
# International frameworks for environmental statistics and their application to climate change related statistics

Ferruzza A.[1], Vignani D.[2,*], Tagliacozzo G.[1], Tersigni S.[1] and Tudini A.[1]

[1] *Istat Italian National Institute of Statistics; ferruzza@istat.it, tagliaco@istat.it, sttersig@istat.it, tudini@istat.it*
[2] *Istat Italian National Institute of Statistics; vignani@istat.it*
[*] *Corresponding author*

***Abstract.*** *The last decades witnessed increasing demand of statistics and accounts in order to adequately describe environmental issues. The information required cover a wide range of interlinked statistical domains. For Climate Change (CC), linkages of environmental statistics with economic and social ones are particularly strong. Referenced frameworks - among the several national and international initiatives responding to the growing demand - have the advantage of structuring the overwhelming amount of information produced. The aim of this work is to present how two main international frameworks can be used for providing environmental statistical information, especially on CC. The first framework, the UNSD-FDES 2013 and its methodological 2014-2016 developments, is based on a multi-purpose conceptual and statistical approach, defining standardized concepts, definitions and methodologies. The second is the System of Environmental Economic Accounting 2012 - Central Framework (SEEA-CF) providing the first international statistical standard for environmental-economic accounting. In the UN-ECE context, FDES and SEEA are both primary sources in the work to define an internationally comparable set of key CC related statistics and indicators. A main objective of the UN-ECE Groups is to enhance the role of NSOs in the development of statistics on CC related phenomena. Istat provides a significant contribution to these frameworks development in building and implementing harmonized methods and definitions. The challenge is to adequately transform data into environmental statistics, relevant to official statistics production, ensuring a coherent system at national and international level, suitable to meet the increasing information demand on environment and especially on Climate Change.*

***Keywords.*** *Environment; Climate Change; FDES- SEEA international frameworks; official statistics.*

## 1 Introduction

The demand for environment statistics and accounts is increasing along with continued environmental degradation and the challenges associated with better management of the environment. Environmental data are large amounts of unprocessed observations and measurements on the environment and related processes; National Statistical Offices (NSOs) or other parts of the national statistical system collect them by means of statistical surveys, or compile them from administrative records, registers, inventories, monitoring networks, remote sensing, scientific researches and environmental field studies.

By aggregating, synthesizing and structuring environmental and other data according to statistical

standards and methods, statistics are derived to describe the state and trends of the environment and the main processes affecting it. The wide range of information produced covers biophysical aspects of the environment and those aspects of the socio-economic system that directly influence and interact with the environment.

Climate Change (CC) provides a clear example of how the complexity of the issue at stake requires information encompassing a wide range of interlinked statistical domains. Statistical frameworks described in the following paragraphs have the advantage of organizing the overwhelming amount of information produced, thereby guiding its development and improving its quality. In the UN-ECE context, they are used to define an internationally comparable set of key CC related statistics and indicators.

## 2 FDES

Istat together with other NSOs took part in an Expert Group on the UNSD Framework for the Development of Environment Statistics (FDES, 2013) and is currently working on the related methodological manual.

FDES 2013 is a multi-purpose comprehensive and integrative conceptual and statistical framework. It is comprehensive because it facilitates data integration within environmental economic and social statistics, contributes to structuring and aggregating them into statistical series and indicators. It gives importance to geospatial information that, taking into account environmental issues (e.g., climate change, biodiversity loss, ecosystem health, natural disaster, population growth, etc.), enables integrated analyses according to different geographical units. FDES is integrative because it considers the other frameworks and systems such as the System of Environmental-Economic Accounting (SEEA), the Driving force–Pressure–State–Impact–Response (DPSIR) framework, the Millennium Development Goals (MDGs), the sustainable development indicator frameworks and the CC issues. FDES is also based on ecosystem concepts. An environment ecosystem[1] in a vital and healthy state constitutes a prerequisite to ensure an authentic well-being for all components of society.

FDES 2013 organizes environment statistics into a structure of six components: environmental conditions and quality; availability and use of environmental resources and related human activities; use of the environment as a sink for residuals and related human activities; extreme events and disasters; human settlements and environmental health; social and economic measures for the protection and management of the environment. Each component is broken down into statistical topics.

A Core Set of Environment Statistics with high priority and relevance has been identified. Besides the NSOs and environmental ministries, several other institutions are key players in the production of data used in environment statistics, adding elements of complexity to the challenge.

FDES facilitates their production in an internationally comparable manner. The UNSD expert group is currently developing detailed methodological guidance for the Core Set of Environment Statistics, including classifications, definitions, data collection and compilation methods. The sections on Water resources statistics, Waste statistics, Mineral resources, Energy resources, Expenditures on Environmental Protection and Resource Management, Land cover and Land Use, Biodiversity, Natural extreme events and disasters and will be available in the first months of 2016.

[1] The presence of a pristine environmental is the only durable insurance of having unpolluted water, clean air uncontaminated soils and food. These factors are also tightly linked to a sustainable energy consumption and transportation, smart cities and high quality human settlements.

# 3 The System of Environmental-Economic Accounting (SEEA) Central Framework

The SEEA Central Framework is the international statistical standard describing the interactions between the economy and the environment by means of three main types of accounts:

- "Physical flow accounts" (PFA), recording the supply of resources - e.g. minerals, timber, fish - from the environment to the economy, the flows of products within the economy and the flows of residuals from the economy to the environment in the form of, for example, solid waste and air emissions;

- "Asset accounts", measuring in quantity as well as monetary units, the stock of a specific environmental asset at the beginning and at the end of the accounting period and the changes (additions and reductions) during the accounting period;

- "Environmental activity accounts and related flows", concerning the monetary transactions between economic units whose primary purpose is environmental protection and preservation.

There is no specific account for CC within the SEEA-CF but, rather, all three types of accounts can be used to analyse several CC related issues, for example: Green House Gas (GHG) emissions caused by economic activities and households, in the case of PFA, water asset accounts describing the changes in precipitation regimes and their implications for water stocks in the case of asset accounts, monetary expenditure for actions and activities to reduce, prevent or eliminate GHG emissions, in the case of the accounts for monetary transactions.

The consistency of SEEA with the System of National Accounts (SNA) principles, definitions and classifications, and its comprehensive approach to the description of environmental issues such as CC make it a suitable candidate for deriving an internationally consistent and comparable set of key CC-related statistics and indicators; this is the purpose of the work of a UN-ECE Task Force, described in detail in the next paragraph.

# 4 The UN-ECE Task Force

With the aim of supporting the development of CC related statistics, a Task Force established by UN-ECE at the request of the CES, worked in 2012-2014 to develop a document of Recommendations for improving the statistics related to CC collected by national statistical systems.

The Task Force analysed existing reference frameworks to delineate the statistical subject areas related to CC: in addition to the already mentioned FDES and SEEA, also the DPSIR, the Natural capital approach and the IMA (Impact, mitigation and adaptation) have been reviewed.

The recommendations are grouped by three main areas: 1) data needed for GHG inventories (Emissions and Drivers); 2) data needed for other CC related statistics (Impacts, Mitigation, Adaptation); and 3) statistical infrastructure required for this work.

Regarding the first area, it is recommended to NSOs to be more aware of how the data of national statistical systems are or could be used in GHG inventories and to improve data and quality of required statistics. For the second area main recommendations are to: facilitate access to data that already exists; improve and support geo-spatial analysis, improve linking between socioeconomic and environmental data and develop new statistics based on a review of key data needs. For the third area the need of reviewing existing classification systems, registers, definitions, products is expressed.

As a follow up to the recommendations, the UN-ECE established in 2014 two groups that are currently working in parallel:

- a Steering Group having the mandate to provide direction on countries' progress in implementing the Recommendations, to identify areas that require further methodological work or where practical guidance would need to be developed, to promote sharing of ideas and good practice, for instance through the expert meetings;

- a new Task Force having the mandate to work on a set of key climate change -related statistics using SEEA and other frameworks such as FDES. The objective is to provide a key set of climate change -related indicators organized according to the five areas defined by the previous Task Force: (i) Emissions: GHG emissions and their human causes (ii) Drivers: human causes of climate change that deal with sources of emissions (iii) Impacts: impacts of climate change on human and natural systems (iv) Mitigation: efforts of humans to avoid the consequences (v) Adaptation: efforts to adapt to these consequences.

# 5 Conclusions

Human wellbeing depends on the environment and it is crucial to have statistical information on correlated theme such as climate change, biodiversity loss and natural resource management. Being interdisciplinary by nature, environment statistics are produced by a variety of data collecting institutions, and similarly numerous methods are applied in their compilation. The challenge is to build national capacities to adequately transform environmental data into environmental statistics within official systems and regular programs of work. Istat works hard both on the development of statistical frameworks and on their implementation in a continuous process aiming at enhancing the quality of official environmental statistics.

## References

[1] UNECE, (2014). Conference of European Statisticians Recommendations on climate change-related statistics. *United Nations Economic Commission for Europe*. Geneva (CH). (http://www.unece.org/statistics/about-us/statstos/task-force-on-climate-change-related-statistics.html).

[2] FDES, (2013). Framework for the Development of Environment Statistics. *United Nations Statistics Division*. New York (USA). (http://unstats.un.org/unsd/environment/fdes.htm).

[3] SEEA, (2014). System of Environmental-Economic Accounting 2012 - Central Framework. United Nations New York (USA). (http://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf).