

# Introduction to environment statistics

National Workshop on Environment  
Statistics in Namibia  
Windhoek, 3-5 December 2019



# Outline

1. Overview of FDES and implementation tools: Basic Set, Methodology sheets, ESSAT, Blueprint for action, NAP (20 min)
2. Data collection methods (10 min)
3. GIS and Earth observation (10 min)
4. Compilation of statistics (10 min)
5. Quality control and validation of Environment Statistics (10 min)
6. Discussion (30 min)



# Overview of FDES and implementation tools



# Overview of FDES and implementation tools

- The UN Statistical Commission endorsed the revised FDES 2013 at its 44th session in 2013 as the framework for strengthening environment statistics programmes in countries.
- The Statistical Commission also recognized the FDES 2013 as a useful tool in the context of **sustainable development goals (SDGs)** and the post-2015 development agenda.
- The objective are:
  - Help international and regional institutions to **support strengthening capacity in countries** to develop environment statistics
  - Enhance **comparability** and availability of environment statistics using a common framework
  - Better inform policy making decisions



# FRAMEWORK FOR THE DEVELOPMENT OF ENVIRONMENT STATISTICS (FDES 2013)



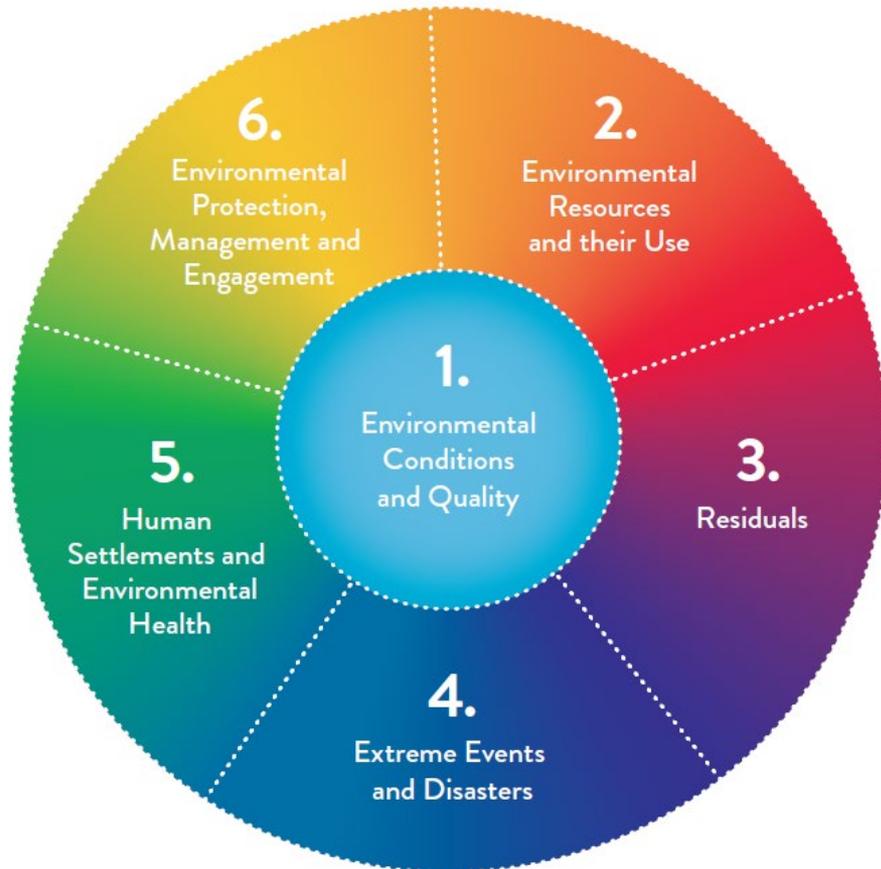
United Nations

*United Nations Statistics Division*

<https://unstats.un.org/unsd/environment/FDES/FDES-2015-supporting-tools/FDES.pdf>



## FDES is structured into 6 components



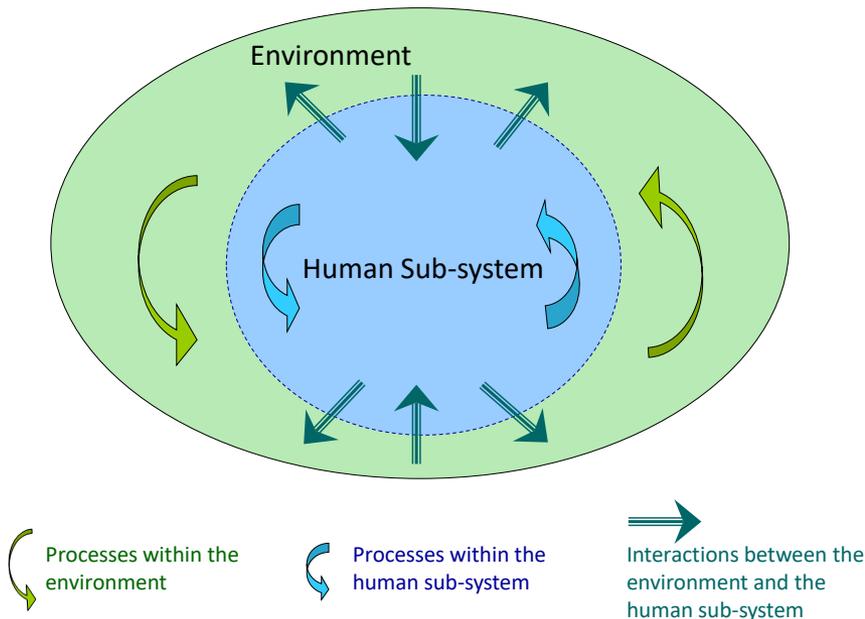
- 6 components
- At the centre: Component 1: Environmental Conditions and Quality
- All of the components relate to each other
- Multi-level (component, sub-component, topic, individual statistics)
- Flexible
- Adaptable



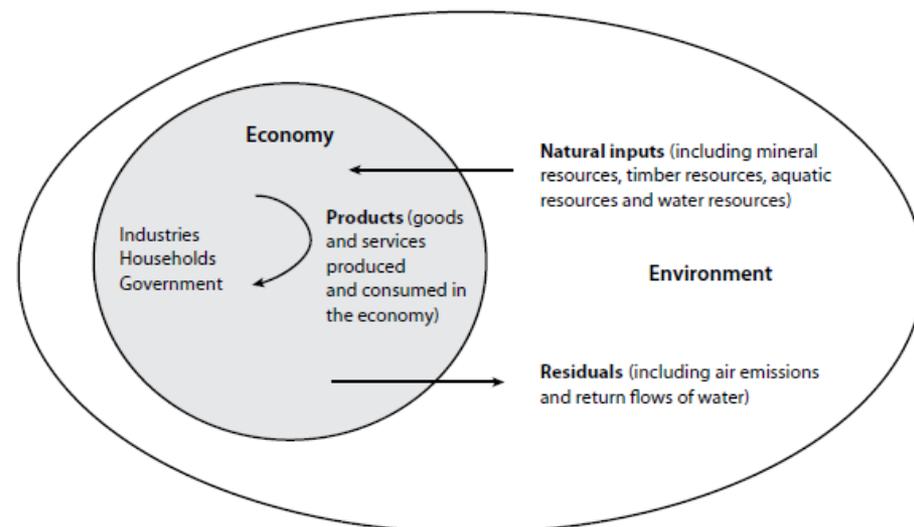
# Description of the FDES

## Scope of the FDES

- ❖ FDES covers **biophysical** aspects of the environment; 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.



Physical flows of natural inputs, products and residuals



# Main Attributes of the Components of the FDES

FDES Component	Description	Types of Data	Main Sources and Institutions	Relation to DPSIR and the SEEA
<b>1 Environmental Conditions and Quality</b>	Meteorological, hydrographical, geological, geographical, biological, physical and chemical conditions and characteristics of the environment that determine ecosystems and environmental quality	<ul style="list-style-type: none"> <li>• <b>Geospatial</b></li> <li>• <b>Physical</b></li> <li>• <b>Qualitative</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Monitoring and remote sensing data</b></li> <li>• Environmental, meteorological, hydrological, geological and geographical authorities or institutions</li> </ul>	<ul style="list-style-type: none"> <li>• <i>State and Impact element in DPSIR</i></li> <li>• <i>Experimental ecosystem accounts of the SEEA</i></li> </ul>
<b>2 Environmental Resources and their Use</b>	Quantities of environmental resources and their changes, and statistics on activities related to their use and management	<ul style="list-style-type: none"> <li>• <b>Physical</b></li> <li>• <b>Geospatial</b></li> </ul>	<ul style="list-style-type: none"> <li>• Statistical surveys, administrative records, field surveys, land registers</li> <li>• Sector statistics on production and consumption activities, infrastructure</li> <li>• Remote sensing data</li> <li>• Statistics databases of respective <b>national authorities and institutions such as mining, energy, agriculture, water and forest</b></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Driving force, Pressure and State elements in DPSIR</i></li> <li>• <i>Asset and physical flow accounts of the SEEA-CF</i></li> </ul>
<b>3 Residuals</b>	Generation, management and discharge of residuals to air, water and soil	<ul style="list-style-type: none"> <li>• <b>Physical</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Administrative records</b></li> <li>• Estimates based on activity statistics and technical coefficients</li> <li>• Sector statistics</li> <li>• Monitoring data</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Pressure and Response elements in DPSIR</i></li> <li>• <i>Physical flow accounts of the SEEA-CF</i></li> </ul>



## 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
<b>4 Extreme Events and Disasters</b>	Occurrence and impact of natural extreme events and disasters, and technological disasters	<ul style="list-style-type: none"> <li>• <b>Physical</b></li> <li>• <b>Monetary</b></li> <li>• <b>Geospatial</b></li> <li>• <b>Qualitative</b></li> </ul>	<ul style="list-style-type: none"> <li>• Administrative records</li> <li>• Remote sensing</li> <li>• <b>National emergency and disaster authorities</b></li> <li>• Seismic, meteorological monitoring and research centres</li> <li>• Industrial complexes that work with hazardous substances and processes</li> <li>• Insurance companies</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Pressure, Impact and Response elements in DPSIR</i></li> <li>• <i>Asset accounts of the SEEA-CF</i></li> </ul>
<b>5 Human Settlements and Environmental Health</b>	The built environment in which humans live, particularly with regard to population, housing, living conditions, basic services and environmental health	<ul style="list-style-type: none"> <li>• <b>Geospatial</b></li> <li>• <b>Physical</b></li> </ul>	<ul style="list-style-type: none"> <li>• Population and housing censuses, household surveys, administrative records, and remote sensing</li> <li>• Health and administrative records</li> <li>• Housing and urban planning and oversight authorities</li> <li>• Cartographic authorities</li> <li>• Transport authorities</li> <li>• <b>Health authority</b></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Driving force, Pressure and Impact elements in DPSIR</i></li> </ul>
<b>6 Environmental Protection, Management and Engagement</b>	Environmental protection and resource management expenditure, environmental regulation, both direct and via market instruments, disaster preparedness, environmental perception, awareness and engagement of the society	<ul style="list-style-type: none"> <li>• <b>Monetary</b></li> <li>• <b>Qualitative</b></li> </ul>	<ul style="list-style-type: none"> <li>• Administrative records</li> <li>• Surveys</li> <li>• Entity producing government expenditure statistics</li> <li>• Statistical entity in charge of national or sub-national surveys</li> <li>• <b>Environmental authority</b> and other sector authorities</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Response element in DPSIR</i></li> <li>• <i>Environmental activity accounts and related flows of the SEEA-CF</i></li> </ul>

## 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 Millennium Development Goals (MDGs), SDGs and the sustainable development indicator (SDI) 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.



# Methodological Development and Dissemination of Knowhow



## Methodology

**Methodological work** includes the elaboration of frameworks, concepts, methods, definitions, and data compilation guidelines to support the development and harmonization of national and international statistics on the environment.

- ▶ FDES 2013
- ▶ Basic Set of Environment Statistics
- ▶ Environment Statistics Self-Assessment Tool
- ▶ Expert Group on Environment Statistics
- ▶ Manual on the Basic Set of Environment Statistics
- ▶ International Recommendations for Water Statistics
- ▶ Environmental surveys
- ▶ Concepts and Methods of Environment Statistics
- ▶ Glossary

## Capacity Development

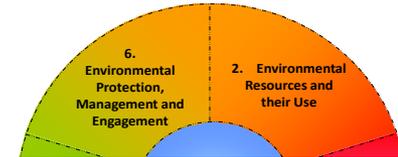
**Technical cooperation, training and capacity building** is provided through regional and sub-regional projects, international training workshops, fellowship arrangements and assistance to countries. Recent projects covered the countries of the CARICOM, ESCWA, ECOWAS and EAC regions.

- ▶ COMESA
- ▶ EAC project
- ▶ ECOWAS project
- ▶ ESCWA project
- ▶ CARICOM project
- ▶ Workshops

<https://unstats.un.org/unsd/envstats/index.cshtml>

# Basic Set of Environment Statistics and Manual of the Basic Set





# Basic Set of Environment Statistics

28 August 2018

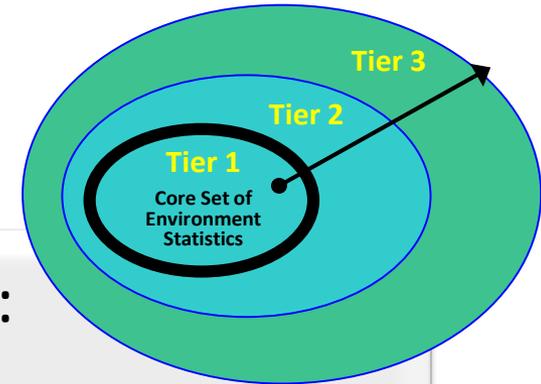
## Component 1: Environmental Conditions and Quality

### Sub-component 1.1: Physical Conditions

Topic	Statistics and Related Information ( <b>Bold Text</b> - Core Set/Tier 1; Regular Text - Tier 2; <i>Italicized Text</i> - Tier 3)		Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
<b>Topic 1.1.1: Atmosphere, climate and weather</b>	a.	Temperature		<ul style="list-style-type: none"> <li>National</li> <li>Sub-national</li> </ul>	<ul style="list-style-type: none"> <li>World Meteorological Organization (WMO)</li> <li>Intergovernmental Panel on Climate Change (IPCC)</li> <li>National Oceanic and Atmospheric Administration (NOAA)/National Aeronautics and Space Administration (NASA)</li> </ul>
		1. <b>Monthly average</b>	Degrees		
		2. <b>Minimum monthly average</b>	Degrees		
		3. <b>Maximum monthly average</b>	Degrees		
	b.	Precipitation (also in 2.6.1.a)			
		1. <b>Annual average</b>	Height		
		2. <b>Long-term annual average</b>	Height		
		3. Monthly average	Height		
		4. Minimum monthly value	Height		
		5. Maximum monthly value	Height		
	c.	Relative humidity		<ul style="list-style-type: none"> <li>National</li> <li>Sub-national</li> <li>By station</li> </ul>	
		1. Minimum monthly value	Number		
		2. Maximum monthly value	Number		
	d.	Pressure			
		1. <i>Minimum monthly value</i>	Pressure unit		
		2. <i>Maximum monthly value</i>	Pressure unit		
	e.	Wind speed		<ul style="list-style-type: none"> <li>National</li> <li>Sub-national</li> <li>By station</li> </ul>	
		1. <i>Minimum monthly value</i>			
	2. <i>Maximum monthly value</i>				
f.	Solar radiation				
	1. <i>Average daily value</i>				
	2. <i>Average monthly value</i>				

- BSES is available in all UN official languages: <https://unstats.un.org/unsd/envstats/fdes/basicset.cshtml>
- All statistical tables from chapter 3 included, on 44 pages document
- From Basic set to core set in chapter 4

# Why do we need a Basic Set of Environment Statistics?



- The Basic Set was developed in response to:
  - country demand;
  - relevance of the statistics to environmental policies/issues;
  - corresponding FDES topics.
- The statistics contained in the Set are useful for:
  - generating national sets or databases of environment statistics.
  - reporting on environment (MEAs) or sustainable development (SDGs).
  - calculating environmental indicators.
  - generating environmental-economic accounts.



# The Basic and the Core Set of Environment Statistics

## Basic Set of Environment Statistics

- A comprehensive but not exhaustive set of statistics - supports national environment statistics programmes
- Map priority policy needs to statistics – helps determine priority environment statistics for national environment statistics programme
- It is flexible - **458 statistics** – not all to be collected at once, **structured at 3 tiers**. Start with main priorities given available resources

## Core Set of Environment Statistics

- **Tier 1 of the Core Set of Environment Statistics**
- Indicates the most relevant and available environment statistics, with sound methodological foundation
- Often initial focus for national environment statistics programmes



## What were the selection criteria of the Core Set

- **Relevance:** meets needs of a variety of users and is responsive to changes in the environment and related human activities
- **Measurability:** sufficient supporting data and meta-data readily available, of accepted quality, and regularly updated, or possible to compile the statistics in the near term
- **Methodological soundness:** Core statistics should adhere to professional and scientific methods, as well as to internationally agreed concepts and definitions to the extent possible.



## Do you remember what the components are?

Component 1: Environmental Conditions and Quality

Component 2: Environmental Resources and their Use

Component 3: Residuals

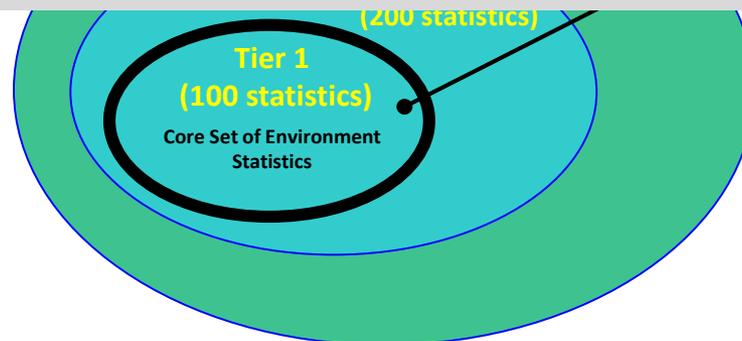
Component 4: Extreme Events and Disasters

Component 5: Human Settlements and Environmental Health

Component 6: Environmental Protection, Management and Engagement

Core Set or Tier 1 = 100 statistics

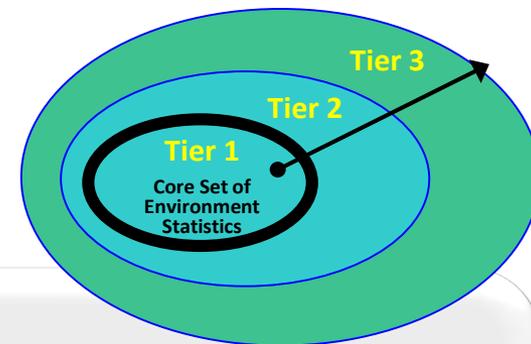
Basic Set = 458 statistics



Number of Statistics	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



## The Basic Set and its three tiers of statistics



The three tiers of statistics are defined as follows:

- Tier 1, corresponding to the Core Set of Environment Statistics, includes **100** statistics which are **of high priority and relevance to most countries** and have a **sound methodological foundation**. It is recommended that countries consider producing them in the **short-term**.
- Tier 2 includes **200** environment statistics which are of **priority and relevance to most countries** but require greater investment of time, resources or methodological development. It is recommended that countries consider producing them in the **medium-term**.
- Tier 3 includes **158** environment statistics which are either of **lower priority or require significant methodological development**. It is recommended that countries consider producing them in the **long-term**.



Core set statistics

- Temperature, precipitation, watersheds
- Coastal waters, coastlines, coastal areas
- Soil types, erosion, desertification
- Ecosystems and their extent, flora and fauna
- Protected areas, forest area, land cover types extent
- Air quality, freshwater quality, marine water quality

ing water source  
 tion facility  
 e collection  
 treatment  
 event and  
 on  
 prevalence,  
 and  
 (quality)  
 f MEAs

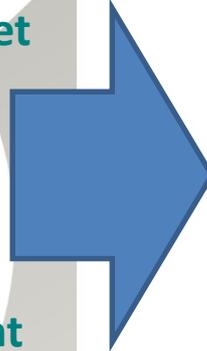
Number of Statistics	Component 1	Component 2	Component 3	Component 4	Component 5	Component 6	Total
Tier 1	32	30	19	4	12	3	100
Tier 2	58	51	34	11	22	24	200
Tier 3	51	43	5	16	20	23	158
Total	141	124	58	31	54	50	458



## Reason

### FRAMEWORK FOR THE DEVELOPMENT OF ENVIRONMENT STATISTICS (FDES 2013)

- **Scope of environment statistics**
- **Organizing structure**
- **Comprehensive, though not extensive, list of statistics (Basic Set of Environment Statistics)**
- **Relevance of the statistical topics, the typical data sources and institutional partners and information on the most important aspects of temporal and spatial aggregation, as well as on existing methodology**



FDES 2013 does **not include**:

- Methodological guidance with regard to the collection and compilation of environmental data and its transformation into statistics.
- Practical and detailed guide to many of the **Basic Set themes**, including:
  - variable definitions,
  - description of sources and data collection,
  - methods of data compilation/processing for environment statistics production,
  - quality control and validation
  - methods of presentation and dissemination and
  - Applications in SDGs, SEEA, common indicators, etc.



# Manual of the BSES

## Guidance on Indicators using FDES Statistics

### Manual on the Basic Set of Environment Statistics

---

The objective of the Manual is to produce and disseminate a set of methodology sheets or metadata for the collection or compilation of all environment statistics of the Basic Set of Environment Statistics embedded in the FDES 2013. The template for these methodology sheets has been agreed by the [Expert Group on Environment Statistics](#) (EGES).

These methodology sheets offer detailed and in-depth methodological guidance including definitions, classifications, statistical methods for collection and/or compilation, dissemination and main uses of the sets of the respective environment statistics. These aspects are provided by the standards and guidelines established by lead agencies in the relevant fields, such as FAO, UNFCCC and UN-HABITAT, which ensures that the methodology sheets utilize established international best practices. The references can be found with the respective definitions and classifications.

The work on the Manual is being coordinated by UNSD and is being carried out in a collaborative way with the EGES and other thematic experts from specialized agencies as needed. The experience of this global group is being utilized in order to construct up to date, hands-on guidance to benefit practitioners working in environment statistics in different countries.

As there are 458 environment statistics identified in the [Basic Set of Environment Statistics](#), their methodology sheets are being developed in a modular and progressive manner. The available volumes (sets) of methodology sheets are disseminated below.

- [MS 1.1.4 Soils](#) **new**
- [MS 1.2.2 Ecosystems and Biodiversity Statistics](#)
- [MS 1.2.1 & 2.3.1 Land Cover and Land Use](#)
- [MS 1.2.3, 2.3.2, 2.5.1 & 2.5.5 Forests](#)
- [MS 1.3.1 Air Quality](#) **new**
- [MS 2.1 Mineral Resources](#)
- [MS 2.2 Energy Resources](#)
- [MS 2.5 Crops and Livestock Statistics](#)
- [MS 2.6 Water Resources](#)
- [MS 3.3.1 & 3.3.2 Generation and Management of Waste](#) **new**
- [MS 5.1 Human Settlements](#)
- [MS 6.1.1 Environmental Protection Expenditures](#)



# Manual of the BSES

## Manual on the Basic Set of Environment Statistics of the FDES 2013



### Water Resources Statistics

(Sub-component 2.6 Water Resources  
of the Basic Set of Environment Statistics of the FDES 2013)

*Elaborated by the Environment Statistics Section  
of the United Nations Statistics Division,  
in collaboration with the  
Expert Group in Environment Statistics.*

Version 1.0  
7 June 2017

Methodology sheet of the Basic Set of Environment Statistics of the FDES:

[http://unstats.un.org/unsd/environment/FDES/Manual\\_BSES.htm](http://unstats.un.org/unsd/environment/FDES/Manual_BSES.htm)  
<http://unstats.un.org/unsd/environment/2016.htm>



# The Basic Set is presented into the FDES structure, supplemented with additional guidance

Component 2: Environmental Resources and their Use				
Sub-component 2.6: Water Resources				
Statistics and Related Information ( <b>Bold Text - Core Set/Tier 1</b> ; Regular Text - Tier 2; <i>Italicized Text - Tier 3</i> )		Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 2.6.1: Water resources				
a.	Inflow of water to inland water resources		<ul style="list-style-type: none"> <li>National</li> <li>Sub-national</li> <li>By territory of origin and destination</li> </ul>	<ul style="list-style-type: none"> <li>UNSD: IRWS</li> <li>UNECE Standard Statistical Classification of Water Use (1989)</li> <li>UNSD: MDG Indicator 7.5 Metadata</li> <li>FAO AQUASTAT</li> <li>SEEA Central Framework (2012) asset accounts</li> <li>SEEA Water</li> <li>UNSD: Environment Statistics Section-Water Questionnaire</li> </ul>
	<b>1. Precipitation</b> (also in 1.1.1.b)	Volume		
	<b>2. Inflow from neighbouring territories</b>	Volume		
	<i>3. Inflow subject to treaties</i>	Volume		
b.	Outflow of water from inland water resources			
	<b>1. Evapotranspiration</b>	Volume		
	2. Outflow to neighbouring territories	Volume		
	3. Outflow subject to treaties	Volume		
	4. Outflow to the sea	Volume		
c.	Inland water stocks		<ul style="list-style-type: none"> <li>National</li> <li>Sub-national</li> </ul>	
	1. Surface water stocks in artificial reservoirs	Volume		
	2. Surface water stocks in lakes	Volume		
	<i>3. Surface water stocks in rivers and streams</i>	Volume		
	<i>4. Surface water stocks in wetlands</i>	Volume		
	<i>5. Surface water stocks in snow, ice</i>	Volume		



# Contents of the Manuals

1. Statistics in Sub-Component 2.6 Water Resources .....	3
2. Introduction/ Relevance .....	5
3. Definitions and description of the statistics .....	7
3A. Water Resources (Topic 2.6.1).....	10
3A1. Inflows .....	11

## 3A1. Inflows

### Inflow of water to inland water resources (FDES 2.6.1.a)

Inflow of water to a territory's inland water resources is an aggregate of statistics on precipitation and inflows from neighbouring territories as stated in the Basic Set of Environment Statistics of the FDES.<sup>23</sup>

### Precipitation (FDES 2.6.1.a.1)

## 6D. SDG indicators that incorporate these statistics

SDG indicators related to water resources, abstraction, use and returns fall under target 6.4: by 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.

et, hail, dew, mist,  
e country over one

**Indicator 6.4.1: Change in water-use efficiency over time** is currently a Tier III indicator which is under development. The indicator will measure the output over time of a given major sector per volume of water withdrawn.<sup>103</sup>

**Indicator 6.4.2: Level of water stress:** freshwater withdrawal as a proportion of available freshwater resources (also known as water withdrawal intensity), calculated as:

$$\frac{\text{total freshwater withdrawn by all major sectors (TWW)}}{\text{total renewable freshwater resources, actual (TRWR) – environmental water requirements (Env.)}} * 100$$





# Plan of Work

## 1. Preparation

This stage includes the preparatory work to be carried out by UNSD, including the following tasks:

- Prepare work programme, metadata template
- Discuss with experts
- Distribute work among experts

## 2. Elaboration of draft methodology/metadata sheets

- Elaboration of methodology/metadata sheets (filling all fields of template) for the topics/statistics by responsible experts: UNSD, EGES, other experts from specialized agencies as needed.

## 3. Review and finalization

- The peer review of the drafts of the methodological sheets is carried out on a continuous basis as drafts become available. Both national and international experts are called upon to review submitted methodology/metadata sheets before their finalization.

## 4. Dissemination

- The methodology sheets when finalized is disseminated through the website.



# Topics covered by Methodology Sheets

Component 1: Environmental Conditions and Quality	Component 2: Environmental Resources and their Use	Component 3: Residuals
<b>Sub-component 1.1: Physical Conditions</b>	<b>Sub-component 2.1: Mineral Resources</b>	<b>Sub-component 3.1: Emissions to Air</b>
Topic 1.1.1: Atmosphere, climate and weather	Topic 2.1.1: Stocks and changes of mineral resources	Topic 3.1.1: Emissions of greenhouse gases
Topic 1.1.2: Hydrographical characteristics	Topic 2.1.2: Production and trade of minerals	Topic 3.1.2: Consumption of ozone depleting substances
Topic 1.1.3: Geological and geographical information	<b>Sub-component 2.2: Energy Resources</b>	Topic 3.1.3: Emissions of other substances
Topic 1.1.4: Soil characteristics	Topic 2.2.1: Stocks and changes of energy resources	<b>Sub-component 3.2: Generation and Management of Wastewater</b>
<b>Sub-component 1.2: Land Cover, Ecosystems and Biodiversity</b>	Topic 2.2.2: Production, trade and consumption of energy	Topic 3.2.1: Generation and pollutant content of wastewater
Topic 1.2.1: Land cover	<b>Sub-component 2.3: Land</b>	Topic 3.2.2: Collection and treatment of wastewater
Topic 1.2.2: Ecosystems and biodiversity	Topic 2.3.1: Land use	Topic 3.2.3: Discharge of wastewater to the environment
Topic 1.2.3: Forests	Topic 2.3.2: Use of forest land	<b>Sub-component 3.3: Generation and Management of Waste</b>
<b>Sub-component 1.3: Environmental Quality</b>	<b>Sub-component 2.4: Soil Resources</b>	Topic 3.3.1: Generation of waste
Topic 1.3.1: Air quality	Topic 2.4.1: Soil resources	Topic 3.3.2: Management of waste
Topic 1.3.2: Freshwater quality	<b>Sub-component 2.5: Biological Resources</b>	<b>Sub-component 3.4: Release of Chemical Substances</b>
Topic 1.3.3: Marine water quality	Topic 2.5.1: Timber resources	Topic 3.4.1: Release of chemical substances
Topic 1.3.4: Soil pollution	Topic 2.5.2: Aquatic resources	
Topic 1.3.5: Noise	Topic 2.5.3: Crops	
	Topic 2.5.4: Livestock	
	Topic 2.5.5: Other non-cultivated biological resources	
	<b>Sub-component 2.6: Water Resources</b>	
	Topic 2.6.1: Water resources	
	Topic 2.6.2: Abstraction, use and returns of water	

Complete
Draft under review
Not started

# Topics covered by Methodology Sheets

Component 4: Extreme Events and Disasters	Component 5: Human Settlements and Environmental Health	Component 6: Environmental Protection, Management and Engagement
<b>Sub-component 4.1: Natural Extreme Events and Disasters</b>	<b>Sub-component 5.1: Human Settlements</b>	<b>Sub-component 6.1: Environmental protection and resource management expenditure</b>
Topic 4.1.1: Occurrence of natural extreme events and disasters	Topic 5.1.1: Urban and rural population	Topic 6.1.1: Government environmental protection and resource management expenditure
Topic 4.1.2: Impact of natural extreme events and disasters	Topic 5.1.2: Access to selected basic services	Topic 6.1.2: Corporate, non-profit institution and household environmental protection and resource management expenditure
<b>Sub-component 4.2: Technological Disasters</b>	Topic 5.1.3: Housing conditions	<b>Sub-component 6.2: Environmental Governance and Regulation</b>
Topic 4.2.1: Occurrence of technological disasters	Topic 5.1.4: Exposure to ambient pollution	Topic 6.2.1: Institutional strength
Topic 4.2.2: Impact of technological disasters	Topic 5.1.5: Environmental concerns specific to urban settlements	Topic 6.2.2: Environmental regulation and instruments
	<b>Sub-component 5.2: Environmental Health</b>	Topic 6.2.3: Participation in MEAs and environmental conventions
	Topic 5.2.1: Airborne diseases and conditions	Topic 6.3.1: Preparedness for natural extreme events and disasters
	Topic 5.2.2: Water-related diseases and conditions	Topic 6.3.2: Preparedness for technological disasters
	Topic 5.2.3: Vector-borne diseases	<b>Sub-component 6.4: Environmental Information and Awareness</b>
	Topic 5.2.4: Health problems associated with excessive UV radiation exposure	Topic 6.4.1: Environmental Information
	Topic 5.2.5: Toxic substance- and nuclear radiation-related diseases and conditions	Topic 6.4.2: Environmental Education
Complete		Topic 6.4.3: Environmental Perception and Awareness
Draft under review		Topic 6.4.4: Environmental engagement
Not started		

# More Tools to Support Implementation

## Knowledge Portal

### Methodology

Methodological work includes the elaboration of frameworks, concepts, methods, definitions, and data compilation guidelines to support the development and harmonization of national and international statistics on the environment.

- FDES 2013
- Basic Set of Environment Statistics
- Environment Statistics Self-Assessment Tool
- Expert Group on Environment Statistics
- Manual on the Basic Set of Environment Statistics
- International Recommendations for Water Statistics
- Environmental surveys
- Concepts and Methods of Environment Statistics
- Glossary

### Capacity Development

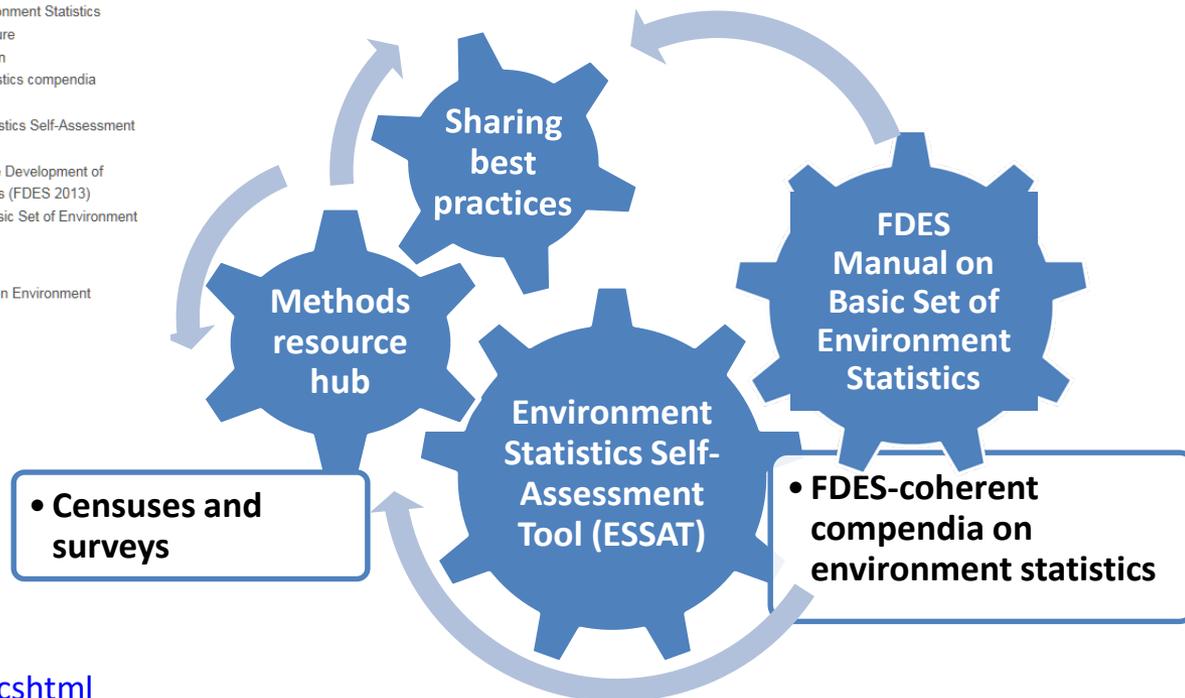
Technical cooperation, training and capacity building is provided through regional and sub-regional projects, international training workshops, fellowship arrangements and assistance to countries. Recent projects covered the countries of the CARICOM, ESCWA, ECOWAS and EAC regions.

- COMESA
- EAC project
- ECOWAS project
- ESCWA project
- CARICOM project
- Workshops

### FDES 2013

- Basic Set of Environment Statistics
- FDES 2013 brochure
- Blueprint for Action
- Environment statistics compendia applying FDES 2013
- Environment Statistics Self-Assessment Tool
- Framework for the Development of Environment Statistics (FDES 2013)
- Manual on the Basic Set of Environment Statistics

Expert Group on Environment Statistics

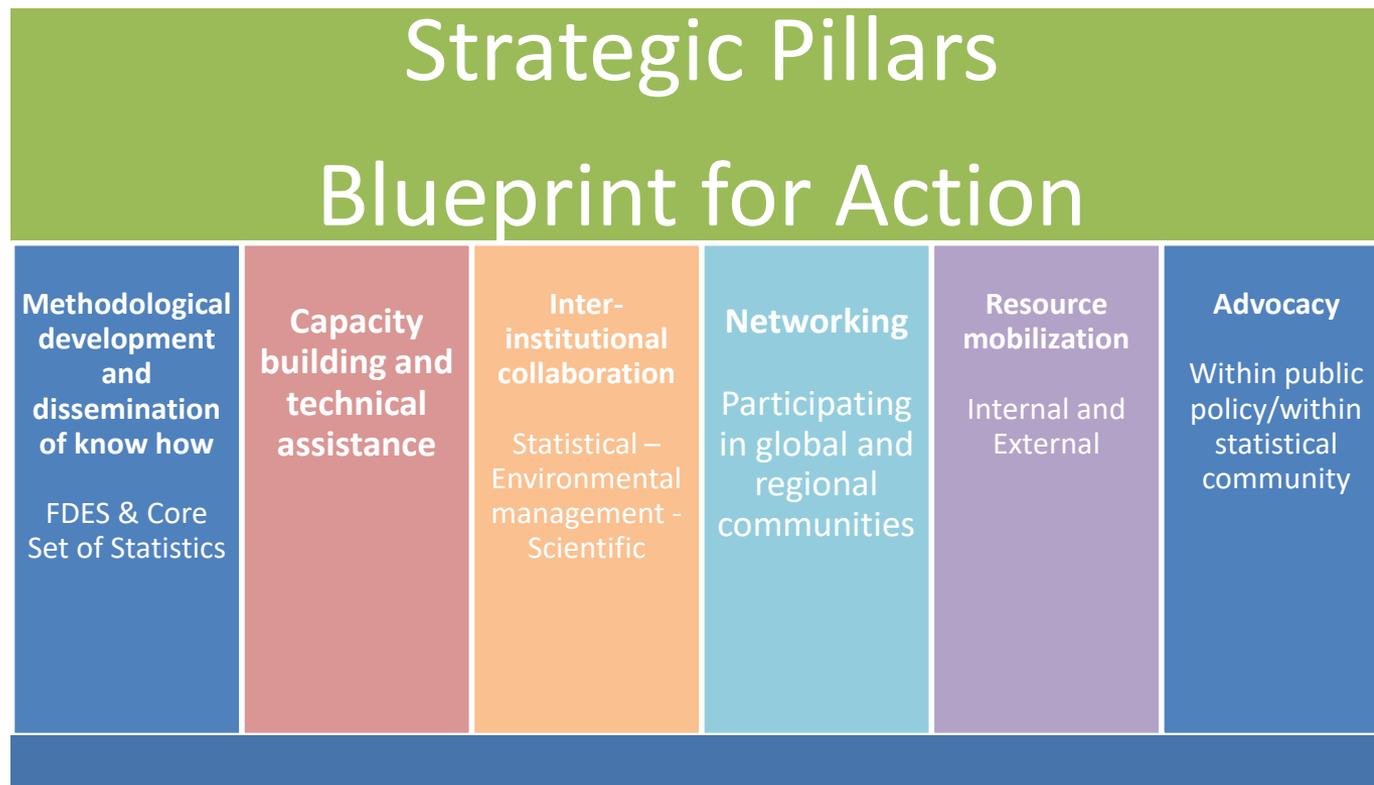


<https://unstats.un.org/unsd/envstats/index.cshhtml>



# Blueprint for Action, 2013

(also adopted at 44 Session of Stat. Commission)



[https://unstats.un.org/unsd/statcom/doc13/BG-FDES-Environment\\_Blueprint.pdf](https://unstats.un.org/unsd/statcom/doc13/BG-FDES-Environment_Blueprint.pdf)



# National Action Plan - template

## 1.0 Background and justification

### 1.1 Justification

### 1.2 National and international environment policies

### 1.3 Other related initiatives

## 2.0 Objective of the national plan

## 3.0 Stakeholders

## 4.0 Environment Statistics Self-Assessment (ESSAT) Summary

### 4.1 Data summary

### 4.2 Institutional needs

### 4.3 Organisational needs

## 5.0 Outputs and activities

### 5.1 Impact

### 5.2 Outcome

### 5.3 Outputs and activities

Objective 1.0: Inter-institutional collaboration: Improve collaboration, coordination and awareness of key players across all stages of statistical production and dissemination

Objective 2.0: Methodological development and dissemination of know-how

Objective 3.0: Capacity building and technical assistance

Objective 4.0: Investing in physical infrastructure

Objective 5.0: Human resource development and management

Objective 6.0: Networking

Objective 7.0: Resource mobilization and advocacy

## 6.0 Workplan

## 7.0 Overall budget

## 8.0 Next Steps

# Key considerations

- National statistics system
- Data providers
- Data storage, management and quality control
- Statistics compilation dissemination
- Users needs and data services



# The Environment Statistics Assessment & Environment Statistics Self-Assessment Tool



# What is it?

- The full ESSAT is composed of two parts
  - I. Institutional Dimension of Environment Statistics
  - II. Statistics Level Assessment

## Environment Statistics Self-Assessment Tool (ESSAT)

### Part I: Institutional Dimension of Environment Statistics

in support of the Framework for the Development of Environment Statistics (FDES 2013)



Prepared by the United Nations Statistics Division  
27 June 2016  
Version 1.0

## Environment Statistics Self-Assessment Tool (ESSAT)

### Part II: Statistics Level Assessment

in support of the Framework for the Development of Environment Statistics (FDES 2013)



Prepared by the United Nations Statistics Division  
28 August 2018  
Version 1.1

*United Nations Statistics Division*



# ESSAT Part 1 of E

Start date (dd/mm/yyyy):

Completion date (dd/mm/yyyy):

Country:

G. Inter-institutional collaboration for the production of

K. The way forward in environment statistics

- A. Identification of institutions
- B. Existing national policies related to environment statistics
- C. Mandate and organization of environment statistics
- D. Mandate and organization of environment statistics
- E. Production of environment statistics
- F. Uses of environment statistics
- G. Inter-institutional collaboration for the production of environment statistics
- H. Existing and required resources for environment statistics
- I. International and regional cooperation
- J. Technical assistance and training
- K. The way forward in environment statistics

K1. In which areas are there plans to strengthen and develop environment statistics programmes, units and/or activities in the country?

Legal framework (describe)	
Institutional set up (describe)	
Budgetary resources (describe)	
Human resources (describe)	
Technical assistance and training (describe)	
Advocacy (describe)	
Other (describe)	

K2. What are the main vehicles through which the country requires technical assistance and capacity building to develop environment statistics?

- Manuals/technical guidance in the language used in the country
- Regional/sub-regional workshops
- National workshops
- Country visits/study tours
- Bilateral consultations
- E-learning
- Networking
- Other (describe)

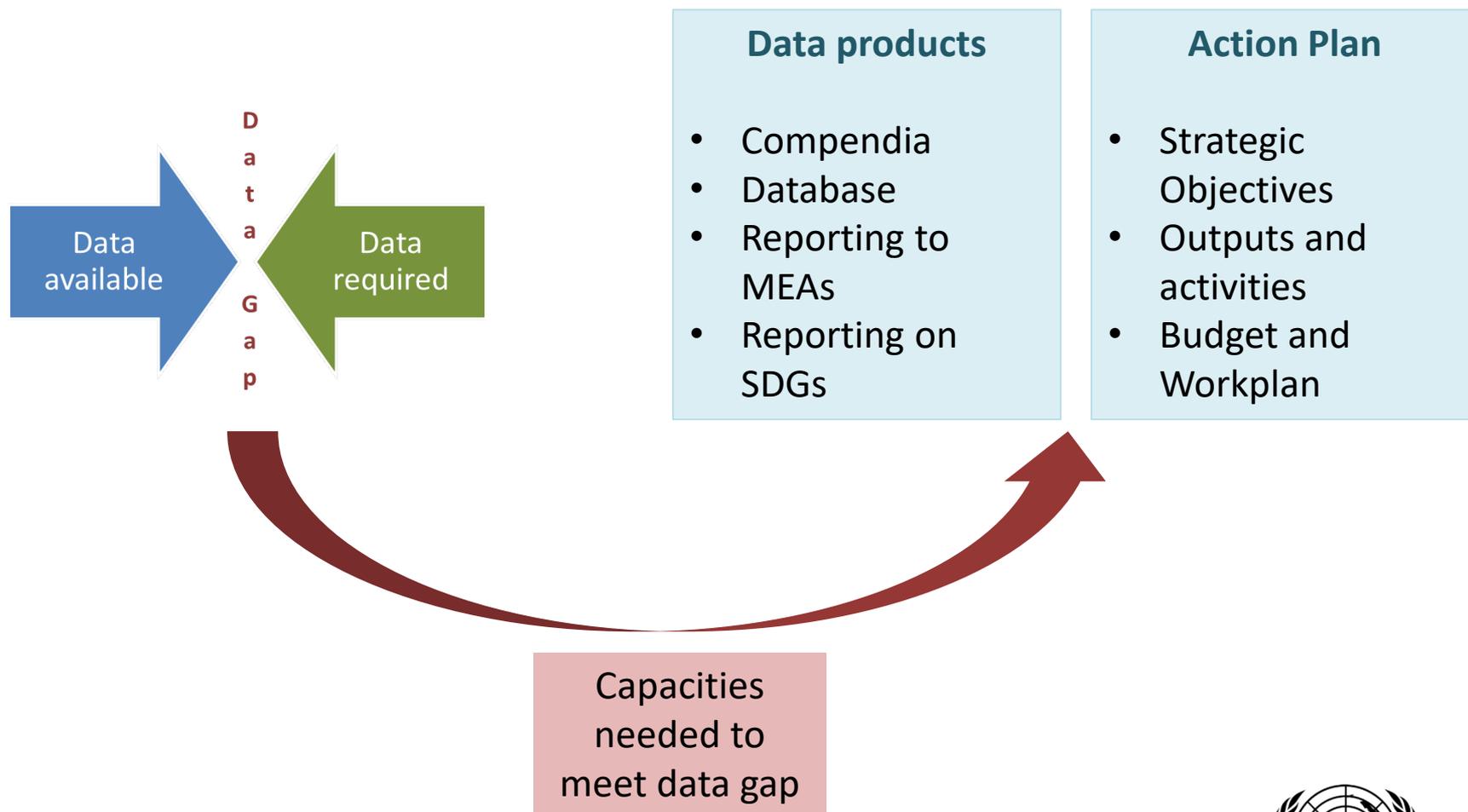


# 1. Aim of the assessment

- Which **institutions** are involved
- What data is **available** (ESSAT Part II)
- What data is **needed**
  - For national environment policies
  - Reporting for Multilateral Environment Agreements and SDGs
- To **identify the data gaps**/additional data needed by comparing data availability with need
- To **identify the capacity development needs** to meet existing needs and fill data gaps
- To **prioritize** data needed



# 1. Aim of the assessment



### 3. Data availability

- Existing compendia, year-books are good to start with
- Producers should identify which statistics they produce and record on ESSAT
- Statistics can go beyond those listed if related to the environment and nationally relevant
  - E.g. some countries include tourism related statistics



## Use of the Environment Statistics Self-Assessment Tool Process

- **Guides a multi-stakeholder consultation** and discussion process.
- Process led by the National Statistical Office or the Ministry of Environment
- Joint effort by all main relevant stakeholders in environment statistics
- Convene stakeholders: agree on process, conduct assessment with each stakeholder
- Validation of assessment for each stakeholder and as a group – agree on picture of environment statistics in country as a group, in open and transparent manner
- **Country can convene stakeholders under existing or new committee, inter-institutional working group or task force to bring together all the stakeholders**



# Capacity building and technical assistance



## Capacity building and technical assistance

- Activities with DA 9 and 10 projects and UNSD regular programme of technical cooperation
- Delivering in kind contributions with partners
- Regional, sub-regional and national workshops, national capacity development
- Development of training material and delivery of e-learning course

### UNSD activities

#### Regional workshops to disseminate FDES

- Common Market for Eastern and Southern Africa (COMESA), Mauritius (Jan 2015)
- East African Community (EAC), Tanzania (July 2015)
- Economic Community of West African States (ECOWAS), Togo (Oct 2015)
- Economic Community of Central African States (ECCAS), Gabon (Nov 2017)
- Economic and Social Commission for Western Asia (ESCWA), Lebanon (Nov 2018)
- UNECA regional workshop (Kenya)(Sep 2017)
- Caribbean Community (CARICOM) (Nov 2019)

National workshops such as: Kenya, Uganda, Egypt (with COMESA), Rwanda, Tanzania, Burundi, Gambia, Namibia, Equatorial Guinea, Grenada



# Countries conducting or initiating Environment Statistics Self-Assessment Tool (ESSAT)



ESSAT: <https://unstats.un.org/unsd/envstats/fdes/essat.cshtml>



## Countries compiling FDES-coherent compendia



All compendia available at: <https://unstats.un.org/unsd/envstats/fdescompendia.cshtml>

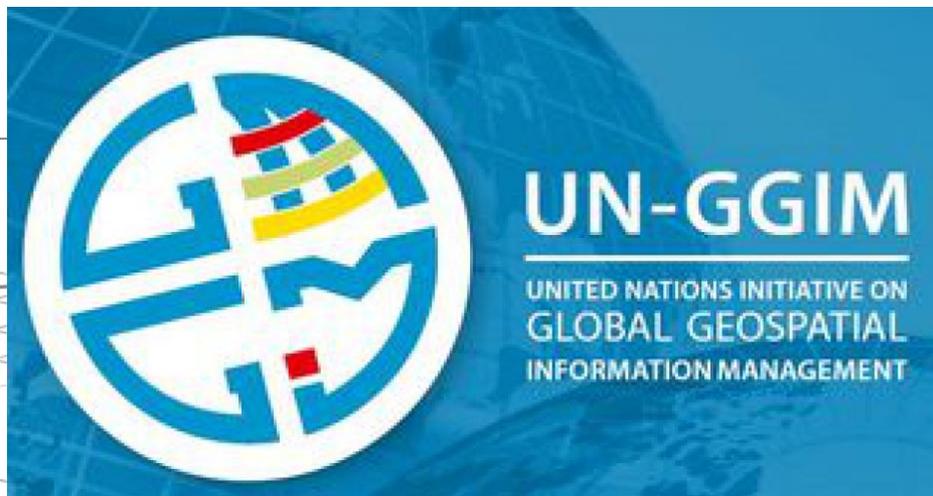
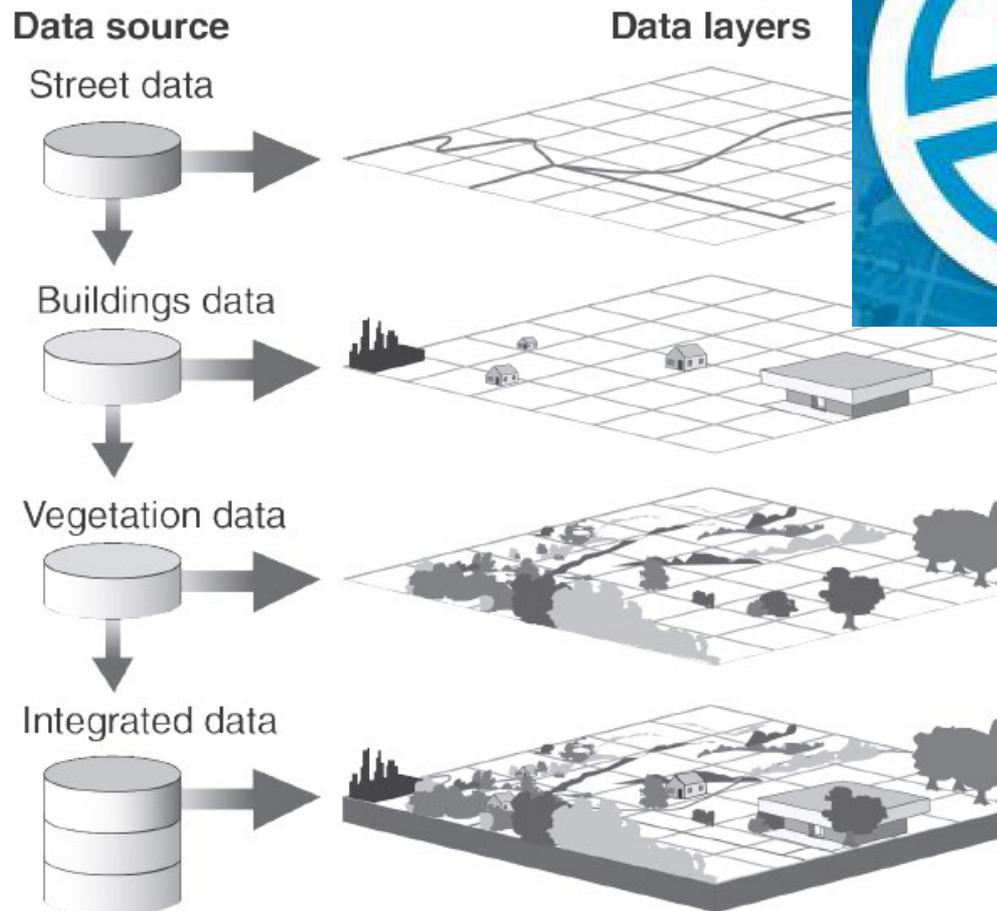


# GIS and Earth observation



# Geospatial information adds significant value and utility to environment statistics

Example of GIS data layers or themes<sup>16</sup>



**Geological and geographical information and Statistics**  
(Topic 1.1.3)  
of the Basic Set of Environment Statistics of the FDES 2013)

Draft Version 1.0  
05 April 2019

Government Accountability Office (2004). "Geospatial Information: Better Coordination, Reduced Duplicative Investments", available from [www.gao.gov/assets/250/243133.pdf](http://www.gao.gov/assets/250/243133.pdf)

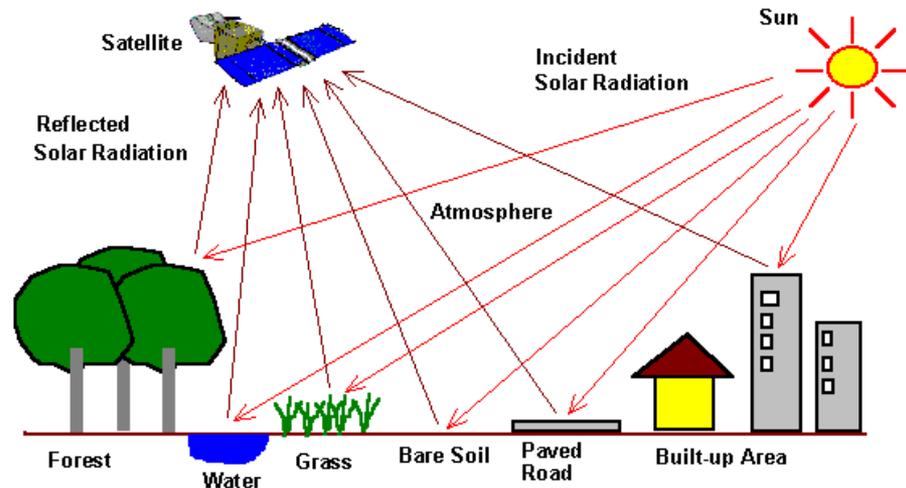
Elaborated by the Environment Statistics Section of the United Nations Statistics Division, in collaboration with the Expert Group on Environment Statistics.

# Main concepts and definitions on GIS

- **GIS** is “An integrated collection of computer software and data used to view and manage information about geographic places, analyze spatial relationships, and model spatial processes” Source: ESRI
- The underlying assumption is that any geographic entity can be depicted as a **Feature** (point, line or polygon), or group of **Grid** cells
- A set of feature data representing a concrete theme is called **vector layer**, for example layer of post offices (points), layer of roads, layer of rivers (lines), layer of cadastral properties (polygons). Multiple layers can be overlaid and visualized as composite landscape structures on a single **layout map**.
- A **raster layer** references a raster file as its data source and a raster renderer that defines how the raster data should be rendered and any additional display properties. Source: ESRI
- The single maps are ‘fixed’ as a **Data frame** (containing several layers and grids as separate files) and saved as a **Project**
- **Geodatabase** is a set of shapefiles (either points, lines, polygons) and grids linked in a single structure
- Complete list of terms available from ESRI here:  
[http://webhelp.esri.com/arcgisserver/9.3/java/geodatabases/definition\\_frame.htm](http://webhelp.esri.com/arcgisserver/9.3/java/geodatabases/definition_frame.htm)

# Main concepts and definitions on Earth Observation

- 1. Remote sensing: the science and art of identifying, observing, and measuring an object without coming into direct contact with it.** This process involves the detection and measurement of radiation of different wavelengths reflected or emitted from distant objects or materials, by which they may be identified and categorized by class/type, substance, and spatial distribution (NASA).
  - **Measures continuous arrays of reflectance values and the (approximate!) geographic location of pixels or grid-cells**



- 2. Optical remote sensing: Satellite and Aerial: for land cover and use**
- 3. Synthetic Aperture Radar: for biomass, peatlands, elevation**



# Satellite instruments

## High resolution

- NASA's Landsat
- ESA's Sentinels
- SPOT

## Very high resolution

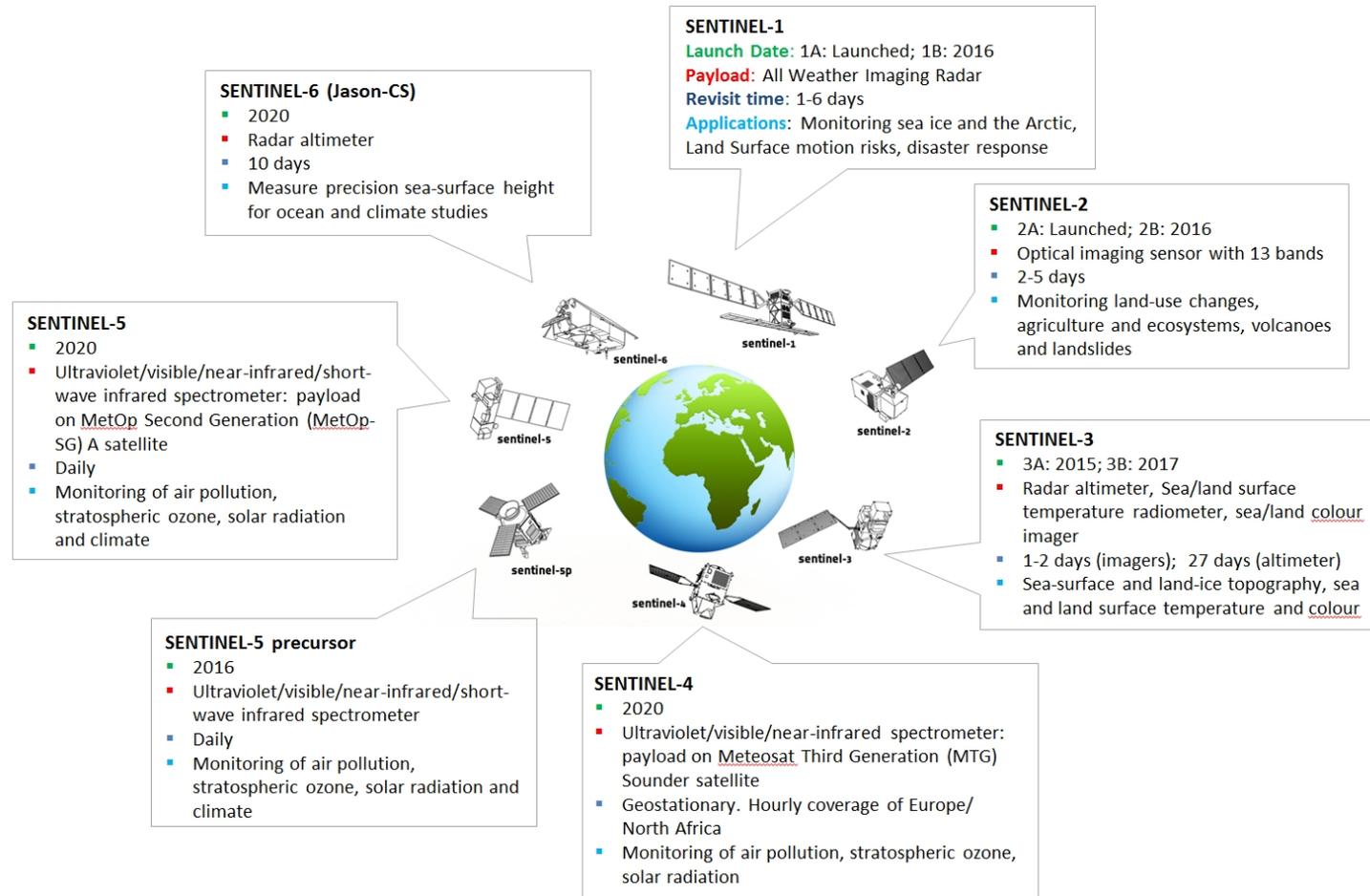
- QuickBird
- Ikonos

## Moderate resolution

- NASA's MODIS
- ESA's MERIS

## SAR

- ALOS-PALSAR



# Interface of ArcMap

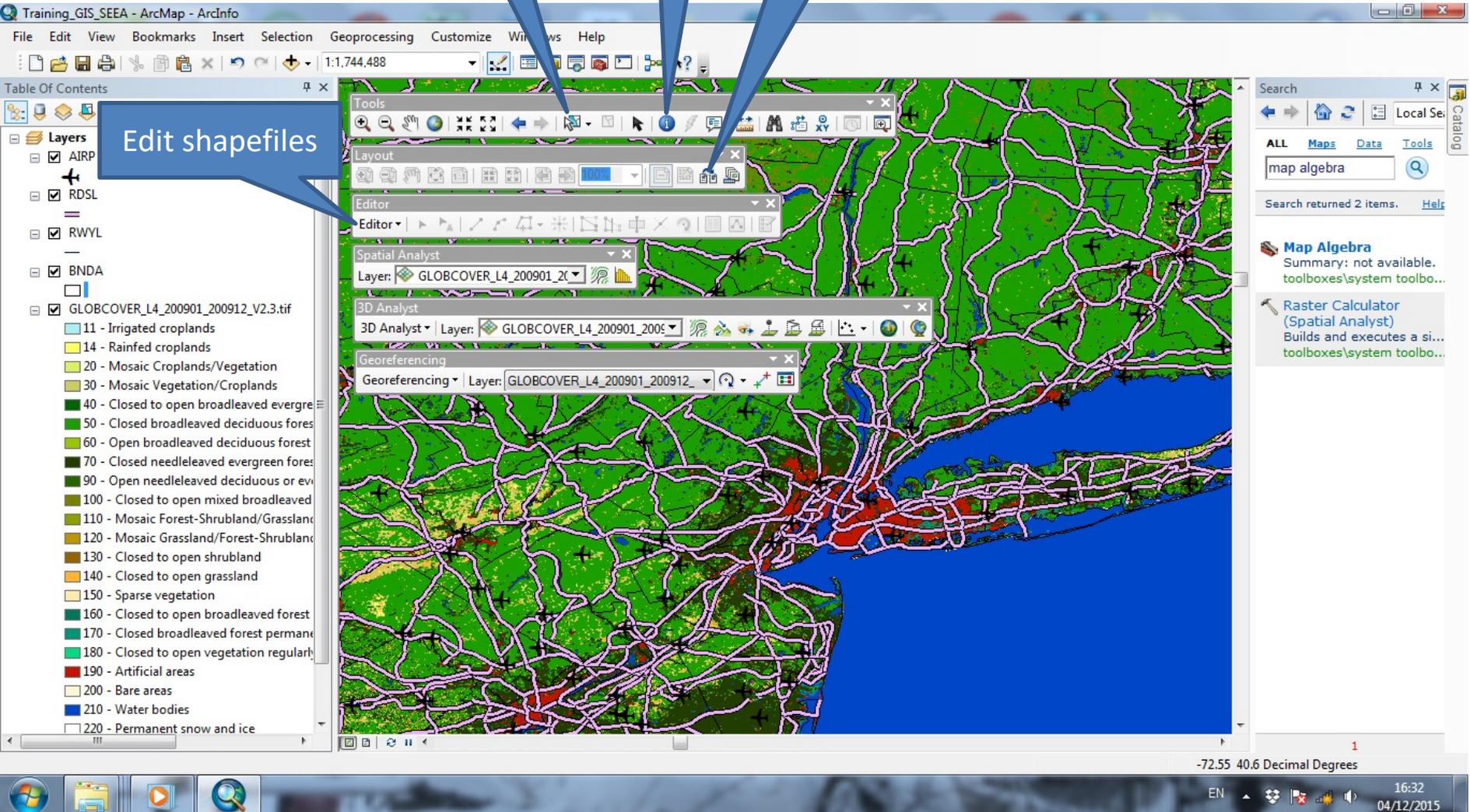
Select feature

Check Value

Change Layout template

Main Toolbars and functions (in menu Customize/Toolbars .....

Edit shapefiles



# Getting Started with GIS (for ArcGIS 10.0)

- by Esri
- Course Introduction
- Before You Start
- Course Data

- Module 1: **The Big Picture of GIS**
  - Six questions about GIS
    - What does GIS stand for?
    - How are paper, digital, and GIS maps different?
    - What are the functions of a GIS?
    - How was GIS used in the past?
    - What is the definition of GIS?
    - What is the geographic approach to solving problems?
  - GIS maps
    - Evaluation
- Module 2: **Understanding Geographic Data**
  - GIS data
    - Understanding vector data
    - Understanding raster data
    - Explore vector and raster data
  - Map meets database
    - How is geographic data organized?
    - Explore the feature-attribute relationship
  - Thematic mapping
    - What is a thematic map?
    - Classifying features
    - What is a map layout?
    - Create thematic maps
  - Evaluation
- Module 3: **Analyzing Geographic Data**
  - Query
    - What is attribute query?
    - Practice querying attributes
    - Query data based on attribute
    - What is location query?
    - Explore location query
    - Query data based on location
  - Analysis
    - What is buffer?
    - Create buffers
    - What is overlay?
    - Create overlays
  - Bringing it all together
    - The geographic inquiry process
    - Solve a problem with GIS: Paper map
    - Solve a problem with GIS: Digital map
  - Evaluation
  - Course Exam

## The Big Picture of GIS

In this module, you start your exploration of GIS. You first learn the answers to six questions about GIS. In the second lesson, you learn some fundamental GIS concepts and practice working with GIS maps.

### Learning objectives

- A student who completes this module will be able to:
- Describe the difference between paper, digital, and GIS maps.
  - List the three functions of a GIS.
  - Identify one use of GIS in the past or present.
  - Define GIS.
  - Describe the geographic approach to solving problems.
  - List four components of a feature.
  - Explain the relationship between features and layers.
  - Explain how scale on a GIS map is different from scale on a paper map.

# E-learning course designed to introduce thorough conceptual and practical issues in 3 modules.

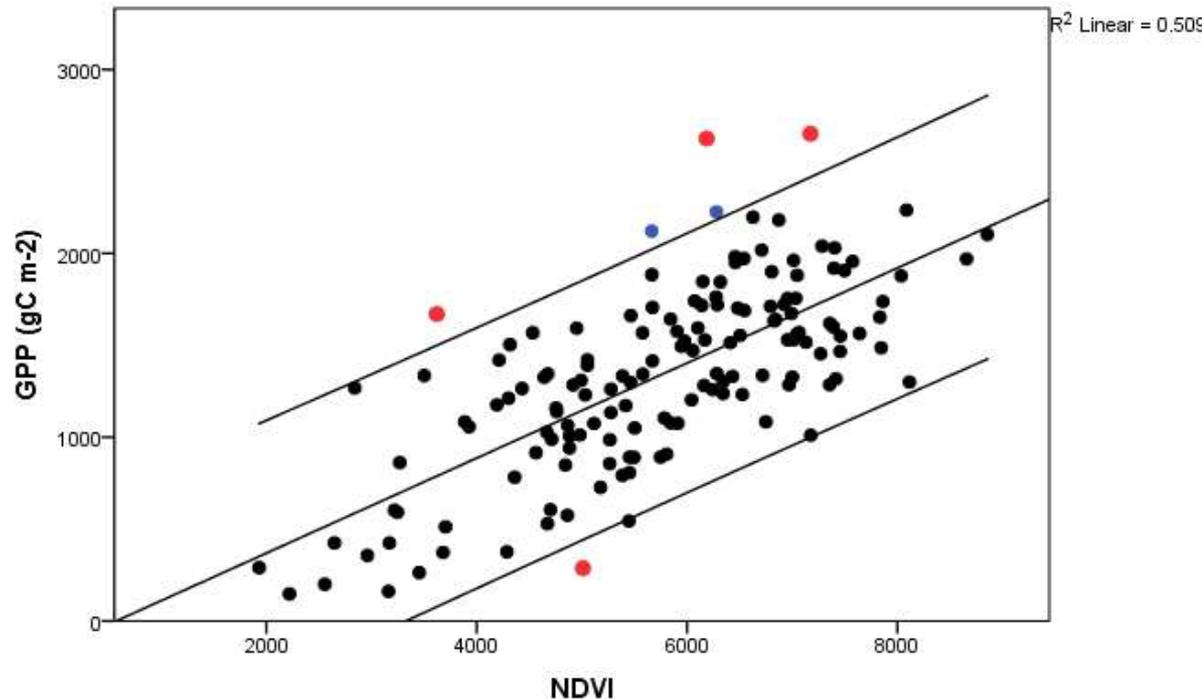
# Quality control and validation of Environment Statistics



# Uncertainty in environmental data and statistics

Unlike many areas of social and economic statistics, environment is subject of big uncertainties, because:

- Inherent strong variations (e.g. precipitation, temperatures)
- Often data is produced with small samples (for ex. vegetation sampling)
- Remote sensing inputs (on land cover)
- Modelling (if often needed to fill in gaps)



## Fundamental Principles of Official Statistics

**Principle 1.** Official statistics provide an indispensable element in the information system of a democratic society, serving the Government, the economy and the public with data about the economic, demographic, social and environmental situation. To this end, official statistics that meet the test of practical utility are to be compiled and made available on an impartial basis by official statistical agencies to honour citizens' entitlement to public information.

**Principle 2.** To retain trust in official statistics, the statistical agencies need to decide according to strictly professional considerations, including scientific principles and professional ethics, on the methods and procedures for the collection, processing, storage and presentation of statistical data.

**Principle 3.** To facilitate a correct interpretation of the data, the statistical agencies are to present information according to scientific standards on the sources, methods and procedures of the statistics.

**Principle 4.** The statistical agencies are entitled to comment on erroneous interpretation and misuse of statistics.

**Principle 5.** Data for statistical purposes may be drawn from all types of sources, be they statistical surveys or administrative records. Statistical agencies are to choose the source with regard to quality, timeliness, costs and the burden on respondents.

**Principle 6.** Individual data collected by statistical agencies for statistical compilation, whether they refer to natural or legal persons, are to be strictly confidential and used exclusively for statistical purposes.

**Principle 7.** The laws, regulations and measures under which the statistical systems operate are to be made public.

**Principle 8.** Coordination among statistical agencies within countries is essential to achieve consistency and efficiency in the statistical system.

**Principle 9.** The use by statistical agencies in each country of international concepts, classifications and methods promotes the consistency and efficiency of statistical systems at all official levels.

**Principle 10.** Bilateral and multilateral cooperation in statistics contributes to the improvement of systems of official statistics in all countries.

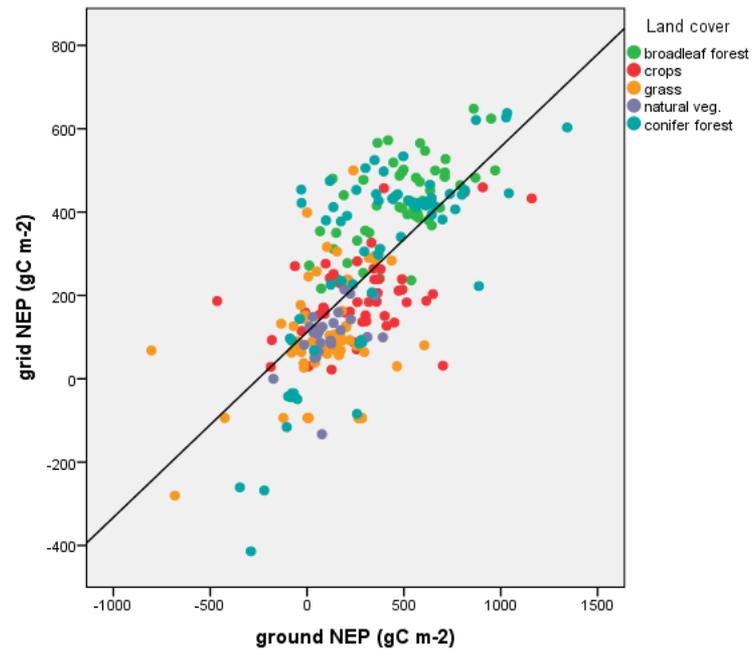
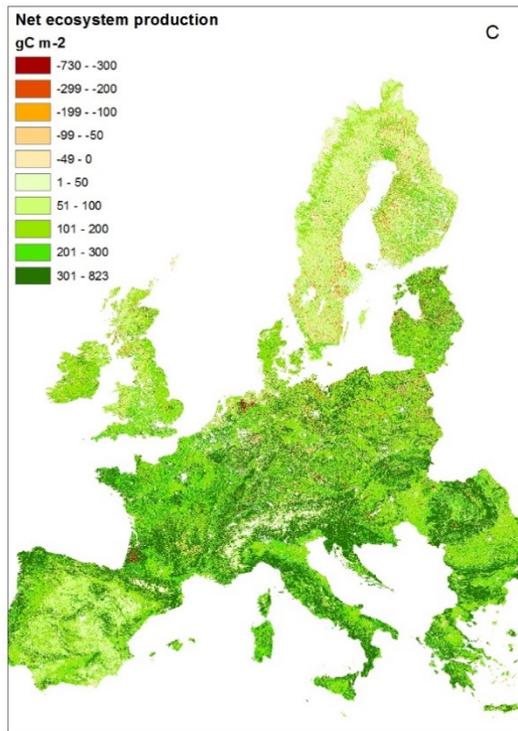


# Six Quality Dimensions of official statistics

1. Relevance, considers the coverage and contents of the needed information;
2. Accuracy, is 'The closeness between an estimated result and the (unknown) true value';
3. Timeliness and punctuality, is the time-lapse between the publication of data and referred period
4. Accessibility and clarity, refer to clarity of metadata; easiness of users to understand the data;
5. Comparability, is 'the degree to which data can be compared over time and domain', spatial domains include sub-national, national and international;
6. Coherence, is 'the degree to which data derived from different sources or methods produce similar output.



# Validation example: Net ecosystem production in Europe



$r = 0.71$   
significant at  
0.01 level

Dom. land cover	N	R	mean ground NEP	mean grid NEP	bias	bias (%)	RMSE
broadleaf forest	54	0.62	470	419	-51	-11	192
crops	51	0.51	286	197	-89	-31	248
grass	64	0.33	90	98	8	9	166
natural veg.	22	0.58	91	105	14	16	84
needle-leaf forest	67	0.74	366	297	-69	-19	238
<b>Total</b>	<b>258</b>	<b>0.71</b>	<b>279</b>	<b>237</b>	<b>-42</b>	<b>-15</b>	<b>205</b>





# Thank you for your attention!

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

E-mail: [envstats@un.org](mailto:envstats@un.org)

website: <http://unstats.un.org/unsd/ENVIRONMENT/>

