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Second Report of the Interlinkages Workstream

Prepared by the IAEG-SDG Interlinkages Workstream

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1.0 Background and Mandate of the Group

In September 2015, UN Member States adopted the 2030 Agenda for Sustainable Development, noting that the 17 goals and 169 targets are integrated and indivisible, and that they balance the economic, social and environmental dimensions of sustainable development. The General Assembly tasked the United Nations Statistical Commission to develop the underlying global indicator framework, indicating that the framework was to be developed by the Inter-Agency and Expert Group on Sustainable Development Goal Indicators (IAEG-SDG) and would, “be simple yet robust, address all Sustainable Development Goals and targets, including for means of implementation, and preserve the political balance, integration and ambition contained therein,” noting specifically that, “the interlinkages and integrated nature of the Sustainable Development Goals are of crucial importance in ensuring that the purpose of the new Agenda is realized. If we realize our ambitions across the full extent of the Agenda, the lives of all will be profoundly improved and our world will be transformed for the better” (A/RES/70/1).

The IAEG-SDG was created in March 2015 at the forty-sixth session of the United Nations Statistical Commission. It is composed of 27 representatives from a regionally-balanced group of Member States and includes regional and international agencies, as well as other key stakeholders, as observers. As noted in the 47th Statistical Commission, monitoring and reporting on the more than 230 indicators will be a monumental task and will require significant investment and the creation of new strategies and data collection mechanisms. Additionally, the 2030 Agenda should allow for analyses that bridge the social, economic and environmental dimensions of the framework. While each goal and target represents a different facet of sustainable development, many of them are interdependent, whereby progress on one target or goal can affect advancement on another. In order to effectively monitor the complex network of interlinkages within the SDG framework, an understanding of what these interlinkages are must first be established. As a result, the Commission proposed that a working group be created, which reports to the IAEG-SDG, and is tasked with examining the interlinkages between SDG indicators and leveraging these possibilities to facilitate statistical reporting of the global SDG indicator framework.

The Interlinkages Working group was initially comprised of 10 IAEG-SDG member countries. In 2016 membership was opened to interested stakeholders and another 8 members from multilateral organizations, civil society and academia.¹ The primary objective of the Working Group is to identify possible interlinkages in the statistics underlying the global SDG indicators and research and identify ways in which these interlinkages can be leveraged to facilitate global, regional and national SDG monitoring and analysis.

The Terms of reference for the group include 4 proposed activities. These are to:

1. Analyse and compare the sustainable development goals, targets and indicators to identify possible interlinkages within the Global indicator framework, building upon the work already completed by the IAEG.
2. Conduct an open consultation with relevant stakeholders to identify possible interlinkages and to identify examples of uses of existing statistical frameworks such as the SEEA and SNA, but also on interlinkages in the social sphere, that can showcase established interlinkages to support integrated analysis in the SDG monitoring.
3. Review best practices and country experiences on related issues (such as MDGs and other relevant national and regional initiatives).

¹ Interlinkages working group consists of the following countries: Bahrain, Cameroon, Egypt, France, Sweden, Tanzania, Philippines, Netherlands, and is co-chaired by Canada and China. In 2017, 8 additional members were added to the group 3 from academia, 3 from international and regional organizations and 2 from civil society.

4. Propose strategies that use the identified interlinkages to facilitate Global SDG monitoring and facilitate the use of the produced statistics as a means for policymakers to make informed decisions in the area of sustainable development.

The first report of the Interlinkages working group was released as a background document to the 50th Statistical Commission. The purpose of the first report was to: a) define the concept of interlinkages; b) to identify interlinkages within 2030 Agenda (between goals, targets and indicators and dimensions of sustainable development) and c) to identify and explore other statistical frameworks that are interlinked to the SDGs and that could support in monitoring progress towards the 2030 agenda. The report also took a cursory examination at practical applications of interlinkages and provided some country examples.

The focus of this second report is to build upon the first report through a) a more in-depth look at how the System of Environmental and Economic Accounts can be used for the SDGs, b) the examination of the interlinkages of the treaties/legislation related to the SDGs, c) discussion of the interlinkages within regions and how these may differ across regions and d) provide more explanation and examples of practical application of the interlinkages of the Sustainable Development Goals to support integrated policy analysis and development.

2.0 In-depth examination of the SEEA and SDGs

Agenda 2030 requires the measurement of sustainable agriculture, sustainable fisheries, sustainable forestry and clean technology. Indeed, Goal 12 is specifically related to responsible and sustainable production and consumption further emphasizing the importance of the environmental and societal impacts in the production chain.

While the importance of sustainability is foundational to the 2030 Agenda, to measure sustainability is a challenge for even for statistical systems where the measurement of industries is well established in terms of their contributions to the GDP, investments and production in monetary terms. Adding the qualifier 'sustainable' inherently indicates that other dimensions beyond the traditional measurement of production need to be included. For instance, other dimensions that should be included in the measurement of the sustainability of an industry includes the dependence of various industries on fossil fuels, the practices in place for the management of air and water emissions, waste treatment practices, etc. This is complicated, but fortunately much progress has been made to combine various types of statistics related to both the economy and to the environmental pressures to analyse such aspects in a single statistical framework.

The System of Economic and Environmental Accounts (SEEA) includes energy, employment, water and material use with the details of the production and the consumption in a country and ties this together with the emissions to air, water emissions or waste. As the Agenda 2030 is concerned with people's need of resources as well as the state of the environment these questions appear in many of the goals and at least ten of the goals have targets that are concerned with environmental economic issues in some way.

Many questions regarding the economy and environmental parameters have been tested in the last twenty years in the statistical offices, where some statistics are now annually up-dated. The areas that have been developed are covered by the goals relating to water, energy, growth and employment, sustainable production and consumption, climate change, and partly land degradation and biodiversity loss.

Thus the SEEA can be seen as a tool that can be used to investigate the ways that the use of resources impact on the environment and how the economic actors contribute to that process. While SEEA has

not been implemented in all countries, in those countries where it has been, it has strengthened the overall system of national accounts as well as strengthening the measurement of SDG indicators.

2.1 How are we linking the economy to the environment in statistics?

Here, the common denominator to link the economy and the environment, has been the economic actors in society as they are classified in the economic statistics of industries² such as agriculture, forestry, fishing, mining, construction, service industry, the government and households.

Using the industry (rather than a single company or a more loosely defined sector) as the main interlinking category has several advantages. Firstly, it is an internationally harmonised classification so that comparisons can be made through countries but also through different variables. Secondly, it is aggregated so that the secrecy requirements of the source data needs not be compromised. And thirdly, it provides more details than showing the national economy as one block.

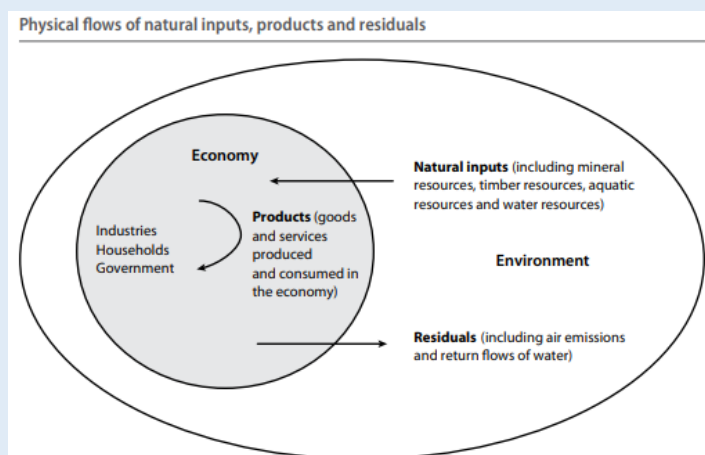
For the environment one important source of data has been fossil energy use by industry that can be recalculated into air emissions, but also data on other resource uses such as material flows including water, land use or the services environmental systems provide to the society.

The System of Environmental-Economic Accounting (SEEA), integrates economic and environmental data into a coherent statistical framework that provides a comprehensive and multipurpose view of the interrelationships between the economy and the environment.

It contains internationally agreed standard concepts, definitions, classifications, accounting rules and tables for producing internationally comparable statistics and accounts.

The SEEA framework follows a similar accounting structure as the System of National Accounts (SNA). The framework uses concepts, definitions and classifications consistent with the SNA in order to facilitate the integration of environmental and economic statistics.

The SEEA is a multi-purpose system that generates a wide range of statistics, accounts and indicators with many different potential analytical applications.



² The global classification is called ISIC – **International Standard Industrial Classification of All Economic Activities**

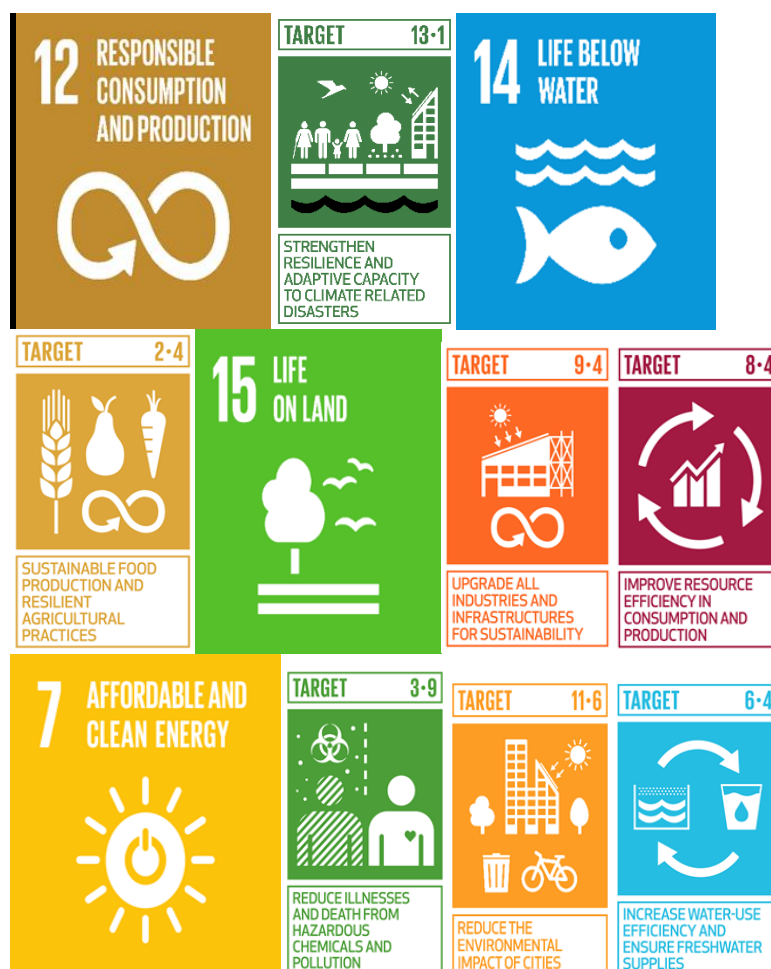
2.2 How to measure the responses

The System of Economic and Environmental Accounts within the System of National Accounts makes it possible to see how the economic instruments such as taxes and subsidies are distributed over the economy and over product groups with different environmental impacts.

Typical results from the accounts indicate that the basic (primary) industries usually have the most significant direct environmental externalities within the economy. Conversely, further up in the value chain there the SEEA indicate fewer negative environmental externalities. However the exception to this is the transportation industry which is a significant user of fossil fuels. Additionally, it is important to note that although industries further up the value chain may have fewer environmental impacts, they often rely upon primary industries. As such, their impacts should not be assessed in isolation.

The technology and the energy system are essential to how the national economy puts pressure on the environment. Understanding the production process and its main impact on the environment is a crucial first step to assess changes in the production process that enable sustainability and reduce the negative externalities on the environment and living conditions.

Several goals touch on the links between the economy and the environment, visualised below:
Icons from here: <https://www.globalgoals.org/resources>



2.3 The SEEA and specific SDG indicators

The SEEA can be used to provide structure to some specific indicators within the global goals. Use of the SEEA for these indicators provides coherent comparable statistics as either a component of the indicator or in some cases, the SEEA itself. SEEA can be used in compilation of indicators 8.4.1, 8.4.2, 12.2.1, and 12.2.2.

Specific targets and indicators that would benefit from the SEEA include the following:

6.4.1 Change in water-use efficiency over time.

- For this indicator, sectoral efficiencies can be calculated for different ISIC categories (i.e. industries) which are then aggregated up to the economy level using economy totals in the national accounts. As such, development of SEEA accounts for water in countries would mean it would be possible to attribute water use at the industry level (by ISIC categories), in the same way that value added is currently attributed to ISIC categories in the national accounts.

12.c.1 Fossil fuel subsidies.

- Developmental work is currently being undertaken in the London Group where countries are sharing experiences with the aim to find a common method that can harmonise national measures and that gives a full picture of fossil fuel subsidies and taxation.

15.9 Integrate ecosystem and biodiversity into governmental planning.

- By introducing a second indicator 15.9.2 UNSD has been working with CBD and UNEP-WCMC as custodians of the indicators, to integrate the number of countries compiling the SEEA, using data available from the Global Assessment.

2.4 Summary

Work of statisticians to create interlinking statistical systems such as the SEEA provide a coherent harmonized structure to data that increase the use of these data and has been shown to provide valuable information to policy makers. The system of economic accounts is well established and contains a wealth of detail, thus the re-use of these statistics in the calculations related to the environment represents an added quality and can provide some of the interlinkages called for in the Agenda 2030 when combined with the environmental statistics described in the FDES statistical framework.

The value of using the SEEA as a framework for the development of relevant parts of the SDG statistics is the coherence that it provides to the measurement of the environment and the links to the System of National Accounts.

3.0 Legislation/Treaties interlinked with the 2030 Agenda for Sustainable Development

The 2030 Agenda proposes a new systemic vision and includes also the synergies already available in terms of international legislation making it possible to design an international regulatory framework for the sustainable development. The UN Charter, the Universal Declaration of Human Rights and the Rio Declaration on Environmental and Development are the fundamental basis to which the structure of the SDGs framework is inspired. But the SDGs define a political framework that also draws on various commitments expressed by International Conventions and Agreements. Some Conventions are expressly indicated in the official targets or indicators, while others can be deduced from the clear

reference to some Conventions titles. Moreover, in the case of the Goal 13 there is a clear acknowledgement of the central role of the United Nations Framework Convention on Climate Change and of the related Conventions and protocols. But but we can easily extend this link to all those targets that refer to climate change. The following table shows those International Conventions that are directly or indirectly linked to specific Goal, Target or indicator .

As can be seen, each of the instruments shown in table 3.1 is linked to Targets and indicators across the 2030 Agenda. Additionally, many of the Conventions are related to the same Target or indicator, which further illustrates the interlinked nature of those instruments.

This table should not be considered as exhaustive and many relations with additional International Conventions, Treaties and Protocols can certainly be identified with a further analysis of the international legislative body. But it provides a clear image of the main interlinkages of the 2030 Agenda with current international legislations that can also be considered instrumental to the attainment of the SDGs by 2030.

Convention can have different ties in supporting SDG implementation policies. Annex 1 provides an example using the World Health Organization Framework Convention on Tobacco Control (WHO FCTC).

Table 3.1: International Conventions, legislation and related SDG, targets, indicators. Conventions expressly indicated in the SDGs framework are green marked.

Conventions/Agreements/Protocols	SDG
Universal Declaration on Human Rights (1948)	SDGs 1.2; 1.3; 2.1,2.2, 2.a; 3.1; 3.2;4.1; 4.2; 4.c; 6.1; 6.2; 7.1; 7.1; 7.b; 8.5;8.7; 9.5; 9.c; 10.2; 10.3; 10.4; 11.1; 11.4; 16.1; 16.3; 16.9; 16.10; 17.6; 17.9,
International Covenant on Economic, Social and Cultural Rights (1966)	SDG 1.2; 1.3; 2.1, 2.2, 2.a; 3.1; 3.2; 4.1; 4.2; 4.b; 6.1; 6.2; 7.; 7.a; 7.b; 8.5; 9.5; 10.2; 10.3; 10.4; 11.1; 11.4; 12.; 4.1;4.28; 17.9
Convention on the Rights of the Child (1989)	SDGs:1.2; 1.3; 2.1; 2.2; 3.1; 3.2; 4.c; 5.1; 5.6; 5.2; 8.7; 10.2;10.3; 10.4; 11.4; 16.1; 16.2
Convention on the Rights of Persons with Disabilities (2006)	SDGs: 1.3; 4.1; 4.2; 4.c; 8.5; 10.2; 10.3; 10.5; 11.4; 16.9; 17.9
International Convention on the Elimination of All Forms of Discrimination against Women (1979)	SDGs: 1.4; 3.1; 3.2; 4.5; SDG5; 8.7; 16.3;
Declaration on the Elimination of Violence against Women (1993)	SDG 5.2
Declaration on the Rights of Indigenous Peoples (2007)	SDGs: 4.1; 4.2; 4.c
International Covenant on Civil and Political Rights (1966)	SDGs: 10.2; 10.3; 10.4; 12.8; 8.7; 9.c; 16.1; 16.3; 16.9; 16.10
Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (1984)	SDGs 16.1
Declaration on the Right to Development (1986)	SDGs: 10.2; 10.3; 10.4; 17.9
International Convention for the Protection of All Persons from Enforced Disappearances (2006)	SDGs: 16.1

ILO Core Labour Conventions and ILO Declaration on Fundamental Principles and Rights at Work	SDG 8.5; 8.7
International Convention on the Elimination of All Forms of Racial Discrimination	SDGs: 10.2; 10.3; 10.4
Convention on Biological diversity (Rio de Janeiro, 5 June 1992)	SDG 15
Convention on Wetlands of International Importance	SDG 15
Convention on the Conservation of Migratory Species of Wild Animals	SDG 15
International Plant Protection Convention	SDG15
Convention on International trade in Endangered Species of Wild Fauna and Flora	SDG 15.7
Doha Development Agenda	SDG 17.10
International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families (1990)	SDGs:8.8; 10.2; 10.3; 10.4; 10.7; 10.c
Sendai Framework for Disaster Risk Reduction 2015 -2030	SDG indicator 1.5.3 , SDG 11.b; SDG indicator 13.1.2
Doha Development Round	SDG 2.b
World Health Organization Framework Convention on Tobacco Control	SDG 3.a
Doha Declaration on the TRIPS Agreement and Public Health	SDGs 3.b
Agreement on Trade – related aspects of intellectual Property Rights	SDG 3.b
International Health Regulation (IHR)	SDG indicator 3.d.1
Programme of Action of the International Conference on Population and Development and the Beijing Platform for Action	SDG 5.6
10 Years Framework programmes on Sustainable Consumption and Production	SDG 8.4; SDG 12.1
Global Jobs Pact of the international Labour Organization	SDG 8.b
United Nation Framework Convention on Climate Change	SDG 13
Global Programme of Action for the Protection of the Marine Environment from Land based Activities	SDG target 14.1; SDG target 14.3
United Nations Convention on the Law of the Sea	SDG 14.c;
Strategic Plan for Biodiversity 2011-2020	SDG indicator 15.9.1

Adopting a Human rights approach

The Danish Institute for Human Rights, which has created two tools that enable users to examine how human rights are interlinked across the 2030 Agenda.

The first tool, *The Human Rights Guide to the Sustainable Development Goal* consists of an online searchable database that illustrates links between Human Rights and labour laws and environmental treaties and instruments. The Guide provides the relevant targets for each goal that have an instrument that underlies the target. It also notes the specific article (or description) that relates to the article, so that users understand precisely what part of the instrument is linked to the target.

A second tool, *The SDG-Human Rights Data Explorer* examines 145,000 recommendations from 67 international human rights mechanisms and links them to the SDGs. Their analysis has found that 59% of the recommendations are directly linked to a SDG target. The tool can provide information by country, recommendation and notes actions that can be taken. As such, these tools can be used by countries in the national implementation of SDGs, via development of a human rights approach or consideration of priority areas for national implementation. This tool may also be of use for various follow-up and review activities.

The Human Rights Guide to the Sustainable Development Goal - <https://humanrights.dk/tools/human-rights-guide-sustainable-development-goals>

The SDG-Human Rights Data Explorer <https://sdgdata.humanrights.dk/en>

The following section offers a different perspective on interlinkages identified on a legislative basis with an application in the European Union context.

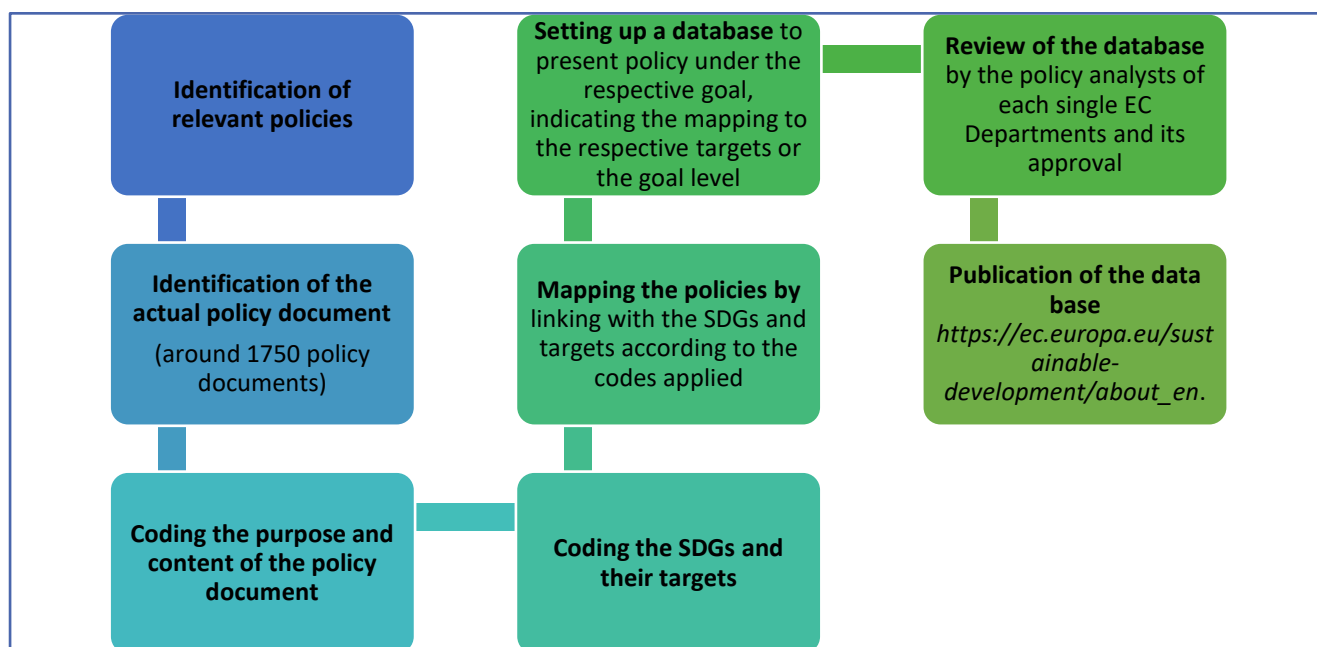
3.1 A legislative oriented perspective applied in the European Union context

Sustainable development is fully integrated into the policies of the EU, which in the Article 3.3 of the Lisbon Treaty states that “The Union shall [...] work for the sustainable development of Europe [...]”. Over time, different strategies for sustainable development have influenced the EU policy.

In 2017 an internal European Commission (EC) stocktaking exercise to map the EU policies relevant for the SDGs implementation (Figure 3.2) has produced a database including 1,119 European policies relating to the SDGs³. This data base, reviewed in January 2019, is the starting point to identify synergies in EU by adopting a legislative oriented approach (Miola, et al. 2019).

³ https://ec.europa.eu/sustainable-development/about_en

Figure 3.2. Ad hoc method to map EU policies into SDGs framework.



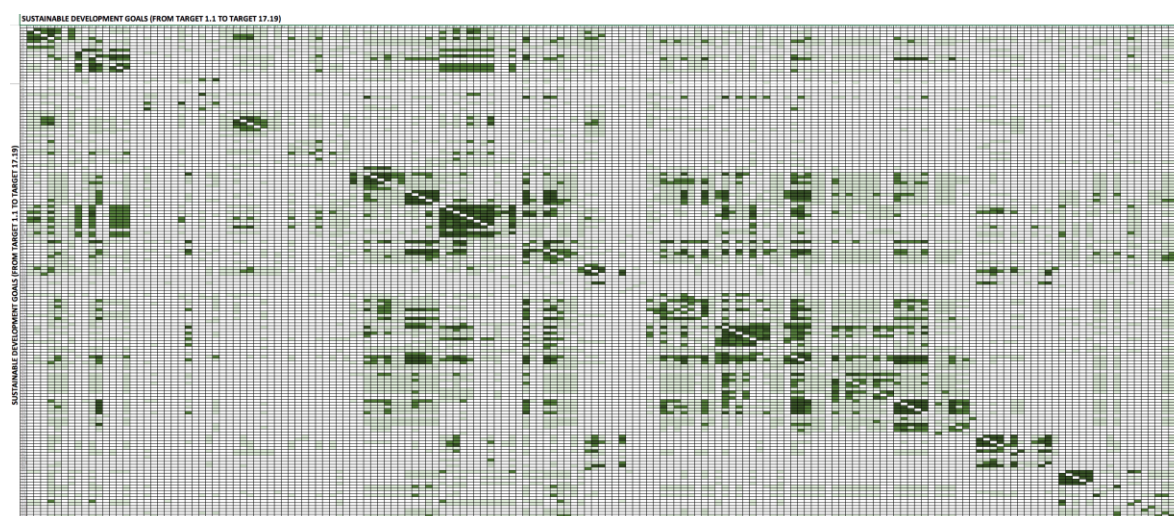
As many EU policies affect more than one single target or Goal, synergies have been defined on the basis of the number of legislative acts in common between two targets. Adopting this legislative oriented perspective, a dashboard can be designed on EU legislative nodes in terms of synergies relevant for SDGs implementation in EU legislation system (Figure 3.3).

This four-color dashboard attributes one out of 4 nuances to target combinations. Each nuance translates the number of legal acts in common between two specific targets as reported in the data base mapping EU policies into SDGs: (i) White: no policy in common; (ii) Light green: 1-2 policies in common; (iii) Medium green: 3-4 policies in common; (iv) Dark green: more than 4 policies in common.

The number of policies and instruments relating to a given SDG does provides a picture of the degree in which sustainable development is permeating policy actions via legislation.

The “policy nodes” of synergies already in place can be the levers to define effective policy actions in terms of identification of priority areas and more effective budget allocation.

Figure 3.3: EU policy nodes in the SDGs context. Synergies based on EU legislation.



Each single column and each single row correspond to one of the 169 targets of the SDGs framework (Miola, et al, 2019: page 24) https://public.tableau.com/profile/steve.borchardt#!/vizhome/Dashboards_115/Story1

3.2 Summary

The existing close relationship between the 2030 Agenda and International Conventions and legislation offers synergies for mutual support in pursuing common goals. However, there are some challenges that are still open.

First of all, it would be advisable to coordinate the different reporting systems of International Conventions and the 2030 Agenda. For example, the National Voluntary Review reports of the 2030 Agenda could be more closely aligned with the Intended Nationally Determined Contribution reports of the Paris Agreement. A coordination of these international reporting systems would facilitate the identification of interlinkages between the entire SDGs framework and the thematic one of the single Convention. In this way, the mutual support with the different Conventions would be strengthened. Secondly, this type of coordination would avoid additional administrative burden on Member States.

Finally the most relevant challenge in the legislation context is the identification of possible tradeoffs between the 2030 Agenda and international legislation. This aspect deserves a further systemic analysis in view of a possible coordination to allow the management of possible conflicts among different objectives.

4.0 Interlinkages at the Regional Level

Sustainable Development Goals (SDGs) are inter-connected in a complex network of interactions of various sub targets. Their universality implies that none of the SDGs are prioritized, whereas their integrated nature results in complex feedbacks to targets in other SDGs. The goals and their feedback comprise of economic, social, and/or environmental targets that are dependent on the institutional, infrastructural, and/or political context of the different countries and regions. The importance of the regional context is a critical lesson learnt from the Millennium Development Goals (MDGs). Universal goals ignore imbalances and inequalities within countries. Conditions at the regional level can be quite heterogeneous. Within the same regions there can be vast differences in the interlinkages, so an examination of interlinkages should be done cautiously to ensure validity. Setting goals and benchmarks, independent of a region or country specific context might be counter-productive to the long run development.

A well-documented case is MDG 4, with a universal target to reduce child mortality to two-thirds of the 1990 level in each country. This was challenging for most countries, especially sub-Saharan Africa. At the same time, the MDG targets were not ambitious enough for rapidly developing countries such as Brazil and China. In contrast, the World Bank (2015) states that even though large resources were poured into sub-Saharan Africa, countries have regressed relative to the rest of the world from the baseline year of 1990. While in 1990 30.4 percent of all child deaths occurred in sub-Saharan Africa, in 2015 it had increased to an estimated 49.6 percent of all child deaths globally. This is partly due to the advances in other regions but also because the global targets did not take the regional and socio-economic differences into account.

4.1 Examining interlinkages at the regional level and why they might differ

Bali Swain and Ranganathan (2019) argue that it is important to understand the network of SDG interlinkages within the regional or country context, to identify and target the core SDGs that actively reinforce each other to achieve sustainable development. Focusing on the SDGs target indicators, their analyses identify the channels of underlying interlinkages between the various SDGs in OECD countries. Extending their investigation to other regions of the world such as sub-Saharan Africa (SSA)

and South Asia (SA) etc., demonstrates the differences in the SDG interlinkages and trade-offs within the regional contexts.

Bali Swain and Ranganathan (2019) employ a network analysis to identify the interactions among the SDGs, by building a correlational network, using IAEG-SDG data on SDG indicators from the UN Sustainable Development dataset, for the period 2000-2017. The interactions are modeled between the different pairs of SDGs targets. The focus on the SDG targets is deliberate to capture the specific indicators synergies and trade-offs at the sub-SDG level. They employ network statistics and automatic community detection algorithms, to identify, the core SDG targets that work together in a community of SDG targets for different regions of the world, such as OECD, South Asia, East Asia, and sub-Saharan Africa (figure 4.1).

A cursory look at the network visualization presented in figure 4.1 shows that the various regions of the world represent a very different SDG interlinkages reality.

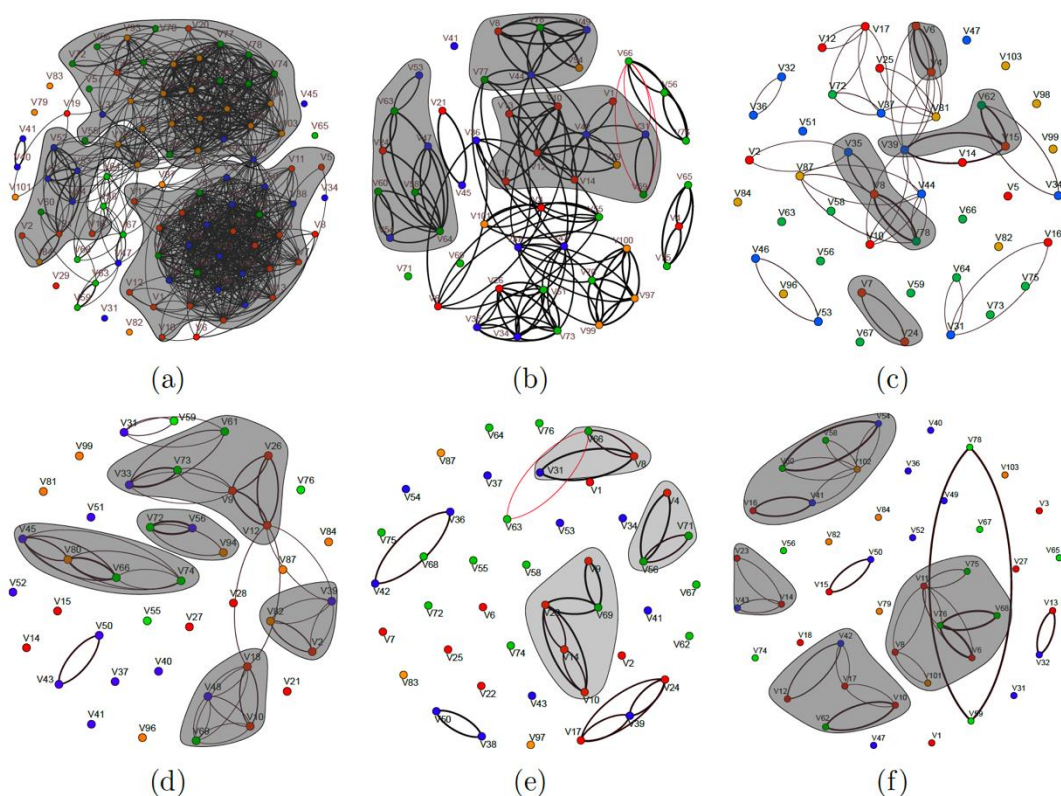


Figure 4.1: Trade-offs and synergies for medium threshold interlinkage in the SDG targets (a) OECD, (b) South Asia, (c) East Asia, (d) Latin America, (e) Sub-Saharan Africa, and (f) MENA countries. The black edges in the figures represent the synergies between the targets, whereas the red edges are the trade-offs. Each node in the network reflects the indicators of the SDG sub-targets. The SDGs have been broadly categorized into 4 groups in this analysis. These groups are color-coded. For all sub-figures: the red nodes represent indicators SDGs 1 to 6 and the green nodes represent indicators for SDGs 13-15. Blue nodes represent SDGs 7-12, while SDGs 16 and 17 are color coded orange.

Source: Bali Swain and Ranganathan (2019)

Figure 4.1 represents an SDG indicator, while the edges are the interlinkages and/or trade-offs between the different target indicators. For OECD countries the three most central target variables as ranked by centrality measures are factors like Red List Index (SDG 15), labor share of the GDP (comprising wages, social protection transfers) (SDG 10) and the proportion of women in managerial positions (SDG 5). Other factors such as average proportion of Mountain key biodiversity areas (SDG 15), and economic factors like, proportion of population with access to electricity (SDG 7) and proportion of the population using safely managed drinking water services (SDG 6), are also key to success of SDG targets, in the OECD. Other centrality measures also identify target variables for SDGs

2, 9 (economic) and SDG 12 as important. Identifying individual indicators does not lead to sustainable development. While these SDG targets are critical for effective SDGs progress, they do not work in silos and involve complex tradeoffs and synergies. Using modularity and automatic community detection, Bali Swain and Ranganathan (2019) detect, three main communities of variables for OECD countries (Figure 4.1 (a)). These communities suggest a network of target variables of SDGs that work concurrently. Working clockwise from left, the community of SDG targets towards the left hand side consists of focus on indicators of gender equality (SDG 5), registration of birth and death (SDG 17), people of pensionable age receiving pension (SDG 1) and crude death rate attributed to ambient air pollution (SDG 3). Compliance with several international environmental conventions (SDG 12) and land area (SDG 15) are also important.

The central community identified for the OECD countries emphasizes institutional attributes of social targets (SDGs 5,16 and 17) and environmental factors (SDGs 11, 13, 14, 15), with selected economic factors (SDGs 2, 6, 8 and 9). Social attributes include adopting and implementing constitutional, statutory and/or policy guarantees for public access to information, Human Rights compliance and net official development assistance. Environmental factors, include environmental disasters, protected marine zones, expenditure on ocean science, forest area net change rate, mountain green cover and area, countries that are contracting to the International Treaty on Genetic Resources for Food and Agriculture and Ngoya protocol etc. Economic factors such as population above pensionable age receiving pension, access to clean water, population with account at financial institution, and carbon-dioxide emissions per unit of GDP also contribute to this network community.

The third and final network community emphasizes the economic SDGs (SDG 1-3, 6-9) with some very special aspects of social SDGs (4, 5 and 10) and environmental SDGs (11, 12 and 15). This community requires a focus on the proportion of poor population, undernourishment, government expenditure on agriculture, local breeds at risk of extinction, maternal mortality ratio, child mortality, sanitation, access to electricity, clean fuel and technology, number of commercial bank branches, unemployment rate and manufacturing value added as a proportion of GDP. Combined with these economic aspects, the community includes social factors such as a certain level of proficiency in functional skills, women empowerment and labor share of GDP, comprising wages and social protection transfers. The environmental aspects of this community include people affected by disaster, material footprint per capita among the bottom 40 percent of the population, biodiversity indicators and mountain green cover. This community suggests a comprehensive policy that targets the well-being of the relatively disadvantaged sections of the population.

In contrast to the OECD network results, the visualization for South Asia (figure 4.1(b)) is distinctly different. Note that the South Asia network and communities are less dense than the OECD network. This is noted to be partly true due to better reported and more frequently collected data for OECD countries. The top ranked centrality measures for South Asia reflect the state of the socio-economic development of the region. A proportion of population below the poverty line (SDG 1), official flows for agriculture (SDG 2), proportion of births attended by skilled health personals (SDG 3), proportion of women married or in union before age 18 (SDG 5), adults with account in financial institution or mobile-money-service provider (SDG 8), manufacturing employment as a proportion of total employment (SDG 9) and above ground bio-mass in forest (SDG 15).

For South Asia, the central community (figure 4.1(b)) identifies socio-economic target indicators. The majority of the indicators within this network community include indicators that represent the disadvantaged and weaker sections of the population. According to Bali Swain and Ranganathan (2019), it is thus best to focus the South Asian SDGs effort on these identified target indicators. The identified community of indicators include, the proportion of population below the international poverty line (SDG 1), total official flows for agriculture and local breed at unknown risk of extinction (SDG 2), maternal mortality rate, births attended by skilled health personal and international health regulations (SDG 3), proportion of population with clean fuel and technology (SDG 7), passenger

volume by road (SDG 9), and the number of victims of international homicide (SDG 16). South Asia is home to the largest number of poor in the world, thus policy focus on basic economic, social and security conditions is the relevant intervention for this region.

The left hand side and center top network communities for South Asia (Figure 4.1(b)) reiterate that this region with emerging large economies like India, cannot ignore the environmental targets. These network communities include carbon dioxide emissions per unit of GDP, forest area as a proportion of total area, land area, above ground biomass, party to the International Treaty on Plant Genetic Resources for Food and Agriculture, reported number of Standard Material Transfer Agreements, compliance with convention of hazardous waste and other chemicals, urban population in slums and progress in multi-stakeholder development effectiveness monitoring frameworks. These set of SDG targets indicate that due diligence should be paid in designing policies that address challenges in agriculture, land-use and rapid urbanization and waste management for South Asia.

This network visualization and analyses provides evidence to argue that each country or region has its own separate path for achieving sustainable development and SDGs. Employing global benchmarks on diverse countries would not only be ineffective but also expensive in terms of misallocation of limited resources, especially for Asia and Africa. The exigency in addressing the climate change (IPCC 2018) and the precipitously passing time to achieve Agenda 2030 implies that a region-specific and nuanced data based approach needs to be adopted for achieving SDGs. However, analyses and the subsequently derived policies are only as good as the available data and its quality. Furthermore, by their very nature SDGs are wide-ranging. Thus, a region specific and data informed SDG interlinkages analyses is critical in identifying effective benchmarks and setting priorities and strategies to target limited resources for maximum SDG impact.

4.2 Impact on Policy

The universality and the potential inconsistencies within the SDGs make identifying priorities and setting specific-well defined goals, a very challenging exercise. It is also inappropriate to create policies in silos. Ignoring the interlinkages between the various SDGs imply that the synergies and trade-offs effects cannot be captured. A regional context is critical to capturing these interlinkages, without which benchmarking the SDGs and designing effective policies for sustainable development will be meaningless. Granularity of data is a key factor in policy making. As emphasized in Bali Swain and Ranganathan (2019), focus on analysis using the SDG targets, instead of SDGs themselves is indispensable as aggregating the data at the goal level is just too broad to provide informed analyses for effective implementation. Network community analyses at the regional sub-SDG level helps identify specific target indicators within the SDGs. These targets provide useful input to build an unambiguous definite policy plan to promote sustainable development. Thus, instead of focusing equally on all SDGs, which is problematic, governments may focus on those SDGs that contribute to the sustainable development of the specific region.

Benchmarking target indicators, is a way to quantify progress towards goals. Some of the quantitative targets are provided in the 2030 Agenda for Sustainable Development (UN 2015). When such targets are missing, other policy documents are usually used. Alternatively, the average indicator score of the 5 percent top (or bottom) performers in the data may also be sometimes used to benchmark. As is shown by Figure 4.1, universal targets or benchmarking may be viewed to be unproductive in the absence of understanding the regional context and development is taken into consideration. Indeed, the evidence presented on network communities for the OECD, South Asia and other regions in Figure 4.1 show significant differences. Thus instead of global benchmarks, there is a need to benchmark using these sub-SDG targets, identified via regional analyses of data.

Bali Swain and Ranganathan (2019) further suggest that benchmarking at regional level should be attempted, only if the region is relatively homogenous in terms of its level of development etc. The level of analysis is also of critical importance and would require the adaptation of the SDG indicators to the level of analysis as some targets are designed for national data while others are more local. They further note that benchmarking of SDGs at the global or national level is distinct from the operationalization of the SDGs for businesses or any particular sector of the economy or even at the level of the local government.

4.3 Case study: an analysis of interlinkages at the EU using the EU's dashboard indicators

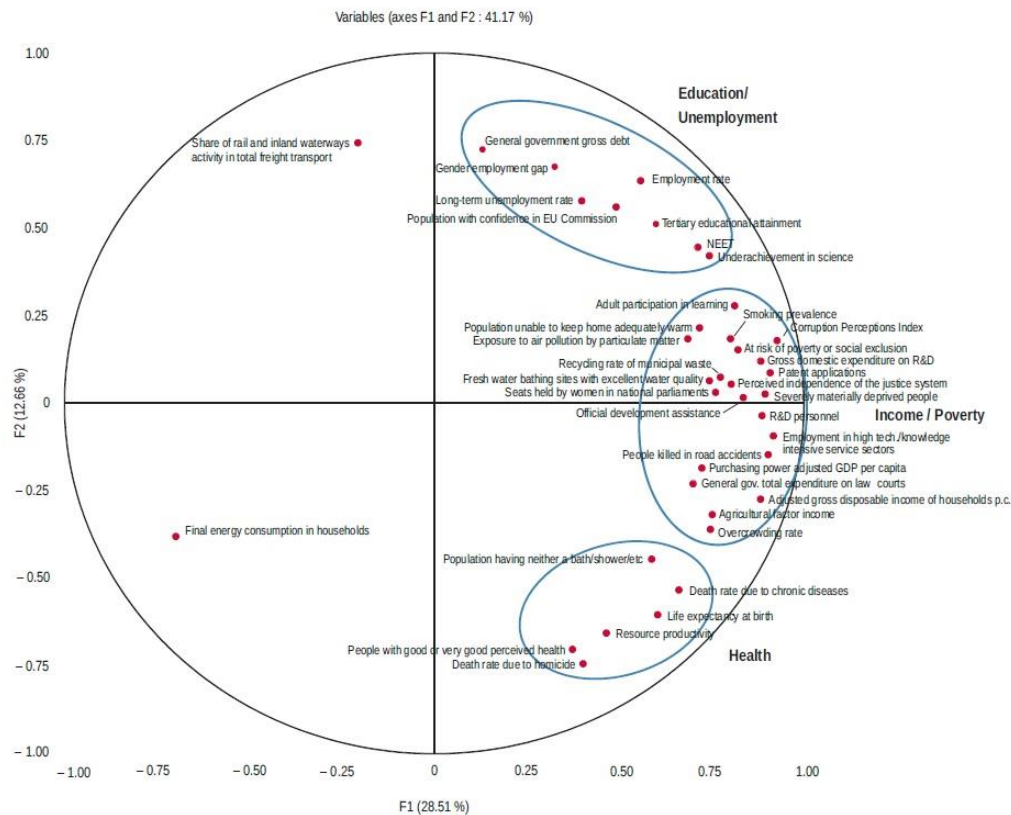
The statistical study conducted by French NSO (Insee) analyses cross sectional data, based on the EU's dashboard indicators. The EU dashboard includes 100 indicators, derived from the global Sustainable Development Indicators, to implement SDGs in the context of European policies. Interlinkages are measured with a quantitative approach, reducing use of arbitrary and subjectivities hypotheses, while supposedly providing results of correlation analyses easier to interpret. The method used is a Principal Component Analysis (PCA), which is a widely used data analysis technique used since the 1960s, and which is well adapted to analyze this kind of data sets. This method provides quantitative measure of correlations between indicators and a clear visualization of these correlations. It helps to identify patterns in the data in the case of large sets, here analyzing a 28 X 88 matrix (countries x indicators). It also compares the situation of EU countries for their contribution to the variance and their position along the axes composed from a linear combination of indicators.

4.3.1 The principal component analysis (PCA)

The Principal Component Analysis (PCA) groups indicators into three broad categories of the economic and social domain: income/poverty; health; education/ employment. The indicators for each of these categories are strongly correlated. More specifically, SDG1 (Poverty), SDG9 (Innovation) and SDG 10 (Inequality) are strongly interlinked; there are also interlinkages between these SDGs and with SDG3 (Health). SDG4 (Education) and SDG8 (Employment) are also interlinked between themselves, as well as with, to a lesser extent, with the first group of SDGs. Indicators of SDG16 (Governance) are related to those of SDG3 (Health) and SDG10 (especially GDP/capita). This analysis found that indicators for other SDGs have few interlinkages.

The main results of PCA can be visualized by the position of the indicators in the plan defined by the first two axes of this PCA (which represents respectively 28.5 % and 12.7 % of the variance). **Figure 4.3.1** represents the best represented indicators in the PCA on the correlation circle according to the first two axes of this PCA, that is to say those closest to this circle. By convention, we retain only the indicators whose distance to the circle of radius 1 is less than 1/3. A total of 38 indicators fall into this, which represents nearly half of the total indicators selected in our analysis. According to the usual interpretation of the PCA, the proximity between two indicators indicates a strong positive correlation between these two indicators, while two indicators located on the same line passing through the origin but on each side thereof are very negatively correlated. On the other hand, two indicators located on perpendicular lines passing through the origin are not correlated with each other (for instance employment rate and life expectancy at birth, or gender employment gap and the gross disposable income of households per capita). This figure represents the correlation circle drawn from the corrected values of these indicators. In order to make the absolute correlations (positive or negative) between indicators more visible on this circle, we give a negative sign to the indicators for which a great value is considered negatively by Eurostat. As an example, the number of persons killed in road accident is very negatively correlated to the GDP per capita. Because values of these indicators have been corrected, they all appear very close on Figure 4.3.1.

Figure 4.3.1: Correlation circle with axes 1 and 2



Source: Eurostat; authors' calculations

The first category of indicators comprises those associated with **income, poverty and inequalities**. This group includes the majority of the indicators for SDG 1 “Poverty” and SDG 10 “Inequalities”.⁴ There are also other indicators on this list that have high correlation with the incidence of poverty in a country: smoking prevalence (SDG 3 “Health”), the share of the population unable to keep home adequately warm (SDG 7 “Energy”) and the rate of overcrowding in housing (SDG 11 “Sustainable Cities”). As it has been remarked above, the majority of indicators for SDG 9 (“Industry, Innovation and Infrastructure”) fall into this group, which indicates the correlation between the importance of innovation within a country and its level of income.⁵

There is close correlation between the indicators of SDG 3 (“Health”), which also often correlate with those relating to poverty and the level of national income (with the exception of self-reported unmet need for medical care). To give an example, the correlation coefficient between life expectancy at birth and the percentage of severely materially deprived people is -0.61. The correlation coefficient between life expectancy and gross disposable income per inhabitant is 0.72. The indicator relating to the population having neither a bath, nor a shower, nor or indoor flushing toilet in their household (SDG 6 “Water”) also falls into this group. It is also the case for the rate of deaths attributable to road traffic accidents (SDG 11 “Sustainable Cities”) and the homicide rate (SDG 16 “Peace, Justice and Strong Institutions”).

In terms of **education and employment**, the indicators for SDG 4 are inter-correlated and correlate with the three indicators for SDG 8 (“Employment”), which relate to employment directly: young people neither in education, nor in employment and training (NEET indicator); employment rate; long-term unemployment rate. The employment gap between men and women (SDG 5 “Gender”) also correlates with these indicators. The latter likewise correlate with the indicators for SDG 9 on

⁴ With the exception of the indicator relating to asylum applications, inclusion of which under this goal seems atypical.

⁵ The last two indicators for SDG 9 relating to the proportion of public transport used for passenger travel and the share of railway and inland waterways activity in total freight transport are quite different in nature and are therefore not part of this group.

innovation (see above): gross domestic expenditure on R&D; R&D personnel in the country; patent applications, etc. As already mentioned, the indicators for education and employment also correlate negatively with the poverty indicators.

Indicators associated with **governance** also relate to one of the three groups stated above depending on the case. For example, the death rate due to homicide relates, in practice, to indicators associated with health (see above). The indicators associated with perceived independence of justice and perceived corruption are strongly inter correlated and also correlate with the country's income per capita. The correlation between confidence in the judicial system and the level of GDP/capita has been highlighted in comparisons of developed countries (18). Finally, the proportion of the population with confidence in the European institutions is strongly linked to employment conditions in each country (NEET and long-term unemployment in particular). Only the indicator relating to the population reporting occurrence of crime, violence or vandalism in their area seems to be weakly correlated to the other indicators on the list.

In contrast, **the indicators relating to the environment in a broad sense** (in particular SDG 7 "Energy", SDG 13 "Climate" and SDG 15 "Life on Land") are much more heterogeneous, generally having tenuous links with each other and with those of other categories. Some environment indicators such as exposure to pollution from fine particulates, greenhouse gas emissions and the recycling rate of municipal waste correlate strongly to the country's level of income (GDP/capita or gross disposable income/capita), but not between themselves or with other indicators of the list. This specificity of environmental indicators should be analysed further. Apart from data quality issues,⁶ it might suggest that EU countries follow different environmental models and policies, which go beyond the structure of their economy or their economic development level. Cultural values as well as geographic characteristics play a definite role in this domain.

The results of the principal component and hierarchical cluster analyses of the EU Sustainable Development Indicators show that the differences between countries is derived primarily from their level of economic development, measured especially by their gross disposable income of households per capita, and to a lesser extent their GDP/capita. In contrast, the indicators relating to the environment in a broad sense are much more heterogeneous, generally having tenuous links with each other and with those of other categories. These indicators do not contribute to the segmentation between countries, with the notable exception of exposure to air pollution by particulate matter (which is strongly related to GDP/capita).

4.4 Summary

The SDGs are considered more interlinked as compared to the MDGs. They thus enable more cohesive policies that take their synergies and tradeoffs into account. However, this universality and unambiguity becomes a constraint in prioritizing or strategizing, especially when it comes to policy making and limited availability of resources. Compounding this is that there are differences in interlinkages between regions. Moreover as the Principal Component Analysis undertaken by INSEE showed, even within regions the interlinkages can differ. As a result, policy development at a regional level should also take into consideration that there can be within region differences which may result in differing policy outcomes within and across the three domains of sustainable development if not addressed.

⁶ The sustainable development indicators related to the environment suffer from various quality problems and their overall quality is inferior to the quality ensured for socio-economic indicators. For several of these indicators a breakdown by EU countries is not available, thus were removed from the analysis. There are many missing values for other indicators (see indicators commented in box 3), which also prevented us from including them in the PCA/HCA.

5.0 Practical Examples for Integrated Analysis of the SDGs to Support Policy

The Sustainable Development Goals refer to different domains of analysis - social, economic, environmental and institutional - and consider as catalysts elements: integration, universality and participation. The interconnection between human systems and natural systems must therefore be integrated into a global perspective, considering the possible synergies between national and international institutions.

One of the purposes of the examination of the interlinkages is to better understand the interrelations of the economic, social and environmental dimensions of policy and programs. These interlinkages are important to understand not only for monitoring and measurement but also for policy implications of interlinkages. However, understanding the existence of interlinkages is only the first step. Developing policy that takes into consideration the interlinkages across the 2030 Agenda is far more complex as there can be both known as well as unintended impacts of policy.

The establishment of the 2030 Agenda as well as a broader understanding by citizens of the interplay between the social, economic and environment domains, is pushing policy makers more than ever before to develop coherent policy that looks at impacts and allows for coordination beyond a single policy node. For instance, the interlinked nature of the SDGs requires that effective policy development should include integration of the economic, environmental and social dimensions into both the elaboration of policy in addition to the assessment of the effectiveness of policy. However, while it is often possible to measure the positive and negative externalities of a policy on the various domains after the fact, it is more difficult to not only anticipate the impacts on other areas, but also to measure the impacts of new policy. Countries are starting to examine means to incorporate the SDG interlinkages in to the development of policy. Here we examine four countries to see different methods of addressing interlinkages.

5.1 Italy – Examination of strength of interconnectedness across disaggregation categories

The national statistical office in Italy (Istat) has undertaken a study of the interactions between the different domains of the of the SDGs which can help in policy development as it highlights the synergies of policy actions, helps define policy priorities and identifies trade-offs.

They note that human well-being is intrinsically linked to the health of natural ecosystems and failure to protect them poses a threat to long-term prosperity in development, and that addressing the inequalities in the distributive benefits of development is fundamental for sustainable development. To examine this, Istat undertook a series of cross-sectional textual analyses related to the several dimensions including various vulnerable populations as well as urban dimensions, climate change, innovation and infrastructure as development engines, to better display interlinkages. For example in Figure 5.1.1, Istat analysis illustrates the linkages between migration and the goals – illustrating the strength of the bond which can help policy makers in determining areas of policy focus. In this analysis we see that addressing issues related to migration is strongly linked to achievement of Goal 1 and Goal 5 (strong bonds). However, Goals 3, 4, 7, 8, 10, 11 16 and 17 would also be impacted by the development of policy related to migration (see Annex 2 for a full examination of the Istat interlinkages work).

Figure 5.1.1 – Statistical indicators for monitoring SDGs. Interlinkages in the Istat SDGs Statistical System related to migration



5.2 Canada – Integration of Sustainable Development into Policy Development

In Canada, Sustainable Development is enshrined in legislation. The Federal Sustainable Development Act (FSDA) came into force in 2008. Initially, this legislation focussed primarily on the environmental dimension of sustainable development. It legislates that the Government of Canada must set out a Federal Sustainable Development Strategy (FSDS) every three years.⁷

The FSDS sets out the Government of Canada’s environmental sustainability priorities, establishes goals and targets, and identifies actions to achieve them. It outlines what actions the Government of Canada will take to promote clean growth, ensure healthy ecosystems and build safe, secure and sustainable communities over a three year period.

In defining federal environmental sustainability commitments and actions, the 2019–2022 FSDS complements the National Strategy on the 2030 Agenda being developed by Employment and Social Development Canada. While the FSDS and the National Strategy are different, they reinforce each other.

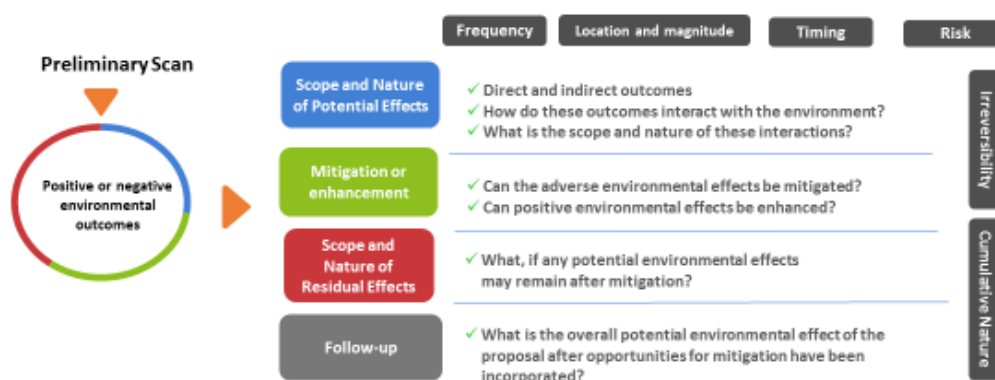
Under the current Federal Sustainable Development Act, 26 federal organizations are required to prepare their own strategies that comply with and contribute to the FSDS. An additional 16 organizations contribute on a voluntary basis.

⁷ In 2019, the FSDA was amended to incorporate the social and economic dimensions of sustainable development, but has not yet come into force.

Additionally, because there are often positive and negative externalities of policy decisions, all federal departments and agencies are expected to assess potential environmental effects when developing policy proposals and to provide the results of these assessments to ministers and Cabinet and communicate these results to Canadians.

To facilitate this, there is a Cabinet Directive on the Environmental Assessment of policy, plan and program proposals that requires that all proposals undertake an environmental assessment to ensure that both the positive and negative externalities are understood (Figure 5.2). Prior to budget approval, policy and programming proposals must undertake this assessment examining risks, potential impact in terms of magnitude and location, timing, irreversibility and cumulativeness (<https://www.ceaa.gc.ca/default.asp?lang=En&n=b3186435-1>).

Figure 5.2 Visualization of Strategic Environmental Assessment



As gender equality and a focus on vulnerable and diverse groups is key to the attainment of the global goals, examination of how gender equity in policy is important. In Canada, in addition to environmental assessment as part of policy and program development, there is a further requirement to undertake a Gender Based Analysis plus (GBA+) review. GBA+ refers to the examination of how sex and gender intersect with other identities such as: race, ethnicity, religion, age and mental or physical disability. In the development of new policy, departments are required to undertake this assessment to potential gender issues. If potential issues are found departments are required to undertake a complete assessment to ensure that the policy or program under development takes into consideration the diverse needs of the various groups are being addressed and integrated (<https://www.canada.ca/en/treasury-board-secretariat/services/treasury-board-submissions/gender-based-analysis-plus.html>).

5.3 China

In 2017, China undertook a pilot project to monitor and measure SDGs at a subnational level. Deqing County in Zhejiang province was selected as a pilot study area. The pilot study was conducted by a joint taskforce led by the National Geomatics Center for China (NGCC) together with several universities and high-tech enterprises and Deqing Government. A set of data-driven and evidence-based approaches were developed and applied in alignment with the global indicator framework through integration of statistical and geospatial data to track the overall progress towards SDGs in the pilot county. The results from this pilot study have been used by the local policy-makers to develop concrete implementation strategies and formulate the Five-Year Action Plan (2019-2024), which translated the Agenda into its own development vision and priorities, and to address the gaps and

challenges towards achieving the SDGs, such as reducing industrial emissions, lessening energy consumption and material consumption, improving public transport convenience, etc.

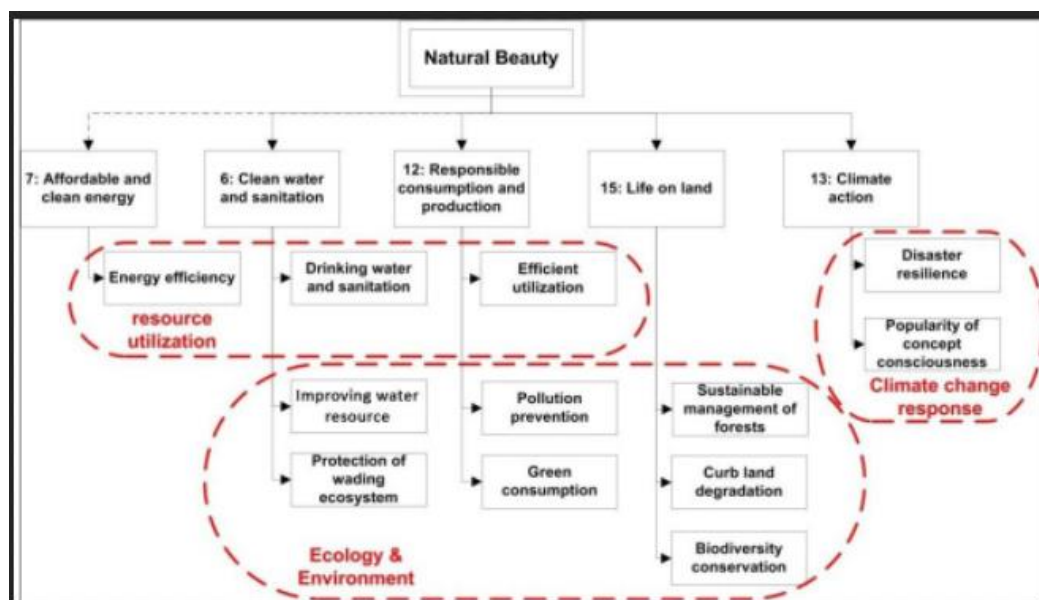
In the pilot study, the 16 goals (excluding Goal 14) were analyzed one by one with related indicators and evidence. Besides, a cluster analysis by leveraging the interlinkages among goals and indicators was also proceeded to obtain an overall picture about the economic growth (economic clusters), social inclusion (social clusters), and natural beauty (environmental clusters), and support the policy makers to address the gaps and challenges towards SDGs. Among the three clusters, the environmental cluster has been selected as a practical example for the integrated analysis as follows.

One of the key elements of this approach is the localization of SDG global indicator framework with three criteria (adaptability, comprehensiveness and measurability). After an analysis of the 17 goals and local sustainable development practices, a set of 102 quantitative indicators was selected which combined statistical and geospatial information data. Among them, 85 indicators were quantified by statistical data, 10 indicators were derived from geospatial data, and the remaining 7 indicators were measured by combined calculation of statistical and geospatial data. All SDG Goals (except Goals 14 and 17⁸) were grouped into three different SDG clusters - economic, social and environmental, according to the contribution or relevance of their indicators.

According to the indicator rating and the results of the single goal assessment, the degree of coordination of each SDG cluster is calculated through the mean, standard deviation and coefficient of variation. These are used to evaluate the development coordination degree of every indicator within each SDG cluster and among the three clusters. The overall development level, characteristics and best practices are further elaborated on the basis of the analysis results of single goal and SDG clusters. The final results can be used to elaborate how Deqing has implemented its SDGs and what are their challenges and future directions.

The SDG goals specific to the environment (6, 7, 12, 13 and 15) were grouped into a cluster named Natural Beauty. The focus of analysis included resource utilization, protection of ecological environment and responses to climate change as pictured in Figure 5.3.

Figure 5.3 Analysis of environment cluster in Deqing County



⁸ As Deqing is inland, goal 14 was not included. Goal 17 was not included as it focussed on coordination.

In general, the results of the “natural beauty” cluster of Deqing were positive as there have been remarkable achievements in the sustainable use of terrestrial ecosystems and the county has actively responded to environmental issues such as climate change. Various eco-environment indicators have improved in recent years to address climate change.

As shown in Table 5.3 the degree of coordination of the various indicators within the environmental cluster needs to be improved. The coefficient of variation in the field of resource utilization is 0.157, and clean water supply is fully covered. However, there is a gap in the intensity of energy use, which requires constant energy conservation and consumption reduction. The coefficient of variation in Ecology and Environment sub-cluster was calculated to be 0.109. The county has undergone rapid industrialization and the industrial structure is still in the process of continuous adjustment and optimization, nevertheless the amount of hazardous waste generation needs further reduction, and the comprehensive disposal rate still needs further improvement. At the same time, although Deqing County is rich in freshwater resources, the rapid increase in industrialization and urbanization has added to the pressure on freshwater resources and there is a need for continuous improvement of water resource utilization.

Table 5.3 Statistical Analysis of the Connotation Elements of SDGs Environmental Target Group in Deqing County

	μ	σ	C.V.
Environmental cluster	3.810	0.402	0.106
Resource utilization	3.667	0.577	0.157
Ecology & Environment	3.800	0.414	0.109
Climate change response	4.000	0.000	0.000

5.4 France: a new tool to facilitate the integrated analysis of the SDGs to support policies

In 2016, France developed a data visualisation tool, entitled “rosettes”, in order to help different stakeholders to report on SDGs, taking into account the interlinkages between the 17 goals. These rosettes are the fruit of collaboration between the Ministry of Ecological and Inclusive Transition and Cerema, a public body specialising in ecological transition and territorial cohesion. The rosettes are not intended to be exhaustive but rather serve to highlight common issues between the SDGs. They enable a visual representation of all the facets of the 2030 Agenda and their links in a user-friendly way.

The SDGs do not define a trajectory: everyone remains responsible for defining their own trajectory. Thus the rosettes are a tool to highlight the links between one goal vis-à-vis the other 16 SDGs. The tool has been designed to encourage dialogue and reduce the siloed approach to addressing the SDGs.

The rosettes identify both the existing synergies as well as the challenges that must be reconciled between one SDG and the other 16 Goals. Rosettes not only raise the awareness of the interlinkages but can also act as a tool for mobilization. The contents can evolve according to the current priorities and issues, and the actors are invited to create their own rosettes to identify their own challenges.

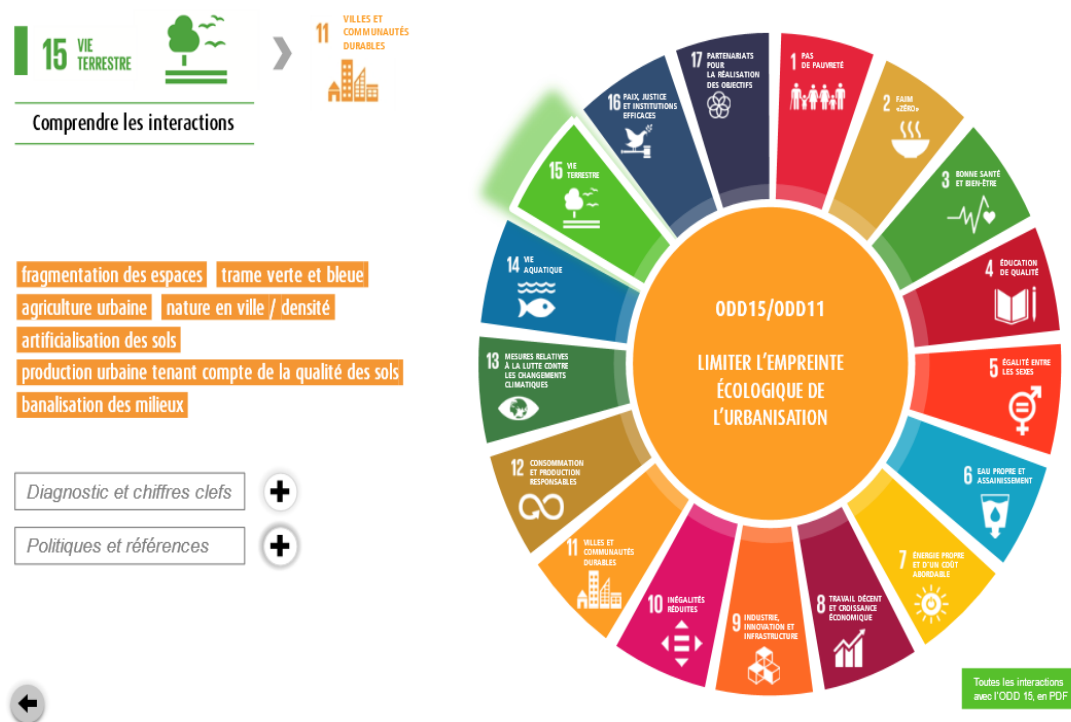
The rosettes tool includes:

- Downloadable rosettes in pdf format with, for each interaction, including a summary, indicating how the implementation of SDG 11 on Sustainable Cities for example, can contribute to the implementation of SDG 15 on Ecosystem and Biodiversity. These summaries also contain, complementary keywords to facilitate understanding. They specify possible interactions – for example looking at the interactions between SDG11 and SDG15 – we see that Nature in the City, Density, Green and Blue corridor, Fragmentation of Spaces etc. are noted as possible interactions.

- A second level of information is offered through a "diagnostic" bubble which provides benchmarks, sometimes quantified and a "political" bubble indicating public policies and actions carried out in France, sometimes with references, methods and tools.
- Finally the rosettes offer a series of internet links which enable the user to deepen their understanding about the Goal.

For example, for SDG 15 (Ecosystem and Biodiversity) the detail of SDGs is described in the centre of the SDG rosette. When you click on a petal (each petal represents one of the 16 other SDGs), there is information on the relationship between the two SDGs. As shown below – clicking on SDG 11 (Sustainable Cities) brings up the corresponding sentence "Limit the Ecological Footprint of Urbanization". Additionally, a set of key words appears (Nature in the Town, Density, Green and Blue Corridor, Fragmenting of Spaces, etc.) appears on the left-hand side. The "diagnostic" bubble can be selected to provide some key statistics. The "policy and references" bubble provides a set of references on policy and actions, with internet links on laws, texts or other regulations, for example the implementation of "Avoid, Reduce, Compensate "to evaluate plans and programs.

Figure 5.4 – Example of the rosettes which displaces the interlinkages between Goal 15 and Goal 11



The dynamic rosettes available at <https://www.agenda-2030.fr/beta/>

These rosettes support local authorities in implementing the 17 Sustainable Development Goals. They also facilitate reporting to the High-Level Political Forum taking into account these interlinkages. Six rosettes were implemented to illustrate the interrelationships between the SDGs targeted for the 2018 High-Level Political Forum, namely SDG6 (Water Management) - SDG7 (Energy) - SDG11 (Sustainable Cities) - SDG12 (Consumption and Production) - SDG15 (Ecosystem and Biodiversity) which are predominantly environmental objectives as well as ODD17 (partnerships) and the others.

5.5 Summary

Since the adoption of the Sustainable Development Goals in 2015, there has been substantial work done to understand how to address the interlinked nature of the goals within policy. Many multilateral organizations and individual countries are undertaking policy development using a multi-domain lens to try and understand how to optimize the impact of actions while minimizing unintended consequences. Key to effective SDG integration in policy is on-going follow-up and analysis, which will allow policy and programming to be modified when required, emerging risks to be addressed and mitigated, and enable effective and responsive policy.

6.0 Conclusions

This second report of the Interlinkages working group built upon the first report of the group which provided an overview of the interlinkages across the 17 goals and targets, as well as the interlinkages across other statistical frameworks. The goal of the first report was to elaborate not only how the 2030 Agenda is interlinked, but also to provide information related to other indicator frameworks that could be used to help in the measurement of SDGs. Building on the first report, the focus of this second report was four-fold. First, the report included a more a more detailed description of how statistical frameworks such as the SEEA can be designed and used to help measure the interlinkages of the 2030 Agenda (in the case of the SEEA economy and environment. The second, was to illustrate the interlinkages of the treaties/legislation related to the SDGs. Additionally, the report provided a discussion of the interlinkages within regions and how these may differ across regions and as a result, each region should undertake their own interlinkage analysis prior to developing policy. Finally, the report provided examples of practical application of the interlinkages of the Sustainable Development Goals to support integrated policy analysis and development.

While not an exhaustive examination of the on-going work related to the interlinkages of the 2030 Agenda for Sustainable Development, the two reports of the group provide a robust overview of the work going on in various domains and across jurisdictions to better understand and address the interconnected nature of the SDGs.

Annex 1: Conventions interlinked with the 2030 Agenda for Sustainable Development - The World Health Organization Framework Convention on Tobacco Control

The World Health Organization Framework Convention on Tobacco Control (WHO FCTC), internationally negotiated and legally binding, provides its Parties with a comprehensive set of evidence-based measures for tobacco control. Its full implementation is a cornerstone of the global response to the tobacco epidemic and, as it is one of the SDG targets, its implementation also contributes to the achievement of SDGs.⁹ The Convention itself acknowledges the relationship between tobacco and development and makes connections to relevant United Nations conventions that protect populations, including those on human rights, particularly the right to health. The WHO FCTC is one of the only three international conventions referenced in the SDGs and their related targets. Target 3.a of the SDGs specifically calls for strengthening implementation of the WHO FCTC. The “Global Strategy to Accelerate Tobacco Control: Advancing Sustainable Development Through the Implementation of the WHO FCTC 2019-2025”¹⁰, adopted by the Conference of the Parties at its eighth session in October 2018 seeks to meaningfully contribute to reaching the overall health goal of SDG goal 3 and target 3.4 on NCDs. SDG 17 recognizes that the goals can only be realized with a strong commitment to global partnership and cooperation.

The seventh session of the Conference of the Parties, in its decision FCTC/COP7(27): “Contribution of the Conference of the Parties to achieving the noncommunicable disease global target on the reduction of tobacco use”, “welcoming the 2030 Agenda for Sustainable Development, including, *inter alia*, Sustainable Development Goal (SDG) 3 (Ensure Healthy Lives and Promote Well-being for All at All Ages), and reaffirming its specific and interlinked targets, including SDG target 3.4 and SDG target 3.a” requested the WHO FCTC Secretariat “to promote WHO FCTC implementation as an essential and high-impact strategy for achieving SDG target 3.4”.

(Decision FCTC/COP7(27). [https://www.who.int/fctc/cop/cop7/FCTC_COP7\(27\)_EN.pdf](https://www.who.int/fctc/cop/cop7/FCTC_COP7(27)_EN.pdf))

The case of implementing WHO FCTC as an accelerator for sustainable development is clear: the WHO FCTC addresses an epidemic that kills more than 7 million people annually and costs the world economy 2% of its gross domestic product.

“There is compelling evidence that the Convention has had an impact on a range of global governance institutions and agendas, especially the global NCD agenda, and the 2030 Sustainable Development Agenda. The Convention has been the basis for the engagement of other UN system members in tobacco control through the UN Interagency Task Force, through collaborative initiatives with UNODC and with UNDP to promote national development strategies including tobacco control.”

(Document FCTC/COP/7/6/: Impact assessment of the WHO FCTC: Report by the Expert Group. https://www.who.int/fctc/cop/cop7/FCTC_COP_7_6_EN.pdf?ua=1)

The implementation of the WHO FCTC is already positioned, in global policy documents and resources, as a key contributor to the achievement of target 3.4 on the prevention and control of NCDs. Furthermore, its implementation contributes to other health issue responses under SDG 3, including tuberculosis and HIV/AIDS, maternal and child health, reproductive health, and universal health

⁹ <https://sustainabledevelopment.un.org/index.php?page=view&type=30022&nr=186&menu=3170>

¹⁰ <https://apps.who.int/iris/bitstream/handle/10665/325887/WHO-CSF-2019.1-eng.pdf?ua=1>

coverage, to name only a few. The Issue Brief of UNDP and the WHO FCTC Secretariat¹¹ outlines how tobacco consumption worsens TB and HIV outcomes and how the integration of tobacco control could increase health benefits and efficiencies. Key approaches and practical options for such integration are outlined, based on a review of research and case studies.

Implementation of WHO FCTC is also key to sustainable development. There is an increasing recognition of the tremendous burden of tobacco use and its negative impact on various development dimensions such as health, economics, environment, and communities. Implementing the WHO FCTC in its entirety helps leverage its impact and the win-wins it offers in projects carried out in all these development dimensions.

The need to integrate WHO FCTC implementation into countries development plans is well-recognized by United Nations. Therefore, the Ad Hoc Inter-Agency Task Force on Tobacco Control, incorporated in the work of the UN Interagency Task Force on Non-communicable Diseases (UNIATF), called upon the UN agencies, programmes and funds to provide coordinated support in the pursuit thereof. In this regard, the UNDP carried out a study to provide recommendations to facilitate integrating the WHO FCTC into national development plans and the One UN programmes (formerly called as UNDAFs) that support them. The UNDP reviewed the status of such integration for 120 countries, did an in-depth desk analysis for 48 countries and conducted detailed interviews with 10 countries to identify best practices. This study has concluded with recommendations on how such integration could be done. The recommendations included that *“The UN system and Parties should adopt a more proactive approach to integrating the WHO FCTC into UNDAFs, which would be to view support for WHO FCTC integration, at the very least, as an international obligation that the UN is mandated to support in respect to the implementation of the WHO FCTC by States Parties. This would allow supporting the integration of the WHO FCTC into UNDAFs without any precondition of activities first being included in the NDPs.”*¹²

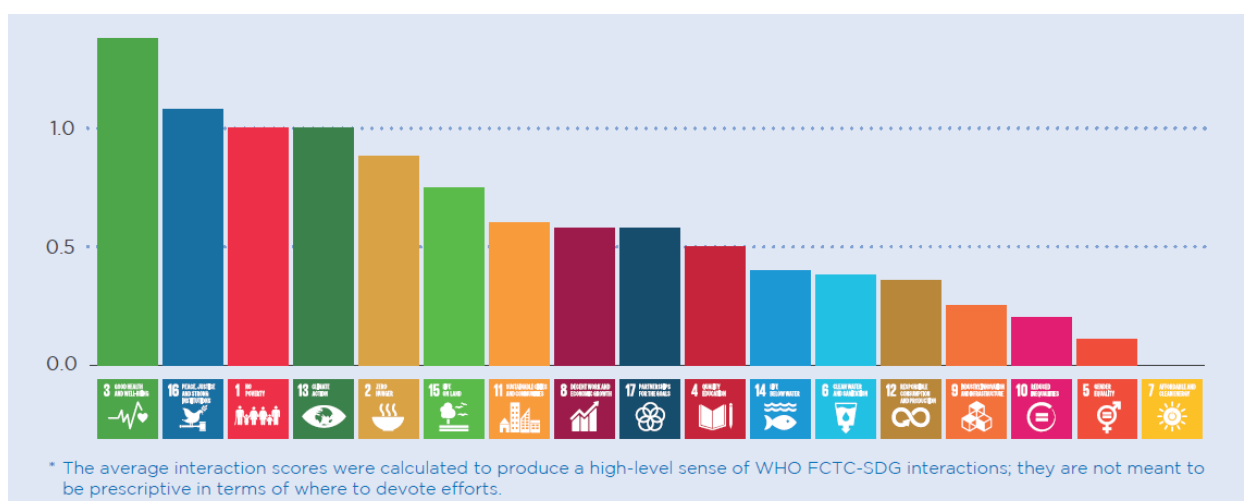
Another study conducted by UNDP found that WHO FCTC implementation interacts positively with 67 SDG targets¹³ (Figure 1). The authors calculated interaction scores between the WHO FCTC and 16 of the 17 SDGs. This study demonstrates the many interlinkages that exist; all these numerous entry points show the mutually reinforcing nature between WHO FCTC articles and selected SDG targets. For example, tobacco control can help accelerate poverty alleviation efforts (SDG 1). It is evident that spending on tobacco can divert a significant percentage of household resources from spending on basic needs such as food, education and other investments that could lift people out of poverty. Additionally, tobacco use can cause high medical expenditures, which imposes a huge burden especially on the poor households, trapping them in the ‘vicious cycle’ of poverty. Another example is how tobacco control measures which address gender-specific risks, as required under Article 4.2(d), can advance gender equality. Tobacco use is rising rapidly amongst women and girls, largely because of targeted tobacco industry campaigns which associate smoking with female empowerment and gender equality.

¹¹ <https://www.undp.org/content/undp/en/home/librarypage/hiv-aids/integrating-tobacco-control-into-tuberculosis-and-hiv-responses.html>

¹² <https://www.undp.org/content/dam/undp/library/HIV-AIDS/HIV%20MDGs%20and%20Development%20Planning/Development%20Planning%20and%20Tobacco%20Control%202014%2002%2028%20PDF%20FINAL.pdf>

¹³ <https://www.who.int/fctc/implementation/publications/who-fctc-undp-wntd-2017.pdf?ua=1>

Figure 4.1: WHO FCTC interaction scores (averages) for all 17 goals



The Framework Convention Alliance for Tobacco Control, an observer to the Conference of the Parties of the WHO FCTC and a partner of the WHO FCTC Secretariat in projects to promote implementation of the treaty, has published an advocacy toolkit on how to integrate WHO FCTC implementation in their overall SDG response and in more comprehensive national development plans. This toolkit presents examples, at country level, of how each of SDGs is linked to WHO FCTC, and how WHO FCTC implementation feeds in acceleration of SDGs achievement¹⁴.

1.1 Examples and opportunities of interlinkages at regional (or subregional) levels

Applying the requirements of the WHO FCTC at regional (or subregional) level could improve the outreach of the treaty, promoting uniform measures in a group of Parties. Such synergy could improve implementation efficiency and impact within entire regions (or subregions). Measures implemented at regional level also guarantees their integration with regional development agendas and priorities.

The WHO FCTC currently have 181 Parties out of which one, the European Union (EU), is an economic integration organization. The EU became WHO FCTC Party in 2005, and since then coordinates the application of requirements of the WHO FCTC in all its member states in the areas of its competence. As the EU's primary competency relates to the regulation of an internal market, in case of implementation of the WHO FCTC, its competency concerns areas that have trade facets or implications. An attempt to promote such integration and present a coherent approach to tackle the tobacco epidemic at regional level, the EU Tobacco Products Directive (TPD) was adopted in 2014. Each EU Member States are required to integrate the TPD into their national legislation by 2016, which includes rules regulating the manufacture, presentation (packaging and labelling) and sale of traditional and novel tobacco products, regulating and reporting on their ingredients and emissions. Implementation of TPD requires the involvement of non-health sectors, reflects the interlinkages that need to exist for effective implementation of the Convention within a unified market setting, and its alignment with development agendas.

Other regional blocks are also moving to reflect on interlinkages between health and non-health sectors and interventions to strengthen implementation of the Convention. Tobacco control efforts in the Caribbean Community (CARICOM)¹⁵ are another example of coordinated regional efforts of fifteen countries (fourteen of which are Parties to the Convention). The CARICOM have signed the "Port-of-

¹⁴ https://www.fctc.org/wp-content/uploads/2015/10/SDGs_ToolkitFINAL.pdf

¹⁵ CARICOM Member States: Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, Saint Lucia, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Suriname, and Trinidad and Tobago.

Spain Declaration on Non-Communicable Diseases” in 2007. In that document the CARICOM committed to address causal risk factors, including tobacco use. Acting within its mandate under the Port-of-Spain Declaration the CARICOM developed and adopted, in December 2012, the “Regional Standard for the Labeling of Retail Packages of Tobacco Products” thus promoting implementation of Article 11 of the Convention (Packaging and labelling of tobacco products) among its Member States.

The Cooperation Council for the Arab States of the Gulf (previously called as Gulf Cooperation Council (GCC))¹⁶, a political and economic alliance, agreed to move forward with promoting implementation of Article 6 of the Convention (Price and tax measures to reduce the demand for tobacco), one of the most cost-effective measures for tobacco control. The six WHO FCTC Parties that are members to GCC have adopted and introduced, in 2017, an excise tax for tobacco products and harmonized its rate, in a regional effort to reduce tobacco consumption through higher tobacco prices. A similar tobacco tax harmonization initiative has been carried out in the Economic Community of West African States (ECOWAS)¹⁷, with fifteen-member countries, all of which are Parties to the Convention. ECOWAS adopted a new directive on tobacco taxation in December 2017, aiming at a comprehensive economic integration and harmonization of tobacco taxation. The WHO regional office for South-east Asia elaborated a report describing interlinkages between WHO FCTC implementation and other SDGs that are relevant to the region.¹⁸

1.2 Examples of interlinkages at national level

The Convention promotes comprehensive multisectoral measures and responses, including in the form of national tobacco control strategies, plans and programmes. Governance and administrative mechanisms at national level aimed at putting in place the requirements of the Convention involve liaising with the non-health government departments, organizations and institutions, including involvement of the civil society and exclusion of the tobacco industry and other entities and individuals that further the interests of the tobacco industry. Such interactions promote, at the same time, interlinkages with various health and non-health SDGs, in the same way as they are presented in Figure 4.1, above.

A few examples are presented as follows. Article 5.2 of the Convention promote establishment and operation of national coordinating mechanisms or focal points for tobacco control. In an increasing number of instances such coordinating mechanisms are responsible for coordinating both NCD control (target 3.4) and implementation of the WHO FCTC (target 3.a). Moreover, especially in low-resource settings, the focal points responsible for tobacco control also cover broader, related issues, such as NCDs or other NCD risk factors.

There are various programmes implemented under the auspices of the COP promoting interlinkages at national level. The COP-mandated project with the most experience gathered so far is the so-called “**needs assessment**”. In this, representatives of countries, the WHO FCTC Secretariat, WHO, UNDP, and other partners as appropriate (e.g., the World Bank) engage in a joint assessment of the country’s FCTC implementation status and come up with recommendations on how the different government sectors should strengthen their contributions to the achievement of target 3.a.

At its seventh session, the Conference of the Parties (decision FCTC/COP7(27)) requested the WHO FCTC Secretariat “*to work with the United Nations Development Programme (UNDP), WHO and other partners in the United Nations Development Group (UNDG) to embed support of the implementation of the WHO FCTC throughout Parties’ national efforts to achieve the SDGs, including by integrating*

¹⁶ GCC Member States: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates.

¹⁷ ECOWAS Member States: Benin, Burkina Faso, Cabo Verde, Côte d’Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo.

¹⁸ South-East Asia: <https://apps.who.int/iris/bitstream/handle/10665/255509/9789290225782-eng.pdf?sequence=1&isAllowed=y>

WHO FCTC implementation in national priorities in the development of the United Nations Development Assistance Frameworks". Against this backdrop, and primarily as part of the needs assessment exercise described above, the WHO FCTC Secretariat and its partners promote **integration of WHO FCTC implementation with United Nations Development Assistance Frameworks (UNDAFs)** or equivalent planning frameworks that reflect the 2030 Agenda. The UNDAF provides a system-wide overview of key UN activities and functions at country level, in support of national policies, priorities and plans, while ensuring coordination, coherence, effectiveness and efficiency for maximum impact. UNDAF processes help expressing and enhance national ownership, promote good governance, and provide a platform for intersectoral cooperation to achieve SDGs, including target 3.a. For WHO FCTC implementation to be successfully integrated with UNDAFs, more than one UN agency active at country level should specify plans for supporting WHO FCTC implementation. A few FCTC Parties have included reference to WHO FCTC implementation or to tobacco control interventions in their UNDAFs. To achieve better mobilization of UN agencies to support achievement of target 3.a, additional efforts will be required, possibly by UNDP, the WHO FCTC Secretariat and/or civil society, to sensitize UN agencies beyond WHO on the relevance of tobacco control to their mandates, and their responsibilities towards implementing the WHO FCTC.

An area of critical importance in promoting coordination of policies in implementation of the WHO FCTC is tobacco growing and transition to viable alternative activities and livelihoods by tobacco farmers. The Conference of the Parties, in October 2018, adopted a decision (FCTC/COP8(19))¹⁹ that reiterates that *"the implementation of Articles 17 and 18 of the WHO FCTC can contribute to the achievement of some goals of the 2030 Agenda for Sustainable Development, namely, Goal #2 (Zero hunger), Goal #3 (Good health and Well-being), Goal #6 (Clean water and Sanitation), Goal #8 (Decent Work and Economic growth), Goal #12 (Responsible consumption and production), Goal #13 (Climate action), Goal #14 (Life below water), and Goal #15 (Life on land)"*. Furthermore, the COP required work to be conducted *"to identify and recommend options and sustainable practices to enhance the implementation of alternative livelihoods to tobacco growing and measures to mitigate social, cultural, environmental, economical and occupational risks of tobacco production, in line with 2030 Agenda for Sustainable Development"*.

Equally important are assessments of the macroeconomic impacts of tobacco use and stakeholders' assessments in terms of their role in response and country-level planning.²⁰ In a related exercise, more recently, the WHO FCTC Secretariat and UNDP partnered to initiate so-called **"investment cases"** for tobacco control; they are studies whose results show that there is an opportunity to reduce the health and economic burden of tobacco by enacting WHO FCTC policy measures. At national level, this initiative helps governments in advancing multisectoral response to tobacco and investing in the health of their populations, save lives, increase their revenue streams, generate strong economic gains and reduce poverty – and all of these support the achievement of various SDGs.

²⁰ https://www.who.int/fctc/publications/Development_Planning_and_Tobacco_Control_20140312.pdf

Annex 2: Italy - Statistical measures for SDGs: complexity, interlinkages and networks

The Sustainable Development Goals refer to different domains of analysis - social, economic, environmental and institutional - and consider as catalysts elements: integration, universality and participation. The interconnection between human systems and natural systems must therefore be integrated into a global perspective, considering the possible synergies between national and international institutions.

To facilitate the analysis of the Istat SDGs information system, an approach that considers the links and interactions between Goal and Target is useful, making the “interlinkages” between the related statistical indicators and thus building the possible related “mappings” dedicated to specific topics.

At both international and national level, attention is paid to the analysis of interlinkages: the analysis of the links helps to define the critical points and the nodes of sustainable development and, at the same time, to identify the interrelations between the statistical indicators, to support of active processes and policies.

The analyses related to interlinkages may have three main purposes. The first one is to facilitate the production of statistical information, aimed at bridging information gaps, identifying the most appropriate proxy indicators or the most relevant specific national indicators. The explanation and analysis of the interrelationships can help to understand the philosophy underlying the statistical measures to be developed and to identify the critical dimensions. This allows to focus attention on the fundamental dimensions of each target, trying to make the most of available statistical information.

The second purpose is to make complex statistical information more accessible, through the integrated analysis of social, economic and environmental dimensions and their interrelations, making explicit, for example, the interconnections related to climate change, the urban dimension, the possible development drivers, or aspects related to cross-cutting issues such as gender or citizenship inequalities or issues related to disability. The third purpose proposes the use of the identified links to facilitate the use of statistical measures for monitoring, even cross-referencing, of sustainable development objectives to support policies. The integrated statistical systems, such as the current statistical platform SDGs Istat, as well as the study of the interactions between the different domains of the SDGs and the clarification of the links between the indicators, can support the monitoring and the choices on the synergistic actions to be developed, the definition of priorities, the identification of the trade-offs and of the relevant dimensions to be monitored, contributing to an overall improvement in the consistency of the policies to be implemented. Policies aimed at improving a specific dimension could generate impacts in other dimensions with possible positive or negative effects in the short and long term cascade. The analyses can help identifying key variables that could be used to define more precisely the main targets to be pursued.

In this chapter, some of the analyses aimed to explore the nature of interlinkages between Goals and finalized to take into account the different purposes, referring to statistical measures, used as a tool to identify such interactions, are described. It will therefore be highlighted how much the Istat SDGs Information System approaches the theoretical intentions set out in the UN-IAEG-SDGs system for the analyzed phenomena and what, instead, is additionally available, both for specific interests matured over the years and for the wealth of data sources.

The results are shown using a visualization through the graphs which helps to identify the main nodes related to the identified interconnections.

The SDGs network: UN-IAEG-SDGs metadata

Reading the interconnections and the interactions between themes, domains and objectives is useful to consider the indicators in a global perspective, navigating among the statistical measures useful for the construction of indicators for monitoring sustainable development. This analysis commences with an examination of the information contained in the metadata system of the Inter-agency and Expert Group on Sustainable Development Goals Indicators (UN-IAEG-SDGs): the links defined between the indicators and between the statistical measures explain the interactions between the targets.

The pictures present the information contained in the UN-IAEG-SDGs metadata, according to the latest updates, which define the possible links with indicators of other Goals. Specifically, for each of the indicators that have well-defined metadata, the targets with which there are interrelations are indicated. These links were accounted for in matrices and visualized by graphs.

The links defined between the indicators make the interactions between the objectives explicit; a network in which some thematic areas are closely linked together and are often also "comprehensive and mature" in terms of structured statistical information (many Tier I indicators).

The synthetic representations of the relationships between the Goals are realized through the sum of the number of links indicated, without taking into account their direction: therefore, there are graphs relative to the light links (from 1 to 3 connections), medium links (from 4 to 10) and strong links (more than 10).

Figure 1.1 – Statistical indicators for SDGs monitoring by typology of links – Light (1-3 links)



Figure 1.2 - Statistical indicators for SDGs monitoring by typology of links – Medium (4-10 links)

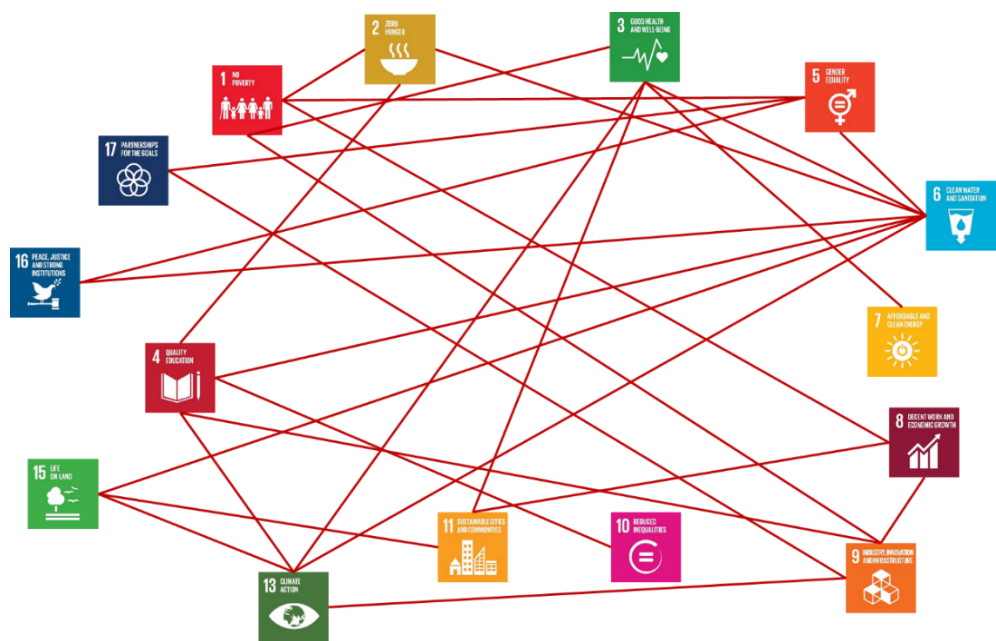


Figure 1.3-Statistical indicators for SDGs monitoring by typology of links – strong (more than 10 links)



The analysis carried out shows that the network based on the UN-IAEG-SDGs metadata is connected and inclusive, leaving no development goals excluded. In fact, there are no isolated nodes that cannot be reached through the paths that can be developed.

Widely connected and central to the network are the Goal 1 (No Poverty) and 11 (City) with 15 links, the Goal 4, (Quality education) with 14 links, the Goal 5 (Gender Equality) and 6 (Clean water), with 13 links, the Goal 8 (Work) with 12 links.

The analysis by intensity (strong, medium, light) of the relations shows how, while for medium and light links, the network of objectives concerns all 17 objectives, the strong ties currently exclude only four Goals: the 2 (Food) , 7 (Energy), 10 (Equality), 9 (Innovations and infrastructures).

Identifying the connections between objectives and targets through the links of the statistical measures underlying the indicators, included in the global SDGs framework, is a valid support to promote the subsequent integrated analyzes to be tested at national level, identifying specific thematic areas to study the paths for groups of objectives, considering the purposes related to production, analysis and monitoring.

SDGs network: the analyses

Analytical approach

The approach adopted in the SDGs on sustainable development is based on the idea that economic prosperity, environmental protection and social well-being are interconnected elements that cannot be addressed separately.

It is therefore an integrated approach, according to which: human well-being is intrinsically linked to the health of natural ecosystems; failure to protect them also poses a threat to long-term prosperity in development; addressing the inequalities in the distributive benefits of development is fundamental for global sustainable development; the management, maintenance and preservation of natural capital are essential aspects to guarantee a sustainable use of resources.

Consistent with the "no one left behind" principle and following what is required by the target 17.18, the possible disaggregations for each Goal were extended: by region, by city, by degree of urbanization, by gender, by citizenship, by presence of disability.

Gender, citizenship, disability can be explained in the analysis of the interconnections between objectives, targets and indicators: their potential information can improve the consistency of the analyses, making synergies and complementarities explicit.

Cross-sectional analyses related to the urban dimension, climate change, innovations and infrastructures as development engines, can explain further aspects related to interconnections, conceptual and due to coherence also with other international frameworks, such as the Sendai Framework or those related to Changes climate.

The interrelationships are analyzed by comparing the hypothesized by UN-IAEG-SDGs with the statistical information currently available in the Istat-SDGs Information System, making the links explicit through graphs.

Disability

In the 2030 Agenda, a concrete application of the "no one left behind" principle is represented by the inclusion of disability among the topics considered. According to the UN-IAEG-SDGs metadata, people with disabilities are explicitly mentioned in goals and targets six times: in education targets (target 4.5 and 4.a), growth and employment (target 8.5), inequalities (target 10.2), accessibility to green spaces in urban environments (target 11.7), as well as data collection and SDG monitoring (target 17.18). To highlight the importance of inclusion in order to ensure equal opportunities for quality of life and development, it was deemed appropriate to consider other words as well: nine times the word "vulnerability" occurs, six times the need for "universal access" and 31 times the access and availability of goods, services "for all".

Figure 1.4 - Statistical indicators for SDGs monitoring. Interrelations to monitor according to 2030 Agenda to give information on people with disabilities

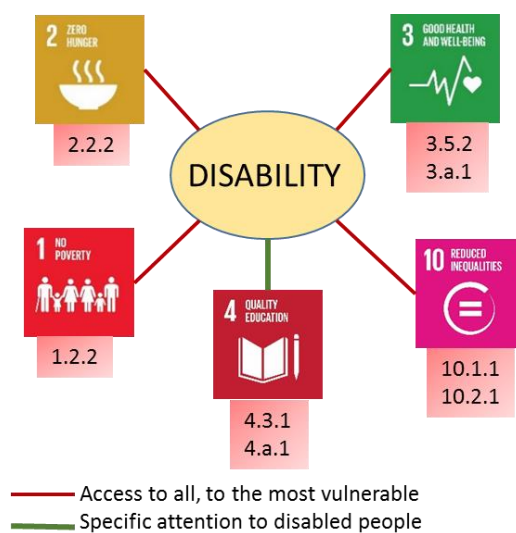


Istat has therefore integrated the information relating to people with disabilities into the current dissemination: in addition to the nine indicators produced in 2018 with the differentiation between presence of disabilities and non-disabilities, three other indicators have been added, for a total of 16 measures disaggregated also due to the presence of disabilities. The classification variable used, chosen as a proxy for the condition of disability, is the Global Activities Limitations Indicator (GALI), currently used in population surveys in Europe, which makes it possible to estimate the number of people with severe limitations in daily activities.

For indicators on the possibility of attendance in schools of students with disabilities (4.3.1) and on schools with students with disabilities equipped with adapted computer workstations (4.a.1) students with disabilities are those who have a certification based on Law 104/92 and who have a support teacher.

The current availability of interconnected statistical information on disability is explained in the following graph.

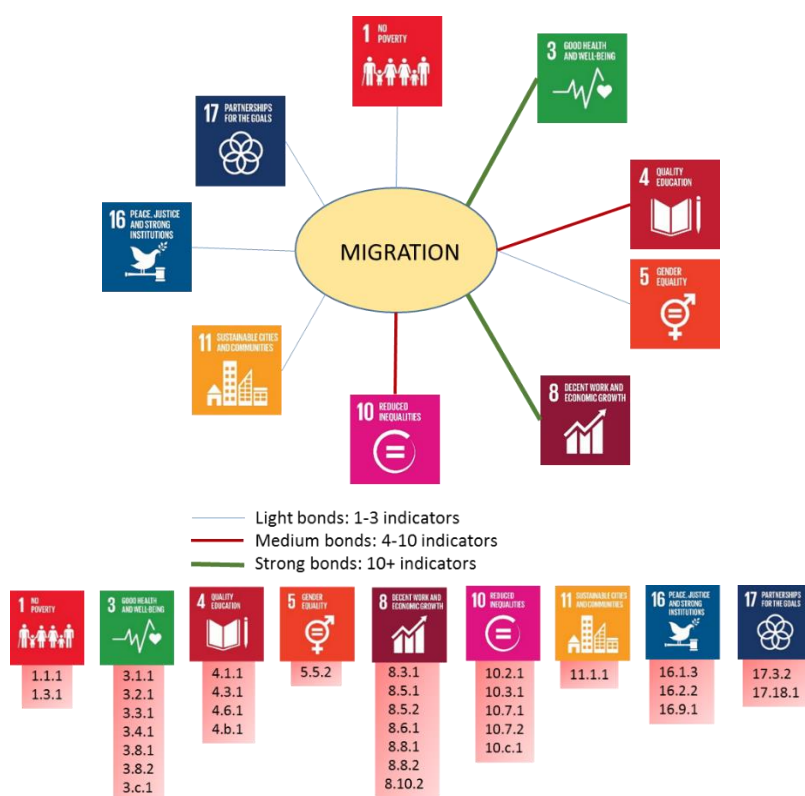
Figure 1.5 - Statistical indicators for SDGs monitoring according to 2030 Agenda and available indicators to give information on people with disabilities



Migrations

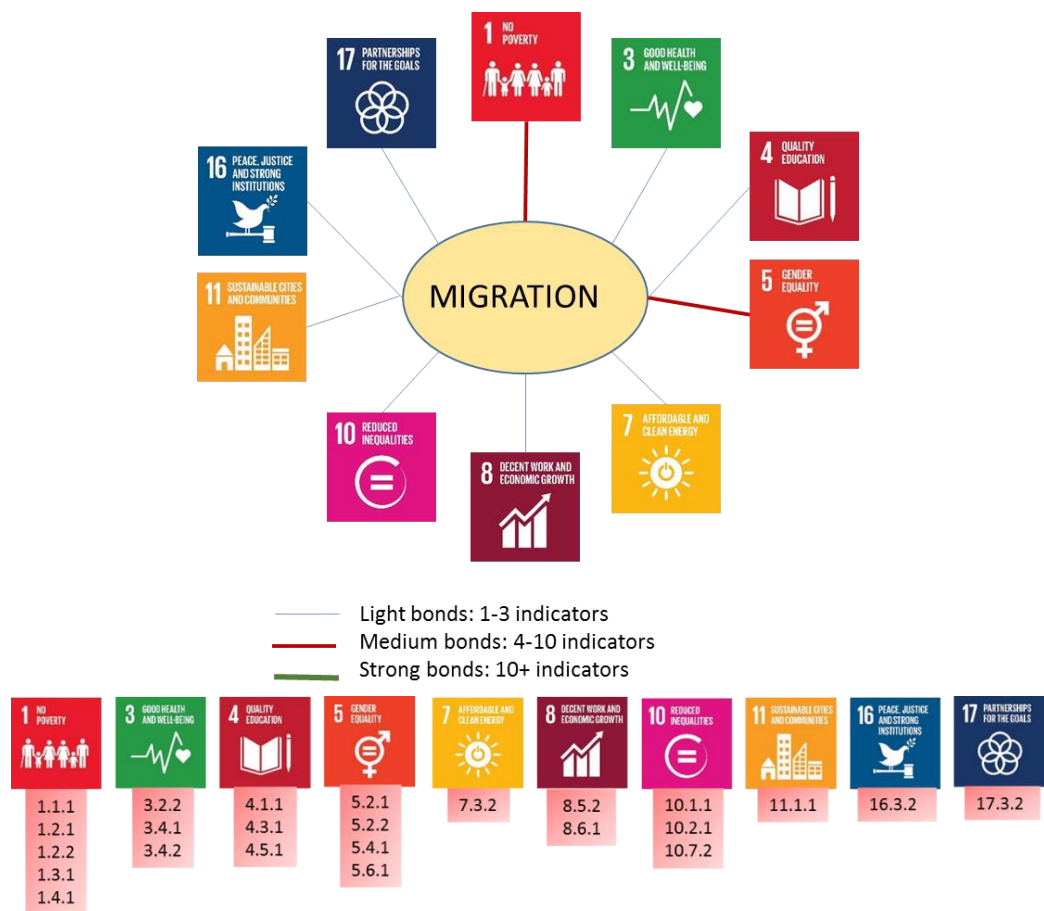
In the 2030 Agenda, specific indicators classified “for migrants” are identified: the indicator 4.b.1, Volume of public development aid for scholarships by sector and type of study); 10.7.1, Cost for the employment of the employee in relation to the monthly income achieved in the destination country; 10.7.2, Number of countries with migration policies that facilitate migration and orderly, safe, regular and responsible mobility; 10.c.1, Costs of remittances as a percentage of the amount remitted; 16.2.2, Number of victims of trafficking in human beings per 100,000 inhabitants, by sex, age and form of exploitation. Two other indicators explicitly indicate a disaggregation related to migrations: 8.8.1 Frequency rates of fatal and non-fatal injuries, by gender and migrant status and 8.8.2 National compliance level of labor rights (freedom of association and collective bargaining), by gender and migrant status. A further 22 indicators, which do not explicitly require disaggregation by migration status, are however considered relevant by the UN to understand the condition of migrants in the host countries.

Figure 1.6 - Statistical indicators for SDGs monitoring according to 2030 Agenda and available indicators to give information related to migration



The information available in the Istat SDGs Information System has been integrated through the insertion of specific indicators (the measures of 10.7.2 on permits issued and the acquisition of citizenship and the measures introduced on this occasion for 17.3.2, i.e. remittances to foreigners in Italy in millions of euros and in percentage terms) and with the most frequent use of breakdowns by citizenship. Soon, the breakdown by country of birth will also be considered. It was also considered appropriate to distinguish between first generation migrants and second generation migrants, using the variable (called in the "nationality" database) used by the Invalsi Statistical System to differentiate native students (born in Italy from Italian parents), the first generation students (born abroad from foreign parents) and second generation students (born in Italy from foreign parents). In the SDGs Istat information system there are a total of 52 measures that take into account the theme, corresponding to 24 UN-IAEG-SDGs indicators.

Figure 1.7 – Statistical indicators for monitoring SDGs. Interlinkages in the Istat SDGs Statistical System related to migration



As suggested by the United Nations, in the statistical measures, aspects related to access to basic services - such as education, health services and social protection - are made available to consider how much migrants are integrated into the host society and whether they suffer any violence or discrimination.

Urban sustainability

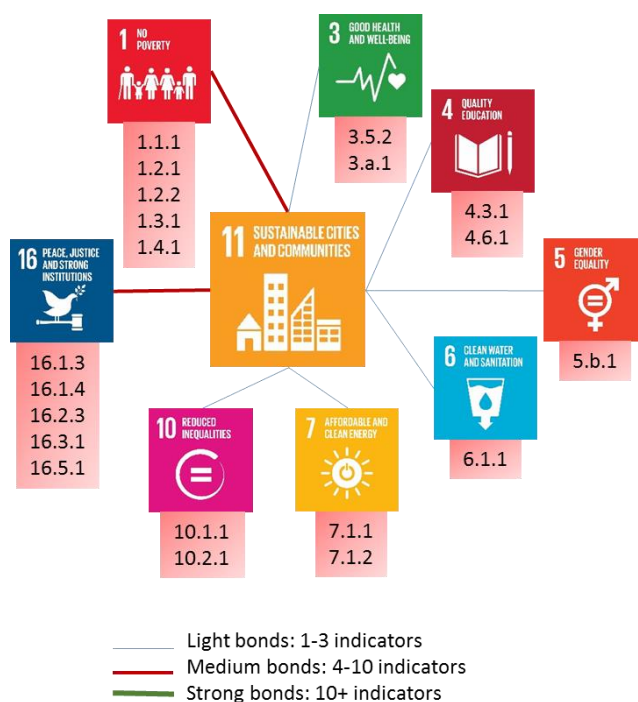
The theme of urban sustainability is fundamental for the 2030 Agenda. The concentration of the population in urban areas gives rise to substantial shares of energy consumption and carbon emissions and to the increasing pressure on the environment. Urban space is therefore a crucial development factor. The analysis of the theme does not only concern the Goal 11, but must be understood in a transversal manner considering, where possible, the degree of urbanization also for other indicators connected to sustainable development. Therefore, there are many dimensions to consider in a systemic, inclusive and integrated way, in order to analyze the issue of urban sustainability. According to the United Nations metadata related to the Goal 11 indicators, the network of connections between this and almost all the others is, in fact, very dense, with strong connections too. The most frequent connections are with the Goal 1 (Poverty), the Goal 13 (Climate change), the Goal 6 (Water) and the Goal 16 (Strong institutions and justice). Also important are the connections with the Goal 3 (Health), Goal 8 (Work and growth) and Goal 15 (Land) indicators.

Figure 1.8 - Statistical indicators for SDGs monitoring, Urban sustainability indicators and interlinkages according to UN-IAEG-SDGs



Widening the statistical information made available on the occasion of the current dissemination has allowed the development of indicators at the most detailed territorial level possible: from the country, to the regions, to the cities. By provincial capital there are 10 measures included in the Goal 11; there are 17 measures in Goal 1, 4, 7, 10 and 11 which consider the degree of urbanization; 15 measures are widespread in Goals 1, 5, 6, 7, 11 and 16 which consider the municipal typology subdivided according to metropolitan areas and the number of the population.

Figure 1.9 - Statistical indicators for SDGs monitoring, urban sustainability indicators and interlinkages in the Istat SDGs Statistical system



Further analytical insights will be developed in this regard in future editions.

Climate change

To respond to the information challenge posed by the 2030 Agenda, it is essential to consider in an integrated and transversal manner also the statistical measurement issues related to climate change. The Goal 13 refers to urgent and substantial impact issues to combat climate change and its consequences. Rising temperatures in the atmosphere and the ocean, changes in precipitation regimes, rising sea levels and acidification are climate changes that have consequences for the environment and ecosystems, but also for the socio-economic system, damaging the territory with significant consequences in productive activities, in infrastructures, for people. The anthropogenic pressures generated by both economic activities - such as agricultural and forestry practices, industrial processes and service activities - and those of transport and household heating have concrete effects. Climate change is also the cause of the escalation of some climatic and hydro-meteorological calamities. To act against climate change, the transition to a greener economy must be guaranteed, combining social well-being, environmental protection and economic competitiveness.

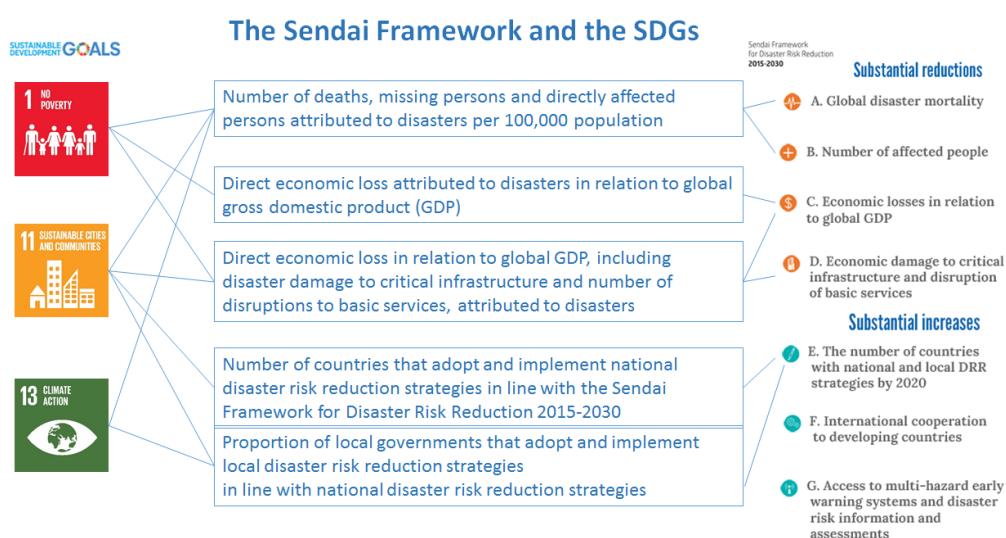
The United Nations Framework Convention on Climate Change and related agreements, such as the Kyoto Protocol and the Paris Agreements, the Sendai Framework for Disaster Risk Reduction 2015-2030 have translated, in terms of information demand, into different frameworks international statistical indicators that have strong interconnections with the UN-IAEG-SDGs indicators.

In terms of cause or effect, issues related to climate change are, therefore, present in almost all sustainable development objectives.

Goal 13 targets are aimed at developing and integrating measures to combat climate change into national policies, strategies and plans, to increase the resilience of the territories to climate-related risks and natural disasters.

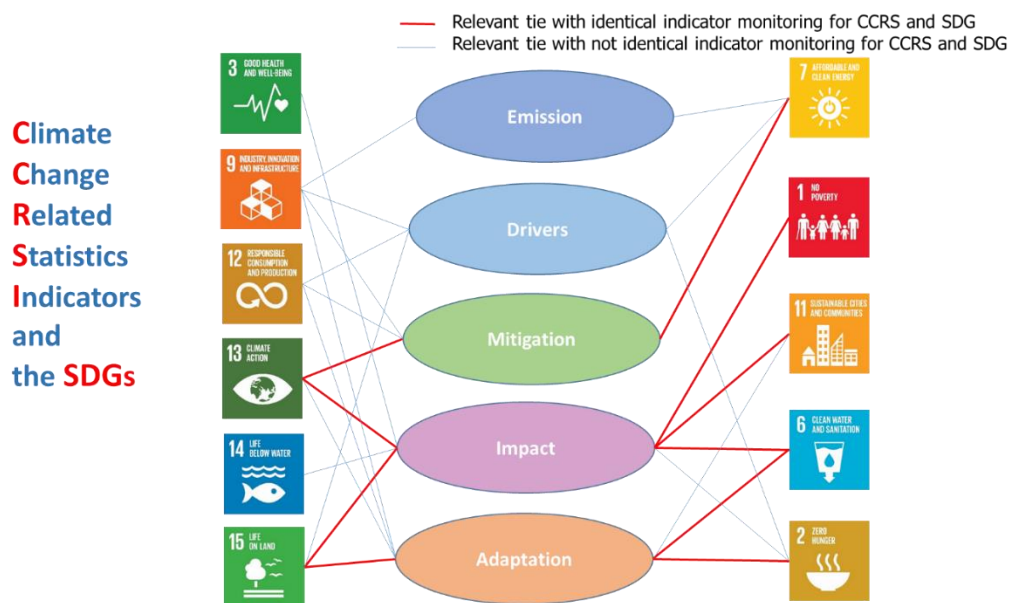
Three of the objectives of 2030 Agenda include some of the indicators of the Sendai Framework for risk reduction from disasters, as well as in Goal 13, present in the Goal 1 (Poverty), to consider the vulnerability connected to environmental risks and in Goal 11 (City) to consider degraded, cemented and densely populated urban areas.

Figure 1.10 - Interlinkages among SDGs and Sendai Framework



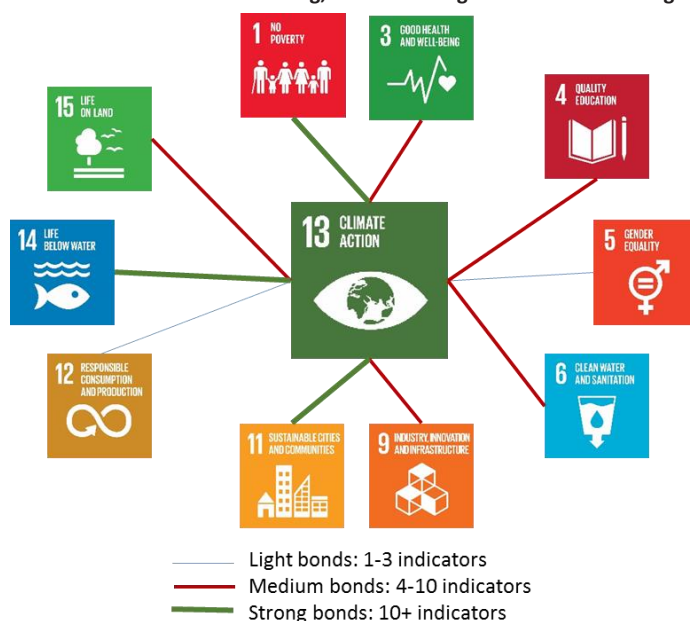
Seven Goals are interlinked to UNECE statistical indicators for Climate Change monitoring.

Figure 1.11 Interlinkages among SDGs and UNECE Climate Change Related Statistics indicators



According to the UN-IAEG-SDGs metadata, the network of connections between the Goal 13 and the others highlights numerous links, of which the most frequent are the Goal 1 (Poverty), the Goal 11 (City) and the Goal 14 (Sea). Also important are the interrelations with the indicators of the Goal 15 (Earth), of the Goal 6 (Water), of the Goal 9 (Infrastructure and industry) and with the Goal 4 (Education) and 3 (Health), which concern the well-being of people.

Figure 1.12 - Statistical indicators for SDGs monitoring, Climate Change indicators according to UN-IAEG-SDGs



In the Istat-SDGs information system, there are 11 indicators that develop 27 statistical measures. Although a considerable effort has been made so far in this regard, it is certainly a domain in which the development of quality statistical information offers the possibility of having significant areas for improvement.

Figure 1.13 - Statistical indicators for SDGs monitoring, Climate Change indicators and interlinkages in the Istat SDGs statistical system



Research, innovation and infrastructure

The Goal 9 has links with a multiplicity of objectives and targets, given that it focuses on elements - infrastructure, industrialization, research and innovation - that can be considered the engine of economic growth and a lever for competitiveness, as well as enabling factors for social and environmental development.

The most important role is represented by the indicators associated with scientific research, technological development and innovation (target 9.5), since these represent the tools through which to achieve many of the objectives of sustainable development: from the improvement of morbidity and mortality to the lengthening of the life expectancy thanks to the results of medical research (Goal 3), the expansion of technological innovation in agriculture (Goal 2), energy (Goal 7) and marine (Goal 14) to the promotion of cooperation for capacity building and extension of scientific and technological knowledge, particularly in developing countries (Goal 12 and 17). Development of quality infrastructures (target 9.1) and increase in productivity and efficiency in the use of resources (target 9.4) are connected with many indicators relating to Goals 1 and 11 (access to transport), 2 (rural infrastructure and agricultural productivity), 6 (efficiency of water distribution networks), 7 (energy intensity and energy distribution infrastructures), 8 (labor productivity), 12 (material consumption).

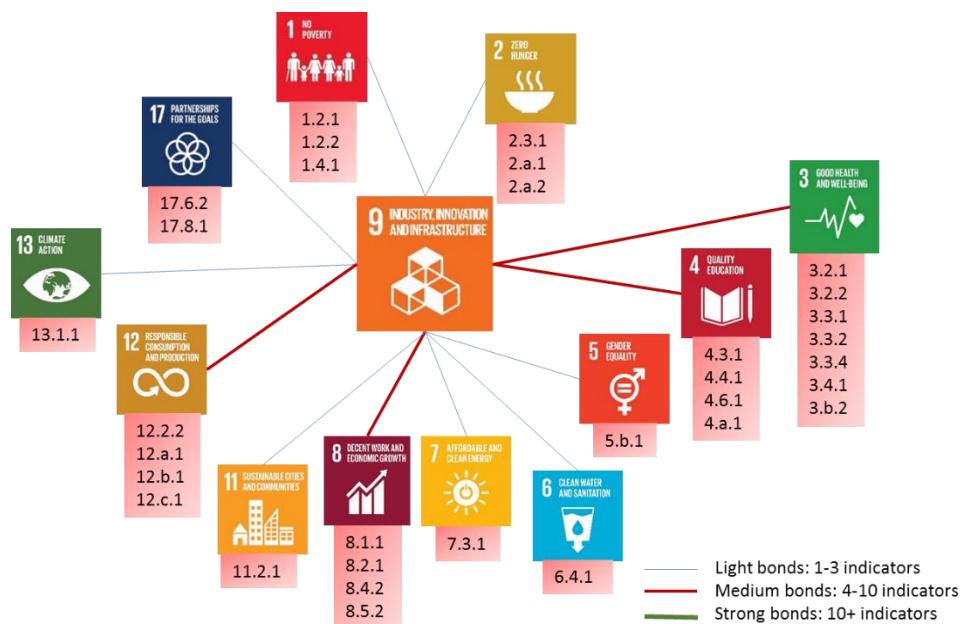
The adoption of technologies and production processes that are less harmful to the environment, referred to by the 9.4 target, impacts, in terms of CO2 emissions (indicator 9.4.2), on the indicators concerning air quality (Goal 11) and the climate change (Goal 13). The support and strengthening of the industry (target 9.2), an important source of income and work, is functional to combat poverty (Goal 1) and to economic growth and employment (Goal 8), while ICT and, in particular, the Internet (to which the 9.c target audience is targeted), in addition to providing those basic services for citizens and the education required by the Goals 1 and 4, are tools to allow fair and inclusive access to information, to knowledge, market and financial services, as called for by the Goals 2, 4, 5, 11 and 16.

Figure 1.14 - Statistical indicators for SDGs monitoring, Innovation, research, infrastructure indicators and interlinkages according to UN-IAEG-SDGs



The abundance of interconnections exposed, which could be exploited for statistical purposes in order to better illustrate and monitor the political aims of the Agenda, characterizes the Goal 9

Figure 1.15 - Statistical indicators for SDGs monitoring, Innovation, research, infrastructure indicators and interlinkages in the Istat SDGs statistical system



SDGs network: monitoring the Italian National Sustainable Development Strategy

The network of the SDGs of 2030 Agenda can be analyzed considering the interrelations expressed in the National Sustainable Development Strategy (SNSvS). It is useful, in fact, to consider how national SDGs can be achieved in a systemic way, and how it is possible to identify actions that take into account the multiple relationships existing between the different dimensions of sustainability.

The available Istat SDGs information system measures, in fact, constitute the natural input for the measurement of the SNSvS and were considered in the activities carried out by the Working Technical Table on Indicators for the implementation of the National Sustainable Development Strategy, with the objective to define a small and representative core subset of indicators for its monitoring.

The Technical Table defined and agreed upon the criteria and the methodological approach necessary to identify a set of indicators relevant for the monitoring of the SNSvS.

In order to highlight the interconnections in a systematic way and to take into account the key principles guiding the 2030 Agenda, a first experimental application has been represented in the following graph.

Figure 1.16– The Network of Istat SDGs Information System to monitor the SNSvS



Sustainability, in fact, must be considered, in a global and national, integrated perspective, making explicit the interactions between the social, economic, environmental and institutional domains also for monitoring: the graph highlights its complexity. The steps taken to achieve progress in a Goal can be reinforced or can compete with those established for another Goal.

In perspective, the analysis, given as example, of the interrelations between objectives, targets and national quantitative indicators, can help to consider synergies and trade-offs between adopted policy measures and to render explicit any "reinforcement or balancing" actions between thematic areas and interconnected issues.

Future analyses

Sustainability is intrinsically complex and there is not only one way to define sustainability paths. Interconnected strategies are needed for regions, cities, citizens, communities, businesses and civil society: the transition from a linear economy to a circular economy, in order to re-use resources, reduce recourse to natural capital of the planet and at the same time the emissions of greenhouse gases; the guarantee of sustainability from the producer to the consumer; energy and mobility issues; technological, structural and demographic evolution in a more interconnected world that guarantees sustainable equality.

For this reason, the systemic and integrated approach seems to be the most appropriate one, considering sustainable urban development, climate change, factors of economic growth and social and environmental development, issues related to sustainable equality.

Explaining, highlighting, analyzing the interconnections between Goal, Target and indicators can facilitate in understanding the dimensions and complexity of sustainable development, it can help in making the best use of the statistical information available by exploiting interconnections to ensure

the highest possible coverage of all Targets of Goals; it can facilitate choices related to competing strategies or actions.

The activities planned by Istat foresee a further development of this type of analysis, to consider further specific thematic routes and to continue the current analyzes. After completing the conceptual analysis aimed at mapping the existing interconnections considering other thematic paths not yet represented, further studies will be carried out using historical and geographical data, and analysis of the existing interconnections will be activated, taking into account the statistical correlations between the indicators.

References

Bali Swain, Ranjula and Shyam Ranganathan. 2019. Modeling Interlinkages between Sustainable Development Goals Using Network Analysis, conference paper, 5thInternational Conference on CSR Communication on September 18-20, 2019 Stockholm.

Cerema, actor of the 2030 Agenda: new tools and support for local communities to implement the 17 Sustainable Development Goals: <https://www.cerema.fr/fr/actualites/cerema-acteur-agenda-2030-nouveaux-outils-accompagnement>

Cling Jean-Pierre, Eghbal-Téhérani Sylvie, Orzoni Mathieu, Plateau Claire, « The differences between EU countries for Sustainable Development Indicators : It is (mainly) the Economy !, Document de travail N°G2019/06 August 2019

Cling Jean-Pierre, Eghbal-Téhérani Sylvie, Orzoni Mathieu, Plateau Claire, « France and the Sustainable Development Goals » The French Economy, 2019 Edition – Insee Reference

IPCC. 2018. Special report global warming of 1.5 c. Intergovernmental Panel on Climate Change.

Miola A, Borchardt S, Neher F, Buscaglia D, 2019 , Interlinkages and policy coherence for the Sustainable Development Goals implementation: An operational method to identify trade-offs and co-benefits in a systemic way, EUR 29646 EN, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-79-99556-9, doi:10.2760/472928, JRC115163

United Nations (UN). 2015. Transforming our world: The 2030 agenda for sustainable development. United Nations.

World Bank. 2015. Levels and trends in child mortality: estimates developed by the UN Inter-agency Group for child Mortality Estimation (IGME) report 2015.