

United Nations Framework for the development of environment statistics (FDES)

Michael Nagy (UNECE)

This presentation includes slides developed by the Environment Statistics Section of the United Nations Statistics Division

Workshop on the System of Environmental-Economic Accounting Central Framework and Sustainable Development Goals Indicators
(Minsk, Republic of Belarus, 15-18 January 2018)

Why was there a need for a Framework for the Development of Environment Statistics 2013 (FDES)?

Environment statistics		Needs for a framework that:
multi- and interdisciplinary.	→	marks out the areas and the corresponding statistics that fall into its scope.
types of sources of environment statistics: statistical surveys, administrative records, remote sensing and thematic mapping, monitoring systems, scientific research and special projects.	→	provides common tools (definitions, classifications) that bring the different data together in an integrative manner.
multitude of sources means a multitude of stakeholders.	→	marks out the roles of the different stakeholders and brings them together to a common platform.
❖ Need an internationally recognized and recommended framework to guide the development, coordination and organization of environment statistics.		

What is the FDES?

- ☐ The FDES 2013 targets a broad user community, including environmental statisticians in national statistical offices (NSOs), environmental ministries and agencies, as well as other producers of environment statistics.
- ☐ It helps to mark out the roles of the different data producers, thus facilitating coordination at different levels.
- ☐ It also indicates the corresponding availability of methodologies and classifications and the most common sources of data and identifies the typical institutional partners to facilitate interagency cooperation.
- ☐ It can also be used by international and regional institutions, as well as by other users and producers.

Environment Statistics Section, United Nations Statistics Division



Objectives of Environment Statistics

- ☐ **Improve knowledge on the environment**
- ☐ **Support evidence-based policy and decision making**
- ☐ **Provide information for the general public and specific user groups about the state of the environment and the main factors that influence it.**

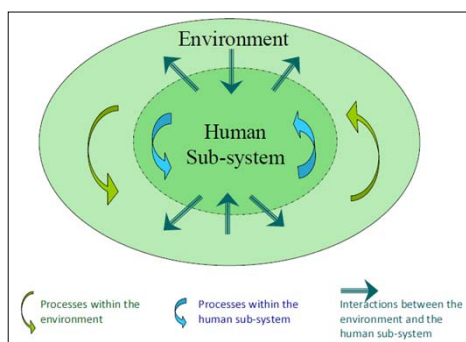
Information about the environment includes:

- Most important changes over time and across locations
- Main factors that influence them

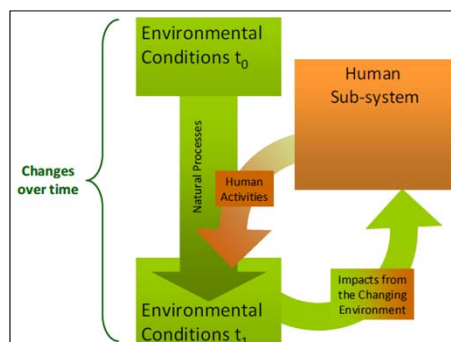


Conceptual Foundation of the FDES

Environment, Human Sub-system and Interactions



Environmental conditions and their changes



Scope of the FDES

Biophysical aspects of the environment, those **aspects of the human sub-system** that directly influence the state and quality of the environment, and the **impacts** of the changing environment on the human sub-system.

Includes interactions with the environment, and among the environment, human activities, and natural events.



Important Terminology: Data, Statistics, Indicators

Environmental **DATA**:

- Unprocessed observations and measurements about the environment and related processes
- Sources: Surveys, administrative sources, research,...

Environment **STATISTICS**:

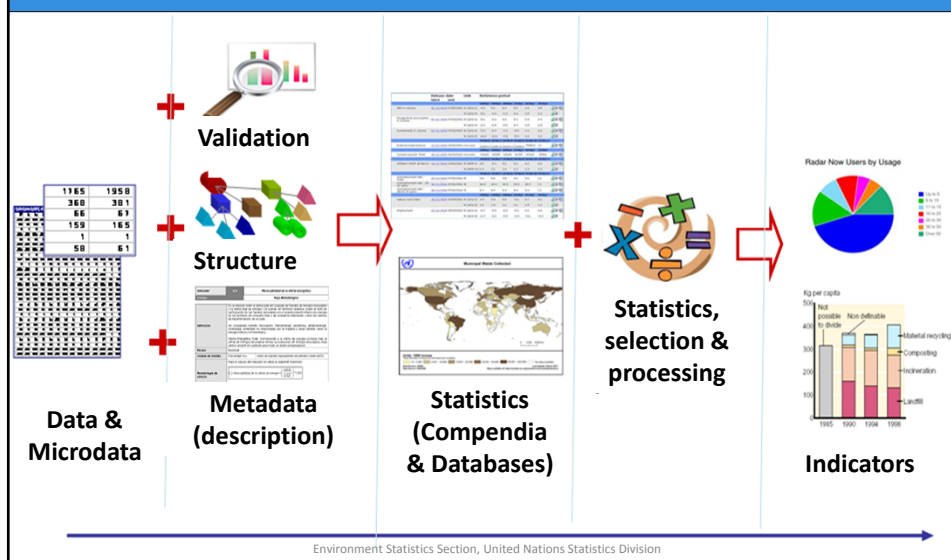
- Statistical methods, standards, procedures applied
- Role of environment statistics to process environmental data into meaningful statistics

Environmental **INDICATORS**:

- Synthesize and present complex statistics
- Define objectives, assessing present and future directions etc.
- Frameworks are e.g. Sustainable Development Goals, Drivers / Pressures / State / Impact / Response (DPSIR), Core set of climate change-related indicators etc.



Statistical process: from raw data to statistics and indicators



Main Users of Environment Statistics

The type, level of thematic, spatial and temporal aggregation, and format of environment statistics depend on the type of user and intended use.

Users	Main Types of Environment Statistics
Policy and Decision Makers	Environmental indicators and more aggregated statistics
General Public (including media and civil society)	Environmental indicators and more aggregated statistics
Analysts, Researchers, and Academia	Extensive and detailed environment statistics
International Agencies	Detailed environment statistics, indicators and their metadata

Environment Statistics Section, United Nations Statistics Division

Sources of Environment Statistics

- Environment statistics synthesize data originating from various types of sources.
- Data used to produce environment statistics are not only compiled by many different collection techniques, but also by many different institutions.
- Understanding the pros and cons of each source is key in the production of environment statistics.



Environment Statistics Section, United Nations Statistics Division



Sources of Environment Statistics

Types of Sources

1. **Statistical surveys** (e.g., censuses or sample surveys of population, housing, agriculture, enterprises, households, employment, and different aspects of environment management)
2. **Administrative records** of government and non-government agencies responsible for natural resources, as well as other ministries and authorities
3. **Remote sensing and thematic mapping** (e.g., satellite imaging and mapping of land use and land cover, water bodies or forest cover)
4. **Monitoring systems** (e.g., field-monitoring stations for water quality, air pollution or climate)
5. **Scientific research and special projects undertaken to fulfill domestic or international demand**

Environment Statistics Section, United Nations Statistics Division



Sources of Environment Statistics

Statistical Surveys

- a) **Census**: a survey that collects data from the entire population of interest
- b) **Sample Survey**: a survey carried out using a sampling method, in which data are collected from a representative portion of the population of interest and not the whole population

Environment statistics can be collected from surveys by:

- I. adding environment-related questions to surveys intended primarily to collect data on other topics;
- II. using surveys intended primarily to collect environment statistics.
 - When environmental data are collected through environment statistics surveys, the survey design reflects the objective of producing environment statistics.
- Environment statistics surveys are not always economically feasible with restricted budgets.
- Data are frequently obtained from other existing statistical surveys (e.g., social, economic and sectoral) whose primary objective differs from the production of environment statistics.



Environment Statistics Section, United Nations Statistics Division



Sources of Environment Statistics Administrative Records

Administrative data kept by government agencies are often used for the production of environment statistics

Advantages:

- Cost of collecting such data is significantly less than creating and conducting a survey
- Level of response burden is minimized
- Complete coverage of units under administration is assured

Possible Limitations:

- Differences between administrative and statistical terms and definitions
- Deliberate misreporting may occur
- Data may not be checked or validated for statistical purposes;
- Restrictions may be placed on access to data
- Coverage, though complete for administrative purposes, might not match statistical requirements

Environment Statistics Section, United Nations Statistics Division



Sources of Environment Statistics Remote Sensing and Thematic Mapping



- Remote sensing is the science of obtaining information about objects or areas from a distance, typically from aircraft or satellites.
- Remote sensing makes it possible to:
 - Collect data on dangerous or inaccessible areas
 - Replace costly and slow data collection on the ground, thus ensuring that areas or objects are not disturbed
- Uses: satellite, aircraft, spacecraft, buoy, ship, balloon and helicopter images
- Result can be: mapped, imaged, tracked and observed
- Example:

Remote sensing data can be captured and analyzed to measure forest cover, compare the impact of natural disasters, changes in the area of soil erosion, the extent of pollution, changes in land cover or population estimates of animal species.

Remote sensing, combined with thematic mapping data and sufficient validation using actual measurements in the field, usually provides consistent and high quality data for environment statistics.

Environment Statistics Section, United Nations Statistics Division



Sources of Environment Statistics Monitoring Systems

- Typically comprised of **field-monitoring stations** which are used to describe the qualitative and quantitative aspects of the environmental media (e.g., air, water or soil quality, or hydrological or meteorological characteristics).

Main advantages:

- Usually collected using verifiable scientific methods
- Usually validated
- Often available as time series
- Frequently use models to improve data quality



Possible limitations:

- Field monitoring stations are usually located in “hot-spot” areas with
 - high levels of pollution;
 - high sensitivity; or
 - large numbers of the population being affected

Therefore, the measurements will be location-specific and more difficult to aggregate over space to produce measures of quality over larger territories

Environment Statistics Section, United Nations Statistics Division



Sources of Environment Statistics Scientific Research and Special Projects

Main advantages of using data from scientific research and special projects are that they:

- are usually available at no or low cost
- minimize the response burden
- can be used to address data gaps
- are useful for developing coefficients for models



Possible limitations of using these sources include that:

- they often use terms and definitions that differ from those used in statistics
- access to microdata may be limited
- metadata may be missing
- data are often available only for case examples (i.e., limited areas or industries)
- data are often available on a one-time basis only

Environment Statistics Section, United Nations Statistics Division



Classifications and other groupings relevant to environment statistics

- There is no single overarching, internationally agreed classification of the environment for statistical purposes, such as International Standard Industry Classification (ISIC). There are coexisting and emerging classifications and categorizations for specific subject areas, which include standardized statistical classifications as well as less formalized groupings or categories.
 - Environment statistics uses specific classifications, e.g., FAO Land Cover Classification System, UN Framework Classification for Fossil Energy and Mineral Reserves and Resources (UNFC), Classification of Environmental Activities (CEA)
 - Also, environment statistics uses classifications, categories and groupings, e.g., the classification of natural and technological disasters (CRED-EMDAT), the classification of protected areas and of threatened species (UNEP-WCMC and IUCN), or the source categories for GHGs from the IPCC, that were not developed for statistical purposes.
- Environment statistics also uses economic and social-demographic classifications:
 - International Standard Industrial Classification of All Economic Activities (ISIC)
 - Central Product Classification (CPC)
 - International Classification of Diseases (ICD)
- The use of these classifications facilitates integration of environment statistics with economic and social-demographic statistics.



Environment Statistics Section, United Nations Statistics Division



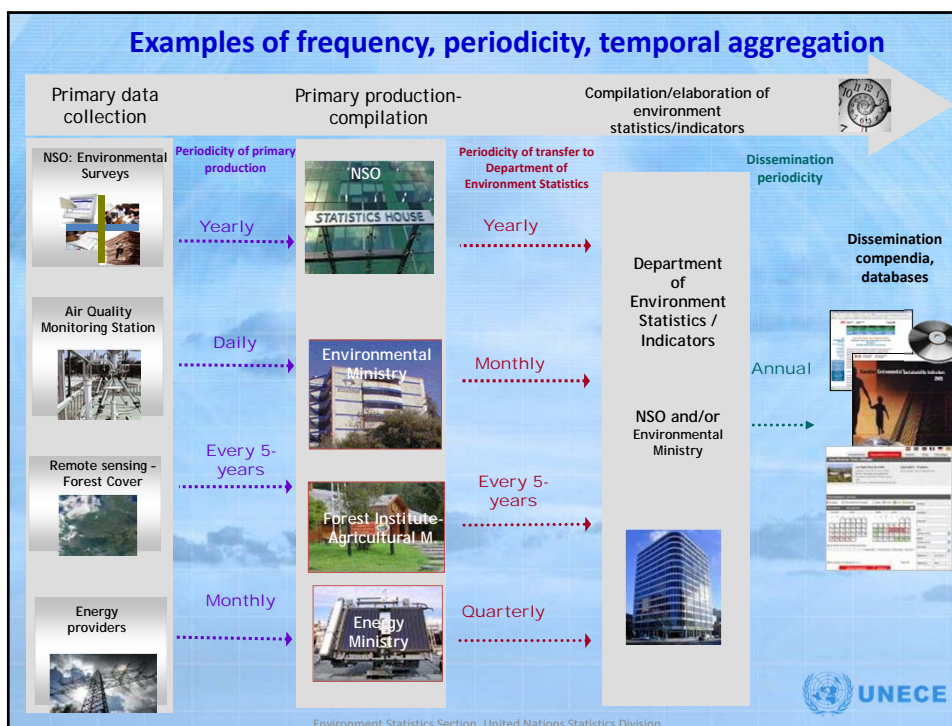
Temporal Considerations



- Different time scales or longer or shorter time periods must be used to aggregate environmental data over time.
 - For example air pollution daily... forest cover every 5 years
- Determining the appropriate temporal aggregation of environment statistics involves a variety of considerations depending on the nature of the measured phenomena
- Even when environmental data are produced at irregular intervals, environment statistics based on these data can still be produced at regular intervals if there are enough data points in each period to do so.

Environment Statistics Section, United Nations Statistics Division





Temporal Considerations (cont.)

Example:

- **Fluid environmental phenomena** call for careful consideration of the temporal dimension because ebbs and flows, droughts and floods, snow and runoffs can occur, which all influence measurements.
- Variations may be daily and, at other times, seasonal depending on what is being measured.
 - Seasonal variations may be seen in the fluctuations in certain types of fish biomass, surface water levels, ice cap surface or the incidence of fires. In such cases, monitoring must focus more on certain months than others.

Spatial Considerations

- The occurrence and impacts of environmental phenomena are distributed spatially without regard for political-administrative boundaries.
- **Meaningful spatial units for environment statistics are**
 - natural units, e.g., watersheds, ecosystems, eco-zones, landscape or land cover units; or
 - management and planning units based on natural units, such as protected areas, coastal areas or river basin districts.
- Economic and social statistics are aggregated traditionally according to administrative units.
 - This difference can complicate the collection and analysis of environment statistics particularly when they must be combined with data originating from social and economic statistics.
 - However, there is a trend towards producing more geo-referenced data, which would overcome some of the spatial complications of analysis.

Environment Statistics Section, United Nations Statistics Division



Institutional Dimension of Environment Statistics

- It comprises the legal framework that establishes the mandates and roles of the main partners, the institutional setting and institutional development level of environment statistics units, and the existence and effectiveness of inter-institutional cooperation and coordination mechanisms at the national level and with specialized international agencies.
- Given the multi-disciplinary and cross-cutting nature of environment statistics, the production of environmental data and statistics involves numerous stakeholders, actors and producers.
- Insufficient institutional development, overlapping mandates and functions, inadequate inter-agency coordination and other institutional issues are very common in many countries.

These limitations also exist at international level: multiple partner agencies operate under different mandates, work programmes, and production timetables.



Environment Statistics Section, United Nations Statistics Division



Resolving institutional concerns

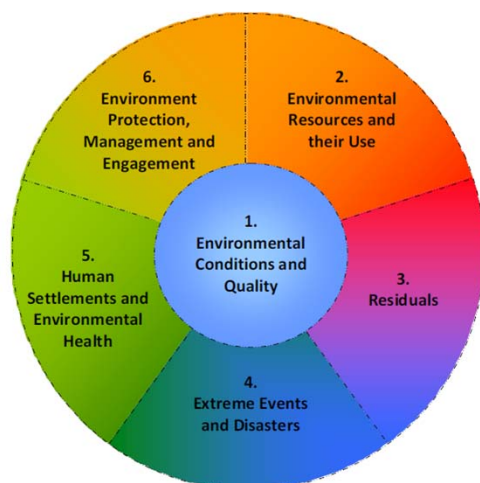
- Identifying the primary institutional obstacles that impede the production of environment statistics and developing a strategy to overcome these is essential for countries that seek to develop or strengthen their environment statistics programmes.
- Key elements pertaining to the institutional dimension that should be considered and dealt with simultaneously while developing environment statistics include:
 - The legal framework
 - Institutional development
 - Inter-institutional collaboration
 - Institutional cooperation among national, regional and global bodies



Environment Statistics Section, United Nations Statistics Division



FDES structure and overview of its 6 components

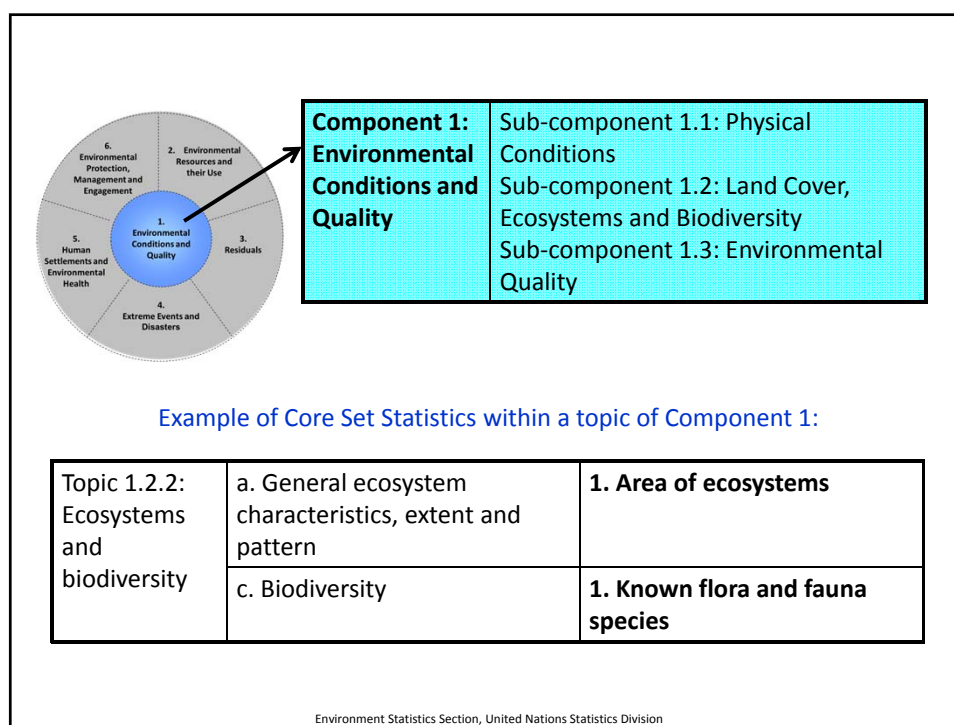
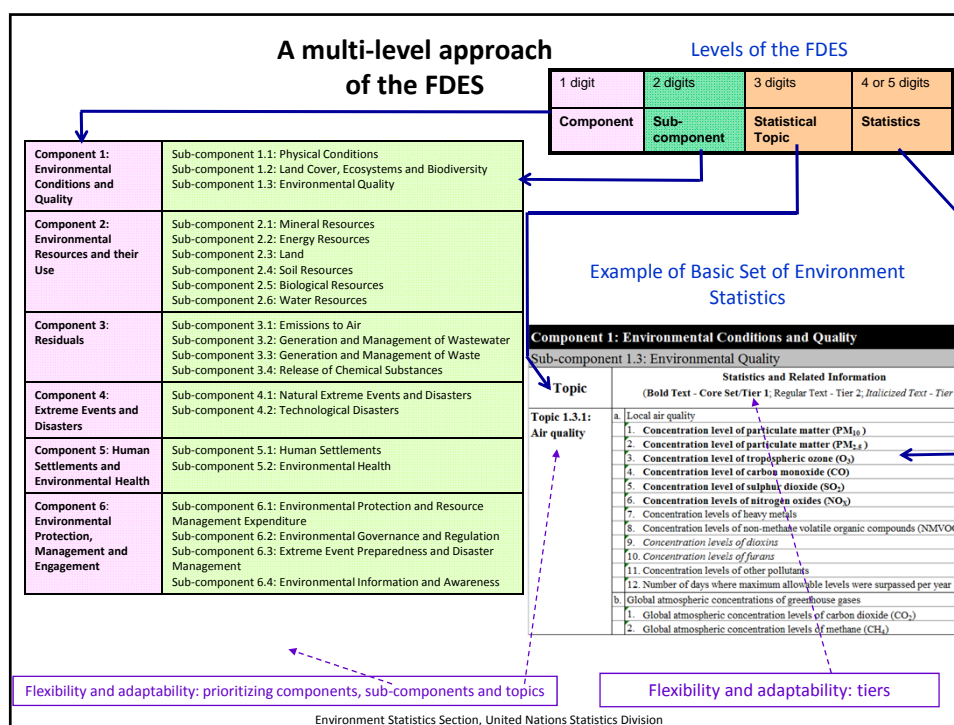


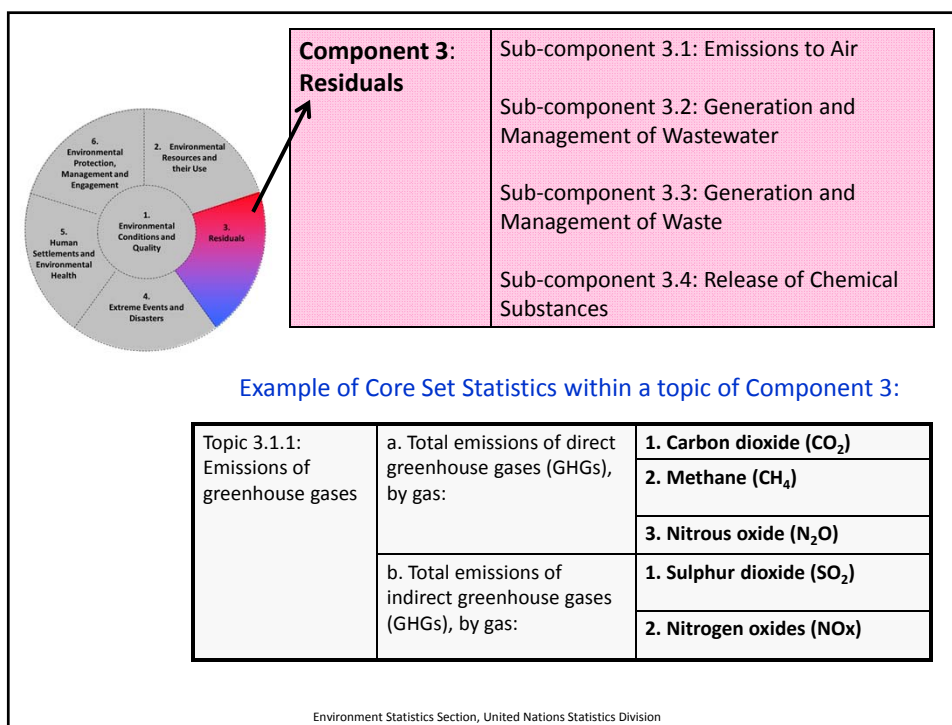
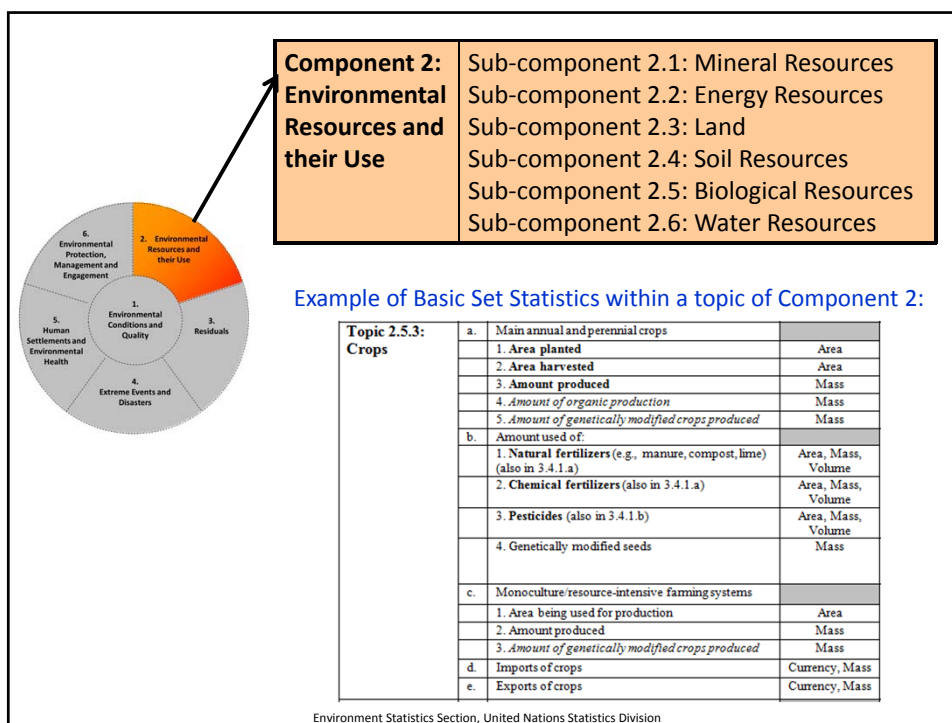
Slide 24

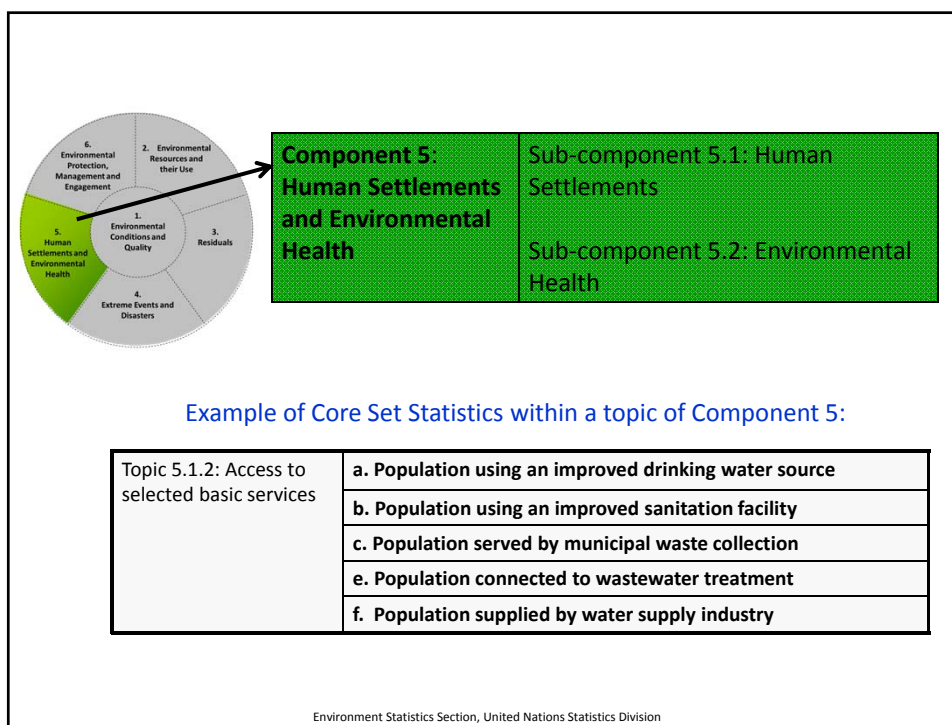
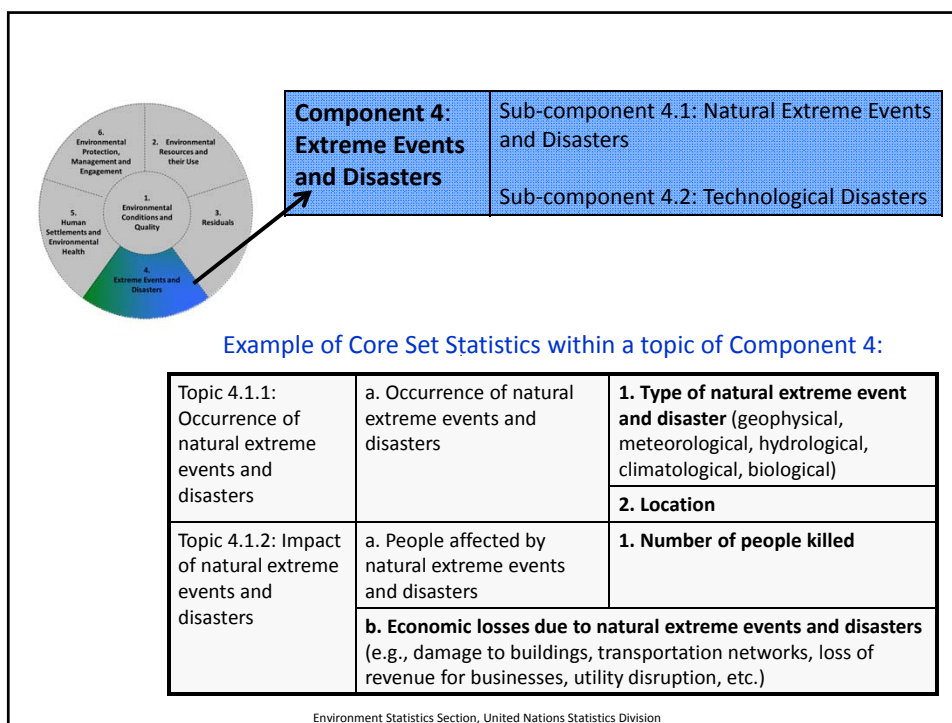
MN5

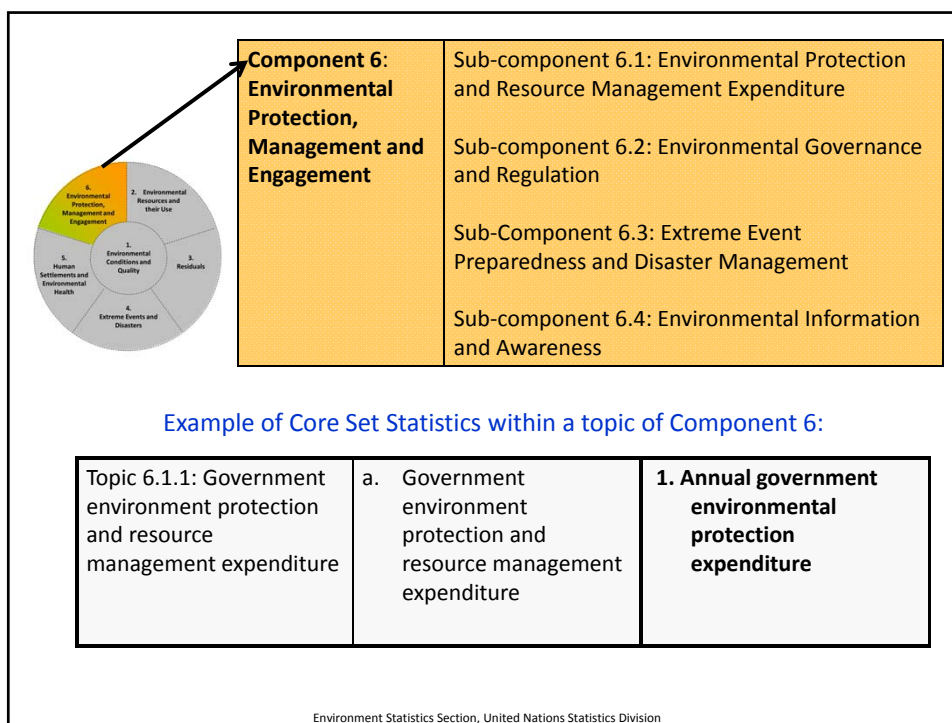
Russion version is hidden below

Michael Nagy, 07/04/2017





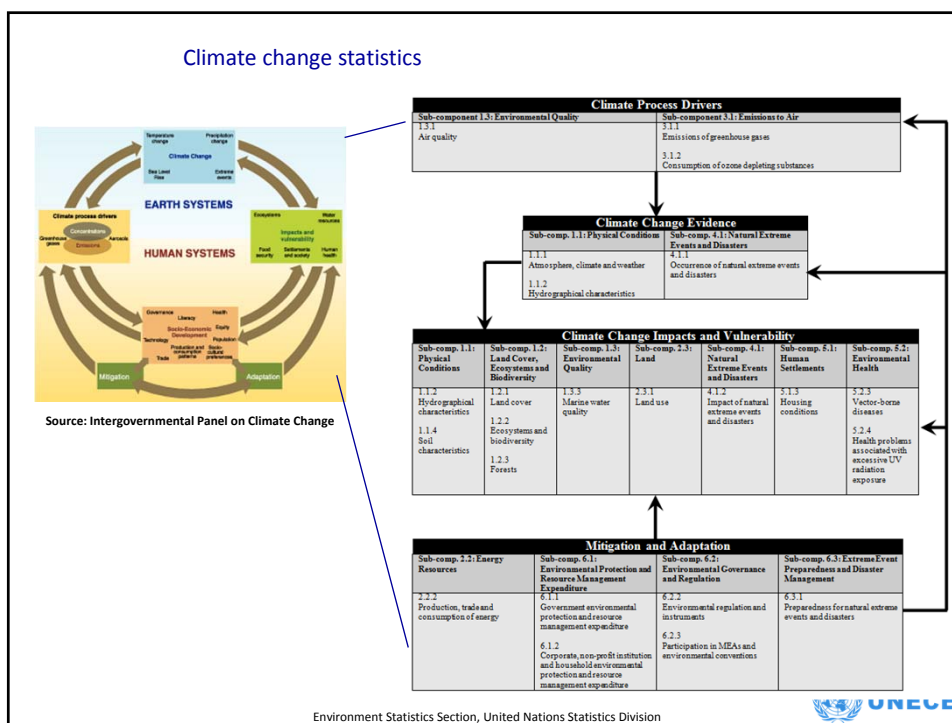
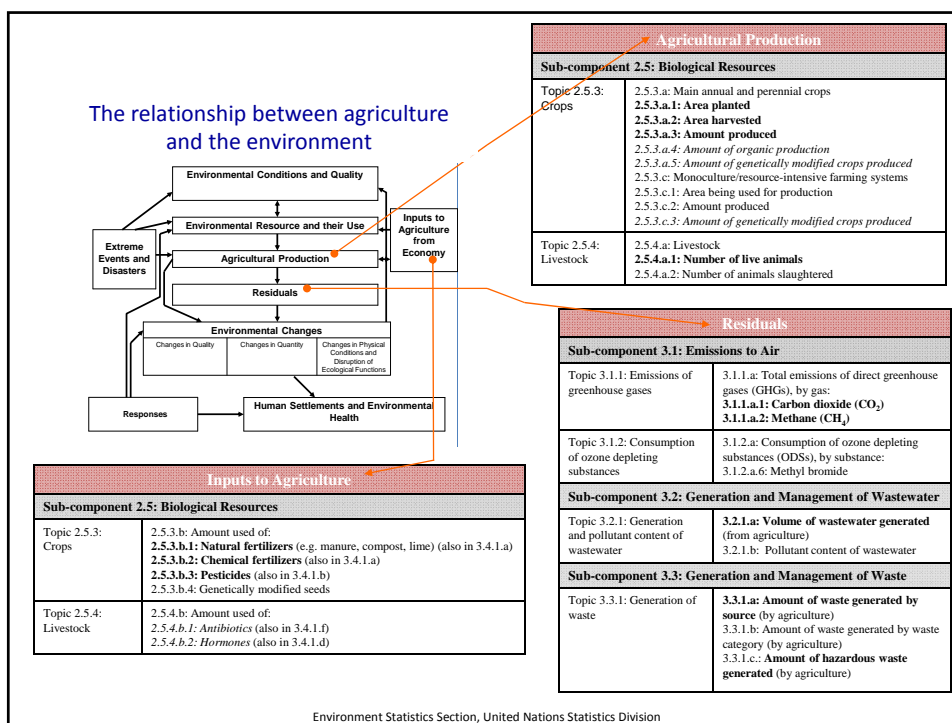




Applications of the FDES to cross-cutting issues (Chapter 5 of FDES 2013)

- ☐ The FDES can be applied to inform about cross-cutting policy issues important to countries at any given time.
- ☐ Examples:
 - ☐ Water and the environment
 - ☐ Energy and the environment
 - ☐ Climate change
 - ☐ Agriculture and the environment





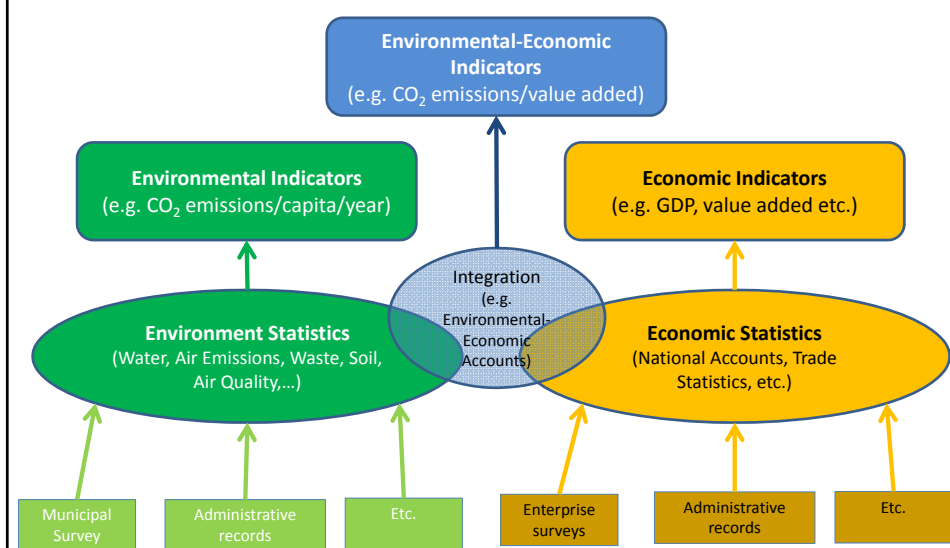
Links between the FDES and social and economic statistics

- ❑ The FDES 2013 is structured in a way that allows links to economic and social domains.
- ❑ It seeks to be compatible with other frameworks and systems, both statistical and analytical, such as the System of Environmental-Economic Accounting (SEEA), the Driving force-Pressure-State-Impact-Response (DPSIR) framework, and the Sustainable Development Goals (SDGs) indicator frameworks.
- ❑ When applicable, it is based on existing statistical classifications.
- ❑ As such, the FDES facilitates data integration within environment statistics and with economic and social statistics.

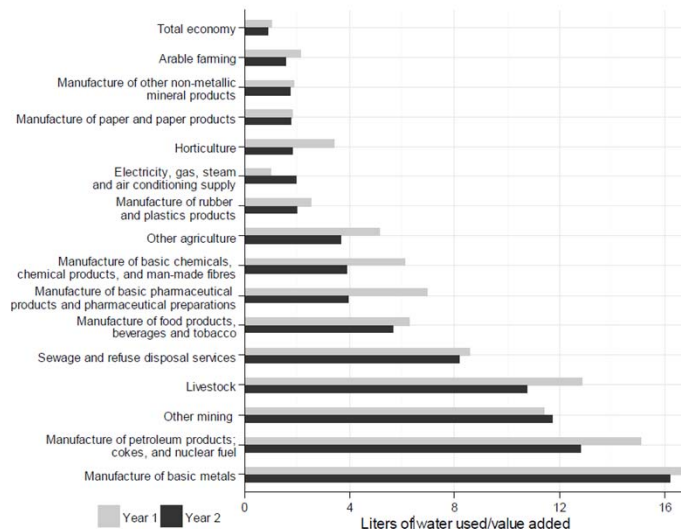
Environment Statistics Section, United Nations Statistics Division



Integrating Environment Statistics with other statistical Domains Example: Environmental-Economic Accounting



Example for Integration of Environment Statistics: Industry level water use intensity indicators (liters/\$ value added)



Requires integration

Water statistics. Data sources:

- Industry Surveys
- Municipal Surveys
- Records of Ministry of Environment
- Records of Ministry of Agriculture
- ...

Other Statistics. Data sources:

- Industry surveys
- Agriculture survey
- ...

Use of unified industry classification (ISIC/NACE) essential

Conclusion: Environment Statistics is beautiful and powerful, and the FDES helps us to develop it

Environment Statistics provides a single set of trusted environmental information which can be used for multiple purposes:

- Simple and complex policy questions
- International comparisons and cross-boundary issues
- Sub-national, national, regional and global indicators
- Information of the general public
- Research
- Etc.

Why do we need official environment statistics (e.g. next to administrative records)?

- Official Statistics (fundamental principles applied)
- International framework (FDES) that tries to cover the complexity of the environment and its interactions as a whole
- Statistical quality standards
- Statistical classifications
- Can be integrated with other statistics (e.g. economic and social statistics)
- Accounting frameworks can be applied

Thank you for your attention!

michael.nagy@unece.org



Environment Statistics Section, United Nations Statistics Division