

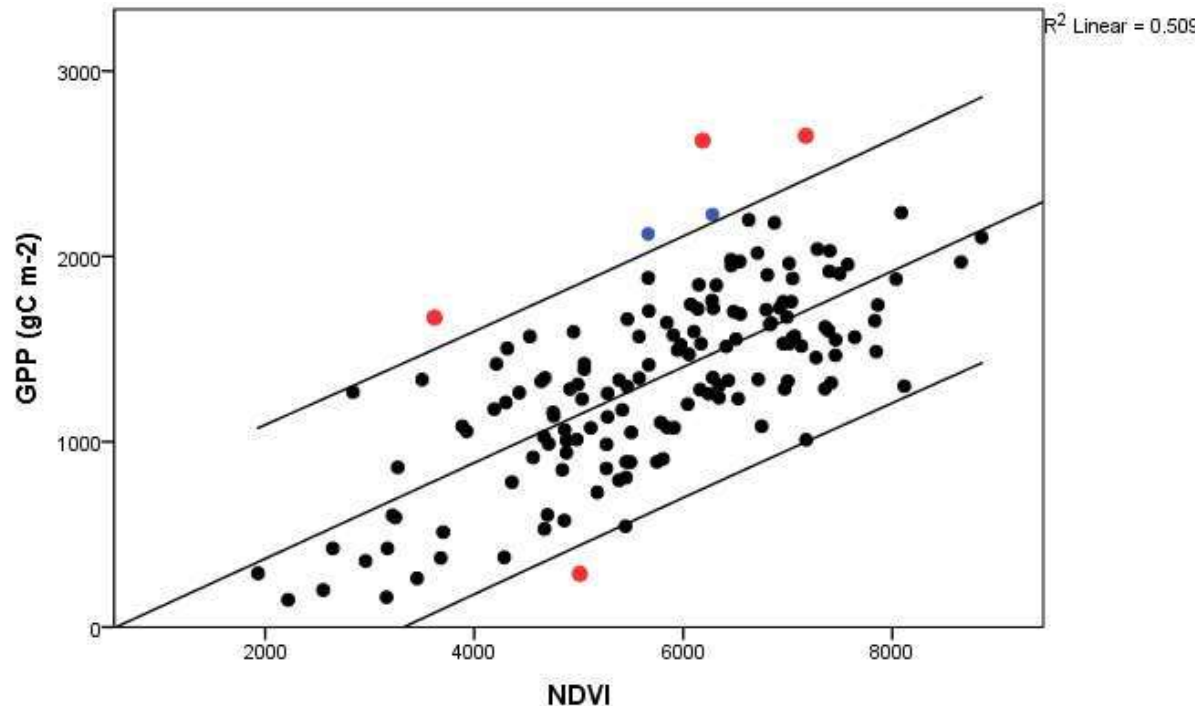
# Quality control and validation of Environment / Climate Change Statistics



# Uncertainty in environmental and climate data and statistics

Unlike many areas of social and economic statistics, environment is subject of big uncertainties and data quality issues, 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, vegetation)
- Modelling (often needed to fill in gaps, impute data)



# Role of NSO and NSS

- The main purpose of developing national programmes of environment / climate change statistics is to **ensure that high-quality, transparent and sustained production** of such statistics is set in place.
- This will be done via including all the needed statistics to monitor climate change, its impacts, and support the implementation of mitigation and adaptation actions in the **National Statistical System (NSS)**.
- **[definition]** National Statistical System, comprises the national statistical office (NSO) and all the other producers of official statistics in the country.
- Legislation stipulates formalized relationships of data exchange, quality control and dissemination
- The key role of NSOs is to lead the processes of expanding/consolidating the NSS to include climate change statistics, which includes stipulating what constitutes official statistics, applying criteria and standards for the compilation, validation and dissemination of official climate statistics. These processes will face challenges in novel statistical areas, such as environmental and climate change statistics and continuous assessment and learning, exchange of lessons and good practices will be necessary.
- The main vehicle to transform unofficial/alternative data and statistics into official statistics is from applying the Fundamental Principles of Official Statistics.



Developed by UNSD

Adopted by the Statistical Commission in 2013

Adopted by the General Assembly in 2014

le element in the information system of  
iomy and the public with data about the  
ation. To this end, official statistics that meet  
available on an impartial basis by official  
bublic 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.

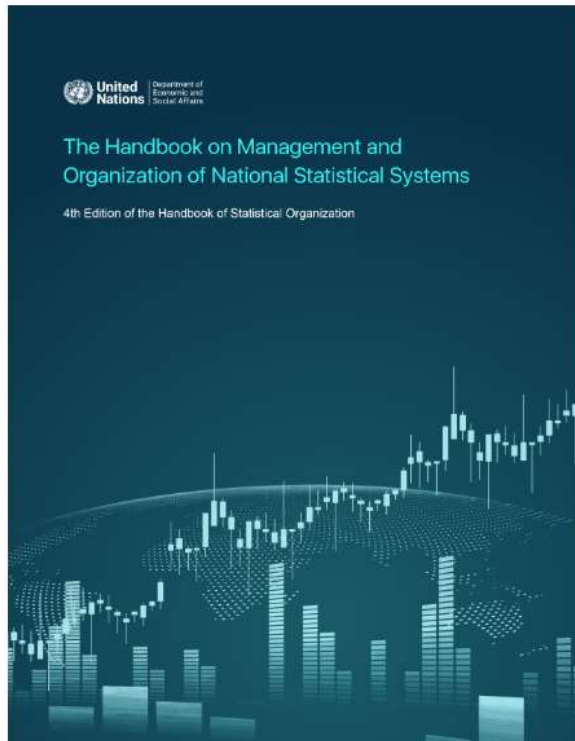
**Principle 9.** The use by statistical agencies in each country of international concepts, classifications and methods promotes the consistency and efficiency of statistical systems at all official levels.

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



# UN Handbook on Management and Organization of National Statistical Systems

Chapter 7 of the UN Handbook on Management and Organization of National Statistical Systems provides **comprehensive guidance to NSOs on quality management systems and standards**; frameworks, guidance and tools, evaluation and implementation. Included in the chapter are descriptions of quality tools, developed by the United Nations and other agencies, that have been used by NSOs. [https://unstats.un.org/capacity-development/handbook/html/topic.htm#t=Handbook%2FC7%2FImplementing\\_a\\_quality\\_management\\_framework.htm](https://unstats.un.org/capacity-development/handbook/html/topic.htm#t=Handbook%2FC7%2FImplementing_a_quality_management_framework.htm)



## [Chapter 7. Quality Management](#)

### [7.1 Introduction](#)

### [7.2 Generic quality management systems and other relevant standards](#)

### [7.3 Quality assurance frameworks, guidelines, and tools](#)

### [7.4 National quality assurance frameworks, guidelines, and tools](#)

### [7.5 Designing and developing a quality management framework](#)

### [7.6 Evaluation of a statistical process and its outputs](#)

### [7.7 Quality evaluation and certification of NSOs](#)

### [7.8 Relationships with other organizational policies, strategies, and frameworks](#)

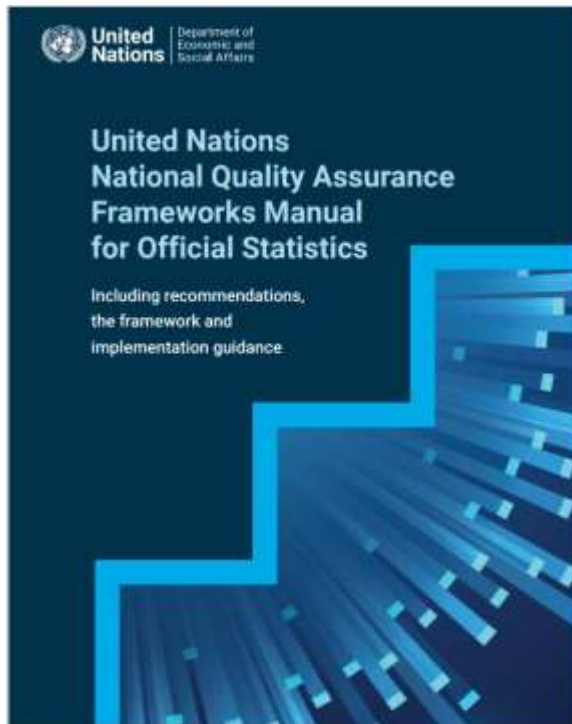
### [7.9 Implementing a quality management framework](#)

### [7.10 Relevance to other producers of official statistics](#)



# United Nations National Quality Assurance Frameworks Manual for Official Statistics

Chapter 6 of the National Quality Assurance Framework (UN NQAF) focuses upon **implementation of quality assurance within a statistical system**. Emphasis is put on the fact that such a system spans well beyond the NSO itself, and must include other producers of official statistics, typically, statistical units of government ministries, departments, agencies, and regional and local government offices. The harmonization of concepts, definitions, classifications and sampling frames is necessary. The upholding of confidentiality while striving for efficiency via data sharing agreements is also paramount.



## Structure of the Manual

Part	Chapter	Title
Introduction	Chapter 1	Contents of the <i>Manual</i>
Recommendations	Chapter 2	Recommendations on quality assurance for official statistics
UN-NQAF	Chapter 3	United Nations National Quality Assurance Framework: principles and requirements
Implementation	Chapter 4	Assessment tools and risk management
	Chapter 5	Development and implementation of a national quality assurance framework
	Chapter 6	Implementation of quality assurance within the national statistical system
	Chapter 7	Quality assurance for statistics compiled from different data sources
	Chapter 8	Quality assurance for data and statistics on SDG indicators
	Chapter 9	Quality assurance in the global statistical system
References	Chapter 9	Quality assurance in the global statistical system
UN-NQAF annex	Annex	Detailed list elements to be assured

# United Nations National Quality Assurance Frameworks Manual for Official Statistics

A self-assessment checklist for organisations, based on the UN NQAF, can be accessed at <https://unstats.un.org/unsd/methodology/dataquality/tools/>. This tool can be used to: conduct quality assessments to identify improvement actions; provide initial assessments for learning purposes; or introduce staff members to quality assurance.

	A	B	C	D	E	F	G	H	I	J	K
4					Compliance assessment						
5		<b>Level</b>		<b>Principle</b>	<b>Full</b>	<b>Partial</b>	<b>No</b>	<b>Not assessed</b>	<b>Missing</b>	<b>Score</b>	
6	<b>A</b>	<b>Managing the statistical system</b>	1	Coordinating the national statistical system	0	3	1	0	0	38	<a href="#">details</a>
7	2		Managing relationships with stakeholders	1	4	1	0	1	#N/A	<a href="#">details</a>	
8	3		Managing statistical standards	0	3	0	0	0	50	<a href="#">details</a>	
9	<b>B</b>	<b>Managing the institutional environment</b>	4	Assuring professional independence	0	2	1	0	0	33	<a href="#">details</a>
10	5		Assuring impartiality and objectivity	0	1	5	0	1	#N/A	<a href="#">details</a>	
11	6		Assuring transparency	0	1	0	1	0	50	<a href="#">details</a>	
12	7		Assuring statistical confidentiality and data security	2	2	1	1	0	60	<a href="#">details</a>	
13	8		Assuring the quality commitment	0	5	3	0	0	31	<a href="#">details</a>	
14	9	Assuring adequacy of resources	0	0	3	0	0	0	<a href="#">details</a>		
15	<b>C</b>	<b>Managing statistical processes</b>	10	Assuring methodological soundness	0	2	3	0	0	20	<a href="#">details</a>
16	11		Assuring cost-effectiveness	0	3	3	0	0	25	<a href="#">details</a>	
17	12		Assuring appropriate statistical procedures	0	0	0	5	0	#DIV/0!	<a href="#">details</a>	
18	13		Managing the respondent burden	0	0	0	0	4	#N/A	<a href="#">details</a>	
19	<b>D</b>	<b>Managing statistical outputs</b>	14	Assuring relevance	0	0	0	0	4	#N/A	<a href="#">details</a>
20	15		Assuring accuracy and reliability	0	0	0	0	3	#N/A	<a href="#">details</a>	
21	16		Assuring timeliness and punctuality	0	0	0	0	4	#N/A	<a href="#">details</a>	
22	17		Assuring accessibility and clarity	0	0	0	0	7	#N/A	<a href="#">details</a>	
23	18		Assuring coherence and comparability	0	0	0	0	3	#N/A	<a href="#">details</a>	
24	19		Managing metadata	0	0	0	0	3	#N/A	<a href="#">details</a>	
25					Overall score					#N/A	

# Six Quality Dimensions of official statistics

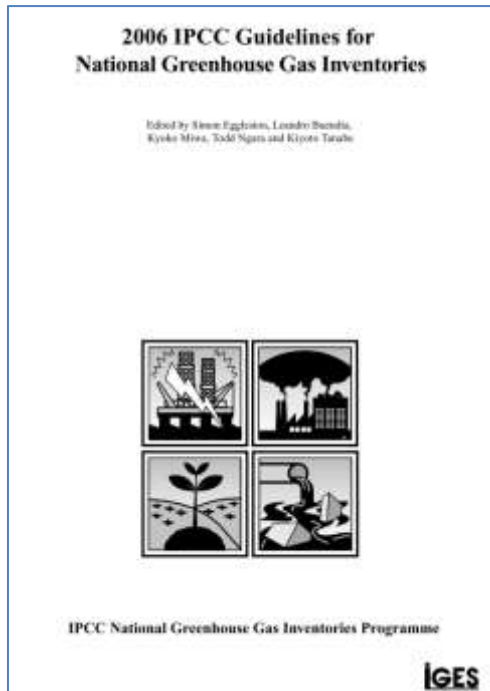
1. **Relevance**, considers the coverage and contents of the needed information;
2. **Accuracy**, is 'The closeness between an estimated result and the (unknown) true value';
3. **Timeliness and punctuality**, is the time-lapse between the publication of data and referred period
4. **Accessibility and 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.





# Quality in the Implementation guidelines for the Global Set

For the MRV transparency process, usually countries are responsible for organizing their quality assurance framework (QA/QC). You can check the IPCC 2006 guidelines – section 1 General issues where you should find a chapter on QA/QC guidance. QA at national level; QC at international.



## CHAPTER 6: QUALITY ASSURANCE / QUALITY CONTROL AND VERIFICATION

6.1	Introduction .....	6.5
6.2	Practical considerations in developing QA/QC and verification systems .....	6.6
6.3	Elements of a QA/QC and verification system .....	6.7
6.4	Roles and responsibilities .....	
6.5	QA/QC plan .....	
6.6	General QC procedures .....	
6.7	Category-specific QC procedures .....	
6.7.1	Emissions factor QC .....	
6.7.2	Activity data QC .....	
6.7.3	Calculation-related QC .....	
6.8	QA procedures .....	
6.9	QA/QC and uncertainty estimates .....	
6.10	Verification .....	
6.10.1	Comparisons of national estimates .....	
6.10.2	Comparisons with atmospheric measurement .....	
6.11	Documentation, Archiving and Reporting .....	
6.11.1	Internal documentation and archiving .....	
6.11.2	Reporting .....	6.23

- Timeliness
- Completeness
- Consistency (internal consistency as well as time series)
- Comparability
- Accuracy
- Transparency
- Improvement

[Publications - IPCC-TFI \(iges.or.jp\)](http://iges.or.jp)

[Microsoft Word - V1\\_Ch6\\_QA\\_QC\\_final\\_v2.doc](#)  
[iges.or.jp](http://iges.or.jp)

United Nations Statistics Division



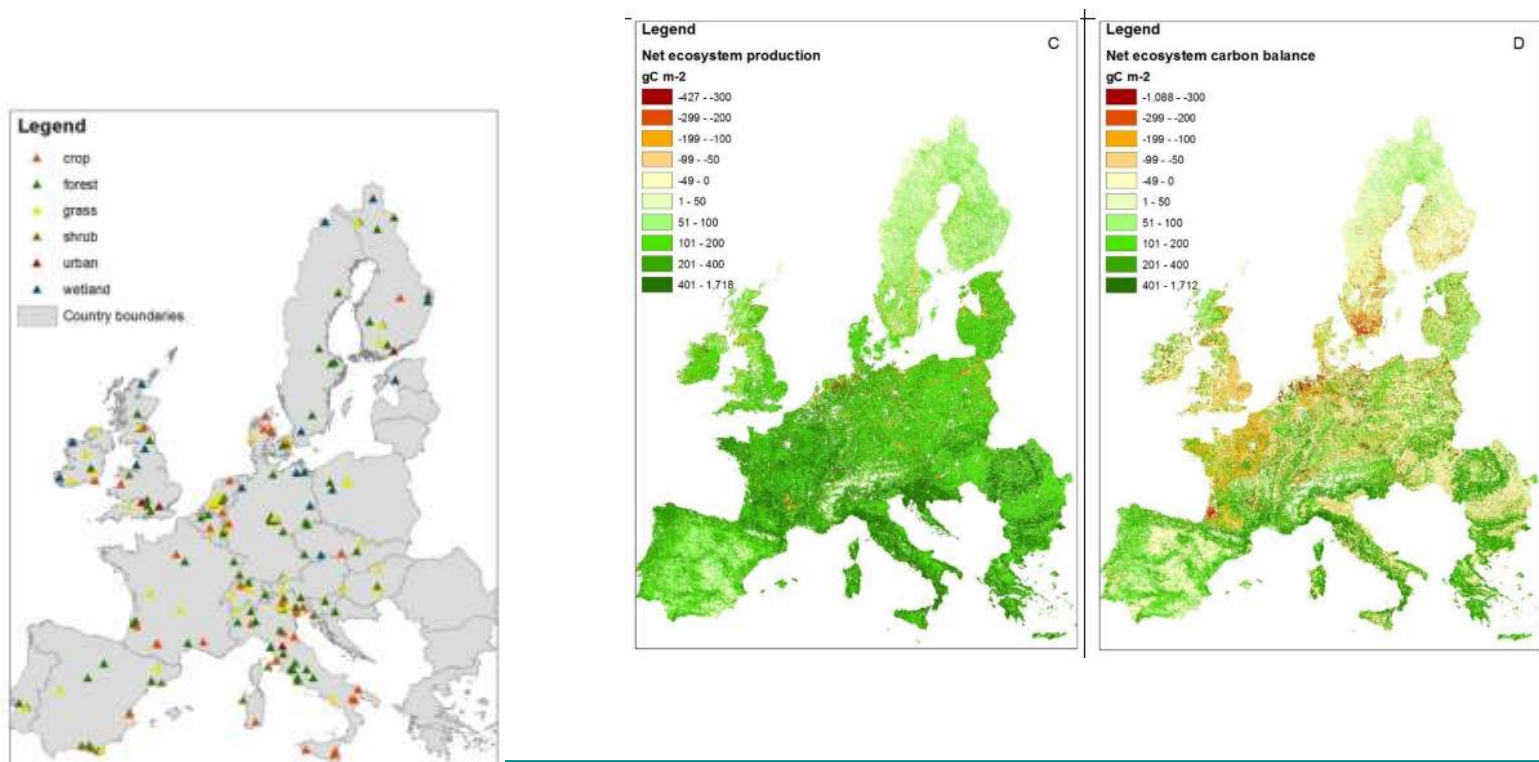
# Regional frameworks

- **European Statistical System** covers regulations, standards, guidelines and tools directed towards countries in the European Union. It includes the European Statistics Code of Practice (ES CoP), with a Quality Declaration, Principles, Quality Assurance Framework of the European Statistical System, European Central Bank - Statistics Quality [Framework, Handbook for Quality and Metadata Reporting](#) as well as Other ESS Quality Management Tools.
- **International Monetary Fund - Data Quality Assessment Framework (DQAF)** is designed for use by IMF staff and NSOs in assessing the quality of specific types of national datasets. Its aim is to complement the IMF Special Data Dissemination Standard (SDDS) and the Enhanced General Data Dissemination System (e-GDDS) and mainly covers economic and finance statistics but can be adopted for social statistics. In Jamaica, the e-GDDS includes population statistics.
- **African Charter on Statistics** has six quality principles in 25 quality statements covering most of the quality principles in the ES CoP but **reorganized** and tailored to the African situation.
- **ECLAC – Code of Good Practice in Statistics for ECLAC** was modelled on the European Statistical Code of Practice (2008) and extended to include coordination of the NSS.
- **Caribbean Community – Statistics Code of Practice** is based on the ES CoP and has 15 principles and 78 indicators.
- **ASEAN Community Statistical System Code of Practice** is also modelled on the ES CoP (2008) but has fewer principles and indicators.
- **UNECE Quality Indicators for the Generic Statistical Business Process Model** ([GSBPM](#)) sets out a template for describing surveys and administrative data collections in eight phases and 44 sub-processes with a set of indicators to monitor the quality of the production processes for each phase.
- **United Nations Statistical Quality Assurance Framework (UN SQAF)** is a generic quality assurance framework used by UN agencies in managing their statistical data. Agencies without a quality framework are able to use this generic version. United Nations Statistics Division, United Nations National Quality Assurance Framework (with particular attention to chapter 6: Implementation of quality assurance within the national statistical system), available at: [https://unstats.un.org/unsd/methodology/dataquality/references/manual-2019/UNNQAFManual\\_Chapter%206%20Implementation%20of%20quality%20assurance%20within%20the%20NSS-WEBSITE.pdf](https://unstats.un.org/unsd/methodology/dataquality/references/manual-2019/UNNQAFManual_Chapter%206%20Implementation%20of%20quality%20assurance%20within%20the%20NSS-WEBSITE.pdf) (accessed 23 November 2022).



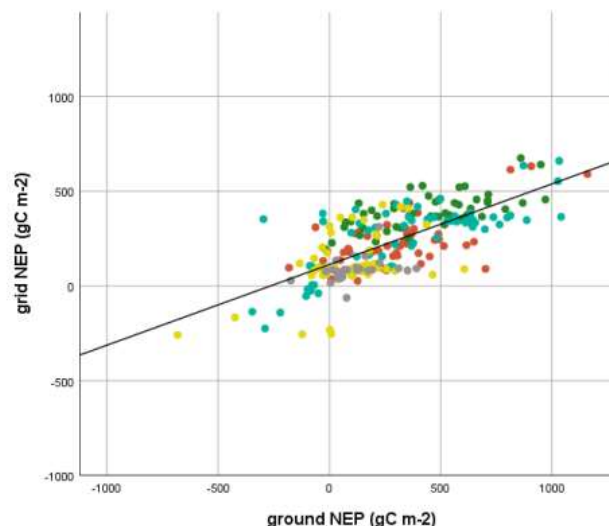
# Personal example – from PhD thesis

Ivanov, Emil. "Evaluating interactions between carbon sequestration and provisioning ecosystem services in Europe." PhD diss., University of Nottingham, 2021.



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Dom. land cover	<i>N</i>	<i>R</i>	mean ground NEP	mean grid NEP	bias	bias (%)	RMSE
broadleaf forest	56	0.6	463	392	-71	-15	178
crops	48	0.61	315	238	-77	-24	170
grass	53	0.5	90	115	25	27	142
natural veg.	29	0.4	103	80	-23	22	71
conifer forest	65	0.75	358	262	-96	-26	212
<u>Total</u>	<u>251</u>	<u>0.73</u>	<u>287</u>	<u>234</u>	<u>-53</u>	<u>-18</u>	<u>166</u>





# 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/>

