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Workshop Challenges in the Measurement of
Nature In Official Statistics

Beyond-GDP Measures and the Link with Natural Assets Accounting: the Istat Experience

Fabiola Riccardini

Istat | Dipartimento delle statistiche economiche, ambientali e contabilità nazionale

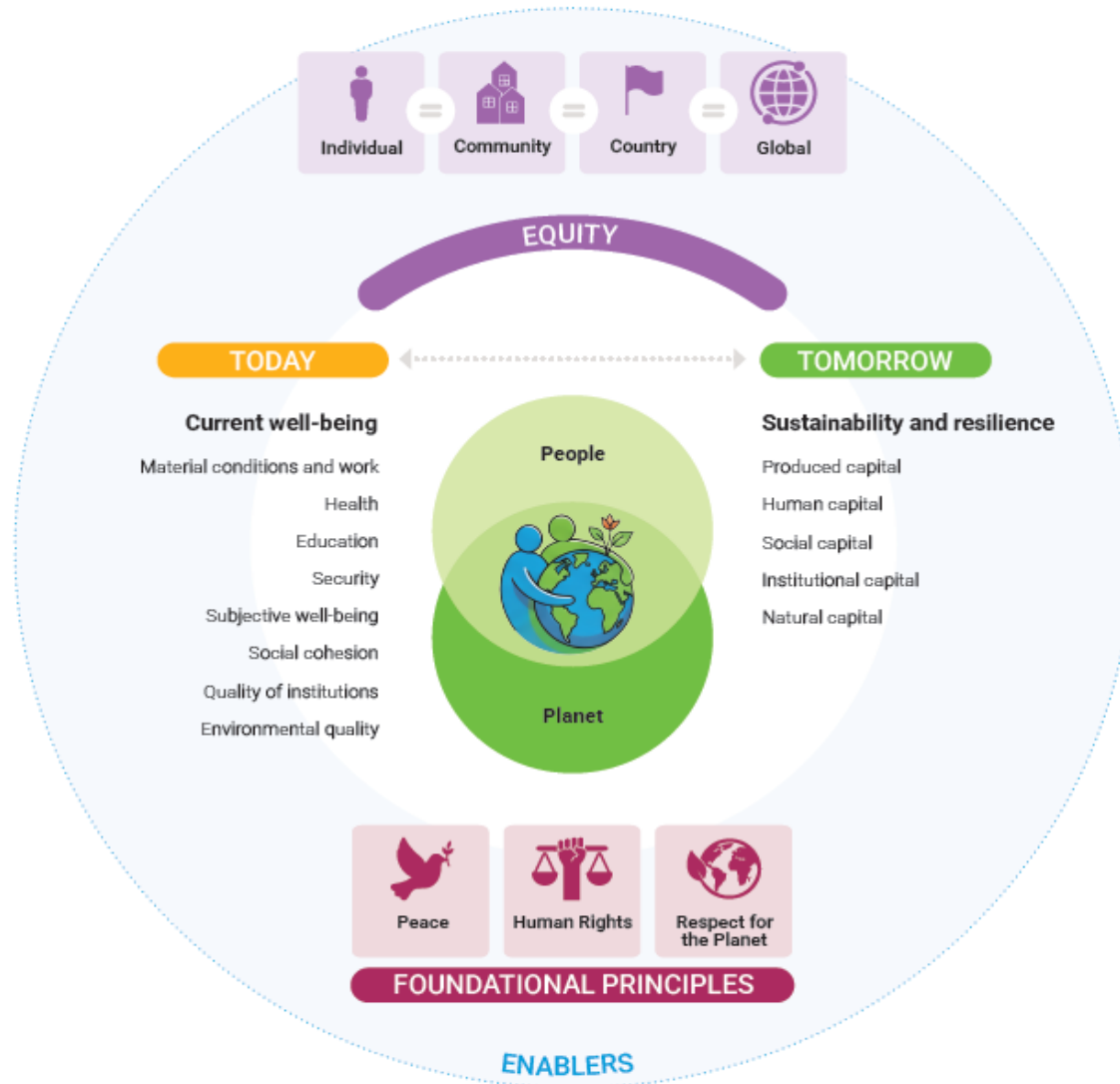
Contents

- Beyond GDP and the UN-HLEG framework
- Environmental indicators inside the UN-HLEG framework and their characteristics
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Defining Progress and measuring it in UN-HLEG framework

- UN HLEG Report is a response to **decades of research** and to **national and international efforts** to measure progress, **including work undertaken in the context of the SDGs**, promoting convergence of past and ongoing initiatives.
- It proposes **global norms** for measuring progress beyond GDP: a **conceptual framework**, a **dashboard of indicators**, avenues for future **headline indicators**, and **priorities for statistical development**, research, and national uptake.
- At the heart of the framework lies the well-being of people and planet. **Progress means equitable, inclusive and sustainable wellbeing. It is multidimensional and intergenerational in scope, recognising that wellbeing depends on economic, social, institutional and environmental conditions and how sustainable those conditions are over time.**
- The dashboard builds on **what already exists** (half of the indicators are drawn from the SDGs) and from **national experience** in measuring wellbeing, incorporating **other measures for dimensions of progress: social cohesion, subjective wellbeing, and institutional quality.**
- Because the dashboard is not always the most effective tool for public communication, it recommends developing **headline indicators.**

A conceptual framework for measuring equitable, inclusive, and sustainable well-being and progress in the UN-HLEG



31 indicators around for 4 components:

1. Fundamental principles: peace, human rights, **respect for the planet**
2. Current wellbeing, measured across people's lived experience: material conditions and work, health, education, security, subjective wellbeing, social cohesion, quality of institutions, and **environmental quality**
3. Equity and inclusion, a cross-cutting dimension
4. Sustainability and resilience, which connects present outcomes to future wellbeing through key forms of **capital**: produced, human, social, institutional, and **natural**

Well-being multidimensional concept, a set of indicators that complement GDP,

This framework is based on the Capabilities Approach of A. Sen and the Stiglitz-Sen-Fitoussi Report

Environmental indicators for a Healthy Planet and People in the UN-HLEG

Main points from the report:

1. A healthy planet and environment through a dual perspective: **intrinsic value of the planet** and its environment, as well as the environment as a **crucial determinant of human wellbeing**.
2. The **need for protecting the planet even when there are no apparent immediate economic benefits** of doing so.
3. Environment indicators: on **boundaries within which humanity can thrive**, (including through climate stability, biodiversity, fertile soil and clean water). If the limits are breached, we risk irreversible tipping points.
4. Environment indicators: on **contributions to human wellbeing** (clean air and water are key for our health, fertile soil and pollination secure food systems, and forests regulate floods and stabilize local climates).
5. The dual perspective **prevents a «sustainability mirage», in which economic or human capital accumulation masks ecological degradation or wealth indicators overstate sustainability** in cases where decreases in natural capital are compensated by increases in other forms of capital. Without explicit focus on planetary boundaries, such trajectories could be misinterpreted as sustainable.
6. **Climate change and environmental damage often hit the poorest communities the hardest.** The resources and environment of future generations are significantly affected by today's disregard for our planet.
7. **Cross-border spill overs:** protection of a stable climate requires collaboration and solidarity across countries, fundamental for people and planet.

Indicator types for the environment in the UN-HLEG

1. Planetary boundaries: as part of our fundamental principle:

- *Total greenhouse gas emissions and greenhouse gas emissions per capita*
- *Biodiversity intactness index*

2. Human-centric indicators, current wellbeing/environmental quality (SDG6, SDG13, SDG14, SDG15): focused on environmental quality and its impact on current wellbeing (such as pollution and access to clean water), which capture the direct link between planetary wellbeing and human wellbeing:

- *Annual mean levels of fine particulate matter in cities*
- *Proportion of population using safely managed drinking water services*

3. Natural capital indicators: used to assess whether society is sustaining or eroding the base that supports current and future wellbeing and progress. - *Environmental assets (land, water, soil, and subsoil resources, etc.) building on the SEEA and complemented by Ecosystem Accounting approaches that capture ecosystems as integrated assets*

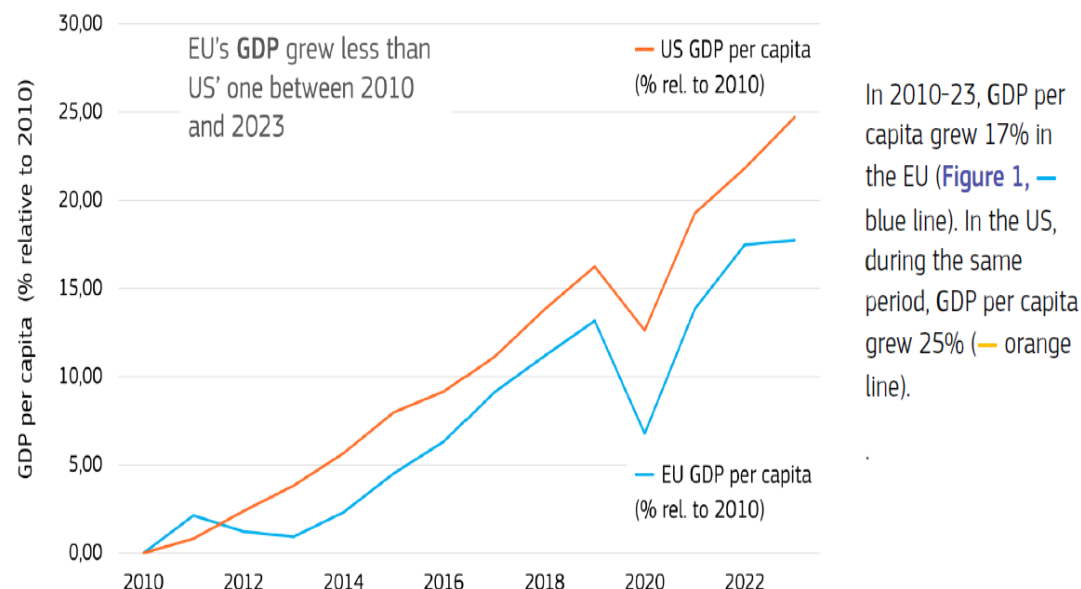
Points of reflection for nature measurement from the HLEG Report

The report points to a **process** and provides some tenets **for official statistics**:

- The **planetary boundaries** are explicitly taken into consideration. Inside them, humans should act for their well-being and the planet's health.
- It seems to embrace **strong sustainability** rather than weak;
- The research programme it supports is not aimed at building a «corrected» GDP (for inclusive and net of depletion of capitals it may be), **but to develop measures that fit with the people's lives beyond GDP.**
- It invites to capture **the intrinsic value of the environment in statistics: the focus of measurement have to no longer be immediate economic benefits**
- It is important to have **a global framework for global policies for planet and people's well-being.**
- We have to select with parsimony, relevance, accuracy, and quality the indicators that influence current and future well-being, **by the UN Fundamental Principles of Official Statistics.**

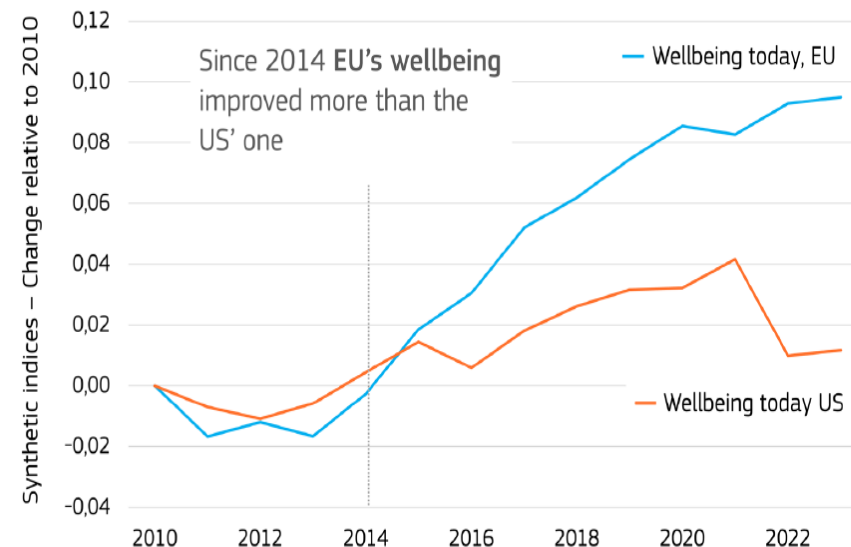
Applications from the UN-HLEG Report

Figure 1 – GDP per capita growth (in 2015 PPP) since 2010, EU and US



Source: JRC compilation of data from the World Bank.

Figure 2 – Wellbeing today since 2010, EU and US



Source: JRC compilation of data from the OECD, World Bank, UN, ILO, World Happiness Report, Eurostat.

When we will see, along with annual/quarterly data on GDP, the well-being annual/quarterly data, we will see a different picture of reality, closer to people's lives (see Giovannini et al. JRC, 2026).

We should do the same for «the Economic-Productive Wealth» and the «index for Environmental Progress»

Sustainability in the UN-HLEG framework: SNA2025



Contribution from SNA 2025

Specific chapters on well-being and sustainability



First data production 2030

Figure 35.1: Components of four capitals

Type of capital	Main components	Links to SNA and SEEA measurement boundaries	
		SNA	SEEA
Economic capital	Produced non-financial assets (excluding natural resources)	Assets in the integrated framework of national accounts	
	Non-produced non-financial assets (excluding natural resources)		
	Financial assets and liabilities		
Natural capital	Natural resources <ul style="list-style-type: none">• Land• Mineral and energy resources (renewable and non-renewable)• Biological resources• Water resources• Other natural resources		Environmental Assets <ul style="list-style-type: none">Individual natural resources*
	Ecosystem assets		Ecosystem assets
Human capital			
Social capital			

* Note that the SEEA excludes the radio spectra and renewable energy resources.

Points of reflection from the SNA 2025

- SNA 2025 on well-being and sustainability: «**aggregation across capitals and interpretation of any balance sheet values in monetary terms should be undertaken cautiously and using as much complementary data as possible**».
- Many international institutions are dealing with the implementation of SNA 2025 and most countries are scheduled to produce their first official national accounts estimations under the 2025 SNA between **2028 and 2031**. Due to the scale of the transition, first official international data transmissions—such as those required by **Eurostat**—are widely targeted for **September 2030**

Weak and strong Sustainability

Weak: The different forms of capital - natural, human, and produced - are in principle substitutable, and their aggregate monetary value constitutes a meaningful index of the productive base from which future well-being can be derived

. Examples: Wealth Accounts (World Bank, The Wealth Reports, and the Inclusive Wealth Report by UNEP) ➡ correction of GDP.

BUT Daly (1992) demonstrated that the tripartite distinction between allocation, distribution and scale corresponds to analytically distinct problems that cannot be collapsed into a single monetary aggregate without irreversible loss of information. The physical throughput of materials and energy relative to the regenerative capacity of natural systems is not an issue that price signals can resolve endogenously. Wealth aggregates constructed on market or shadow prices are therefore constitutively incapable of signalling whether the economy operates within biophysical limits. Furthermore the monetary wealth aggregates cannot capture the scale dimension.

Radermacher, Steurer 2015: The «monetization possibility frontier», beyond which causation adds uncertainty and error rather than information

The narrow capital approach, monetizing natural capital and aggregating it into a total wealth figure for the purpose of tracking society's performance over time, is not adequate for monitoring sustainable development. It misleads rather than informs

Strong: Substitutability between different forms of 'capital' is limited. For some forms of capital (e.g. critical natural capital), there is no substitutability, i.e. no other forms of capital can produce the same goods or services.

The **Conference of European Statisticians** explicitly declined to endorse monetary wealth aggregates as core sustainability indicators precisely on the grounds that such accounts cannot be made fit for monitoring purposes across the full range of natural assets (UNECE 2013).

It is not possible to monetize all forms of capital... and may be is not useful use the word "capital" for representing Nature!

Weak Sustainability: UN Enviromental Programme

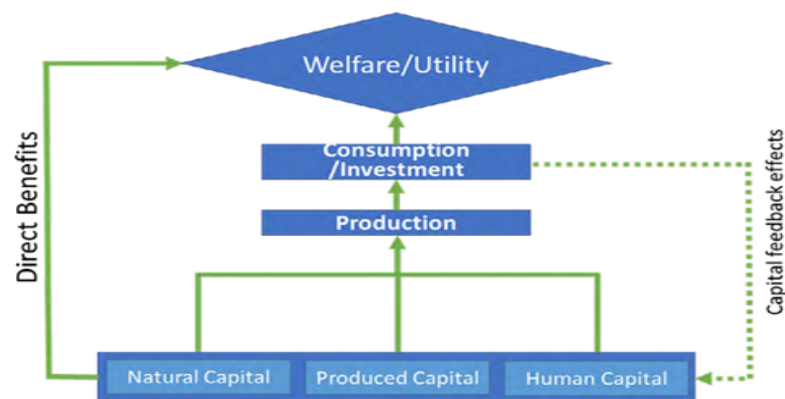


Figure 5.1: A three-capital model of wealth creation

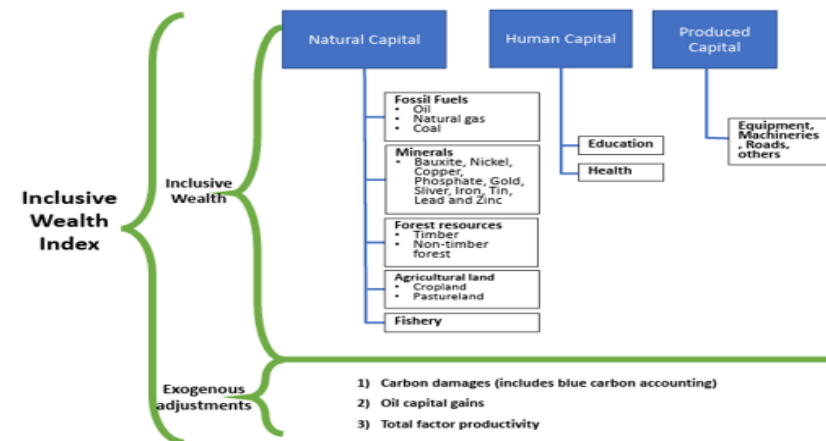


Figure 5.2: Schematic representation of the Inclusive Wealth Index and the Adjusted Inclusive Wealth Index

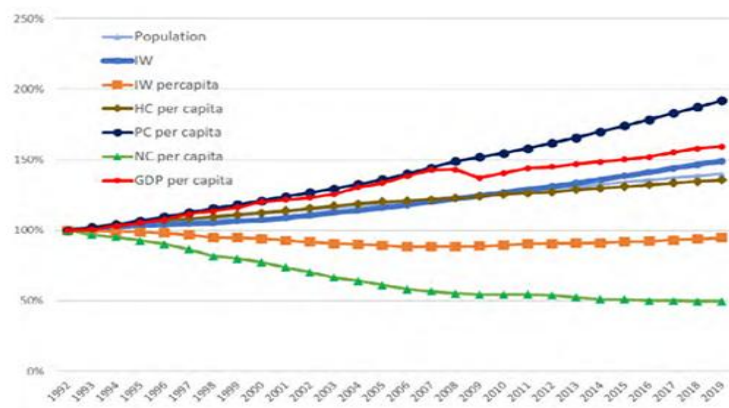


Figure 5.9: Changes in worldwide inclusive wealth per capita and other indicators, 1992–2019

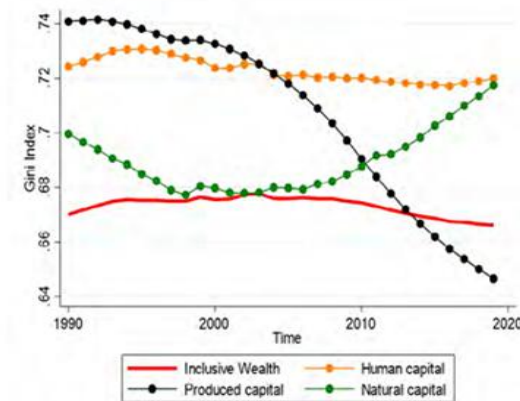


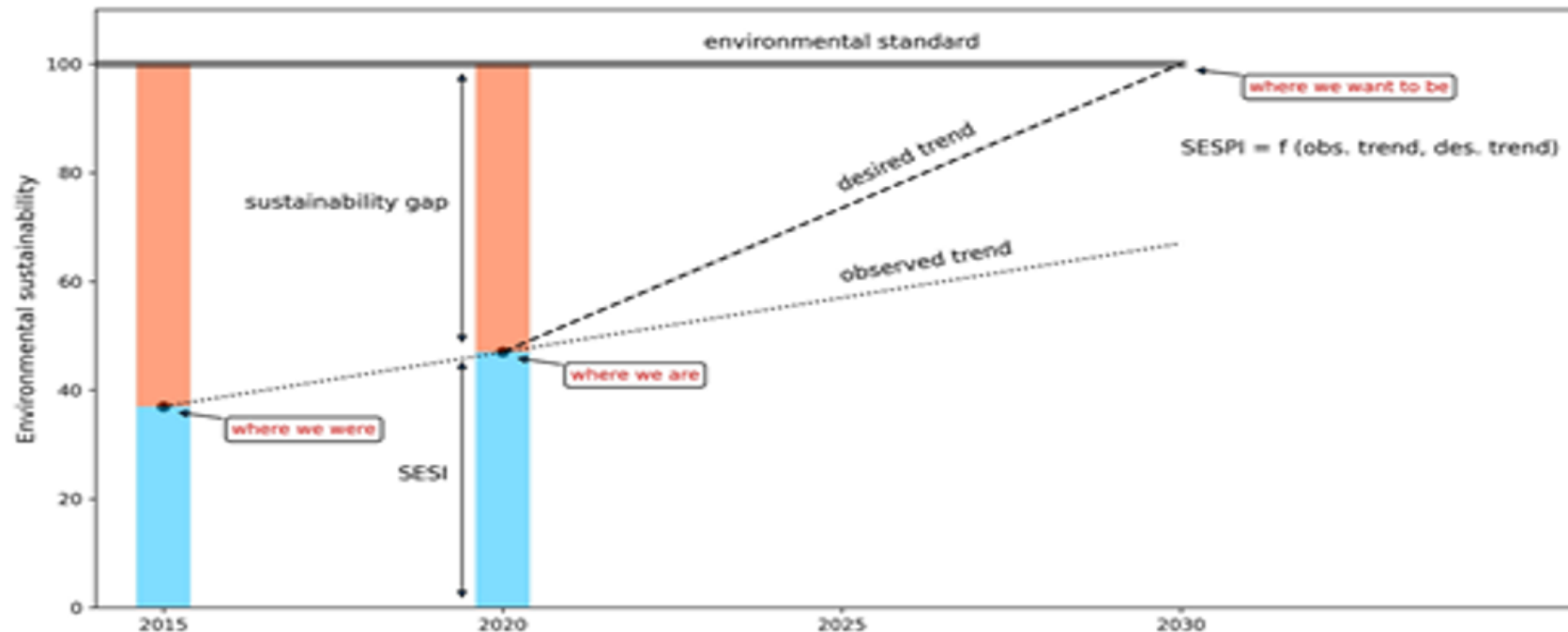
Figure 5.13: Global Gini coefficient of Inclusive Wealth and its components, 1990–2019

Strong Sustainability: ESCAP methodology

The Strong Environmental Sustainability Progress Index (SESPI)

Usubiaga-Liano, A. and Ekins, P. 2022 'Are we on the right path? Measuring progress towards environmental sustainability in European countries', *Sustainability Science*, doi.org/10.1007/s11625-022-01167-2

Source; Ekins' presentation for this workshop



Sustainability in UN-HLEG framework: SEEA EA

UN-HLEG indicators, in particular 3.

Sustainability and Resilience

- Environment assets (land, water, soil, and subsoil resources, etc) building on the SEEA and complemented by Ecosystem Accounting approaches that capture ecosystems as integrated assets

SEEA Central Framework:

Environmental flows. The flows of natural inputs, products and residuals between the environment and the economy, and within the economy, both in physical and monetary terms.

Stocks of environmental assets. The stocks of individual assets, such as water or energy assets, and how they change over an accounting period due to economic activity and natural processes, both in physical and monetary terms.

Economic activity related to the environment. Monetary flows associated with economic activities related to the environment, including spending on environmental protection and resource management, and the production of 'environmental goods and services'.

on water, minerals, energy, timber, fish, soil, land and ecosystems, pollution and waste, etc. aligned with those of the System of National Accounts, this environmental information can then be **integrated with economic information**

SEEA EA:

about habitats and landscapes, the ecosystem services, tracking changes in ecosystem assets, and linking this information to economic and other human activity.

The five ecosystem accounts are:

1. ECOSYSTEM EXTENT accounts record the **total area of each ecosystem**, classified by type within a specified area (ecosystem accounting area). **Ecosystem extent** accounts are measured **over time** in ecosystem accounting areas (e.g., nation, province, river basin, protected area, etc.) by ecosystem type, thus illustrating the changes in extent from one ecosystem type to another over the accounting period.

2. ECOSYSTEM CONDITION accounts record the **condition of ecosystem assets** in terms of selected characteristics at **specific points in time**. **Over time**, they record the changes to their condition and provide valuable information on the health of ecosystems.

3. & 4. ECOSYSTEM SERVICES flow accounts (physical and monetary) record the supply of ecosystem services by ecosystem assets and the use of those services by economic units, including households.

5. MONETARY ECOSYSTEM ASSET accounts record information on **stocks and changes in stocks** (additions and reductions) of ecosystem assets. This includes accounting for ecosystem degradation and enhancement.

The SEEA EA also supports 'thematic accounting': such as **biodiversity, climate change, oceans and urban areas, protected areas, wetlands and forests**.

Points of reflection from SEEA EA for Natural Capital for HLEG framework

- There are **measurement issues still open**; experts from various **statistical institutes are discussing them**. Many International institutions are organizing meetings to discuss the implementation, i.e. UNECE/OECD Expert Group on implementation of SEEA on 24-26 March 2026, UNECE Conference of EU Statisticians on 4-5 May 2026, the next London Group meeting on September 2026. For Europe the first obligation to provide data is 2026.
- **Appropriate calculations and data collection are still necessary** in order to achieve an harmonization of data and space for specificities **representing natural assets**. Therefore, the beyond GDP set of **global indicators for natural capital**, identified by HLEG, in according to the UN methodological classification, should be **classified in tiers 2 and 3**
- In principle, first we have to produce data from the SEEA CF on natural assets; secondly we need to have extensions and conditions of ecosystems data; finally we could add ecosystem services. In addition more work on **how to deal with monetary values related to ecosystem services**: some official statisticians consider them “exchange values” of ecosystem services because they equate them with goods and services in market transactions. **Others consider them differently and estimate them at values other than their potential exchange values: “values connected to” or “dependent on” ecosystems**. This means valuation at costs, or cost opportunity, or risks related to services, or according to their degradation, depending on the services that are estimated each time (as *Istat 2023, AMBIENTE E TERRITORIO, Strumenti e Metodi per un’analisi del consumo di risorse e degli ecosistemi*), Comitato per il Capitale Naturale 2022, *VI Rapporto sullo Stato del Capitale Naturale in Italia*) and this workshop is a step forward for harmonization of such a data.
- Once again, **the correction of GDP and the wealth accounts are misleading**.

Italy: BES/SDGs and natural resources



BES, Benessere equo e sostenibile, 12 fundamental domains, with about 150 indicators, started in 2010 and an annual report from 2013.

From 2016 for a smaller set of indicators, an annex to the Economic and Financial Document is provided, which includes an analysis of recent trends and an assessment of the impact of the proposed policies.

SDGs, 17 goals and 169 targets, with about 250 indicators, started before 2015, and an annual report from 2016

The set of BES/SDG are part of the **process of Beyond GDP**, but not all: **We are completing our framework, taking in consideration the UN-HLEG framework, with the experience of National Accounts in contributing to these two dashboard of indicators with the satellite accounting too**

Environmental, Landscape and Quality of Services indicators for Natural Resources inside BES-ITALY

AIR & CLIMATE

- Air quality – PM2.5
- CO2 Emissions trends
- Extreme precipitation events
- Warm spell duration index
- Greenhouse gas emissions
- Electricity from renewables
- Consecutive Dry Days
- Climate change concern

LAND & NATURE

- Concern for biodiversity loss
- Soil sealing (artificial cover)
- Population at risk: Flood
- Coastal bathing waters
- Protected natural areas
- Urban green spaces
- Population at risk: Landslides
- Domestic material consumption

WASTE & WATER

- Municipal waste generated
- Landfill of waste
- Water system losses
- Satisfaction for environment
- Separate collection service
- Contaminated sites
- Sewage treatment coverage
- Resource efficiency

HERITAGE & SERVICES

- Landscape deterioration concern
- Mining & quarrying pressures
- Municipal waste services
- Environmental satisfaction
- Impact of forest fires
- Irregularities in water supply
- Cultural heritage integrity
- Public service reliability





Environment for the well-being: focus on social aspects

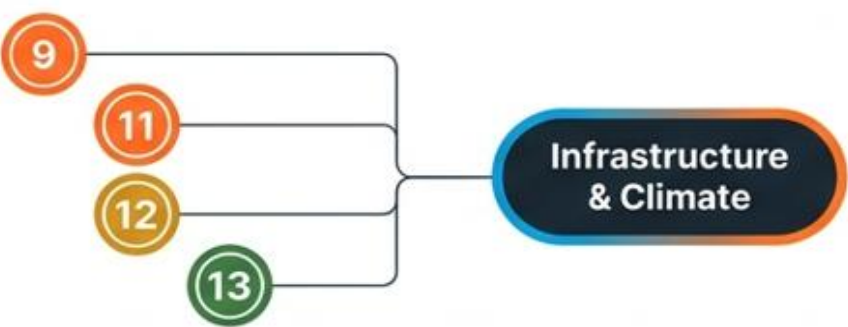
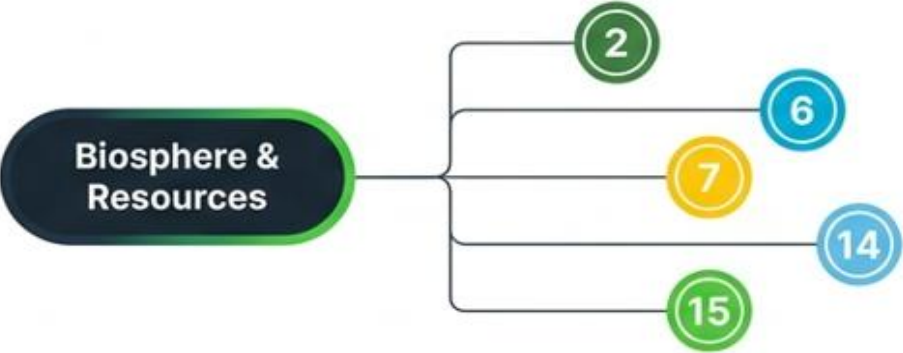
Source: ISTAT - Benessere Equo e Sostenibile (BES) Framework

Defining the Environmental Architecture of the Istat SDGs

9 Goals Analyzed

Tracking the ratio of Environmental Indicators (EI) to Total Indicators across Biosphere, Society, and Economy.

	Identical (Id)	Directly mirrors the UN global indicator.
	National Context (Nc)	Adapted to specific national measurement frameworks.
	Proxy (Pr)	An alternative metric approximating the UN global indicator.
	Partial	Captures a specific subset of the UN global indicator.




Defining the Environmental Architecture of the Istat SDGs

SDG ENVIRONMENTAL METRICS [1/3]

Metric Types: [Id] = Identical, [Nc] = National Context, [Pr] = Proxy

Pillar I: Measuring the Biosphere

Fundamental indicators tracking the health, stability, and biodiversity of our foundational natural ecosystems.




Terrestrial Ecosystems & Land (Goals 15 & 11)

1. Forest & Land Health
Forest area proportion (15.1.1) [Id/Nc]
Sustainable forest management progress (15.2.1) [Id]

2. Biodiversity
Protected area coverage for terrestrial/freshwater (15.1.2) [Id/Nc] & mountain biodiversity (15.4.1) [Id]
Mountain Green Cover (15.4.2) [Id]
Red List Index (15.5.1) [Pr]

3. Land Degradation & Threats
Proportion of degraded land (15.3.1) [Pr/Nc]
Land consumption rate vs. population growth (11.3.1) [Pr/Nc]
Illicitly trafficked wildlife (15.7.1) [Pr]
Invasive alien species legislation (15.8.1) [Nc]




Aquatic & Marine Life (Goals 6 & 14)

1. Water Ecosystems
Change in extent of water-related ecosystems (6.6.1) [Id]
Ambient water quality (6.3.2) [Partial/Pr]

2. Ocean Health
Proportion of fish stocks within biologically sustainable levels (14.4.1) [Pr]
Beached marine litter (14.1.1) [Nc]

3. Marine Protection
Coverage of protected areas in relation to marine areas (14.5.1) [Nc/Pr/Id/Partial]



Climate Stability (Goal 13)

1. Emissions Base
Total greenhouse gas emissions per year (13.2.2) [Id/Nc]

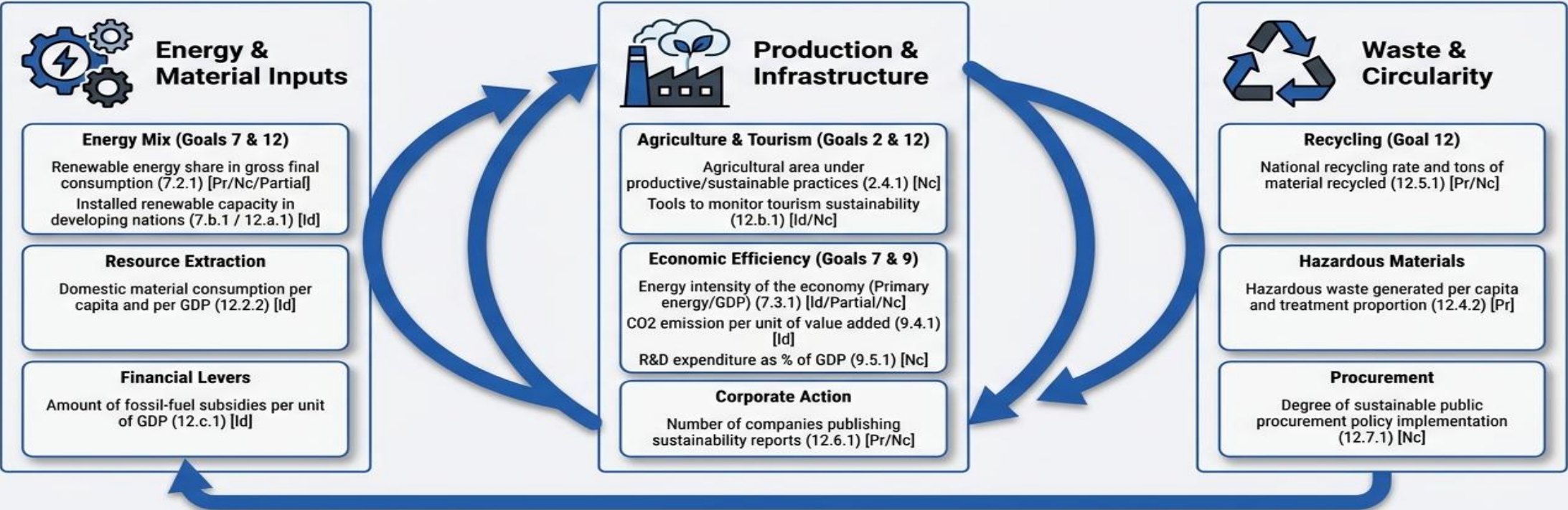
2. Systemic Alignment
Extent of sustainable development integration into national policies, curricula, and education (13.3.1) [Pr]

Defining the Environmental Architecture of the Istat SDGs

SDG ENVIRONMENTAL METRICS [2/3]

Pillar II: Indicators of the Sustainable Economy

Metrics tracking the efficiency, circularity, and resource intensity of global production and infrastructure.



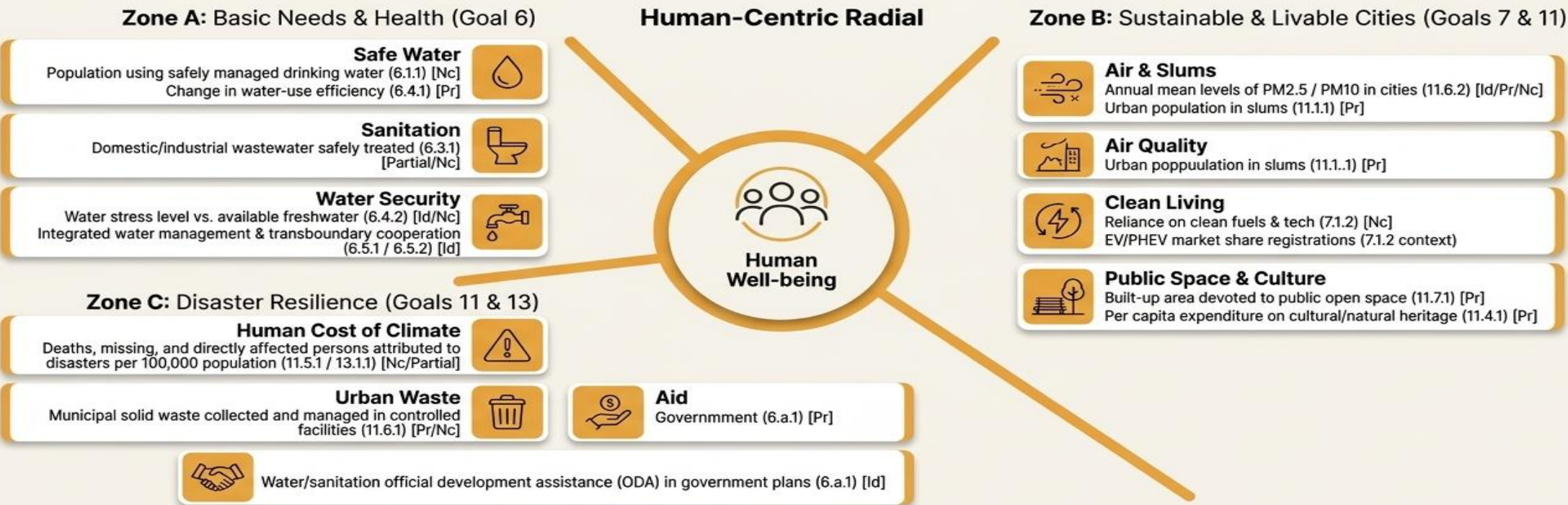
NotebookLM

Defining the Environmental Architecture of the Istat SDGs

SDG ENVIRONMENTAL METRICS [3/3]

Pillar III: Social Well-being & Human Impact

Indicators directly correlating environmental conditions to human health, community resilience, and quality of life.



NotebookLM

Points of reflection from BES/SDGs dashboard in Italy

Is this sufficient for the HLEG prescriptions?

- Not completely, we have now to go further for selecting **environmental indicators** that analyse in details the **relations between economy, society and the biosphere characteristics and limits**, looking to well-being of people (we could see for each BES domain, for example, the impacts of go beyond the planetary limits on health of people, and planet).
- The **SEEA accounting** contribute to the BES/SDG dashboard, in particular for **7,12,13,14 e15**. The intention is to enlarge its contribution.
- We should think also **how to aggregate in a composite index or headline indicators**, that represent sustainability (critical resources and not critical) **if possible**.
- **The way forward for ISTAT is to adjust and develop a framework fit to the HLEG one**, taking in consideration the BES/SDGs frameworks, advanced example of measures for well-being and sustainability. **Data from SEEA EA are crucial and when they will be available we can complement the set of measures for a sustainable environment. The positive point is that official statistics is well involved in the implementation of SEEA EA.**
- The cross-border spill over effects still have to be addressed: i.e., oceans and seas have not only national border.

Conclusion and the way forward

1. The conceptual framework and set of indicators derived from the **HLEG report** leave room for the development of **environmental indicators that adhere to the concept of strong sustainability**. Especially the section on sustainability and resilience for the future wellbeing, needs to be developed, and **explicit reference is made to the SEEA and complemented by Ecosystem Accounting that capture ecosystems as integrated assets**.
2. This workshop is contributing to focus the attention on those environmental accounting and it is clear that **Official Statisticians have taken under their responsibility, by producing national official data and following the UN Fundamental Principles of Official Statistics**.
3. The report suggests the global framework and the **process for going beyond GDP** for Official Statistics. **Planetary limits and current well-being, as well as future wellbeing are the key elements. The intrinsic value of the environment should be measured**, without immediate economic benefits too.
4. Istat for **Italy is adapting its systems of beyond-GDP indicators to the HLEG requirements**, even though Istat has a long tradition in using indicators practice for the **BES/SDGs framework for measuring well-being and sustainable development**. Many of those **indicators** are focusing the attention on the **environment**, and are trying to capture the **relations among economy, society and healthy biosphere**.
5. There are several **measurement issues still to be resolved and data collection practices** conducted in order to arrive at a shared set of indicators **for natural capital**. Italy will actively participate at the UNStatCom to advance the beyond-GDP project as well. According to the UN methodological classification of **indicators**, the natural capital ones **should be classified in tiers 2 and 3**.

Thank you

Fabiola Riccardini, fabiola.riccardini@istat.it



Istat

Istituto Nazionale
di Statistica

Beyond GDP and the UN-HLEG

Historically, it arose from the need to overcome the limitations of GDP as the sole indicator of well-being and progress, as early as the 1970s with the **report "The Limits to Growth."** Then, with Amartya Sen and the **Human Development Index**, and the **Stiglitz Sen-Fitoussi Report**, leading to the adoption of more comprehensive indicators than economic ones, including environmental, social, and equity factors, as well as sustainability.

OECD began measuring progress and promoted social and environmental indicators alongside economic ones. **"How is life?"** 2012

Sustainable Developments Goals (2015)

UN meeting in 2024 on the **"Compact for the Future,"** which envisioned the development of a global framework of measures that complement GDP to reflect on the relevant dimensions of sustainable development.

The recent (2025) **"Seville Compromise"** highlighted the importance of statistical data in enabling evidence-based policy decisions and improving transparency, promoting public trust and international cooperation.



The **UN Secretary-General** tasked a **High-Level Group** to develop a **conceptual framework** that identifies key dimensions of progress and to develop an **initial list of nationally owned and universally applicable sustainable development indicators** to provide governments with the information they need. The High Level Expert Group

Many other International institutions or research centers follow this process, as UNCTAD, UNECE, UNEP, World Bank, JRC, European Commission, WISE, MERGE, SPES, along with many INS has developed measures on wellbeing and SDGs

Analysing Water/Energy-biophare/Food in Istat SDGs dashboard

Biosphere and Essential Resources: Measuring Ecological Baselines



NotebookLM

SEAA

Analysing the wellbeing of people in Istat SDGs dashboard

Infrastructure, Cities, and Climate Action: Tracking Human Impact

Goal 9 (Industry, Innovation & Infrastructure)

- CO2 emission per unit of value added ⓘ 1 Id
- R&D expenditure as proportion of GDP ⓘ 1 Nc



Goal 11 (Sustainable Cities & Communities)

- Land consumption vs population growth ⓘ 1 Pr | 1 I
- Disaster deaths & affected persons ⓘ 2 Nc | 4 Partial
- Controlled municipal solid waste ⓘ 1 Pr | 1 Nc
- PM2.5 & PM10 levels in cities ⓘ 2 Id | 4 Pr | 5 Nc
- Open public space share ⓘ 1 Pr



Goal 12 (Responsible Consumption & Production)

- Domestic material consumption ⓘ 3 Id
- Hazardous waste generated & treated ⓘ 3 Pr
- National recycling rate ⓘ 3 Pr | 2 Nc
- Published sustainability reports ⓘ 2 Pr | 4 Nc
- Sustainable public procurement policies ⓘ 1 Nc
- Renewable capacity in developing nations ⓘ 1 Id
- Tourism sustainability accounting ⓘ 1 Id | 2 Nc
- Fossil-fuel subsidies ⓘ 1 Id



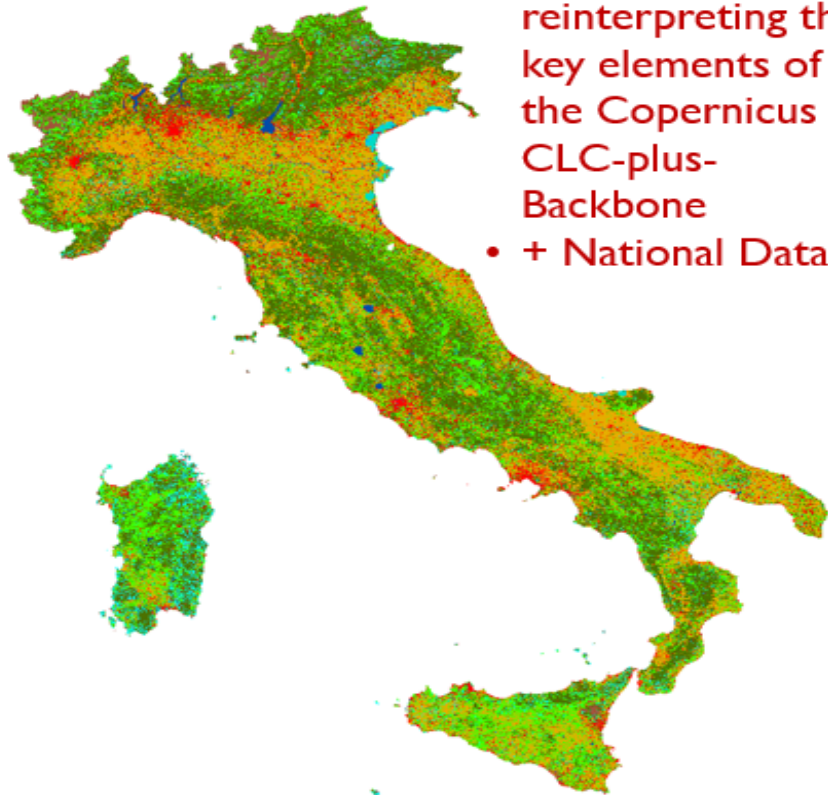
Goal 13 (Climate Action)

- Disaster deaths & affected persons ⓘ 7 Nc | 4 Partial
- Total greenhouse gas emissions per year ⓘ 3 Id | 6 Nc
- Integrated sustainable/global education ⓘ 1 Pr



PRELIMINARY MAP OF **IT** ECOSYSTEM TYPES (2021)

- 10-m. resolution
- national coverage
- Integrating and reinterpreting the key elements of the Copernicus CLC-plus-Backbone
- + National Data.



Preliminary data - 2021

Credit: Raffaella Chiocchini, Istat

- The first step in ecosystem accounting is mapping the extent of ecosystem. By combining a large number of geographical sources related to different themes, the Italian inter-institutional group has produced a preliminary map.
- With respect to the classification system and ecosystem types proposed by Eurostat
- In accordance with the guidelines provided by SEEA-EA

Preliminary Data - Ecosystem Type: Level I

	Name of ecosystem type	% Surface
1	Settlements and other artificial areas	9,37
2	Cropland	25,48
3	Grassland (pastures, semi-natural and natural grasslands)	24,89
4	Forest and woodland	31,36
5	Heathland and shrub	3,56
6	Sparsely vegetated ecosystems	3,91
7	Inland wetlands	0,07
8	Rivers and canals	0,29
9	Lakes and reservoirs	0,60
10	Marine inlets and transitional waters	0,36
11	Coastal beaches, dunes and wetlands	0,09
12	Marine ecosystems (coastal waters, shelf and open ocean)	0,02
Tot Italy		100,00

An exercise of empirical ecosystem services accounting

La Notte A. et al (2022) *The INCA in Europe: twelve lessons learned from empirical ecosystem service accounting*,

Compilation with INCA of 9 Ecosystem Services Accounts

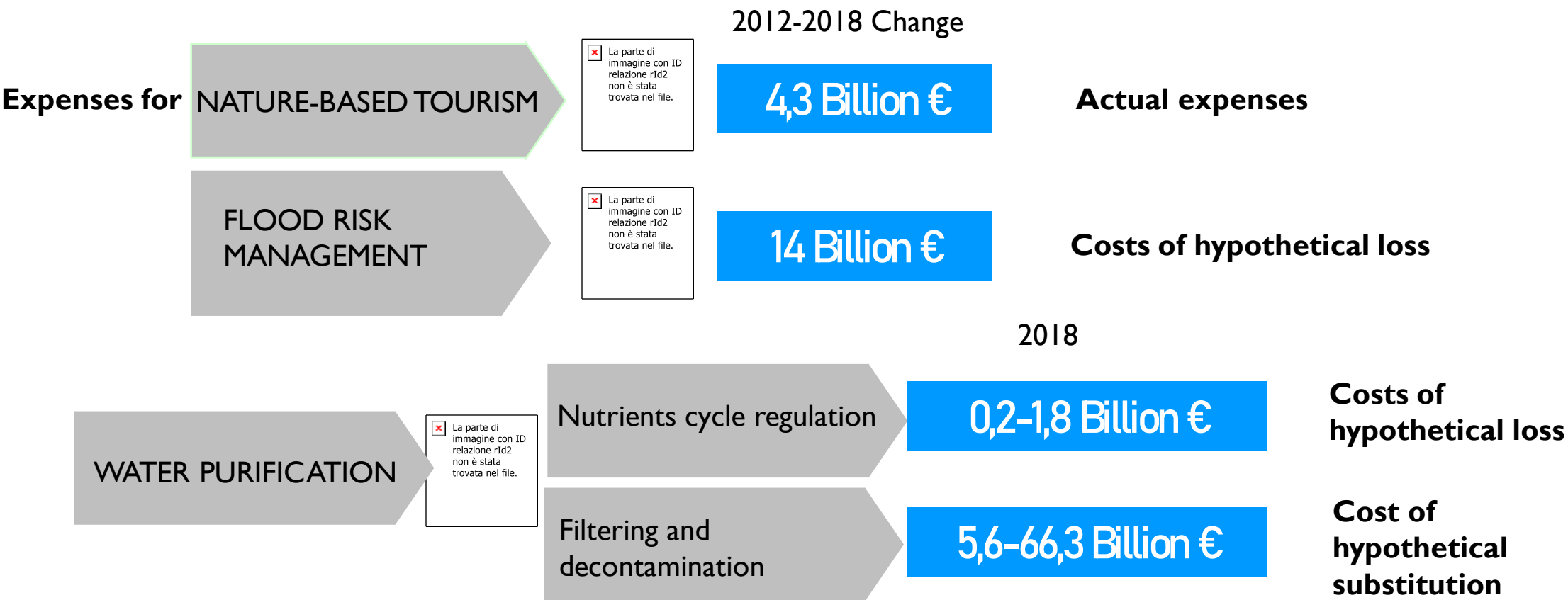
Summaries table of different degree of complexity in assessing and valuing the 9 ES

Table 1.

Summary of the nine ES assessed in INCA with respect to the degree of complexity. Colours represent: easy (green); relatively easy (yellow); relatively complex (orange); complex (red). A fast-track approach indicates green cells in both biophysical assessment and monetary evaluation.

Ecosystem services	Biophysical assessment	Monetary valuation
<i>Crop provision</i>	Combination of biophysical modelling and already existing raw data	Adapted market price: dataset available (no need for modelling)
<i>Timber provision</i>	Raw data already available (no need for modelling)	Market price: dataset available (no need for modelling)
<i>Crop pollination</i>	Combination of biophysical modelling and already existing raw data	Adapted market price: dataset available (no need for modelling)
<i>Soil retention</i>	Biophysical modelling (with no spatial path dependency)	Replacement cost and market price: moderate processing
<i>Flood control</i>	Biophysical modelling (with spatial path dependency)	Avoided damage cost: need for modelling
<i>Water purification</i>	Biophysical modelling (with spatial path dependency)	Replacement cost: need for modelling
<i>Carbon sequestration</i>	Raw data already available (no need for modelling)	Carbon rates: dataset available (no need for modelling)
<i>Habitat and species maintenance</i>	Biophysical modelling (with no spatial path dependency)	Choice Experiment: need for modelling
<i>Nature-based recreation</i>	Biophysical modelling (with no spatial path dependency)	Travel cost method: need for modelling

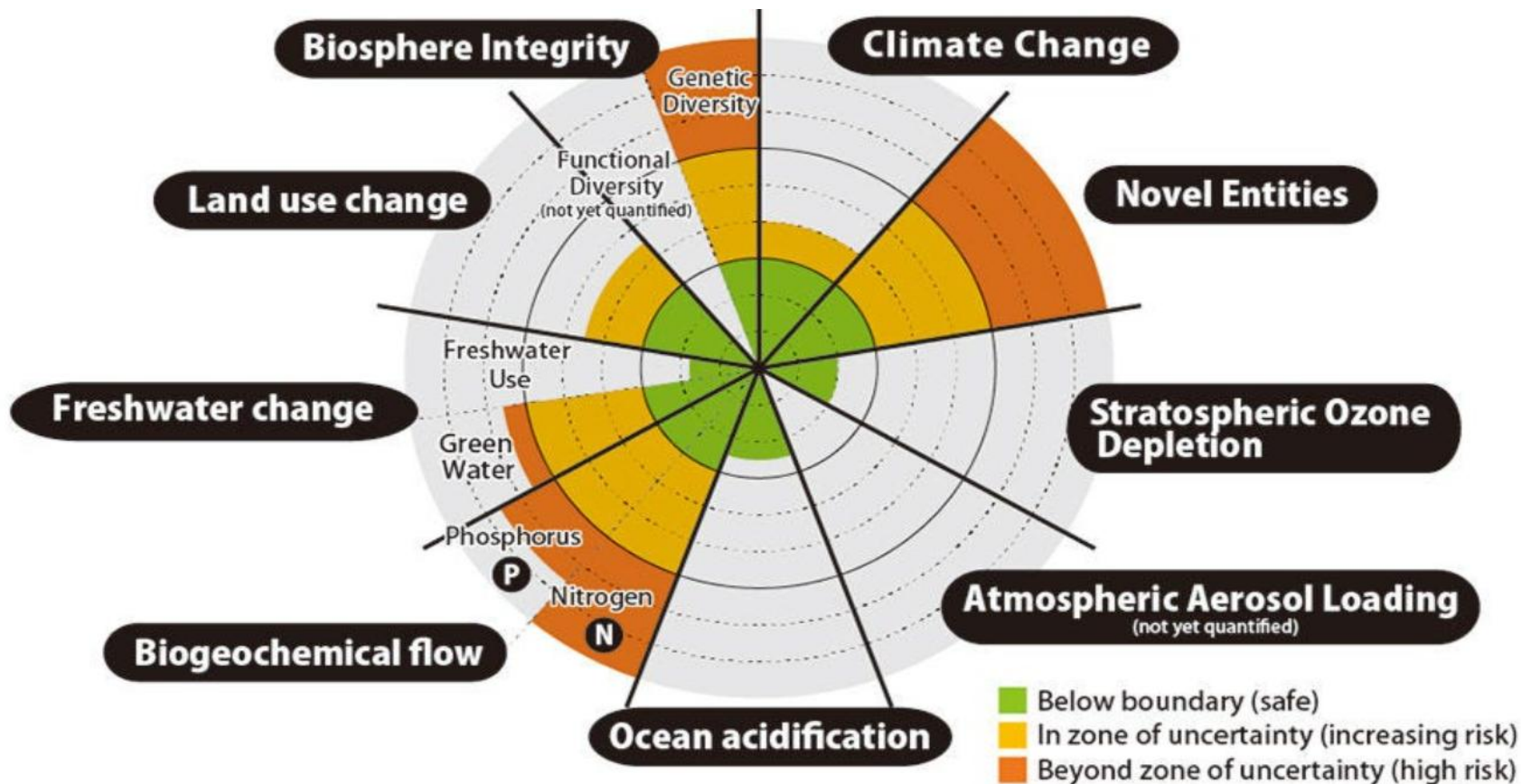
Examples of «connected values» in the Italian State of Natural Capital Report



Fonte: IV Report on the State of Natural Capital in Italy, 2021

9 categories of the planetary boundaries

Current state of planetary boundaries (Source: Azote for Stockholm Resilience Centre, based on analysis in Wang-Erlandsson et al 2022)

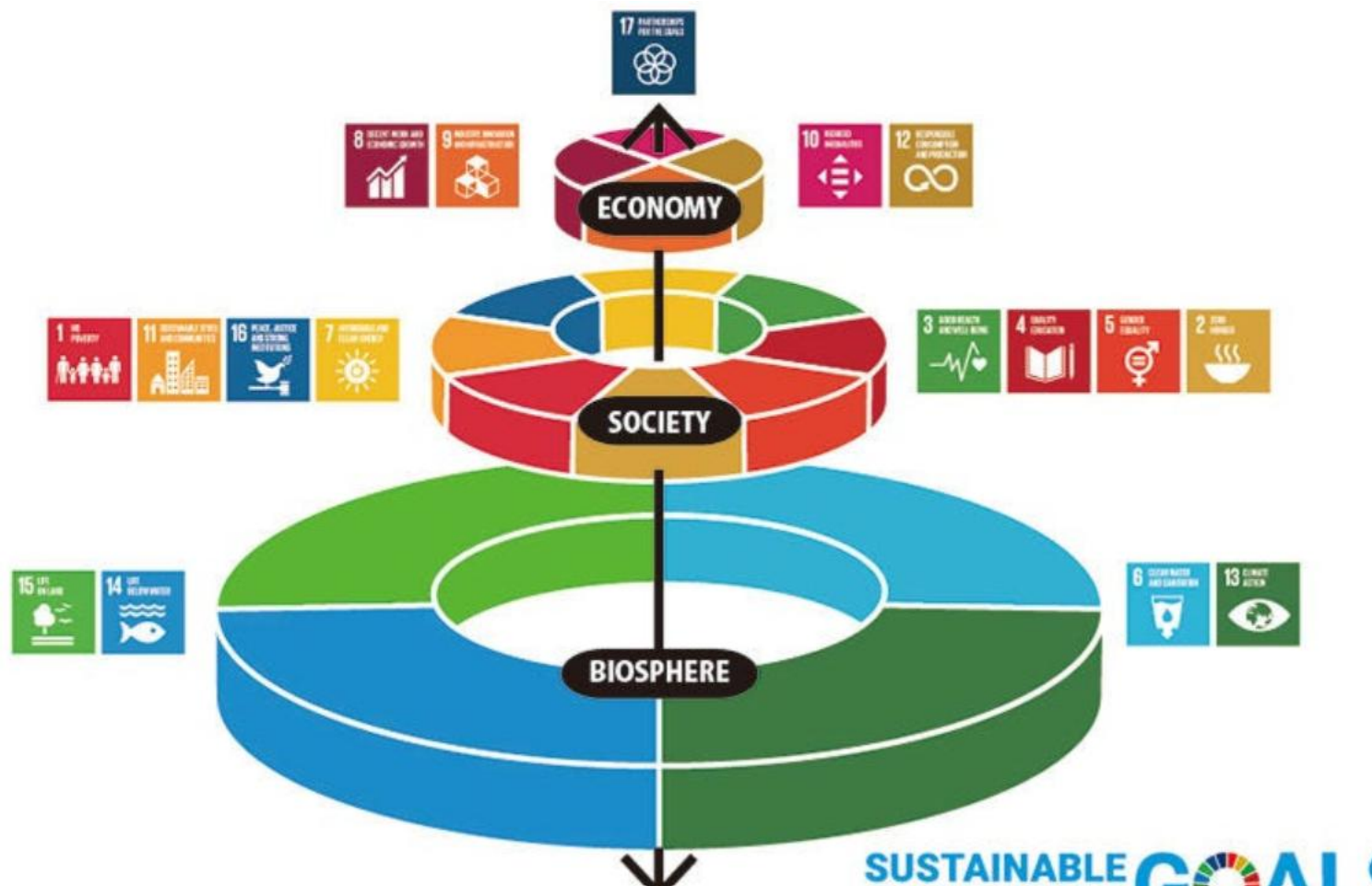


For each boundary, a level (threshold) is set that must not be exceeded (or fall below).

Looking at Fig. 2, which shows the current state of the planetary boundaries, "biosphere integrity" in terms of the rate of extinction, "biogeochemical flows", and "novel entities" have already exceeded their boundary values.

SDGs is influenced by the concept of planetary boundaries

Hierarchical structure of SDGs



The 17 SDGs can be divided into three main categories: biosphere goals, social goals, and economic goals.