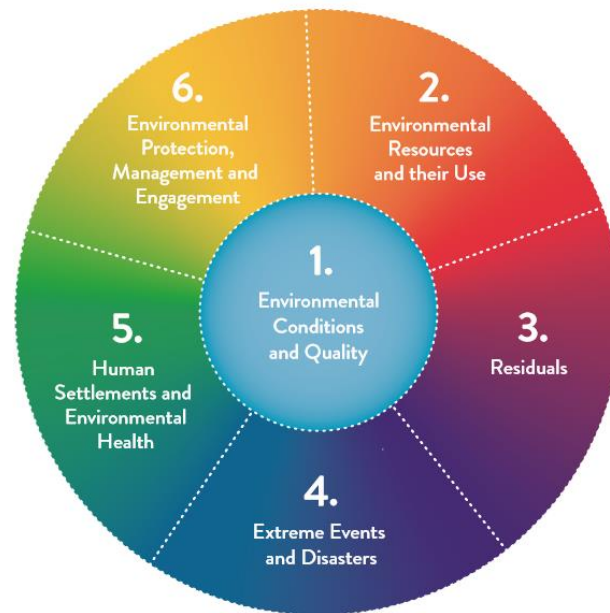# Session 1.2: Conceptual Foundation and Structure of the FDES

Workshop on Environment Statistics and Information for Sustainable Development in the Arab Region

(Beirut, Lebanon, 12-16 November 2018)

This presentation has been elaborated by the Environment Statistics Section of the United Nations Statistics Division.
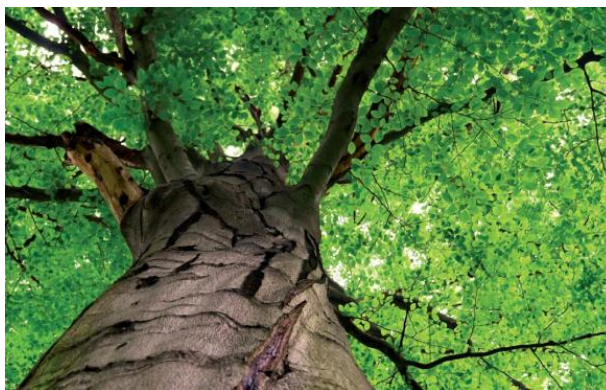
It is based on Chapter 2 of the Framework for the Development of Environment Statistics (FDES 2013).

Table of Contents

1. Need for a framework for developing environment statistics

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.		

# 2. Revision of the FDES and development of a Core Set of Environment Statistics

Statistical Commission mandate: The 41st session (2010) of the UN Statistical Commission endorsed the revision of the 1984 FDES and the development of a Core Set of Environment Statistics.

Statistical Commission endorsement: The 44th session (2013) endorsed the revised Framework (FDES 2013) as the framework for strengthening environment statistics programmes in countries, and recognized it as a useful tool in the context of sustainable development goals and the post-2015 development agenda.

2. Revision of the FDES and development of a Core Set of Environment Statistics
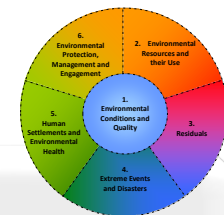
- ❖ 1984 – 2010: improved scientific knowledge and emerging environmental concerns called for a revision of the FDES 1984.
- ❖ Contents and structure of FDES required considerable work by the Expert Group and UNSD.
- ❖ To develop the draft Core Set of Environment Statistics, more than 2,500 environmental indicators and statistics were analyzed, in terms of relevance, statistical feasibility and methodological soundness.
- ❖ The draft Core Set was tested in 25 countries through a pilot exercise (August to September 2012): substantive improvement, prioritized statistics within Basic Set.
- ❖ Both the revised FDES and the Basic Set were subjected to a Global Consultation process: 76 countries, areas and organizations provided feedback (September to November 2012).

Expert Group on the Revision of the FDES
Comprised of experts representing all regions, including developing (13) and developed (10) countries, as well as 7 international agencies and UNCEEA. It represented the interest of NSOs, environmental ministries and agencies, and academia.

Expert Group and UNSD met four times and worked together remotely continually during the process.

3. Description of the FDES
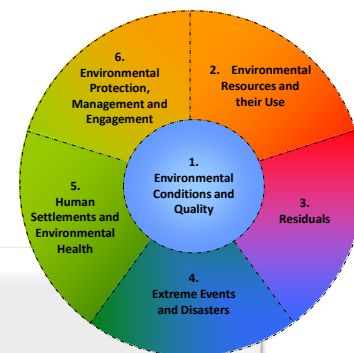
❖ The resulting FDES 2013 is a flexible, multi-purpose conceptual and statistical framework that marks out the scope of environment statistics.

❖ It provides an organizing structure to guide the collection and compilation of environment statistics at the national level, bringing together data from the various relevant subject areas and sources.

❖ It is broad, comprehensive and integrative. It covers the issues and aspects of the environment that are relevant for policy analysis and decision making and it can be applied to inform about cross-cutting issues such as climate change.

3. Description of the FDES
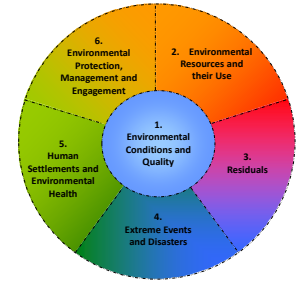
Scope of the FDES

- ❖ The scope of the FDES covers 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.
- ❖ It includes interactions within and among the environment, human activities and natural events.

Audience of the FDES

Though the FDES has been designed to guide countries at early stages in the development of their environment statistics programmes, it is relevant to, and recommended for use by all countries.

3. Description of the FDES
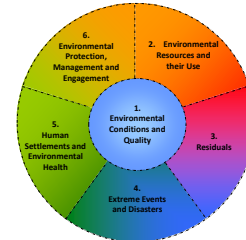
Users of the FDES

❖ 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.

4. Conceptual foundation of the FDES

The environment, the human sub-system, and interactions between them
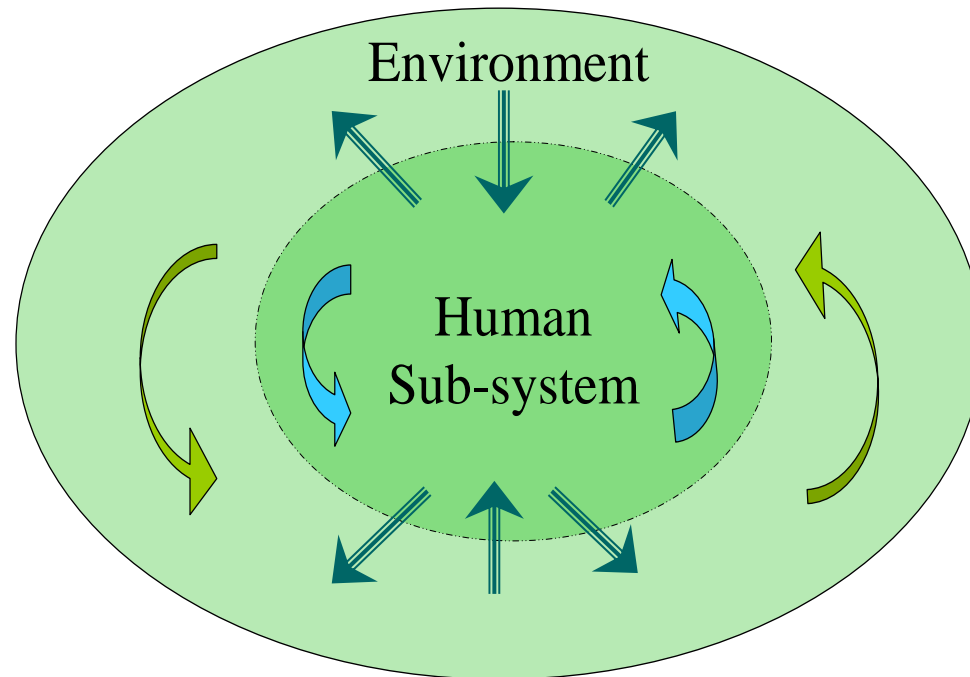
Legend:
- Processes within the environment
- Processes within the human sub-system
- Interactions between the environment and the human sub-system

Environmental conditions and their changes
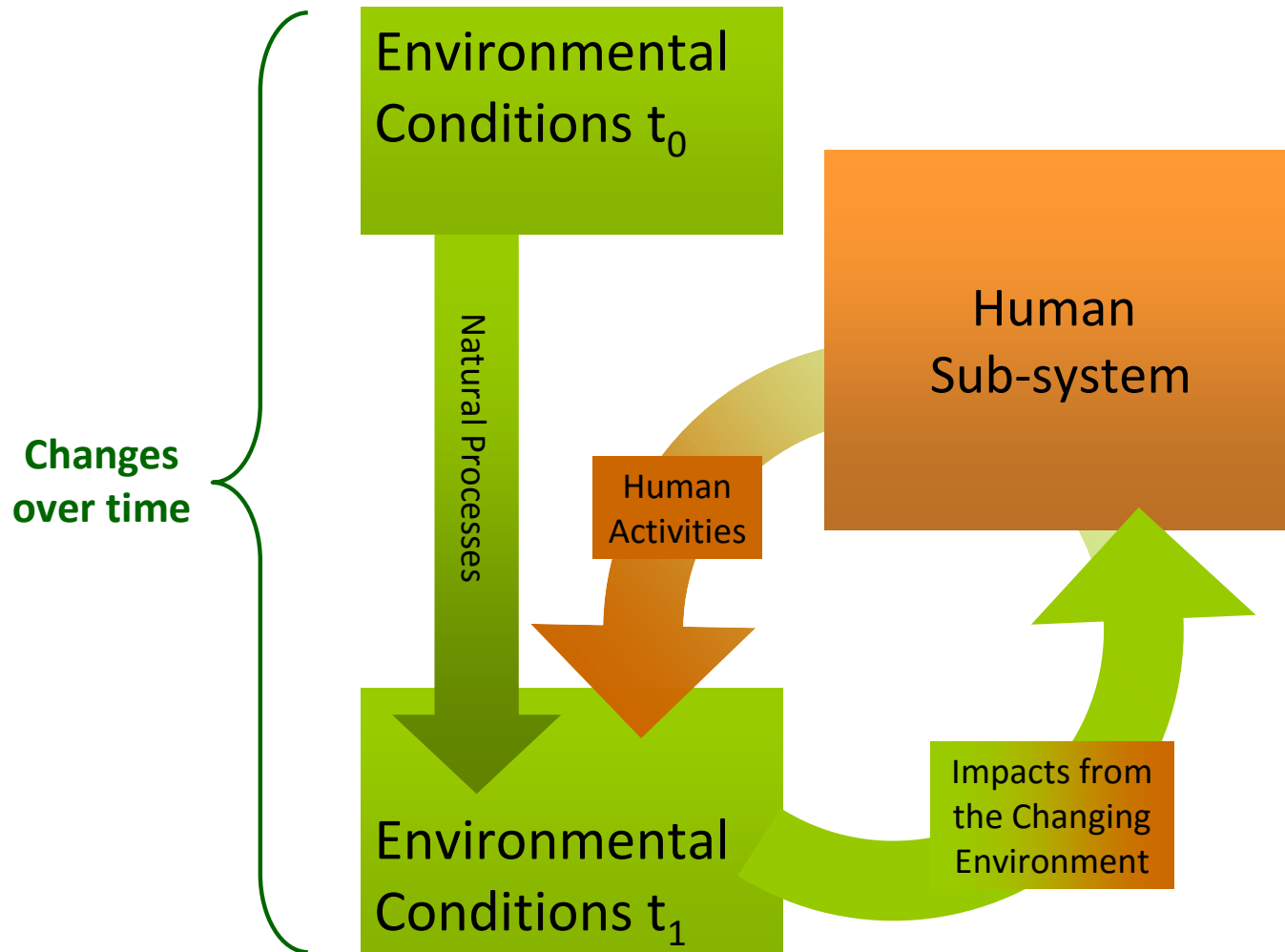
5. FDES structure and overview of its 6 components

- 6 components

- At the centre of the FDES: Component 1: Environmental Conditions and Quality

- All of the components relate to each other

- Multi-level (component, sub-component, topic, individual statistics)

- Flexible

- Adaptable

The Basic Set of Environment Statistics

- **Basic Set of Environment Statistics** is a comprehensive, but not exhaustive, set of environment statistics.
- Basic Set is organized in **three tiers**, based on the level of relevance, availability and methodological development of the statistics.
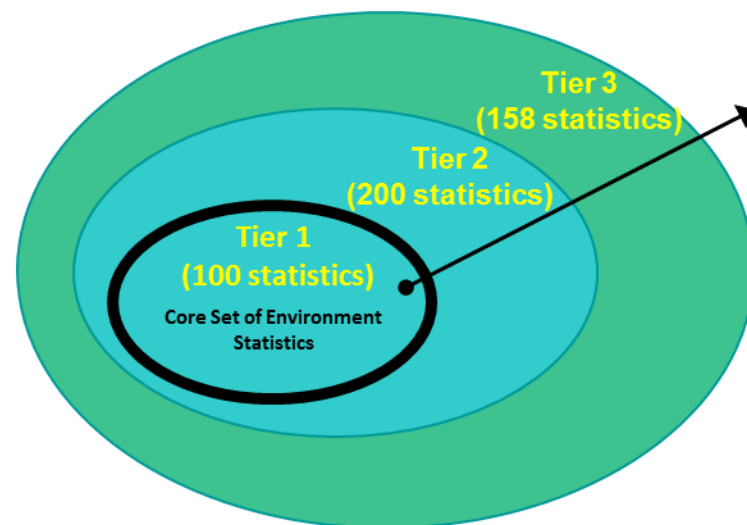
- **Tier 1**, corresponds to the **Core Set of Environment Statistics**, which are of high priority and relevance to most countries and have a sound methodological foundation.
- **Tier 2** includes environment statistics which are of priority and relevance to most countries but need more investment in time, resources or methodological development.
- **Tier 3** includes environment statistics which are either of lower priority or require significant methodological development.

	Component 1	Component 2	Component 3	Component 4	Component 5	Component 6	Total
Tier 1	32	30	19	4	12	3	100
Tier 2	58	51	34	11	22	24	200
Tier 3	51	43	5	16	20	23	158
Total	141	124	58	31	54	50	458

Number of Statistics
Core Set or Tier 1 = 100
Basic Set = 458

A multi-level approach of the FDES

Levels of the FDES

1 digit	2 digits	3 digits	4 or 5 digits
Component	Sub-component	Statistical Topic	Statistics

Component 1: Environmental Conditions and Quality	Sub-component 1.1: Physical Conditions Sub-component 1.2: Land Cover, Ecosystems and Biodiversity Sub-component 1.3: Environmental Quality
Component 2: Environmental Resources and their Use	Sub-component 2.1: Mineral Resources Sub-component 2.2: Energy Resources Sub-component 2.3: Land Sub-component 2.4: Soil Resources Sub-component 2.5: Biological Resources Sub-component 2.6: Water Resources
Component 3: Residuals	Sub-component 3.1: Emissions to Air Sub-component 3.2: Generation and Management of Wastewater Sub-component 3.3: Generation and Management of Waste Sub-component 3.4: Release of Chemical Substances
Component 4: Extreme Events and Disasters	Sub-component 4.1: Natural Extreme Events and Disasters Sub-component 4.2: Technological Disasters
Component 5: Human Settlements and Environmental Health	Sub-component 5.1: Human Settlements Sub-component 5.2: Environmental Health
Component 6: Environmental Protection, Management and Engagement	Sub-component 6.1: Environmental Protection and Resource Management Expenditure Sub-component 6.2: Environmental Governance and Regulation Sub-component 6.3: Extreme Event Preparedness and Disaster Management Sub-component 6.4: Environmental Information and Awareness

Example of Basic Set of Environment Statistics

Component 1: Environmental Conditions and Quality
Sub-component 1.3: Environmental Quality

Topic	Statistics and Related Information (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)
Topic 1.3.1: Air quality	a. Local air quality
	1. **Concentration level of particulate matter (PM_{10})**
	2. **Concentration level of particulate matter ($PM_{2.5}$)**
	3. **Concentration level of tropospheric ozone (O_3)**
	4. **Concentration level of carbon monoxide (CO)**
	5. **Concentration level of sulphur dioxide (SO_2)**
	6. **Concentration levels of nitrogen oxides (NO_X)**
	7. Concentration levels of heavy metals
	8. Concentration levels of non-methane volatile organic compounds (NMVOCs)
	9. *Concentration levels of dioxins*
	10. *Concentration levels of furans*
	11. Concentration levels of other pollutants
	12. Number of days where maximum allowable levels were surpassed per year
	b. Global atmospheric concentrations of greenhouse gases
	1. Global atmospheric concentration levels of carbon dioxide (CO_2)
	2. Global atmospheric concentration levels of methane (CH_4)

Flexibility and adaptability: prioritizing components, sub-components and topics

Flexibility and adaptability: tiers

Main Attributes of the Components of the FDES

| FDES Component	Description	Types of Data	Main Sources and Institutions	Relation to DPSIR and the SEEA
1 Environmental Conditions and Quality	Meteorological, hydrographical, geological, geographical, biological, physical and chemical conditions and characteristics of the environment that determine ecosystems and environmental quality	• Geospatial • Physical • Qualitative	• Monitoring and remote sensing data • Environmental, meteorological, hydrological, geological and geographical authorities or institutions	• State and Impact element in DPSIR • Experimental ecosystem accounts of the SEEA
2 Environmental Resources and their Use	Quantities of environmental resources and their changes, and statistics on activities related to their use and management	• Physical • Geospatial	• Statistical surveys, administrative records, field surveys, land registers • Sector statistics on production and consumption activities, infrastructure • Remote sensing data • Statistics databases of respective national authorities and institutions such as mining, energy, agriculture, water and forest	• Driving force, Pressure and State elements in DPSIR • Asset and physical flow accounts of the SEEA-CF
3 Residuals	Generation, management and discharge of residuals to air, water and soil	• Physical	• Administrative records • Estimates based on activity statistics and technical coefficients • Sector statistics • Monitoring data	• Pressure and Response elements in DPSIR • Physical flow accounts of the SEEA-CF

Main Attributes of the Components of the FDES (cont.)

FDES Component	Description	Types of Data	Main Sources and Institutions	Relation to DPSIR and the SEEA
4 Extreme Events and Disasters	Occurrence and impact of natural extreme events and disasters, and technological disasters	• Physical • Monetary • Geospatial • Qualitative	• Administrative records • Remote sensing • National emergency and disaster authorities • Seismic, meteorological monitoring and research centres • Industrial complexes that work with hazardous substances and processes • Insurance companies	• Pressure, Impact and Response elements in DPSIR • Asset accounts of the SEEA-CF
5 Human Settlements and Environmental Health	The built environment in which humans live, particularly with regard to population, housing, living conditions, basic services and environmental health	• Geospatial • Physical	• Population and housing censuses, household surveys, administrative records, and remote sensing • Health and administrative records • Housing and urban planning and oversight authorities • Cartographic authorities • Transport authorities • Health authority	• Driving force, Pressure and Impact elements in DPSIR
6 Environmental Protection, Management and Engagement	Environmental protection and resource management expenditure, environmental regulation, both direct and via market instruments, disaster preparedness, environmental perception, awareness and engagement of the society	• Monetary • Qualitative	• Administrative records • Surveys • Entity producing government expenditure statistics • Statistical entity in charge of national or sub-national surveys • Environmental authority and other sector authorities	• Response element in DPSIR • Environmental activity accounts and related flows of the SEEA-CF

Overview of each Component of the FDES 2013
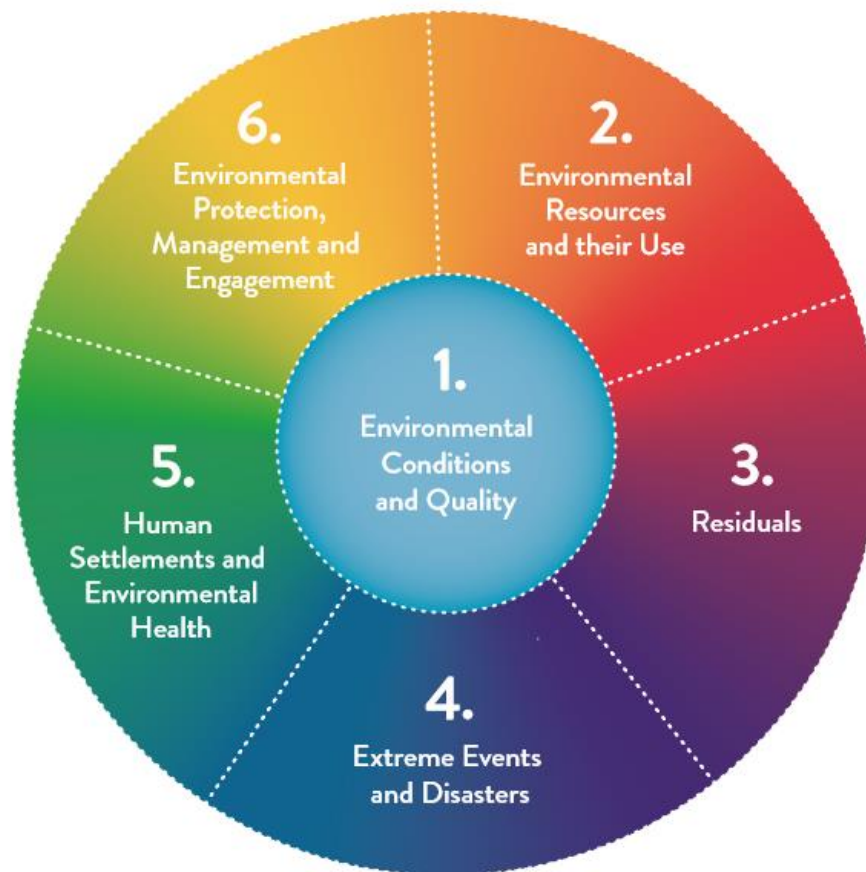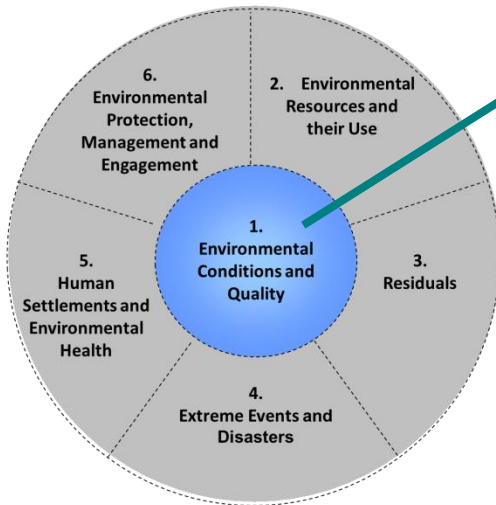
Component 1: Environmental Conditions and Quality	Sub-component 1.1: Physical Conditions Sub-component 1.2: Land Cover, Ecosystems and Biodiversity Sub-component 1.3: Environmental Quality

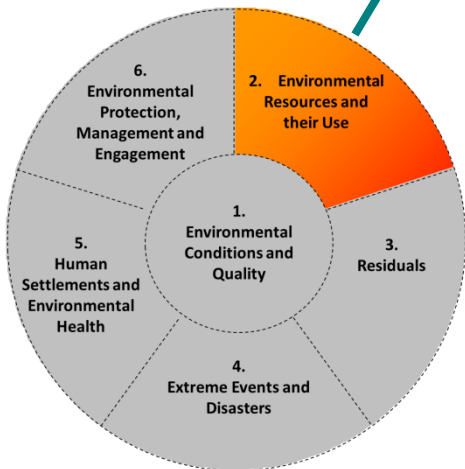Example of Core Set Statistics within a topic of Component 1:

Topic 1.2.2: Ecosystems and biodiversity	a. General ecosystem characteristics, extent and pattern	1. Area of ecosystems
	c. Biodiversity	1. Known flora and fauna species

Component 2: Environmental Resources and their Use	Sub-component 2.1: Mineral Resources
	Sub-component 2.2: Energy Resources
	Sub-component 2.3: Land
	Sub-component 2.4: Soil Resources
	Sub-component 2.5: Biological Resources
	Sub-component 2.6: Water Resources

Example of Basic Set Statistics within a topic of Component 2:

Topic 2.5.3: Crops	a.	Main annual and perennial crops	
		1. **Area planted**	Area
		2. **Area harvested**	Area
		3. **Amount produced**	Mass
		4. *Amount of organic production*	Mass
		5. *Amount of genetically modified crops produced*	Mass
	b.	Amount used of:	
		1. **Natural fertilizers** (e.g., manure, compost, lime) (also in 3.4.1.a)	Area, Mass, Volume
		2. **Chemical fertilizers** (also in 3.4.1.a)	Area, Mass, Volume
		3. **Pesticides** (also in 3.4.1.b)	Area, Mass, Volume
		4. Genetically modified seeds	Mass
	c.	Monoculture/resource-intensive farming systems	
		1. Area being used for production	Area
		2. Amount produced	Mass
		3. *Amount of genetically modified crops produced*	Mass
	d.	Imports of crops	Currency, Mass
	e.	Exports of crops	Currency, Mass
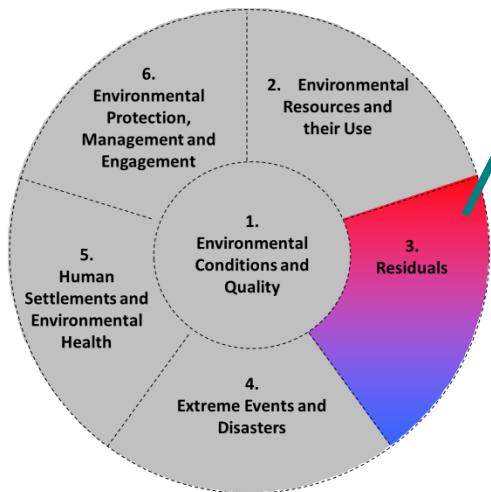
Component 3: Residuals	Sub-component 3.1: Emissions to Air
	Sub-component 3.2: Generation and Management of Wastewater
	Sub-component 3.3: Generation and Management of Waste
	Sub-component 3.4: Release of Chemical Substances

Example of Core Set Statistics within a topic of Component 3:

Topic 3.1.1: Emissions of greenhouse gases	a. Total emissions of direct greenhouse gases (GHGs), by gas:	**1. Carbon dioxide (CO_2)**
		2. Methane (CH_4)
		3. Nitrous oxide (N_2O)
	b. Total emissions of indirect greenhouse gases (GHGs), by gas:	**1. Sulphur dioxide (SO_2)**
		2. Nitrogen oxides (NOx)
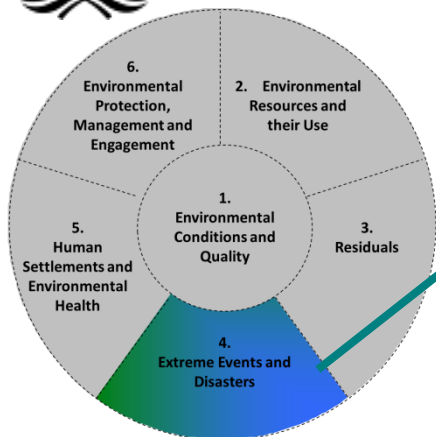
Component 4: **Extreme Events and Disasters**	Sub-component 4.1: Natural Extreme Events and Disasters
	Sub-component 4.2: Technological Disasters

Example of Core Set Statistics within a topic of Component 4:

Topic 4.1.1: Occurrence of natural extreme events and disasters	a. Occurrence of natural extreme events and disasters	**1. Type of natural extreme event and disaster** (geophysical, meteorological, hydrological, climatological, biological)
		2. Location
Topic 4.1.2: Impact of natural extreme events and disasters	a. People affected by natural extreme events and disasters	**1. Number of people killed**
	b. Economic losses due to natural extreme events and disasters (e.g., damage to buildings, transportation networks, loss of revenue for businesses, utility disruption, etc.)	
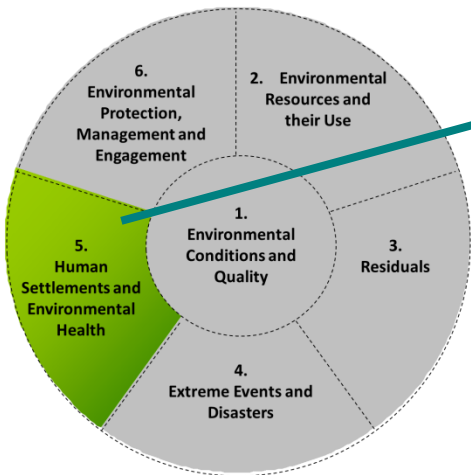
| Component 5: Human Settlements and Environmental Health | Sub-component 5.1: Human Settlements |
| | Sub-component 5.2: Environmental Health |

Example of Core Set Statistics within a topic of Component 5:

Topic 5.1.2: Access to selected basic services	**a. Population using an improved drinking water source**
	b. Population using an improved sanitation facility
	c. Population served by municipal waste collection
	e. Population connected to wastewater treatment
	f. Population supplied by water supply industry
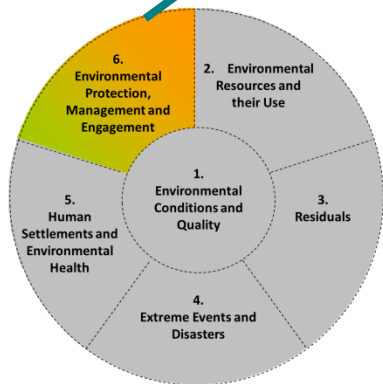
Component 6: **Environmental Protection, Management and Engagement**	Sub-component 6.1: Environmental Protection and Resource Management Expenditure
	Sub-component 6.2: Environmental Governance and Regulation
	Sub-Component 6.3: Extreme Event Preparedness and Disaster Management
	Sub-component 6.4: Environmental Information and Awareness

Example of Core Set Statistics within a topic of Component 6:

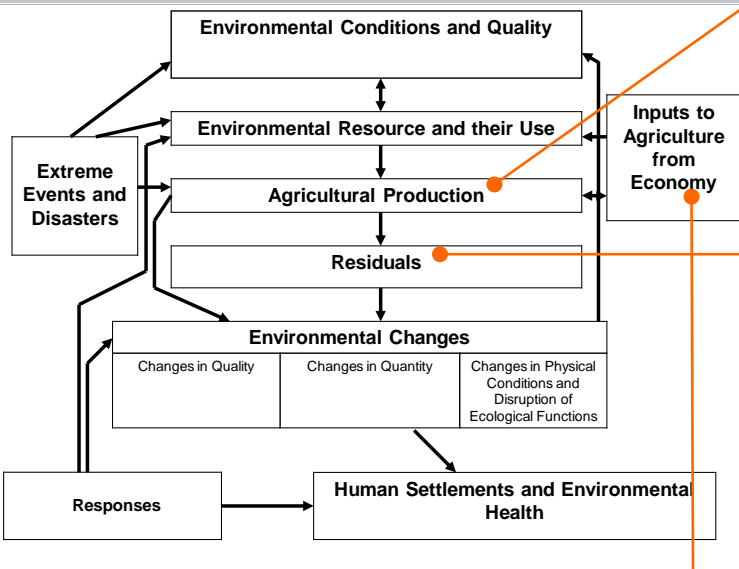| Topic 6.1.1: Government environment protection and resource management expenditure	a. Government environment protection and resource management expenditure	1. **Annual government environmental protection expenditure**

❖ 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
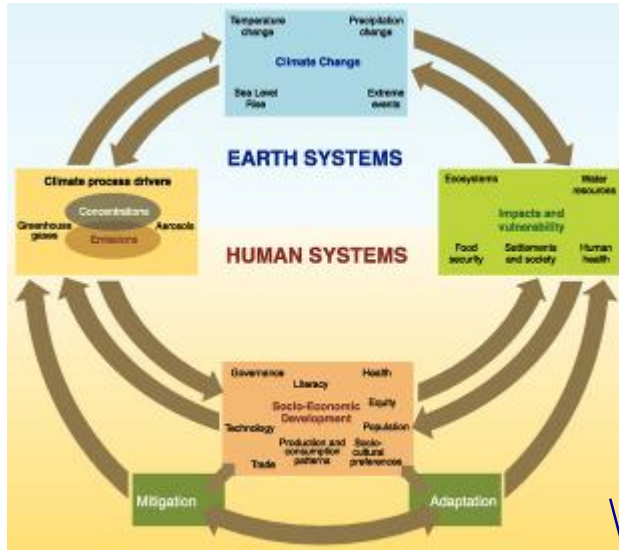
The relationship between agriculture and the environment

Diagram boxes: Environmental Conditions and Quality; Environmental Resource and their Use; Extreme Events and Disasters; Agricultural Production; Inputs to Agriculture from Economy; Residuals; Environmental Changes (Changes in Quality | Changes in Quantity | Changes in Physical Conditions and Disruption of Ecological Functions); Responses; Human Settlements and Environmental Health

Agricultural Production

Sub-component 2.5: Biological Resources

Topic 2.5.3: Crops	2.5.3.a: Main annual and perennial crops **2.5.3.a.1: Area planted** **2.5.3.a.2: Area harvested** **2.5.3.a.3: Amount produced** *2.5.3.a.4: Amount of organic production* *2.5.3.a.5: Amount of genetically modified crops produced* 2.5.3.c: Monoculture/resource-intensive farming systems 2.5.3.c.1: Area being used for production 2.5.3.c.2: Amount produced *2.5.3.c.3: Amount of genetically modified crops produced*
Topic 2.5.4: Livestock	2.5.4.a: Livestock **2.5.4.a.1: Number of live animals** 2.5.4.a.2: Number of animals slaughtered

Inputs to Agriculture

Sub-component 2.5: Biological Resources

Topic 2.5.3: Crops	2.5.3.b: Amount used of: **2.5.3.b.1: Natural fertilizers** (e.g. manure, compost, lime) (also in 3.4.1.a) **2.5.3.b.2: Chemical fertilizers** (also in 3.4.1.a) **2.5.3.b.3: Pesticides** (also in 3.4.1.b) 2.5.3.b.4: Genetically modified seeds
Topic 2.5.4: Livestock	2.5.4.b: Amount used of: *2.5.4.b.1: Antibiotics* (also in 3.4.1.f) *2.5.4.b.2: Hormones* (also in 3.4.1.d)

Residuals

Sub-component 3.1: Emissions to Air

Topic 3.1.1: Emissions of greenhouse gases	3.1.1.a: Total emissions of direct greenhouse gases (GHGs), by gas: **3.1.1.a.1: Carbon dioxide (CO_2)** **3.1.1.a.2: Methane (CH_4)**
Topic 3.1.2: Consumption of ozone depleting substances	3.1.2.a: Consumption of ozone depleting substances (ODSs), by substance: 3.1.2.a.6: Methyl bromide

Sub-component 3.2: Generation and Management of Wastewater

Topic 3.2.1: Generation and pollutant content of wastewater	**3.2.1.a: Volume of wastewater generated** (from agriculture) 3.2.1.b: Pollutant content of wastewater

Sub-component 3.3: Generation and Management of Waste

Topic 3.3.1: Generation of waste	**3.3.1.a: Amount of waste generated by source** (by agriculture) 3.3.1.b: Amount of waste generated by waste category (by agriculture) 3.3.1.c.: **Amount of hazardous waste generated** (by agriculture)

Source: Intergovernmental Panel on Climate Change

Climate Process Drivers

Sub-component 1.3: Environmental Quality	Sub-component 3.1: Emissions to Air
1.3.1 Air quality	3.1.1 Emissions of greenhouse gases 3.1.2 Consumption of ozone depleting substances

Climate Change Evidence

Sub-comp. 1.1: Physical Conditions	Sub-comp. 4.1: Natural Extreme Events and Disasters
1.1.1 Atmosphere, climate and weather 1.1.2 Hydrographical characteristics	4.1.1 Occurrence of natural extreme events and disasters

Climate Change Impacts and Vulnerability

Sub-comp. 1.1: Physical Conditions	Sub-comp. 1.2: Land Cover, Ecosystems and Biodiversity	Sub-comp. 1.3: Environmental Quality	Sub-comp. 2.3: Land	Sub-comp. 4.1: Natural Extreme Events and Disasters	Sub-comp. 5.1: Human Settlements	Sub-comp. 5.2: Environmental Health
1.1.2 Hydrographical characteristics 1.1.4 Soil characteristics	1.2.1 Land cover 1.2.2 Ecosystems and biodiversity 1.2.3 Forests	1.3.3 Marine water quality	2.3.1 Land use	4.1.2 Impact of natural extreme events and disasters	5.1.3 Housing conditions	5.2.3 Vector-borne diseases 5.2.4 Health problems associated with excessive UV radiation exposure

Mitigation and Adaptation

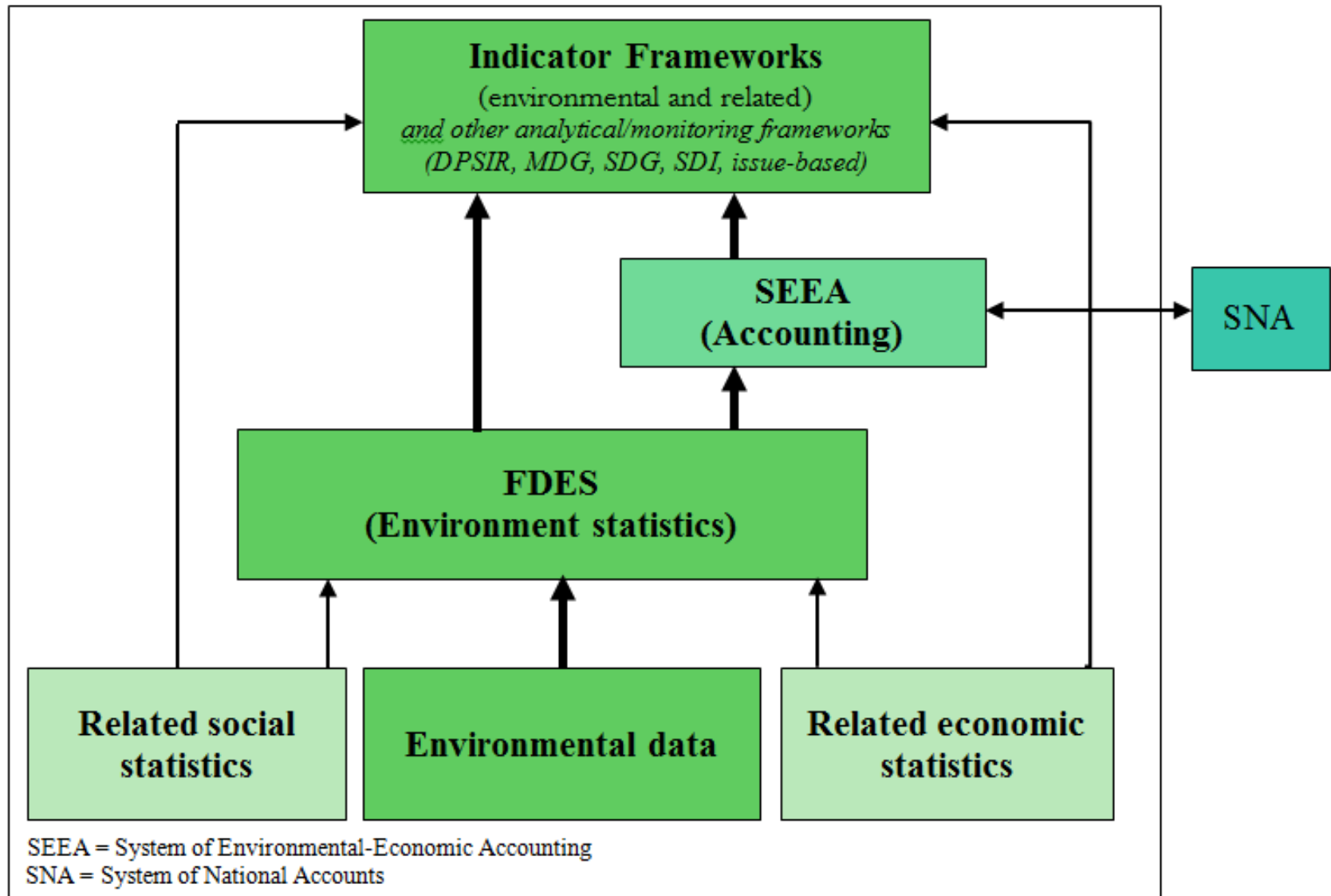| Sub-comp. 2.2: Energy Resources	Sub-comp. 6.1: Environmental Protection and Resource Management Expenditure	Sub-comp. 6.2: Environmental Governance and Regulation	Sub-comp. 6.3: Extreme Event Preparedness and Disaster Management
2.2.2 Production, trade and consumption of energy	6.1.1 Government environmental protection and resource management expenditure 6.1.2 Corporate, non-profit institution and household environmental protection and resource management expenditure	6.2.2 Environmental regulation and instruments 6.2.3 Participation in MEAs and environmental conventions	6.3.1 Preparedness for natural extreme events and disasters

❖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 Millennium Development Goals (MDGs), SDGs and the sustainable development 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.

Relationship of the FDES to other frameworks, systems and indicator sets


```
Indicator Frameworks
(environmental and related)
and other analytical/monitoring frameworks
(DPSIR, MDG, SDG, SDI, issue-based)

SEEA
(Accounting)                    SNA

FDES
(Environment statistics)

Related social        Environmental data    Related economic
statistics                                   statistics
```

SEEA = System of Environmental-Economic Accounting
SNA = System of National Accounts

Thank you for your attention!

For more information please contact the Environment Statistics Section at the United Nations Statistics Division:

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Website: https://unstats.un.org/unsd/envstats/