# Introduction to environment statistics

**National Technical Training Workshop on Environment Statistics**

**Kololi, Banjul, The Gambia**

**6-8 August 2019**

# Outline

1. Overview of FDES and implementation tools: Basic Set, Methodology sheets, ESSAT (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.

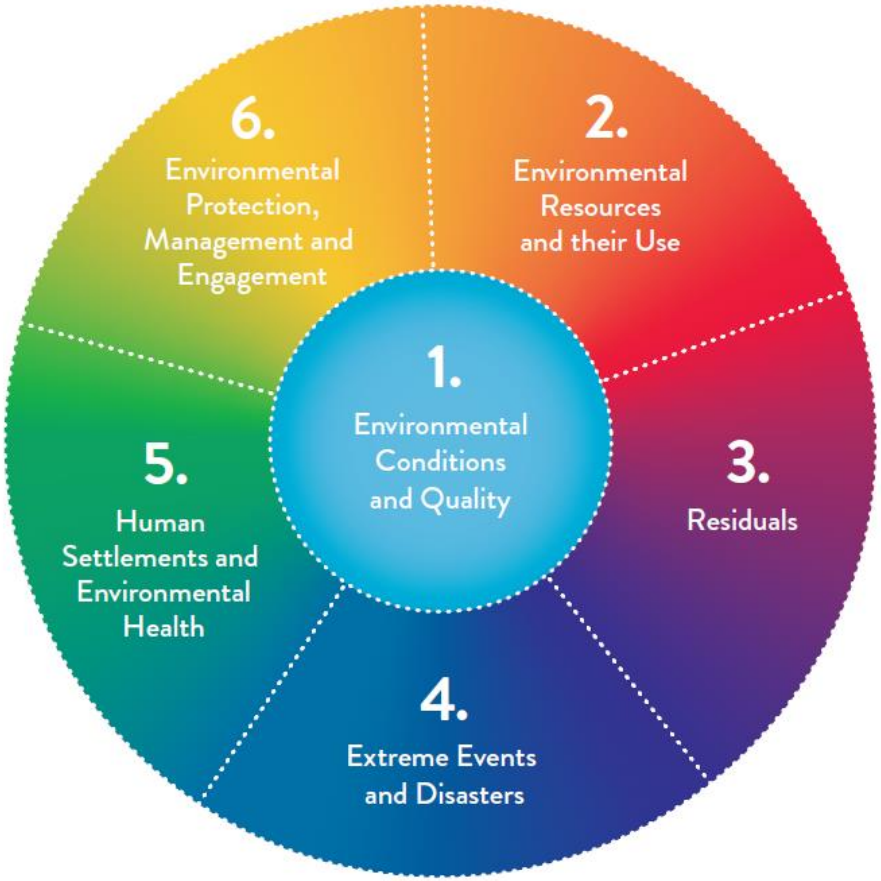
- The objective are:
  - Help international and regional institutions to support strengthening capacity in countries to develop environment statistics
  - Enhance comparability and availability of environment statistics using a common framework
  - Better inform policy making decisions

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




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

# FDES is structured into 6 components

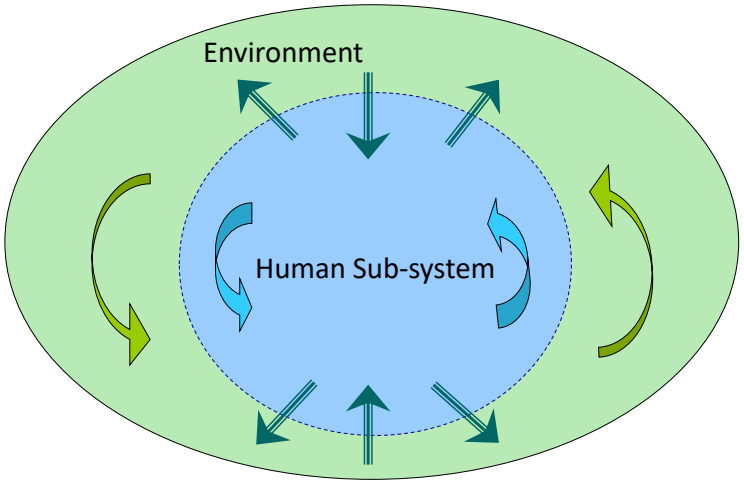



- 6 components
- At the centre: Component 1: Environmental Conditions and Quality
- All of the components relate to each other
- Multi-level (component, sub-component, topic, individual statistics)
- Flexible
- Adaptable

# Description of the FDES

## Scope of the FDES

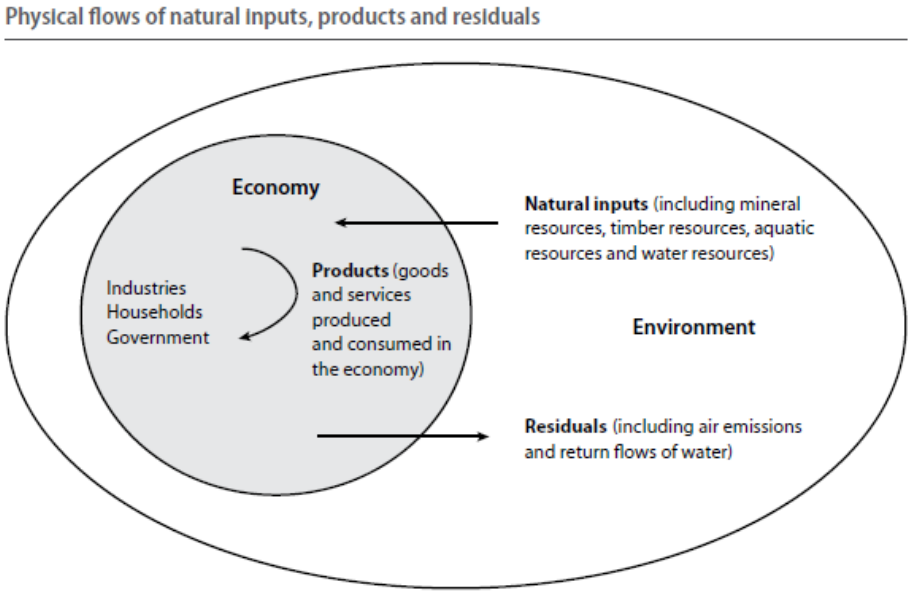
- FDES covers biophysical aspects of the environment; aspects of the human sub-system that directly influence the state and quality of the environment, and the impacts of the changing environment on the human sub-system.
- It includes interactions within and among the environment, human activities and natural events.




Processes within the environment

Processes within the human sub-system

Interactions between the environment and the human sub-system



# 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*** <br> • ***Physical*** <br> • ***Qualitative*** | • Monitoring and remote sensing data <br> • Environmental, meteorological, hydrological, geological and geographical authorities or institutions | • *State and Impact element in DPSIR* <br> • *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*** <br> • ***Geospatial*** | • Statistical surveys, administrative records, field surveys, land registers <br> • Sector statistics on production and consumption activities, infrastructure <br> • Remote sensing data <br> • Statistics databases of respective national authorities and institutions such as mining, energy, agriculture, water and forest | • *Driving force, Pressure and State elements in DPSIR* <br> • *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 <br> • Estimates based on activity statistics and technical coefficients <br> • Sector statistics <br> • Monitoring data | • *Pressure and Response elements in DPSIR* <br> • *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*** <br>• ***Monetary*** <br>• ***Geospatial*** <br>• ***Qualitative*** | • Administrative records <br>• Remote sensing <br>• National emergency and disaster authorities <br>• Seismic, meteorological monitoring and research centres <br>• Industrial complexes that work with hazardous substances and processes <br>• Insurance companies | • *Pressure, Impact and Response elements in DPSIR* <br>• *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*** <br>• ***Physical*** | • Population and housing censuses, household surveys, administrative records, and remote sensing <br>• Health and administrative records <br>• Housing and urban planning and oversight authorities <br>• Cartographic authorities <br>• Transport authorities <br>• 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*** <br>• ***Qualitative*** | • Administrative records <br>• Surveys <br>• Entity producing government expenditure statistics <br>• Statistical entity in charge of national or sub-national surveys <br>• Environmental authority and other sector authorities | • *Response element in DPSIR* <br>• *Environmental activity accounts and related flows of the SEEA-CF* |

# 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

# Manual of the Basic Set

# 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. Start with main priorities given available resources

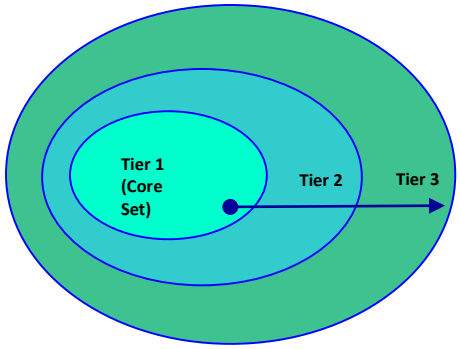
## Core Set of Environment Statistics

- 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.

# The Basic Set and its 3 Tiers




- Tier 1 is the Core Set of Environment Statistics which are of high priority and relevance to most countries, and have a sound methodological foundation, so countries are recommended to consider producing them in the short-term.
- Tier 2 includes environment statistics which are of priority and relevance to most countries but need more significant investment in time, resources or methodological development, so countries are recommended to consider producing them in the medium-term.
- Tier 3 includes environment statistics which are either of less priority or require significant methodological development, so countries are recommended to consider producing them in the long-term.

# Basic and Core Set of Environment Statistics

Core Set or Tier 1 = 100

Basic Set = 458

| | 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 |

# 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

https://unstats.un.org/unsd/envstats/fdes/manual_bses.cshtml

# 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.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** (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*) | | **Category of Measurement** | **Potential Aggregations and Scales** | **Methodological Guidance** |
| Topic 2.6.1: Water resources | | | | |
| a. | Inflow of water to inland water resources | | • National<br>• Sub-national<br>• By territory of origin and destination | • UNSD: IRWS<br>• UNECE Standard Statistical Classification of Water Use (1989)<br>• UNSD: MDG Indicator 7.5 Metadata<br>• FAO AQUASTAT<br>• SEEA Central Framework (2012) asset accounts<br>• SEEA Water<br>• UNSD: Environment Statistics Section-Water Questionnaire |
| | 1. **Precipitation** (also in 1.1.1.b) | Volume | | |
| | 2. **Inflow from neighbouring territories** | Volume | | |
| | 3. *Inflow subject to treaties* | Volume | | |
| b. | Outflow of water from inland water resources | | | |
| | 1. **Evapotranspiration** | Volume | | |
| | 2. Outflow to neighbouring territories | Volume | | |
| | 3. Outflow subject to treaties | Volume | | |
| | 4. Outflow to the sea | Volume | | |
| c. | Inland water stocks | | • National<br>• Sub-national | |
| | 1. Surface water stocks in artificial reservoirs | Volume | | |
| | 2. Surface water stocks in lakes | Volume | | |
| | 3. *Surface water stocks in rivers and streams* | Volume | | |
| | 4. *Surface water stocks in wetlands* | Volume | | |
| | 5. *Surface water stocks in snow, ice* | Volume | | |

# Contents of the Manuals

# Manual of the BSES
# Guidance on Indicators using FDES Statistics

- Water: Sub-component 2.6 - Topic 2.6.1 Water resources; Topic 2.6.2 - Abstraction, use and returns of water
- Crops and Livestock: Sub-component 2.5 -Topic 2.5.3 Crops;Topic 2.5.4: Livestock
- Minerals and Energy: Topic 2.1.1 Stocks and changes of mineral resources; Topic 2.1.2 Production and trade of minerals; Topic 2.2.1 Stocks and changes of energy resources; Topic 2.2.2 Production, trade and consumption of energy resources
- Waste: Sub-component 3.3 -Topic 3.3.1 Generation of Waste; Topic 3.3.2 Management of Waste
- Environmental Protection, Management and Engagement: Sub-component 6.4 - Environmental Information and Awareness

# Manual of the BSES
# Guidance on Indicators using FDES Statistics

- Soils: Topic 1.1. - Soil characteristics
- Geology: Topic 1.1.3 -Geological and geographical information and Topic
- Natural Disasters: Sub-component 4.1 - Topic 4.1.1 Occurrence of natural extreme events and disasters; Topic 4.1.2: Impact of natural extreme events and disasters
- GHG: Sub-component 3.1 - Topic 3.1.1 Emissions of greenhouse gases
- Air Quality: Sub-component 1.3 -Topic 1.3.1 Air quality
- Forest: Sub-component 1.2 - Topic 1.2.3 Forests; Topic 2.3.2 Use of forest land; and Topic 2.5.1 Timber resources

# Manual of the BSES
# Guidance on Indicators using FDES Statistics

- Environmental Protection: Sub-component 6.1 Topic 6.1.1 Government environment protection and resource management expenditure
- Ecosystems and Biodiversity: Sub-component 1.2 - Topic 1.2.2 Ecosystems and Biodiversity
- Land use/land cover: Sub-component 1.2-Topic 1.2.1 Land cover; Sub-component 2.3 - Topic 2.3.1 Land use
- Human Settlements: Sub-component 5.1 - Topic 5.1.1 Urban and rural population; Topic 5.1.2 Access to selected basic services; Topic 5.1.3 Housing conditions; Topic 5.1.4 Exposure to ambient pollution; Topic 5.1.5 Environmental concerns specific to urban settlements

# More Tools to Support Implementation

Knowledge Portal

### Methodology

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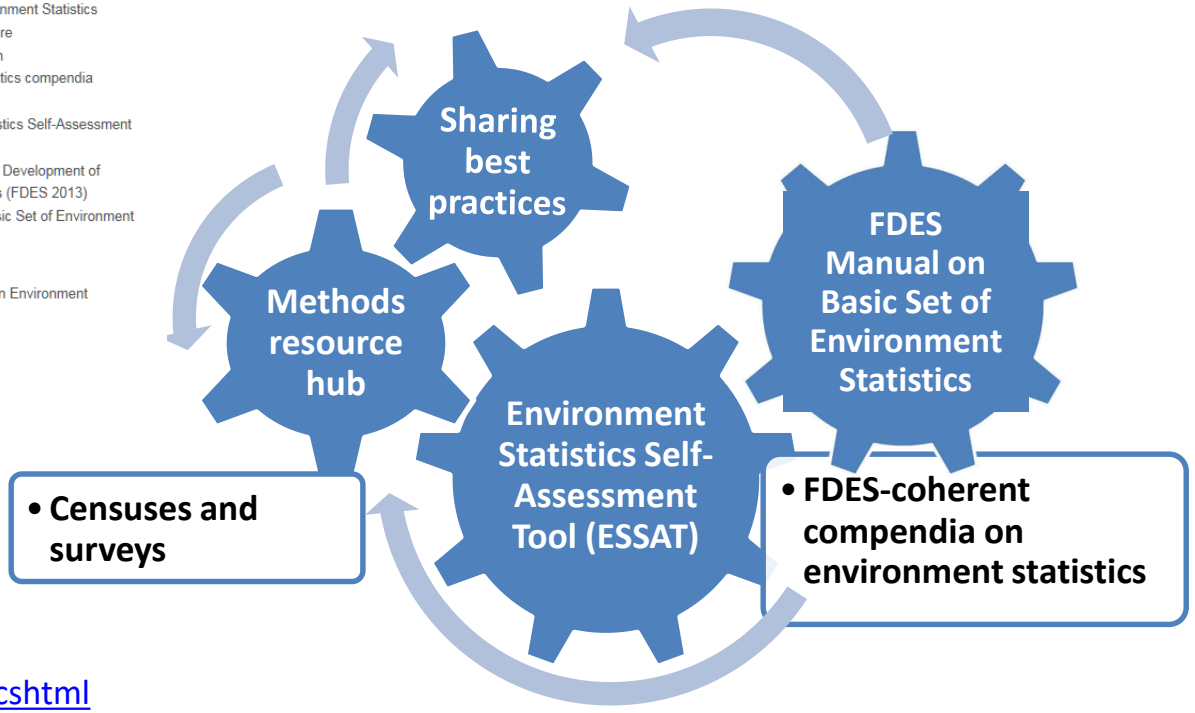
- EAC project
- ECOWAS project
- ESCWA project
- CARICOM project
- Workshops

### 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

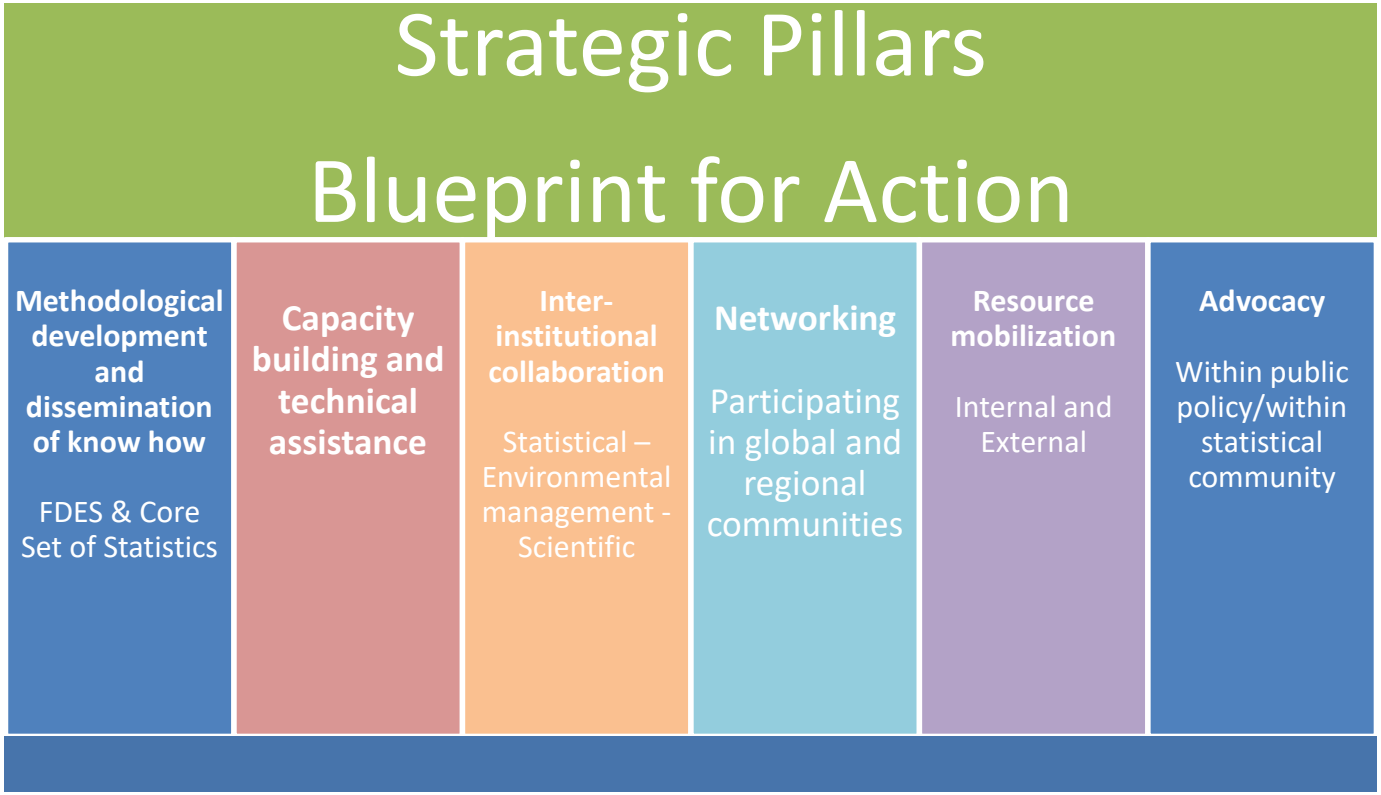
Expert Group on Environment Statistics




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

# Blueprint for Action, 2013

(also adopted at 44 Session of Stat. Commission)




https://unstats.un.org/unsd/statcom/doc13/BG-FDES-Environment_Blueprint.pdf

# Pillars of the Blueprint for Action

- National priorities identified within the pillars
- Methodological development and dissemination of know-how
  - Application of methodological tools to strengthen national statistical systems
- Capacity building and technical assistance
  - Participate in the programme of technical assistance and capacity building using the FDES
  - Initiate national environment statistics programmes and participate in training and capacity building activities
- Inter-institutional collaboration
  - Appropriate legal mandate and management organs are in place
  - Start/strengthen national committees for inter-institutional collaboration in the development of environment statistics
- Networking
  - Develop national capacities to integrate into or create national, regional and global networks
- Resource mobilization
  - Develop statistical, policy/management and expert communities
  - Ensure adequate resources to environment statistics programmes. Support and participate in fundraising and advocacy global groups
- Advocacy
  - Develop communication methods for various audiences
  - Promote the use of environment statistics in national policy planning and development activities

# Guidance tools and reporting templates

1. ESSAT, with 3 parts:

   2.1 Introduction (key concepts)

   2.2 Part I (institutional setting)

   2.3 Part II (data and statistics)

   ESSAT reporting template (pre-set sections: 1. purpose, 2. rationale, 3. Env. Policies, 4. Collaboration/institutions, 5. Organizational issues, 6. Stakeholders and FDES topics, 7. summary of env. Stats, 8. data gaps, 9. priorities to improve)

2. NAP template (1. background and justification, 2. objectives, 3. stakeholders, 4. ESSAT summary, 5. Outputs/activities e.g. six following pillars, 6. Workplan, 7. Budget, 8. Next steps, 9. Annex – ESSAT)

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

# Background of the Environment Statistics Self-Assessment Tool

- Part of the work programme for implementation of the Framework for Development of Environment Statistics
- Approved by UN Statistical Commission in 2013 : Environment Statistics Self-Assessment Tool (ESSAT)
- Objective: for countries to use in assessing and diagnosing the state of environment statistics in the application of the FDES
- Developed by UNSD in collaboration with the Expert Group on Environment 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

# ESSAT Part I

- Organization: Interinstitutional work group/steering group
  - Law, Budget, Formalized MoU, Producer – user talks, FDES implementation, Dissemination: from yearbooks to advanced web/map service tools
- Uses: National policies support, SDG, SEEA
- Trends: HR, IT, other resources: increasing, decreasing, steady
- Participation in EGES, regional groups, Assistances/training, Pillars
- Key/priority components and topics

# ESSAT Part II

- Map and assess data sources for basic set: availability/gaps, quality, relevance, etc.
  - Tier 1 - High priority and relevance to most countries and have a sound methodological foundation (core set) (100 statistics)
  - Tier 2 - Require more time, resources or methodological development (200 statistics)
  - Tier 3 - Require significant methodological development (158 statistics)
- Excel template with options prefilled according to the BSES
  - If needed can be changed, are they adequate, should these be developed further?
- Self-assessment challenges:
  - Resources; lacking methods, poor quality, inaccessibility

# ESSAT and NAP

1. Purpose
2. Rationale
3. Environment Policies
4. Collaboration and Institutional Structures
   4.1 Legal Framework
   4.2 National Strategy for the Development of Statistics (NSDS) or Sector Strategic Plan for Environment Statistics (SSPES)
   4.3 Coordination within the National Statistical System/Cooperation

6. Stakeholders and FDES Topics
7. Summary of available environment statistics
8. Data Overlaps and Data Gaps
9. Priority future activities to improve environment statistics

Annexes

1. Background and justification
   1.1 Justification
   1.2 National and international environment policies
   1.3 Other related initiatives
2. Objective of the national plan
3. Stakeholders
4. Environment Statistics Self-Assessment (ESSAT) Summary
   4.1 Data summary
   4.2 Institutional needs
   4.3 Organisational needs
5. Outputs and activities
   5.1 Impact
   5.2 Outcome
   5.3 Outputs and activities

Objective 1: Inter-institutional collaboration: Improve collaboration, coordination and awareness of key players across all stages of statistical production and dissemination
Objective 2: Methodological development and dissemination of know-how
Objective 3: Capacity building and technical assistance
Objective 4: Investing in physical infrastructure
Objective 5: Human resource development and management
Objective 6: Networking
Objective 7: Resource mobilization and advocacy

6. Workplan
7. Overall budget
8. Next Steps
9. Annex 1: Environment Statistics Self-Assessment (ESSAT)

# NAP Reporting Template

**Reporting Template**

- Pillars of the Blueprint for Action allows for sequential, modular, incremental plan
  - Allows for results based framework
  - Can be used fully or partially to develop project plans
  - Extraction of modules based on donor interest
  - Pillars/outputs/workplan/budget

- Uses results of the ESSAT to inform outputs and activities

- Structure fits into  statistics project plans and into NSDS
  - Can be used to inform workplan of NSDS and Strategic Objectives
  - NSDS goes beyond the Action Plan – longer period, additional strategic components

# 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

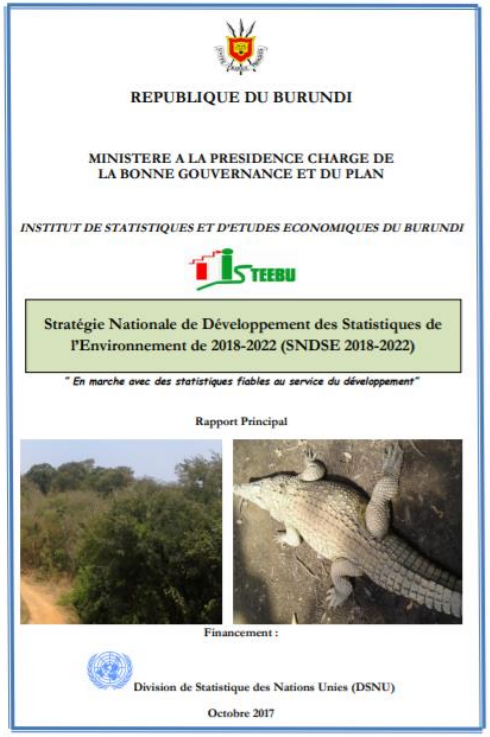
Regional workshops to disseminate FDES

- 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)
- plus UNECA regional workshop (Kenya)(Sep 2017)

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

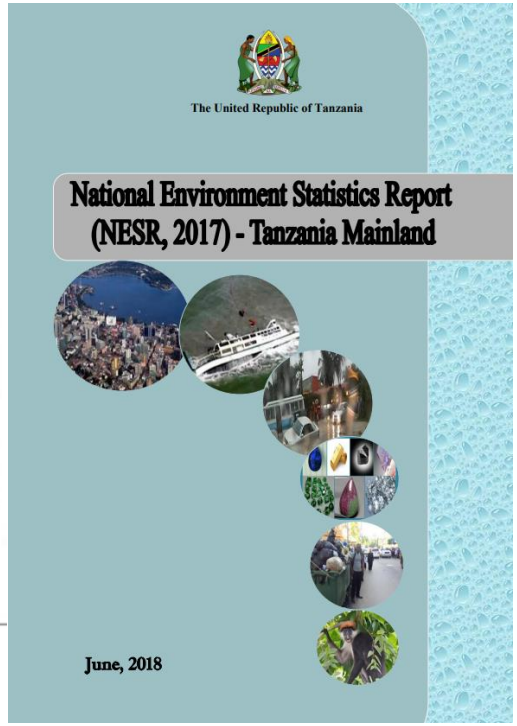
# Capacity building results

**National Action Plan**




**Committee**

**Compendium**



# 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

# Data collection methods in Environment Statistics – Characteristics and Challenges

# 1. Main users of environment statistics

The type, the level of thematic, spatial and temporal aggregation, and the format of environment statistics depend on the type of user and the intended purpose of 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** |

# Products of Environment Statistics

Common products of environment statistics are:

- Detailed descriptive environment statistics series
- Environmental indicators

Both can be:

- Stored in multi-purpose databases
- Disseminated in the form of:
  - Online databases
  - Publications (e.g. compendia, yearbooks)
  - Thematic reports
  - Analytical publications (e.g.,state of the environment reports)

# 2. Environmental information, data, statistics and indicators

| Examples of quantitative environmental information |
| --- |
| Environmental data |
| Environment statistics |
| Environmental indicators |
| Environmental indices |
| Environmental-economic accounts |

## 2. Environmental information, data, statistics and indicators

# Environmental information

- Environmental information describes quantitative, qualitative or geographically referenced facts representing the state of the environment and its changes.
- **Quantitative environmental information**
  - **Consists of data, statistics and indicators and is generally disseminated through databases, spreadsheets, compendia and yearbook type products.**
- Qualitative environmental information
  - Consists of descriptions (e.g. textual, pictorial) of the environment or its constituent parts that cannot be adequately represented by accurate quantitative or geographically referenced descriptors.
- Geographically referenced environmental information
  - Provides facts on the environment and its components using digital maps, satellite imagery and other sources linked to a location or map feature.

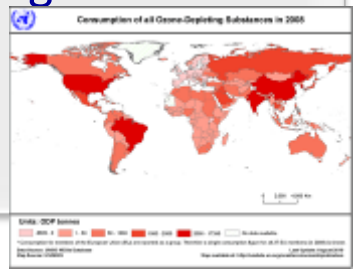
# Environmental data

- Environmental data are large amounts of unprocessed observations and measurements about the environment (or its components) and related processes.
- They can be collected or compiled by:
  - NSOs, environmental ministries, sectoral authorities (water, forest, mining, etc.)
  - Using different types of sources:
    - Statistical surveys (censuses or sample surveys)
    - Administrative records, registers, and inventories
    - Monitoring networks, remote sensing, scientific research, and field studies.

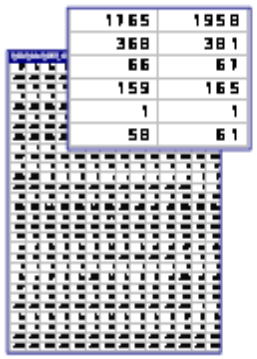
# Environment statistics

- Environment statistics structure, synthesize and aggregate environmental and other data according to statistical methods, standards and procedures.
- Environment statistics process environmental data into meaningful statistics describing the state and trends of the environment and the main processes affecting it.
- Not all environmental data are used in the production of environment statistics.
  - The FDES provides a framework that identifies environmental data that fall within its scope
  - The FDES contributes to structuring, synthesizing and aggregating data into statistical series and indicators

| | LINK Transaction Volumes (millions) | | | | |
|---|---|---|---|---|---|
| Month | 2007 | 2008 | 2009 | 2010 | 2011 |
| Jan | 208.00 | 214.00 | 224.90 | 224.00 | 232.90 |
| Feb | 204.50 | 224.00 | 216.40 | 224.20 | 229.90 |
| Mar | 236.10 | 234.00 | 245.20 | 253.90 | 259.79 |
| Apr | 226.30 | 232.00 | 241.06 | 252.20 | 259.70 |
| May | 237.90 | 251.50 | 255.19 | 262.00 | 262.20 |
| Jun | 233.80 | 235.90 | 246.00 | 255.00 | 257.48 |
| Jul | 231.60 | 244.70 | 251.30 | 266.70 | 268.04 |
| Aug | 236.00 | 244.21 | 247.60 | 256.30 | 259.24 |
| Sep | 229.00 | 237.22 | 244.00 | 253.30 | 260.52 |
| Oct | 239.00 | 250.40 | 260.20 | 263.10 | 268.06 |
| Nov | 234.00 | 236.70 | 241.00 | 246.60 | |
| Dec | 230.00 | 237.20 | 244.00 | 242.00 | |
| Total | 2,746.20 | 2,841.83 | 2,916.85 | 2,999.30 | 2,557.83 |

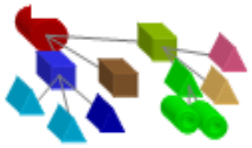


Environment statistics units compile, collect, validate, describe and structure environmental data to produce environment statistics series



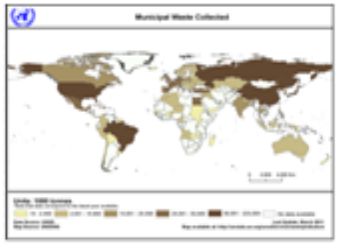
Data & Microdata

Validation



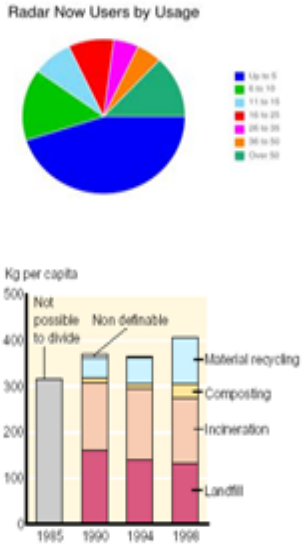
Structure

Metadata (description)



Statistics (Compendia & Databases)

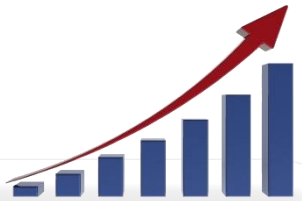
Statistics, selection & processing




Indicators

Statistical process: from raw data to statistics and indicators

# Environmental indicators

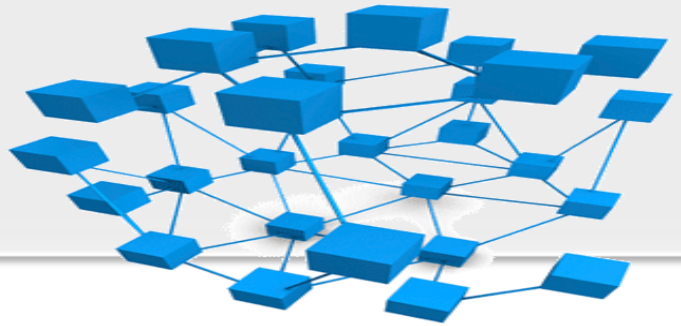


- Environmental indicators:
  - are environment statistics that are in need of further processing and interpretation. Environment statistics are usually too numerous and detailed to satisfy the needs of policy makers and the general public
- Environmental indicators:
  - Synthesize and present complex statistics
  - Are measures that summarize, simplify and communicate information
  - Define objectives, assess present and future direction with respect to goals and targets
  - Evaluate specific programmes, demonstrate progress, measure changes in a specific condition or situation over time.
  - Determine impact of programmes and conveying messages.

Policy frameworks such as the S**ustainable Development Goal indicator framework** are used for the identification and structuring of indicators

# 3. Sources of environment statistics

- Environment statistics synthesize data originating from a wide range of source types.
- Data used for the production of environment statistics are compiled by many different collection techniques and institutions.
- Understanding and knowing pros and cons of each source is key in environment statistics production

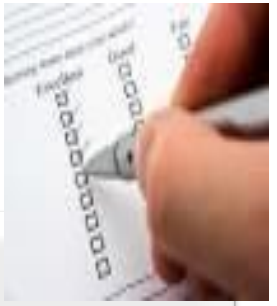


# 3. Sources of environment statistics

## Types of sources

1. Statistical surveys (i.e., 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 in charge of natural resources as well as other ministries or authorities
3. Remote sensing and thematic mapping (i.e., satellite imaging of land use, water bodies or forest cover)
4. Monitoring systems (i.e., field-monitoring stations for water quality, air pollution, temperature, etc.)
5. Scientific research and special research projects undertaken to fulfill national or international demand

## 3. Sources of environment statistics



# Statistical Surveys

(a) **Censuses**: collection of data from the entire population of interest

(b) **Sample Surveys**: carried out using a sampling method, in which data are collected from a representative portion of the population of interest

**Environment statistics can be collected from surveys by:**

(i) adding environment-related questions (modules) to surveys primarily intended to collect data on other topics

(ii) using surveys primarily intended to collect environment statistics

When environmental data are collected through environment statistics surveys, the survey is designed according to its objective of producing environment statistics.

- Environment statistics surveys are not always feasible or economical with restricted budgets
- Many environment-related surveys and censuses are available at: https://unstats.un.org/unsd/envstats/censuses/

# Administrative records

Administrative data kept by **government agencies and other organizations** may be used for the production of environment statistics

Advantage:

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

Possible Limitations:

- Differences between administrative and statistical terms and definitions
- Risk of deliberate misreporting
- Data may not be checked or validated for statistical purposes; there may be restrictions of access to the data
- Coverage of data, though complete for administrative purposes, might not match statistical requirements

# 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, ensuring in the process 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 extension of pollution, changes in land cover **or** population estimates of different animal species.

## 3. Sources of environment statistics

# Monitoring systems

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

Main advantages of these data are that they are:

(i) Usually collected using verifiable scientific methods
(ii) Usually validated
(iii) Often available as time series
(iv) Frequently use modeling to improve data quality

Possible limitations of data from monitoring systems are:

- Field-monitoring stations are usually located in "hot-spot" areas where there are
  (i) high levels of pollution
  (ii) highly sensitive areas
  (iii) large numbers of the population are affected

**Consequently, the measurements will be location-specific and due to the limitations of their representativeness, they are difficult to aggregate over space**

## 3. Sources of environment statistics

# Scientific Research

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

(i) these data are usually available for free or for low cost

(ii) they minimize response burden

(iii) they can be used to fill in data gaps

(iv) they are useful for developing coefficients for models

Possible limitations of using these sources include:

(i) they often use terms and definitions that differ from those used in statistics

(ii) access to microdata may be limited

(iii) metadata may be missing

(iv) often data are available only for case examples (i.e. limited areas or industries)

(v) often data are available on a one-time basis

# 4. Institutional dimension of environment statistics

- The institutional dimension can be as important as technical capacity when developing environment statistics at the national level.
- 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 interagency coordination and other institutional issues are very common in many countries.

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

## 4. Institutional dimension of environment statistics

### Resolving institutional concerns

- Identifying the primary institutional obstacles that impede the production of environment statistics and developing a strategy to overcome these is vital for countries keen on developing or strengthening their environment statistics programmes.
- Key elements pertaining to the institutional dimension:
  - The legal framework, clear mandate, clear Memoranda of Understanding
  - Institutional development
  - Inter-institutional collaboration
  - Institutional cooperation of national, regional and global bodies
- Applying the Environment Statistics Self-Assessment Tool (ESSAT) can help in this regard: https://unstats.un.org/unsd/envstats/fdes/essat.cshtml

## 4. Institutional dimension of environment statistics

# Institutional development

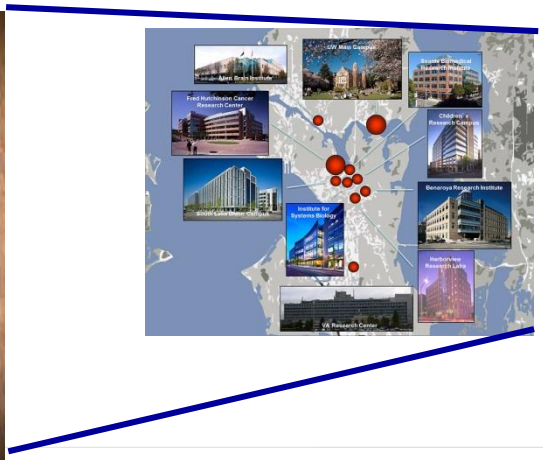
- A well defined mandate and a specific unit in charge of carrying out the production of environment statistics is critical for the successful organization of a national environment statistics programme within the official institutions responsible for the production of statistics.

- This unit requires a regular budget for operations and a minimum number of trained personnel for the tasks entailed.

***It is ideal for environment statistics units to have a capacity building programme for staff***.

# Inter-institutional collaboration

Institutions and people



- Environment statistics cover several topics for which the data are being generated by NSOs, specialized agencies, ministries, provincial and municipal governments and scientific institutions.
- Inherent to environment statistics: collaboration of these stakeholders, both at the strategic and technical level.

## 4. Institutional dimension of environment statistics

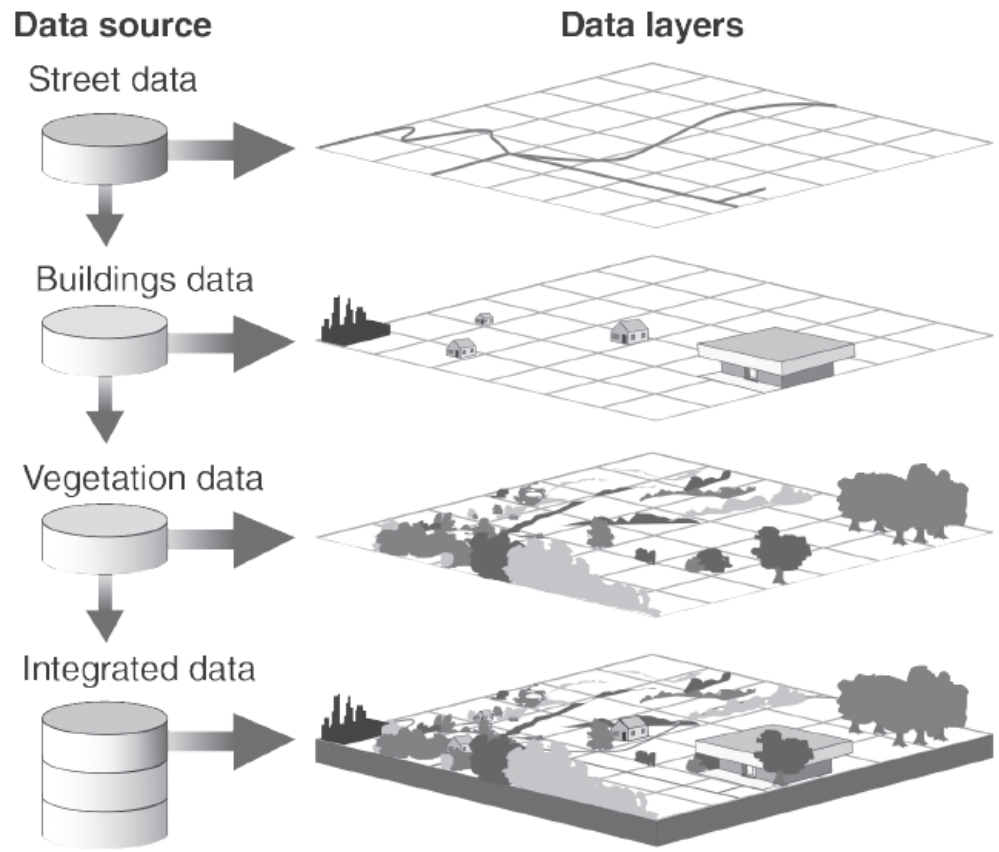
### Inter-institutional collaboration

- Formalized by inter-agency platforms/committees tasked with coordinating the production of environment statistics: brings together all institutions that produce and use environmental data and statistics.
- One of the tasks of the platform is to ensure that common statistical methodology, protocols and tools are being used to ensure comparability and statistical soundness. Another relevant function is to preserve continuity over time, despite significant turnover of staff in the different partner institutions.
- Depending on the institutional set-up, in many developing countries the coordination role in such platforms lies with the NSO or the environmental ministry or equivalent institution.
- The NSO, if tasked with overseeing the national statistical system and coordinating these platforms, must have adequate authority, resources or capacities to lead the multi-stakeholder processes.

# GIS and Earth observation

# Geospatial information adds significant value and utility to environment statistics

Example of GIS data layers or themes[16]




Government Accountability Office (2004). "Geospatial Information: Better Coordination Needed to Identify and Reduce Duplicative Investments", available from www.gao.gov/assets/250/243133.pdf

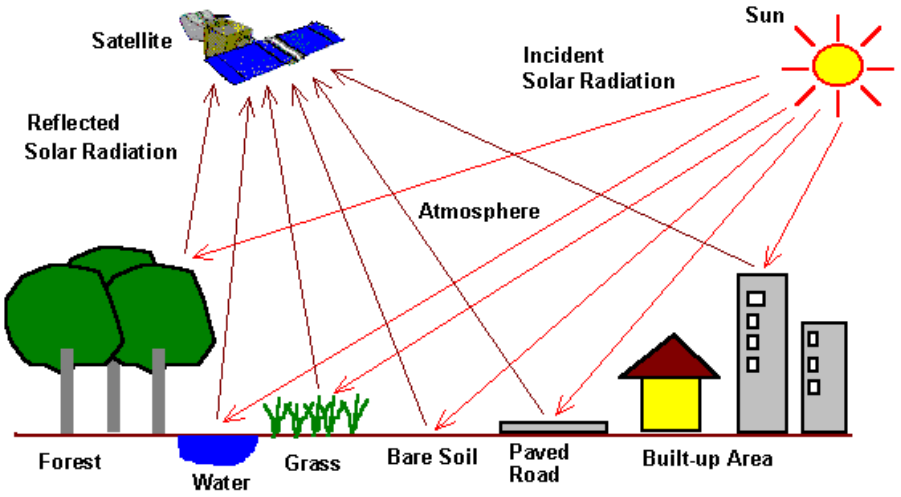
# Main concepts and definitions on GIS

- 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

# 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**

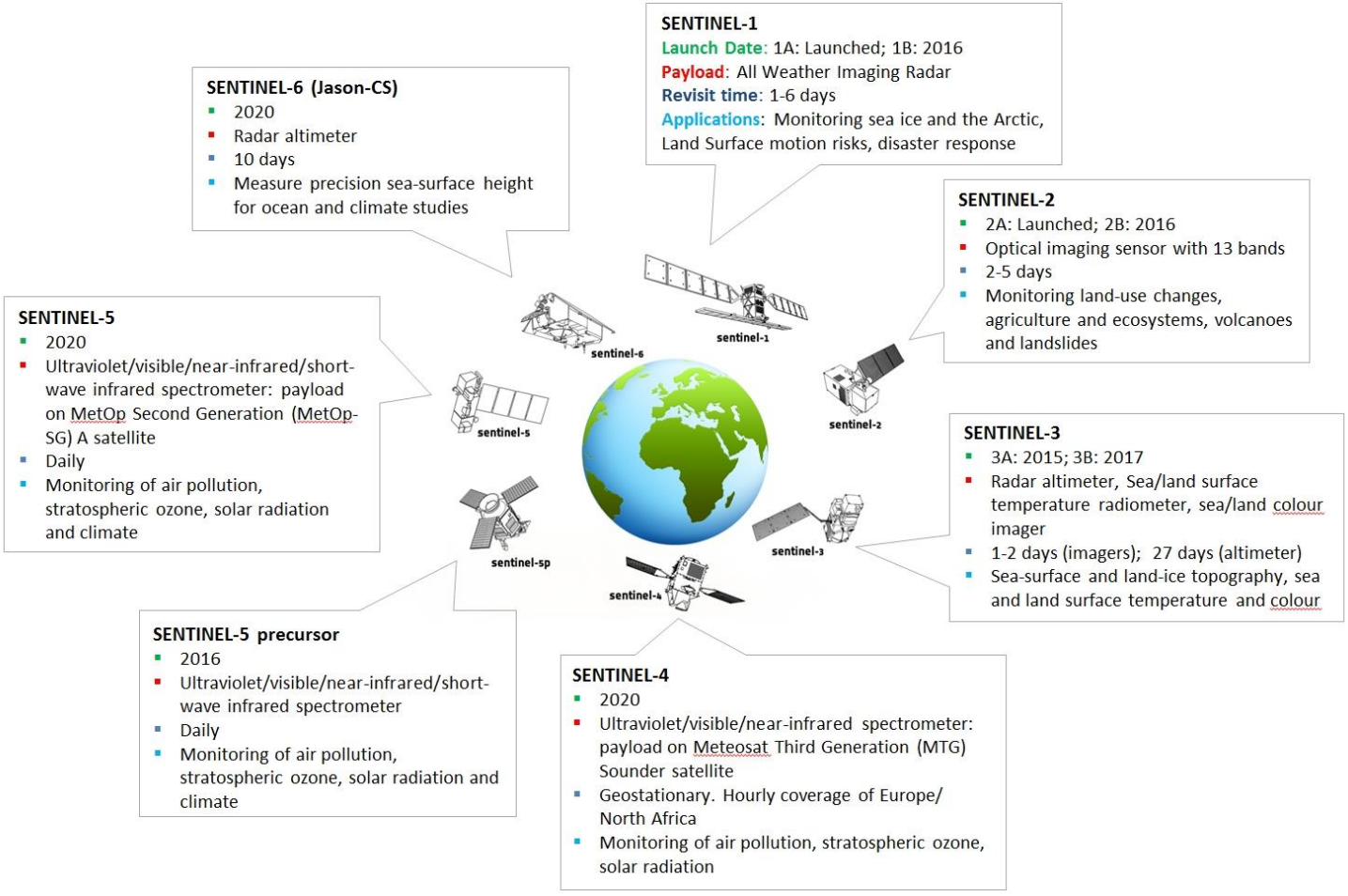
# Satellite instruments

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

Very high resolutior
- QuickBird
- Ikonos

Moderate resolutio
- NASA's MODIS
- ESA's MERIS

SAR
- ALOS-PALSAR



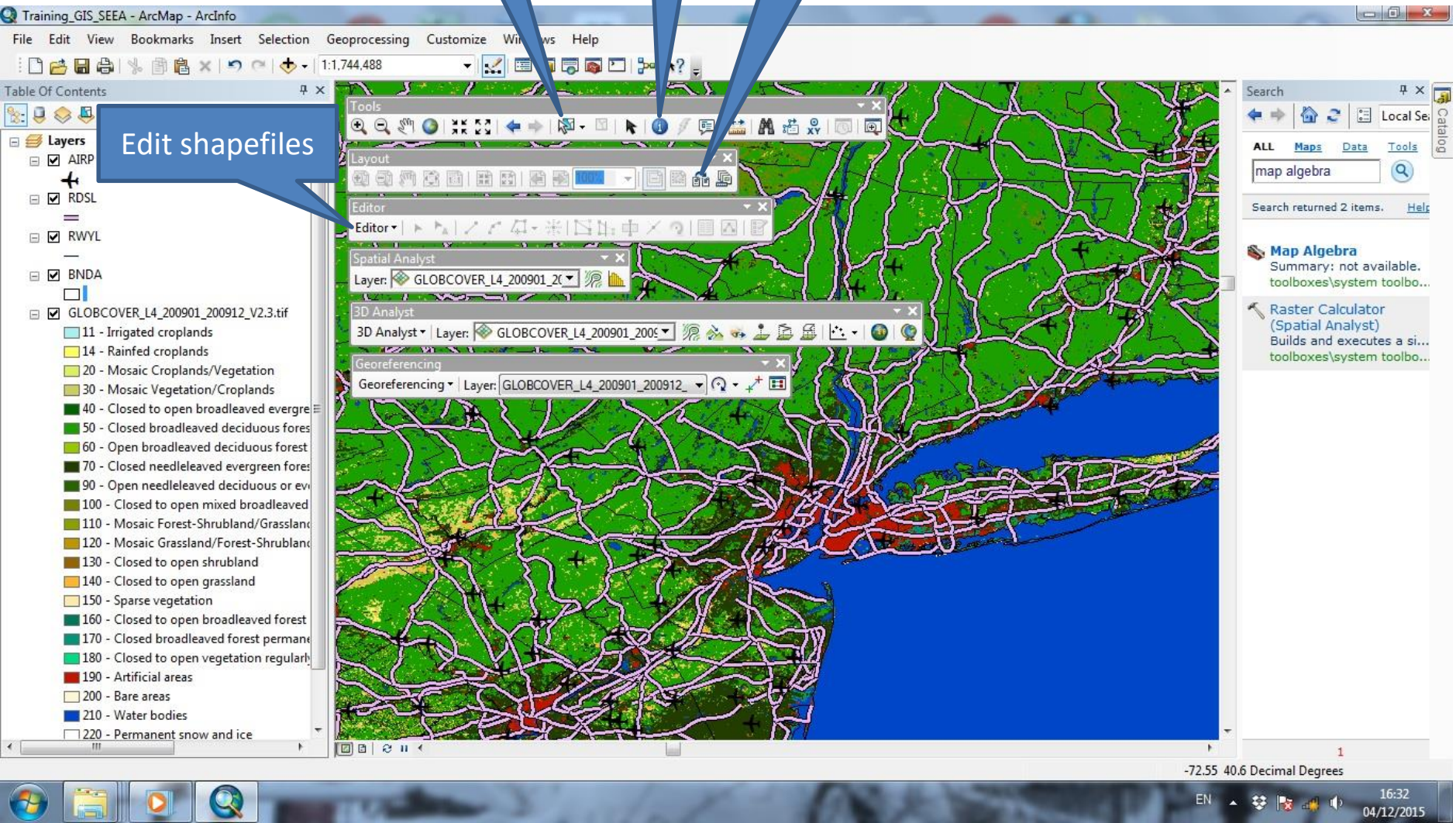
# Interface of ArcMap

Select feature

Check Value

Change Layout template

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



# Coordinate systems and projections

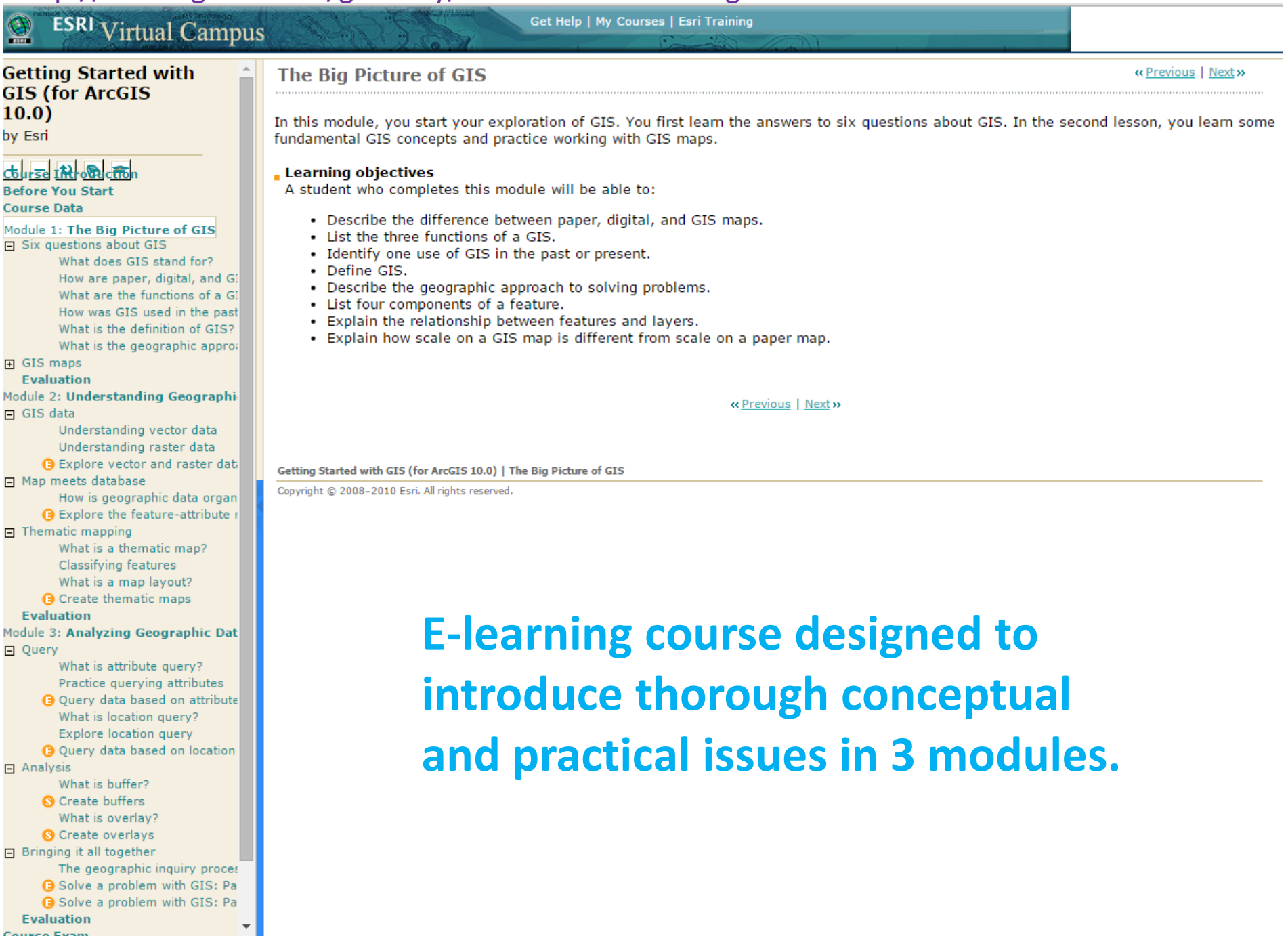
- Every geographic map is distorted illustration of the curved earth surface onto a flat plate, coordinate systems and geographic projections set the parameters for this

**Coordinate systems** enable geographic datasets to use common locations for integration. A coordinate system is a reference system used to represent the locations of geographic features, imagery, and observations such as GPS locations within a common geographic framework. ESRI: http://webhelp.esri.com/arcgisexplorer/2012/en/map_projections.htm

There are two common types of coordinate systems (ESRI):

- A global or spherical coordinate system such as latitude-longitude. These are often referred to as *geographic coordinate systems*.
- A projected coordinate system based on a map projection such as transverse Mercator, Albers equal area, many national ones … project the spherical into 2-dimensional plate
- In ArcMAP projections suitable for global view: WGS 1984; For national UTM

http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&CourseID=1911




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

# Compilation of Environment Statistics

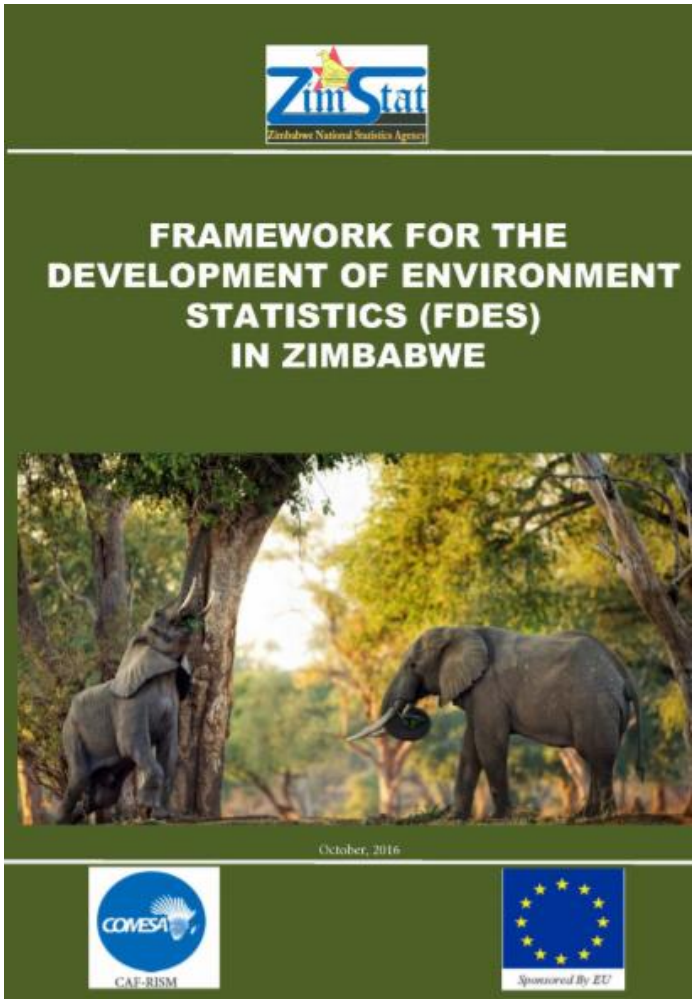
How can we move from the existence of data sources spread across institutions to well compiled environment statistics?

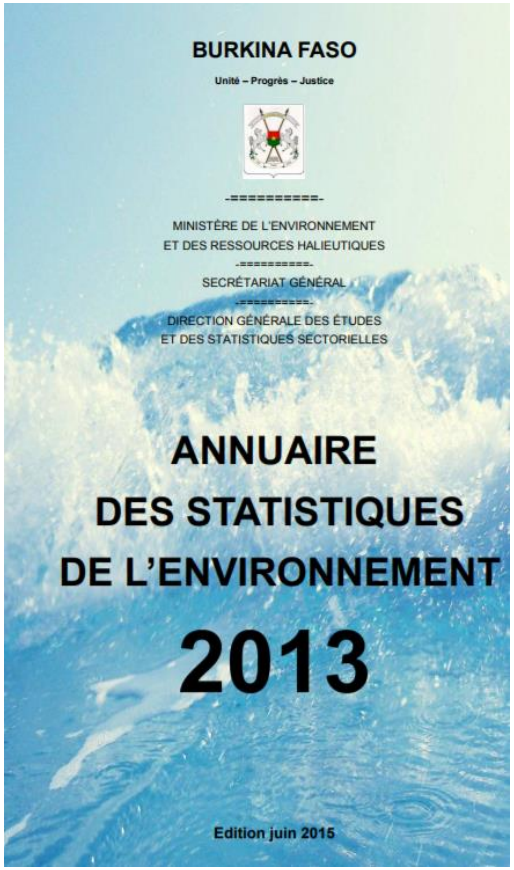
# Compilation of Environment Statistics

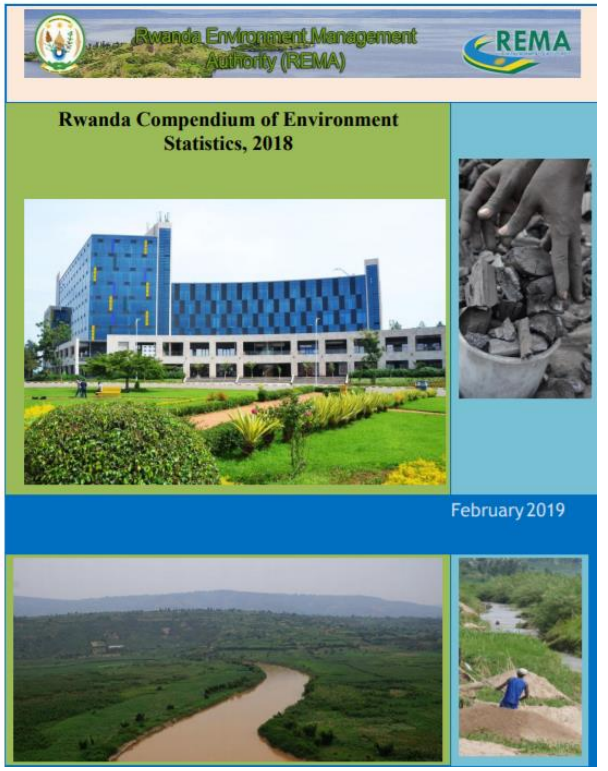
Let us look at some successful cases among African countries…

Burkina Faso
Burundi
Cabo Verde
Ethiopia
Guinea
Madagascar
Mali
Mauritius
Rwanda
United Republic of Tanzania
Zambia
Zimbabwe

All compendia are available at: https://unstats.un.org/unsd/envstats/fdescompendia.cshtml and on each country's respective website.

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Website: www.zamstats.gov.zm

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**Digest of Environment Statistics**

**2015**

November 2016
(Price Rs 200)

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Un Peuple – Un But – Une Foi

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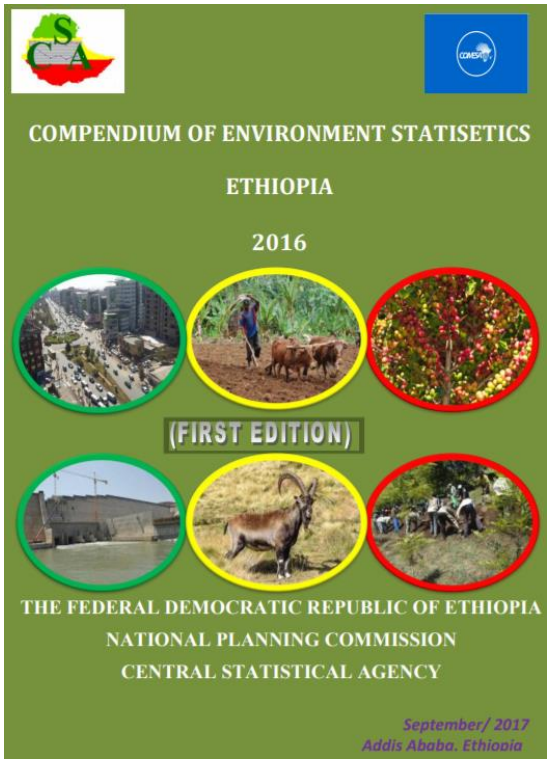
RECUEIL DES DONNEES SISE

**Recueil de données du système d'informations statistiques environnementales (SISE 2010-2015)**

Edition d'octobre 2016

Statistics Sweden
International Consulting Office

Sida

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Travail-Justice-Solidarité

MINISTERE DU PLAN ET DU DEVELOPPEMENT ECONOMIQUE

**INSTITUT NATIONAL DE LA STATISTIQUE**

**ANNUAIRE DES STATISTIQUES DE L'ENVIRONNEMENT**

**2016**

All known compendia available here: https://unstats.un.org/unsd/envstats/fdescompendia.cshtml

## Compendiums:

- Burkina Faso, Yearbook of Environmental Statistics, 2013, French - PDF Background Link
- Burkina Faso, Yearbook of Environmental Statistics, 2012, French - PDF Background Link
- Burundi, Directory of Statistics of the Burundi Environment, 2016, French - PDF Background Link
- Burundi, Directory of Statistics of the Burundi Environment, 2015, French - PDF Background Link
- Cabo Verde, Environmental Statistics, 2016, Portuguese - PDF Background Link
- Curacao, Environmental Statistics Compendium, 2015 - PDF Background Link
- Ethiopia, Compendium of Environment Statistics, 2016 - PDF Background Link
- Guatemala, Compendium of Environment Statistics, 2013, Spanish - PDF Background Link
- Guinea, Yearbook of Environmental Statistics, 2013, French - PDF Background Link
- Guinea, Yearbook of Environmental Statistics, 2016, French - PDF Background Link
- India, EnviStats India 2018 - PDF Background Link
- Indonesia, Environment Statistics of Indonesia, 2017, Indonesian and English - PDF Background Link
- Indonesia, Environment Statistics of Indonesia, 2015, Indonesian and English - PDF Background Link
- Jamaica, Climate Change Statistics, 2016 - PDF Background Link
- Jordan, Environment Statistics, 2014-15, Arabic - PDF Background Link
- Jordan, Environment Statistics, 2014-15 - PDF Background Link
- Madagascar, Yearbook of Environmental Statistics Under the Framework for the Development of Environment Statistics, 2016, French - PDF Background Link
- Mali, Information system data collection - Environmental statistics, 2016, French - PDF Background Link
- Mauritius, Digest of Environment Statistics, 2015 - PDF Background Link
- Nepal, Environment Statistics of Nepal, 2019 - PDF Background Link
- Nepal, Compendium of Environment Statistics, 2015 - PDF Background Link

# Typical content of a compendium…

- Preamble
- Acknowledgements
- List of tables
- List of figures
- Abbreviations
- Introduction
- Methodology

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

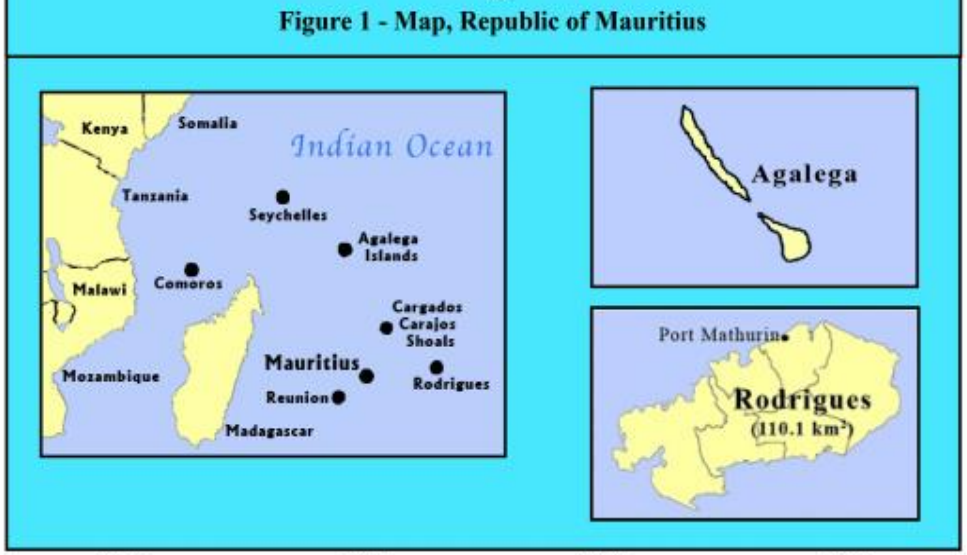
- References

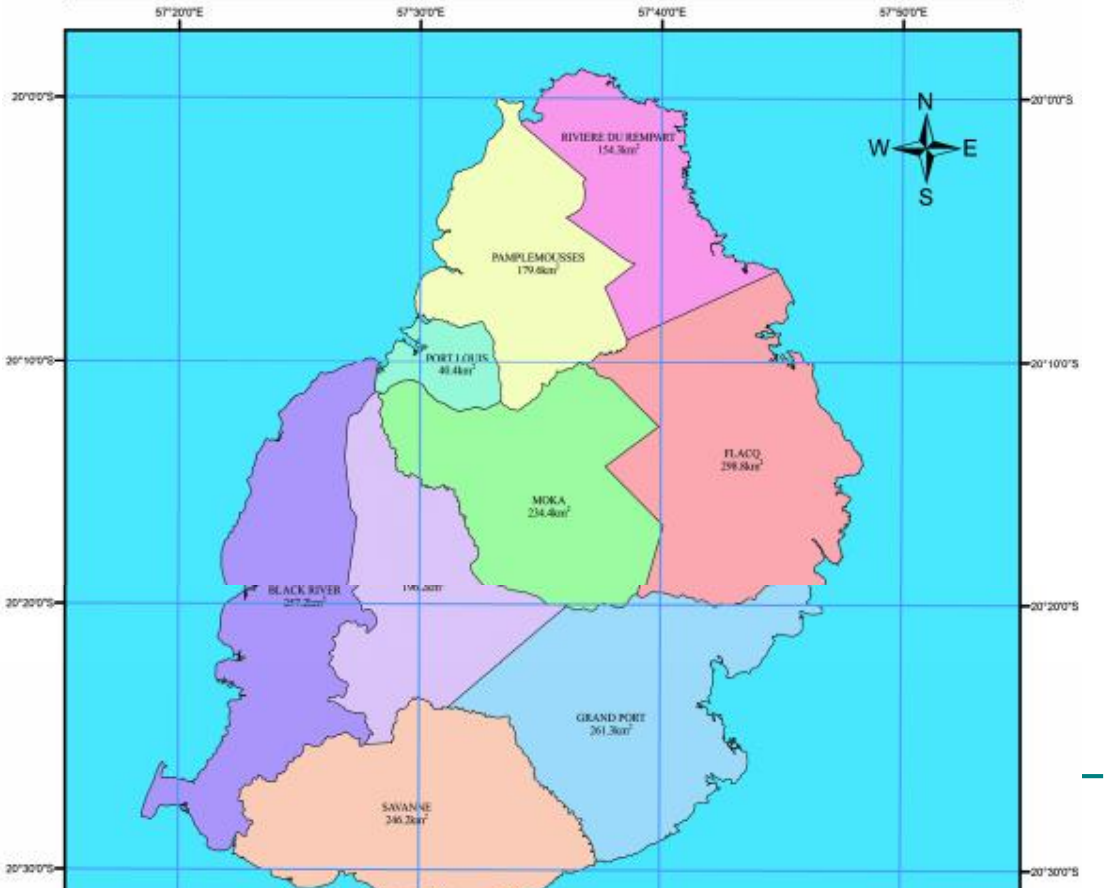
**All of the above undertaken per the situation and needs of The Gambia**

# Demonstration of the Mauritian example…

## Contents

# Demonstration of the Mauritian example… use of maps



# Demonstration of the Mauritian example: descriptive text to complement data…

***1.2 Temperature***

In 2015, December was the warmest month in the Island of Mauritius with a mean of 26.7˚C and July, the coolest month with a mean of 21.5˚C (Table 1.2).

The mean maximum temperature was above the long term mean (1981-2010) for all the months of 2015 except for January and February. On the other hand, the mean minimum temperature was above the long term mean for all the months of 2015except for February which was same (Tables1.3&1.4).

The highest maximum temperature was 35.4˚C, recorded on 28February 2015 at Champs De Mars, Port Louis. The lowest minimum temperature was 9.7˚C, which was recorded on 7July 2015 at Mon Desir Alma.

***1.3 Precipitation***

During the year 2015, the mean amount of rainfall recorded around the Island of Mauritius was 2,377 millimetres (mm), representing an increase of 13.5% compared to 2,094 mm in 2014 and an increase of 18.7% compared to the long term mean (1981-2010) of 2,003 mm (Table 1.5).

# Demonstration of the Mauritian example: descriptive text to complement data…

**Table 1.2 Monthly Mean temperature, 2006 - 2015**

Degrees celcius

| Year \ Month | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sept | | Oct | | Nov | | Dec | | Mean annual temperature | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LTM [1] (26.1) | | LTM (26.2) | | LTM (25.8) | | LTM (24.9) | | LTM (23.2) | | LTM (21.4) | | LTM (20.6) | | LTM (20.7) | | LTM (21.3) | | LTM (22.3) | | LTM (23.9) | | LTM (25.3) | | LTM (23.5) | |
| | Mean | Difference from LTM | Mean | Difference from LTM | Mean | Difference from LTM | Mean | Difference from LTM | Mean | Difference from LTM | Mean | Difference from LTM | Mean | Difference from LTM | Mean | Difference from LTM | Mean | Difference from LTM | Mean | Difference from LTM | Mean | Difference from LTM | Mean | Difference from LTM | Mean | Difference from LTM |
| 2006 | 25.8 | *-0.2* | 26.0 | *-0.2* | 25.9 | *0.2* | 25.2 | *0.3* | 23.1 | *-0.1* | 22.2 | *0.8* | 20.7 | *0.1* | 20.4 | *-0.2* | 21.4 | *0.1* | 22.5 | *0.2* | 24.5 | *0.6* | 26.2 | *0.9* | 23.7 | *0.2* |
| 2007 | 26.8 | *0.7* | 26.6 | *0.4* | 25.6 | *-0.1* | 25.2 | *0.3* | 23.7 | *0.5* | 21.3 | *-0.1* | 21.3 | *0.7* | 20.9 | *0.3* | 21.6 | *0.3* | 22.3 | *0.1* | 24.1 | *0.3* | 25.8 | *0.6* | 23.8 | *0.3* |
| 2008 | 26.1 | *0.0* | 26.2 | *-0.1* | 25.3 | *-0.5* | 25.0 | *0.1* | 23.1 | *-0.1* | 21.3 | *-0.1* | 20.4 | *-0.2* | 21.3 | *0.6* | 21.8 | *0.5* | 22.8 | *0.5* | 24.7 | *0.8* | 25.9 | *0.7* | 23.6 | *0.1* |
| 2009 | 26.9 | *0.8* | 26.8 | *0.6* | 26.2 | *0.4* | 25.8 | *0.9* | 23.8 | *0.6* | 22.4 | *1.0* | 21.0 | *0.4* | 20.9 | *0.3* | 21.5 | *0.3* | 23.0 | *0.7* | 24.2 | *0.3* | 25.8 | *0.6* | 24.0 | *0.5* |
| 2010 | 26.4 | *0.4* | 26.9 | *0.7* | 26.5 | *0.7* | 25.3 | *0.4* | 24.4 | *1.2* | 22.8 | *1.4* | 21.0 | *0.4* | 20.8 | *0.2* | 21.4 | *0.1* | 23.2 | *1.0* | 23.8 | *0.0* | 25.3 | *0.1* | 24.0 | *0.5* |
| 2011 | 26.2 | *0.1* | 26.6 | *0.4* | 26.1 | *0.3* | 25.5 | *0.6* | 23.7 | *0.5* | 22.9 | *1.5* | 21.4 | *0.8* | 21.1 | *0.4* | 21.8 | *0.6* | 22.9 | *0.6* | 24.8 | *0.9* | 25.5 | *0.3* | 24.0 | *0.5* |
| 2012 | 26.0 | *0.0* | 27.0 | *0.8* | 26.0 | *0.3* | 25.5 | *0.6* | 23.3 | *0.1* | 21.6 | *0.2* | 21.4 | *0.8* | 21.3 | *0.7* | 21.8 | *0.5* | 23.2 | *0.9* | 24.8 | *0.9* | 26.3 | *1.0* | 24.0 | *0.5* |
| 2013 | 26.4 | *0.4* | 26.7 | *0.5* | 26.1 | *0.4* | 25.0 | *0.1* | 23.0 | *-0.2* | 21.6 | *0.2* | 20.5 | *-0.1* | 21.1 | *0.5* | 22.2 | *0.9* | 23.6 | *1.3* | 24.6 | *0.7* | 25.9 | *0.6* | 23.9 | *0.4* |
| 2014 | 26.7 | *0.6* | 26.8 | *0.6* | 26.4 | *0.6* | 25.3 | *0.4* | 23.5 | *0.3* | 22.4 | *1.0* | 22.0 | *1.4* | 21.6 | *0.9* | 22.0 | *0.7* | 24.2 | *2.0* | 25.5 | *1.6* | 26.4 | *1.1* | 24.4 | *0.9* |
| 2015 | 26.4 | *0.3* | 26.2 | *0.0* | 26.0 | *0.2* | 25.3 | *0.4* | 24.0 | *0.8* | 22.7 | *1.3* | 21.5 | *0.9* | 21.6 | *0.9* | 22.1 | *0.8* | 23.7 | *1.4* | 24.5 | *0.6* | 26.7 | *1.4* | 24.2 | *0.7* |

Source: Mauritius Meteorological Services

[1] LTM: Long term mean, 1981-2010



# Demonstration of the Mauritian example: descriptive text to complement data…

**Table 1.5 - Mean annual rainfall [1] by region, 2006 - 2015**

| Region | | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **West** LTM [2] (912 mm) | Mean (mm) | 740 | 1,012 | 1,154 | 1,200 | 609 | 1,050 | 631 | 971 | 906 | 1,242 |
| | % of LTM | 81 | 111 | 131 | 137 | 69 | 115 | 69 | 106 | 99 | 136 |
| **North** LTM (1,294 mm) | Mean (mm) | 1,463 | 1,094 | 1,645 | 1,688 | 1,062 | 1,443 | 963 | 1,262 | 1,264 | 1,386 |
| | % of LTM | 113 | 85 | 120 | 123 | 78 | 111 | 74 | 97 | 98 | 107 |
| **South** LTM (2,572 mm) | Mean (mm) | 2,200 | 2,355 | 2,943 | 2,828 | 2,400 | 2,213 | 1,996 | 2,668 | 2,607 | 2,958 |
| | % of LTM | 86 | 92 | 113 | 109 | 93 | 86 | 78 | 104 | 101 | 115 |
| **East** LTM (2,568 mm) | Mean (mm) | 2,646 | 2,736 | 2,999 | 3,155 | 2,756 | 2,794 | 2,289 | 2,716 | 2,758 | 2,959 |
| | % of LTM | 103 | 107 | 124 | 130 | 114 | 109 | 89 | 106 | 107 | 115 |
| **Centre** LTM (2,568 mm) | Mean (mm) | 2,433 | 2,744 | 3,043 | 2,959 | 2,153 | 2,228 | 2,158 | 2,898 | 2,833 | 3,238 |
| | % of LTM | 95 | 107 | 116 | 113 | 82 | 87 | 84 | 113 | 110 | 126 |
| **Whole Island** LTM (2,003 mm) | Mean (mm) | 1,914 | 1,946 | 2,381 | 2,383 | 1,806 | 1,948 | 1,621 | 2,126 | 2,094 | 2,377 |
| | % of LTM | 96 | 97 | 120 | 120 | 91 | 97 | 81 | 106 | 105 | 119 |

Source: Mauritius Meteorological Services

[1] Average of 23 stations for different regions

[2] LTM : Long Term Mean, 1981 - 2010

# Demonstration of the Mauritian example: some (country-owned) definitions of terms used…

## 4. Extreme Events and Disasters

***Warnings***: The tropical cyclone warning system in Mauritius is as follows:

***Class I***: Issued 36 to 48 hours before Mauritius or Rodrigues is likely to be affected by gusts reaching 120 km/hr.

***Class II***: Issued so as to allow, as far as practicable, 12 hours of daylight before the occurrence of gusts of 120 km/hr.

***Class III***: Issued so as to allow, as far as practicable, 6 hours of daylight before the occurrence of gusts of 120 km/hr.

***Class IV***: Issued when gusts of 120 km/hr have been recorded and are expected to continue to occur.

***Termination***: Issued when there is no longer any appreciable danger of gusts exceeding 120 km/hr.

# Demonstration of the Mauritian example: abbreviations used throughout…

## ABBREVIATIONS AND SYMBOLS

**Abbreviations**

| | |
|---|---|
| a.m.s.l | above mean sea level |
| % | Percentage |
| 000 | Thousand |
| c.i.f | Cost, insurance, freight |
| CFU/ ml | Colony-forming unit per millilitre |
| EIA | Environmental Impact Assessment |
| f.o.b | free on board |
| Gg | Gigagram (thousand tonnes) |
| GWh | Gigawatt hour (million kWh) |
| hPa | Hectopascal |
| IUCN | International Union for Conservation of Nature |
| ktoe | Thousand tonnes of oil equivalent |
| kWh | Kilowatt hour |
| LPG | Liquefied Petroleum Gas |
| mm | Millimetre |
| $m^3$ | Cubic metres |
| $Mm^3$ | Million cubic metres |
| n.e.s | Not elsewhere specified |
| NPCS | National Parks and Conservation Service |
| PER | Preliminary Environmental Report |
| Rs | Rupees |
| Rs mn | Rupees million |
| Toe | Tonne of oil equivalent |
| TSP | Total suspended particles |
| $ug/m^3$ | Micrograms per cubic metre |
| mg/l | Milligram per litre |
| ug/l | Micrograms per litre |

# The value of an Environment Statistics Compendium

- Data and information can be shared with the public to inform perception and debate
- Data are more readily accessible to researchers, policy analysts, key decision makers
- The Gambia is in ownership of its own data
- A compendium is a natural follow-up to an assessment (e.g. if a country applies the Environment Statistics Self-Assessment Tool (ESSAT))
- Compendium serves as a tool of coordination among the Statistical Office and ministries/agencies
- Behind the scenes of a glossy compendium, there is invariably a database or several databases on several environmental themes which can be developed in the long-term
- Compendium can improve quality of data

# Process toward realising an Environment Statistics Compendium

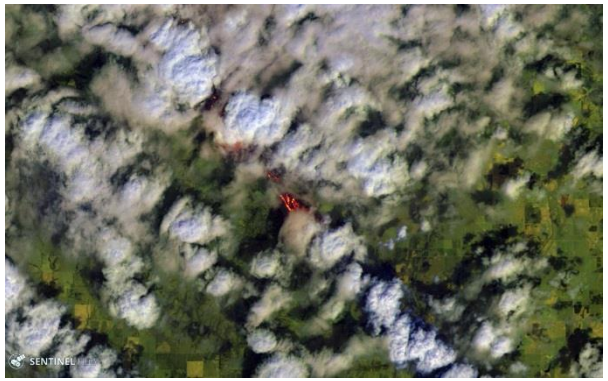
- Following an assessment, identification of who (which institution) collects data; at what periodicity; via which data collection instrument (survey/ monitoring station/ administrative data) etc. can be made
- Data may be centrally collected and compiled into a compendium by the NSO in collaboration with key stakeholders
- A National Committee on Environment or similar committee can provide forum for conversation between NSO and ministries/agencies

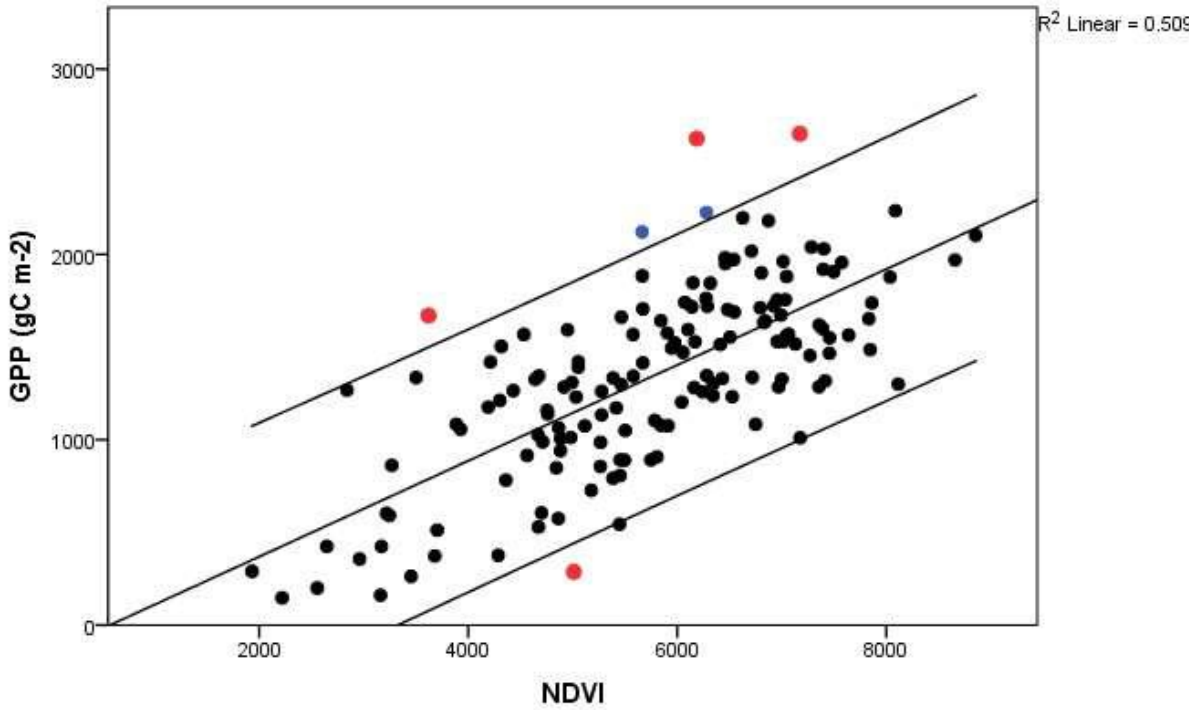
# Quality control and validation of Environment Statistics

# 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.

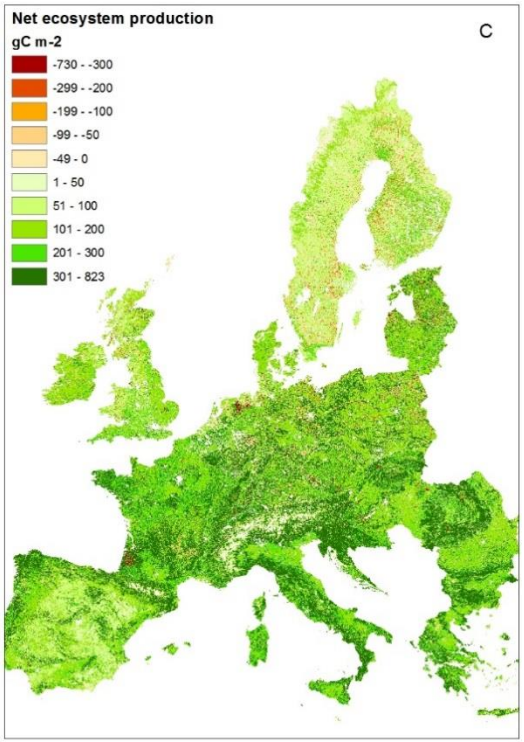


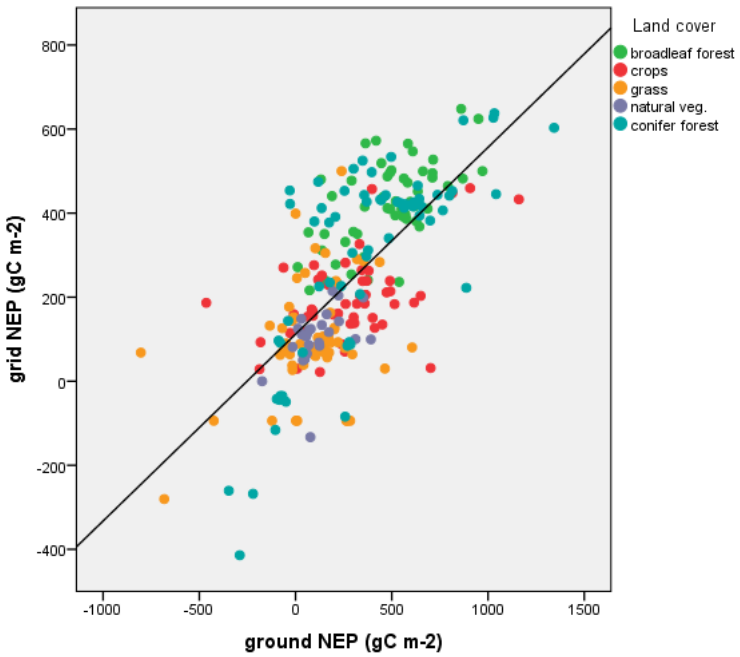
*Source:* United Nations Statistics Division. Fundamental Principles of Official Statistics, available from http://unstats.un.org/unsd/dnss/gp/fundprinciples.aspx

# 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. Timelines 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 |
| Total | 258 | 0.71 | 279 | 237 | -42 | -15 | 205 |

# Questions and discussions

- **What are env. statistics useful for?**
- **Where to get data?**
- **What EO and GIS can and can’t do?**
- **Why to is quality and uncertainty relevant?**

# Thank you for your attention!

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

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