Especially in the latter case the indicators require priority attention of environmental data managers and statisticians in order to further advance their methodology and the accessibility of data for decision-making, given that some of such commonly used indicators do not yet make part of the UNECE core set.

Important to note is that the below analysis is not a review of publications per se: their logic, structure, content or presentation. It exclusively focuses on how the countries are using the indicators. However, overlaps between these two angles may certainly occur[22].

National state-of-the-environment reports

The most obvious contexts for the use of environmental indicators, for both awareness and decision-making, are the most recent state-of-the-environment reports that were taken for the analysis for each of the countries (please see the list in annex B). However, since some of the official narrative reports were published years ago, we additionally included in the analysis the most recent 2015 indicator-based assessment of the Republic of Moldova and a publicly accessible 2016 draft of the state-of-the-environment report of Belarus. The point of the analysis was to see how indicators are incorporated in the reports, in a visual or table format, as their integral elements to illustrate and support the statements and the analysis in the narrative. On the contrary, the study did not look at the use of particular data sets for calculating statistics and other numbers directly quoted in the text.

[21] See e.g. Denisov, N. and L. Christoffersen 2001. Impact of environmental information on decision-making processes and the environment. GRID-Arendal Occasional Paper No. 1/2000, UNEP / GRID-Arendal 2000

[22] For an overview of overall user perspectives on environmental assessments in Eastern Europe and the Caucasus, see country reports and the regional synthesis from 2017 EEA study Efficiency and effectiveness of recent environmental assessments in the Eastern Partnership countries.

Table 4.1 Indicators commonly used in recent national state-of-the-environment reports of Eastern Partnership countries

	ARM 2013	AZE 2011	BLR 2010	GEO 2014	MDA 2011	UKR 2017	BLR 2016	MDA 2015
From the narrow core set of UNECE environmental indicators								
A1: Emissions of pollutants into the atmospheric air		T S	T S M	G S	T G S	T G	T S	
A2: Ambient air quality in urban areas	T		T G S M	S M	S	T G S		T S
A3: Consumption of ozone-depleting substances				T S	T			T G
B1: Air temperature		S	T S	M	T S		T	
B2: Atmospheric precipitation		S	S	M	T S			
B3: Greenhouse gas emissions			T G S	S	T G S	T S	S	T G S
C1: Renewable freshwater resources			T S	G	T G S	T		
C2: Freshwater abstraction	S		T G S	S G	T	T		
C3: Total water use		G S	T S	G	T S	T G		
C10: BOD and concentration of ammonium in rivers	M		T G S	G	T G	T	T	S
C11: Nutrients in freshwater	M	S	T G S		T S	T	T S	S
C16: Polluted wastewaters			T G S	G M	S	T S	S	
D1: Protected area	T	T	T G M	T S M	T	T	T	T G S
D3: Forests and other wooded land		T M	T M	G M	T S		T	
D4: Threatened and protected species			T		T		T	
E1: Land uptake			T			T	T	
G1: Final energy consumption				S	T G S	T		
G2: Total primary energy supply				T	T	T		
I1: Waste generation		T G S	G S	G S	T S	T G S	T	
I2: Management of hazardous waste		T			T S	T G	S	

	ARM 2013	AZE 2011	BLR 2010	GEO 2014	MDA 2011	UKR 2017	BLR 2016	MDA 2015
From the extended set of UNECE environmental indicators								
C9: Drinking water quality			T	D	D S	T		
D5: Trends in the number and distribution of selected species			T	T S	T D		T	
E2: Area affected by soil erosion			T D M	M	T S			
F2: Fertilizer consumption / F4. Pesticide consumption			T S	D S	T S	T D	T S	
H1: Passenger transport demand / H2. Freight transport demand			T D	S	T	T S	T D S	
I3: Waste reuse and recycling / I4: Final waste disposal			T D		T S	T	T D	
J1: Environment protection expenditure	T S	D S	D S	S	T G	D		
Other indicators								
Land resources / land use			T D	D M	T	T D	T D	
Soil contamination		T			D	T	T D	
Contamination of precipitation					T D S M	T D	D	
Damage to forests (incl. forest fires)			T S			S	S	
Afforestation			T	S			S	
Natural (and other) hazards and disasters			S	T S D	T D S M	S	T S	
Radiological situation		T S	T S	T	T D S	T S M		
Monitoring and on-site inspection capacities and activities	T	M		T		M	S	
Transport vehicles			T D S	S	TM			
Energy balance				T	T S	T D S		
Industrial production				D S	T S	T S		

Key: T – table; D –diagram; S –time-series graphic; M – map

Among the 23 indicators from the narrow UNECE set (see chapter 1), the most widely used in the reports are those reflecting emissions to the atmosphere and the resulting air quality in cities; indicators related to climate change (both greenhouse gas emissions and various climate parameters) reflecting both the availability of data and political attention to the cause; the use of water and surface water quality; protected areas and forests; and the generation of waste. Also used, although relatively less commonly, are the consumption of ozone-depleting substances, the number of threatened and protected species, changes in land-use and energy supply.

Outside of the narrow UNECE set (including 'additional' indicators of the extended UNECE set, further marked with a star*), often used are indicators of land use (although not necessarily land conversion); numbers of common species*; the use of fertilisers and pesticides in agriculture*; passenger and freight transport*; soil erosion*, the chemical quality of soil and precipitation; waste management*; damage to forests and forest fires; natural disasters; environmental expenditures* and environmental protection activities including monitoring. Pointing to 1986 Chernobyl experience and its heritage, almost all countries include in their reports indicators of the radiological situation. Many countries present various sectoral trends, and almost all show the GDP and population dynamics. About 30 other indicators (many are outside the UNECE core set) are included in country reports but are not common for all the countries.

Most of the indicators are presented in the reports in a visual form either as graphs showing time-series, as static diagrams or as their combinations. Quite often the same data are repeated in tables. For indicators related to biological species, the generation and management of waste, the indicators of energy balance and land use, table format without visualization is the most common. Some of the reviewed reports make an impression of being slightly over-saturated with visualised indicators: for instance, the 2014 report of Georgia quite often presents the different data sets for the same indicator as separate time-series, resulting in pages of graphs not immediately accompanied by a narrative. Parts of the 2010 report of Belarus, 2011 of the Republic of Moldova, 2016 of Ukraine too make an impression of prioritising data which were available over those primarily needed to make the narrative points. The format of presentation relates to the capacities of report-producing teams. For instance, maps are used relatively less compared with other types of infographics, and even less frequently for showing statistical data although here interesting examples exist, e.g., in Belarus and the Republic of Moldova. Worthwhile to note that the national audiences of state-of-the-environment reports, which were polled in the above-mentioned 2017 EEA study, do complement the use of visualization for presenting data and indicators but also note that in a number of cases presentation can still be improved.

Links between indicators and the respective narratives are typically strong and weak in different ways at the same time. While in some cases indicator tables and visuals simply appear inside the text without being discussed much or at all, in other cases (and quite often in sections presenting the results of monitoring environmental quality) the text literally describes tables and visuals point by point, not adding to them much value. Yet the indicators are relatively rarely used in an analytical manner in order to pose (and answer) questions "why?", "so what?", "what next?" or similar[23]. One exception here is information about greenhouse gas emissions, which is almost always put in the analytical context of discussing sectoral responsibilities, projections and mitigation measures. More analytical examples are also present e.g. in reports of Belarus, and in the Republic of Moldova's latest

[23] See, e. g., European Environment Agency. Reporting on environmental measures: Are we being effective? Environmental issue report No 25. Copenhagen, 2001

DPSIR-based assessment (which only covers a limited number of topics but does so on a deeper level). This said, some of the reviewed reports having been published in less accessible languages, a comprehensive insight into the analytical context of their use of indicators has at this stage been difficult.

Country reports under international conventions

As an example, the use of indicators has been analysed in three sets of reports to international conventions: the latest national communications to UNFCCC;[24] the latest national reports to CBD;[25] and the summary reports from the third reporting exercise under the Protocol on Water and Health to the UNECE Water Convention[26]. All the six countries are parties to both agreements.

Predictably, national communications to UNFCCC contain detailed information about the impacts of climate change and greenhouse gas emissions over time, per economic sectors and in many various breakdown forms. The respective UNECE indicators are extensively shown in many possible formats. Indicators in the national communications also show the status and development of important sectors such as energy, transport, agriculture, waste management, land-use and forest management. To illustrate the impact of climate change, most countries have used the indicators of surface river flow, natural disasters and those related to public health. Response indicators such as monitoring capacities / activities and climate-change related projects (e.g. those under CDM) are often included too. Tables are used very commonly, sometimes complemented by diagrams or visualized time series. Almost all countries (except for Belarus and Ukraine) have used maps to show temperature and precipitation patterns and trends; several – to illustrate climate impact on surface waters and natural disasters and to show monitoring activities. Because of the technical and political particularities of climate-related assessments, many of the indicators are presented in the analytical context of projecting future emissions (total and per sector), sectoral development trends and climate-change impacts on temperature, precipitation and water. Another frequent analytical aspect for using the indicators is assessing vulnerability, e.g., with respect to risks of natural disasters (Armenia and Georgia have calculated and visualised vulnerability across their territories).

The national reports to CBD naturally make broad use of biodiversity-related and other ecological indicators such as protected areas, endangered, protected and common biological species etc. The frequently used UNECE forest-cover indicator is supplemented with indicators of forest fires or other types of damage as well as afforestation. Indicators of fish catch are often used to illustrate pressures on the aquatic environment, as are UNECE and other indicators of water quality. Greenhouse gas emissions are shown too. On the response side countries most often show environmental / nature-protection expenditures as well research and monitoring activities. Indicators of environmental education are used too. Specific to CBD is the indicator of invasive species (part of the UNECE set) and the response indicator of the status of seed collections and genetic banks. In reports to CBD maps are used relatively seldom (most frequently, to show forests and protected areas) while tables are common. Quite a few indicators are presented in direct relation to Aichi biodiversity targets, globally agreed in the Strategic Plan for Biodiversity 2011-2020, and are expressed as part of the textual narrative. (For this reason, the reports to CBD are the only publications

[24] Available at UNFCCC web site for parties and non-parties to Annex I to UNFCCC, please see the annex.
[25] Available at the CBD web site. Please see annex B.
[26] Available at the web site of the Water and Health Protocol to the UNECE Water Convention.

for which we also reviewed the use of textually expressed indicators.) Overall, the link is quite strong in the reports to CBD between indicators and the global or national biodiversity targets: the former are very often used to illustrate and explain progress towards the latter. Ukraine in its report in addition refers to progress towards achieving the Millennium Development goals.

Table 4.2 Indicators common in national communications under the United Nations Framework Convention on Climate Change

	ARM	AZE	BLR	GEO	MDA	UKR
From the extended set of UNECE environmental indicators						
B1: Air temperature	P	P	P	P	P	P
B2: Atmospheric precipitation	P	P	P	P	P	P
B3: Greenhouse gas emissions	P	P	P	P	P	P
D3: Forests and other wooded land		*		*	P	
G1: Final energy consumption	P	P	P	P	P	P
G2: Total primary energy supply	P		*	P	*	*
H1. Passenger transport / H2. Freight transport demand	*		P		*	*
I1: Waste generation	P		*	*	P	*
Other indicators						
River flow (i.a. selected rivers / areas)	P		P	*	P	P
Natural (and other) hazards and disasters	V		*	V		
Land resources / land use			*		P	*
Industrial production	P				P	*
Mining production (incl. fossil fuel)		*			*	*
Agricultural production (and livestock)	P	*			P	*
Tourism intensity		*		*	*	
Morbidity / mortality	*	*		*	*	
Monitoring capacities and activities	*		*		*	
CDM / other projects	*			*	*	

Table 4.3 Indicators common in national reports under the Convention on Biological Diversity

	ARM	AZE	BLR	GEO	MDA	UKR
From the extended set of UNECE environmental indicators						
B3: Greenhouse gas emissions		*	A M		A	M
C10: BOD and concentration of ammonium in rivers	A		A			A
C11: Nutrients in freshwater	A		A			A
C16: Polluted (non-treated) wastewaters	*	A				A M
D1: Protected area	A	A	A M	A M	A	A M
D3: Forests and other wooded land		*	A M	A M	A	M
D4: Threatened and protected species	A		A	A	*	A
J1. Environment protection expenditures	A		A	A		A
Other indicators						
Other biological species	A	*	A		*	*
Damage to forests (including fires)	*	*	A	*		
Forestry and forest stock	*	*				A
Afforestation, rehabilitation of other natural ecosystems	*	A	A	A	A	A
Fishing	A	A	A	A		
Monitoring and research activities	A	*	A	A	A	A M
Seed collections / genetic banks	*		A	A		
Environment / nature protection activities	*	*	A	A	A	A

Environmental education			A	A	A	

Key to the tables: * - present; P – used in projections; V – used in the analysis of vulnerability;
A – linked to Aichi biodiversity targets; M – linked to the Millennium Development Goals.

According to the Water and Health Protocol, countries should set targets and target dates within two years of becoming a Party, and then to collect and evaluate data on their progress vis-à-vis achievement of the targets and on indicators designed to show how that progress has contributed towards preventing, controlling or reducing water-related disease. Reports under the Protocol focus on drinking and surface water quality (although, strictly speaking, not in terms of the UNECE set of environmental indicators), water supply, use and disposal. UNECE indicators are supplemented with indicators of ground water quality, water-related diseases as well as, in single cases, such protocol-specific measures as the coverage of schools with water supply and sanitation services or the availability of water meters. The summary reports follow a standardised template, and the indicators are presented in a table or narrative format.

Table 4.4 Use of indicators in summary reports under the Protocol on Water and Health to UNECE Water Convention

	ARM	AZE	BLR	GEO	MDA	UKR
From the extended set of UNECE environmental indicators						
C2: Freshwater abstraction	*	*	*	*	*	*
C3: Total water use		*				*
C5: Water supply industry and population connected	*	*	*	*	*	*[1]
C8. Reuse and recycling of freshwater						*
C9. Drinking water quality	*[2]	*[2]	*[2]	*[2]	*[2]	*[2]
C10: BOD and concentration of ammonium in rivers	*[3]	*[3]	*[3]		*[3]	*[3]
C11: Nutrients in freshwater	*[3]	*[3]	*[3]		*[3]	*[3]
C14: Population connected to wastewater treatment	*	*	*	*	*	*[1]
C16: Polluted (non-treated) wastewaters		*				*
Other indicators						
Microbiological pollution of surface waters					*	
Groundwater quality		*[3]	*[3]		*	
Number of cases of extreme pollution					*	
Infectious diseases potentially related to water	*	*	*	*	*	*
Morbidity from infectious diseases						*
School coverage by water supply and sanitation	*					
Installed water meters	*					

[1] data per selected localities [2] bacteriological and / or chemical parameters [3] five quality classes are shown

Indicators of Eastern Europe and the Caucasus in the regional context

To illustrate the regional / global use of environmental indicators from Eastern Europe and the Caucasus in the regional context, we have reviewed the pan-European volume of the 6th Global Environmental Outlook (GEO-6), produced in 2016 by UNEP and UNECE[27].

[27] United Nations Environment Programme. Global Environment Outlook GEO-6. Assessment for the pan-European region. 2016

Table 4.5 Use of indicators in the pan-European volume of GEO-6

	E EUROPE CAUCASUS	W EUROPE / OTHER
From the extended set of UNECE environmental indicators		
A1: Emissions of pollutants into the atmospheric air	Ps	
A2: Ambient air quality in urban areas		Rm
B1: Air temperature	Pm	
B2: Atmospheric precipitation	Pm	
B3: Greenhouse gas emissions	Rs	Rs
C1: Renewable freshwater resources / C2: Freshwater abstraction	Pm	
C3: Total water use	Ps	
C10: BOD and concentration of ammonium in rivers		Rm
C11: Nutrients in freshwater		Rm
C12: Nutrients in coastal seawaters		Rm
C14: Population connected to wastewater treatment	Rd Pm	
D1: Protected area	Ps	
D4: Threatened and protected species	Rt	Rt Rd Rm Cs
E1: Land uptake		Rd
I1: Waste generation	Ct Cs	Ct Cs
I3: Waste reuse and recycling		Cd
Other indicators		
River flow	Rm*	Rm
Ecological status of water basins		Rm
Freshwater temperature	Rm*	Cs Rm
Discharge of nutrients to sea	Rd* Rs*	Rd Rs Rm
Oil spills in the North Sea		Rm
Hazardous substances in seas	Rm*	Rm
Arctic ice extent		Rs Rm
Sea level trends		Rm
Flora and fauna	Rs Pm	
Forestry	Rt	Rt
Fish catch, consumption, aquaculture	Rm*	Rs Rm
Agricultural land	Pm	
Food production and cropland	Cs**	Cs Rs
Soil productivity		Rm
Soil erosion		Rm
Sensitivity to desertification		Rm
Soil temperature changes		Rm
Pesticide stockpiles		Ct
Material extraction, intensity, footprint	Rs	Rd Cs Rs
E-waste management		Rd
Natural (and other) hazards and disasters	Ps	
Passenger and cargo transport Baltic Sea		Rm
Participation in MEAs	Rs	Rs
Toxic chemicals in live organisms		Rs

Chemicals addressed by policies / plans	Pd	
Classification and labelling of chemicals	Ct*** Rt	Ct Rt
Poverty and environmental inequality		Rd
Projected effects on air pollution on life expectancy		Rm
DAILYs vs noise	Pd	
Dioxins in human milk		Cs
PCBs in human milk	Cd**	Cd
Lost time injury rates		Rs
Overweight and obesity	Rd	Rd
Factors of human well-being		Cd
Population in cities	Pm	
Change in population		Rm

Key: C – country-scale; R – regional-scale; P – pan-European scale information;
t – table; d – diagram; s – time-series graphic; m – map;
* – the Black Sea; ** – Ukraine; *** – Georgia;
bold – is present for Eastern Europe and the Caucasus (separately or as part of an aggregate)

Out of 16 indicators in GEO-6 that fully or partially match UNECE definitions, two thirds are presented for both Eastern Europe / the Caucasus and other regions (primarily the EU as well as Russia or Central Asia). Of more than 30 other indicators used in the report, one third also covers Eastern Europe and the Caucasus. (Indicators common for Eastern Europe / the Caucasus and other regions are marked bold in the table.)

Particular gaps in coverage are visible for water quality (both freshwater and marine) as well as other information related to the marine environment (whereas the Black Sea is well covered, information about the Sea of Azov or the Caspian Sea is practically non-existent.) Gaps also exist in information about soils, public health and the management of electronic waste.

Some of the gaps are easily explained by the difficulty of accessing information to compile it on the regional scale: while on the country level many of the missing indicators do exist and are accessible (see chapter 1), their format or mode of access do not always easily allow for bottom-up regional-scale compilation. Hence whenever such are not readily available from global (e.g., WHO) or regional databases, compiling them for the purpose of a particular regional or global assessment is not always practical or economical.

This contrasts with the systematic compilations of data and indicators for the EU countries and other member-states of the European Environment Agency, the results of which are widely used throughout GEO-6 and show what can be achieved in this respect with an efficient regional institutional setup. It also shows why SEIS goal of attaining comparable environmental information throughout the entire pan-European region remains relevant.

Other gaps point to cases where certain indicators may simply not exist or be sufficiently advanced in Eastern Europe and the Caucasus compared to the EU, thus offering another avenue for innovation in the field of environmental information and monitoring environmental policies.

ANNEX B

PUBLICATIONS OF EASTERN PARTNERSHIP COUNTRIES REVIEWED FOR ASSESSING THE USE OF ENVIRONMENTAL INDICATORS

National state-of-the-environment reports

Republic of Armenia. Ministry of Nature Protection. Ministerial report 2007 – 2011. Yerevan 2011

Azərbaycan Respublikası. Ekologiya və Təbii Sərvətlər Nazirliyi. Azərbaycanda ətraf mühitin vəziyyəti və görülmüş işlərə dair MƏLUMAT (2008-2012-ci illər). Bakı 2013

Министерство природных ресурсов и охраны окружающей среды Республики Беларусь. Государственное научное учреждение «Институт природопользования Национальной академии наук Беларуси». Состояние окружающейкружающеиокhttp://беларусь. Национальный доклад. Минск: «Белтаможсервис» 2010

Министерство природных ресурсов и охраны окружающей среды Республики Беларусь. Республиканское научно-исследовательское унитарное предприятие «Бел НИЦ “Экология”». Состояние окружающей среды Республики Беларусь. Национальный доклад [проект]. Минск: Бел НИЦ «Экология» 2015

2010-2013 წლების გარემოს მდგომარეობის შესახებ ეროვნული მოხსენება

Ministerul Mediului al Republicii Moldova Academia de Ştiinţe a Moldovei. Institutul de Ecologie şi Geografie. Starea mediului în Republica Moldova în 2007–2010 (raport naţional). Chişinău 2011

[Indicator-based assessment of the state of the environment in the Republic of Moldova, 2015] The text of the assessment is also available through environmental indicator entries of the Government Open Data Portal of the Government of the Republic of Moldova

Міністерство екології та природних ресурсів України. Національна доповідь про стан навколишнього природного середовища в Україні у 2015 році. Київ 2017

National communications under the United Nations Framework Convention on Climate Change

Republic of Armenia. Ministry of Nature Protection. Third National Communication on Climate Change
under The United Nations Framework Convention on Climate Change. Yerevan: “Lusabats” Publishing House 2015

Ministry of Ecology and Natural Resources Republic of Azerbaijan. Third National Communication to the United Nations Framework Convention on Climate Change. Republic of Azerbaijan. Baku 2015

Министерство природных ресурсов и охраны окружающей среды Республики Беларусь. РУП «Бел НИЦ "Экология"». Шестое национальное сообщение Республики Беларусь в соответствии с обязательствами по Рамочной конвенции ООН об изменении климата. Минск 2015

Ministry of the Environment and Natural Resources Protection of Georgia. Georgia's Third National Communication to the UNFCCC. Tbilisi 2015

Ministry of Environment. Third National Communication of the Republic of Moldova under the United Nations Framework Convention on Climate Change. Chisinau 2013

Министерство экологии и природных ресурсов Украины, Государственная служба Украины по чрезвычайным ситуациям, Национальная академия наук Украины, Украинский гидрометеорологический институт. VI национальное сообщение Украины по вопросам изменения климата, подготовленное на выполнение статей 4 и 12 Рамочной конвенции ООН об изменении климата и статьи 7 Киотского протокола. Одобрено на заседании Межведомственной комиссии по обеспечению выполнения требований Рамочной конвенции ООН об изменении климата 30.12.2012 г.

National reports under the Convention on Biological Diversity

Fifth National Report of the Republic of Armenia to the Convention on Biological Diversity. September 2014

Azerbaijan fifth national report. April 2014

Конвенция о биологическом разнообразии. Республика Беларусь. [Министерство природных ресурсов и охраны окружающей среды Республики Беларусь. Государственное научно-производственное объединение «Научно-практический центр Национальной академии наук Беларуси по биоресурсам».] Пятый национальный доклад. 24.03.2014 г.

Ministry of Environment and Natural Resources Protection of Georgia. Georgia's Fifth National Report to the Convention on Biological Diversity

United Nations Development Programme, Ministry of Environment. Project "National Biodiversity Planning to Support the Implementation of the CBD 2011- 2020Strategic Plan in the Republic of Moldova". Fifth national report on biological diversity. Chişinău 2013

Fifth national report of Ukraine to the Convention on Biological Diversity

Summary reports under the Protocol on Water and Health to the UNECE Water Convention

Summary report under the Protocol on Water and Health. Republic of Armenia

Азербайджан. Типовая форма кратких докладов в соответствии с Протоколом по проблемам воды и здоровья

Краткий доклад в соответствии с Протоколом по проблемам воды и здоровья. Республика Беларусь

Краткий доклад в соответствии с Протоколом по проблемам воды и здоровья (Грузия). Тбилиси 2016

Типовая форма кратких докладов в соответствии с Протоколом по проблемам воды и здоровья [Республика Молдова]

Ukraine. Summary report in accordance with article 7 of the Protocol on Water and Health. Kyiv 2016