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Statistical Assessment of Sustainable Urban Water Ecosystems

The integrated character of Sustainable Development Goals (SDGs) reflects interconnectedness of water systems and their rich biodiversity, supplying communities with foods, clean water and air, mineral resources, and regulating their welfare and economic growth. The increasing awareness of the importance of public access to water ecosystems can have a positive impact on these ecosystems and encourage partnerships to responsible management of these resources and reactions on water crises through improvements of skills and competencies.

The article highlights that the development of partnership relations for the achievement of SDGs is a target 17 of SDGs. An assessment of global and national objectives and indicators laid in the basis of the assessment of a progress on the way to the sustainable environmental accounting and the development of urban water ecosystems is given.

It should be noted that the statistical information in divided into four groups which data are used in monitoring of the green economy performance: statistical base of nature assets; environmental and resource productivity of economy; environmental quality of life; economic capabilities and political reactions.

The analysis showed the importance of the environmental inclusion of respective spatial groups. Aggregations based on drainage basin or ecosystem can provide better understanding of the environmental dimension of many interconnections defined for sweet water and seawater ecosystems. It is expected, however, that the applicable methods and tools will be elaborated in parallel, to simplify data use by politicians. A deeper understanding of interconnections of SDGs will enable for enhancing the efficiency of political measures.

It is concluded that the sustainable development and the 2030 Agenda for Sustainable Development can be achieved only by implementing the overall sectoral approach that will combine the tendencies of the indicators related with the environment with robust policy analysis. This requires the cohesion of all the sustainable development policy dimensions on the basis of the integrated approach, to ensure the elaboration of complementary strategies and to avoid compromises.

Key words: *statistical assessment, water resources, environmental-economic accounting, Sustainable Development Goals, ecosystem services.*

Introduction. The issue of human activity impact on the environment and water ecosystems in particular is a central one at global and national level. On the one hand, the environmental impact from economic activities in each country needs to be explored at national and international level. On the other hand, the dependence of sustainable economic growth and human welfare on resources taken from the environment has gained a wider recognition. It poses a problem of how the gifts of nature should be used. Are water resources consumed by too rapid rates undermining their capacities for renewal? Do business economic activities provoke the increasing emissions of pollutants in the ambient air, with the pollution rate exceeding the absorption capacity of the environment, resulting in the adverse effects for human health and welfare? Issues like this occur more and more often, as the existing phenomena of technogenous origin may threaten the current and future environmental performance. These issues require urgent solutions from the sustainable development perspective, being the most pressing environmental problems for present and future generations.

17 Sustainable Development Goals (SDGs) and 169 targets of the 2030 Agenda propose a scheme for sustainable and stable future, where the responsible management of limited resources of our planet can create the background for good existence and development for future generations. Global crises and conflicts, especially the COVID-19 pandemic and the war in Ukraine, the aggravating food, energy and humanitarian crises, the crisis of refugees within the country and beyond it or the mass-scale emergency situation with the climate are factors showing the increasing importance of streamlining efforts on implementing a plan for recovery of the environmental future of the planet, including water ecosystems.

The abovementioned demonstrates that improvements in methodological and technical framework for the statistical assessment of a progress towards the achievement of sustainable development of water ecosystems and its environmental effects would require a comprehensive statistical approach. Statistical analyses and assessments enable for a deeper grasp into the operation of this complex and dynamic system, with elaborating the tools correcting business operation in a way reducing is adverse effects for water ecosystems and eliminating negative environmental consequences of human activities.

The integrated character of SDGs reflects the holistic nature of water ecosystems and their rich biodiversity supplying humans with food, clean water and air, raw resources, and determining their prosperity and economic growth. Hence, the achievement of SDGs requires an integrated approach, where the causality of these problems and their solutions is accepted through statistical assessment, thus making one understand the various factors' impact on ecosystems.

Literature review. The issue of progress on the way to sustainable environmental accounting and development at national and regional level has been a research priority. A conditional division of SDGs into economic, environmental and social components could be possible through monitoring of indicators proposed by J. Rockström and P. Sukhdev [1].

The set of indicators was grouped into environmental ones by D. R. Kanter et al. in assessing the compromises in the period of sustainable development [2]. A composite index for the assessment of sustainable development (FEEM SI), to measure the overall balance, was proposed by L. Campagnolo et al. [3].

However, a comparative assessment of a progress on the way to achieving sustainable urban water ecosystems using global or national SDGs and their indicators has never been performed.

The research objective is to assess global and national targets and indicators laid in the basis of the assessment of a progress in achieving the sustainable environmental accounting and the development of urban water ecosystems.

Results of research. To explore environmental phenomena, a community needs a scheme for their observation, with gradual accumulation of time and spatial records about environmental processes, which systematization will be laid in the basis of creating appropriate databases of environmental statistics. The final purpose of constructing a scheme for sustainable environmental accounting (EA) is to compile comprehensive environmental statistical information at high aggregation level, which will be subject to analysis, dissemination and interpretation. The implementation of EA is quite a difficult task, because it requires creating additional tools for collecting data, elaborating a methodological framework, advanced information and software support, competent staff, normative and legal support and financial resources for carrying out statistical processes. Programs of international and national statistical organizations involve supplementary surveys and administrative data as additional sources for creating a high-quality statistical product, EA in particular. At international level, statistical institutions such as Eurostat [4] in close cooperation with the European Environment Agency [5] and Joint Research Center [6] create international environmental statistics, EA and indicators that support elaboration, introduction, monitoring and assessment of environmental policies, strategies and initiatives in EU. It should be noted that Programs of Environmental Actions [7] have been tools for environmental policy setting in EU since the beginning of 1970s. The Eighth Program [8] entitled "Living well, within the limits of our planet" [9] (Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013), operable till 2020, provided the description of what should be achieved from "EU 2050". These strategic initiatives are included in the Roadmap on Biodiversity Strategy to 2030 [10] and Low Carbon Economy in 2050 [11].

It is well known that sweet water has fundamental role in supporting the environment, community and economy. Ecosystems such as wetlands, rivers or lakes are indispensable for the life on Earth. Sweet water ecosystems are vitally important for direct supply of goods and services such as drinking water and recreation, agriculture and energy generation, as habitats of water forms of life and environmentally friendly decisions for water cleaning and resistance to climate change. Sweet water ecosystems can be defined as "a dynamic complex of groups of plants, animals and microorganisms and nonliving environment with dominating presence of running water or still water, which interacts as a functional unit" [12].

The impact of climate change and volatility on water resources is becoming more and more visible. Changing rainfalls, ambient air and water temperature, as well as extreme weather phenomena provoking floods, draughts or storms change the quality of water due to the increased acidification of oceans resulting from the grown absorption of carbon dioxide (UN Environment Program [UNEP] 2017), all this being escalated by climate change. Besides that, the increasing sea level aggravates the conditions of ground waters due to the penetration of salt in coastal areas (UN Organization on Education, Science and Culture [UNESCO] 2020).

The SDG target 6.6 aims at the protection and renewal of water ecosystems and includes the indicator 6.6.1 based on monitoring of various types of sweet water ecosystems including lakes, rivers, wetlands, ground waters and artificial water reservoirs.

Maritime systems supply humans with necessary services such as catching carbon for mitigating climate, regulating climate, supplying oxygen, renewable energy sources, protection from stormy waves, and constitute an essential economic factor. As a special target for the indicators related with the ocean, SDG 14 include indicators of maritime ecosystems: prevention and substantial reduction of ocean pollution, minimization and elimination of the effects of acidification of the ocean and cessation of excessive catch, illicit, unregistered or unregulated fishery.

Water resources and ecosystems ensure food (SDG 2) and energy safety (SDG 7), help improve human health and environmental performance (SDG 2), have importance for industry (SDG 9). Integrated management of water resources can contribute in elimination of poverty (SDG 1) and inequality (SDG 10), promote economic development (SDG 8), development of urban conditions (SDG 11) and sustain protection of ecosystem services (SDG 6 for sweet water, SDG 14 for sea waters, and SDG 15 for ground waters). However, the sustainability of water ecosystems is threatened due to climate change (SDG 13), excessive pollution (SDGs 6 and 14) and excessive exploitation. It determines the need in sustaining the quality of water and reducing its shortage, in preventing water-related conflicts (SDG 16), and in regulating consumption and production (SDG 12) for future generations. Besides that, considering the links of water sector with all the sectors of a national economy, the coherence of policy has critical importance in achieving the synergy and preventing compromises between economic activities.

The access to water resources and their quality obviously has various impact on humans (SDG 6). The increased public awareness of the importance of access to healthy water and water ecosystems can have positive effect for these ecosystems and encourage partnerships to responsible management of these resources and reactions on water crises by improving skills and competencies (SDG 17).

A review of the existing European, international or national statistics of sustainable development shows that the most important areas of the modern environmental statistical research, including public one, are as follows: nature capital; biodiversity; land use; forest resources; sweet water resources; mineral resources; environmental efficiency of production; management of water resources; internal consumption of raw materials; waste treatment; balances of nitrogen and phosphor; energy management; renewable energy; emissions of greenhouse gases; environmental quality of life of the population; gas-like air pollutants; pollution of ambient air; level of noise; access to drinking water; cleaning of communal drainage waters; green zones; organic farms; expenditure on environmental protection; environmental taxes; activities in research and development; accounting of environmental inventions and patents; accounting of environmental innovations; green technologies; a scheme for environmental management and environmental audit; green public procurement.

An important aspect of statistical studies and official statistics in Europe is that green economy is organically linked to the sustained social development concept. The statistical data used for monitoring of the green economy performance are presented in four groups: statistical base of nature assets; environmental and resource productivity of the economy; environmental quality of life; economic capabilities and political reactions. For the information support of the abovementioned indicators, the European statistical system, apart from results of statistical observations and environmental-economic accounting, uses big data of administrative origin, data of national power bodies, whereas data of international organizations are used for international comparisons.

At national level, the information support for the official accounting of water use relies on the administrative report by form 2ТП-water resources (river), used for the compilation of the State Water Cadaster of Ukraine [14]. The information from this statistical observation lays the basis for statistical assessment of water supply for Ukrainian households, economy and regions.

A scheme for public control based on reliable and timely data from public accounting of water ecosystems, designed for effective water consumption, has been created in Ukraine. Aggregated data on water use in Ukraine and in its regions can be found in open access on the official website of the State Water Agency, allowing one to have an objective picture of intake, consumption and discharge of water resources for taking relevant, evidence-based and effective management decisions.

Environmental indicators are currently produced in Ukraine by many ministries and administrative departments. As a result, the State Statistics Service of Ukraine uses opened administrative information on the production of industry-specific indicators for purposes of environmental-economic accounting and compiling environmental accounts of water. According to aggregated data, the water intake in Ukraine from natural water objects fell by 4% (367,000,000 m2) over the latest five years and made 8,857,000,000 m3, including 1.5% reduction in the intake from surface waters (111,000,000 m3), 15% reduction in the intake from underground sources (176,000,000 m3). (Table 1, compiled by author using data from [15]).

Table 1

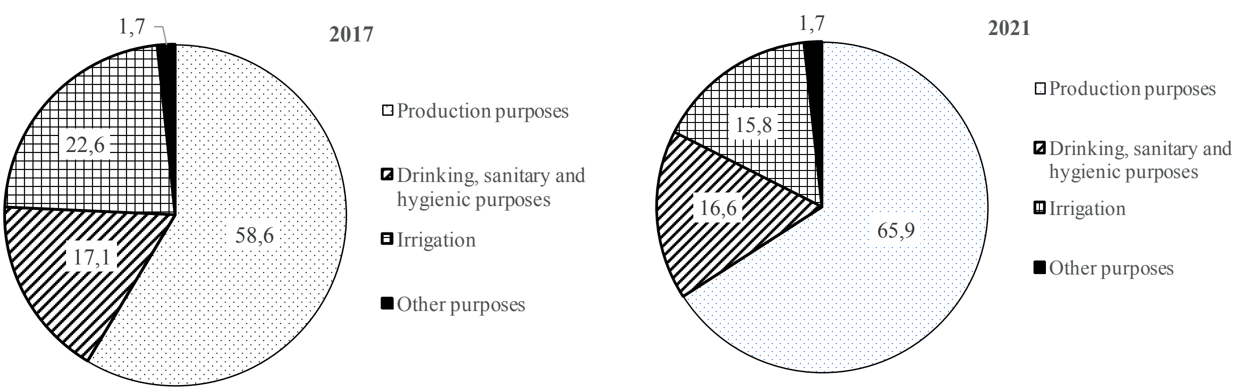
Main indicators of intake and discharge of water, Ukraine, 2017–2021 (million m³)

Indicator / Year	2017	2018	2019	2020	2021
Water intake from natural water objects, total	9224	11296	11111	9952	8857
Used fresh water (including sea water), total	6853	7363	7318	7238	6143
Overall drainage of waters	4921	5412	5573	5292	4837
Discharge of water in surface water objects	4715	5210	5374	5160	4685
Capacity of wastewater treatment facilities	5415	5378	5546	5142	5521

It is a known fact that the environment does not have official borders. Today, there is an increasing necessity in regular analysis of the environmental performance using environmental indicators, for exercising control over formulating and implementing of environmental policies. Ukraine pursues environmental policies aimed to preserve the environment that would be safe for the existence of the living and inanimate nature, to protect life and health of the population from adverse effects of the environmental pollution, to achieve harmonic interactions of community and nature, to ensure protection, rational use and rehabilitation of water resources.

It should be noted that the policy aimed at using administrative data for statistical purposes in parallel with statistical observations constitutes an integral component of the Eurostat's vision of the production of the European statistical information [16]. The nomenclature of environmental indicators, recommended by the United Nations Economic Commission for Europe, was approved at the session of the Commission on Improvements in Methodology and Reporting Documentation of the State Statistics Service of Ukraine (Protocol from 20.12.2013 No15). The methodological guidelines elaborated for this nomenclature contain information about the environmental indicators produced by the State Statistics Service of Ukraine, sources of data for their estimation and a description of their content and structure of presentation to users in official statistics offices.

Data on the use of fresh water by the Ukrainian economy are given in Figure 1 (constructed by the authors by data from [15]). In the analyzed period, the share of fresh water use (including seawater) for production purposes grew from 58% in 2017 to 66% in 2021. Its share for irrigation purpose, instead, decreased from 23% in 2017 to 16% in 2021.



a) b)

Figure 1. Fresh water use (including seawater) by purpose, Ukraine, %

Figure 2 (constructed by the authors by data from [15]) shows the dynamics of discharges of water resources and the capacities of national wastewater treatment facilities in 2017–2021. The estimated results could confirm that the largest discharge in surface waters over the five-year period was in 2019, resulting in the highest capacity of wastewater treatment facilities.

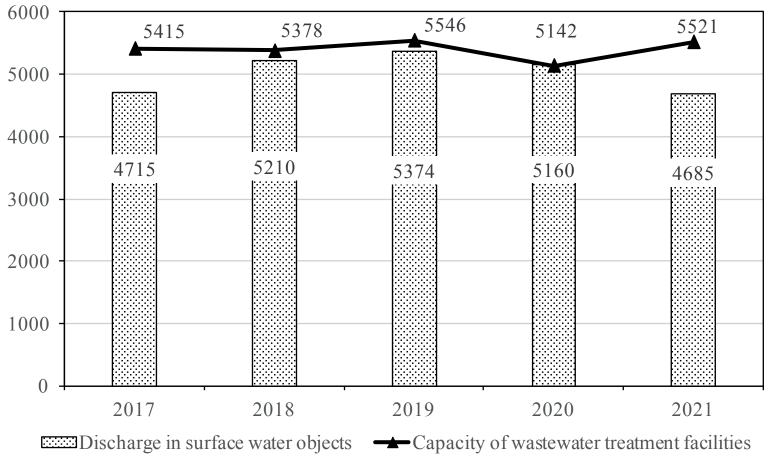


Figure 2. The dynamics of fresh water discharges and capacities of wastewater treatment facilities, Ukraine, 2017–2021

The intake of water from natural water objects by region in 2021 is shown in Figure 3 (constructed by the authors by data from [15]). According to administrative data of the State Agency for Water Resources, the intake of fresh water was from surface (in the most part of the regions) and underground sources. The total amount of water taken from natural water objects in 2021 made 8,857,000,000 m³. The shares of sweet and sea & estuary water in the structure of taken water were 94.3% and 5.7%. The largest water intake from underground sources was recorded on the territory of Volyn, Lviv, Ternopil, Poltava, and Sumy regions.

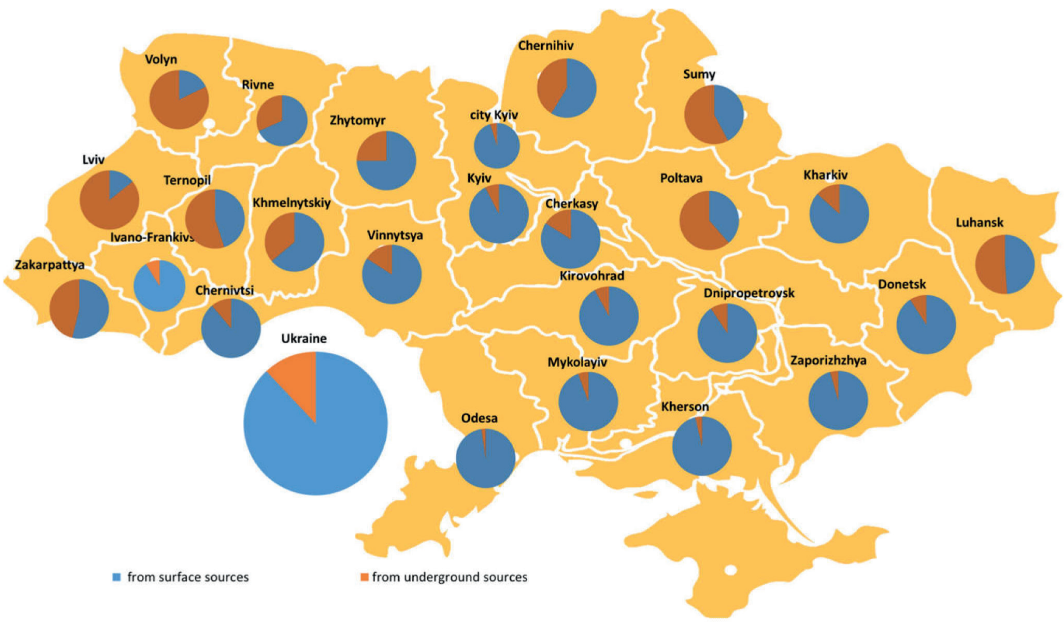


Figure 3. The water intake in Ukraine by region, 2021

The analysis of the dynamics of the fresh water use in Ukrainian regions in 2017–2021 shows that the average use of water in the domestic economy in this period made 6,983,000,000 m³; the water use fell by 10.7% (710,000,000 m³) in 2021 relative to 2017.

The analysis of fresh water use by region shows its growth in six Ukrainian regions. The largest growth was recorded in Kyiv region (70.4% or 2,016,000,000 m³). The growth in other five regions varied from 1.8% to 15.4% (Figure 4, constructed by the authors by data from [15]).

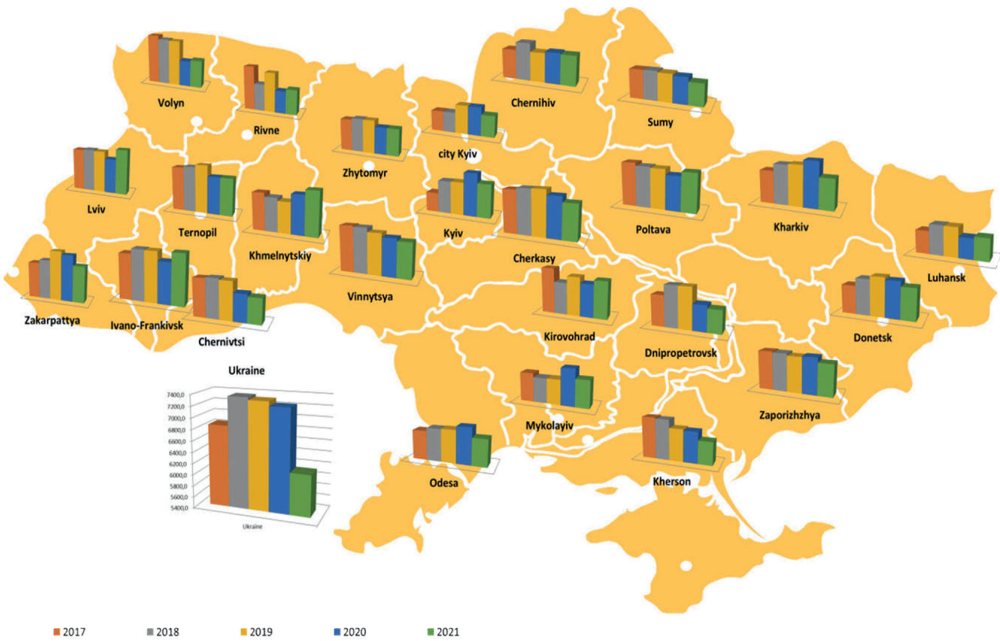


Figure 4. The dynamics of fresh water use in Ukraine by region, 2017–2021

It needs to be noted that the main objective of environmental-economic accounts is estimating the share of actual environmental spending for preventing environmental degradation or rehabilitating the environment, in the total reported expenditures in economic and environmental sectors.

The System of Environmental-Economic Accounting (SEEA) is the basic international standard for the sustainable environmental-economic accounting, designed as a framework for the compilation and presentation of statistical data on the environment and their links with economy. It combines economic and environmental information in internationally cohered set of standard concepts, definitions, classifications, rules of accounting and tables for estimating internationally comparable statistical data [8].

The central SEEA structure covers the measurement in the following dimensions:

– environmental flows (flows of nature resources, products and their residues between environment and economy, and within economy, in kind and value units);

– endowments of environmental assets (endowments of selected assets, such as water or energy one, the vector of change in their records over a reporting period due to economic activities and natural processes, in kind and value units).

Besides that, SEEA is a system integrating environmental, economic and social records (accounts) in a single structure for taking evidence-based and effective management decisions: accounts of agriculture, forestry and fishery; accounts of emissions in the ambient air; energy accounts; accounts of environmental activities; accounts of ecosystems; land accounts; accounts of material flows and water accounts. An important aspect of using SEEA in official statistics activities is the Experimental Ecosystem Accounting constituting an integrated statistical framework for the compilation of biophysical data, accounting of ecosystem services, monitoring of change in ecosystem assets and linking this information to economic and other human activities.

The SEEA Experimental Ecosystem Accounting supplements the central SEEA structure by another perspective. It means that the central SEEA structure considers "selected environmental assets" such as water resources, energy resources etc. and ways of these assets' interactions between environment and economy. Unlike this, the SEEA Experimental Ecosystem Accounting involves the ecosystem perspective and considers the way of environmental assets' interactions as part of natural processes in a given spatial zone. This Accounting has a system of environmental accounts, providing a cohered and comprehensive grasp of ecosystems (Figure 5, created and constructed by the authors):

1. The account of ecosystem's size, providing the overall "starting point" for the ecosystem accounting and systematizing the information on the extent of various types of ecosystems in quantitative terms.

2. The account of ecosystem's condition, measuring the overall quality of ecosystem's asset and fixing, in form of key indicators, the ecosystem's condition or operation from the perspective of its naturalness and capacity for providing ecosystem services.

3. The account of ecosystem services, which is a set of ecosystem accounts analyzing the supply of

ecosystem services and their beneficiaries classified by broad categories of national accounts or other groups of economic units.

4. The account of cost assets, recording monetary values of initial and final endowments of all the ecosystem assets within the ecosystem accounting, increases and reductions in these endowments.

5. Thematic accounts referring to a set of accounts covering the accounts of land, water, carbon a biodiversity; they are autonomous accounts with direct importance for the accounting of ecosystem conditions and the assessment of policy reactions

Accounts of SEEA by material flow supplement and balance other data sets and accounts. The macroeconomic accounts of material flows are created by compiling various accounts (e. g. accounts of forestry, water, air emission etc.) in the consistent system of accounting. This set of incremental accounts makes up the overall material balance of the economy, with the flexibility in selecting accounts that are most relevant at national level.

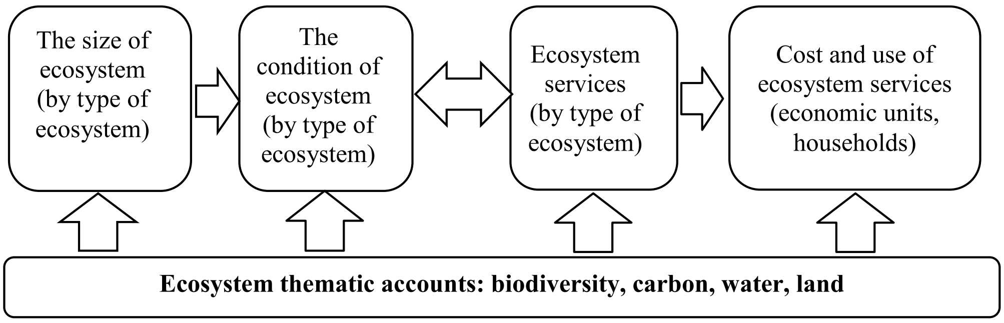


Figure 5. A module of SEEA experimental accounts of ecosystems

SEEA accounts of water resources (SEEA-Water) is an integrated approach to the monitoring water resources, combining a wide range of statistics pertaining to water resources in various sectors in an integrated statistical system. This set of accounts constitutes a conceptual framework, which, along with hydrologic information, provides economic information in a consistent manner. SEEA-Water has three main types of accounts for recording the hydrologic system and its relationships with economy:

– accounts of physical flow, recording physical flows of water resources between environment and economy: water intake by economy, water incoming in economy and its reverse flows back to environment;

– accounts of physical assets, giving a description of the hydrological cycle during a reporting period: the endowments of water and their exhaustion, including reference to water intake and consumption by economy;

– economic accounts including, inter alia, the flows pertaining to other water products, information on the expenditures on water use and supply and information on the financing pertaining to water.

The Central SEEA structure lays the foundation for the sustainable environmental-economic accounting, because the processes and improvements involved in it result in the information showing the relationship between country's environment and economy. It should be noted that the appropriate composition and system approach of SEEA makes it a perfect framework for measuring SDG indicators and provides additional information for many other sources. The UN Committee of Experts on Environmental-Economic Accounting (UNCEEA) has exerted heavy effort to harmonize SEEA and SDG frameworks, and now 40 indicators for nine SDGs can be estimated using SEEA data. Besides that, SEEA has good positions for supporting the progress in a series of key global initiative, e. g. the 2030 Agenda, the Post-2020 Biodiversity Framework and the international climate policy.

Today, data and estimates are available for 92 SDG indicators pertaining to the environment, but the world is yet to approach the final goal – to implement the environmental dimension of DSGs until 2030. But some news can be regarded as positive.

The global accessibility of SDG data grew up to 59% in 2022 from only 34% in 2018 and 42% in 2020. Although only 38% of environmental indicators give evidence of an improvement in the environmental performance, it is much better than only 28% in 2020. Besides than, indicators of some SDGs demonstrated strong positive tendencies, in particular SDG 9 on infrastructure, SDG 7 on energy and DSG 6 on sweet water.

The integrated character of SDGs reflects the interrelated nature of land and water ecosystems and rich biodiversity supported by them, thus providing for food, clean water and air, as well as for raw materials, which stimulates economic growth that ensures prosperity and human life. Hence, the achievement of SDGs requires an integrated approach accepting the causality between these problems and their solutions.

By means of statistical analysis, it enables for understanding the specifics of impact of various factors and effects on sweet water and seawater ecosystems.

The global political debate will benefit from new analytical approaches to understanding crucial interrelations and driving forces determining the tendencies of individual indicators. The used analytical approach can have potential contribution in a more relevant integrated analysis.

It should be noted that the indicators are grouped into four categories: environmental performance; driving forces of change; human welfare; socio-economic and environmental factors.

The analysis could confirm many known causalities between sweet water and seawater ecosystems and variable factors. It also revealed several new causalities that could not be easily explained by existing literature, which requires further studies, in order to find out if they were recently identified factors. Consideration of these new factors may have great importance in elaborating new innovative policies for the protection of these ecosystems. The estimation of indicators at national level can allow for a more comprehensive and effective interpretation of essential causalities than at global level, but global tendencies remain to be critically important for the assessment of overall progress on the way to SDGs. A unique aspect of the analysis is the inclusion of causalities at both global and national level. Although some causalities could be revealed at both levels, others could be found at more detailed national level. Diverse positive and negative causalities revealed between ecosystem performance, driving forces of change, human welfare and socio-economic and environmental factors demonstrate that loosely correlating factors need to be included in the analysis. Although some factors occur in global and national dimension, determining of other national factors considered as ones that have synergies or compromises with water and related ecosystems is a necessary step in elaborating targeted policies

The inclusion of global and national level in the statistical analysis allowed for confronting global causalities with national thematic research and highlighting the impact of disaggregated data. Thus, efforts for water protection had a constant positive correlation with indicators of sweet water ecosystems at both levels, whereas indicators of the effectiveness of water use correlated with sweet water ecosystems only at national level.

However, the analytical approach found some critical gaps in the data on water ecosystems and raised doubt in the applicability of some indicators for identifying significant change in the condition of sweet water and seawater ecosystems.

Whereas the lack of disaggregated data for water intake limited the capacity for robust assessment of coastal ecosystems.

Conclusions. It is very important that the effective use of the set of SDG indicators should be followed up by disaggregating the data able to inform subnational policies, with sustaining the comparability at global level. Because data and indicators are key to taking evidence-based political decisions, determining the practicability of options and inconsistencies that may result from the decisions, decreasing the cost of these inconsistencies and finding appropriate compromises.

The rethinking of applicability of the existing methodologies for constructing sets of indicators for analysis of the environmental change is required to improve the procedures for collection of data for other indicators pertaining to environment. It is expected, however, that methods and tools will be elaborated in parallel, to simplify data use by politicians working in political or geographical dimensions. A fuller understanding of the causalities involved in SDGs will eventually allow for enhancing the effectiveness of elaborated political actions. Thus, integrated management of water resources is the optimal political response requiring the inclusion of an evidence-based analysis of most relevant external factors determining ecosystem and resource problems, system approach to planning and conventional approach focused on contributions of stakeholders. This has critical importance in cohering policies with evidence-based and relevant recommendations.

The 2030 Agenda is elaborated in a way to cohere economic, environmental, political and social dimensions. The achievement of sustainable development depends on understanding of synergies and compromises between the implemented actions and the actions that may impede or enable them. Thus, the series "Measuring Progress" explores the causality between environmental indicators and economic or social indicators. In the report "Measuring Progress: Environment and the SDGs" (2021), these SDG indicators are put on the map by means of DPSIR (Drivers, Pressures, States, Impacts, Responses) framework and classified into indicators of environmental performance, social performance and direct impact, which allows to determine their synergy by means of simple correlation. But a simple correlation analysis could provide only a limited perception of the causalities that often proved to be complex and, hence, required further studies for the effective policy setting. An attempt to determine statistical links between some factors and SDG indicators of environmental dimension failed to give effective results. The report puts emphasis on the need for data and methods allowing for comprehensive multifactor analysis, to understand implications of the full set of SDG policies and elaborate new actions in a more effective way.

Considering the importance of disaggregated data and their role in determining targeted relationships between indicators, the assessment is performed for sweet water ecosystems at global, national and basin level, and for seawater ecosystems – at global and national level. A meaningful analysis going beyond the boundaries of the correlation analysis covers additional factors apart from population, GDP and geographic region, to improve understanding of the factors that have impact on the causalities.

The sustainable development and the 2030 Agenda can be achieved not only by the overall sectoral approach combining the tendencies of environmental indicators and a robust policy analysis. In view of this, analysis of mutual coherence between economic, environmental, political and social indicators from the water ecosystems perspective is expected as a theme of future research.

References

1. Rockström, J., & Sukhdev, P. (2016). How food connects all the SDGs. *Stockholm Resilience Centre*. Retrieved from https://www.stockholmresilience.org/research/research-news/2016-06-14-how-food-connects-all-the-sdgs.html

2. Kanter, D. R., Musumba, M., Wood, S. L. R., Palm, C., Antle, J., & Balvanera, P. et al. (2016). Evaluating agricultural trade-offs in the age of sustainable development. *Agricultural Systems, 163,* 73–88. doi: 10.1016/j.agsy.2016.09.010

3. Campagnolo, L., Carraro, C., Eboli, F., Farnia, L., Parrado, R., & Pierfederici, R. (2017). The Ex-Ante Evaluation of Achieving Sustainable Development Goals. *Social Indicators Research, 136 (1),* 73–116. doi: 10.1007/s11205-017-1572-x

4. Category: EU institutions glossary. *ec.europa.eu*. Retrieved February 08, 2023 from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Category:EU_institutions_glossary

5. EEA indicators. *eea.europa.eu*. Retrieved February 08, 2023 from https://www.eea.europa.eu/ims

6. Joint Research Centre (JRC). *ec.europa.eu*. Retrieved from https://ec.europa.eu/info/departments/joint-research-centre_en

7. Environment. *ec.europa.eu*. Retrieved from https://ec.europa.eu/environment/action-programme/

8. System of Environmental Economic Accounting. *seea.un.org*. Retrieved February 08, 2023 from https://seea.un.org/content/about-seea

9. Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 ‘Living well, within the limits of our planet’ (20123). *Official Journal of the European Union, 354/171*. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013D1386

10. Biodiversity strategy for 2030. (2020). *eur-lex.europa.eu*. Retrieved from https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX% 3A52011DC0244

11. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. A Roadmap for moving to a competitive low carbon economy in 2050. (2011). *eur-lex.europa.eu*. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011DC0112

12. Ecosystems and Human Well-Being: Wetlands and Water. Synthesis. (2005). *Millennium Ecosystem Assessment (MEA)*. Retrieved from https://www.millenniumassessment.org/documents/document.358.aspx.pdf

13. Water. *www.unep.org*. Retrieved from https://www.unep.org/explore-topics/water

14. Nabory danykh. Derzhavne ahentstvo vodnykh resursiv Ukrainy [Datasets. State Water Resources Agency of Ukraine]. *data.gov.ua*. Retrieved February 08, 2023 from https://data.gov.ua/organization/derzhavne-ahentstvo-vodnykh-resursiv-ukrayiny [in Ukrainian].

15. Dovkillia Ukrainy. 2021: stat. zb. [Environment of Ukraine.2021: Statistical Yearbook]. *Derzhstat Ukrainy*. Retrieved from https://www.ukrstat.gov.ua/druk/publicat/kat_u/2022/zb/11/zb_dovkillia_2021.pdf [in Ukrainian].

16. Commission of the European communities. Communication from the commission to the European parliament and the council on the production method of EU statistics:a vision for the next decade. (2009). *eur-lex.europa.eu*. Retrieved from URL: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM 2009:0404:FIN:EN:PDF

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Статистичне оцінювання сталих водних урбанізованих екосистем

Інтегрований і неподільний характер Цілей сталого розвитку (ЦСР) відображає взаємозв'язок водних екосистем та їх багатого біорізноманіття, що забезпечує суспільство продовольством, чистою водою та повітрям, сировиною, а також регулює його добробут та зростання економіки. Підвищення обізнаності щодо важливості доступу громадян до водних екосистем може позитивно впливати на ці екосистеми та заохочувати партнерства до відповідального управління такими ресурсами й реагування на водні кризи шляхом вдосконалення навичок і знань.

У статті зазначено, що розвиток партнерських відносин для досягнення цілей сталого розвитку є одним із завдань ЦСР 17. Представлено оцінку глобальних та національних завдань і показників, які є основою для оцінки прогресу в напрямі сталого екологічного обліку та розвитку водних міських екосистем. Варто зазначити, що статистична інформація поділяється на чотири групи, дані яких використовуються для моніторингу стану зеленої економіки: статистична база природних активів; екологічна та ресурсна продуктивність економіки; екологічна якість життя; економічні можливості та політична реакція. Аналіз показав важливість включення екологічного аспекту у відповідні просторові угруповання. Агрегації на основі водозбірного басейну або екосистеми можуть дати краще розуміння екологічного виміру багатьох взаємозв'язків, визначених для прісноводних і морських екосистем. Проте очікується, що застосовувані методи та інструменти будуть розроблені одночасно для полегшення використання даних політиками. Поглиблення розуміння взаємозв'язків ЦСР зрештою дасть змогу розробляти ефективніші політичні заходи.

Зроблено висновок, що реалізація сталого розвитку та Порядку денного у сфері сталого розвитку на період до 2030 року можлива лише з використанням загальногалузевого підходу, який об'єднуватиме тенденції руху показників, пов'язаних із навколишнім середовищем, з надійним аналізом політики. Це вимагає узгодженості політики у сфері сталого розвитку за всіма його аспектами на основі інтегрованого підходу для забезпечення розробки взаємодоповнювальних стратегій та уникнення компромісів.

Ключові слова: *статистичне оцінювання, водні ресурси, еколого-економічний облік, Цілі сталого розвитку, екосистемні послуги.*

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