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Developments relating to environmental information systems and reporting on the Shared Environmental Information System

Report on the review of the environmental theme "air quality and air pollution" using the revised United Nations Economic Commission for Europe environmental indicators

Note by the Working Group

Summary

At the Ninth Environment for Europe Ministerial Conference (Nicosia, 5–7 October 2022), ministers adopted the Ministerial Declaration (ECE/NICOSIA.CONF/2022/L.1), thereby commending the general establishment of the Shared Environmental Information System across the region to support a regular process of environmental assessment, and invited countries to continue their efforts to implement all pillars of said System – content, infrastructure and cooperation – and to address any remaining gaps.

At its twenty-fourth session (Geneva (hybrid), 11–12 April 2022), the United Nations Economic Commission for Europe (ECE) Working Group on Environmental Monitoring and Assessment agreed to review annually a limited number of environmental themes and indicators, based on the Shared Environmental Information System assessment framework, and agreed to review the theme "air pollution and air quality" in 2023 and that the revised ECE indicator guidelines should be implemented and used.

The present document aims to facilitate the Working Group's agreement on the review of the environmental theme "air quality and air pollution", which was conducted in 2023 using the revised ECE indicator guidelines. The report will also contribute to assessing progress in implementing the outcomes of the Ninth Environment for Europe Ministerial Conference related to the Shared Environmental Information System.

I. Introduction

A. Introduction to the Shared Environmental Information System

1. Environmental data and information are the starting point for any activity in the field of environment and even beyond. The availability, timeliness and quality of relevant data and information form a solid foundation for sound policymaking and provide factual evidence of whether policy is effective in the long term. The availability of information also represents a powerful tool against the degree of uncertainty surrounding many issues requiring governance, while also enhancing public participation and awareness should that information be made public and easily accessible. This is particularly true regarding the preservation and improvement of environmental conditions, the formulation of sound environmental policy at all levels of governance, the attainment of global targets such as the Sustainable Development Goals, and sound state-of-the-environment reporting at the national level.

2. Based on this rationale, in 2008, the European Commission set up a policy instrument known as the Shared Environmental Information System. This development was a clear response to the need for an integrated platform for the sharing of environmental data and experiences in developing knowledge-based environmental policy and a knowledge-based economy, making such data accessible to a vast array of users to increase environmental awareness and increasing the efficiency of environmental data production to inform decision-making. The Shared Environmental Information System should facilitate regular environmental assessments and reporting. At its heart lay existing data and information flows relevant at the country and international levels. These flows should be linked with the support of modern technologies, such as the Internet, and shared between existing networks.

3. Subsequently, the Shared Environmental Information System has not only expanded geographically in its scope but, in the past decade, has also evolved into a multi-actor governance structure. A number of regional agencies and international organizations are operating and cooperating towards implementing the System's principles; the European Environment Agency (EEA), the United Nations Economic Commission for Europe (ECE) and the United Nations Environment Programme (UNEP) have gradually taken on leading roles in jointly implementing the System across the pan-European region, working closely with national authorities to harmonize and make available and accessible environmental data.

4. The goal of the Shared Environmental Information System is to create an improved, decentralized system for the simplification, streamlining and modernization of existing environmental information-gathering systems. Such a system would improve the quality and facilitate the availability, accessibility and harmonization of environmental data. To meet this goal, the European Commission set out seven principles underpinning the framework and operating mechanism of the Shared Environmental Information System.[1]

5. The Shared Environmental Information System is thus based on three particular aspects of data quality: accessibility, interpretability and coherence of data. Accessibility relates to the degree of ease with which different users can access particular data and the sustainability of the means through which information is made available. The System aims to move away from paper-based reporting and take full advantage of the latest information and communication technologies to provide a common platform for data derived from different sources, enabling harmonization, multipurpose use and compatibility. Interpretability requires the availability of information that will help provide insights into the data collected. Lastly, coherence refers to consistency in data collection, production and release and comparability of data to broader analytical frameworks. Based on these combined aspects, the Shared Environmental Information System provides a powerful tool to improve data monitoring and sharing to provide better state-of-the-environment reports and sounder policy for the environment.

[1] See Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions, Brussels, 1 February 2008, COM(2008) 46 final, "Towards a Shared Environmental Information System (SEIS)", pp. 2–3. Available at https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0046:FIN:EN:PDF.

6. The Shared Environmental Information System is a set of principles, operationalized as a distributed environmental information system that is connected and integrated using modern technologies. Reinforcing and building upon those principles, EEA established three pillars – content, infrastructure and cooperation – defining the core elements needed for an effective and functional Shared Environmental Information System.

7. Content refers to the type of content required and the identification of potential sources to acquire such content. It also comprises information necessary to understand the changes in the state of the environment as per specific thematic areas (e.g., air, water and waste) and the interlinkages between them (as also addressed under the multilateral environmental agreements). Such data are available from various institutions at various levels, and are crucial in terms of both policymaking and awareness-raising and need to follow agreed, common format requirements, at least for those data and information constituting international flows.

8. Infrastructure refers to an effective, web-enabled technical infrastructure, taking full advantage of pioneering information and communication technologies, including web services, to provide easy access to a wide range of environmental information and data flows so that they can be accessed by users, including experts, who can analyse the information and share it for further use.

9. Cooperation refers to the need for positive interaction between relevant actors at the various levels in the country and the designation of governance structures to manage human resources, inputs and networking. This pillar includes issues such as development or amendment of the legal framework and data policy agreements and protocols to enable data exchange, cooperation and coordination, while ensuring trust building and confidence between various data providers and between them and users.

10. The Shared Environmental Information System operates based on environmental indicators and underlying data flows and compliant with international standards. In collaboration with EEA, the ECE Working Group on Environmental Monitoring and Assessment agreed in 2007 upon a set of environmental indicators and their guidelines for application – the ECE environmental indicators.

11. The ECE environmental indicators have been revised since 2007 and, in 2022, the Joint Task Force on Environmental Statistics and Indicators agreed on a revised set of priority indicators to be produced across the pan-European region.

12. Governance of the Shared Environmental Information System involves a high degree of cooperation between international organizations, regional agencies, member States, national environmental authorities and other relevant stakeholders. ECE, UNEP and the European Commission, through EEA, each played and still play a role in the establishment and governance of the Shared Environmental Information System principles.

13. At the European Union level, the Open Data Directive entered into force on 16 July 2019,[2] replacing the Public Sector Information Directive. The Open Data Directive relates to all public sector content accessible under national access documents and article 13 (1) thereof refers to the following thematic categories of high-value data sets:

(a) Geospatial;

(b) Earth observation and environment;

(c) Meteorological;

(d) Statistics;

(e) Companies and company ownership;

(f) Mobility.

[2] Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32019L1024.

14. The Open Data Directive promotes principles in line with those of the Shared Environmental Information System, which were established with a focus on environmental data.

15. The European Union and its member States therefore nowadays support the implementation of the Shared Environmental Information System principles mainly through implementation of the Open Data Directive.

16. As to the future of the Shared Environmental Information System, at its twenty-fourth session (Geneva (hybrid), 11–12 April 2022), the ECE Working Group on Environmental Monitoring and Assessment:

(a) Discussed and agreed on how the Shared Environmental Information System should be used in the future and suggested regularly checking the establishment of the System for specific environmental themes;

(b) Also discussed the need to develop the System further, including at the national level, and suggested continuing its regular and continuous use, sharing data and exchanging good practice experience and that the System should ideally be linked to the multilateral environmental agreements and should continue to support regular environmental assessment;

(c) Agreed to review annually a limited number of environmental themes and indicators based on the Shared Environmental Information System assessment framework (ECE/CEP-CES/GE.1/2019/3);

(d) Also agreed that the revised ECE indicator guidelines should be implemented and used;

(e) Further agreed to review the theme "air pollution and air quality" in 2023.[3]

17. At the Ninth Environment for Europe Ministerial Conference (Nicosia, 5–7 October 2023), ministers adopted the Ministerial Declaration (ECE/NICOSIA.CONF/2022/L.1), thereby commending the general establishment of the Shared Environmental Information System across the region to support a regular process of environmental assessment, and invited countries to continue their efforts to implement the System's pillars – content, infrastructure and cooperation – and to address any remaining gaps.

18. Ministers also recommended that countries make environmental information publicly available, findable, accessible, interoperable and reusable, reflecting the Open Data Directive principles, and encouraged the collection of local and Indigenous knowledge, citizen science and crowdsourced data. They also encouraged countries, when developing digitalization of environmental information systems relying on open data, big data and state-of-the-art digital technologies, to improve data availability, transparency and public involvement in decision-making.

19. The present document aims to facilitate the Working Group's agreement on the Shared Environmental Information System review of the environmental theme "air pollution and air quality", which was conducted in 2023 by using the revised ECE indicator guidelines. The report presents the results of data collected for 30 indicators related to the subcomponents emissions to air and environmental quality and based on an assessment framework (ECE/CEP–CES/GE.1/2019/3) developed by the Working Group in close cooperation with ECE, UNEP and EEA. The assessment framework focuses on the quality of the ECE environmental indicators (relevance, accuracy, timeliness and punctuality, clarity, comparability of data and institutional and organizational arrangements).

20. The report will contribute to assessing progress in implementing the outcomes of the Ninth Environment for Europe Ministerial Conference (Nicosia Ministerial Conference) related to the Shared Environmental Information System, and support countries to understand the System as part of their regular internal environmental monitoring process, assess their capacities related to the availability and quality of air-related data and indicators, and help identify resource needs for regular environmental monitoring and assessment based on the key findings of the report.

[3] ECE/CEP/AC.10/2022/2, para. 33 (a)–(c).

21. The purpose of the review is furthermore to show progress against agreed data quality criteria, in order to allow countries to assess their capacities and help identify resource needs for regular environmental monitoring and assessment. Many other initiatives and projects have, in parallel, supported the implementation of environmental information systems applying the principles of the Shared Environmental Information System, and have significantly contributed to the System's establishment. Other initiatives include national reforms to improve information systems, several dedicated projects implemented by EEA, projects implemented by UNEP in Central Asia and the European Union-funded project "EU4 Environment – Water Resources and Environmental Data", supporting the strengthening of the Shared Environmental Information System principles and pillars and environmental data in the European Union Eastern Neighbourhood countries. The European Environment Information and Observation Network – a partnership network of EEA and its member and cooperating countries – has continued to complement the implementation of the Shared Environmental Information System in said member and cooperating countries through its work on environmental monitoring, open data and digital transformation.

22. The present report was prepared using the reporting tool (spreadsheet) developed based on the assessment framework. The report builds on countries' responses to a self-assessment questionnaire, as part of the assessment framework, covering seven quality categories associated with data production and use of the ECE environmental indicators. These are: relevance; accuracy; timeliness and punctuality; accessibility; clarity; comparability; and institutional and organizational arrangements. The present review addresses all three pillars of the Shared Environmental Information System — content, infrastructure and cooperation — and all seven of its principles. The report may be considered by the Committee on Environmental Policy for its mid-term review on the outcomes of the Nicosia Ministerial Conference. The provision of timely, relevant and reliable information and indicators to policymakers and the public remains crucial for the Working Group and future Environment for Europe Ministerial Conferences.

23. The review is based upon self-assessments submitted by 14 of the 53 ECE member States in Europe, the Caucasus and Central Asia:[4] Andorra, Armenia, Azerbaijan, Belarus, France, Georgia, Greece, Italy, North Macedonia, Serbia, Spain, Türkiye, Turkmenistan and Ukraine. Overall, this reflects only a moderate level of participation, in particular from Central Asia. Compared to the latest Shared Environmental Information System review report prepared for the Nicosia Ministerial Conference, this is a clear decline in submitted self-assessments.

B. Revised United Nations Economic Commission for Europe Guidelines for the Application of Environmental Indicators – 2023 Edition

24. The Guidelines for the Application of Environmental Indicators – 2023 Edition are based on the 2009 version and consist of a revised version aimed at:

(a) Informing better recent and new global policies (such as the 2030 Agenda for Sustainable Development, the Paris Agreement on climate change and the Sendai Framework for Disaster Risk Reduction);

(b) Link them with statistical frameworks, such as the United Nations Framework for the Development of Environment Statistics and the System of Environmental-Economic Accounting Central Framework;

(c) Increasing user-friendliness of the metadata.

25. The review process of the Guidelines was initiated by the Joint Task Force on Environmental Statistics and Indicators at its fourteenth session (Rome, 2–3 October 2017), which emphasized the need to keep the Guidelines under review and work towards their alignment with the 2030 Agenda and other relevant global policies.[5]

[4] The 56 United Nations Economic Commission for Europe (ECE) member States, excepting Canada, Israel and the United States of America.

[5] ECE/CEP-CES/GE.1/2017/6, para. 46 (a).

26. Updates in the Guidelines – 2023 Edition include the:

(a) Revised organization and content of the indicators presented in the first version of the Guidelines to better align it with the United Nations Framework for the Development of Environmental Statistics and to make a clear distinction between data, statistics and indicators;

(b) Updated methodological descriptions, policy references and methodological references;

(c) A revised list of (priority) indicators, including new indicators (e.g., Sustainable Development Goal indicators), and replacement or deletion of existing indicators to better inform current and new policy areas and to consider methodological developments;

(d) Harmonization of indicators, to the extent possible, with the indicator system employed by the EEA European Environment Information and Observation Network.

27. Taking into account the important role of environmental indicators, members of the Joint Task Force on Environmental Statistics and Indicators and participants in its nineteenth session, in close cooperation with EEA and UNEP, agreed on a set of priority indicators for application in the pan-European region. These indicators are described in detail in the Guidelines for the Application of Environmental Indicators – 2023 Edition.

28. The priority indicators presented in the 2023 Edition of the Guidelines will be implemented by countries with priority to facilitate comparability of indicators across the ECE region in support of regional and global policy processes.

29. The indicators are designed to support all phases of environmental policymaking and for applying the “DPSIR” (Driving Forces – Pressure – State – Impact – Response) analytical framework to support policymaking from its design phase to its target setting phase, and from monitoring progress in policy implementation and evaluation to communication to the public and decision-makers.

30. Each indicator tells the reader about the trend (or status) of the phenomenon being investigated over a given period. It also specifies whether associated policy objectives and quantitative targets are being met and, if not, discusses the reasons why.

31. The Guidelines are expected to help in:

(a) Improving the systems of environmental monitoring and reporting for the purpose of environmental decision-making and public awareness-raising;

(b) Making national environment assessments comparable with those of other Member States of the United Nations;

(c) Facilitating data gathering for future environmental assessment reports.

32. The current review on the Shared Environmental Information System “air pollution and air quality theme” is based on the revised ECE Guidelines and the present document is limited to the review of 30 priority indicators related to four environmental topics (“Emissions of greenhouse gases (GHGs)”, “Emissions of other substances to air”, “Air quality” and “Consumption of ozone-depleting substances (ODSs)”) from the revised ECE Guidelines for the Application of Environmental Indicators – 2023 Edition. The topics and indicators reviewed are shown in table 1. Questions to member States to assess data quality covered the following areas: improvements since the latest (2021/2022) assessment in implementation of the Shared Environmental Information System; information on availability of indicator-based and integrated state-of-the-environment reports; handling of user feedback; multiple use of data, data sources and formats; data validation and revision; timeliness and punctuality; accessibility and availability of data; policy link; metadata; comparability of data; national legislation; and institutional arrangements.

Table 1
Reviewed themes and priority indicators

Theme (old classification)	*Subcomponent (revised Guidelines – 2023 Edition)*	*Topic (revised Guidelines – 2023 Edition)*	*Indicator (revised Guidelines – 2023 Edition)*
A. Air pollution and ozone depletion	Emissions to air	Emissions of GHGs	A-1.1 Emissions of SO_x per capita
			A-1.7 Emissions of NMVOCs per capita
			A-1.8 Emissions of NMVOCs per km^2
			A-1.12 Share of emissions of NMVOCs from stationary or mobile sources
			A-1.15 Share of hydrocarbons emissions from stationary or mobile sources
			A-1.20 Total emissions of NO_x
			B-3.7 CO_2 emission per unit of value added (SDG indicator 9.4.1)
			B-3.11 CO_2 emissions from fuel combustion within the national territory
		Emissions of other substances to air	A-1.16 Share of TSP emissions from stationary or mobile sources
			A-1.17 Share of PM_{10} emissions from stationary or mobile sources
			A-1.18 Share of $PM_{2.5}$ emissions from stationary or mobile sources
			A-1.21 Total emissions of $PM_{2.5}$
			A-1.28 Emissions of ammonia per capita
			A-1.30 Emissions of ammonia per km^2
	Environmental quality	Air quality	A-2.10 PM_{10}: Annual mean concentration in cities
			A-2.8 Annual mean level of PM_{10} in cities (population weighted) (SDG indicator 11.6.2)
			A-2.9 $PM_{2.5}$: Annual mean concentration in cities
			A-2.7 Annual mean level of $PM_{2.5}$ in cities (population weighted) (SDG indicator 11.6.2)
			A-2.11 SO_x: Annual mean concentration in cities
			A-2.12 NO_x: Annual mean concentration in cities

Theme (old classification)	*Subcomponent (revised Guidelines – 2023 Edition)*	*Topic (revised Guidelines – 2023 Edition)*	*Indicator (revised Guidelines – 2023 Edition)*
	Emissions to air	Consumption of ODSs	A-3.1 Total consumption of ODSs
		Emissions of GHGs	A-1.19 Total emissions of SO_x
B. Climate change	Emissions to air	Emissions of GHGs	B-3.1 Total GHG emissions per capita
			B-3.2 Total GHG emissions per km^2
			B-3.3 Total GHG emissions per unit of GDP
			B-3.4 Total GHG emissions by sectors (energy, transport, industrial processes, solvent and other product use, agriculture, land use and forestry, waste)
			B-3.5 Total GHG emissions (excluding LULUCF) from the national territory
			B-3.10 GHG emissions from LULUCF
			B-3.12 Total GHG emissions from production activities
			B-3.13 GHG emission intensity of production activities

Abbreviations: GDP, gross domestic product; LULUCF, land use, land-use change and forestry; NMVOCs, non-methane volatile organic compounds; NO_x, nitrogen oxides; PM, particulate matter less in diameter than the number of micrometres shown in the subscript; SDG, Sustainable Development Goal; SO_x, sulfur oxides; TSP, total suspended particle.

II. Overview of main achievements and key findings

33. The Shared Environmental Information System review on the theme “air pollution and air quality” revealed a mixed picture for the countries that submitted a self-assessment. Some member States have made progress in applying the revised ECE Guidelines for the Application of Environmental Indicators – 2023 Edition; put efforts into producing and sharing the priority indicators related to air pollution and quality; and enhanced the implementation of the System’s principles and pillars. However, several other member States have not progressed significantly since the latest review and are producing a more limited set of indicators from the old guidelines and still face challenges related to the regularity of updates and content of the System. For some questions and countries, a deterioration compared to the 2021/2022 review was noted, or no answer was provided for the same questions for the current review.

34. Some member States have, however, made progress in making air-related information publicly available. Nevertheless, it is not possible to confirm that all principles and pillars of a Shared Environmental Information System and principles of open data in a wide context are upheld in the pan-European region, due to the limited number of self-assessments submitted and the fact that the assessment was limited to the theme “air quality and pollution”.

A. Working Group recommendations

35. Based on key findings and results of the present draft assessment based on the 14 submissions by member States, as presented in the sections below, the Working Group recommends that countries:

(a) Improve national legislation in place and close legislative gaps in the area of "air" (gaps were reported for two of the Caucasus subregion countries), where such gaps still exist for monitoring and reporting related to the "air" theme;

(b) Develop or update, where not yet the case, the objectives and targets for monitoring consumption of ODSs, emissions of GHGs, emissions of other substances to air and air quality, for producing related statistics and indicators and for data sharing for all air related ECE priority indicators;

(c) Engage all relevant stakeholders and establish or improve institutional arrangements for regular production, sharing of and reporting on data related to consumption of ODSs, emissions of GHGs, emissions of other substances to air and air quality between various institutions at the national level, including between environmental agencies and/or ministries and statistical offices;

(d) Ensure that sufficient financial resources are allocated to the establishment, operation and maintenance of air quality and emissions to air monitoring, as well as information systems, through national budgets and international support;

(e) Close gaps in the air quality monitoring station network, ensuring coverage of both urban and rural areas, and implement real-time monitoring systems to provide up-to-date information;

(f) Promote integration of pollutant release and transfer registers and emissions inventory data into the Shared Environmental Information System;

(g) Further enhance the technological infrastructure required for data storage, processing and dissemination;

(h) Enhance the use of the latest technologies in environmental monitoring and production of environmental data (e.g., Earth observation, big data, the Internet of Things and artificial intelligence), and further enhance digitalization of environmental data to strengthen the availability and accessibility of high-quality environmental data, thus supporting member States also in implementing their digital agendas and open data frameworks;

(i) Implement robust quality assurance and quality control measures to ensure the accuracy and reliability of air quality and emissions to air data;

(j) Fully apply the priority indicators of the ECE revised Guidelines and continue to strengthen the implementation of standardized data formats and metadata to ensure interoperability and easy sharing of air-related data among various stakeholders and to facilitate data exchange with regional and international environmental information systems and organizations for reporting purposes (including under the Convention on Long-range Transboundary Air Pollution and the United Nations Framework Convention on Climate Change);

(k) Further improve the use of air-related indicators and underlying data flows in the production of environmental assessments and reports, including for the pan-European environmental assessment and thematic assessments;

(l) Develop user-friendly interfaces, for example, through single entry points for accessing and visualizing air quality data;

(m) Provide training to strengthen the capacity of personnel involved in data collection, analysis and system operation and maintenance;

(n) Strengthen mechanisms for continued improvement of the Shared Environmental Information System based on user feedback and technological advancements;

(o) Use opportunities for collaboration with neighbouring countries and international organizations to align national environmental information systems with all principles of the System and open data;

(p) Continue to review the System's implementation, using the results for self-evaluation and for identifying necessary measures for improvement.

36. By systematically addressing these steps and considerations, a Shared Environmental Information System and environment-related open data frameworks can be successfully implemented, facilitating informed decision-making and fostering collaboration among various stakeholders.

B. Key findings

37. The self-assessments confirm that various countries have continued to strengthen their national environmental monitoring and information systems, for example, through increasing the monitoring network, including for ambient air quality, through continuing work on the development of integrated databases, and through harmonizing relevant data flows and indicators since the latest review on the establishment of the Shared Environmental Information System in Europe and Central Asia, which was launched at the Nicosia Ministerial Conference. This demonstrates a positive trend.

38. Preliminary results reveal that the subcomponent "Emissions to air" has a higher average performance score than the second subcomponent "Environmental quality", while the topic "Emissions of greenhouse gases (GHGs)" has the highest average performance, followed by the topics "Emission of other substances to air", "Air quality" and "Consumption of ozone-depleting substances (ODSs)".

39. At the indicator level, "Total GHG emissions by sectors" performed best, followed by "Total emissions of nitrogen oxides (NO_x)", "Greenhouse gas emissions from land use, land-use change and forestry (LULUCF)", "Total emissions of sulfur oxides (SO_x)", "Total GHG emissions (excluding land use, land-use change and forestry (LULUCF)) from the national territory", "Total greenhouse gas emissions from production activities", "Total GHG emissions per capita", "Total GHG emissions per unit of GDP", "Total emissions of $PM_{2.5}$", "PM_{10}: Annual mean concentration in cities", "CO_2 emissions from fuel combustion within the national territory", "CO_2 emission per unit of value added (SDG indicator 9.4.1)", "Share of PM_{10} emissions from stationary or mobile sources", "Share of emissions of non-methane volatile organic compounds (NMVOCs) from stationary or mobile sources", "NO_x: Annual mean concentration in cities", "SO_x: Annual mean concentration in cities", "Share of $PM_{2.5}$ emissions from stationary or mobile sources", "Share of total suspended particle (TSP) emissions from stationary or mobile sources", "$PM_{2.5}$: Annual mean concentration in cities", "Emissions of sulfur oxides (SO_x) per capita", "Total consumption of ozone-depleting substances (ODS)", "Total GHG emissions per square kilometre", "Share of hydrocarbons emissions from stationary or mobile sources", "Annual mean level of PM_{10} in cities (population weighted) (SDG indicator 11.6.2)" and "Greenhouse gas emission intensity of production activities". The lowest average performance scores were reported for "Emissions of non-methane volatile organic compounds (NMVOCs) per capita", "Emissions of non-methane volatile organic compounds (NMVOCs) per square kilometre", "Emissions of ammonia per square kilometre", "Emissions of ammonia per capita" and "Annual mean level of $PM_{2.5}$ in cities (population weighted) (SDG indicator 11.6.2)". The performance for indicators varies from country to country and some countries still do not yet produce all air related priority indicators. This is partly also because no monitoring has been established as yet, for example in the case for PM_{10} and $PM_{2.5}$ in Armenia due to lack of technical equipment and capacity and some other countries.

40. The majority of air pollution- and air quality-related indicators (data flows) (50.7 per cent) are used for more than one purpose, including for national and international reporting obligations such as state-of-the-environment reports, thematic reports, preparation of national emissions inventories and for the disaggregation of emissions at the regional and provincial levels, reporting under multilateral environmental agreements, in particular the United Nations Framework Convention on Climate Change and the Convention on Long-range

Transboundary Air Pollution, European Union reports, for various assessments including public health assessments, and for the production of indicators. However, there are still gaps, considering that, for almost a quarter (23.6 per cent) the reply was "No" and for another quarter of indicators (25.7) no reply was provided at all. All reporting countries except one stated that the indicator of "Total GHG emissions by sectors" is used for multiple purposes, followed by the indicator "Total emissions of nitrogen oxides (NO_x)", for which twelve countries replied positively. Eleven countries reported that the indicators of "Total emissions of sulfur oxides (SO_x)", "Greenhouse gas emissions from land use, land-use change and forestry (LULUCF)" and "Total GHG emissions (excluding land use, land-use change and forestry (LULUCF)) from the national territory" are used for multiple purposes. Further details can be found in figure III.

41. While these are positive developments, there is still room for improvement for other indicators to fully comply with the Shared Environmental Information System principles of "sharing with others for many purposes". The indicator "Annual mean level of $PM_{2.5}$ in cities (population weighted) (SDG indicator 11.6.2)" performed worst, with only two countries using the indicator for multiple purposes, followed by "Greenhouse gas emission intensity of production activities", "Emissions of ammonia per capita", "Emissions of ammonia per square kilometre", "Emissions of non-methane volatile organic compounds (NMVOC) per capita", "Emissions of non-methane volatile organic compounds (NMVOC) per square kilometre" and "Share of hydrocarbons emissions from stationary or mobile sources", with four countries using each of the indicator for multiple purposes.

42. Overall performance on production and accessibility of "air pollution and air quality" related indicators from the revised list of priority indicators from the ECE Guidelines for Application of Environmental Indicators – 2023 Edition and by applying the quality criteria from the Shared Environmental Information System assessment framework, as reflected in the reporting tool, was highest for Georgia, which showed significant progress, followed by Italy and North Macedonia. Gaps still exist, however, in all countries, to a varying degree. User feedback on indicator production is not collected by all countries.

43. The majority (72 per cent) of countries produce integrated environmental reports covering several thematic areas, including, in most cases, air pollution and ozone depletion, climate change, water, biodiversity, land and soil, agriculture, waste, energy and transport.

44. In the majority of cases (64.3 per cent), integrated environmental reports are produced with regular frequency (annually, every second year or every five years), however, it should be noted that the information could not be verified in all cases, considering that some of the web links provided by countries in the self-assessment did not work or referred to other information or websites of international projects and processes. There were also differences or discrepancies noted in the replies provided by the countries for both the 2021/2022 and the current review. Another limitation that was noted is that information is often presented only in national languages, thus making its use for multiple purposes difficult.

45. The majority (72 per cent) of countries that submitted a self-assessment regularly (annually, every second year or every four or five years) produce an indicator-based national state-of-the-environment report. This reflects a percentage increase since the 2021/2022 review on the establishment of the Shared Environmental Information System.

46. In all, 14 per cent of countries do not produce an indicator-based report or, at least, not with regular frequency, and another 14 per cent did not respond to this question. Reasons listed for not producing indicator-based reports include insufficient capacity at the level of specialists and limited funding, as well as institutional limitations overall.

47. One good practice example provided by Italy shows the Italian indicator-based report[6] linking the environmental indicators to relevant policy targets and the DPSIR framework.

[6] Available at https://indicatoriambientali.isprambiente.it/sites/default/files/users/matteo.salomone/2022/Totale.pdf (Italian only).

Another good example of using indicators in state-of-the-environment reports was provided by Spain.[7]

48. The use of indicators for reporting on the state and trends of the environment is a positive, recent development. Gaps do exist however in several countries regarding reporting on the state of the environment overall. Countries of Central Asia still face the greatest challenges in this regard, as confirmed by Turkmenistan, which reported that no regular integrated reports or indicator-based reports are produced. However, Turkmenistan has begun preparations for a national state-of-the-environment report in 2024, with the support of ECE and UNEP. While Uzbekistan did not submit a self-assessment under the current review, it should be noted that, for example, the country has made progress in this area and launched a new national state-of-the-environment report in February 2024,[8] many years after launching the previous such report.

49. These positive developments demonstrate the inherent value of continued monitoring and evaluation of the implementation of the Shared Environmental Information System principles and pillars and principles of open data and of applying quality criteria as suggested in the System's assessment framework. Regular self-assessments that lead to enhanced national action and support to the strengthening of environmental monitoring and information management, and thus contribute to enhanced knowledge for decision-making, are therefore considered indispensable. Where needed, this process will continue to be supported by international organizations such as ECE, EEA and UNEP, as well as the work under intergovernmental bodies such as the ECE Working Group on Environmental Monitoring and Assessment and the Joint Task Force on Environmental Statistics and Indicators.

50. The Shared Environmental Information System principles and pillars remain valid for the future, particularly as the System promotes and fosters the production, accessibility and multiple use of environmental indicators and underlying data flows, with a strong emphasis on indicators and data quality and comparability of environmental data across a wider region, thus complementing national efforts on open data.

51. Multiple use of indicators and underlying data flows, as well as other environmental information products such as environmental reports and assessments, should be further fostered, in particular for integrated policies and their implementation in support of a transition to a green economy and sustainable development and in order to urgently address the risks posed by the triple planetary crisis. Multiple use of indicators and data flows will also be employed at the national level for reporting and assessments, as well as at the international level for assessments such as the regular pan-European environmental assessment or the Global Environment Outlook.

52. The self-assessments submitted by countries revealed that limitations still exist in comparing indicators across subregions or between countries, including for "PM_{10}: Annual mean concentration in cities", "SO_x: Annual mean concentration in cities" and "NO_x: Annual mean concentration in cities". Another example is that of total "Greenhouse gas emissions from land use, land-use change and forestry (LULUCF)". The performance gaps in the area of comparability may partly be due to the fact that several countries do not yet produce all priority indicators in the area of air pollution and air quality as suggested in the ECE Guidelines, did not provide information on the methodology, or have not provided information on time series or links to data flows, which did not allow for a full comparison.

53. Relevant achievements have also been noted in the area of linking indicators and data flows on air pollution and air quality to national policy targets. National examples of linking the indicators with policy targets include: (a) a regularly reviewed atmospheric environment strategy that sets out objectives and actions to be achieved over a time horizon and the use of GHG emissions as the basic indicator for planning all national mitigation actions (Andorra); (b) Nationally Determined Contributions under the Paris Agreement, which entails a substantial reduction target of GHG emissions (Armenia); (c) use of relevant indicators (e.g., $PM_{2.5}$ and PM_{10}) for measuring progress towards achieving Sustainable Development Goal

[7] Available at www.miteco.gob.es/es/calidad-y-evaluacion-ambiental/temas/informacion-ambiental-indicadores-ambientales/indicadores-ambientales/perfil_ambiental_2021.html (Spanish only).

[8] Available at www.iisd.org/publications/report/uzbekistan-state-of-the-environment.

indicator 11.6, towards the National Environmental Action Programme, or in informing and evaluating progress towards Nationally Determined Contributions (Georgia); (d) use of indicators as a reference to the National Air Pollution Control Programme (Greece); (e) linking of indicators to policy targets in the published indicator-based national state-of-the-environment report (Italy); (f) or use of indicators in national strategies on climate change, the State Programme on Energy Saving or the National Programme for Socioeconomic Development (Turkmenistan).

54. Despite very positive examples, there also remain gaps in linking indicators and associated data flows to national policy targets. Some countries did not provide information on whether there is a linkage to policy targets.

55. Progress has also been achieved in the establishment of integrated environmental information/data portals that also contain information on air quality and air pollution. However, for some countries, it is still difficult to confirm fully, as they either have several platforms or websites with environmental information in place or because the portals are available only in national languages, making evaluation difficult.

56. Subsection C provide information on relevant findings and developments from the review conducted according to the Shared Environmental Information System pillars.

C. Shared Environmental Information System pillars

57. The core elements of a functioning Shared Environmental Information System are content, infrastructure and cooperation, emphasizing the importance of linking environmental indicators and underlying data flows with technology, governance and policymaking. All three pillars are considered within the present review report to account for the entire data value chain.

1. Content

58. Countries reported that the majority of the 30 priority indicators on air pollution and air quality are published regularly (57 per cent). In most cases, data flows are published annually. This is positive as it emphasizes the added value of national environmental information systems as a continuous source of high-quality information and data for decision-makers and the public. No regular frequency in publishing was reported by Serbia for example for the indicators “Emissions of sulfur oxides (SO_x) per capita”, “Emissions of non-methane volatile organic compounds (NMVOC) per capita”, “Emissions of non-methane volatile organic compounds (NMVOC) per square kilometre”, “Emissions of ammonia per capita” and “Emissions of ammonia per square kilometre”. However, it should also be noted that no country that has submitted a self-assessment answered this question for all 30 indicators, which may be interpreted as either that the indicator is not produced at all or is not published with regular frequency.

59. The priority indicators on air quality and air pollution are, to a large extent (44 per cent), presented as complete fact sheets (67 per cent) and are used to produce different types of content such as reports and visual representations. This too is a positive development.

2. Infrastructure

60. According to the submitted self-assessments, the majority of the 30 indicators (54.3 per cent) are readily available and accessible online for users on national platforms, however the replies to this question were incomplete, since no country provided a reply for each indicator or a weblink to each indicator. Another aspect that was noted in this regard is that most countries do not yet strictly follow the list of priority indicators on air quality and air pollution from the 2023 Edition of the ECE Guidelines.

61. This suggests that there is further need for support to countries in producing and ensuring accessibility and availability of the priority indicators on air quality and pollution, in order to support the full implementation of the System’s pillars and principles and in supporting countries in implementing open data frameworks and in contributing to comparability of environmental indicators across the pan-European region.

62. As noted in previous reviews, inconsistencies have been found in the self-assessments regarding links provided for the individual indicators, as some are either not operational, do not indicate the indicator but rather a general source or platform, or refer to websites of international organizations and not to national platforms.

63. The self-assessments submitted by countries revealed that, for a majority of indicators (55 per cent), data validation procedures have been established. For 53 per cent of indicators, procedures for data revision were reported as being in place. Several countries referred in this regard also to procedures established under the Convention on Long-range Transboundary Air Pollution and the United Nations Framework Convention on Climate Change and respective reporting requirements thereunder.

64. For the latest report on the establishment of the Shared Environmental Information System in Europe and Central Asia in 2021/2022, it was noted that some countries have formal procedures in place and apply international standards for data validation, while others follow internal validation practices without having them formalized. This is still the case for data and indicators related to air quality and air pollution, thus trustworthiness of data has not increased in all countries.

3. Cooperation

65. All countries except two (Armenia and Azerbaijan) reported having in place institutional arrangements for the regular production and sharing of data for both air quality and emissions to air between various institutions at the national level. Andorra – a positive example in this area – provides information and links to institutional and interorganizational agreements on collaboration on data production and statistics for specific areas on a government website.[9]

66. Besides allocation of sufficient resources, collaboration between relevant actors in the area of monitoring and production of statistics and indicators remains crucial at the local, regional and national levels.

67. The self-assessments submitted by countries revealed that institutional cooperation has been strengthened in past years. In particular, cooperation in preparing national inventories on GHGs was highlighted by several countries.

68. Reporting on “air quality and air pollution” under the Shared Environmental Information System has fostered further interaction between “air quality and air pollution” related data producers, thus underlining, similarly to previous reviews, the added value of the System for improving interaction and communication between data producers and interinstitutional cooperation overall.

69. Continued strengthening of interaction and collaboration between data producers but also with data users will be essential in order to advance decision-making and actual action for a successful transformation to a green and circular economy, while at the same time contributing to the outcomes of the Nicosia Ministerial Conference.

70. Improving understanding of the state of the environment is crucial for shifting towards a circular and greener economy. Therefore, collecting a broad range of different types of data and sharing them with other actors at the national and international levels can provide new insights, knowledge and fields of application.

71. Since the 2021/2022 review, several positive developments have been noted (see box below).

72. Countries have continued to implement the principles and pillars of the System and open data and several organizations have complemented this process, thus contributing to its further advancement since the Nicosia Ministerial Conference.

73. The European Union-funded project “EU4 Environment – Water Resources and Environmental Data”, implemented by ECE, the Organisation for Economic Co-operation

[9] See www.estadistica.ad/portal/apps/sites/#/estadistica-ca/pages/estadistiques-i-dades-detall?Idioma=ca&N2=405&N3=274&DV=2480.

and Development (OECD), Environment Agency Austria, the International Office for Water of France and the Austrian Development Agency, has provided support to European Union Eastern Neighbourhood countries in advancing existing environmental information systems such as the Armenian Ecoportal, or by aiming to establish a single access point for data and information on the environment in Georgia. With the help of the "EU4 Environment" project, the Armenian Ecoportal, for example, has been expanded to cover other thematic areas of the environmental domain. The project also provides capacity development support in the areas of environmental monitoring and data collection, environmental statistics and indicators and reporting, including on air pollution and quality. UNEP has been continuing work on the Shared Environmental Information System principles in Central Asia through various projects, by promoting the use of geospatial information for monitoring, and has, together with ECE, supported Uzbekistan in developing a national state-of-the-environment report. The European Environment Information and Observation Network has continued to lead environmental reporting in EEA member and cooperating countries.

74. While reporting of EEA member and cooperating countries is well advanced, gaps remain in most of the countries, as also shown in the self-assessments submitted under the current review by European Union countries and EEA member and cooperating countries.

Developments since the 2021/2022 review report

In all, 8 of 14 member States reported having taken steps since the 2021/2022 review to further the Shared Environmental Information System, 1 reported that no steps had been taken and 5 did not reply.

Steps taken by member States included: (a) enhancements in the environmental monitoring networks, including for air quality monitoring; (b) updating and production of environmental data and indicators; (c) preparations for or development of environmental assessments and reports; and (d) creation of new, or restructuring or updating of, existing national environmental databases and portals.

North Macedonia reported, for example, that work had been conducted to further the establishment of national environmental databases for all environmental topics, with appropriate application modules that enable automated and standardized data gathering and automated data validation in the Ministry of Environment and Physical Planning.

Serbia referred to improvements of components of the information system that are in progress, including related to air quality and the National Register of Pollution Sources, while Armenia reported that work has continued to develop an integrated database within Armhydromet, which will serve as the central repository for a wide range of environmental data (see para. 73).

Another example is Georgia, where, according to the self-assessment from 2021–2022, the number of surface water monitoring points increased from 176 to 231, the number of groundwater monitoring points increased from 56 to 68 and the number of drinking water samples rose from 503 to 522, while soil monitoring was conducted in 60 cities instead of 58 in 2020. Monitoring of heavy metals and benzo[a]pyrene in air has begun at 7 locations in 4 cities. Furthermore, indicative measurement of air pollutants was expanded to 30 cities and 8 new air quality monitoring stations and 2 mobile stations were purchased. Georgia also concluded the National Forest Inventory in 2021 and a forest information and monitoring system is being developed, as a part of which Inventory data will be available. A New State of Environment Report for 2017–2021 was developed and approved and various assessments were developed, including: an air emission inventory and informative inventory report on emissions of

air pollutants 1990–2021; the 2020–2021 Yearbook on the Quality of Surface Waters in the Territory of Georgia; the 2020–2021 Yearbook on the Quality of Ambient Air in the Territory of Georgia; a report to the United Nations Convention to Combat Desertification; the Information Hydrogeological Report - Assessment of Quantitative and Qualitative Characteristics of Fresh Drinking Groundwater Resources of Georgia; the National Report to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal; a report on the implementation of the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention); and the Georgia Solid Waste Sector Assessment Report.

In 2021, Georgia also launched a new electronic system to gather data on specific waste generation and management, which fall under the extended producer's responsibility umbrella, and an electronic system of refrigerant management has been developed and launched since 1 January 2023. An electronic water accounting module for water users was developed and submission of reports through the system has started.

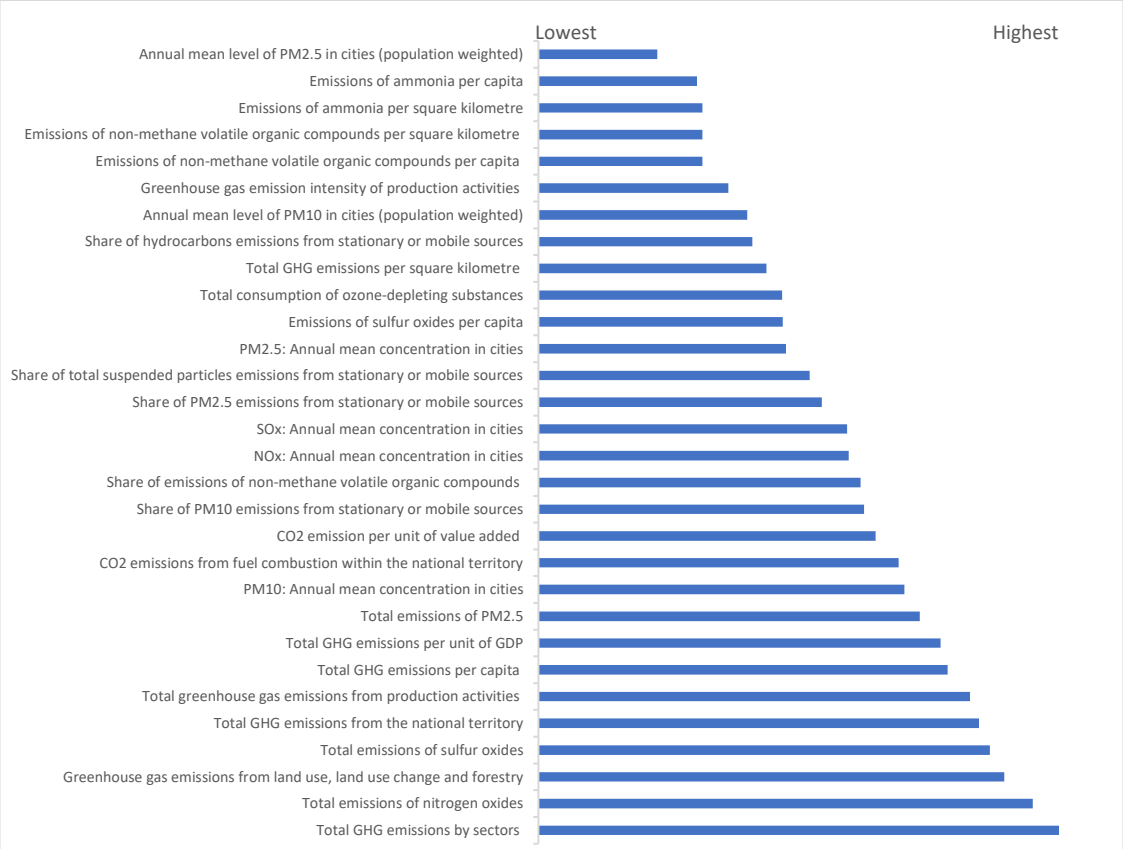
Turkmenistan reported on a programme launched within the framework of the Sustainable Cities project, which will improve environmental monitoring and increase technical capacity. Italy reported that it has improved the National Environmental Information System and the implementation of EcoAtlante.

D. Indicator and national performance

75. Preliminary results reveal that the subcomponent "Emissions to air" has a higher average performance score than the second subcomponent "Environmental quality", while the topic "Emissions of greenhouse gases (GHGs)" has the highest average performance, followed by the topics "Emission of other substances to air", "Air quality" and "Consumption of ozone depleting substances (ODSs)".

76. At the indicator/data flow level, "Total GHG emissions by sectors" performed best, followed by "Total emissions of nitrogen oxides (NO_x)", "Greenhouse gas emissions from land use, land-use change and forestry (LULUCF)", "Total emissions of sulfur oxides (SO_x)", "Total GHG emissions (excluding land use, land-use change and forestry (LULUCF)) from the national territory", "Total greenhouse gas emissions from production activities", "Total GHG emissions per capita", "Total GHG emissions per unit of GDP", "Total emissions of $PM_{2.5}$", "PM_{10}: Annual mean concentration in cities", "CO_2 emissions from fuel combustion within the national territory", "CO_2 emission per unit of value added (SDG indicator 9.4.1)", "Share of PM_{10} emissions from stationary or mobile sources", "Share of emissions of non-methane volatile organic compounds (NMVOC) from stationary or mobile sources", "NO_x: Annual mean concentration in cities", "SO_x: Annual mean concentration in cities", "Share of $PM_{2.5}$ emissions from stationary or mobile sources", "Share of total suspended particles (TSP) emissions from stationary or mobile sources", "$PM_{2.5}$: Annual mean concentration in cities", "Emissions of sulfur oxides (SO_x) per capita", "Total consumption of ozone-depleting substances (ODS)", "Total GHG emissions per square kilometre", "Share of hydrocarbons emissions from stationary or mobile sources", "Annual mean level of PM_{10} in cities (population weighted) (SDG indicator 11.6.2)", "Greenhouse gas emission intensity of production activities". Lowest average performance scores were reported for "Emissions of non-methane volatile organic compounds (NMVOC) per capita", "Emissions of non-methane volatile organic compounds (NMVOC) per square kilometre", "Emissions of ammonia per square kilometre", "Emissions of ammonia per capita" and "Annual mean level of $PM_{2.5}$ in cities (population weighted) (SDG indicator 11.6.2)" (see figure I).

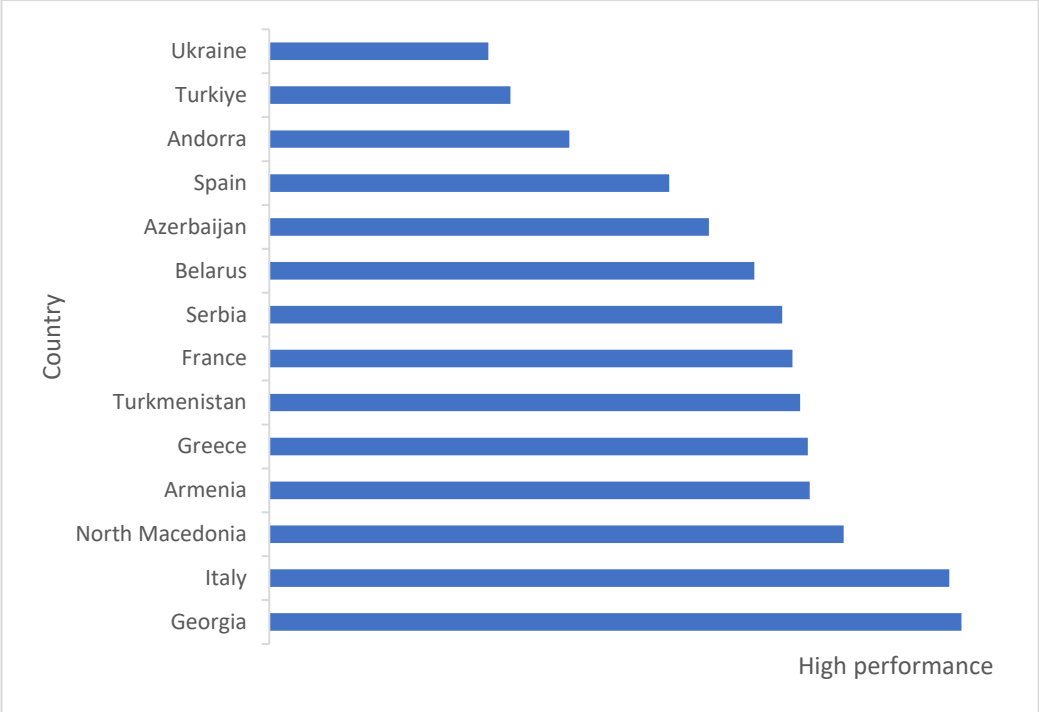
Figure I
Average indicator performance score



77. According to the self-assessments submitted by countries (see figure II), Georgia performed best, followed by Italy and North Macedonia. The three countries answered most of the questions for the two subcomponents “Emissions to air” and “Environmental quality”.

78. The national performance ranking should, however, be treated with some caution as the ranking is based only on the self-assessments submitted. Considering that countries have only to a varying degree submitted a complete self-assessment, the calculation of the performance score may be incomplete.

Figure II
National performance based on self-assessments



III. Further steps

79. The review report on the implementation of the Shared Environmental Information System in the area of air quality and air pollution is a novelty in that it is the first such review to focus on a specific environmental topic and the priority indicators from the revised ECE Guidelines. Similarly to the 2021/2022 review, the current review was based on the Shared Environmental Information System assessment framework and addressed the quality aspects formulated therein for 30 priority indicators under the subcomponents “Emissions to air” and “Environmental quality” and the topics “Emissions of greenhouse gases (GHGs)”, “Emission of other substances to air”, “Air quality” and “Consumption of ozone-depleting substances (ODSs)”. Considering that the review format is different than in the past, it is difficult to compare and assess progress in view of full implementation of the System. Progress was assessed to the extent possible based on a few indicators and underlying data flows and the quality criteria from the assessment framework.

80. Due to the limited number of self-assessments submitted by countries for the review on air quality and air pollution, it is difficult to determine whether progress has been made in implementation of the System in all ECE member States in Europe and Central Asia.

81. Full participation in the preparation of the report by all countries in the pan-European region was not achieved. Participation from member States from the European Union, Central Asia and South-East Europe remained low. Furthermore, not all countries of Eastern Europe provided an assessment. The only subregion where all countries submitted a self-assessment is the Caucasus. Further steps to achieve wider participation for any future reviews are therefore needed.

82. Capacity development on the priority set of ECE revised indicators and the reporting tool should continue, as well as on the benefits of regular reporting for strengthening the evidence base for informed decision-making.

83. Technical assistance and collaborative efforts between member States and regional and international organizations, including EEA, UNEP and ECE, should remain a priority and the ECE Working Group on Environmental Monitoring and Assessment and the Joint

Task Force on Environmental Statistics and Indicators should remain a platform for discussing progress, remaining challenges and possible solutions.

84. It is also important for countries to: participate in any future reviews of progress; report on all priority indicators in order to provide a complete picture; and continue digitalization of environmental data by using new technologies and to make said data fully available and accessible for the public. This will also support the implementation of the Nicosia Ministerial Conference outcomes.

85. The closing of all existing gaps in implementing the System and evaluating performance through regular self-assessment will also support countries in implementing open data frameworks and strategies, considering the similarity of the principles. The assessment framework consequently provides a tool that allows countries to continue to monitor progress and identify needed resources and gaps to be closed, including for open data overall.

86. Similarly to previous reviews, persisting gaps on how countries use the data in policymaking, monitoring progress towards policy targets and streamlining reporting processes need to be closed.

87. The present report is based on countries' self-assessments. The secretariat has only to a limited extent verified the information provided by countries through the reporting tool. Inconsistencies in the information provided do, however, suggest a need for a validation mechanism. Any future reviews might consider this and other gaps identified.

88. The presented findings will need to be revised for any future reviews on specific environmental themes, including the topic selected by the Working Group on Environmental Monitoring and Assessment for 2024, "waste and circular economy", or the implementation of Shared Environmental Information Systems in full following the principles and pillars established.

IV. Fact sheets on key findings and messages

89. Table 2 lists the ECE member States in Europe and Central Asia and whether they have submitted self-assessments. Table 3 indicates which themes reporting countries have covered.

90. Regular reporting on the state of the environment in the pan-European region countries provides comprehensive and targeted information about environmental conditions, trends and pressures in each country. The resulting reports provide a strategic view to shape policy and action. National state-of-the-environment reports, based on a sound evidence base, aim to inform and provide knowledge for decision-makers and the public and to engage readers to influence their behaviour.

91. Most pan-European region countries review the state of the environment regularly and prepare integrated reports covering several thematic areas and/or indicator-based national state-of-the-environment reports. However, as noted in preceding sections, gaps remain in several cases.

92. Within the framework of the final review of the establishment of a Shared Environmental Information System in Europe and Central Asia, ECE member States in the pan-European region were asked to provide information on the regularity and type of reports they produce. The reports vary in regularity, content and form but all of them support the transition to a more sustainable use of natural resources and the protection of the environment for human well-being. Table 4 provides an overview of whether national state-of-the-environment reports or indicator-based state-of-the-environment reports are produced regularly and includes data extracted from the submitted self-assessments.

Table 2
Overview of self-assessment submissions by country

Country	*Submitted report: Yes/No*
Albania	No
Andorra	Yes
Armenia	Yes
Austria	No
Azerbaijan	Yes
Belarus	Yes
Belgium	No
Bosnia and Herzegovina	No
Bulgaria	No
Croatia	No
Cyprus	No
Czechia	No
Denmark	No
Estonia	No
Finland	No
France	Yes
Georgia	Yes
Germany	No
Greece	Yes
Hungary	No
Iceland	No
Ireland	No
Italy	Yes
Kazakhstan	No
Kyrgyzstan	No
Latvia	No
Liechtenstein	No
Lithuania	No
Luxembourg	No
Malta	No
Monaco	No
Montenegro	No
Netherlands	No

Country	*Submitted report: Yes/No*
Norway	No
North Macedonia	Yes
Poland	No
Portugal	No
Rep. of Moldova	No
Romania	No
Russian Federation	No
San Marino	No
Serbia	Yes
Slovakia	No
Slovenia	No
Spain	Yes
Sweden	No
Switzerland	No
Tajikistan	No
Türkiye	Yes
Turkmenistan	Yes
Ukraine	Yes
United Kingdom	No
Uzbekistan	No

Table 3
Overview of whether thematic level questions were answered by countries compared to 2021/2022 review

Countries	*Air pollution and ozone depletion (2021/2022 review)*	*Climate change (2021/2022 review)*	*Air pollution and ozone depletion (2023 review)*	*Climate change (2023 review)*
Andorra*	No	No	Yes*	Yes*
Armenia*	No	No	Yes	Yes*
Azerbaijan*	Yes	Yes	Yes*	Yes*
Belarus*	Yes	Yes	Yes*	Yes*
France*	Yes	Yes	Yes*	Yes*
Georgia	Yes	Yes	Yes	Yes
Greece*	No	No	Yes*	Yes*
Italy	No	No	Yes	Yes

North Macedonia*	Yes	Yes	Yes*	Yes*
Serbia*	Yes	Yes	Yes*	Yes*
Spain*	Yes	Yes	No*	No*
Türkiye*	No	No	Yes*	Yes
Turkmenistan	No	No	Yes	Yes
Ukraine*	No	No	Yes*	No

*Thematic questions answered only in part.

Table 4
Overview of national state-of-the-environment reporting

Country	*Regular production of an integrated state-of-the-environment report*	*Year of latest state-of-the-environment report*	*Regular production of an indicator-based state-of-the-environment report*	*Year of latest indicator-based state-of-the-environment report*
Andorra	No	-	Yes	2020
Armenia*	No	2011	Yes	2022
Azerbaijan*	No*	2019	Yes	TBC
Belarus*	Yes	2023	Yes	TBC
France*	Yes	TBC*	No (different reply than in 2021)	-
Georgia	Yes	2023	Yes	2023
Greece	No	-	Yes	2019
Italy*	Yes* (different reply than in 2021/2022)	TBC	Yes	2022
North Macedonia*	Yes*	TBC	Yes	2022
Serbia	Yes	2021	Yes* (different reply than in 2021/2022)	TBC
Spain	Yes	2022	Yes	2022
Türkiye*	TBC*	TBC	TBC*	TBC
Turkmenistan	No	TBC	No	TBC
Ukraine*	TBC*	TBC	TBC*	TBC

Source: Self-assessment reports by countries and national websites.
Abbreviations: TBC, to be confirmed.

*Self-assessment of countries does not fully match the information provided on the indicated websites.

A. Relevance

93. In the category of "relevance", countries were invited to specify, for each indicator, whether it was used for more than one purpose, such as for the production of national indicators and in order to meet reporting obligations, with the option of replying "Yes", or "No". The results from the 14 submissions are shown in figure III. Overall, the performance for air-related indicators seems to be poorer than for the 2021/2022 review.

94. Similarly to the 2021/2022 review, countries were asked to provide examples of multipurpose use of indicators. The replies included combinations of the following:

(a) Production of national state-of-the-environment reports;

(b) Reporting under multilateral environmental agreements, in particular the United Nations Framework Convention on Climate Change and the Convention on Long-range Transboundary Air Pollution, and for other national/international reporting purposes;

(c) Preparation of national emissions inventories and for the disaggregation of emissions at the regional and provincial levels;

(d) Inputs to reports to the European Union;

(e) Production of thematic bulletins, technical reports and studies;

(f) Various assessments, including public health assessments;

B. Accessibility

95. In the category of "accessibility", countries were invited to specify, for each indicator, whether it was readily available and accessible online for users on a national platform, with the option of replying either "Yes" or "No". The results from the 14 submissions are shown in figure IV below. Most countries replied that the indicators of "Total GHG emissions by sectors (energy, transport, industrial processes, solvent and other product use, agriculture, land use and forestry, waste)", "Total emissions of nitrogen oxides (NO_x)" and "Greenhouse gas emissions from land use, land-use change and forestry (LULUCF)" are readily available. Significant gaps remain, however, for other indicators such as "Annual mean level of $PM_{2.5}$ in cities (population weighted) (SDG indicator 11.6.2)", "Emissions of ammonia per capita", "Emissions of ammonia per square kilometre", "Emissions of non-methane volatile organic compounds (NMVOC) per capita", "Emissions of non-methane volatile organic compounds (NMVOC) per square kilometre and "Greenhouse gas emission intensity of production activities", where only a minority of countries replied that the indicators are readily available and accessible. Several countries did not provide a reply to this question for specific indicators.

C. Comparability

96. Within the category of "comparability", limitations in comparing the indicator across countries and the region were assessed. Limitations were identified still for various indicators, due also to the fact that several countries did not provide links to the indicator or information on the time series or that no metadata were made available.

D. Accuracy

97. In the category of "accuracy", countries were invited to specify, for each indicator, whether there are procedures in place to carry out revisions to the data. The results are shown in figure V below. Almost all countries reported that, for the indicator "Total GHG emissions by sectors (energy, transport, industrial processes, solvent and other product use, agriculture, land use and forestry, waste)" followed by "Total emissions of nitrogen oxides (NO_x)", "Total GHG emissions per capita", "Greenhouse gas emissions from land use, land-use change and forestry (LULUCF)", "Total greenhouse gas emissions from production

activities", "Total GHG emissions per square kilometre", "Total GHG emissions per unit of GDP", and "Total GHG emissions (excluding land use, land-use change and forestry (LULUCF)) from the national territory", procedures are in place to carry out revisions. Revisions are made, for example, when the methodology changes, when errors are detected or when new data become available. Several countries did not provide a reply to this question for specific indicators.

E. Timeliness and punctuality

98. Countries were asked in this category how often the indicators are published. Countries replied in their self-assessments that about 40 per cent of all indicators are published annually, for 4 per cent of all indicators publication is conducted with a frequency of more than one year, or, for 13 per cent, according to the legal provisions on the frequency of dissemination. No regular frequency was reported for 1 per cent of indicators and for 42 per cent of indicators no reply was provided.

F. Clarity

99. Metadata are crucial for enhancing the clarity and quality of the information provided. According to the reports received, metadata are available for 50 per cent of the 30 indicators, while for the other 50 per cent, either no answer was provided or no metadata were made available (14.5 per cent). Gaps were noted, for example, for the indicators "Emissions of non-methane volatile organic compounds (NMVOC) per capita", "Total GHG emissions per capita", "Total GHG emissions per square kilometre", "Emissions of ammonia per capita", "Emissions of ammonia per square kilometre" and others. Metadata information include information on methodology, data sources, as well as temporal coverage, while the significant amount of indicators for which no metadata were provided should be noted.

G. Institutional and organizational arrangements

100. All countries except two (Armenia and Azerbaijan) reported that there is national legislation and/or plans, programmes or strategies in place on monitoring and reporting in relation to the topics air quality and emissions to air. While Azerbaijan reported that no legislation and/or plans, programmes or strategies are in place for the topic of air quality, Armenia did not provide a reply for the topic of emissions to air.

Figure III
Use of indicator for more than one purpose

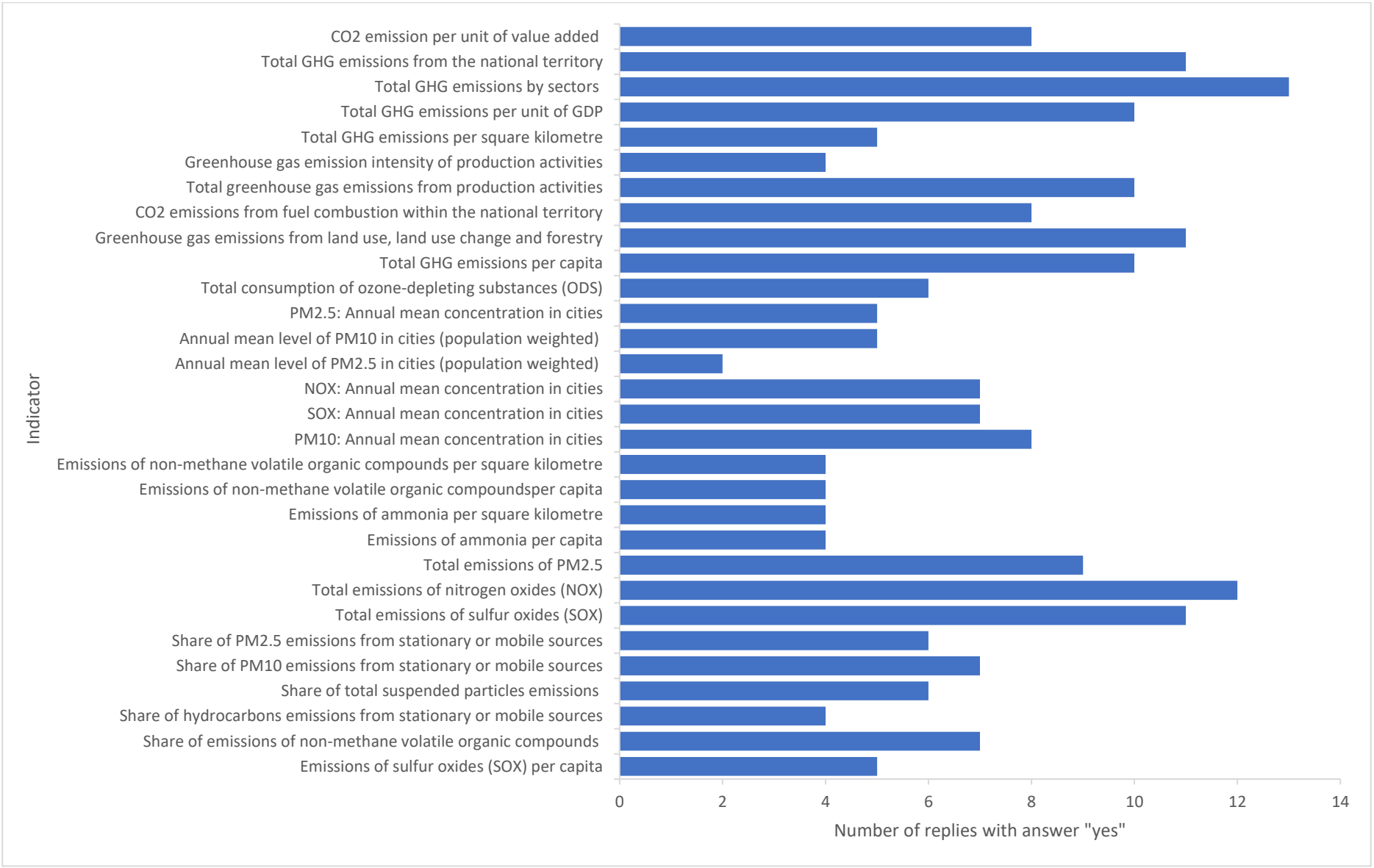


Figure IV
Ready online availability and accessibility of indicators on a national platform

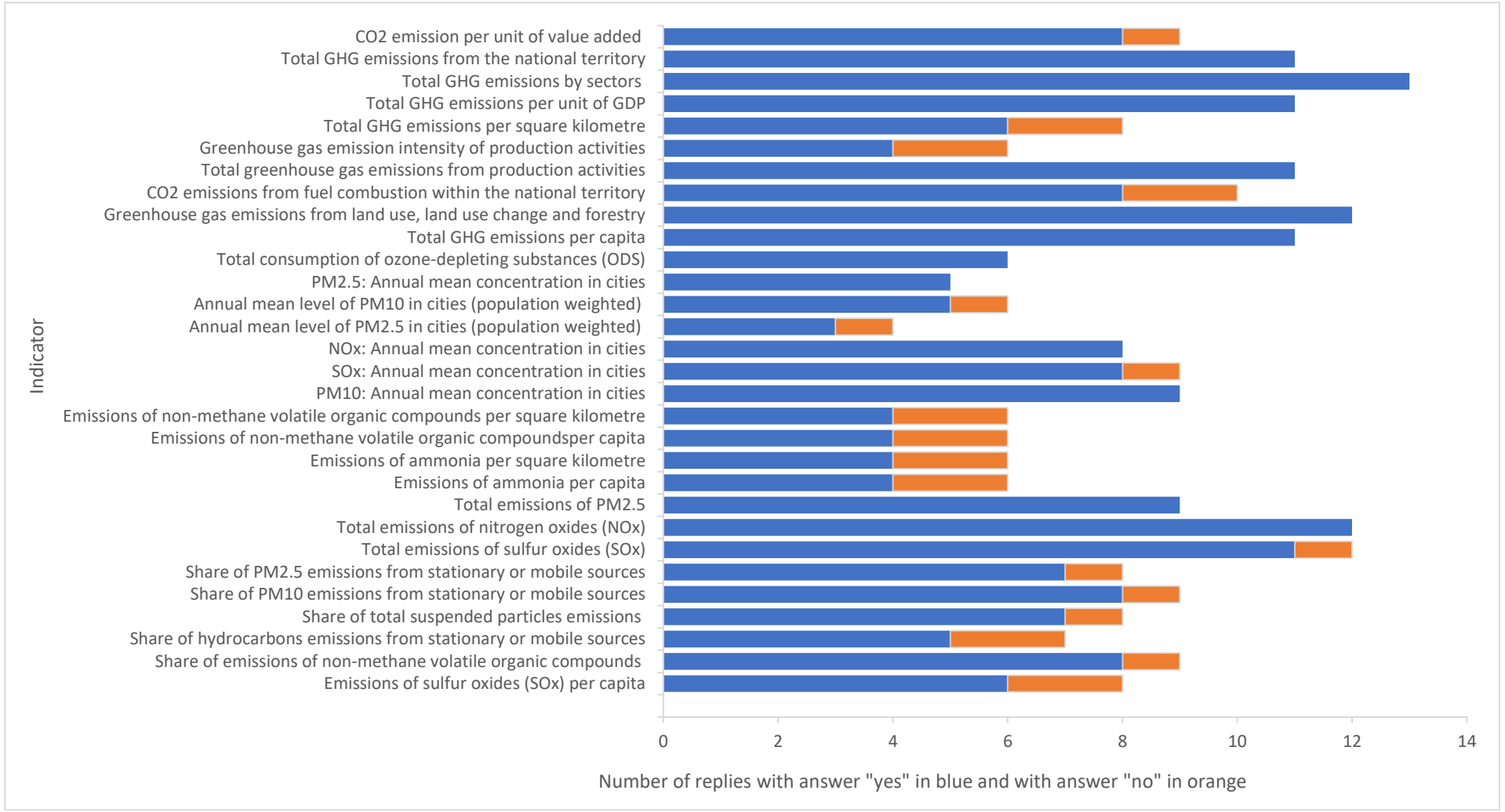


Figure V

Procedures in place to carry out revisions to the data