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United Nations National Quality Assurance Frameworks Manual for Official Statistics

Including recommendations, the framework and implementation guidance

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United Nations National Quality Assurance Frameworks Manual for Official Statistics

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Department of Economic and Social Affairs

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Preface

At its fiftieth session in March 2019, the United Nations Statistical Commission adopted the *United Nations National Quality Assurance Frameworks Manual for Official Statistics* and the recommendations contained therein (decision 50/106).[1] The Statistical Commission welcomed the *Manual* as an important contribution in guiding countries in the implementation of a national quality assurance framework, including for new data sources, new data providers and for data and statistics of the Sustainable Development Goal indicators. The *Manual* was developed by the Expert Group on National Quality Assurance Frameworks, which was re-established by the Statistical Commission at its forty-eighth session in March 2017.[2] The *Manual* builds on and replaces the generic United Nations national quality assurance framework template and guidelines (UN-NQAF template and guidelines) adopted in 2012.

At its forty-eighth session, the Statistical Commission agreed to update the UN-NQAF template and guidelines of 2012 to address the new challenges posed by the enlarged data ecosystem and the 2030 Agenda for Sustainable Development. In its decision 48/106, the Commission: (a) requested the Expert Group to take into account the work on data quality already undertaken at the national, regional and global levels to avoid duplicating existing efforts and with a view to harmonizing existing frameworks, and to consider the relationship with the Fundamental Principles of Official Statistics; (b) emphasized the importance of ensuring the quality of data derived from new sources and new data providers, including those outside the official statistical system; and (c) requested the Expert Group to address issues involved in the implementation of the national quality assurance framework, including issues of coordination, and the need to support countries in its implementation.[3]

The Expert Group developed the *Manual* supported by a series of virtual meetings and two rounds of formal consultations. The Expert Group also conducted a survey of national practices that informed its work.[4] In October 2018, the Expert Group met in New York to discuss and finalize the draft of the *Manual*. In November 2018, the draft of the *Manual* was sent for worldwide consultation and review to all Member States and shared for information with the international and supranational organizations that are members of the Committee for the Coordination of Statistical Activities. More than 60 countries and three international/regional organizations provided their feedback. Respondents expressed strong support for the draft *Manual*. All comments were carefully reviewed by the Expert Group and incorporated to the extent possible. Furthermore, the Expert Group incorporated additional suggestions expressed during the fiftieth session of the Statistical Commission. Pursuant to its further programme of work[5] endorsed by the Statistical Commission, the Expert Group will develop and provide additional materials and tools to support the implementation of a national quality assurance framework in countries, including best practices. Many countries have already updated the information about their national practices on the website of the Statistics Division of the Department of Economic and Social Affairs of the United Nations.[6]

[1] See E/2019/24.

[2] For more information on the Expert Group on National Quality Assurance Frameworks, see https://unstats.un.org/unsd/methodology/dataquality/expert-group.

[3] See E/2017/24.

[4] See https://unstats.un.org/unsd/statcom/50th-session/documents/BG-Item3d-NQAF-E.pdf.

[5] See E/CN.3/2019/6.

[6] See https://unstats.un.org/unsd/methodology/dataquality/quality-references/.

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The Statistics Division is grateful to the experts for their work, their countless contributions and their very active participation in the Expert Group. Canada and the Philippines guided the work of the Expert Group as Co-Chairs and deserve special credit for the timely completion of its work. The Statistics Division is also grateful to the countries and organizations that provided valuable comments during the worldwide consultation and participated in the survey of national practices.

The preparation of the *Manual* was undertaken under the supervision of F. Perucci, Chief of the Development Data and Outreach Branch of the Statistics Division. M. Reister, Chief of the Development Data Section, provided secretariat services to the Expert Group, contributed to the drafting and was responsible for the finalization of the Manual in close collaboration with T. Kulaga, and supported by I. Rutherford and Z. Lin. In addition, V. Markhonko and H.V. Sæbø provided indispensable and critical input and support during the drafting and review process as Statistics Division consultants. R. Roberts and M. Guerrero, former United Nations staff, afforded valuable inspiration and guidance as external experts.

Abbreviations and acronyms

ECE	Economic Commission for Europe
Eurostat	European Statistical Office
GAMSO	Generic Activity Model for Statistical Organizations
GSBPM	Generic Statistical Business Process Model
GSIM	Generic Statistical Information Model
IMF	International Monetary Fund
ISI	International Statistical Institute
ISO	International Organization for Standardization
IT	Information technology
NQAF	National quality assurance framework
NSO	National statistical office
NSS	National statistical system
OECD	Organization for Economic Cooperation and Development
SDG	Sustainable Development Goal
SDG-WG	Sustainable Development Goal indicator working group
SDMX	Statistical Data and Metadata eXchange
UN-NQAF	United Nations National Quality Assurance Framework

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Chapter 1
Content and use of the *Manual*

1.A. Objective, structure, users and uses

1.1. Chapter 1 describes the objective, structure, users and uses of the United Nations *National Quality Assurance Frameworks Manual for Official Statistics* (*Manual*). It provides a basic introduction to data quality and definitions of important terms used in this *Manual*.

1.2. *Objective of the Manual: responding to the new data ecosystem*. In recent years, new data sources, data providers and statistics producers have emerged, fuelled by technological advances and new demands for detailed and timely data for policy-making in the context of the 2030 Agenda for Sustainable Development. This new data ecosystem poses challenges and opportunities for official statistics. For example, in the future, national statistical offices may see their role as a producer of official statistics diminished while adopting a new role as a curator of data and statistics produced by others. This *Manual* provides guidance for developing and implementing a national quality assurance framework (NQAF) and aims to address quality assurance in different circumstances and situations, thereby supporting countries in safeguarding the role of official statistics as a trusted source of information in a changing environment.

1.3. The *Manual* and its recommendations are directed at assuring the quality of official statistics throughout the entire national statistical system (NSS), which consists of the national statistical office (NSO) and other producers of a country's official statistics (see the definitions of "national statistical office" and "national statistical system" in section 1.C.). The *Manual* also provides guidance for engagement with statistics producers and data providers outside of the NSS that cooperate with members of the NSS in the production of official statistics. For example, the *Manual* addresses quality assurance in the use of different data sources (chapter 7) and Sustainable Development Goal (SDG) indicator data and statistics (chapter 8). As a result, the *Manual* responds to the challenges posed by the new data ecosystem, which is characterized by the emergence of new data sources, new data providers and statistics producers. The *Manual* does not aim to replace any of the existing statistical quality assurance frameworks and guidelines for official statistics. Countries and individual producers of official statistics that are already fully engaged in quality assurance and are following one of the existing quality frameworks may view this *Manual* only as an additional reference point that supports what they are already doing, and as a source of information on the application of quality assurance in different situations.

1.4. *Structure of the Manual*. The *Manual* contains recommendations, the updated United Nations National Quality Assurance Framework (UN-NQAF) and practical guidance for its implementation. Specifically, chapter 2 presents recommendations for quality assurance that are mainly based on the Fundamental Principles of Official Statistics, identifying and clearly spelling out the responsibilities of the members of the NSS for assuring the quality of data and statistics. Chapter 3 contains the

updated UN-NQAF with 19 quality principles and their associated requirements. The annex to the *Manual* complements chapter 3 by providing, for each requirement, elements to ensure that good practices are used. Chapters 4 to 8 provide guidance for the implementation of the UN-NQAF (or any other quality assurance framework). They give an overview of quality assessment tools (chapter 4), institutional arrangements and actions for implementation (chapters 5 and 6), and special considerations for different data sources (chapter 7) and for SDG indicator data and statistics (chapter 8). Chapter 9 discusses how quality assurance at the national and global levels are linked. Figure 1.1 shows how the *Manual* is structured.

Figure 1.1
Structure of the *Manual*

Part	Chapter	Title
Introduction	Chapter 1	Contents of the *Manual*
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 managment
	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
References	Chapter 9	Quality assurance in the global statistical system
UN-NQAF annex	Annex	Detailed list elements to be assured

1.5. *Users and uses: how to use this Manual.* All chapters of the *Manual* can be read independently, offering different entry points to the topic of quality assurance for official statistics:

(a) Chapter 2. This brief chapter is important to readers who are interested in recommendations for quality assurance for their organization. The United Nations recommendations on statistical quality assurance in chapter 2 are meant to support NSOs in achieving an adequate mandate and institutionalization of statistical work and quality assurance in their countries throughout their respective NSSs. Only then will countries be able to assure the availability and quality of official statistics produced by their NSSs through a multitude of statistics producers. Even in well-established statistical systems there may be serious gaps when it comes to the quality of official statistics. One such example is the lack of access to data from administrative or private sources in some countries;

(b) Chapter 3 and annex. Chapter 3 provides readers with a comprehensive framework for statistical quality assurance which they can adopt or adapt for their own organizations or compare with their own existing frameworks. The updated UN-NQAF in chapter 3 of the *Manual* is based on the 2012 UN-NQAF template and guidelines. Like its predecessor, UN-NQAF is descriptive and constitutes guidance only in the sense that it provides the components and a general structure within which an individual country-specific NQAF can be developed. No attempt is made to prescribe to coun-

tries which specific quality assurance framework should be followed, as countries should make their choice according to national circumstances. The annex to the *Manual* contains a list of elements that countries can use to assess and assure their compliance with the various quality requirements;

(c) Chapters 4 to 8. Readers may want to refer to the chapter (or parts thereof) that is of most interest to them. Chapters 4 to 8 provide guidance for the implementation of an NQAF and can be read independently from each other and from other parts of the *Manual*:
   (i) Chapter 4 lists the various tools and instruments for quality assessment and contains a small section on risk management;
   (ii) Chapter 5 is concerned with the development and implementation of an NQAF at the NSO and other statistical agencies;
   (iii) Chapter 6 builds on chapter 5 and discusses the role of NSS-wide bodies for the implementation of an NQAF throughout the NSS;
   (iv) Chapter 7 approaches quality assurance from the perspective of the data source being used, which is relevant to the discussion of quality assurance of data from new data sources;
   (v) Chapter 8 provides an introduction to statistical quality assurance for statisticians involved in the compilation of SDG indicators;

(d) Chapter 9. This chapter provides reference materials for statisticians who are interested in the links between quality assurance at the national and global level. It discusses collaboration within the global statistical system in assuring data quality at the global level, taking into consideration the need for international comparability of data, especially in the context of the compilation of the indicators for monitoring progress towards national, regional and global goals and targets of the 2030 Agenda for Sustainable Development.

1.6. *Relationship with the generic 2012 UN-NQAF template and guidelines.* The updated UN-NQAF (see chapter 3) is based on the generic 2012 UN-NQAF template and guidelines. The template and guidelines were reviewed and amended as necessary to reflect the emergence of an enlarged data ecosystem with potential new data sources, data providers and technologies and methods, such as earth observation, remote sensing and big data. The structure of the updated UN-NQAF has not been changed for reasons of continuity and to facilitate comparisons.

1.B. Introduction to quality management

1.7. *Definition of quality.* "Quality" is the degree to which a set of inherent characteristics of an object fulfils requirements.[7] In the context of statistical organizations, and in this *Manual*, the object is the statistical output or product, the process, the institutional environment or the whole statistical system. A simple definition of quality is "fit for use" or "fit for purpose". It is the users' needs that define the quality. Different users may have different needs that must be balanced against each other to provide the quality concept with concrete content. Over the past 20 years, statistical agencies have arrived at the consensus that the concept of "quality of statistical information" is multidimensional, and that there is no one single measure of quality. For a statistical product, the general definition of quality is operationalized by specifying a set of factors or dimensions that characterize it: relevance; accuracy and reliability; timeliness and punctuality; accessibility and clarity; and coherence and comparability. The dimensions of quality are interrelated, and there are trade-offs between some of

[7] See International Organization for Standardization (ISO) 9000:2015.

them. Adequate management of each of them is essential. At the same time, they must be seen in relation to each other within the statistical production processes.

1.8. *Quality management frameworks and quality management*. Quality management frameworks provide a coherent and holistic system as a basis for quality management (see definition in section 1.C.). There are various general quality management frameworks applicable to any organization, such as total quality management, International Organization for Standardization (ISO),[8] Six Sigma, European Foundation for Quality Management, Balanced Scorecard, Lean and Lean Six Sigma. These frameworks are largely based on common definitions and principles, but their main focus and formalization vary. For example, ISO emphasizes certification and standardization of "processes", while Six Sigma focuses on quality control of the "products/outputs" using statistical methods. Lean emphasizes improvement in efficiency by reducing waste.

[8] There are different relevant ISO standards for quality and other management areas; in addition to covering quality management, including customer satisfaction, they comprise market, opinion and social research and risk management.

1.9. In many ways, total quality management, which was developed in the previous century, is the foundation of all general quality frameworks. Total quality management is defined as "a set of systematic activities carried out by the entire organization to effectively and efficiently achieve company objectives so as to provide products and services with a level of quality that satisfies customers, at the appropriate time and price".[9] The strategic core of all major total quality management models is continuous improvement, often illustrated with reference to the "Plan-Do-Check-Act" cycle made popular by W. Edwards Deming. This cycle is a four-step process that guides all changes for continuous improvement.

[9] The Deming Prize Committee, revised 1998.

1.10. *Statistical quality frameworks*. The above-mentioned general quality frameworks inspired statistical quality frameworks such as the European Statistics Code of Practice, the International Monetary Fund (IMF) Data Quality Assessment Framework, the Recommendation of the Organization for Economic Cooperation and Development (OECD) Council on Good Statistical Practice and the UN-NQAF presented in chapter 3.[10] These are also inspired by and consistent with the Fundamental Principles of Official Statistics, which emphasize independence, impartiality and the protection of data of individuals. Such requirements of official statistics were first formulated jointly in the Fundamental Principles of Official Statistics in 1992.

[10] The various quality assurance frameworks cover the same or similar aspects of statistical quality. Some are referred to as codes of practice, stressing their normative character.

1.11. *Purpose of an NQAF.* An NQAF provides a coherent and holistic system for statistical quality management that assures trust in and the quality of official statistics. The UN-NQAF presented in chapter 3 contains the components that should be considered in managing and assuring the quality of official statistics.

1.12. *Benefits*. The main benefits of having an NQAF for official statistics are as follows:

(a) It provides a generic model for the members of the NSS to adopt, develop or revisit their own quality assurance framework;
(b) It offers a mechanism for the systematic monitoring and ongoing identification of risks and quality issues across the NSS to develop timely corrective measures. It therefore supports quality improvements and their maintenance over time;
(c) It supports NSS coordination by providing common guidance on quality assurance and reference materials for training;
(d) It gives greater transparency to the processes by which quality is assured and reinforces the credibility of statistics producers and the coordinating agency (typically the NSO) within the NSS;
(e) It serves as a common ground to promote dialogue on quality challenges and opportunities at the national, regional and international levels;

(f) It provides a basis for creating and maintaining a culture of quality within the NSS.

1.13. *Quality management and risk management*. Risk management has many similarities with quality management. The approach is a bit different, but risk and quality management frameworks are not mutually exclusive—they are complementary. The implementation of risk-based thinking is one of the requirements of ISO 9001:2015. Risk management itself is guided by the framework of the Committee of Sponsoring Organizations of the Treadway Commission. Risk and quality management should not operate independently of each other. A coordinated approach is cost-effective and facilitates the involvement and support of management (see chapter 4 for further information).

1.C. Important terms

1.14. *References*. The list below provides definitions of important terms used in this *Manual*. The main reference for the definitions is the OECD Glossary of Statistical Terms.[11] In addition, Eurostat offers a comprehensive glossary of statistical terms on its metadata server.[12] Some of these definitions originate from the *Statistical Data and Metadata eXchange (SDMX) Glossary*.[13] In addition to these general glossaries, there are also numerous thematic glossaries for specific statistical domains. The definitions presented below are used throughout this *Manual*, but countries may have their own definitions.

Application programming interface: a programming interface for statistical data that enables users of statistics to integrate data from a statistical agency into their own systems, combine it with their own data and create services, applications and visualizations. Data automatically become available to users whenever the statistical agency updates.

Common Statistical Production Architecture: a system that covers statistical production across the information elements and processes defined by the Generic Statistical Information Model, the Generic Activity Model for Statistical Organizations and the Generic Statistical Business Process Model.

Data and statistics: statistics are numerical information relating to an aggregate of data on units or observations. In general, this *Manual* uses the term *statistics* when referring to an output of a statistics production process and the term *data* when referring to input or possibly throughput in the statistics production process (the term *data* includes *microdata* which, depending on the context, can be also an output).

Data ecosystem: a system in which a number of actors interact with each other to exchange, produce and utilize data. A system can be understood as a set of connected parts forming a complex whole. There are multiple other definitions of data ecosystem. The United Nations Development Programme model[14] consists of data producers, data objects, infomediaries (i.e., media and other commercial information services) and data users, while other models put the national statistical office-led national statistical system at the centre of a system that consists of government agencies, academia and research institutions, the private sector, civil society and international and regional organizations.

Data providers and statistics producers: this *Manual* distinguishes between *data providers*, who provide an input to the statistics production process (such as respondents and holders or owners of statistical, administrative and

[11] See https://stats.oecd.org/glossary.

[12] See http://ec.europa.eu/eurostat/ramon/index.cfm?TargetUrl=DSP_PUB_WELC.

[13] See https://sdmx.org/?sdmx_news=new-sdmx-glossary-available.

[14] United Nations Development Programme, "Data ecosystems for sustainable development", 2017, cited in PARIS21, "Proposing a framework for Statistical Capacity Development 4.0". Available at https://paris21.org/sites/default/files/inline-files/CD4.0-Framework_final.pdf.

other forms of data), and *statistics producers*, who produce a statistical output. Depending on the specific context, when using the term *data provider* this *Manual* refers only to holders or owners of data.

Data sources: this *Manual* distinguishes among three *data sources* according to their purpose and by the entity responsible for their compilation: *statistical data sources* such as surveys; *administrative data sources*; and *other data sources*. In general, *other data sources* include data sources associated with the term "big data" unless already included, in some instances, in statistical or administrative data sources. New data sources can often be associated with other data sources; however, they may be considered part of statistical or administrative data sources as well, depending on national circumstances.

Generic Activity Model for Statistical Organizations (GAMSO): a model that extends and complements the Generic Statistical Business Process Model by modelling additional activities that support statistical production.

Generic Statistical Business Process Model (GSBPM): a model that describes the processes used for the production of statistics, including the specification of needs, design, building, data collection, processing, analysis, dissemination of the products and evaluation of the process.

Generic Statistical Information Model (GSIM): an internationally agreed set of definitions, attributes and relationships that describe the pieces of information used in the production of official statistics.

Metadata: data that define and describe other data. Structural metadata and reference metadata can be distinguished from each other. *Structural metadata* define and accompany the data and consist of identifiers and descriptors that are essential for discovering, organizing, retrieving and processing a statistical data set (e.g., titles, subtitles, short descriptions, dimension names, variable names, etc.) *Reference metadata* are of a more general nature and describe statistical concepts and methodologies used for the collection and generation of data and provide information on data quality, thereby assisting users with the interpretation of the data. Contrary to structural metadata, reference metadata can be decoupled from the data (i.e., they can be generated, collected or disseminated separately from the statistics to which they refer).

National quality assurance framework (NQAF): a coherent and holistic system for statistical quality management that assures trust in and the quality of official statistics.

National statistical office (NSO): the leading statistical agency within a national statistical system. *National statistical office* and *national statistical institute* mean the same thing. In general, the NSO has a coordination role within the national statistical system, and is responsible for the development, production and dissemination of official statistics across multiple statistical domains.

National statistical system (NSS): the ensemble of statistical organizations and units (statistical agencies) within a country that develop, produce and disseminate official statistics on behalf of the national Government (and other levels of government). It is the responsibility of each country to define the scope of its NSS (see also *statistical agencies*, *data providers and statistics producers* and *data ecosystem*).

Official statistics: statistics that describe, on a representative basis, economic, demographic, social and environmental phenomena of public interest. Official

statistics are developed, produced and disseminated as a public good by the members of the NSS in compliance with the Fundamental Principles of Official Statistics and accepted quality frameworks such as the UN-NQAF, as well as other internationally agreed statistical standards and recommendations. In many countries, official statistics are defined and described in the statistical programmes.

Open data: digital data that is made available with the technical and legal characteristics necessary for it to be freely used, reused and redistributed by anyone, at any time, anywhere. There are many similarities between the statistical quality principles of the UN-NQAF and the criteria for open data used in the *Open Data Charter*,[15] such as timeliness and comprehensiveness, accessibility and usability, and comparability and interoperability.

[15] See https://opendatacharter.net.

Other statistics producers: entities that do not produce official statistics and are normally not members of the NSS. Other statistics producers have to be distinguished from other producers of official statistics, who are members of the NSS (see also *statistical agencies*).

Plan-Do-Check-Act cycle: a systematic way of thinking of quality and performance improvements starting with planning a change, implementing it, monitoring the process and resulting outputs against the objectives, and taking actions to improve performance, as necessary. The cycle was made popular by W. Edwards Deming.

Principle, requirement, element to be assured: a *principle* is a general proposition, or procedure, to which statistical agencies and organizations are committed and that will guide them in meeting their quality-related objectives. A *requirement* is something needed in order to ensure the implementation of the UN-NQAF in chapter 3. An *element to be assured* (provided in the annex) is a specific aspect of the UN-NQAF that identifies possible activities, methods and tools to meet the requirement. In this sense, an *element to be assured* reflects a good practice that is observed to work well in one or several NSOs or other producers of official statistics, and thus is a candidate to be promoted for use in other statistical agencies.

Quality: the degree to which a set of inherent characteristics of an object fulfils requirements.[16] A simple definition is "fit for use" or "fit for purpose". It is the users' needs that define the quality. Different users may have different needs that must be balanced against each other.

[16] See ISO 9000:2015.

Quality assessment: the part of quality assurance that focuses on an assessment of how well quality requirements (the stated needs or expectations) are fulfilled.

Quality assurance: a planned and systematic pattern of all the actions necessary to provide adequate confidence that a product will conform to established requirements.

Quality dimensions: for statistics, the general definition of quality is operationalized by specifying a set of factors or dimensions that characterize the quality of the product. The UN-NQAF identifies quality dimensions linked to statistical products in quality principles 14 to 18 (see table 3.1) covering the following dimensions (some principles cover two closely related dimensions):

Relevance: the extent to which the statistics satisfy the needs of the users.

Accuracy: the closeness of estimates to the exact or true values that the statistics were intended to measure.

Reliability: the closeness of the initially estimated value(s) to the subsequent estimated value(s) if preliminary figures are disseminated.

Timeliness: the length of time between the end of a reference period (or date) and the dissemination of the statistics.

Punctuality: the time lag between the release date and the target date by which the data or statistics should have been delivered.

Accessibility: the ease and conditions with which statistical information can be obtained.

Clarity: the availability of appropriate documentation relating to the statistics and the additional assistance that producers make available to users.

Coherence: the ability to reliably combine statistics and data sets in different ways and for various uses. *Consistency* is often used as a synonym for coherence.

Comparability: the extent to which differences in statistics from different geographical areas, non-geographical domains, or over time, can be attributed to differences between the true values of the statistics.

Quality management: the set of systems and frameworks in place within an organization to manage the quality of statistical products and processes. In the case of an NSO and other producers of official statistics, quality management also includes managing the statistical system and the institutional environment, as applicable. *Quality management* includes *quality assurance*, but the terms are often used interchangeably; quality management is a more overarching concept, while quality assurance implies a greater focus on concrete actions.

Respondent burden: the effort, in terms of time and cost, required for respondents to provide satisfactory answers to a survey.

Revision: a change in a value of statistics released to the public. Changes can be the result of errors, but normally the term "revision" is reserved for planned changes in published numbers. Statistics can be revised when more and better source data become available, or due to a change in methodology.

Risk management: the identification, analysis, assessment, control and avoidance, minimization or elimination of unacceptable events.

Source data: data collected (from respondents, administrative entities and other data providers) by members of the national statistical system to be used in the compilation and production of official statistics.

Statistical agencies: members of the NSS, encompassing the NSO and other producers of official statistics. Statistical agencies other than the NSO normally have other main purposes and tasks than the production of official statistics and only a section or a small group of people within the institution produces statistics. The quality requirements for processes and output are the same for all official statistics. However, for a ministry or administrative body where only a part of that body produces statistics, the requirements linked to the institutional environment apply only to the entity producing official statistics. For example, while the ministry or administrative body is typically not independent, the unit within the ministries/administrative bodies that is responsible for producing statistics should decide on how to produce and when to disseminate its statistics independently.

Statistical Data and Metadata eXchange (SDMX): an international initiative that aims at standardizing and modernizing ("industrializing") the mechanisms and processes for the exchange of statistical data and metadata among international organizations and their member countries.

Statistical purpose: tasks aimed at developing, producing and disseminating official statistics, including experimenting and testing.

Statistical standards: standards define and establish uniform specifications and characteristics for products and/or services. In the context of this *Manual*, *statistical standards* refers to a comprehensive set of statistical concepts, definitions, classifications[17] and models, methods and procedures used to achieve the uniform treatment of statistical issues within or across processes and across time and space.

[17] See, for example, https://unstats.un.org/unsd/classifications/Family.

Chapter 2
Recommendations on quality assurance for official statistics

Introduction

2.1. The recommendations presented in this chapter establish United Nations recommendations on statistical quality assurance based on the 10 Fundamental Principles of Official Statistics and related existing guidance (see table 2.1 and box 2.1). The recommendations are meant to guide and support the NSO and other members of the NSS in assuring the availability and quality of official statistics produced throughout the NSS by a multitude of statistics producers. Accordingly, the present chapter stresses the commitment to quality assurance by United Nations Member States and recommends concrete measures such as the adoption of a national quality assurance framework.

2.2. These recommendations can be updated and amended in the future according to changing circumstances, while the Fundamental Principles of Official Statistics are not expected to change. Countries may consider reflecting all recommendations in their national statistical laws[18] and/or regulations, according to their national circumstances.

2.A. Scope of the recommendations

2.3. *Who and what is subject to these recommendations.* The following recommendations apply to the NSS, which comprises the NSO and other producers of official statistics (other statistical agencies).[19] However, under specific circumstances, as established by countries, the recommendations are proposed to be used by other statistics producers and providers of data[20] that do not produce official statistics and are not part of the NSS.

2.4. *Members of the extended data ecosystem.* Examples of other producers of statistics and providers of data that frequently are not considered to be part of the NSS include:

(a) International and supranational agencies and entities;
(b) Enterprises that produce data on a regional or global scale, such as Gallup World Poll, or enterprises that provide transboundary geospatial information obtained, for example, by Earth observation;
(c) Private or public-private professional organizations, business associations or non-governmental entities;
(d) Enterprises that compile data from information generated and provided on the Internet;
(e) Scientific studies and measurements that aspire to provide statistical data;
(f) All types of citizen-generated data and statistics.[21]

[18] See, for example, *Generic Law on Official Statistics for Eastern Europe, Caucasus and Central Asia* (United Nations publication, Sales No. T.16.II.E.21). Available at https://ec.europa.eu/eurostat/ramon/statmanuals/files/UNECE_Generic_law_2016_EN.pdf.

[19] It is the responsibility of each country to define the scope of its national statistical system and thereby widen or narrow the scope of producers of statistics to whom these recommendations apply. See section 1.C. for a definition of the term "national statistical system".

[20] See section 1.C. for a definition of the terms "data providers" and "statistics producers".

[21] This list is only an indicative enumeration and not a classification of other statistics producers or data providers outside of an NSS.

2.5. Specific circumstances in which the recommendations may apply to other statistics producers could include, for example: when the statistics of such producers are published with the support of a member of the NSS, when they are used for government decision-making or when members of the NSS outsource or subcontract parts of the statistical production process to public or private entities that are not part of the NSS, such as universities and research centres.

2.B. Five core recommendations and nine additional recommendations for the implementation of the Fundamental Principles of Official Statistics

2.6. *Five overarching core recommendations*. Recommendation 1, together with recommendations 2 to 5, form the overarching core recommendations that, if implemented, establish the basis for quality assurance for official statistics in a country. Recommendation 1 is directly derived from two existing resolutions of the General Assembly on statistics.[22] Recommendations 2 to 5 are largely based on principle 1 of the Fundamental Principles of Official Statistics, which states that official statistics should meet the test of practical utility. Practical utility is defined as "fitness for use" or "fitness for purpose", which is the definition of data quality.

[22] Resolutions 68/261 on the Fundamental Principles of Official Statistics and 71/313 on the work of the Statistical Commission pertaining to the 2030 Agenda for Sustainable Development.

> Recommendation 1: **It is recommended** that, in order to be effective, the fundamental values and principles that govern the development, production and dissemination of official statistics be guaranteed by legal and institutional frameworks and be respected at all political levels and by all stakeholders in national statistical systems.

> Recommendation 2: **It is recommended** that countries include the requirements of quality assurance in their national statistical legislation and other legislation mandating the production of statistics for official use (derived from principle 1 of the Fundamental Principles of Official Statistics).[23]

[23] See, for example, *Generic Law on Official Statistics* (United Nations publication, Sales No. T.16.II.E.21). Available at https://ec.europa.eu/eurostat/ramon/statmanuals/files/UNECE_Generic_law_2016_EN.pdf.

> Recommendation 3: **It is recommended** that countries establish a national quality assurance framework for official statistics and that all members of the national statistical system commit to continually assessing, improving and reporting on the quality of official statistics, as well as on the quality of data and statistics used in the production of official statistics as required[24] (derived from principle 1 of the Fundamental Principles of Official Statistics).

[24] This commitment of members of the NSS should also, as deemed appropriate and required, extend to data and statistics that are disseminated jointly with other statistics producers that are not members of the NSS.

> Recommendation 4: **It is recommended** that the national quality assurance framework for official statistics be developed in consideration or in alignment with the United Nations National Quality Assurance Framework or similar existing quality assurance frameworks (derived from principles 1 and 2 of the Fundamental Principles of Official Statistics).

> Recommendation 5: **It is recommended** that the national quality assurance framework be implemented at the national statistical office and throughout the entire national statistical system. Furthermore, **it is recommended** that the national quality assurance framework be applied to all data and statistics produced outside of the national statistical system that are disseminated with the help and support of a member of the national statistical system or that are used for government decision-making, as deemed appropriate and required (derived from principle 1 of the Fundamental Principles of Official Statistics).

2.7. *Recommendations that aim at the implementation of specific Fundamental Principles of Official Statistics*. The following recommendations provide an interpreta-

tion of the Principles to facilitate their implementation and to stress their importance in the context of statistical quality assurance, as the Principles provide the normative basis for official statistics. The recommendations may be incorporated into a country's statistical laws, as appropriate, to assure adherence to the Principles.

2.8. Recommendations 6 to 14 are either directly derived from one or two of the Fundamental Principles of Official Statistics or are a repetition of a specific principle. The Principles and the associated recommendations of the present chapter support specific principles contained in the UN-NQAF and give them an obligatory character (see chapter 3, which contains references to the applicable Principles).

Recommendation 6: In accordance with principles 1 and 2 of the Fundamental Principles of Official Statistics, **it is recommended** that statistics at all levels, including the local level, be planned, designed, developed, produced and disseminated on an impartial basis, and according to strictly professional considerations.

Recommendation 7: In accordance with principle 3 of the Fundamental Principles of Official Statistics, **it is recommended** that statistics and data be presented in a way that facilitates their correct interpretation, which implies that appropriate metadata, such as that relating to data sources, methods and procedures used, be made available in conjunction with the released data or statistics.

Recommendation 8: In accordance with principle 4 of the Fundamental Principles of Official Statistics, **it is recommended** that all members of the national statistical system comment on erroneous interpretation and misuse of official statistics in their respective subject-matter domain(s) of statistical production and dissemination, as required.

Recommendation 9: In accordance with principles 1 and 5 of the Fundamental Principles of Official Statistics, **it is recommended** that countries include in their statistical laws: (a) the mandate of producers of official statistics to collect needed information to compile statistics directly from respondents if it is not already available in the national statistical system and cannot be obtained from existing data; and (b) the entitlement to select data sources based on professional considerations, including "new" sources such as big data.

Recommendation 10: In accordance with principle 6 of the Fundamental Principles of Official Statistics, **it is recommended** that individual data collected by statistical agencies for statistical compilation, whether they refer to natural or legal persons, be kept strictly confidential and used exclusively for statistical purposes.

Recommendation 11: In accordance with principle 7 of the Fundamental Principles of Official Statistics, **it is recommended** that the laws, regulations and measures under which the national statistical systems operate be made public.

Recommendation 12: In accordance with principle 8 of the Fundamental Principles of Official Statistics, **it is recommended** that the work of the national statistical system be properly coordinated to achieve consistency and efficiency, and that, therefore, the statistical law of the country: (a) clearly identifies the roles and responsibilities of the individual members within the national statistical system; and (b) establishes a body that is responsible for managing and coordinating system-wide activities, including promotion of the national quality assurance framework.

Recommendations 13: In accordance with principle 9 of the Fundamental Principles of Official Statistics, **it is recommended** that the national statistical office and all other members of the national statistical system, including members at the local level, use international statistical concepts, classifications and methods, thereby ensuring the consistency of official statistics and the efficiency of statistical systems at all levels.

Recommendation 14: In accordance with principle 10 of the Fundamental Principles of Official Statistics, **it is recommended** that countries participate in bilateral and multilateral cooperation in statistics to improve official statistics in all countries.

Table 2.1
Origins of the recommendations on quality assurance for official statistics

Recommendations		General Assembly resolutions[a]	Fundamental Principles of Official Statistics									
			1	2	3	4	5	6	7	8	9	10
Overarching core recommendations	#1 Integrate Fundamental Principles of Official Statistics into the legal and institutional frameworks	✸										
	#2 Include the requirement for quality assurance in the statistical legislation		✸									
	#3 Establish an NQAF; commit to quality assurance		✸									
	#4 Base or align the NQAF with international or regional quality frameworks		✸	✸								
	#5 Implement the NQAF comprehensively		✸									
Recommendations that aim at the implementation of specific Fundamental Principles of Official Statistics	#6 Be impartial and follow professional considerations		✸	✸								
	#7 Present data properly and provide metadata				✸							
	#8 Address erroneous interpretation and misuse					✸						
	#9 Include adequate rights to access data from all sources for statistical purposes						✸					
	#10 Ensure statistical confidentiality							✸				
	#11 Make the laws and regulations under which the NSS operates public								✸			
	#12 Take measures to ensure the proper coordination of the NSS									✸		
	#13 Use international concepts, classifications and methods										✸	
	#14 Participate in bilateral and multilateral cooperation											✸

[a] Resolutions 68/261 on the Fundamental Principles of Official Statistics, and 71/313 on the work of the Statistical Commission pertaining to the 2030 Agenda for Sustainable Development.

Box 2.1
Fundamental Principles of Official Statistics[a]

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.

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[a] General Assembly resolution 68/261. The 10 Fundamental Principles of Official Statistics are not to confused be with the UN-NQAF quality principles in this *Manual*, which are presented in chapter 3. See table 3.1 on how the 10 Fundamental Principles of Official Statistics support the 19 UN-NQAF quality principles.

Chapter 3
United Nations National Quality Assurance Framework: principles and requirements

Introduction

3.1. The UN-NQAF addresses quality assurance with regard to the development, production and dissemination of official statistics. The UN-NQAF quality principles and associated requirements consist of four levels, ranging from overarching institutional and cross-institutional management and statistical production processes to the outputs (see also chapter 4, figure 4.1):

Level A: Managing the statistical system;

Level B: Managing the institutional environment;

Level C: Managing statistical processes;

Level D: Managing statistical outputs.

3.2. Each level contains a concise set of principles and requirements to guarantee quality in that aspect of quality assurance. These requirements are vital indicators that, when met, will ensure that provisions have been made to assure quality.

3.3. A list of elements to be assured, which supports and assists the implementation of the principles and requirements and provides more detail, is available in the annex. The elements to be assured can be seen as good practices, meaning that not all elements are equally needed or relevant for all countries. However, the elements should be followed or assured as long as they are applicable. In this view, the annex is an integral part of chapter 3.

3.4. While striving for compliance with the quality assurance framework, it should be kept in mind that there are trade-offs among the principles.[25] There are, for example, trade-offs among accuracy, timeliness and cost-efficiency. The editing of data used for statistics production improves accuracy, but increases costs and may have a negative effect on timeliness. Another example is the trade-off between timeliness and punctuality, as ambitious goals for timeliness may lead to the rescheduling of release times, and result in a lower level of punctuality. Therefore, targets cannot be set for individual principles in isolation. Consideration of such trade-offs is an important part of statistical professionalism emphasized in the Fundamental Principles of Official Statistics.

3.5. The UN-NQAF and its principles and requirements are not mandatory, and countries may choose and follow their own national quality assurance frameworks. However, UN-NQAF quality principles and requirements are strongly connected to the Fundamental Principles of Official Statistics agreed by United Nations Member States and the recommendations on quality assurance detailed in chapter 2. Therefore, implementing the principles of the UN-NQAF or a similar NQAF is required if a country wishes to follow the Fundamental Principles of Official Statistics

[25] Data quality is multidimensional and there is no ranking among the individual quality principles. The principles should be applied in a balanced way depending on the specific situation. Some of the principles are codified in statistical laws (also called statutory requirements) which can give them a mandatory character.

and the recommendations set out in chapter 2 of this *Manual*. Table 3.1 shows how the UN-NQAF quality principles are linked to and supported by the Fundamental Principles of Official Statistics. Among particular quality principles supported by the Fundamental Principles of Official Statistics, there is a distinction between a Fundamental Principle that provides strong support (usually one Fundamental Principle per quality principle), and a Fundamental Principle that provides additional support.

Table 3.1
United Nations National Quality Assurance Framework quality principles and supporting Fundamental Principles of Official Statistics

Quality principles	Fundamental Principles of Official Statistics									
	1	2	3	4	5	6	7	8	9	10
Level A: Managing the statistical system										
1: Coordinating the national statistical system								✸		
2: Managing relationships with data users, data providers and other stakeholders	✸				✸			○		○
3: Managing statistical standards									✸	
Level B: Managing the institutional environment										
4: Assuring professional independence	○	✸					○			
5: Assuring impartiality and objectivity	✸	○	○	○	○		○			
6: Assuring transparency			✸				○			
7: Assuring statistical confidentiality and data security						✸				
8: Assuring commitment to quality		✸								
9: Assuring adequacy of resources	○									
Level C: Managing statistical processes										
10: Assuring methodological soundness		✸			○				○	○
11: Assuring cost-effectiveness					✸				○	
12: Assuring appropriate statistical procedures		✸			○					
13: Managing the respondent burden					✸					
Level D: Managing statistical outputs										
14: Assuring relevance	✸		○		○					
15: Assuring accuracy and reliability	✸				○					
16: Assuring timeliness and punctuality	✸				○					
17: Assuring accessibility and clarity	✸		○							
18: Assuring coherence and comparability	✸		○						○	
19: Managing metadata			✸						○	

Legend:

✸ Fundamental Principles of Official Statistics (usually one) providing very strong support

○ Additional supporting Fundamental Principles of Official Statistics (subject to different views)

3.6. Some overlap among the quality principles of the UN-NQAF in terms of their underlying requirements is unavoidable and appropriate because they refer to different levels and must be interpreted in different contexts. Cross-cutting and important issues such as relations with stakeholders, transparency, quality commitment, cost-effectiveness and metadata management are examples of issues addressed by various principles. Table 3.2 shows the most important interlinkages among the 19 UN-NQAF principles.

Table 3.2
Main interlinkages among the United Nations National Quality Assurance Framework quality principles

Level	Quality principles	Quality principles																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Managing the statistical system	1: Coordinating the national statistical system		✸																	
	2: Managing relationships with data users, data providers and other stakeholders	✸												✸	✸					
	3: Managing statistical standards																		✸	
Managing the institutional environment	4: Assuring professional independence																			
	5: Assuring impartiality and objectivity						✸		✸								✸			
	6: Assuring transparency					✸												✸		
	7: Assuring statistical confidentiality and data security																			
	8: Assuring commitment to quality					✸														
	9: Assuring adequacy of resources											✸								
Managing statistical processes	10: Assuring methodological soundness												✸							
	11: Assuring cost-effectiveness									✸										
	12: Assuring appropriate statistical procedures										✸									✸
	13: Managing the respondent burden		✸																	
Managing statistical outputs	14: Assuring relevance		✸																	
	15: Assuring accuracy and reliability																			
	16: Assuring timeliness and punctuality					✸														
	17: Assuring accessibility and clarity						✸													✸
	18: Assuring coherence and comparability			✸																
	19: Managing metadata												✸					✸		

Legend:

✸ Interlinkages among UN-NQAF principles

3.A. Level A: Managing the statistical system

The national statistical system comprises the statistical agencies or units within a country that develop, produce and disseminate official statistics on behalf of the national Government, normally with the national statistical office as the leading agency. Coordination of this system and managing relations with all stakeholders is a precondition for the quality and efficient production of official statistics. Ensuring the use of common statistical standards throughout the system is an important part of this management.

Principle 1: Coordinating the national statistical system

Coordination of the work of the members of the NSS is essential for improving and maintaining the quality of official statistics. Principle 1 is supported by principle 8 of the Fundamental Principles of Official Statistics.

Requirement 1.1: A statistical law establishes the responsibilities of the members of the national statistical system, including its coordination. Its members are identified in a legal or formal provision.

Requirement 1.2: There are a body and mechanisms for the coordination of the national statistical system for activities at the local, national, regional and international level.

Requirement 1.3: There is a mechanism for considering statistics produced outside the national statistical system and, if appropriate, for those statistics to become official.

Requirement 1.4: There is a national plan or programme for the development and production of official statistics.

Principle 2: Managing relationships with data users, data providers and other stakeholders

The statistical agencies should build and sustain good relationships with all their key stakeholders, including users, data providers, funding agencies, senior government officials, relevant community organizations, academia and the media. The statistical agencies should have access to all data necessary to satisfy the information needs of society in an effective and efficient way. Principle 2 is supported mainly by principles 1 and 5 of the Fundamental Principles of Official Statistics.

Requirement 2.1: Stakeholders are identified and consulted regarding their interests, needs and obligations.

Requirement 2.2: The statistical agencies have a strategy, and institutional arrangements are in place to engage with their users.

Requirement 2.3: The statistical agencies continuously maintain and develop cooperation with funding agencies, academic institutions and international statistical organizations, as appropriate.

Requirement 2.4: The national statistical office and, if appropriate, other statistical agencies have the legal authority or some other formal provision to collect data for the development, production and dissemination of official statistics.

Requirement 2.5: The national statistical office and, if appropriate, other statistical agencies have the legal authority or some other formal provision to obtain administrative data and adequate access to those data from other government agencies for statistical purposes.

Requirement 2.6: The national statistical office and, if appropriate, other statistical agencies have the legal authority or some other formal provision and related agreements to access and use data (including big data) maintained by private corporations or other non-governmental organizations for statistical purposes on a regular basis, including for testing and experimentation.

Requirement 2.7: The national statistical office cooperates with and provides support and guidance to data providers.

Principle 3: Managing statistical standards

Standards refer to a comprehensive set of statistical concepts, definitions, classifications and models, methods and procedures used to achieve the uniform treatment of statistical issues within or across processes and across time and space. The use of standards promotes the consistency and efficiency of statistical systems at all levels. Principle 3 is supported by principle 9 of the Fundamental Principles of Official Statistics.

Requirement 3.1: The statistical agencies cooperate in the development and implementation of international, regional and national statistical standards.

Requirement 3.2: The national statistical office provides support and guidance to all data providers and producers of official statistics in the implementation of statistical standards.

Requirement 3.3: Divergences from the international, regional or national statistical standards are kept to a minimum, and are documented and explained to all stakeholders.

3.B. Level B: Managing the institutional environment

The quality of the institutional environment is one of the prerequisites to ensuring the quality of statistics. Principles to be assured are professional independence, impartiality and objectivity, transparency, statistical confidentiality, quality commitment and the adequacy of resources.

Principle 4: Assuring professional independence

Statistical agencies should develop, produce and disseminate statistics without any political or other interference or pressure from other government agencies or policy, regulatory or administrative departments and bodies, the private sector or any other persons or entities. Such professional independence and freedom from inappropriate influence ensures the credibility of official statistics. This should apply to the national statistical office as well as to other producers of official statistics. Principle 4 is supported mainly by principle 2 of the Fundamental Principles of Official Statistics.

Requirement 4.1: A law or other formal provision explicitly declares that statistical agencies are obligated to develop, produce and disseminate statistics without interference from other government agencies or policy, regulatory or administrative departments and bodies, including from within the statistical agencies, private sector or any other persons or entities.

Requirement 4.2: The appointment of the heads of the national statistical office, and other statistical agencies where appropriate, is based on professional criteria and follows transparent procedures. Reasons for dismissal cannot include reasons affecting professional independence. The heads of the statistical agencies are of the highest professional calibre.

Requirement 4.3: The heads of the national statistical office and, if appropriate, other statistical agencies have sole responsibility over the decisions on statistical methods, standards and procedures, and on the content and timing of statistical releases.

Principle 5: Assuring impartiality and objectivity

Statistical agencies should develop, produce and disseminate statistics respecting scientific independence and in a way that is professional, impartial and unbiased, and in which all users are treated equitably. Principle 5 is supported mainly by principle 1 of the Fundamental Principles of Official Statistics.

Requirement 5.1: There is a law or formal provision in force, which is publicly available, that specifies that statistical agencies should develop, produce and disseminate statistics following professional standards and treat all users in the same way.

Requirement 5.2: The statistical agencies implement a declaration or code of conduct or ethics that governs statistical practices, and compliance with it is followed up.

Requirement 5.3: Data sources and methodologies are chosen on an objective basis.

Requirement 5.4: Statistical releases are clearly distinguished from political/policy statements.

Requirement 5.5: Statistical release dates and times are announced in advance.

Requirement 5.6: In cases in which errors are detected, they are corrected as soon as possible, and users are informed as to how they affected the released statistics.

Requirement 5.7: The statistical agencies comment publicly on statistical issues, misinterpretation and misuse of official statistics, as appropriate.

Principle 6: Assuring transparency

Statistical agencies' policies and management practices, and the terms and conditions under which their statistics are developed, produced and disseminated and, if applicable, subsequently revised (including the legal basis and purposes for which the data are required), are documented and available to users, respondents, owners of source data and the public. Principle 6 is supported mainly by principle 3 of the Fundamental Principles of Official Statistics.

Requirement 6.1: The terms and conditions for producing and disseminating official statistics are available to the public.

Requirement 6.2: The terms and conditions for the governance and management of statistical agencies are available to the public.

Principle 7: Assuring statistical confidentiality and data security

Statistical agencies should guarantee that the privacy of data providers (persons, households, enterprises and other data providers) will be protected, and that the information they provide will be kept confidential, will not be able to be accessed by unauthorized internal or external users and will be used for statistical purposes only. Principle 7 is supported by principle 6 of the Fundamental Principles of Official Statistics.

Requirement 7.1: Statistical confidentiality is guaranteed by law.

Requirement 7.2: Appropriate standards, guidelines, practices and procedures are in place to ensure statistical confidentiality.

Requirement 7.3: Strict protocols to safeguard data confidentiality apply to users with access to microdata for research or statistical purposes.

Requirement 7.4: Penalties are prescribed for any wilful breaches of statistical confidentiality.

Requirement 7.5: The security and integrity of data and their transmission is guaranteed by appropriate policies and practices.

Requirement 7.6: The risk that individual respondents may be identified is assessed and managed.

Principle 8: Assuring commitment to quality

Statistical agencies should be dedicated to assuring quality in their work, and systematically and regularly identify strengths and weaknesses to continuously improve process and product quality. Principle 8 is supported by principle 2 of the Fundamental Principles of Official Statistics.

Requirement 8.1: There is a quality policy or a statement of the statistical agency's commitment to quality, which is publicly available.

Requirement 8.2: The statistical agencies promote a culture of continuous improvement.

Requirement 8.3: There is a specific body responsible for quality management or the coordination of quality management within the statistical agency, and it receives necessary support to fulfil this role.

Requirement 8.4: The national statistical system staff receive training on quality management.

Requirement 8.5: Guidelines for implementing quality management are defined and made available to the public.

Requirement 8.6: Indicators on statistical output quality are regularly measured, monitored, published and followed up to improve statistical products and processes.

Requirement 8.7: Statistical products and processes undergo periodic reviews.

Requirement 8.8: Risk analyses addressing the quality of important statistical products and processes are performed.

Principle 9: Assuring adequacy of resources

The financial, human, and technological resources available to statistical agencies should be adequate both in magnitude and quality, and sufficient to meet their needs regarding the development, production and dissemination of statistics.

Requirement 9.1: Financial, human and technological resources are sufficient to implement the statistical work and development programme.

Requirement 9.2: Planning and management principles are aimed at the optimal use of available resources.

Requirement 9.3: The statistical agencies' use of resources is reviewed.

3.C. Level C: Managing statistical processes

International standards, guidelines and good practices are fully observed in the statistical processes used by the statistical agencies to develop, produce and disseminate official statistics, while constantly striving for innovation. The credibility of the statistics is enhanced by a reputation for good management and efficiency. The relevant principles to be assured are methodological soundness, cost-effectiveness, appropriate statistical procedures and managing the respondent burden.

Principle 10: Assuring methodological soundness

In developing and producing statistics, the statistical agencies should use sound statistical methodologies based on internationally agreed standards, guidelines or best practices. Principle 10 is supported mainly by principle 2 of the Fundamental Principles of Official Statistics.

Requirement 10.1: The methodologies applied by statistical agencies are consistent with international standards, guidelines and good practices, and are regularly reviewed and revised as needed.

Requirement 10.2: The statistical agencies recruit qualified staff and conduct regular programmes to enhance their methodological skills.

Requirement 10.3: The statistical agencies choose data sources taking into account accuracy and reliability, timeliness, cost, the burden on respondents and other necessary considerations.

Requirement 10.4: The registers and the frames for surveys are frequently evaluated and adjusted.

Requirement 10.5: The statistical agencies cooperate with the scientific community to improve methods and promote innovation in the development, production and dissemination of statistics.

Principle 11: Assuring cost-effectiveness

Statistical agencies should assure that resources are effectively and efficiently used. They should be able to explain to what extent set objectives were attained, that the results were achieved at a reasonable cost and are consistent with the principal purposes of the statistics. Principle 11 is supported mainly by principle 5 of the Fundamental Principles of Official Statistics.

Requirement 11.1: The costs of producing all individual statistics are measured and analysed, and mechanisms are in place to assure the cost-effectiveness of statistical activities or processes.

Requirement 11.2: Procedures exist to assess and justify demands for new statistics against their cost.

Requirement 11.3: Procedures exist to assess the continuing need for all statistics, to determine whether any can be discontinued to free up resources.

Requirement 11.4: Modern information and communication technologies are applied to improve the performance of statistical processes.

Requirement 11.5: Proactive efforts are made to improve the statistical potential of administrative data and other data sources.

Requirement 11.6: The statistical agencies define, promote and implement integrated and standardized production systems.

Principle 12: Assuring appropriate statistical procedures

Effective and efficient statistical procedures underpin quality and should be implemented throughout the statistical production chain. Principle 12 is supported mainly by principle 2 of the Fundamental Principles of Official Statistics.

Requirement 12.1: Statistical processes are tested before implementation.

Requirement 12.2: Statistical processes are well established and regularly monitored and revised as required.

Requirement 12.3: Procedures are in place to effectively use administrative and other data sources for statistical purposes.

Requirement 12.4: Revisions of statistics follow standard and transparent procedures.

Requirement 12.5: Metadata and documentation of methods and different statistical processes are managed throughout the processes and shared as appropriate.

Principle 13: Managing the respondent burden

Individuals, households or businesses that provide the data upon which statistical products are based are fundamental contributors to the quality of data and information. The requirement to collect data should be balanced against production costs and the burden placed on respondents. Mechanisms to maintain good relationships with providers of data and to proactively manage the respondent burden are essential to improving quality. Principle 13 is supported by principle 5 of the Fundamental Principles of Official Statistics.

Requirement 13.1: The range and detail of requested information is limited to what is necessary.

Requirement 13.2: Mechanisms are in place to promote the value and use of statistics to respondents.

Requirement 13.3: Sound methods, including information technology (IT) solutions, are used in surveys to reduce or distribute respondent burden.

Requirement 13.4: Data sharing, data linkage and the use of administrative and other data sources are promoted to minimize respondent burden.

3.D. Level D: Managing statistical outputs

Statistics serve the needs of national Governments, research institutions, businesses, the general public and the international community. Output quality is measured by the extent to which the statistics are relevant, accurate and reliable, timely and punctual, readily accessible by and clear to users, and coherent and comparable across geographical regions and over time.

Principle 14: Assuring relevance

Statistical information should meet the current and/or emerging needs or requirements of its users. Without relevance, there is no quality. However, relevance is subjective and depends upon the varying needs of users. The statistical agency's challenge is to weigh and balance the conflicting needs of current and potential users to produce statistics that satisfy the most important and highest priority needs within the given resource constraints. Principle 14 is supported mainly by principle 1 of the Fundamental Principles of Official Statistics.

Requirement 14.1: Procedures are in place to identify users and their needs and to consult them about the content of the statistical work programme.

Requirement 14.2: Users' needs and requirements are balanced, prioritized and reflected in the work programme.

Requirement 14.3: Statistics based on new and existing data sources are being developed in response to society's emerging information needs.

Requirement 14.4: User satisfaction is regularly measured and systematically followed up.

Principle 15: Assuring accuracy and reliability

Statistical agencies should develop, produce and disseminate statistics that accurately and reliably portray reality. The accuracy of statistical information reflects the degree to which the information correctly describes the phenomena it was designed to measure, namely, the degree of closeness of estimates to true values. Principle 15 is supported mainly by principle 1 of the Fundamental Principles of Official Statistics.

Requirement 15.1: Source data, integrated data, intermediate results and statistical outputs are regularly assessed and validated.

Requirement 15.2: Sampling errors are measured, evaluated and documented. Non-sampling errors are described and, when possible, estimated.

Requirement 15.3: Studies and analyses of revisions are carried out and used to improve data sources, statistical processes and outputs.

Principle 16: Assuring timeliness and punctuality

Statistical agencies should minimize the delays in making statistics available. Timeliness refers to how quickly—after the reference date or the end of the reference period—the data and statistics are made available to users. Punctuality refers to whether data and statistics are delivered on the promised, advertised or announced dates. Principle 16 is supported mainly by principle 1 of the Fundamental Principles of Official Statistics.

Requirement 16.1: The timeliness of the statistical agency's statistics comply with international standards or other relevant timeliness targets.

Requirement 16.2: The relationship with data providers is managed with regard to timeliness and punctuality needs.

Requirement 16.3: Preliminary results can be released when their accuracy and reliability is acceptable.

Requirement 16.4: Punctuality is measured and monitored according to planned release dates, such as those set in a release calendar.

Principle 17: Assuring accessibility and clarity

Statistical agencies should ensure that the statistics they develop, produce and disseminate can be found and obtained without difficulty, are presented clearly and in such a way that they can be understood, and are available and accessible to all users on an impartial and equal basis in various convenient formats in line with open data standards. Provision should be made for allowing access to microdata for research purposes, in accordance with an established policy that ensures statistical confidentiality. Principle 17 is supported mainly by principle 1 of the Fundamental Principles of Official Statistics.

Requirement 17.1: Statistics are presented in a form that facilitates proper interpretation and meaningful comparisons.

Requirement 17.2: A data dissemination strategy and policy exists and is made public.

Requirement 17.3: Modern information and communication technology is used for facilitating easy access to statistics.

Requirement 17.4: Access to microdata is allowed for research purposes, subject to specific rules and protocols on statistical confidentiality that are posted on the statistical agency's website.

Requirement 17.5: Mechanisms are in place to promote statistical literacy.

Requirement 17.6: The statistical agencies have a dedicated focal point that provides support and responds to inquiries from users in a timely manner.

Requirement 17.7: Users are kept informed about the quality of statistical outputs.

Principle 18: Assuring coherence and comparability

Statistical agencies should develop, produce and disseminate statistics that are consistent, meaning it should be possible to combine and make joint use of related data, including data from different sources. Furthermore, statistics should be comparable over time and between areas. Principle 18 is supported mainly by principle 1 of the Fundamental Principles of Official Statistics.

Requirement 18.1: International, regional and national standards are used with regard to definitions, units, variables and classifications.

Requirement 18.2: Procedures or guidelines are in place to ensure and monitor internal, intrasectoral and cross-sectoral coherence and consistency.

Requirement 18.3: Statistics are kept comparable over a reasonable period of time and between geographical areas.

Principle 19: Managing metadata

Statistical agencies should provide information covering the underlying concepts and definitions of the data collected and statistics produced, the variables and classifications used, the methodology of data collection and processing, and indications of the quality of the statistical information—in general, sufficient information to enable the user to understand all of the attributes of the statistics, including their limitations. Principle 19 is supported mainly by principle 3 of the Fundamental Principles of Official Statistics.

Requirement 19.1: The metadata management system of the statistical agency is well defined and documented.

Requirement 19.2: Metadata are documented, archived and disseminated according to internationally accepted standards.

Requirement 19.3: Staff training and development programmes are in place on metadata management and related information and documentation systems.

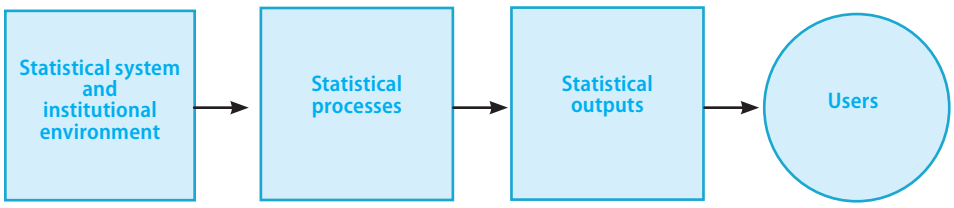
Chapter 4
Assessment tools and risk management

Introduction

4.1. Chapter 4 introduces the concepts of quality management and quality assessment in the context of the statistical production process. Section 4.A describes the Generic Statistical Business Process Model (GSBPM), the Generic Activity Model for Statistical Organizations (GAMSO) and the Generic Statistical Information Model (GSIM) as important tools that support quality management and assessment. Metadata management is briefly introduced in section 4.B, and methods and tools for quality assessment are discussed in section 4.C, the main part of the chapter. The concept of risk management is introduced, and its relationship to quality management explained in section 4.D. While some basic explanation of the various quality assessment tools is provided, readers will need to consult the respective references for more detailed information on their use.

4.2. The UN-NQAF was developed using existing statistical quality frameworks (see introduction to quality management in section 1.B). It follows the holistic model of quality management, including the statistical system and institutional environment and statistical processes and outputs (see figure 4.1).

Figure 4.1
Quality management framework of the United Nations National Quality Assurance Framework



4.3. *Quality assessment as part of quality management.* Statistical quality assessment is an important part of the overall quality management system of a statistical organization. It frequently focuses on the statistical products and processes leading to their production, but can also encompass the statistical system and institutional environment. Methods and tools for statistical quality assessment comprise quality indicators (for both products and processes), quality reports, user surveys and external and self-assessments and auditing (internal or external quality reviews), including peer reviews. The assessments may lead to labelling and certification. Use of these methods in an efficient and cost-effective manner requires that they be used in combination with each other. For example, quality reports can be the basis for audits and user feedback.

4.A. Quality management, the Generic Statistical Business Process Model and the Generic Activity Model for Statistical Organizations

4.4. *Quality management and the GSBPM*. The improvement in quality of statistical products requires the improvement of statistical processes. The GSBPM describes and defines the set of business processes needed to produce official statistics, and thereby provides a framework for process quality documentation, assessment and improvement. The GSBPM facilitates the assurance of UN-NQAF requirements (see, for example, requirement 8.7 in the annex). Quality management is defined in the GSBPM as an overarching process that includes quality assessment and control mechanisms. It recognizes the importance of evaluation and feedback throughout the statistical business process. Metadata management is recognized as another overarching process that is closely linked to quality management. Figure 4.2 illustrates the main structure of the GSBPM (the first of a total of three levels).

Figure 4.2
Generic Statistical Business Process Model – statistical production process and quality management[a]

[a] See GSBPM (version 5.1, January 2019). Available at https://statswiki.unece.org/display/GSBPM/GSBPM+v5.1.

4.5. *Relationship between the GAMSO and the GSBPM*. While the GSBPM focuses on statistical production processes, it does not elaborate in detail on the additional activities (e.g., human resource management, statistical programme management) needed to support production. The GAMSO[26] describes and defines the activities that take place within a typical organization that produces official statistics. It extends and complements the GSBPM by adding additional activities needed to support the production of statistics, thus providing a broader context of corporate strategies, capabilities and support that are important for statistical quality management.

[26] See GAMSO (version 1.2, January 2019). Available at https://statswiki.unece.org/display/GAMSO/Generic+Activity+Model+for+Statistical+Organizations.

4.6. *Using the GSBPM and the GAMSO for quality management*. The GSBPM and the GAMSO establish a common language when referring to statistical business processes and activities that take place within a typical statistical organization. In particular, the GSBPM is intended to apply to all production activities undertaken by producers of official statistics that result in statistical outputs. It is designed to be independent of the data source, so it can be used for the description and quality assessment of processes based on surveys, censuses, administrative records and other or mixed sources. One needs to understand all relationships and interlinkages among different activities and intermediate outputs in order to improve the quality of statistical products and processes. The GSBPM also supports the management of reference metadata. After identifying the product or process that needs quality improvement, the GSBPM (and the GAMSO) function as a navigator for users of a national quality assurance framework to ensure they take the most efficient path for assuring data quality at all phases, from specifying needs to conducting evaluations.[27]

[27] The GSBPM and the GAMSO are models relevant for all aspects of quality management. However, there are other statistical models, such as the Generic Statistical Data Editing Models (see https://statswiki.unece.org/display/sde/Statistical+Data+Editing), that cover very specific aspects of quality management in great technical detail.

4.B. Metadata management

4.7. *Metadata management as a tool for quality assurance*. The use and good management of metadata is essential to assure quality and the efficient operation of statistical processes. Metadata management can be facilitated and guided by the use of standard models such as the GSBPM, as stated in the previous paragraph, and the GSIM.[28] The GSIM is a reference framework of internationally agreed definitions, attributes and relationships that describe the pieces of information used in the production of official statistics (information objects). It covers the entire statistical process and includes information on objects used in phases of the GSBPM, and ranges from specifying needs to conducting evaluations and assessments. The GSIM supports and is consistent with part A of the Common Metadata Framework,[29] which identifies the 16 core principles of metadata management recommended for the design and implementation of a statistical metadata system. One approach would be to assess the compliance of an organization's metadata management with these 16 principles. Requirements for metadata are important in the UN-NQAF and are reflected in requirements 12.5 and 17.1 and in quality principle 19 on managing metadata.

[28] GSIM (version 1.2). Available at https://statswiki.unece.org/display/gsim/GSIM+and+standards.

[29] See Economic Commission for Europe (ECE), "Common Metadata Framework, Part A: Statistical metadata in a corporate context: A guide for managers". Available at https://unstats.un.org/unsd/EconStatKB/KnowledgebaseArticle10163.aspx.

4.C. Methods and tools for quality assessment

4.8. This section briefly introduces the methods and tools for quality assessment. In general, the use of quality indicators, the production of quality reports and the conduct of user surveys are considered to be the basic level of quality assessment. Self-assessments and audits constitute the next level of quality assessment, while labelling and certification can be looked upon as advanced practices.[30]

[30] See Eurostat, "Handbook on data quality assurance methods and tools". Available at https://unstats.un.org/unsd/dnss/docs-nqaf/Eurostat-HANDBOOK%20ON%20DATA%20QUALITY%20ASSESSMENT%20METHODS%20AND%20TOOLS%20%20I.pdf. The list of tools is not exhaustive. For example, countries may also use so-called control panels as a checklist in each of the phases of the GSBPM model.

Essential tools for quality assessment (basic level of quality assessment)

4.9. *Quality principles*. Before conducting a quality assessment it is necessary to gain a clear understanding of the quality principles, requirements and elements that are applicable to statistical outputs, statistical processes, the national statistical system as a whole and the institutional environment (see chapter 3 and the annex for details):

(a) The UN-NQAF defines product quality in terms of five quality principles: relevance; accuracy and reliability; timeliness and punctuality; accessibility and clarity; and coherence and comparability;

(b) The UN-NQAF defines process quality in terms of four quality principles: methodological soundness; cost-effectiveness; appropriate statistical procedures; and managing respondent burden;

(c) The UN-NQAF defines quality of the NSS and the institutional environment in terms of nine quality principles: coordination; relationships with stakeholders; statistical standards; professional independence; impartiality and objectivity; transparency; statistical confidentiality and data security; commitment to quality; and adequacy of resources.

4.10. *Quality indicators*. Quality indicators have to be identified (or developed) in order to measure compliance with the respective quality principles and requirements. They are specific and measurable elements of statistical practice that can be used to characterize the quality of statistics. They measure the quality of statistical products or processes from several aspects and, for example, can give an indication of both the output (e.g., timeliness) and process quality (e.g., response rates that can be used as a proxy for accuracy). Quality indicators allow for the description and comparison of quality among different statistics and over time. When quality indicators

are used to inform users about the quality of statistics, qualitative statements should be included to help users interpret information on quality and summarize its main effects on the usability of the statistics. Quality indicators are important for process management and continuous improvement, and are reflected in UN-NQAF requirement 8.6.

4.11. Work on defining and developing quality indicators can be undertaken by survey managers, data collection specialists and methodologists, and should also take into consideration input from users. Statistical agencies and units may simply draw from existing lists of quality indicators, including a list of quality indicators linked to the different stages of the GSBPM.[31] The statistical agency can also set levels of requirements for the quality indicators in the form of quality targets. The defined targets can then serve as a tool for monitoring quality developments over time.[32]

4.12. *Quality reports*. Communicating about the quality of a statistical process or product can be accomplished through the preparation of reports that explain and review the main characteristics of the process and its products. Because of the multidimensional nature of quality, quality reports typically examine and describe quality according to those components or dimensions (quality principles) the agency has used to define its products' fitness for purpose. The reports are meant to convey the necessary information to enable users to assess the quality of the product. Different user groups should be clearly identified and may be presented with different subsets of quality indicators. While a main target group of a quality report is the users of the statistics, quality reports are also an important monitoring tool for statistics producers and managers. In the optimal case, quality reports are based on specific quality indicators and are presented according to a standard reporting structure to facilitate comparability.[33] The need for quality reports is reflected in UN-NQAF requirement 17.7 and in the list of associated elements to be assured (see annex).

4.13. *User surveys*. User feedback is a crucial element in the set of information needed for a comprehensive quality assessment. The statistical agency should regularly consult with its users about their needs and perceptions of quality, take them into account in the quality assessment exercise and follow up with the users, for example through meetings (e.g., focus group discussions) or in a more formal way by using user satisfaction surveys. Since the main objective of user surveys is normally to collect information on the users' perceptions and use it as a basis for improvement, their results can provide valuable inputs to the self-assessment and auditing activities described below. There are different groups of users of statistics; therefore, different types of user surveys should be carried out. User satisfaction surveys can take different forms (e.g., standardized questionnaires, qualitative interviews, web-based surveys, etc.). The choice will depend on the type of feedback required and on the resources available. In accordance with UN-NQAF requirement 14.4, user satisfaction should be regularly measured and systematically followed up.

4.14. *Role of the quality assurance framework as a tool*. An NQAF can be used as a basis on which to develop quality indicators. However, as a tool, it is more directly applicable as a template for self-assessments.

Tools for next-level quality assessments

4.15. *Self-assessments and other assessment and auditing practices (internal or external quality reviews), including peer reviews.* Based on the information collected by the statistical agency using the tools mentioned above, the quality of the processes and products can be evaluated and eventually labelled. Evaluation can be done in the form of self-assessments, other assessments, audits or peer reviews, which are very powerful approaches that allow organizations to check and review their processes and prod-

[31] See, for example, High-level Group for the Modernisation of Official Statistics, "Quality indicators for the Generic Statistical Business Process Model (GSBPM),for statistics derived from surveys and administrative data sources (version 2.0, October 2017). Available at https://statswiki.unece.org/display/GSBPM/Quality+Indicators.

[32] Target setting is frequently subjective and may first require the identification of a stable level. Target setting also depends on the objective, such as maintaining the existing level or achieving improvements. However, some targets are set by government ministries or international organizations (e.g., IMF, OECD and Eurostat), particularly with regard to coverage, periodicity and timeliness. Targets are also often set, implicitly or explicitly, with regard to revisions of data (reliability).

[33] See Eurostat, *ESS Handbook for Quality Reports*, 2014 ed. (Luxembourg, Publications Office of the European Union, 2015). For information on other tools and standards on quality reporting developed by Eurostat, see https://ec.europa.eu/eurostat/web/quality/quality-reporting.

ucts. They can be undertaken by internal or external experts, and the time frame can vary from days to months, depending on the scope. The objective is always the identification of improvement opportunities in processes and products. Therefore, these approaches constitute an important element of the Plan-Do-Check-Act cycle.

4.16. *Self-assessments.* Self-assessments are comprehensive, systematic and regular reviews of an organization's activities carried out by the organization (i.e., those responsible for the relevant activities) itself. The results are referenced against a model or framework. Compliance with the Fundamental Principles of Official Statistics has been assessed using self-assessments several times.[34] The choice of the self-assessment tool is a strategic decision, and its scope should be clearly defined. For example, the self-assessment could be applicable to the entire institutional environment or simply to the statistical production processes. Oftentimes, self-assessment checklists are developed to be used for the systematic assessment of the quality of the statistical production process.[35] The self-assessment process can be carried out by staff teams and supported by internal or external experts to explain the framework and facilitate the filling out of the forms used, which is referred to as an "assisted self-assessment". A self-assessment may be biased and does not necessarily provide a correct and accurate picture. However, a self-assessment based on an established quality framework can be a good way to facilitate systematic quality work. It establishes the quality framework and quality thinking in the organization and allows for the identification of weak points and actions to improve them. Use of self-assessments is one of several tools reflected in the elements to be assured under UN-NQAF requirement 8.2 (see annex). Box 4.1 contains further details on the establishment of a checklist and a scoring system that can be used for self-assessment.

4.17. *Other internal or external assessments.* Assessments can also be conducted by an internal group not responsible for the assessed statistics, or by an external

[34] See, for example, "Supplementing the United Nations Fundamental Principles of Official Statistics: implementation guidelines". Available at https://unstats.un.org/unsd/statcom/50th-session/documents/BG-Item3b-FPOS-Implementation-guidelines-E.pdf.

[35] See, for example, "DESAP: The European Self-Assessment Checklist for Survey Managers". Available at https://unstats.un.org/unsd/dnss/docs-nqaf/Eurostat-desap%20G0-LEG-20031010-EN.pdf.

Box 4.1

Development and use of specific checklists with a scoring system

The annex to this *Manual* provides a detailed list of elements that need to be assured in order to comply with the principles and requirements set out in chapter 3. The list provides a comprehensive, universally applicable, generic checklist from which different self-assessment checklists can be derived. For the UN-NQAF version of 2012, a checklist including a scorecard was made available.[a] The Expert Group intends to develop a similar checklist and to give guidance on its application, including on a scoring system. Typically, scoring systems may indicate full, partial or non-compliance with individual requirements and elements to be assured, which allows for both aggregation to a total score and scores for different parts. Checklists and scoring systems should take into consideration the fact that data quality is multidimensional and that there is no ranking among the individual quality principles. The quality principles should be applied in a balanced way depending on the specific situation. The significance of scoring should not be exaggerated; equally, or even more important, are comments regarding why requirements were met, were only partially met or were not met.

[a] See https://unstats.un.org/unsd/dnss/docs-nqaf/NQAF%20CHECKLIST%202013_28aug-FINAL.xls.

party. IMF, using its Data Quality Assessment Framework, has undertaken assessments under the Reports on the Observance of Standards and Codes data module. The Reports are considered an assessment of a country's main statistical products and the underlying NSSs/institutions that produce/disseminate these products. Eurostat and some of the United Nations regional commissions implement assessments of NSSs as well.

4.18. *Quality audits*. A quality audit is a systematic, independent and documented process for obtaining evidence and determining the extent to which quality requirements are fulfilled. In contrast to self-assessments, audits are always carried out by a third party that is either internal or external to the organization. Internal audits are led by a team of internal quality auditors who are not in charge of the process or product under review. External audits are conducted either by stakeholders or other parties that have an interest in the organization, by an external and independent auditing organization or by a suitably qualified expert. Audits and reviews are normally preceded by a self-assessment as well as documentation of the processes and products in question.

4.19. *Peer reviews*. Peer reviews are a type of external audit carried out by others working in the same field (a peer), in this case typically by an external expert or team of experts in statistics, such as colleagues from another statistical agency or country. Contacts can be established through professional forums and associations. Normally, peer reviews do not address specific aspects of data quality but instead examine broader organizational and strategic questions. They are typically systematic examinations and assessments of the performance of one organization by another, with the ultimate goal of helping the organization under review comply with established standards and principles, improve its policymaking and adopt best practices. The assessment is conducted on a non-adversarial basis and relies heavily on mutual trust between the organization and its assessors, as well as on their shared confidence in the process.[36] Like other external assessments and audits, peer reviews are normally preceded by a self-assessment. The UN-NQAF provides a suitable framework for peer reviews as well as for self-assessments. The need for periodic reviews is reflected in UN-NQAF requirement 8.7.

[36] In Europe, there is a system of peer reviews to monitor the compliance of the national statistical systems of the European Union member States with the European Statistics Code of Practice. See https://ec.europa.eu/eurostat/web/quality/peer-reviews.

Labelling and certification

4.20. *Labelling and certification*. The results of the assessment can be compared to defined standards and requirements. This is often referred to as the labelling or certification layer and helps to enhance trust and credibility in official statistics.

4.21. *Labelling*. The labelling of statistics conveys a message about the extent to which a set of quality standards are met. It can be attached to statistics or a producer of statistics. In the European Statistical System, the labelling of European statistics is based on compliance with the European Statistics Code of Practice. The attachment of a label requires a procedure to guarantee that the message is appropriate and true. The label as such may be brief, for example "official statistics", and in this case would need to be accompanied by explanations regarding its interpretation.

4.22. *Certification*. Certification is an activity that assesses whether a product, service, process or system (e.g., a quality management system) complies with requirements defined by an internationally recognized standard or other formal criterion. It attaches a kind of "label" because the standard is internationally recognized as a guaranteed level of quality. It is conducted by an external independent certification body that can be located at the national or international level. The result of a successful certification is that the certification body, such as ISO, awards a certificate to the organi-

zation. The ISO standards are general and apply to any organization. They supplement but are not alternatives to frameworks such as the UN-NQAF, which are specifically developed for statistical agencies. There are examples of national statistical offices that have been ISO certified.[37] Certification to ISO standards is an advanced method and tool of process quality management. It requires documentation, quality reports, quality indicators, self-assessments and audits. There are significant benefits, but also costs, associated with certification. Unrelated but similar in its approach to this certification process is the certification of statistical agencies and statistical outputs by the NSO, as described in box 4.2.

[37] For example, the State Statistical Committee of Azerbaijan, Statistics Lithuania, Statistics Netherlands and the Statistical Office of Slovakia have been certified for ISO 9001:2015 Quality Management; see www.stat.gov.az/menu/2/quality/en/certificate_2015.pdf, www.stat.gov.lt/kokybes-vadyba, www.cbs.nl/en-gb/background/2018/29/statistical-quality-certification-rules-and-culture and https://slovak.statistics.sk/wps/portal/ext/aboutus/certificates.

Box 4.2

Certification of statistics and statistical outputs by the national statistical office[a]

NSOs may be called upon to assess and certify the quality of statistical agencies and statistical outputs of other members of the NSS (possibly to label their statistics as official) or even of statistics produced outside the NSS (e.g., for Sustainable Development Goal indicator data and statistics). In such cases, the NSO may develop and deploy a checklist for the assessment of statistical outputs in consultation with the concerned stakeholders. A checklist based on the UN-NQAF can be used as a self-assessment tool by all producers of statistics.

[a] For example, the Hellenic Statistical Authority has the responsibility to certify as "official" the statistics produced by other agencies of the Hellenic Statistical System. See www.statistics.gr/documents/20181/1195539/Principles_ELSS_EN.pdf. .

4.D. Risk management

4.23. *Risk management and the production of statistics*. Traditionally, risk management has been applied within financial management, security and safety. Over recent years, the scope of risk management has been extended to modernization and other development programmes and projects, and finally to the production of statistics.[38] Risk management is normally developed in line with recommendations from national authorities and may be mandatory. It is especially important for risk management to be closely coordinated with quality management activities (see annex for the elements to be assured under UN-NQAF requirement 8.8).

[38] See, for example, "Guidelines on risk management practices in statistical organizations", available in English and Russian, and accompanying training materials, prepared by the Modernization Committee on Organizational Framework and Evaluation under the coordination of the High-level Group for the Modernisation of Official Statistics. Available at https://statswiki.unece.org/display/GORM.

4.24. *Definition of risk*. Risks are linked to objectives and are usually expressed in terms of risk sources and potential events that can affect the achievement of the objectives. The level of risk linked to a source is defined as the product of the likelihood or probability of the event and its consequence or effect on the objective. Objectives can be defined as compliance with the NQAF, or more specifically as compliance with each quality principle, such as assuring statistical confidentiality and data security (principle 7) or assuring accuracy and reliability (principle 15).

4.25. *Identification of risks in the statistical production process*. The risk of errors in some statistics can be linked to risk sources such as the quality of the source data, the methodology (e.g., sampling), the production system and the working processes linked to data collection, processing, analysis and dissemination. Accordingly, risk

management can be described as quality assurance for the different phases of a statistical production model (i.e., the GSBPM) in terms of mitigating risks to quality at those phases. For each risk source, the likelihood of deviations/events and their consequences on the final statistics are considered. Possible critical risks are identified and addressed with an action plan to reduce them. Such risk analyses are particularly relevant for cases in which errors can have great impact, such as the consumer price index, statistics on foreign trade and population statistics.

4.26. Risk management has many similarities to quality management. The approach is a bit different, but risk and quality management frameworks are complementary and should not operate independently of each other. Risk management is often promoted or even mandatory for public institutions in some countries. The implementation of risk-based thinking is one of the requirements of ISO 9001:2015. Enterprise risk management is guided by the integrated framework of the Committee of Sponsoring Organizations of the Treadway Commission.[39] A coordinated approach to quality and risk management is cost-effective and facilitates the involvement and support of management.

[39] See www.coso.org/Pages/default.aspx.

Chapter 5
Development and implementation of a national quality assurance framework

Introduction

5.1. Chapter 5 discusses the process and provides guidance on the development of an NQAF and steps for its implementation at the NSO and other producers of official statistics. Chapter 6 discusses the role of NSS-wide bodies for the implementation of an NQAF throughout the NSS.

5.2. The emergence of an enlarged data ecosystem with increased needs for data and statistics, new statistics producers and new data sources and data providers requires that an NQAF be systematically developed and implemented throughout the entire NSS. This will assure the quality of official statistics and maintain the role of official statistics as a provider of trusted information. For example, the NSO and other members of the NSS may find themselves increasingly in the situation of having to use data from new data providers and having to assess statistics produced outside the traditional realm of official statistics, as illustrated by the discussion regarding the use of big data.[40]

[40] See the website of the Global Working Group on Big Data for Official Statistics: https://unstats.un.org/bigdata/.

5.3. *How to use chapters 5 and 6*. Chapters 5 and 6 describe different aspects of institutional arrangements and specific actions of various actors with regard to developing and implementing an NQAF throughout the NSS. These are summarized in figure 5.1, which also shows the relationship between chapters 5 and 6. Readers may find certain sections of greater interest than others:

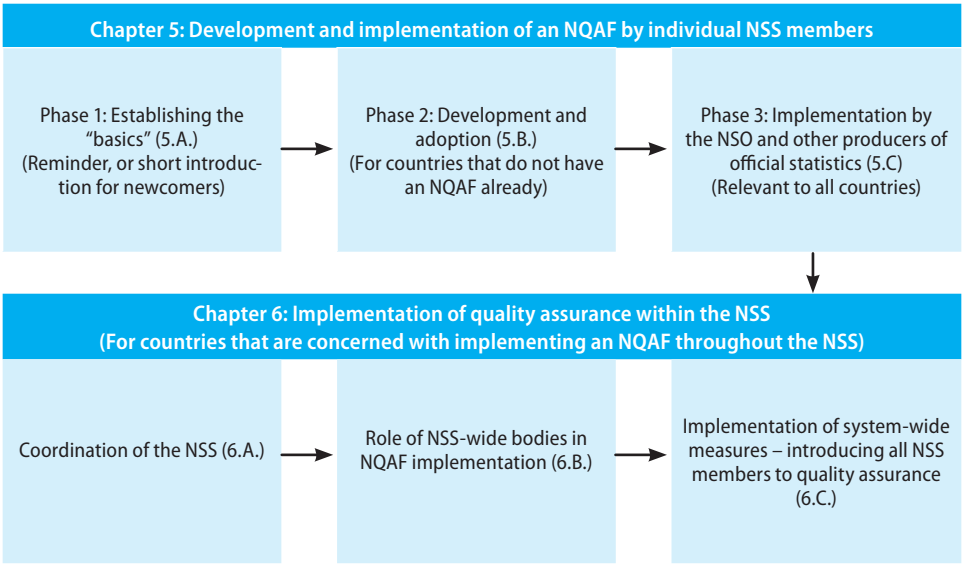
(a) Section 5.A. provides a basic introduction to the purpose of quality assurance and highlights core recommendations on quality assurance of which newcomers to quality assurance should be aware. For a thorough introduction and the full list of recommendations on quality assurance, readers should refer to chapters 1 and 2;

(b) Section 5.B. describes the institutional arrangements and process of developing an NQAF and is directed at staff who work at the NSO or at other members of the NSS who are tasked to develop an NQAF;

(c) Section 5.C. describes the institutional arrangements and actions for implementing an NQAF in a statistical agency. It is directed at staff at statistical agencies who work in the quality unit or as a quality focal point or quality manager within the organization and are tasked with implementing quality assurance;

(d) Staff and senior management at the NSO or at other statistical agencies tasked with supporting the implementation of an NQAF throughout the NSS should refer to and review chapter 6.

Figure 5.1
Institutional arrangements and specific actions at different phases of national quality assurance framework development and implementation (chapters 5 and 6)



5.4. The institutional arrangements for the development and implementation of an NQAF vary in countries, as do the overall national circumstances. NSOs and NSSs in countries (or areas) may only have a few staff or employ thousands of professional statisticians. However, quality assurance is part of the work of any statistician producing official statistics, whether someone has only a few or thousands of colleagues. Chapters 5 and 6 are not meant to assume any specific national circumstances, nor prescribe any specific institutional arrangements nor any specific path for NQAF development and implementation. However, in order to be able to provide a generic description of the overall process, chapters 5 and 6 assume a path for the development and implementation of quality assurance in the NSS that starts at the NSO and is driven by that office.

5.A. Phase 1: Establishing the purpose, scope and responsibility for a national quality assurance framework

5.5. *The case for an NQAF.* The value of official statistics lies in the trust placed by users in the information provided and its quality, which depends on its ability to meet user needs. The NQAF is an instrument to assure trust and quality, and assure that official statistics stay relevant. This entails not only assuring the quality of statistical outputs, but also assuring the quality of statistical processes, the management of the NSS and the institutional environment, which is reflected in the principles and requirements of the UN-NQAF set out in chapter 3 of this *Manual*.

5.6. *Global mandate and core recommendations.* In the context of the monitoring of the Sustainable Development Goals, Member States stressed the need for quality, accessible, timely and reliable disaggregated data to help with the measurement of progress (see General Assembly resolution 71/313). According to the core recommendations for quality assurance in chapter 2:

(a) **It is recommended** that countries include the requirements of quality assurance in their national statistical legislation and other legislation mandating the production of statistics for official use (core recommendation #2);

(b) **It is recommended** that countries establish a national quality assurance framework for official statistics and that all members of the national statistical system commit to continually assessing, improving and reporting on the quality of official statistics, as well as on the quality of data and statistics used in the production of official statistics as required[41] (core recommendation #3);

(c) **It is recommended** that the national quality assurance framework be implemented at the national statistical office and throughout the entire national statistical system. Furthermore, **it is recommended** that the national quality assurance framework be applied to all data and statistics produced outside of the national statistical system that are disseminated with the help and support of a member of the national statistical system or that are used for government decision-making, as deemed appropriate and required (core recommendation #5).

[41] This commitment of members of the NSS should also, as deemed appropriate and required, extend to data and statistics that are disseminated jointly with other statistics producers that are not members of the NSS.

5.7. *Scope of an NQAF and role of the NSO.* As indicated in the above core recommendations, the NQAF applies to all members of the NSS and all official statistics, including some producers of statistics that may be considered by countries as being outside the NSS. The NSO is normally at the centre of the NSS and serves as its coordinator and as a main producer of statistics. In this dual role, the NSO is best placed to develop the NQAF, to support its implementation throughout the NSS and its application to all official statistics and, under specific circumstances and in collaboration with other members of the NSS, to non-official statistics.

5.B. Phase 2: Development and adoption of a national quality assurance framework

5.8. *Institutional arrangements for the development and adoption of an NQAF.* Consequently, it is assumed that the NSO is leading the development of the NQAF for the entire NSS, although specific arrangements in countries may vary.[42] Countries may also decide to initially limit the NQAF implementation to the NSO. The establishment of the necessary institutional arrangements for the development of an NQAF may encompass the following:

[42] The further role of the NSO as a central coordination body and the role of other NSS-wide bodies in the implementation of an NQAF throughout the NSS is elaborated in section 6.B.

(a) *High-level commitment*. The development and implementation of an NQAF requires the support and commitment of the leadership of the NSO and other members of the NSS that are major producers of official statistics;

(b) *Establishment of a quality unit at the NSO responsible for quality assurance*. Typically, the head of the NSO would establish a dedicated quality unit to lead, coordinate and conduct the required conceptual work for the development of an NQAF. Such a unit is typically placed in the division or department responsible for cross-divisional/cross-departmental statistical work, coordination and/or statistical methodology;

(c) *Establishment of a quality task force (or working group).* The head of the NSO would establish a quality task force that would be given the responsibility of developing an NQAF. The quality task force should be composed of a variety of subject matter experts of the NSO and, as appropriate, important members of the NSS to ensure coherence of efforts, broad involvement and subject matter expertise from the start. The NSO would typically chair

and be the secretariat of the quality task force. Representatives of users of official statistics such as ministries, the media or research institutes may be part of the quality task force as well;

(d) *Role of the NSS-wide governance body*. The NSO is normally the coordinator of the NSS but typically has no authority over other members of the NSS such as the country's central bank or government ministries, which are typically above the NSO in the government hierarchy. Therefore, the development and adoption of an NQAF would benefit from an NSS-wide governance body that is able to agree on a common NQAF and implementation guidelines. Many NSSs already have such a governance body in the form of a statistical council or board, typically consisting of the head of the NSO and representatives of other major statistical agencies (see chapter 6 for details);

(e) *Role of an NSS-wide advisory body*. A primary task of such an advisory body would be to ensure that statistical outputs meet user needs, but it may also provide advice on all other aspects of statistics development, production and dissemination. In this function it may raise quality concerns, assess existing statistics or formulate requirements for additional statistics and analysis. It would typically be composed of government users, the business sector, researchers, non-governmental organizations, media and the general public. In some countries the advisory body may take the form of or be called a user committee. In some countries a separate user committee may exist in parallel to the advisory body;

(f) *Establishment of a legal framework for quality assurance*. The requirements and process to include or reflect an NQAF in the national statistical laws and regulations should be evaluated early on. Adequate steps should be taken to achieve a timely incorporation of the NQAF into the national statistical legislation, as part of an effort to guarantee the fundamental values and principles that govern the development, production and dissemination of official statistics by legal and institutional frameworks (core recommendation #1), and to include the requirement of quality assurance in the national statistical legislation (core recommendation #2).

5.9. *Activities for the development and adoption of an NQAF*. Development of an NQAF may be undertaken over a period of a minimum of one year, including review, revision and approval. The process may include the following steps:

(a) *Establishment of a timetable for development and implementation*. The quality unit at the NSO (see para. 5.8.(b)), in collaboration with the quality task force (see para. 5.8.(c)) should identify an initial timetable for the development and implementation of the NQAF and regularly review and update it as needed;

(b) *Review and analysis of national circumstances and practices*. The quality unit at the NSO, in collaboration with the quality task force, should compile and review all relevant national documents such as statistical laws, regulations and guidelines, and national statistical strategies and plans that may be of relevance for the development and implementation of an NQAF for official statistics. Countries should also compile and analyse information about statistical quality frameworks that are already being used within the country and existing practices of quality assurance in general;

(c) *Uses and users of an NQAF and the NQAF implementation plan*. The uses and users of an NQAF should be clearly identified. Countries may want to perform a deeper analysis of their needs, for example by conducting a

"SWOT" analysis (strengths, weaknesses, opportunities, threats) of their NSO or NSS. An initial plan for the implementation of an NQAF, including the identification of resource requirements, should be developed early on;

(d) *Compilation, review and analysis of materials available at the international level*. Countries do not need to start from scratch and can refer to extensive materials relevant for the development of an NQAF. The quality unit at the NSO, in collaboration with the quality task force (which may include other members of the NSS), should compile and review the various existing global, regional and thematic quality assurance frameworks and standards (the UN-NQAF, the European Statistics Code of Practice,[43] the IMF Data Quality Assessment Framework,[44] the Recommendation of the OECD Council on Good Statistical Practice,[45] the African Charter on Statistics,[46] the Association of Southeast Asian Nations (ASEAN) Community Statistical System Code of Practice,[47] the Code of Good Practice in Statistics in Latin America and the Caribbean[48]) and other relevant guidelines such as the GSBPM, as well as practices of other countries;[49]

(e) *Decision on the reference framework for an NQAF*. After the analysis of all requirements, relevant experiences and materials, the quality task force and the NSS members and, if appropriate, the NSS-wide governance body, will need to decide whether to adapt or adopt an existing NQAF (or code of practice) or whether to develop their own NQAF from a combination of existing NQAFs or by identifying specific quality principles themselves. In some regions, countries can either choose for themselves to adopt or align their NQAF with the regional quality assurance framework or code of practice, or are obliged to do so. Countries should follow core recommendation #4, which recommends that the NQAF be developed in consideration or in alignment with the UN-NQAF or similar existing quality assurance frameworks. Generally, NQAFs are not expected to be very different from each other, as existing quality assurance frameworks are very similar;

(f) *First draft of an NQAF and its contents*. Based on the decision on the reference framework, the quality task force will develop a first draft of the NQAF. An NQAF typically consists of a description and the definition of quality concepts and quality principles, which may be complemented by initial implementation instructions and guidelines;

(g) *Quality requirements, elements to be assured and indicators*. The draft of the NQAF should include or will need to be complemented at a later stage by quality requirements and elements to be assured, in order to provide guidance on how the NQAF can be implemented and used with regard to quality assessment and management;

(h) *Consultation and review process of the draft NQAF*. The draft NQAF may undergo an internal review and approval process within the organizations participating in the quality task force, before being subjected to a wider consultation with all concerned producers of official statistics and other stakeholders in order to raise awareness, create ownership and ensure that the NQAF fits different circumstances and reflects all relevant quality aspects. The draft NQAF may even be made available for public consultation;

(i) *Finalization and adoption*. The draft NQAF should be updated on the basis of inputs received during the consultation process and may undergo a final round of consultations with all stakeholders. The updated version would then typically undergo a final review and approval at the management level

[43] See https://ec.europa.eu/eurostat/web/quality/european-statistics-code-of-practice.

[44] See www.imf.org/external/np/sta/dsbb/2003/eng/dqaf.htm.

[45] See www.oecd.org/statistics/good-practice-toolkit/.

[46] See www.paris21.org/sites/default/files/AU-English_African_Charter-web.pdf.

[47] See www.asean.org/storage/images/resources/Statistics/2014/Code%20of%20Practice-ADOPTED-CLEAN.pdf.

[48] See http://statinja.gov.jm/StrategicManagerial/CGP.pdf.

[49] See https://unstats.un.org/unsd/methodology/data-quality/quality-references/.

of the organizations participating in the quality task force before being submitted for adoption to the NSS-wide governance body. The NQAF may also be adopted at a higher political level or reflected in the national statistical legislation;

(j) *Communication and dissemination*. The NQAF should be disseminated to all producers of official statistics and introduced to the staff at the statistical agencies, with an emphasis on its benefits. The adoption of the NQAF should be announced to all users of statistics.

Box 5.1

Experience of the Statistical Institute of Jamaica in establishing its national quality assurance framework

The Statistical Institute of Jamaica developed its quality assurance framework after conducting an extensive review of existing international, regional and national statistical quality assurance frameworks (the UN-NQAF, the IMF Data Quality Assurance Framework, the European Statistics Code of Practice, the Recommendation of the OECD Council on Good Statistical Practice, the Code of Good Practice in Statistics in Latin America and the Caribbean, the CARICOM Statistics Code of Practice and the quality assurance frameworks of Statistics Canada and Statistics South Africa) and related materials such as the Fundamental Principles of Official Statistics and the International Statistical Institute's Declaration on Professional Ethics. The following national references relevant to quality management were reviewed: the Statistics (Amendment) Act of 1984, which established the Statistical Institute of Jamaica as the NSO of Jamaica, the Institute's Five-year Strategic Plan 2012–2017, and its policies and strategies addressing data confidentiality, access to data, metadata, the publication of data, data revision, the misuse of information, the Institute's commitment to quality and other relevant items.

This review established the basis for the adoption and adaptation of relevant guidelines and good practices that are accepted in the global statistical community. In addition to outlining the circumstances and key issues driving the need for quality management, the benefits and challenges of implementing the framework were also taken into account. The development of the quality assurance framework of the NSO was undertaken by staff in the Research, Design and Evaluation Division of the Institute.

The framework uses definitions articulated in the SDMX Glossary of 2016 to describe quality concepts. The layout of the framework draws extensively on the compliance criteria in the Code of Good Practice in Statistics in Latin America and the Caribbean, which was considered useful for facilitating global assessments conducted by the Economic Commission for Latin America and the Caribbean of the national statistical office's compliance with the Code of Good Practice in Statistics. In addition, the framework arranges guidelines for good statistical practice in accordance with the levels of the UN-NQAF (i.e., managing the statistical system (albeit partially), the institutional environment, statistical processes and statistical products).

The Institute has a process for the ratification of official documents which involves the Senior Management Committee and the Board of Directors. After review of the original draft of the framework by the Director of the Research, Design and Evaluation Division, which includes the Quality Management Unit, recommended amendments were implemented. The subsequent draft was submitted to the Senior Management Committee for review, commentary and approval, and then submitted to the Board of Directors for final approval and adoption. On 12 January 2017, the Board of Directors ratified the quality assurance framework of the NSO, which was later issued on 12 June 2017. It may be accessed by the public on the NSO website (www.statinja.gov.jm).

5.C. Phase 3: Implementation of the national quality assurance framework by the national statistical office and other producers of official statistics

5.10. *Building on existing efforts.* Countries may wish to build on already existing quality management tools and guidelines when implementing an NQAF. The following paragraphs describe possible steps and elements for the implementation of an NQAF. Figure 5.2 provides a brief summary and a possible flow sequence for these steps and elements.

Figure 5.2
Implementation of the national quality assurance framework: possible steps and elements

Starting point: NQAF has been developed and adopted	
1	Establish proper institutional arrangements
2	Train staff and conduct an initial self-assessment
3	Communicate internally and externally
4	Develop an implementation strategy and identify implementation actions
5	Analyse business processes and activities (using the GSBPM and the GAMSO)
6	Decide on methods and tools to be used for quality assessment
7	Integrate the implementation steps into the National Strategy for the Development of Statistics and the multi-year statistics plan
8	Ensure ongoing commitment and seek actions with quick/visible pay-offs

5.11. *Institutional arrangements for the implementation of an NQAF.* Quality management must be institutionalized. However, the specific institutional arrangements and roles of the quality units, task forces, quality managers, quality champions and focal points, and quality networks, among other things, that are involved in quality assurance are expected to evolve over time. The arrangements in countries may consist of a mix of permanent and temporary structures depending on the implementation stage and the specific objectives. In general, as specific activities become more established, responsibilities may shift from more centralized structures such as quality units and task forces to more decentralized structures consisting of quality focal points and networks. The following best practices can be identified, which apply to the NSO but also possibly to other major producers of official statistics:

(a) *Quality unit*. The NSO is encouraged to retain a quality unit as a place for quality management or coordination within the NSO in order to maintain sufficient capacity to lead and support the implementation of quality management initiatives throughout the NSO, and to support other NSS members and producers of official statistics if required. Other major statistics producers within the NSS are encouraged to establish their own internal quality units to support the work on quality within their organizations. The quality unit may be headed by the quality manager of the statistical agency;

(b) *Internal quality task force*. The NSO is encouraged to establish an internal quality task force consisting of representatives of the quality unit and representatives from each of the other divisions of the NSO to serve as quality champions/focal points in their respective divisions; such an internal task force would support NQAF implementation throughout the NSO. The internal quality task force should serve as a forum in which quality-related issues in the various aspects of NSO operations can be addressed

at both the strategic management and the operational level. The internal quality task force should also serve as a mobilization mechanism for quality management initiatives, such as documentation workshops or specialized training workshops for improving quality, among other things. Other major producers of official statistics are encouraged to establish their own internal task forces;

(c) *Quality assurance managers or focal points*. The NSO is encouraged to appoint quality assurance managers or focal points in the various statistical domains and to establish clear terms of reference for their work. In general, the quality manager or focal point would be responsible for establishing the quality assurance plan, defining all the quality activities and quality indicators to be implemented and computed in the statistical domain under the responsibility of the quality manager. Other major producers of official statistics are encouraged to establish quality managers or quality focal points as well;

(d) *Central coordination body, NSS-wide governance body and NSS-wide advisory body.* The central coordination body of the NSS (a role typically assumed by the NSO), the NSS-wide governance body and the NSS-wide advisory body should guide and support the implementation of the NQAF at the NSO and throughout the NSS (see chapter 6 for details).

5.12. *Training of staff.* Quality managers and focal points and managers of statistical products need to gain a thorough understanding of the basic concepts, objectives and tools of quality assurance, and the country's NQAF. Chapter 1 of the *Manual* provides an introduction to the basic concepts of quality assurance, defining quality as fitness for use or fitness for purpose and putting the needs of the user at the centre of quality assurance. Chapter 4 of this *Manual* introduces quality assessment tools.

5.13. *Conducting a self-assessment as starting point*. When an NQAF has been adopted, a workshop with managers and experts from throughout the NSO or other statistical agencies can conduct a first self-assessment based on the NQAF. The assessment can be carried out in groups and be facilitated by external experts. Such self-assessment establishes a baseline for NQAF implementation and ensures awareness, ownership and management support for further quality work.

5.14. *External and internal communication*. The NSO is encouraged to explicitly communicate its commitment to high quality and continuous improvement to its stakeholders in the form of a declaration on quality.[50] The declaration would state the principles that guide the approach of the NSO to managing quality, the standards it follows and the commitments to which the NSO can be held accountable in producing official statistics. The declaration on quality should be officially launched, be visible on the NSO website and be actively introduced and promoted internally and externally to all stakeholders. Promotional activities may include quality seminars, quality campaigns or an annual quality week. An important instrument of communication are external quality reports, which should address the needs of various user groups.

[50] For example, the European Statistics Code of Practice 2017 includes a Quality Declaration of the European Statistical System (see https://ec.europa.eu/eurostat/web/products-catalogues/-/KS-02-18-142).

5.15. *Development of an implementation strategy and implementation actions*. The NSO and other statistical agencies that produce official statistics must decide where and how to start with the implementation of an NQAF. They may develop a short-term action plan for quality improvements covering the next data production cycle and prepare in parallel a mid- and long-term strategy and action plan. Generally, quality assurance can be applied at the institutional level and/or at the process or product level. On the process or product level there is the option to: (a) apply all relevant NQAF principles to all processes or products; (b) apply selected principles to all processes or products (the selection of principles can be based on the GSBPM); or

Box 5.2
Quality commitment at the Italian National Institute of Statistics

The Italian National Institute of Statistics quality commitment is publicly available on a dedicated web page of its website.[a] The pillars of the quality strategy are described, as are the organizational structure and activities and the tools.

In order to address the need for quality information from a variety of different users, different quality reports are disseminated through the Institute's website:

- short quality reports for non-expert users, called "Quality at a glance"[b]
- European Statistical System Standard Quality Reports required by Eurostat[c]
- National standard quality reports for users seeking more detailed information on quality (in Italian only)[d]

[a] See www.istat.it/en/organisation-and-activity/institutional-activities/quality-commitment.

[b] See www.istat.it/en/methods-and-tools/tools-for-data-quality/quality-at-a-glance.

[c] See http://siqual.istat.it/SIQual/docQualityReport.do?ric=0&language=UK.

[d] See www.istat.it/it/metodi-e-strumenti/strumenti-per-la-qualit%C3%A0/schede-standard-di-qualit%C3%A0.

(c) apply all relevant principles to selected processes or products. Self-assessments are a useful tool to identify areas for improvement.

5.16. Specific actions and activities for quality assurance may entail:

(a) Implementing quality assurance in the various subject area domains by, among other things, formulating subject-matter quality assurance frameworks, which would include as appropriate any subject-area-specific recommendations. Such domain-specific quality assurance frameworks may reflect guidance issued by the respective international and regional organization responsible for international or regional data collection in this area;[51] relevant international agencies may even be invited to organize and conduct a quality assessment;

(b) Reviewing institutional and legal arrangements, including mandates and authority for data collection, and initiating any changes as required;

(c) Reviewing the extent to which compliance with applicable legal requirements and the organization's risk management can be integrated into statistical quality management;

(d) Conducting staff training with the aim of embedding quality assurance in everyday activities;

(e) Conducting a dialogue between producers and users to provide information on quality, and use its findings and conclusions alongside results from quality assessments and audits. User engagement should be part of the development and execution of the quality assurance programme.

5.17. *Best practices in using the GSBPM and the GAMSO for quality management*. The improvement of the quality of statistics requires the improvement of statistical processes. The precondition for the management (and quality improvement) of statistical processes and activities is their clear identification. The GSBPM describes and defines the set of business processes needed to produce official statistics. The GAMSO extends and complements the GSBPM by adding three additional activities needed to support statistical production: strategy and leadership, capability develop-

[51] For example, the Food and Agriculture Organization of the United Nations is responsible for agricultural statistics, the United Nations Educational, Scientific and Cultural Organization for education statistics, and the United Nations Environment Programme for environment statistics. For the list of the specialized United Nations agencies and other international, supranational and regional organizations active in specific statistical domains, see https://unstats.un.org/unsd/ccsa/members.cshtml.

ment, and corporate support (see chapter 4 for more information on the GSBPM and the GAMSO). The following best practices can be identified:

(a) The NSO and major producers of official statistics are encouraged to use the GSBPM to: (i) document and analyse statistical processes and associated metadata in a standard way; (ii) identify pertinent quality characteristics; (iii) formulate appropriate quality indicators to monitor statistical processes; and (iv) identify necessary actions to improve and assure the quality of statistical processes and outputs. The integration of different statistical processes and achieving data interoperability may be an important objective in the use of the GSBPM;

(b) The NSO and major producers of official statistics may use the GAMSO to facilitate the extension of quality assurance to additional activities needed to support statistical production, namely: strategy and leadership, capability management, and corporate support;

Box 5.3

Experience of the Italian National Institute of Statistics in implementing its national quality assurance framework

At the Italian National Institute of Statistics all statistical processes are mapped to a GSBPM-compliant system. For each subprocess the use of generalized software is documented, activities carried out to monitor or assess quality are documented and standard quality indicators are computed. For example, for a given process, documentation exists which confirms that "run collection" has been carried out by the computer-assisted personal interviewing (CAPI) technique, that the interviewers have taken specific training and are monitored and that the electronic questionnaire has been implemented with the software considered standard at the Institute. Furthermore, response rates (and sometimes control charts for the interviewers) are computed. The process manager can compare the quality of the process with the quality of other similar processes or with indicators from past editions of the same process (phase 8 of the GSBPM).

An extensive self-assessment and auditing programme was carried out from 2010 to 2016. The Institute produced two manuals of quality guidelines (for direct processes and for processes using administrative data). These manuals are both a guide for the statistical activity and a reference to evaluate the compliance with good practices in an auditing and self-assessment programme (supported by an auditing questionnaire).

At the Institute, quality documentation and the standard quality indicators are highly homogeneous. The latter are analysed yearly at the Institute level and an aggregated quality report is published internally, with the aim of identifying areas for quality improvement common to groups of statistical processes. Regarding the statistical production, the modernization programme introduced in April 2016, which resulted in the creation of a centralized data collection and a reinforcement of the methodological function, has fostered the use of standard methodologies and practices.

(c) The NSO is encouraged to pioneer the use of the GSBPM and the GAMSO and then to support other members in the NSS in their use.

5.18. *Methods and tools for quality assessment, statistical and technical standards and standard procedures*. All methods and tools for quality management and assessment, such as quality indicators, quality reports, quality assessments and audits, among other things, as specified in chapter 4, should be considered. The methods and tools are complemented by the statistical concepts, definitions and methods set out in the manuals and guidelines for the respective subject-matter domain, standard procedures for processes and technical standards for IT systems and software specifications. Quality management and assessment entails the ongoing documentation of all processes and the recording of metadata at the input, intermediary and output stages. Existing and internationally recognized data quality assessment instruments should be considered.[52]

5.19. *Overarching activities that impact quality*:

(a) The development and regular update of the National Strategy for the Development of Statistics (and/or the multi-year statistics programme) should be conducted as an inclusive process involving all stakeholders in order to assure that the outputs of the NSO and NSS meet user needs;

(b) To the extent possible, legislative and institutional reform to improve the efficiency of the NSO and the NSS should be employed;

(c) Participation in regional or international activities and initiatives that aim at improving the availability and quality of official statistics can provide important guidance and support for the implementation of an NQAF. For example, countries may participate in one of the three tiers of the IMF data dissemination standards: the Enhanced General Data Dissemination System, the Special Data Dissemination Standard or the Special Data Dissemination Standard Plus;

(d) If possible, a peer review of the compliance with the NQAF may be conducted with the participation of external experts and/or international statistical organizations.

5.20. *The challenge of ongoing commitment and actions with quick/visible pay-offs*. The major challenge for quality assurance is maintaining an ongoing commitment to and investment in quality assurance despite the difficulty in demonstrating immediate pay-offs. Therefore, a clear mandate and legal obligation are important to assure ongoing support for quality assurance. Even more important is the understanding that quality assurance is indispensable to maintaining trust in official statistics, thereby securing its very existence. At the same time efforts should be made to demonstrate the usefulness of quality assurance to users. The following are good practices that are of immediate benefit to statistics users:

(a) Establish an advance release calendar and adhere to it;

(b) Establish and publish some output quality indicators (e.g., on accuracy and timeliness);

(c) Provide metadata and quality reports for users in a systematic and easily accessible way.

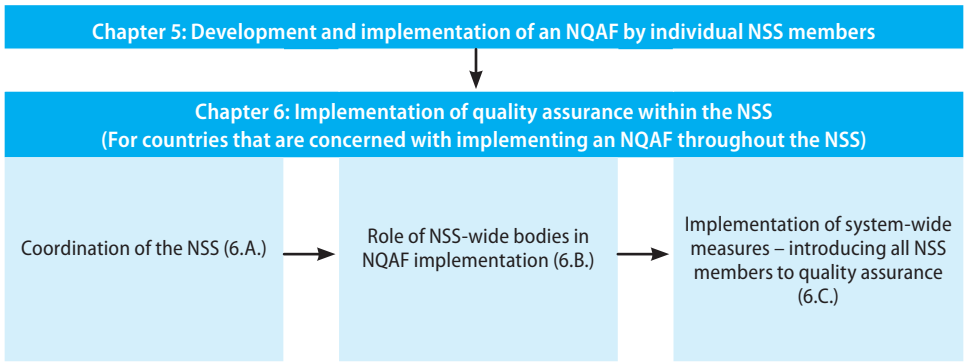
[52] Examples are the data quality toolkit of Statistics Canada; the survey quality assessment framework checklist of the International Household Survey Network, which is especially useful for survey projects; DESAP: The European Self-Assessment Checklist for Survey Managers; the IMF Data Quality Assessment Framework for data dissemination standards; and the Office for National Statistics of the United Kingdom of Great Britain and Northern Ireland "Guidelines for Measuring Statistical Output Quality", version 4.1, which is especially useful for assessing the quality of administrative data. For further references with regard to quality assurance of data from specific data sources, see chapter 7.

Chapter 6
Implementation of quality assurance within the national statistical system

Introduction

6.1. Chapter 5 discusses the process and provides guidance on the development of a national quality assurance framework (NQAF) and the steps for its implementation at the NSO and at other producers of official statistics. Chapter 6 discusses, in section 6.A., the coordination of the NSS to provide the context for the implementation of quality assurance throughout the NSS. Section 6.B. describes the possible role of NSS-wide bodies for the implementation of an NQAF. Finally, section 6.C. discusses the introduction of quality assurance to members of the NSS that have not been engaged in quality assurance before.

Figure 6.1
Institutional arrangements and specific actions at different phases of national quality assurance framework development and implementation (chapters 5 and 6)



6.A. Organization and institutional arrangements of national statistical systems

6.2. *Need for coordination of the NSS.* The NSS is the ensemble of statistical organizations and units (statistical agencies) within a country that jointly collect, process and disseminate official statistics on behalf of the national Government (and other levels of government). The NSS consists of the NSO and other producers of official statistics. It is the responsibility of each country to define the scope of its NSS. It typically includes the central bank, government ministries, government departments and agencies and regional and local government offices, as represented by their statis-

tical units. The NSS may also include producers of official statistics that are not part of the government. The NSS can be organized in different ways. However, all NSSs require coordination for the following reasons:[53]

(a) To ensure that the outcomes of various data collections are comparable or can at least be meaningfully related to each other, the harmonization of concepts, definitions, classifications and sampling frames is necessary;

(b) To avoid duplication of effort and undue burdening of respondents, while respecting the principle of statistical confidentiality and assuring the coverage of the information needs of the country, agreements about efficient and effective data collection and proper data sharing, including the use of administrative and other data sources, are required;[54]

(c) To strengthen the position and enhance the credibility of official statistics, the coordination of statistical methods and dissemination policies is useful;

(d) To represent a country internationally and to facilitate and coordinate international statistical cooperation, the coordination of international policies is needed;

(e) To implement mechanisms to allow the assessment and guarantee the quality of statistics produced by NSS members, policy coordination is needed.

6.3. *Responsibilities of the central coordination body*. In most countries there is a central coordination body responsible for some or all of the above coordination tasks and additional tasks such as capacity-building and monitoring and reporting on progress regarding the SDGs. The concrete functions and authority of the central coordination body depend on the level of centralization or decentralization of the NSS. Normally, the NSO has a role in and often the responsibility for coordinating the NSS. However, depending on the national institutional arrangements, there can be several bodies involved in the coordination of different aspects of the NSS that support and complement the NSO. For example, some coordination functions can be taken on by an NSS-wide governance body and an NSS-wide advisory body and/or user committee.

6.4. *Centralized or decentralized NSS*. In a highly centralized NSS, the authority over the statistical policy and the statistical work programme and large parts of the statistics production rests with a single entity, typically the NSO. In a highly decentralized statistical system, the authority on statistical matters and responsibilities for statistics production is dispersed across many government entities, including regional and local offices of government. Statistical systems exist on a continuum between both extremes.[55] Decentralized statistical systems require more coordination than centralized systems.

6.5. *The responsibility of the central coordination body and members of the NSS for quality assurance*. Based on the Fundamental Principles of Official Statistics:

(a) **It is recommended** that countries establish a national quality assurance framework for official statistics and that all members of the national statistical system commit to continually assessing, improving and reporting on the quality of official statistics, as well as on the quality of data and statistics used in the production of official statistics as required[56] (core recommendation #3);

(b) **It is recommended** that the national quality assurance framework be implemented at the national statistical office and throughout the entire national statistical system. Furthermore, **it is recommended** that the national quality assurance framework be applied to all data and statistics produced outside of the national statistical system that are disseminated

[53] See *Handbook of Statistical Organization, Third Edition: The Operation and Organization of a Statistical Agency* (United Nations publication, Sales No. E.03.XVII.7), para. 50.

[54] In this regard, a user committee composed of users of statistics at the national level may be useful. Italy has such a committee that assesses whether the statistical information needs are covered in the NSS.

[55] See *Handbook of Statistical Organization, Third Edition: The Operation and Organization of a Statistical Agency* (United Nations publication, Sales No. E.03.XVII.7), para. 31.

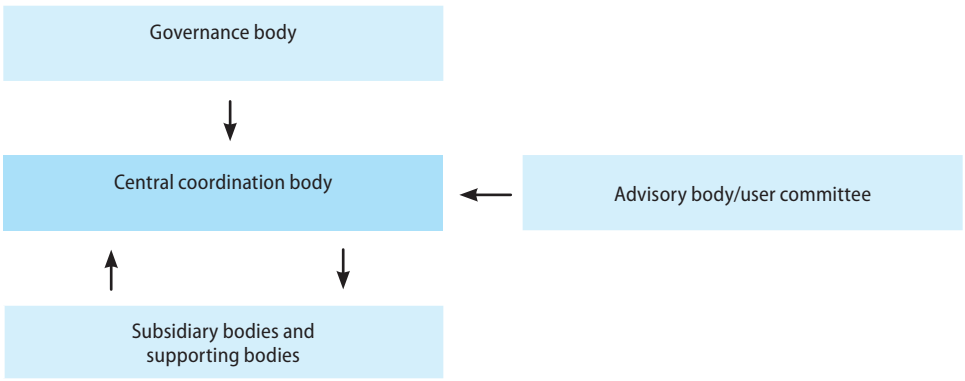
[56] This commitment of members of the NSS should also, as deemed appropriate and required, extend to data and statistics that are disseminated jointly with other statistics producers that are not members of the NSS.

with the help and support of a member of the national statistical system or that are used for government decision-making, as deemed appropriate and required (core recommendation #5).

6.B. Role of national statistical system-wide bodies in the implementation of a national quality assurance framework

6.6. *NSS-wide bodies involved in quality assurance.* NSS-wide bodies involved in the implementation of an NQAF may include, in addition to the central coordination body, an NSS-wide governance body, an NSS-wide advisory body and other NSS-wide subsidiary and supporting bodies such as quality task forces (or working groups) (see figure 6.2). NSSs have different arrangements among these bodies. In some countries, the NSO is not only the central coordination body but also the NSS-wide governance body, tasked with setting statistical policies and standards. In other countries there is a national statistical board (see box 6.1) or a steering committee or special unit in the executive branch of the government that takes on the function of an NSS-wide governance body and sets statistical policies and standards. Often, national statistical legislation creates an NSS-wide advisory body consisting of various stakeholders and users to assist in statistical policymaking. In some countries, the NSS-wide advisory body may take the form of or be called a user committee, or a separate user committee may exist in parallel to the advisory body. Furthermore, work in specific statistical domains and on specific issues and tasks is often conducted and coordinated by working groups and task forces consisting of experts of different members of the NSS.

Figure 6.2
Generic organizational chart of national statistical system-wide bodies[a]



[a] This figure shows a generic organizational structure of the NSS-wide bodies that can be involved in quality assurance for the purpose of illustrating important NSS-wide functions. The figure depicts a set of bodies that may exist in different forms and configurations in countries. However, the figure does not presume that such an organizational structure is in place in many countries, nor does it advocate that such a particular structure should be in place. It only illustrates important NSS-wide functions that may or may not be reflected in separate organizational units.

Box 6.1
Role of a national statistical board

In some countries, the national legislation gives the authority to issue statistical policy directives to a national statistics board. Examples are the UK Statistics Authority and the Philippine Statistics Authority. Such a body typically includes the NSO, other NSS members, certain government agencies and statistical research institutions, among others. The NSO may serve as its secretariat and is responsible for certain tasks and chairs some task forces or working groups. Members of the NSS implement the statistical policies and standards in the areas of their statistical work.

In the United Kingdom, the Statistics and Registration Service Act 2007 established a statistics board: the UK Statistics Authority, an independent body at arm's length from the Government. It has a statutory objective of promoting and safeguarding the production and publication of official statistics that serve the public good, including the responsibility to prepare, adopt and publish a Code of Practice for Statistics. It has a regulatory arm, the Office for Statistics Regulation, and an executive office, the Office for National Statistics – the largest producer of official statistics in the United Kingdom.

The Philippine Statistical Act of 2013 established the Philippine Statistical Authority (PSA) and created the PSA Board, composed of representatives of the Government, the National Statistician, representatives of the statistical community and the private sector. Section 5 of the law states that "the PSA Board shall be the highest policymaking body on statistical matters".

6.7. *Importance of appropriate national legislation*. The effectiveness of these NSS-wide bodies depends on the clarity of the national legislation or other formal provisions, which need to address the following issues:

(a) Which body has the authority to coordinate the functioning of the NSS through the issuance of mandatory policy directives and statistical standards for all members of the NSS;
(b) The scope of activities that this authority covers;
(c) The membership of the NSS;
(d) The mechanisms to ensure the implementation of the statistical policy directives.

6.8. Coordination in general, including the coordination of activities concerning quality assurance, becomes difficult if clarity regarding some of these conditions is not sufficient. Therefore, the process of adoption and implementation of an NQAF should be preceded by a review of the adequacy of the statistical laws or legal framework and their functioning in practice. If necessary, proposals should be made to amend the statistical laws and the legal framework. The clarity of the legislation is a necessary condition, but may not be sufficient, as concrete coordination arrangements also depend on a country's institutional setup or other circumstances present in a country.

6.9. *Role of the central coordination body in quality assurance*. Depending on the specific national circumstances, the central coordination body would be responsible for the following activities in the implementation of an NQAF:

(a) Oversee the development of the NQAF in consultation with all stakeholders (see chapter 5 for details);
(b) Ensure the adoption and endorsement of the NQAF and the mandate for quality assurance at the policy level by including it in national legislation or provisions (see chapter 5 for details);

(c) Review the core recommendations on quality assurance in official statistics contained in chapter 2, and take the necessary steps for their implementation;
(d) Promote the NQAF and support its implementation by members of the NSS;
(e) Align and coordinate the use of the NQAF with the use of other quality frameworks that have already been applied;
(f) Ensure that a template for quality reporting and assessment is established;
(g) Establish advisory and additional supporting bodies, such as working groups and task forces, to address specific quality issues and quality assurance in specific statistical domains;
(h) Promote and support training on quality assurance;
(i) Establish appropriate responsibilities and mechanisms for the quality assurance of SDG indicator data and statistics;
(j) Establish appropriate responsibility and mechanisms for assuring the quality of data and statistics from other and new data sources, new data providers and new statistics producers;
(k) Undertake activities and establish mechanisms to assure the quality of data and statistics produced by entities outside the NSS when they are intended for use in production of official statistics.

6.10. *Role of the NSS-wide governance body in quality assurance.* The central coordination body may be guided and supported in the NSS-wide implementation of an NQAF by an NSS-wide governance body, which may be composed of members of the NSS, representatives of the government, the scientific community and members of the wider user community. The NSS-wide governance body will be very important in a highly decentralized NSS, where the central coordination body may not have sufficient authority or resources to carry out all work related to the development and implementation of the NQAF or sufficient expertise and experience in the collection and processing of data in specific domains of official statistics. The governance body will set system-wide policies, standards and guidelines for quality assurance and establish the roles and responsibilities of the members of the NSS for the implementation of the NQAF. Its decisions may also lead to the mobilization of the required resources. It would also monitor implementation.

6.11. *Role of the NSS-wide advisory body in quality assurance.* The central coordination body may be assisted by an NSS-wide advisory body. The advisory body may be composed of various stakeholders and users, including representatives of the government, the business sector, the scientific community, the media and the general user community. It may advise the central coordination body on its needs and concerns and on emerging issues concerning the quality of data and statistics. In some countries the advisory body may take the form of or be called a user committee, or a separate user committee may exist in parallel to the advisory body.

6.12. *Role of NSS-wide subsidiary and supporting bodies in quality assurance.* NSS-wide subsidiary and supporting bodies can take the form of inter-agency committees, task forces and working groups, with experts from key members of the NSS focusing on specific statistical domains and/or cross-cutting statistical and quality topics, such as the use of administrative data or data from other sources. While there may be multiple task forces or working groups on quality assurance, it is a good practice to establish one NSS-wide quality task force (or working group) that provides overall support for the development and implementation of the NQAF. Typically, the

quality unit within the central coordination body would provide the secretariat for the system-wide subsidiary and supporting bodies.

6.13. *Specific tasks of NSS-wide subsidiary and supporting bodies.* Subsidiary and supporting bodies, such as a quality task force, should assist the central coordination body, as delegated and required, by:

(a) Collecting proposals regarding the content, structure and level of detail of the NQAF, organizing the system-wide discussion on these matters and consolidating the proposed amendments into a draft NQAF (see chapter 5 for details on the development of an NQAF);
(b) Raising awareness of the importance of the NQAF for official statistics among the NSS members and users of official statistics and promoting the NQAF as a common instrument of the NSS;
(c) Conducting the consultation process on good practices in the implementation of the NQAF, including on: (i) how to better implement the NQAF in the various situations of individual NSS members; and (ii) how to implement the NQAF in a phased approach;
(d) Advising on the use of quality indicators and other assessment tools in ways that reflect the specificity of the statistical processes and outputs of particular NSS members;
(e) Developing a training programme and materials;
(f) Setting up focus groups regarding several key challenges that most of the NSS members will face, such as quality assurance of administrative data sources, policies regarding the incorporation of new data sources and data made available by new data providers from outside the NSS and the standardization of metadata, among other things;
(g) Guiding the NSS members on how to draft proposals for the amendment of legal acts and administrative regulations to include quality assurance;
(h) Cooperating with the task force or working group on the SDG indicators in developing an action plan on quality assurance (see chapter 8);
(i) Developing proposals for a coordinated policy on quality assurance with regard to the use of data supplied by providers;
(j) Developing guidelines on the structure of the quality reports to be prepared by the NSS members and agreeing on a schedule for their submission;
(k) Coordinating user outreach, including user-producer dialogues (e.g., countrywide events on the quality of official statistics), among other things.

Box 6.2
Coordination in the Italian National Statistical System

The Italian National Statistical System was established by Italian legislative decree No. 322 in 1989 and includes the Italian National Institute of Statistics; the central statistical offices of the Government's public administrations and other public institutions; the statistical offices of the territorial offices of the Government; the statistical offices of autonomous regions and provinces; the statistical offices of chambers of commerce and municipalities; and the statistical offices of other public and private institutions of public interest (more than 3,400 offices). Statistics relevant to the country are included in the annual National Statistical Programme, which is approved by decree of the President of Italy.

The governance of the NSS is assigned to the Comitato di indirizzo e coordinamento dell'informazione statistica (Comstat), which consists of 15 members from across the NSS, coordinated by the President of the Italian National Institute of Statistics. Comstat is in charge of the National Statistical Programme, the creation of binding directives for the statistical offices of the NSS (e.g., exchange of personal data, adoption of the Italian Code of Official Statistics), assistance in the delivery of guidelines and the establishment of task forces and working groups.

The supervision of the NSS is assigned to the Commissione per la garanzia della qualità dell'informazione statistica (Cogis), which is an independent body composed of five members proposed by the Prime Minister and elected by decree of the President of Italy. The members are from the academic world and are outstanding personalities in research or public administration. Cogis is in charge of supervising the impartiality, completeness and quality of the statistical information produced in the NSS and its compliance with European Union and other international regulations, directives and recommendations. It also contributes to guaranteeing compliance with the legislation on statistical disclosures and personal data protection. Finally, it provides an opinion on the National Statistical Programme.

The Italian National Institute of Statisticsexercises the role of coordination with regard to the planning of statistical production, the execution of statistical processes, data transmission and communication, dissemination, quality reporting and quality coordination through a set of coordinated activities.

Quality coordination is assured by: (a) the monitoring of the Italian Code of Official Statistics (which was formally adopted by Comstat and corresponds to the European Statistics Code of Practice, but is limited to its principles), through periodic surveys and extensive peer reviews conducted from 2010 to 2015; (b) the delivery and sharing of guidelines for the quality of statistics produced by the NSS; (c) quality training; and (d) the statistical auditing of a subset of relevant European statistics. A programme to foster the production of quality reporting will be launched in 2019.

6.C. Implementation of system-wide measures – introducing all national statistical system members to quality assurance[57]

[57] The implementation of an NQAF is covered in chapter 5.

6.14. *Different circumstances of members of the NSS*. The quality of official statistics depends on the implementation of the NQAF by the individual statistical agencies of the NSS. However, for many members of the NSS the production of official statistics is not their primary purpose. For example, for government ministries, the production of statistics is a byproduct of and input to their policymaking tasks. Therefore, it has been suggested that members of the NSS that do not have much experience in quality assurance implement the NQAF in phases.

6.15. *Introducing quality assurance to all members of the NSS*. Members of the NSS without much prior experience in quality assurance of statistics may be introduced to quality assurance by the NSO or other members of the NSS. This may be done as part of a general NSS-wide implementation plan, or as a plan for specific subject domains, such as SDG indicators. Members of the NSS may also decide on their own to implement the NQAF. The following list contains activities that should be reviewed, discussed and highlighted to members of the NSS that are not familiar with quality assurance (members of the NSS that are already beyond this introductory phase should refer to section 5.C.):

(a) Emphasize the obligation of all members of the NSS to assure the quality of the statistics they produced (see core recommendations in chapter 2);
(b) Adopt the country's NQAF as the basis for quality management;
(c) Identify the quality assurance focal point at the statistical agency;
(d) Conduct staff training on the NQAF;
(e) Introduce the essential tools for quality assurance as specified in chapter 4 (quality indicators, quality reports and user surveys) and discuss their use. Conduct an initial self-assessment based on the NQAF as part of a training workshop;
(f) Prepare a short-term plan focusing on the most urgent actions that can be implemented within the available resources and result in improvement of the quality of statistical outputs visible to the users, such as:
    (i) Establishing an advance release calendar (if a system-wide one does not exist);
    (ii) Establishing and publishing some output quality indicators (e.g., on accuracy and timeliness);
    (iii) Providing metadata and simple quality reports for users in a systematic and easily accessible way;[58]
(g) Inform management and develop a plan for the next phase.

[58] These are the same actions that identified in paragraph 5.20 as having "quick/visible pay-offs" for demonstrating the usefulness of quality assurance.

6.16. As described in the previous section, the NSS-wide coordination body and various subsidiary and supporting bodies are expected to provide support for the implementation of the NQAF at statistical agencies.

6.17. The central coordination body may decide how to support other statistics producers that are not part of the NSS in assuring the quality of the statistics they produce.

Chapter 7
Quality assurance for statistics compiled from different data sources

Introduction

7.1. Chapter 7 addresses quality assurance when different data sources are used for the production of statistics. It distinguishes among statistical data sources, administrative data sources and other data sources. The UN-NQAF, set out in chapter 3, applies to all data and statistics regardless of the source, but the challenges to obtain compliance can be different depending on the data source. This chapter aims to highlight certain aspects of quality assurance that are specific, or are of special importance, to statistics that are produced (completely or partially) using specific data sources.

7.2. Section 7.A. provides definitions of the different data sources and highlights the role of the GSBPM for quality assurance. Sections 7.B. to 7.E. discuss the potential benefits and challenges when using statistical, administrative, other or multiple data sources. Table 7.1 in section 7.F. provides examples of specific elements to be assured when different data sources are used in order to mitigate the challenges that have been identified. Section 7.G. provides selected references regarding the use of different data sources.

7.A. Use of different data sources

7.3. *Statistics producers, data providers and the use of different data sources in the production of statistics*. Three types of statistics producers at the national level can be distinguished: the NSO, other producers of official statistics and other statistics producers outside of the NSS. In the context of this chapter, data providers are entities that own or hold the data used in the production of statistics (source data). All types of statistics producers can use any type or combination of data sources, be they statistical, administrative, or other data sources.

7.4. *Definition of different data sources for the production of statistics*. For the purposes of this *Manual* it is suggested that data sources be distinguished by their purpose and by the entity responsible for data compilation. While it is acknowledged that others may want to define and distinguish data sources differently according to their respective needs,[59,60,61] the following definitions and classification of data sources are proposed for the purposes of this *Manual*:

(a) Statistical data sources are data collections created primarily for official statistical purposes by government agencies or other entities working on behalf of the government. Statistical data sources include statistical sample surveys, censuses and statistical registers. There are different types of censuses, such as population and housing censuses, business censuses and agriculture censuses, among other types. Sample surveys and statistical registers can cover different units, for example individuals, households

[59] For example, administrative data sources may be referred to as secondary data sources, as opposed to statistical data sources, which are considered primary data sources (data collected for statistical purposes). See ECE, "Using administrative and secondary sources for official statistics: a handbook of principles and practices", document ECE/CES/13, pp. 1–2. Available at www.unece.org/fileadmin/DAM/stats/publications/Using_Administrative_Sources_Final_for_web.pdf.

[60] The OECD Glossary defines data source as "a specific data set, metadata set, database or metadata repository from where data or metadata are available". The term "data source" is currently not defined in the NQAF Glossary (available at https://unstats.un.org/unsd/dnss/docs-nqaf/NQAF%20GLOSSARY.pdf). The SDMX Glossary (available at https://sdmx.org/?sdmx_news=new-sdmx-glossary-available) defines the term "data source" as a "location or service from where data or metadata can be obtained", with "location" being understood as "a resolvable URL". It groups data sources into three categories depending on the type of access to the data.

[61] The term "data source" means different things for the producers of statistics and for the users

of statistics. For statistics producers, "data source" is the source of the data used for the production of statistics. For statistics users, the term may refer to the place where they obtain their statistics or data. From the perspective of a user, a primary data source is the entity that produces the statistics, while a secondary data source is an entity that disseminates statistics produced by someone else.

and businesses. Statistical registers can themselves be derived from different sources. For example, statistical business registers are often based on administrative data sources;

(b) Administrative data sources are data sets created primarily for administrative purposes by government agencies or other entities working on behalf of the government. Administrative data sources include administrative registers of persons and legal entities and the records of ministries, departments and specialized agencies, such as tax returns, social services records and customs data, or data of regional or local administrations. In contrast to statistical data sources, administrative data sources are not created in response to the need for statistical data but as a part of a government function, such as the provision of services or taxation. In some cases, statistical agencies participate in the design and/or collection of administrative data. In addition, statistical agencies may be involved at different stages of the production process of administrative data, with the aim of ensuring that the data will be usable for statistical purposes;

(c) Other data sources include all data sets that are not created primarily for official statistical or administrative purposes but rather for commercial or other private purposes. Other sources include data sets created by providers of communications, media and e-commerce services, providers of services based on Earth observation and remote sensing, and private insurance companies, but also include traditional sample surveys conducted by companies for their own purposes, such as market research. In general, other data sources include data sources associated with the term "big data" unless already included, in some instances, in statistical or administrative data sources.[62]

7.5. *Other data sources and new data sources*. Often the term "new data sources" is used when referring to other data sources, and both terms may be perceived as largely interchangeable at the time of the drafting of this *Manual*. However, this use of the term "new data sources" is misleading in multiple ways. New data sources can emerge from all three categories of data sources, be they statistical, administrative or other data sources. Furthermore, some of these data sources have been used in some countries for many years, and the notion of what is considered new changes over time.

7.6. *List of other data sources.* The following list of other data sources is provided only for illustrative purposes and is an attempt to reflect other major sources of data. It does not aim to provide an exhaustive list nor a classification of such sources:[63]

(a) Cross-country sample surveys by supranational organizations or international enterprises;

(b) Data compiled and maintained by private professional organizations or business associations, or by non-profit institutions in general;

(c) Data and records compiled and maintained and/or owned by enterprises that cover large parts of the population of statistical units, in particular e-commerce, media and telecommunications providers, but also other enterprises that provide services directly to individuals or businesses, such as insurance companies, banks and airlines;

(d) Earth observation and remote sensing;

(e) Thematic mapping and monitoring systems (e.g., field-monitoring stations for water quality, air pollution, etc.);

(f) Research/scientific and pilot studies;

(g) Citizen-generated data.

[62] The Global Working Group on Big Data appears to distinguish between big data, administrative data and traditional statistical data sources (see https://unstats.un.org/bigdata/). In the terms of reference of the Global Working Group on Big Data (E/CN.3/2015/4), it is explained that the Group should address the use of "new sources" of data, especially as a way to overcome the lack of timeliness (and availability) of data for the monitoring of the Millennium Development Goals.

[63] For a list of data sources, see, for example, ECE, "Using administrative and secondary sources for official statistics: a handbook of principles and practices", document ECE/CES/13, pp. 3–4. Available at www.unece.org/fileadmin/DAM/stats/publications/Using_Administrative_Sources_Final_for_web.pdf.

7.7. *Data sources, the statistical production process and quality assurance*. The statistical production process consists of several phases. The GSBPM addresses the following phases: the specification of needs, design, building, data collection, processing, analysis, the dissemination of the products and the evaluation of the process.[64] The GSBPM provides a universal basis for the identification of pertinent quality characteristics and the formulation of quality indicators by analysing the statistical production process. The use of the GSBPM, if properly applied and interpreted, can pinpoint quality issues in the use of specific data sources.[65] In addition, the selection of the appropriate data source itself is part of the statistical production process. However, overarching processes such as statistical infrastructure and management and support functions also need to be considered when identifying the quality principles and indicators that are most relevant for statistics compiled from a particular data source, or when selecting the data source.

[64] See GSBPM (version 5.1, January 2019). Available at https://statswiki.unece.org/display/GSBPM/GSBPM+v5.1.

[65] It must be noted that for some sources, such as big data, the statistical paradigm is different. The design phase of the GSBPM, especially subprocess 2.3, Design collection, and subprocess 2.4, Design frame and sample, is being substituted by the study on how to extract, interpret, transform and store the data so as to make them manageable and structure them according to statistical needs into units and variables.

Box 7.1

Elements to be assured related to the selection of the data source during the specification of needs phase

Subprocesses 1.1, Identify needs; 1.2, Consult and confirm needs; and 1.3, Establish output objectives

- To what extent does the data source satisfy information demand? (principle 14: Assuring relevance)

Subprocess 1.4, Identify concepts

- Is there metadata for administrative and other sources to determine whether relevant variables are available? (principle 14: Assuring relevance, and principle 18: Assuring coherence and comparability)

Subprocess 1.5, Check data availability

- To what extent have legal constraints regarding data collection, acquisition and use been assessed and any necessary changes been proposed? (principle 7: Assuring statistical confidentiality and data security, and principle 2: Managing relationships with data users, data providers and other stakeholders)
- To what extent do current data sources meet user requirements, taking into consideration the conditions under which they would be available and any restrictions on their use? (principle 14: Assuring relevance)
- If current data sources do not fully meet user requirements, to what extent has a strategy been proposed to fully meet user requirements? (principle 14: Assuring relevance)
- Is there an advance notification plan about the forthcoming changes to the data source? Is a contingency plan for changes to the data or data source in place? (principle 14: Assuring relevance)
- Has the completeness of data source(s) been evaluated, such as the percentage of units not belonging to the target population; the percentage of units missing from the target population; the coverage of the data; the absence of values for key variables; missing values in the source; and the total percentage of empty cells? (principle 15: Assuring accuracy and reliability)

Subprocess 1.6, Prepare and submit business case

- Has the data source been evaluated in terms of its cost-effectiveness? (principle 11: Assuring cost-effectiveness)

7.8. As also indicated in chapter 4, the GSBPM can help countries understand where to start and how to implement the NQAF by analysing the existing statistical production processes. Box 7.1 is based on the work of the Economic Commission for Europe (ECE) on quality indicators for the GSBPM and shows elements to be assured (indicators) related to the selection of the data source during the specification of needs phase, the first phase of the statistical production process.[66] Box 7.1 also shows the link of the indicator to the UN-NQAF principle being addressed.

[66] See High-level Group for the Modernisation of Official Statistics, "Quality indicators for the Generic Statistical Business Process Model (GSBPM) – for statistics derived from surveys and administrative data sources" (version 2.0, October 2017). Available at https://statswiki.unece.org/display/GSBPM/Quality+Indicators.

7.B. Using statistical data sources: potential benefits and challenges

7.9. *Potential benefits in using statistical data sources*. The main advantage of statistical data sources is that they allow data to be obtained according to specified needs and predefined statistical concepts.

7.10. *Challenges in using statistical data sources*. Statistical data sources impose challenges that directly affect the quality of the statistics produced from such sources. The major quality considerations that concern statistics produced from statistical sources are:

(a) The high cost of production (principle 11: Assuring cost-effectiveness);
(b) The availability of resources (principle 9: Assuring adequacy of resources);
(c) The low frequency of conducting sample surveys and censuses (principle 14: Assuring relevance);[67]
(d) The respondent burden and the willingness of respondents to provide information (principle 13: Managing the respondent burden);
(e) Sampling and non-sampling errors (principle 15: Assuring accuracy and reliability);
(f) The need for complex sampling designs (principle 10: Assuring methodological soundness);
(g) The need for careful planning, implementation of instruments, training and supervision of staff and rigorous evaluation (principle 12: Assuring appropriate statistical procedures).

[67] This will not apply to population censuses based on information from civil registers as already performed in some countries and as planned in the European Union. However, register-based population censuses require a fully functioning and complete civil registration system, which many developing countries do not have.

7.11. These quality issues may arise at different phases of the production process, and the GSBPM can be a useful tool for analysing these challenges.

7.C. Using administrative data sources: potential benefits and challenges

7.12. *Potential benefits in using administrative data sources*. The use of administrative data sources offers many potential advantages, such as cost-effectiveness, the reduction of the respondent burden, improved timeliness and improved relevance, accuracy and reliability due to their ability to obtain highly disaggregated data. In many statistical domains administrative data are indispensable to the production of statistics.

7.13. *Challenges in using administrative data sources*. There are multiple concerns and limitations when using administrative data sources, which should be addressed to better realize the potential benefits. The main concerns and limitations of administrative data sources in the context of quality assurance (quality threats) include:

(a) Insufficient cooperation with the providers/holders of data, a frequent lack of clarity with regard to the roles and responsibilities of different stake-

holders and legal challenges to obtaining access (principle 1: Coordinating the national statistical system, and principle 2: Managing relationships with data users, data providers and other stakeholders);

(b) Incoherent use or lack of use of statistical standard concepts, definitions and classifications (principle 3: Managing statistical standards);

(c) A lack of explicit commitment to quality on the part of holders (producers) of administrative data (principle 8: Assuring commitment to quality);

(d) Concepts underlying administrative data sources do not reflect the statistical concepts used to measure the phenomena (principle 14: Assuring relevance);

(e) Methodological and technical difficulties when managing access to administrative data sources, performing record linkage and integrating data across multiple administrative data sources, transmitting the data and integrating them with data from statistical sources (principle 12: Assuring appropriate statistical procedures);

(g) Difficulty in preserving security and preserving confidentiality of individual data when disseminating detailed statistics (principle 7: Assuring statistical confidentiality and data security);

(h) Interference and bias in the statistical production process and lack of information about how the data have been produced (principle 4: Assuring professional independence, principle 5: Assuring impartiality and objectivity, principle 6: Assuring transparency, and principle 19: Managing metadata);

(i) Under- or overcoverage of the target population, misalignment with the statistical reference period and/or inherent and unquantified bias as a result of the original purpose of the administrative data set (principle 15: Assuring accuracy and reliability);

(j) Inability to quantify uncertainty when there are only non-sampling errors (principle 15: Assuring accuracy and reliability).

7.D. Using other data sources: potential benefits and challenges

7.14. *Potential benefits in using other data sources.* The use of other data sources is an opportunity to rethink the elements that constitute the institutional environment and statistical processes and outputs. For example, the use of other data sources can offer the opportunity to overcome resource limitations, allow much more frequent and timely reporting, provide more objective information and, most importantly, generate data on phenomena and their aspects (disaggregations) that are difficult or impossible to capture with traditional statistical and administrative data sources. This leads to improved relevance.

7.15. *Challenges in using other data sources.* The full realization of the potential benefits of other sources is only possible if the identified concerns and quality limitations (quality threats) are addressed. Many of these concerns and limitations relate to the fact that entities outside the NSS own, hold or have responsibility for the other data sources. The major quality issues associated with the statistics compiled from other sources of data include:

(a) Limited access to other data sources and legal challenges regarding their access (as can also be the case for administrative sources) may require arrangements with the data providers (e.g., government agencies and private sector and research institutions); a lack of knowledge about the exist-

ence of such data; and the sustainability of the source over time (principle 2: Managing relationships with data users, data providers and other stakeholders);

(b) Incoherent use or lack of use of statistical standard concepts, definitions and classifications (principle 3: Managing statistical standards) may occur that put the accuracy, reliability, coherence and comparability of the resulting statistics in question;

(c) Providers of data (which may be the owner or holder of the data) are not subject to and may not adhere to the Fundamental Principles of Official Statistics and associated statistical quality principles such as professional independence (principle 4) and commitment to quality (principle 8);

(d) Utilizing data for statistical purpose may potentially put the confidentiality and privacy of individuals, households and businesses at risk, depending on how detailed the data being published are (principle 7: Assuring statistical confidentiality and data security);

(e) Data from sources such as mobile phones or social media are not representative of the entire population and may cause serious selection bias when used for statistical purposes (principle 10: Assuring methodological soundness, principle 12: Assuring appropriate statistical procedures, and principle 15: Accuracy and reliability);

(f) There may be interference and bias in the statistical production process and a lack of information about how the data are being produced (principle 4: Assuring professional independence, principle 5: Assuring impartiality and objectivity, and principle 6: Assuring transparency);

(g) The data collection is not designed for statistical purposes and may not provide the information required by users (principle 14: Assuring relevance) or may not correctly describe the phenomena that are to be measured (principle 15: Assuring accuracy and reliability);

(h) Technical access to and use of the data, in particular large amounts of data, can be very challenging and may require significant IT resources and expertise (principle 12: Assuring appropriate statistical procedures);

(i) Under- or over-coverage of the target population, population changes over time, misalignment of the reference period compared to what is desired and inherent bias as a result of the original purpose of the data set may occur (principle 15: Assuring accuracy and reliability, and principle 18: Assuring coherence and comparability);

(j) There may be an inability to quantify uncertainty when there are only non-sampling errors (principle 15: Assuring accuracy and reliability).

7.16. *Conclusions of the United Nations Statistical Commission on the use of new data sources*. Interest in the use of other data sources (including the data sources covered by the term "big data") for the compilation of official statistics has been growing over the years. With the adoption of the 2030 Agenda for Sustainable Development and in view of the global and national data requirement to measure progress towards the SDGs, the use of other "new" data sources was identified as one of the top priorities for NSSs. Considering both the benefits and concerns/limitations of the use of the new data sources in official statistics, the Commission promoted their use and, at the same time, emphasized "the importance of ensuring the quality of data derived from new sources and new data providers, including those outside the official statistical system".[68] Specifically, the Commission:

[68] See E/2017/24, decision 48/106.

[69] See E/2018/24, decision 49/107.

[70] Please see, in particular, European Statistical System network, "ESSnet on quality of multisource statistics – KOMUSO". Available at https://ec.europa.eu/eurostat/cros/content/essnet-quality-multisource-statistics-komuso_en.

[71] There are extensive methodologies for quality assurance and verification of the headline figures of national accounts such as gross domestic product and gross national income (GNI) owing to their widespread use for policymaking and administrative purposes, such as the determination of countries' financial contributions to regional and international organizations. Please see Eurostat, "Monitoring GNI for own resource purposes", available at https://ec.europa.eu/eurostat/statistics-explained/index.php/Monitoring_GNI_for_own_resource_purposes.

(a) Confirmed "that the use of big data and other new data sources is essential for the modernization of national statistical institutions, so that they remain relevant in a fast-moving data landscape";
(b) Supported the collaboration between the NSS members and providers of the new data sources "including work to formulate standards and guidelines for data governance and information management";
(c) "Emphasized the need to carefully address societal challenges of trust, ethics, privacy, confidentiality and security of data".[69]

7.17. Other data sources should be used for the purposes of compiling official statistics if the quality of the statistical process and outputs are sufficiently assured. Quality assurance activities may be undertaken by the NSO and other NSS members on their own and/or as part of the partnership agreements with data providers.

7.E. Using multiple data sources: potential benefits and challenges

7.18. *Potential benefits of using multiple data sources*. The use of multiple data sources is increasingly common in the compilation of official statistics, especially for the monitoring of the SDGs. The use of one single source may not allow for the required disaggregation of data. However, disaggregated data may be obtained through integration with data from a different source.[70] For example, combining data sources may provide a higher coverage of the target population and consequently the compilation of statistics with the required disaggregation level. Moreover, the integration of data sources can provide a better understanding of investigated phenomena due to the availability of more information. Data integration can include:

(a) Combining data from multiple sources as part of the creation of integrated statistics, such as national accounts, for which the quality depends on the quality of the basic statistics that are being used for its compilation and the quality of the integration and estimation processes;[71]
(b) Pooling data, for example, by merging sample survey data from different collection cycles in one data set (pool of data) with the aim of increasing the effective number of observations of a phenomenon, which allows more accurate estimates of the target population and, potentially, of the estimates pertaining to small domains, to be obtained;[72]
(c) Statistical matching (data fusion) and record linkage routines that link microdata from different sources;[73]
(d) Prioritization, when two or more sources contain data for the same variable but have potentially different values.

7.19. *Major challenges in using data from multiple sources* are:

(a) Assuring methodological soundness (principle 10), as it relates to different coverage and the use of different concepts and definitions, among other things;
(b) Assuring appropriate statistical procedures (principle 12), as they relate to the appropriate procedures, skills and knowledge required to link and integrate data;
(c) Assuring confidentiality and data security (principle 7);
(d) Assuring coherence and comparability over time (principle 18); the quality of the entire integration process should be assessed by calculating proper indicators.[74]

[72] See, for example, Michael Wendt, "Considerations before pooling data from two different cycles of the general social survey", 27 February 2007. Available at www23.statcan.gc.ca/imdb-bmdi/document/8011_D1_T9_V1-eng.pdf.

[73] The methods can be differentiated as follows: (a) if the units of observation in the survey samples are exactly matched using units' identifiers such as social security numbers or names and addresses that are error free, it is called "merging" or "exact matching"; (b) "record linkage" refers to integration procedures where units' identifiers are not error free or, in the absence of identifiers, key variables (name, surname, birthday, gender, etc.) are used to link units; and(c) statistical matching (also called data fusion) typically aims to achieve a complete data file using data from different sources that contain the same units of observation but either have different identifiers or do not contain the same units at all. Statistical matching or data fusion investigates the relationship between variables that are not jointly observed. This can be done by creating synthetic records (statistical matching or data fusion at the micro level) or by estimating parameters of a model such as a regression (statistical matching or data fusion at the macro level). Traditionally, statistical matching is done with regard to the variables common to all data files used in the production of a particular statistical output.

[74] See, for example, Statistics Canada, "Record linkage project process model", 2017. Available at www.statcan.gc.ca/pub/12-605-x/12-605-x2017001-eng.htm.

7.F. Elements to be assured for different types of data sources

7.20. Table 7.1 lists examples of specific elements to be assured when statistical, administrative, other or multiple sources of data are used. These elements can help mitigate the challenges that have been identified for each of the data sources.

Table 7.1
Examples of some specific elements to be assured when different sources of data are used

UN-NQAF principles	Data source	Requirements/elements to be assured[a]	Explanation
Managing the statistical system			
Principle 1: Coordinating the national statistical system	Statistical	There is a body that ensures coordination of sample surveys and their methodological soundness throughout the NSS (1.2, 10.1)	Sample surveys should be coordinated and integrated for cost-effectiveness and methodological soundness
	Administrative	Administrative records are systematically linked with records from other relevant administrative data systems, as permitted by applicable laws (1.2, 10.1, 11.5)	The linking of administrative data will allow the best possible use of the information already available
	Administrative Other	There is a unit that discusses and provides support for the use of administrative data sources and other data sources within the NSS (1.2, 10.1, 11.5)	The use of administrative and other data sources poses unique challenges that should be addressed by sharing experiences and best practices
Principle 2: Managing relationships with data users, data providers and other stakeholders	Administrative Other	Laws and regulations are in place to allow the required access to administrative and other data sources (2.5, 2.6)	Limited access is a frequent obstacle for the use of administrative data sources and other data sources
	Other	Partnership agreements with data providers are in place (2.6)	The use of other data sources benefits from a partnership with the data provider
Principle 3: Managing statistical standards	Statistical Administrative Other Multiple	The national statistical agency monitors the use of statistical standards (3.2)	The use of standard concepts, definitions and classifications facilitates the use and integration of data
Managing the institutional environment			
Principle 5: Assuring impartiality and objectivity	Other	Data sources and methodologies are chosen on an objective basis (5.3)	Data from other sources should only be used if they are selected and compiled according to professional standards
Principle 6: Assuring transparency	Other	The terms and conditions under which other data sources are being used are made public (6.1)	Users must have the ability to know what other data sources are being used and how they are being used

UN-NQAF principles	Data source	Requirements/elements to be assured[a]	Explanation
Principle 7: Assuring statistical confidentiality and data security	Other Multiple	Special procedures exist for keeping linked data secure (7.2, 7.3, 7.5)	The use of data from multiple sources frequently requires establishing record-linkage
Managing statistical processes			
Principle 10: Assuring methodological soundness	Statistical	The sample survey designs are evaluated according to all relevant methodological considerations (e.g., the extent to which the sample survey frame matches the target population, sampling error, etc.), and tested (10.1, 10.4)	Sample survey designs must follow proper methodology to ensure output quality and cost-effectiveness
	Administrative Other	A methodology for the use of administrative data and data of other sources is established (10.1, 10.3)	The use of data from administrative and other sources should follow an established methodology
	Multiple	A methodology for linking data of other sources is established (10.1, 10.3)	The linking of data from multiple sources should follow an established methodology
Principle 11: Assuring cost-effectiveness	Statistical	Different data sources are evaluated in terms of cost-effectiveness (11.2, 11.5)	Censuses and sample surveys are very expensive (therefore, some countries are moving to register-based censuses if they have a civil register)
	Multiple	A data integration unit integrates data centrally (11.6)	Data integration should be done only by experienced and competent staff.
Principle 12: Assuring appropriate statistical procedures	Statistical	Censuses and sample survey data are geocoded (12.2)	Geocoding of censuses and sample survey data facilitates data integration and allows disaggregation by location
	Administrative Other	Procedures for coding, editing, imputing, etc., are documented (12.2)	The steps needed to use administrative data and other data sources for statistical purposes need to be documented
	Multiple	Procedures for linking data from different sources are established and are documented and available (12.2)	Changes in procedures for linking data from multiple sources may threaten consistency of results over time
Principle 13: Managing the respondent burden	Statistical	There is a communication plan to explain the purpose of the sample survey and census (13.2)	The quality of the sample survey and census results depends on the willingness of the respondents to reply accurately to the questions
Managing statistical outputs			
Principle 14: Assuring relevance	Statistical Administrative Other Multiple	Statistics based on new data sources are being developed in response to society's emerging information needs (14.3)	Taking new user needs into account is crucial for the use of all data sources

UN-NQAF principles	Data source	Requirements/elements to be assured[a]	Explanation
Principle 15: Assuring accuracy and reliability	Statistical	Sampling errors are measured, evaluated and systematically documented (15.1, 15.2)	Accuracy and reliability of sample survey results rely on the appropriate sample survey design
	Administrative Other Multiple	Non-sampling errors are described and estimated when possible (15.1, 15.2)	Non-sampling errors could contribute significantly to uncertainty in statistical products, and are difficult to quantify
Principle 18: Assuring coherence and comparability	Administrative Other	Results are compared with other available information and over time (18.2)	The use of administrative data and other data sources requires additional attention to assess coherence and comparability, as they are not compiled primarily for statistical purposes
Principle 19: Managing metadata	Statistical Administrative Other Multiple	Metadata are provided and cover all relevant aspects of the use of different data sources (19.2)	Statistics must always be accompanied by metadata to allow the user to evaluate the statistics being provided

[a] References to the UN-NQAF requirements concerned (or elements to be assured under the UN-NQAF requirements) are indicated in parentheses (see chapter 3 and the annex for details).

7.G. Selected references on quality assurance

7.21. This section provides selected references on quality assurance when specific data sources are being used.

7.22. *Selected references on quality assurance for statistics obtained from statistical sources*:

(a) *Principles and Recommendations for Population and Housing Censuses, Revision 3* (United Nations publication, Sales No. E.15.XVII.10), pp. 66–77. Available at https://unstats.un.org/unsd/demographic-social/Standards-and-Methods/files/Principles_and_Recommendations/Population-and-Housing-Censuses/Series_M67rev3-E.pdf;

(b) Eurostat, *EU legislation on the 2011 Population and Housing Censuses: Explanatory Notes*, 2011 edition (Luxembourg, Publications Office of the European Union, 2011), pp. 21–37. Available at http://ec.europa.eu/eurostat/en/web/products-manuals-and-guidelines/-/KS-RA-11-006;

(c) Statistics Canada, "Appendix B – Quality control and quality assurance" in *Survey Methods and Practices* (12-587-X), pp. 309–319. Available at https://www150.statcan.gc.ca/n1/pub/12-587-x/12-587-x2003001-eng.pdf.

7.23. *Selected references on quality assurance for statistics produced using administrative data sources*:

(a) ECE, "Using administrative and secondary sources for official statistics: a handbook of principles and practices", document ECE/CES/13, pp. 37–42. Available at www.unece.org/fileadmin/DAM/stats/publications/Using_Administrative_Sources_Final_for_web.pdf;

(b) Matthias Schnetzer and others, "Quality assessment of imputations in administrative data", *Journal of Official Statistics*, vol. 31, No. 2 (June 2015). Available at https://ec.europa.eu/eurostat/cros/content/lr23-quality-assessment-imputations-administrative-data_en;

(c) Brian Pink, "Quality management of statistical outputs produced from administrative data", Information Paper, catalogue No. 1522.0 (Australian Bureau of Statistics, March 2011). Available at www.abs.gov.au/websitedbs/D3310114.nsf//home/Quality:+ABS+Quality+Information+Papers;

(d) Statistics Canada, "Use of administrative data in Canada". Available at www.statcan.gc.ca/pub/12-539-x/2009001/administrative-administratives-eng.htm;

(e) William Iwig and others, "Data quality assessment tool for administrative data". Available at www.bls.gov/osmr/datatool.pdf;

(f) Piet Daas and others, "Checklist for the quality evaluation of administrative data sources", Discussion paper 09042 for Statistics Netherlands (The Hague, 2009). Available at http://ec.europa.eu/eurostat/documents/64157/4374310/45-Checklist-quality-evaluation-administrative-data-sources-2009.pdf/24ffb3dd-5509-4f7e-9683-4477be82ee60;

(g) *Register-based Statistics in the Nordic Countries: Review of Best Practices with Focus on Population and Social Statistics* (United Nations publication, Sales No. E.07.II.E.11);

(h) ECE, "Guidelines on statistical business registers", document ECE/CES/39. Available at www.unece.org/fileadmin/DAM/stats/publications/2015/ECE_CES_39_WEB.pdf;

(i) Eva-Maria Asamer and others, "Quality assessment for register-based statistics – results for the Austrian Census 2011" *Austrian Journal of Statistics*, vol. 45, No. 2 (February 2016). Available at https://ec.europa.eu/eurostat/cros/content/lr22-quality-assessment-register-based-statistics-results-austrian-census-2011_en;

(j) UK Statistics Authority, "Quality assurance of administrative data". Available at www.statisticsauthority.gov.uk/osr/monitoring/administrative-data-and-official-statistics/;

(k) UK Statistics Authority, "Administrative data quality assurance toolkit". Available at www.statisticsauthority.gov.uk/wp-content/uploads/2015/12/images-qualityassurancetoolki_tcm97-44368.pdf;

(l) Italian National Institute of Statistics, "Guidelines for the quality of statistical processes that use administrative data", version 1.1 (August 2016). Available at www.istat.it/en/files/2013/04/Linee-Guida-v1.1-Versione-inglese.pdf;

(m) David J. Hand, "Statistical challenges of administrative and transaction data", *Journal of the Royal Statistical Society*, Series A: Statistics in Society, vol. 181, No. 3 (2018). Available at https://rss.onlinelibrary.wiley.com/doi/epdf/10.1111/rssa.12315.

7.24. *Selected references on the use of other data sources*. At this time, there are no specific references on quality assurance for the use of other, including "new", data sources. Some references regarding the use of other data in general include:

(a) The web portal of the Global Working Group on Big Data for Official Statistics: https://unstats.un.org/bigdata/;

(b) Steve Landefeld, "Uses of big data for official statistics: privacy, incentives, statistical challenges, and other issues", paper presented at the International Conference on Big Data for Official Statistics in Beijing in October 2014. Available at https://unstats.un.org/unsd/trade/events/2014/beijing/Steve%20Landefeld%20-%20Uses%20of%20Big%20Data%20for%20official%20statistics.pdf;

(c) Thilo Klein and Stefaan Verhulst, "Access to new data sources for statistics: business models and incentives for the corporate sector", OECD Statistics Working Paper, No. 82 (Paris, OECD, 2017). Available at www.oecd-ilibrary.org/docserver/9a1fa77f-en.pdf?expires=1523719206&id=id&accname=guest&checksum=630A5227A37379F916A6C11B8465BCDC;

(d) "The European Statistical System (ESS) Vision 2020". Available at https://circabc.europa.eu/sd/a/5d9b6106-ca64-4802-9dcf-c9a0f43b477f/ESS_Vision_2020_ESSC_May2014.pdf;

(e) Piet Daas and others, "New data sources for statistics: experiences at Statistics Netherlands", Discussion paper 201109 for Statistics Netherlands (The Hague, 2011). Available at www.cbs.nl/nl-nl/achtergrond/2011/09/new-data-sources-for-statistics-experiences-at-statistics-netherlands;

(f) Abdullahi Abdulkadri, Alecia Evans and Tanisha Ash, "An assessment of big data for official statistics in the Caribbean: challenges and opportunities", *ECLAC – Studies and Perspectives Series – The Caribbean*, No. 48 (Santiago, 2016). Available at https://repositorio.cepal.org/bitstream/handle/11362/39853/1/S1501378_en.pdf.

7.25. Selected references on data integration. Good practices in assuring the quality of data obtained by the integration process from different sources are described in several documents:

(a) European Statistical System network, "ESSnet on quality of multisource statistics – KOMUSO". Available at https://ec.europa.eu/eurostat/cros/content/essnet-quality-multisource-statistics-komuso_en;

(b) Italian National Institute of Statistics and others, "Report on WP1: state of the art on statistical methodologies for data integration", available at www.istat.it/en/files/2013/12/FinalReport_WP1.pdf; and Sorina Vâju and others, "Measuring the quality of multisource statistics", available at https://ec.europa.eu/eurostat/cros/system/files/Vaju-etal%20Measuring%20quality%20multisource_abstract_unblinded.pdf;

(c) Statistics Canada, "Record linkage project process model", 2017. Available at www.statcan.gc.ca/pub/12-605-x/12-605-x2017001-eng.htm;

(d) Eurostat, *Insights on Data Integration Methodologies* (Luxembourg, Office for Official Publications of the European Communities, 2009). Available at http://ec.europa.eu/eurostat/documents/3888793/5845197/KS-RA-09-005-EN.PDF/4cef0f2d-45a0-46b7-bfd6-196a55fca801?version=1.0;

(e) Robert M. Groves and Brian A. Harris-Kojetin, eds., *Innovations in Federal Statistics: Combining Data Sources While Protecting Privacy* (Washington, D.C., National Academies Press, 2017. Available at www.nap.edu/read/24652/chapter/1;

(f) Division of Behavioral and Social Sciences and Education, Committee on National Statistics, "Improving federal statistics for policy and social science research using multiple data sources and state-of-the-art estimation methods". Available at http://sites.nationalacademies.org/dbasse/cnstat/dbasse_170268.

Chapter 8
Quality assurance of data and statistics on Sustainable Development Goal indicators

Introduction

8.1. Chapter 8 provides information and guidance on assuring the quality of data and statistics on SDG indicators.[75] Section 8.A. discusses the challenge of assuring the quality of data and statistics on the SDG indicators. Section 8.B. provides an overview of the roles of the different entities participating in this task. Sections 8.C. to 8.F. introduce the requirements and elements to be assured that are of special importance to the quality assurance of SDG indicators. [76] These requirements and elements are presented as action items and in accordance with the four levels of the UN-NQAF. A rationale for their importance is provided and the responsible entities are identified. Many suggested activities for assuring the quality of the SDG indicators would need to be taken on by a central coordination body such as the NSO, in cooperation with additional supporting bodies such as an SDG indicator working group (SDG-WG). Other activities apply to the individual members of the NSS, but under certain circumstances may also apply to other statistics producers outside the NSS.

8.A. Challenge of assuring the quality of data and statistics on Sustainable Development Goal indicators

8.2. *The global indicator framework*. In September 2015, the General Assembly adopted the 2030 Agenda for Sustainable Development. Its 17 Sustainable Development Goals and 169 targets are expected to guide the actions of the international community to 2030. In its resolution 70/1, the Assembly stated that "quality, accessible, timely and reliable disaggregated data will be needed to help with the measurement of progress and to ensure that no one is left behind". Subsequently, in July 2017, the Assembly adopted resolution 71/313, which contained in its annex a list of 232 global indicators, which were identified by the Inter-Agency and Expert Group on SDG Indicators and agreed upon by the United Nations Statistical Commission at its session in 2017, to monitor and review the progress towards achieving the 2030 Agenda.[77] With this in mind, the Commission requested that the UN-NQAF be updated and emphasized "the importance of ensuring the quality of data derived from new sources and new data providers, including those outside the official statistical system».[78]

8.3. *The special challenge of assuring the quality of SDG indicator data and statistics*. The following factors characterize the special challenge of assuring the quality of the indicator data and statistics for the monitoring of the SDGs:

[75] The *Manual* distinguishes data providers and statistics producers by using the term "statistics" to refer to an output of a statistics production process, and the term "data" to refer to an input to the statistics production process (see section 1.C.). The term "SDG indicator data and statistics" (or "SDG indicators") as used in this chapter does not follow this distinction and refers to the output of a statistical production process.

[76] The information provided in this chapter, and in particular in sections 8.C. to 8.F., benefited from the experiences gained during technical assistance activities conducted by the Statistics Division of the Department of Economic and Social Affairs to support the establishment of SDG monitoring in countries.

[77] The Inter-Agency and Expert Group on SDG Indicators is composed of Member States and includes regional and international agencies as observers. See https://unstats.un.org/sdgs/iaeg-sdgs/.

[78] See E/2017/24, decision 48/106.

(a) The production of the SDG indicators is a task that may involve all members of the NSS as well as new or non-traditional statistics producers and data providers;

(b) The set of identified global SDG indicators is large and diverse, ranging from basic presence or absence indicators (e.g., presence or absence of a certain regulation) to indicators involving complex statistical calculations;[79]

(c) While some indicators are already calculated, others will require the collection of additional data, including from administrative and other data sources;

(d) Countries are establishing their own national indicator frameworks according to their national circumstances and priorities; these localized frameworks are expected to be based on the global SDG indicators, containing some (or many) but not all global indicators and additional national indicators. Furthermore, countries may utilize different types of proxy indicators, which provide indirect or partial measures of the phenomena which the global indicators cover;

(e) When adopted in 2017, the global SDG indicators were at different stages of methodological development, and many global indicators were considered to be lacking an internationally agreed methodology.[80] In addition to the general challenge faced by countries with regard to understanding and compiling data for indicators that were new and had not been compiled before, there was also an initial lack of compilation guidance;[81]

(f) The disaggregation of the global SDG indicators is a major challenge for countries. As of the end of 2018, there was still a lack of methodological guidance on how to disaggregate certain indicators. In addition, given that countries have different needs, there is a lack of guidance on which disaggregations should be prioritized across countries in support of global and regional reporting beyond what is reflected in the indicator titles and target names.

8.4. *Recommendations for quality assurance*. Chapters 5 and 6 discuss the institutional arrangements, organizational aspects and responsibilities for quality assurance within the NSS. This chapter builds on those two chapters and identifies specific quality assurance actions that should be taken by the central coordination body, other NSS-wide bodies and by individual producers of SDG indicators with regard to quality assurance. The actions of the members of the NSS are to be based on the Fundamental Principles of Official Statistics. The following core recommendations for quality assurance of those set out in chapter 2 are of particular importance in assuring the quality of SDG indicator data and statistics:

(a) **It is recommended** that countries include the requirements of quality assurance in their national statistical legislation and other legislation mandating the production of statistics for official use (core recommendation #2);

(b) **It is recommended** that countries establish a national quality assurance framework for official statistics and that all members of the national statistical system commit to continually assessing, improving and reporting on the quality of official statistics, as well as on the quality of data and statistics used in the production of official statistics as required[82] (core recommendation #3);

[79] Some countries may view some of the qualitative indicators as being outside of the scope of official statistics, and therefore not subject to statistical quality assurance. However, users would generally expect that information on all SDG indicators is being provided together and is of similar quality and subject to quality assurance.

[80] See the discussion on the tier classification of the global SDG indicators available on the website of the Inter-Agency and Expert Group on SDG Indicators: https://unstats.un.org/sdgs/iaeg-sdgs/.

[81] For guidance on the compilation of the global SDG indicators, see "E-Handbook on the Sustainable Development Goals Indicators", available at https://unstats.un.org/wiki/display/SDGeHandbook/Home.

[82] This commitment of members of the NSS should also, as deemed appropriate and required, extend to data and statistics that are disseminated jointly with other statistics producers that are not members of the NSS.

(c) **It is recommended** that the national quality assurance framework be implemented at the national statistical office and throughout the entire national statistical system. Furthermore, **it is recommended** that the national quality assurance framework be applied to all data and statistics produced outside of the national statistical system that are disseminated with the help and support of a member of the national statistical system or that are used for government decision-making, as deemed appropriate and required (core recommendation #5).

8.5. *Quality assurance in the global statistical system*. Quality assurance for the SDG indicators at the national level cannot be viewed in isolation. The national data and statistics are submitted to and compiled by designated global custodian agencies that are responsible for calculating regional and global aggregates and providing internationally comparable national data in their specific statistical domains. Frequently, the custodian agencies support countries in the compilation of national data, including with regard to quality assurance. See chapter 9 for further details regarding quality assurance in the global statistical system.

8.6. *The UN-NQAF and assuring the quality of the SDG indicators*. The UN-NQAF presented in chapter 3 and the annex provides a set of principles, requirements and elements to assure the quality of official statistics at four levels: managing the statistical system, managing the institutional environment, managing statistical processes and managing statistical outputs. Quality assurance for individual producers of official statistics typically starts with and focuses on the quality of the statistical outputs. This also applies to SDG indicator data and statistics. However, the quality of the SDG indicators also depends on: (a) the use of proper statistical processes; the presence of an adequate institutional environment; and (c) the efficient management of the statistical system. Therefore, all UN-NQAF principles and requirements are necessary to assure the quality of the SDG indicators.

8.7. *Using the GSBPM*. The GSBPM described in chapter 4 provides a basis for the systematic examination, identification and addressing of pertinent quality aspects for the development, production and dissemination of SDG indicators.[83] All phases of the GSBPM, (i.e., the specification of needs, design, building, data collection, processing, analysis, the dissemination of the products and the evaluation of the process) apply to any statistical production process, including the production of the SDG indicators.

[83] See GSBPM (version 5.1, January 2019). Available at https://statswiki.unece.org/display/GSBPM/GSBPM+v5.1.

8.B. Roles of coordination bodies and individual producers of data and statistics on Sustainable Development Goal indicators in assuring the quality of the indicators

8.8. The NSO as the central coordination body. Specific arrangements may vary, but typically the NSO is the central coordination body of the NSS and the entity responsible for the overall dissemination and reporting of the SDG indicators. In this function, the NSO is expected to play a key role, and to have an overarching responsibility for the assurance of quality with regard to the SDG indicators. In addition, the NSO is typically responsible for the compilation of the largest share of the SDG indicator data and statistics included in the national SDG indicator framework and intended for use by government policymakers and other users.

8.9. *Roles of other NSS-wide bodies*. Depending on the specific national arrangements, quality assurance for the SDG indicators may be supported by an NSS-

wide governance body, an NSS-wide advisory body and subsidiary or supporting bodies, such as an SDG-WG or an NSS-wide data quality task force (see chapter 6 for further details). The NSS-wide governance and NSS-wide advisory body may encompass members from within the NSS, data users and other stakeholders and may issue directives to ensure coordination throughout the NSS and ensure that user needs are articulated and being met. An SDG-WG should consist of members of the NSS and is typically chaired by the NSO. The SDG-WG would discuss all issues related to the production of SDG indicator data and statistics, including quality assurance.

8.10. *The roles of the individual producers of SDG indicator data and statistics.* The individual producers of SDG indicators, such as government ministries, departments and agencies and other public and private entities, are required to produce high-quality data and statistics according to their respective mandates reflected in the laws and regulations of the country or in other formal arrangements. Most of the producers of SDG indicators will be members of the NSS, although some producers may not. All producers of SDG indicators are responsible for assuring the quality of their indicators by properly managing their statistical production processes and outputs. However, some may be new to the concept of statistical quality assurance and may not have the capacity and ability to assure the quality of the SDG indicators under their responsibility alone. In these cases, appropriate capacities need to be built and adequate technical support will need to be provided by the coordination body, other NSS-wide bodies and members of the NSS.

8.11. Sections 8.C. to 8.F. list a set of requirements and elements to be assured for SDG indicators, organized by the different levels of quality assurance according to the UN-NQAF, and provide justification or rationale for their inclusion. In addition, the tables in these sections specify who should be responsible for the implementation of the respective requirement or element to be assured – either the central coordinating body (typically the NSO), the SDG-WG and/or individual producers of SDG indicators.

8.C. Managing the national statistical system as part of assuring the quality of Sustainable Development Goal indicators

8.12. The development, production and dissemination of SDG indicators is a task that involves most if not all members of the NSS. In some countries, statistics producers outside the NSS may participate. Assuring quality at the level of managing the NSS is necessary in view of the methodological complexity of the task and the need to ensure efficient coordination of the data (and metadata) flows between providers of source data and the producers of the SDG indicators. Quality assurance at this level must consider the coordination of the NSS (principle 1), the managing of relationships with data users, data providers and other stakeholders (principle 2) and the managing of statistical standards (principle 3). Table 8.1 identifies essential requirements or elements to be assured with regard to this level of quality assurance. The table also includes the rationale for their inclusion as well as a brief explanation of who is or should generally be responsible for their implementation.

Table 8.1
Sustainable Development Goal indicators: requirements and elements to be assured in managing the statistical system

Requirements/elements to be assured[a]	Rationale for inclusion and description of responsibilities
Principle 1: Coordinating the national statistical system	
As appropriate, review the national statistical law and initiate its update as required to: (a) Establish effective institutional arrangements by, among other things, enhancing the coordination role of the NSO, especially with regard to the production and quality assurance of the SDG indicators; (b) Establish a mechanism for the assessment of data quality; (c) Improve transparency of and public access to the SDG indicators and related metadata. (1.1)	**Rationale:** Effective institutional arrangements are necessary for the development, production and dissemination of SDG indicators, including quality assurance, to be able to respond to current and emerging data and statistical needs. **Responsibility:** The central coordination body (NSO), assisted by a high-level advisory body, should participate in the development of draft amendments to the statistics law, as appropriate; individual NSS members should be consulted and should provide input and comments to ensure that the amendments address their specific needs.
Establish an NSS-wide coordination body and NSS-wide supporting body, such as the SDG-WG, tasked with coordinating the development, production and dissemination of the SDG indicators (and related metadata) and for ensuring their quality. (1.2, 1.3)	**Rationale:** The establishment of an SDG coordination body and an SDG-WG is necessary, as the production of the SDG indicators requires ongoing collective effort and coordination with all producers of SDG indicators and concerned data providers. **Responsibility:** The central coordination body (typically the NSO) should initiate the establishment of the SDG-WG; all producers of SDG indicators should actively participate in the work.
As appropriate, review the legal and/or regulatory framework underpinning data collection activities of NSS members and draft proposals for amendments, as necessary, to facilitate access to administrative and other data needed for the compilation of the SDG indicators. (1.1, 1.3, 2.4–2.6)	**Rationale:** Data collection by individual NSS members is regulated by applicable legislation and/or government regulation; these may need to be amended to allow for the compilation and sharing of data required for the efficient production of the SDG indicators. **Responsibility:** Individual NSS members.
Review and update the National Strategy for the Development of Statistics (1.4, 9.1)	**Rationale:** The National Strategy needs to be reviewed and updated to reflect the additional requirements for the monitoring of the SDGs. **Responsibility:** The central coordination body (NSO) should initiate the review and update of the National Strategy; all NSS members should actively participate in the work as required.
Organize efficient data flows for SDG indicator-related data and metadata exchange between NSS members by, among other things, amending existing memorandums of understanding with the providers of source data (e.g., specify data items, formats of data files, schedules of submission, etc.). (1.2)	**Rationale:** Efficient data flows are required for timely production of the SDG indicators. **Responsibility:** The central coordination body (NSO), SDG-WG and all producers of SDG indicators.
Principle 2: Managing relationships with data users, data providers and other stakeholders	
Create frequent and periodic opportunities for dialogue on the SDG indicators with different user groups, including policymakers, non-governmental organizations, research institutions and the general public. (2.2)	**Rationale:** SDG indicators must be fit for purpose; therefore, consultation and dialogue with users to better understand their needs for monitoring the SDGs is a basic requirement for assuring the quality of the SDG indicators. **Responsibility:** The central coordination body (NSO) and the SDG-WG should initiate a comprehensive dialogue with users; the individual producers of SDG indicators are responsible for consultations with their specific user groups.
Establish NSS-wide guidelines for engagement with international SDG indicator custodian agencies. (2.3)	**Rationale:** International SDG custodian agencies rely on national data and should use the correct national data produced by the NSS. **Responsibility:** The central coordination body (NSO), the SDG-WG and individual producers of SDG indicators (as well as the international custodian agencies) should participate in this effort.
Develop a policy and identify good practices for public-private cooperation in data collection and use of data from private data providers for the production of SDG indicators; establish the necessary institutional arrangements for such cooperation. (1.2, 1.3, 2.3–2.6)	**Rationale:** SDG indicator compilation may require the use of data from multiple data providers, including from private data providers. **Responsibility:** The central coordination body (NSO), the SDG-WG and individual NSS members should participate in this effort.
Establish regular contacts with the media to better disseminate SDG indicator-related information and obtain user feedback. (2.2, 14)	**Rationale:** The general public must be informed about the country's progress; the media plays an important role in that respect, often providing valuable user feedback. **Responsibility:** The central coordination body (NSO) and the SDG-WG should provide leadership and coordination for this task; individual producers of SDG indicators should undertake such efforts.

Requirements/elements to be assured[a]	Rationale for inclusion and description of responsibilities
Principle 3: Managing statistical standards	
Promote, monitor and support a uniform application of international and national statistical standards (statistical concepts and classifications, etc.) by all producers of SDG indicators. (3.1–3.3)	**Rationale:** Standards need to be applied to ensure comparability and to allow the combined use and the merging of data. **Responsibility:** The central coordination body (NSO) should lead this work with support from the SDG-WG; the individual producers of SDG indicators should assure their compliance.
Review the application of international standards in the production of the SDG indicators, identify the reasons for non-compliance and develop action plans to improve compliance. (3.1–3.3, 18.1)	**Rationale:** Nationally produced global indicator data and statistics should be internationally comparable. **Responsibility:** The central coordination body (NSO) and the SDG-WG should steer these efforts; the individual producers of SDG indicators should review their compliance and explain the reasons for non-compliance.
Organize a system-wide staff training on statistical standards and good practices in the production of SDG indicators. (3.2)	**Rationale:** Adequate training will increase the capacity of the NSS to produce the SDG indicators. **Responsibility:** The central coordination body (NSO) and the SDG-WG should organize and conduct such training, while producers of SDG indicators should participate.

[a] References to the UN-NQAF requirements concerned (or elements to be assured under the UN-NQAF requirements) are indicated in parentheses (see chapter 3 and the annex for details).

8.D. Managing the institutional environment as part of assuring the quality of Sustainable Development Goal indicators

8.13. Managing the institutional environment for the production of SDG indicators entails securing a quality commitment from all producers of SDG indicators and assuring that sufficient resources are available for their production (principles 8 and 9). The implementation of activities that aim to assure professional independence (principle 4) and impartiality and objectivity (principle 5) by all members of the NSS involved in the production of SDG indicators will improve the trust of the users in SDG indicator data and statistics. The importance of assuring transparency with regard to the production of SDG indicators (principle 6) and statistical confidentiality and data security (principle 7) of the individual data should be emphasized, as those principles are important to securing the trust of users and cooperation among NSS members. Essential requirements or elements to be assured with regard to this level of the UN-NQAF and a rationale for their inclusion, as well as a brief explanation of the responsibilities for their implementation, are provided in table 8.2.

Table 8.2
Sustainable Development Goal indicators: requirements and elements to be assured in managing the institutional environment

Requirements/elements to be assured[a]	Rationale for inclusion and description of responsibilities
Principles 4 and 5: Assuring professional independence and impartiality and objectivity	
Review and evaluate the policies of producers of SDG indicators regarding the assurance of professional independence, impartiality and objectivity, and amend them as necessary using guidelines provided by the International Statistical Institute's Declaration on Professional Ethics, and advice from the national statistical association. (5.2)	**Rationale:** Users must be able to trust in the quality of SDG indicators; trust will assure wide usage. **Responsibility:** The central coordination body (NSO) and the SDG-WG need to work with the individual producers of SDG indicators to review and evaluate compliance with these principles.
Adopt a code of conduct based on international standards (such as the Fundamental Principles of Official Statistics) and inform the public about the adherence to the code of conduct in the development, production and dissemination of SDG indicators. (5.2)	**Rationale:** Adoption and compliance with a code of conduct helps to gain public trust in the quality of SDG indicators and to ensure their wide use. **Responsibility:** The central coordination body (NSO) and the SDG-WG will support the individual producers of SDG indicators in the adoption of the code; individual producers of SDG indicators must comply with the code of conduct.

Requirements/elements to be assured[a]	Rationale for inclusion and description of responsibilities
Prepare a release schedule of SDG indicators and make it available to all users. SDG indicators are made available to all users at the same time. (5.5)	**Rationale:** All users should be treated equally, as required by the Fundamental Principles of Official Statistics. **Responsibility:** The central coordination body (NSO) and the SDG-WG should develop and publish a release calendar in consultation and cooperation with the individual SDG indicator producers.
Principle 6: Assuring transparency	
Disclose the terms and conditions under which source data for the production of SDG indicators were obtained, and which methods were used in the production of SDG indicators (including methods of estimation of missing data and data modelling). (6.1)	**Rationale:** Users should be able to understand and evaluate how SDG indicators were produced. **Responsibility:** The individual SDG indicator producers should disclose the terms and conditions under which source data are obtained and should disclose the methods applied with regard to the production of SDG indicators.
Principle 7: Assuring statistical confidentiality and data security	
Take appropriate measures and publicly guarantee the privacy of the information provided by individual respondents. (7.2)	**Rationale:** The information provided by the respondents must be protected to ensure their willingness to provide correct information. **Responsibility:** The central coordination body (NSO) and the SDG-WG should develop appropriate measures to assure confidentiality and data security and assist SDG indicator producers in their application.
Principle 8: Assuring commitment to quality	
Declare and explain the commitment to quality of the SDG indicators internally and externally. (8.1)	**Rationale:** Staff at producers of SDG indicators must be aware of the quality commitment of their organization and users must be allowed to hold SDG indicator producers accountable; this will increase trust in and usage of the SDG data and statistics. **Responsibility:** All SDG indicator producers should express their commitment to quality.
Designate a SDG indicator quality focal point or unit within each SDG indicator producer. (8.3)	**Rationale:** There should be a focal point or unit which is tasked with assuring the quality of the SDG indicators. **Responsibility:** All SDG indicator producers should have a quality focal point or unit.
Develop and update, on a regular basis, guidelines for the quality assurance of SDG indicators. (8.5)	**Rationale:** Quality guidelines specify actions to put the commitment to quality into practice. **Responsibility:** The SDG-WG should develop guidelines for quality assurance and all SDG indicator producers should apply them.
Identify appropriate quality indicators to assess the production process of the SDG indicators. (8.6)	**Rationale:** Quality indicators are needed for quality assessment. **Responsibility:** The central coordination body (NSO) and the SDG-WG should prepare the set of applicable quality indicators in cooperation with producers of SDG indicators.
Issue a common quality report on all SDG indicators produced in a country and conduct a user-producer dialogue on its content. (8.6)	**Rationale:** Quality reports raise the confidence of users in the quality of the SDG indicators and provide a benchmark for further improvements. **Responsibility:** The central coordination body (NSO) and the SDG-WG, in cooperation with individual SDG indicator producers, should prepare such a report.
Principle 9: Assuring adequacy of resources	
Assess adequacy of currently available resources to compile the SDG indicators included in the national indicator framework. (9.1)	**Rationale:** The production of SDG indicators requires adequate resources. **Responsibility:** The central coordination body (NSO) and the SDG-WG should provide a consolidated assessment report covering the entire NSS; the individual SDG indicator producers should assess the resources they can use to compile the SDG indicators for which they are responsible.
Prepare a consolidated report on the statistical capacity of the country to produce the SDG indicators; the report should list those SDG indicators which cannot be produced without additional resources; submit the report to the government and development partners. (9.3)	**Rationale:** The need for additional resources must be communicated to policymakers and development partners. **Responsibility:** The central coordination body (NSO) and the SDG-WG should prepare a consolidated report with input from NSS members.

[a] References to the UN-NQAF requirements concerned (or elements to be assured under the UN-NQAF requirements) are indicated in parentheses (see chapter 3 and the annex for details).

8.E. Managing the statistical processes as part of assuring the quality of Sustainable Development Goal indicators

8.14. The management of statistical processes is at the core of the production of the SDG indicators. The production of SDG indicators not currently compiled by NSS members or not compiled with sufficient periodicity may require the revision of existing statistical processes or, in some cases, the setting up of new processes. An opportunity and challenge for the production of SDG indicators is the use of administrative data sources and other data sources such as big data and geospatial data. Assuring methodological soundness (principle 10) and appropriate statistical procedures (principle 12) have a direct impact on the international comparability of the SDG indicators and their comparability over time. Assuring cost-effectiveness in the development, production and dissemination of the SDG indicators (principle 11) and managing the respondent burden (principle 13) are important challenges given the immense requirements of SDG monitoring. Essential requirements or elements to be assured with regard to this level of the UN-NQAF and a rationale for their inclusion, as well as a brief explanation of the responsibilities for their implementation, are provided in table 8.3.

Table 8.3
Sustainable Development Goal indicators: requirements and elements to be assured in managing the statistical processes

Requirements/elements to be assured[a]	Rationale for inclusion and description of responsibilities
Principle 10: Assuring methodological soundness	
Review and evaluate the methodology used for the production of the SDG indicators. (10.1, 10.3)	**Rationale:** The methodology used for the production affects the output quality of the SDG indicators. **Responsibility:** The central coordination body (NSO) and the SDG-WG should conduct this activity together with the individual producers of SDG indicators.
Principle 11: Assuring cost-effectiveness	
Assess whether existing data sources and existing data can be used for the production of SDG indicators. (11.2, 11.5)	**Rationale:** The use of existing data sources or existing data is normally more cost-effective than the collection of new data. **Responsibility:** The central coordination body (NSO), the SDG-WG and producers of SDG indicators should conduct this activity before they commit to carrying out any new data collection.
Use administrative data sources and other data sources and develop data integration and data modelling techniques for the production of SDG indicators where feasible and cost-effective. (11.5)	**Rationale:** The use of administrative and other data sources is often more cost-effective than the use of statistical sources such as sample surveys and censuses. **Responsibility:** All producers of SDG indicators, with the support of the central coordination body (NSO) and the SDG-WG.
Use the GSBPM to analyse the statistical production processes of the SDG indicators. (8.7, 11.6)	**Rationale:** The GSBPM allows a systematic analysis of the statistical production process and the identification of quality issues and appropriate quality indicators. **Responsibility:** The central coordination body (NSO) and the SDG-WG would typically introduce the use of the GSBPM to members of the NSS.
Principle 13: Managing the respondent burden	
Assess the respondent burden when collecting data for SDG indicators and their disaggregation. (13.1)	**Rationale:** Minimizing the respondent burden is an integral part of the statistical operations and contributes to the quality of the information obtained. **Responsibility:** All producers of SDG indicators, with the support of the central coordination body (NSO) and the SDG-WG.

[a] References to the UN-NQAF requirements concerned (or elements to be assured under the UN-NQAF requirements) are indicated in parentheses (see chapter 3 and the annex for details).

8.F. Managing statistical outputs as part of assuring the quality of Sustainable Development Goal indicators

8.15. SDG indicators are statistical outputs obtained at the end of a statistical production process to which all UN-NQAF principles regarding statistical outputs apply. However, some quality requirements may need greater attention than others. For example, assessing the relevance (principle 14) of existing and additional national SDG indicators is a critical step in assuring their usefulness. Assuring the accuracy and reliability (principle 15) of SDG indicators can be challenging in the case of complex statistical production processes and the use of administrative, other or multiple data sources. Principle 18 on assuring coherence and comparability is essential for the comparability of global SDG indicators. Essential requirements or elements to be assured with regard to this level of the UN-NQAF and a rationale for their inclusion, as well as a brief explanation of the responsibilities for their implementation, are provided in table 8.4.

Table 8.4
Sustainable Development Goal indicators: requirements and elements to be assured in managing statistical outputs

Requirements/elements to be assured[a]	Rationale for inclusion and description of responsibilities
Principle 14: Assuring relevance	
Discuss and agree on the national SDG indicator framework in an inclusive consultation process with all national and international stakeholders. (14.1, 14.2) Clearly identify in the national SDG indicator framework the global indicators, national indicators and indirect measures (proxies) of the global indicators as well as the required level of disaggregation. (14.1, 14.2)	**Rationale:** The national indicator framework needs to satisfy user needs, taking into account the needs for global, regional and national monitoring. **Responsibility:** The central coordination body (NSO) and the SDG-WG would typically lead this activity.
Principle 15: Assuring accuracy and reliability	
Employ internationally recognized statistical methods and techniques in the production of the SDG indicators. (10.1, 15.1–15.2)	**Rationale:** Established methods and techniques have been shown to be accurate and reliable. **Responsibility:** The individual SDG indicator producers should conduct this activity with the support of the central coordination body (NSO) and the SDG-WG.
Establish an SDG indicator revision policy that also entails the explanation of revisions to users. Involve the international SDG indicator custodian agency where appropriate. (15.3)	**Rationale:** The availability of a sound revision policy is proof of the commitment to quality and contributes to user confidence. International custodian agencies depend on and provide support for the production of many SDG indicators in developing countries. **Responsibility:** The central coordination body (NSO) and the SDG-WG may issue guidelines on the revision policy and monitor its implementation; the individual SDG indicator producers are responsible for the implementation of the revision policy for their indicators.
Principle 16: Assuring timeliness and punctuality	
Consider the trade-offs between timeliness and other quality dimensions (e.g., accuracy, cost and respondent burden) during development and production of the SDG indicators; include information about trade-offs in the SDG indicator metadata. (16.1)	**Rationale:** Dealing with trade-offs is a part of the planning of the statistical production process; users should be informed about these to understand the limitations of the SDG indicators. **Responsibility:** The central coordination body (NSO), the SDG-WG and the individual SDG indicator producers should conduct this activity.
Automate the SDG indicators production process and related data flows so that the SDG indicators become available as soon as possible after all source data becomes available. (16.1)	**Rationale:** Any delay in SDG indicator production at the final stage of the statistical process should be avoided. **Responsibility:** The central coordination body (NSO) and the individual SDG indicator producers conduct this activity.
Publish an SDG indicator release calendar; it must be in line with the global reporting schedule, as applicable. (5.5, 16.1)	**Rationale:** Users should be informed when SDG indicators are planned to become available. **Responsibility:** The central coordination body (NSO), the SDG-WG and the individual SDG indicator producers should jointly conduct this activity.

Requirements/elements to be assured[a]	Rationale for inclusion and description of responsibilities
Principle 17: Assuring accessibility and clarity	
Establish a national SDG indicator reporting and dissemination platform allowing user-friendly access to all data and metadata. (17.1, 17.3, 17.6) The national SDG indicator reporting and dissemination platform should provide data access that facilitates data integration and redissemination. (17.3)	**Rationale:** A national reporting and dissemination platform is required to give timely and full data access to all users. **Responsibility:** The central coordination body (NSO) is typically responsible for the establishment and maintenance of the SDG indicator database and dissemination platform, while SDG indicator producers need to provide the SDG indicators in accordance with agreed formats and schedules.
Principle 18: Assuring coherence and comparability	
Review and monitor the use of international and national standard concepts, definitions and classifications in the development and production of the global SDG indicators and identify any divergences. (3.3, 10.1, 18.1)	**Rationale:** The use of international standard concepts, definitions and classifications is necessary to achieve international comparability. **Responsibility:** The central coordination body (NSO) and the SDG-WG should conduct this activity together with the individual SDG indicator producers.
Provide information about compliance with international standards in the SDG indicator metadata and quality reports. (3.3, 18.1)	**Rationale:** Information about compliance with international standards will increase the confidence of users and will allow users to understand any differences in national data published by international agencies. **Responsibility:** The central coordination body (NSO), the SDG-WG and the individual SDG indicators producers conduct this activity.
Principle 19: Managing metadata	
Produce, periodically update and make SDG indicator metadata available to users. The metadata should include information about concepts, definitions, classifications, data sources and production methods, including the statistical methodology used. (17.1, 19.2)	**Rationale:** SDG indicator metadata are indispensable for the interpretation of the data by users. **Responsibility:** The central coordination body (NSO), the SDG-WG and the individual SDG indicators producers conduct this activity.
Establish a metadata management system for the SDG indicators. (19.1)	**Rationale:** Metadata must be systematically maintained. **Responsibility:** The central coordination body (NSO), the SDG-WG and the individual SDG indicators producers conduct this activity.

[a] References to the UN-NQAF requirements concerned (or elements to be assured under the UN-NQAF requirements) are indicated in parentheses (see chapter 3 and the annex for details).

8.G. Reference publications and good practices

8.16. A list of relevant reference materials is provided below:

(a) United Nations, Statistics Division, website on the SDG indicators. Available at https://unstats.un.org/sdgs/;

(b) United Nations, Statistics Division, SDG Indicators metadata repository. Available at https://unstats.un.org/sdgs/metadata/;

(c) Council of the International Statistical Institute, "Declaration on Professional Ethics". Available at www.isi-web.org/index.php/news-from-isi/296-declarationprofessionalethics-2010uk;

(d) Eurostat, *Towards a harmonised methodology for statistical indicators – Part 1: Indicator typologies and terminologies*, 2014 ed. (Luxembourg, Publications Office of the European Union, 2014). Available at http://ec.europa.eu/eurostat/documents/3859598/5937481/KS-GQ-14-011-EN.PDF/82855e3b-bb6e-498a-a177-07e7884e9bcb;

(e) European Evaluation Network for Rural Development, "Defining proxy indicators for rural development programmes", draft working document, 2014. Available at https://enrd.ec.europa.eu/sites/enrd/files/assets/pdf/evaluation/WP-ProxyIndicators20140117_en.pdf.

Chapter 9
Quality assurance in the global statistical system

Introduction

9.1. Chapter 9 describes the purpose of the global statistical system and identifies the commitments and obligations of countries and international and regional organizations to jointly assure the quality of data and statistics published at the global level. This joint work is ongoing in the different statistical domains and their specialized forums. However, the monitoring of the SDGs gives this task a new urgency, as the global and regional monitoring is to be based on national data and statistics. In addition, the scope of the SDG indicators is wide, and their production involves most or all members of an NSS.

9.2. The target audience of this chapter are statisticians in countries and regional and international organizations who are interested in the relationship between national and global statistics. The information on the commitments and obligations of international organizations with regard to the use of national data and statistics provided in this chapter allows countries to hold international organizations accountable. At the same time, the chapter stresses the role of international and regional organizations, which are a very important and very special type of user of national data, as producers and users of global and regional statistics. Therefore, the needs of regional and international organizations are an important factor when considering the relevance of the statistics produced by countries. An additional recommendation emphasizes that these commitments and obligations provide the framework to address possible disagreements and differences in data and statistics published at different levels.

9.A. Purpose and functioning of the global statistical system

9.3. *Purpose of the international statistical system*. The purpose of the global statistical system is to support and facilitate the availability of internationally comparable national data in the different statistical domains, to produce global and regional aggregates and to make such data available in line with the Fundamental Principles of Official Statistics[84] and the Principles Governing International Statistical Activities.[85] Accordingly, based on the existing agreement, NSSs submit data to the entities designated for global data collection in specific statistical domains (custodian agencies). Regional and subregional entities are frequently involved in the compilation of international data. Agreements for sharing data among regional and international

[84] See box 2.1 or http://unstats.un.org/unsd/dnss/gp/fundprinciples.aspx.

[85] See box 9.3 or https://unstats.un.org/unsd/ccsa/principles_stat_activities/.

agencies exist to avoid the duplication of data collection, which is a major concern for countries.

9.4. *Role of international and regional organizations.* International and regional organizations, through their member States, play a central role in developing and promoting internationally accepted statistical standards and methodologies and provide leadership in addressing emerging statistical needs. International and regional organizations receive official data and statistics from NSSs and are tasked with ensuring the quality and comparability of the national data. They provide guidance and technical assistance to countries with regard to data compilation in their areas of expertise, in accordance with international standards, to improve data availability and facilitate international comparability. International and regional organizations should use and publish data as provided by countries. At times, however, international and regional agencies may adjust national data to make them internationally comparable or estimate missing data to fill data gaps to allow for the calculation of regional or global aggregates. In those cases, quality standards should be followed, and countries should be fully involved in the estimation process and informed of the adjustments and calculation methods.[86] For detailed guidance on cooperation between countries and international and regional organizations, see box 9.4.

[86] See Economic and Social Council resolution 2006/6 and General Assembly resolution 71/313.

9.B. Commitments and obligations for quality assurance of global data and statistics

9.5. *Towards an international system of quality assurance.* Quality assurance of global statistics in different statistical domains, including the SDG indicators, takes place at the national, regional and global level. Quality assurance procedures at the different levels are linked, as regional and international agencies rely on countries to compile high-quality data and statistics at the national level, while countries rely on regional and international organizations to produce internationally comparable data and statistics for all countries, which are available at regional and global levels. The Fundamental Principles of Official Statistics and the Principles Governing International Statistical Activities, adopted and adapted by countries and organizations according to their specific circumstances, contain the commitment of countries and regional and international organizations to data quality. These commitments are complemented and reinforced by a set of United Nations resolutions and specific guidelines issued by the United Nations Statistical Commission on the compilation of SDG indicator data and statistics at the regional and international level, and the quality assurance frameworks and recommendations implemented in countries and at international and regional organizations. Quality assurance in the global statistical system can therefore be understood to be a system of commitments and obligations of countries, regional and international organizations to provide high-quality data to users. While stressing the obligations of all partners, the quality of the statistical outputs disseminated by regional and international organizations largely depends on the availability and quality of national data.

9.6. *The Fundamental Principles of Official Statistics and the Principles Governing International Statistical Activities that are specifically relevant for quality assurance in the global statistical system.* Several Fundamental Principles of Official Statistics establish the obligations of countries to participate and collaborate in the global statistical system (see box 9.1). Similarly, several Principles Governing International Statistical Activities establish specific obligations regarding the use of national data for global

Box 9.1
Fundamental Principles of Official Statistics regarding participation of countries in the international statistical system[a]

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. (This principle is reflected in core recommendation #13 of this Manual.)

Principle 10. Bilateral and multilateral cooperation in statistics contributes to the improvement of systems of official statistics in all countries. (This principle is reflected in core recommendation #14 of this Manual.)

[a] See chap. 2, box 2.1, for the full list of the Fundamental Principles of Official Statistics.

Box 9.2
Principles Governing International Statistical Activities regarding the use of national data[a]

Principle 2. To maintain the trust in international statistics, their production is to be impartial and strictly based on the highest professional standards.

Principle 4. Concepts, definitions, classifications, sources, methods and procedures employed in the production of international statistics are chosen to meet professional scientific standards and are made transparent for the users.

Principle 5. Sources and methods for data collection are appropriately chosen to ensure timeliness and other aspects of quality, to be cost-efficient and to minimize the reporting burden for data providers.

Principle 8. Standards for national and international statistics are to be developed on the basis of sound professional criteria, while also meeting the test of practical utility and feasibility.

Principle 9. Coordination of international statistical programmes is essential to strengthen the quality, coherence and governance.

Principle 10. Bilateral and multilateral cooperation in statistics contribute to the professional growth of the statisticians involved and to the improvement of statistics in the organizations and in countries.

[a] See box 9.3 in the present chapter for the full list of Principles Governing International Statistical Activities.

statistics and cooperation with NSSs in compiling internationally comparable national data and global and regional aggregates (see box 9.2).

9.7. *UN-NQAF in chapter 3.* The following requirements of the UN-NQAF are particularly relevant to cooperation within the international statistical system, to secure its functioning and international comparability:

(a) Requirement 1.2: There are a body and mechanisms for the coordination of the national statistical system for activities at the local, national, regional and international level;

(b) Requirement 2.3: The statistical agencies continuously maintain and develop cooperation with funding agencies, academic institutions and international statistical organizations, as appropriate;

(c) Requirement 3.3: Divergences from the international, regional or national statistical standards are kept to a minimum, documented and explained to all stakeholders;
(d) Requirement 10.1: The methodologies applied by the statistical agencies are consistent with international standards, guidelines and good practices and are regularly reviewed and revised as needed;
(e) Requirement 14.2: Users' needs and requirements are balanced, prioritized and reflected in the work programme;
(f) Requirement 16.1: The timeliness of the statistical agency's statistics comply with international standards or other relevant timeliness targets;
(g) Requirement 18.1: International, regional and national standards are used with regard to definitions, units, variables and classifications;
(h) Requirement 18.3: Statistics are kept comparable over a reasonable period of time and between geographical areas;
(i) Requirement 19.2: Metadata are documented, archived and disseminated according to internationally accepted standards.

9.8. *United Nations system generic quality assurance framework.* Chief statisticians of the United Nations system have agreed on a generic quality assurance framework, and many international organizations have established their own quality assurance frameworks based on the Principles Governing International Statistical Activities, which provide the basis for quality assurance.[87]

[87] See https://unstats.un.org/unsd/unsystem/documents/UNSQAF-2018.pdf.

9.9. *United Nations resolutions on the international compilation of data and statistics for development indicators.* General Assembly resolution 71/313 of 10 July 2017 and Economic and Social Council resolution 2006/6 of 24 July 2006 spell out requirements for the global monitoring of the SDG indicators and the previously used Millennium Development Goal indicators. Specifically, in Assembly resolution 71/313, Member States:

(a) Stressed that official statistics and data from national statistical systems constituted the basis needed for the global indicator framework;
(b) Requested the Secretary-General to enhance data reporting channels and ensure the harmonization and consistency of data and statistics for the indicators used to follow up and review the Sustainable Development Goals and targets;
(c) Urged international organizations to base the global review on data produced by national statistical systems and, if specific country data were not available for reliable estimation, to consult with concerned countries to produce and validate modelled estimates before publication; urged that communication and coordination among international organizations be enhanced in order to avoid duplicate reports, ensure consistency of data and reduce response burdens on countries; and urged international organizations to provide the methodologies used to harmonize country data for international comparability and produce estimates through transparent mechanisms;
(d) Stressed that all activities of the global statistical system must be conducted in full adherence to the Fundamental Principles of Official Statistics and Economic and Social Council resolution 2006/6.

9.10. *Criteria for the implementation of the Guidelines on Data Flows and Global Data Reporting for Sustainable Development Goals.* Building on the above resolutions and guidance provided by the United Nations Statistical Commission, the Inter-Agency and Expert Group on SDG Indicators and the Committee for the Coor-

dination of Statistical Activities have been working together to identify the criteria for the implementation of the Guidelines on Data Flows and Global Data Reporting for Sustainable Development Goals, which spell out the commitments of the international and supranational statistical agencies and their member States, and the role of NSOs in this matter (see box 9.4).

9.C. Addressing disagreements and differences

9.11. *Recommendation on addressing differences*. Guided by the above commitments and obligations, countries and international and regional organizations can rely on each other's support and work. However, there are occasions when disputes arise over country data published by international or regional organizations, in particular when these data are different from the data published by the country itself. **It is recommended** that disputes between countries and regional and international organizations regarding country data published by international or regional organizations be addressed in accordance with the professional standards required by the Fundamental Principles of Official Statistics and the Principles Governing International Statistical Activities, the explicit guidance provided by the General Assembly and the Statistical Commission and the quality assurance frameworks adopted by countries and international organizations.

9.12. *Reasons for differences and reminder to provide metadata*. Differences between country data published by international organizations and country data published by countries can occur for multiple reasons, such as the use of different sources, non-synchronous update schedules or adjustments to make national data internationally comparable, among other things. The first step in resolving and explaining these differences is to review the available metadata, which should describe the concepts, definitions and methods used in the compilation of the data. International and regional organizations as well as countries are therefore requested to provide adequate metadata at all levels of reporting.

9.13. *Need for greater coordination and transparency*. A major source of differences between country data published by international organizations and country data published by countries is that different national agencies can produce statistics on the same subject and provide these data to international organizations. The document "Criteria for the implementation of the Guidelines on Data Flows and Global Data Reporting for Sustainable Development Goals"[88] aims to address this issue, which results from a lack of coordination and transparency, both at the national and international level.

[88] See box 9.4 and E/CN.3/2019/2, annex I.

Box 9.3
Principles Governing International Statistical Activities[a]

1. High-quality international statistics, accessible for all, are a fundamental element of global information systems

Good practices include:

- Having regular consultations with key users both inside and outside the organization to ascertain that their needs are met
- Periodic review of statistical programmes to ensure their relevance
- Defining a strategy and data quality policy for the use of Open Data[1] and Big Data[2] – as it applies to international statistics
- Providing equal access to detailed statistics for all users; in particular, ensuring that new statistical releases are made accessible to all users at the same time while pre-release access to specific users should be limited, controlled and made transparent
- Ensuring free and open public access to key statistics
- Using a variety of communication channels and information and communication technology tools to publicize data products, make users aware of them and reach different audiences (e.g., press releases, articles, social media, apps stores, alert messaging and notification or traditional communication channels like new publications, etc.)
- Developing different modalities for data access and data dissemination, including various formats for data and metadata downloads.

[1] "Open data" is understood to mean data that are made available to the public free of charge, without registration or restrictive licenses, for any purpose whatsoever (including commercial purposes), in electronic, machine-readable formats that are easy to find, download and use.

[2] Big Data is understood to be data sources with a high volume, velocity and variety of data.

2. To maintain the trust in international statistics, their production is to be impartial and strictly based on the highest professional standards

Good practices include:

- Adopting, advocating, publicly committing to and applying professional codes of conduct, such as the International Statistical Institute's Declaration on Professional Ethics
- Using strictly professional considerations for decisions on methodology, terminology, data dissemination and presentation
- Using the best national data sources in compiling international statistics, be they official or non-official sources, following the Recommended Practices on the Use of Non-Official Sources in International Statistics
- Making a clear distinction, in statistical publications, between statistical and analytical comments on the one hand and policy-prescriptive and advocacy comments on the other
- Ensuring that all statistics published by the organization are endorsed by the established internal statistics governance mechanism
- Having a published policy ensuring that statistical functions must be impartial, based on professional standards and independent from political influence.

3. The public has a right to be informed about the mandates for the statistical work of the organizations

Good practices include:

- Making decisions about statistical work programmes publicly available through various media channels
- Making documents for and reports of statistical meetings, statistical capacity-building initiatives and technical assistance projects publicly available through various media channels
- Making publicly available the statistical workplan and budget reviewed and formally endorsed by the organization's governing bodies.

4. Concepts, definitions, classifications, sources, methods and procedures employed in the production of international statistics are chosen to meet professional scientific standards and are made transparent for the users

Good practices include:

- Adopting a quality assurance framework for the organization
- Striving continuously to improve the quality and transparency of statistics by introducing methodological and systems innovations
- Enhancing the professional competency of staff by encouraging them to attend training courses, to publish scientific papers and to participate in seminars and conferences
- Documenting and publishing concepts, definitions, classifications and metadata used by the organization
- Documenting how data are collected, processed and disseminated by the organization (including information about editing mechanisms applied to country data[3] and aggregation methods to calculate regional and global estimates)
- Giving credit, in the dissemination of international statistics, to the original source and using agreed quotation standards when reusing statistics originally collected by others.

[3] "Country data" refers to data collected from countries, territories or any other relevant area and the term "country" is used as short form.

5. Sources and methods for data collection are appropriately chosen to ensure timeliness and other aspects of quality, to be cost-efficient and to minimize the reporting burden for data providers

Good practices include:

- Facilitating the provision of data from traditional and emerging sources by countries/constituencies by offering different data collection modalities
- Working systematically towards minimizing the time lag between the reference period and the publication date of international statistics
- Reviewing periodically statistical procedures in order to minimize the burden on data providers
- Sharing collected data with other organizations and collecting data jointly where appropriate
- Publishing data collection plans, questionnaires, data release calendars and a list of organizational focal points for each data domain
- Having mechanisms in place to consult countries to address discrepancies between national and international statistics
- Having mechanisms in place to promote the use of the most suitable methods and sources by national statistical offices and other national organizations.

6. Individual data collected about natural persons and legal entities, or about small aggregates that are subject to national confidentiality rules, are to be kept strictly confidential and are to be used exclusively for statistical purposes or for purposes mandated by legislation

Good practices include:

- Putting measures in place to prevent the direct or indirect disclosure of data on persons, households, businesses and other individual respondents
- Developing and implementing a framework describing methods and procedures to provide sets of anonymous microdata and associated data documentation for further analysis by bona fide researchers, maintaining the requirements of confidentiality.

7. Erroneous interpretation and misuse of statistics are to be immediately appropriately addressed

Good practices include:

- Responding appropriately to perceived erroneous interpretation and misuse of statistics
- Enhancing the appropriate use of statistics by increasing statistical literacy for important user groups where needed, e.g., through the development of educational material
- Establishing various communication channels (help desk function, user forum, social media, etc.) to report misuse and answer user requests for clarification.

8. Standards for national and international statistics are to be developed on the basis of sound professional criteria, while also meeting the test of practical utility and feasibility

Good practices include:

- Systematically involving national statistical organizations, departments and other official statisticians in the development of international statistical standards, including good practices and guidelines for implementation
- Ensuring that decisions on such standards are free from conflicts of interest and from political influence
- Advising countries/constituencies on good practices in the implementation of international standards
- Monitoring the implementation of agreed standards.

9. Coordination of international statistical programmes is essential to strengthen the quality, coherence and governance

Good practices include:

- Designating clear responsibilities within the organization to coordinate and implement statistical programmes, and represent the organization in international statistical meetings Participating in international statistical meetings and bilateral and multilateral consultations whenever necessary
- Working systematically towards achieving international agreements about common concepts, classifications, standards and methods
- Working systematically towards achieving international agreements about which sources should be considered as authoritative for each important set of statistics
- Coordinating technical cooperation and capacity-building activities with national and international partners to avoid duplication of effort and to encourage complementarities and synergies
- Establishing internal coordination mechanisms, which facilitate the discussion of responsibilities, methodologies, concepts and common standards.

10. Bilateral and multilateral cooperation in statistics contribute to the professional growth of the statisticians involved and to the improvement of statistics in the organizations and in countries

Good practices include:

- Cooperating and sharing knowledge among international organizations and with countries and regions to further develop national and regional statistical systems
- Ensuring that technical cooperation projects are demand-driven based on user requirements and encourage full participation of the main stakeholders
- Ensuring that technical cooperation projects take into consideration local circumstances and the stage of national statistical development
- Empowering national statistical systems' and governments' institutional capacity development
- Advocating the implementation of the Fundamental Principles of Official Statistics in countries/constituencies and promoting a review of progress over time
- Involving relevant national statistical institutions when undertaking new surveys.

[a] https://unstats.un.org/unsd/accsub-public/principles_stat_activities.htm.

Box 9.4

Criteria for the implementation of the guidelines on data flows and global data reporting for the Sustainable Development Goals[a]

Commissioned by the United Nations Statistical Commission, the present paper focuses on statistical data flows for global reporting on progress towards the Sustainable Development Goals, while it is recognized that non-statistical indicators are also necessary to monitor such progress. The non-statistical indicators in the global framework are not within the competence of national statistical offices as data providers and validators, although national statistical offices may still act as national administrative coordinators of Sustainable Development Goal reporting as a whole, including for non-statistical indicators. To delineate clearly the scope of the following guidelines, it will therefore be necessary to establish a list of non-statistical global Sustainable Development Goal indicators.

Background

In its resolution 71/313 on the work of the Statistical Commission pertaining to the 2030 Agenda for Sustainable Development, the General Assembly stated on 6 July 2017 that it:

(a) Adopted the global indicator framework for the Sustainable Development Goals and targets of the 2030 Agenda for Sustainable Development, developed by the Inter-Agency and Expert Group on Sustainable Development Goal Indicators, as a voluntary and country-led instrument, that will be complemented by indicators at the regional and national levels, which will be developed by Member States;

(b) Stressed that official statistics and data from national statistical systems constitute the basis needed for the global indicator framework, recommended that national statistical systems explore ways to integrate new data sources into their systems to satisfy new data needs of the 2030 Agenda for Sustainable Development, as appropriate, and also stressed the role of national statistical offices as the coordinator of the national statistical system;

(c) Requested the Secretary-General to continue to facilitate collaboration between national statistical systems and the relevant international and regional organizations to enhance data reporting channels and ensure the harmonization and consistency of data and statistics for the indicators used to follow up and review the Sustainable Development Goals and targets, within existing resources;

(d) Stressed that all activities of the global statistical system must be conducted in full adherence to the Fundamental Principles of Official Statistics and Economic and Social Council resolution 2006/6.

At its forty-ninth session in March 2018, the United Nations Statistical Commission (see E/2018/24) welcomed efforts by the Inter-Agency and Expert Group to improve data flows and global reporting, and also welcomed the draft guidelines on data flows and global data reporting for the Sustainable Development Goals as an initial step to improve coordination and harmonization of national and international data systems and to ensure full transparency of data, metadata and data aggregates presented in the Global Sustainable Development Goal Indicators Database; and requested the Inter-Agency and Expert Group to work jointly with custodian agencies and establish a fruitful dialogue between all parties, to further refine the guidelines by taking into account concerns raised at the forty-ninth session of the Commission and to prepare criteria for implementation of the guidelines based on best practices and on ways to limit the burden that the envisaged procedures may represent in terms of time and resources for both national and international statistical systems and that resolve outstanding issues.

The present document is hence intended to establish criteria for the implementation of the guidelines on data flows and global data reporting for the Sustainable Development Goals prepared by the Inter-Agency and Expert Group on Sustainable Development Goals Indicators. However, it should be clear that it is a living document and further additions will be made as new best practices emerge.

I. Overarching objective: statistical indicators for the monitoring of Sustainable Development Goals should meet the Fundamental Principles of Official Statistics

All activities of the global statistical system must be conducted in full adherence to the Fundamental Principles of Official Statistics and Economic and Social Council resolution 2006/6 and, in the case of international and supranational statistical agencies, also the principles governing international statistical activities. In particular, Member States and international and supranational statistical agencies should:

(a) Utilize only concepts, definitions, classifications, sources, methods and procedures that meet professional and scientific standards;

(b) Document fully and make available data sources and estimation or adjustment methods, in a manner that ensures the transparency of the methodology and the replicability and trust of the estimates.

II. Commitment of international and supranational statistical agencies

As custodian agencies, international and supranational statistical agencies have accountability for the quality and accuracy of global reporting on progress towards the Sustainable Development Goals. In order to maximize quality, transparency and trust in the global reporting and adherence to the Fundamental Principles of Official Statistics and principles governing international statistical activities, custodian agencies should:

1. Base the compilation of the international series for Sustainable Development Goal indicators on national official data sources in all cases where national statistical systems produce and release data or national estimates that are consistent with agreed indicator definitions and agreed international statistical standards.

2. Consult with national statistical systems in identifying the most appropriate statistical methods and data sources, exclusively based on professional, scientific and statistically robust considerations and internationally agreed statistical standards. National statistical offices will be notified on those consultations.
3. Provide an opportunity, within a reasonable time frame, for national statistical authorities to review country-specific data and estimates of Sustainable Development Goal indicators prior to their release.
4. Ensure that data sources and methods are thoroughly documented and fully transparent to the public and in particular to national data providers in order to facilitate validation and the replicability of the data.
5. Adequately explain possible discrepancies between national and international data.
6. Provide complete and detailed metadata and methodological guidance in a timely manner to national statistical systems and indicate changes made to these.
7. Provide technical assistance to Member States, through their national statistical offices, if requested, to improve the national reporting on Sustainable Development Goal indicators and the application of agreed international standards.
8. Ensure ongoing dialogue with Member States on the national data reported for global monitoring of the Sustainable Development Goals, in particular when there are disagreements with regard to national data sources and country-specific estimates. Dialogue should focus on maximizing scientific rigour, international comparability, coherence and the implementation of the Fundamental Principles of Official Statistics.
9. Minimize the data reporting burden of national statistical systems by utilizing existing reporting mechanisms or national reporting platforms for Sustainable Development Goal indicators whenever possible, promoting the use of appropriate data transmission standards and tools, such as Statistical Data and Metadata eXchange (SDMX) and web application program interfaces.
10. Coordinate the data collection work of international and supranational statistical agencies and establish effective and efficient data sharing arrangements among them to avoid duplication of efforts.
11. In order to enhance the coordinating role of the national statistical office within the national statistical system and ensure the quality of country-specific data, international and supranational statistical agencies will copy the national statistical office in their data requests in relation to the Sustainable Development Goals and provide the national statistical office with a list of all national data providers and the data collection calendar.
12. International and supranational statistical agencies will only address data requests to countries regarding a specific Sustainable Development Goal indicator if they are the designated custodian agency. In cases where more than one such agency is designated as custodian agency, data shall be collected through common means, such as joint questionnaires.
13. Data collected by the custodian agencies shall be released publicly and shared, in a timely manner and at no cost, with the Statistics Division and other international and supranational statistical agencies that may be interested in the data for other reasons, such as for thematic reporting.
14. Estimates of Sustainable Development Goal indicators published in databases maintained by international and supranational statistical agencies shall be properly documented and sourced, with the provision of clear and comprehensive metadata.

15. Maximize data availability by supporting open data access and public sharing of data pertaining to Sustainable Development Goal indicators, by both international and supranational statistical agencies, and national statistical offices and national statistical systems.
16. Support developing countries, in particular African countries, least developed countries, small island developing States and landlocked developing countries, in strengthening the capacity of national statistical offices and data systems.

III. Member States' commitment

Member States have the primary responsibility for follow-up and review, at the national, regional and global levels, in relation to the progress made in implementing the Sustainable Development Goals and targets. National statistical systems are the primary source of data and statistics for Sustainable Development Goal global reporting, and the quality of the data and statistics they report to international and supranational statistical agencies has a major impact on the overall quality of global reporting on Sustainable Development Goal indicators. In order to maximize accuracy, transparency and trust in global reporting on progress towards the Sustainable Development Goals, Member States should:

17. Produce the underlying data for global Sustainable Development Goal indicators based on internationally agreed definitions and standards.
18. Provide necessary data and metadata for global reporting to custodian agencies in a timely manner and according to quality standards through existing reporting mechanisms or national Sustainable Development Goal indicator reporting platforms whenever possible.
19. When data do not meet international standards, submit the necessary methodological information to allow international and supranational statistical agencies to adjust statistics to ensure international coherence and comparability.
20. Review the information provided by custodian agencies and notify agencies if any issues are identified.
21. Ensure ongoing dialogue with custodian agencies on national data reported for global monitoring of Sustainable Development Goals, in particular when there are disagreements related to national data sources and country-specific estimates. Dialogue should focus on maximizing scientific rigour, international comparability, coherence and the implementation of the Fundamental Principles of Official Statistics.
22. Pursue support for strengthening data collection and capacity-building in their own countries.

IV. Role of the national statistical office

In their capacity as data producers and as coordinators of their national statistical systems, national statistical offices have accountability for the quality and accuracy of global reporting on progress towards the Sustainable Development Goals. Within a country, the national statistical office is often mandated also to provide quality assurance for the statistical data produced by other national data-producing entities, although some national statistics may remain under the supervision of specialized institutions. Arrangements for data reporting from national statistical systems to international and supranational statistical agencies vary considerably across agencies and countries. National statistical offices are the national data providers for many international and supranational statistical agencies. Depending on the governance structure of each such agency, Member States may have designated other authorities, typically in line ministries, as providers

of national data. In such cases, internal coordination within the national statistical system is of utmost importance.

While respecting the existence of different data reporting arrangements among international and supranational statistical agencies, national statistical offices and other actors in the national statistical system, Member States and custodian agencies should promote the coordinating role of national statistical offices in reporting on the Sustainable Development Goals by:

23. Keeping national statistical offices systematically informed on data collection and validation processes related to Sustainable Development Goal indicators even when custodian agencies' primary contact is in other institutions.
24. Strengthening national statistical offices' capacity to coordinate the production of Sustainable Development Goal indicators within the national statistical system and apply a coherent quality framework.
25. Supporting national statistical offices to become the national overall coordinator for the Sustainable Development Goal indicators.
26. Supporting national statistical offices on the dissemination and advocacy of the data and statistical information collected for Sustainable Development Goals.

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[a] E/CN.3/2019/2, annex I.

Annex
Detailed list of elements to be assured

Introduction

A1. The detailed list of elements to be assured is a supporting document aimed at assisting the implementation of the United Nations National Quality Assurance Framework (UN-NQAF) in chapter 3. It identifies possible activities, methods and tools that can provide guidance and evidence for the implementation of the UN-NQAF principles and requirements. It should be noted that not all elements from the list are equally necessary or relevant for all countries. However, if they are applicable, they should be followed or assured.

A2. The list comprises elements to be implemented or secured at both the system/institutional and the process/product level. The order of listing from general to more specific elements indicates the levels, but the responsibilities are normally clear from their content and the context given by the requirements they refer to.

A3. The elements to be assured have been compared with the principles of the Open Data Charter[89] to reflect best practices for the dissemination of statistics.

[89] https://opendatacharter.net/.

Level A: Managing the statistical system

Principle 1: Coordinating the national statistical system

Requirement 1.1: A statistical law establishes the responsibilities of the members of the national statistical system, including its coordination. Its members are identified in a legal or formal provision.

- The coordination role of the NSO or other body is defined in a statistical law.
- The statistical law specifies the requirements for official statistics and the scope of the NSS.
- Members of the NSS are identified in a formal document.
- Responsibilities of NSS members for the development, production and dissemination of official statistics are clearly specified in the respective laws and regulations.

Requirement 1.2: There are a body and mechanisms for the coordination of the national statistical system for activities at the local, national, regional and international level.

- The NSO or other body is tasked with the coordination of the NSS.
- The NSO and other statistical agencies have mechanisms to ensure the coordination (including the exchange of data and statistics within the NSS) and the quality of official statistics.

- An NSS-wide (central) coordination body (which is by default part of the NSS and is typically the NSO) sets, monitors and reviews guidelines for the development, production and dissemination of official statistics.
- A central coordination body establishes and maintains engagement with advisory bodies, academic institutions and other regional and international bodies as appropriate.
- A central coordination body coordinates data collection to improve cost-effectiveness and reduce respondent burden, in particular with regard to coordinating sample surveys.
- A central coordination body monitors the use of agreed standards, concepts, classifications and methods throughout the NSS.
- A central coordination body promotes and enhances data sharing within the NSS and liaisons with members of the extended data ecosystem regarding the sharing of data.
- A central coordination body promotes the sharing of technical knowledge and good statistical practices and ensures the provision of training, including on the production of official statistics and SDG indicators.
- Processes for the evaluation of the quality of the statistics are developed and applied within the NSS.

Requirement 1.3: There is a mechanism for considering statistics produced outside the national statistical system and, if appropriate, for those statistics to become official.

- The body coordinating the NSS evaluates statistics produced outside the NSS for use as official statistics or alongside official statistics. Examples of such statistics are some of the SDG indicators.
- The NSS-wide (central) coordination body or a task force composed of members of various statistical agencies can be given the responsibility for the evaluation of the quality of relevant statistics outside the NSS (e.g., some SDG indicators) as needed.
- There is a unit such as a task force that discusses and provides support for the use of new data sources within the NSS.

Requirement 1.4: There is a national plan or programme for the development and production of official statistics.

- There is a multi-year national plan for the development and production of official statistics, which can take the form of a National Strategy for the Development of Statistics.
- The multi-year national plan for the development and production of official statistics covers the entire NSS.
- The multi-year national plan should address quality assurance.
- Annual plans for the NSS members supplement the multi-year NSS-wide plan.
- The multi-year national plan is established in close consultation with statistics producers, users and data providers.
- The multi-year national plan for the development and production of official statistics is approved for implementation by an NSS-wide governance body and/or a higher-level government or a legislative body.
- The programmes and activities of the multi-year national plan are monitored on a regular basis by the NSS-wide (central) coordination body.

Principle 2: Managing relationships with data users, data providers and other stakeholders

Requirement 2.1: Stakeholders are identified and consulted regarding their interests, needs and obligations.

- The statistical agencies clearly identify all their stakeholders.
- Processes are in place to consult stakeholders about their concerns, interests, needs and obligations.
- Stakeholders are kept informed of actions taken to address their needs and concerns.

Requirement 2.2: The statistical agencies have a strategy and institutional arrangements are in place to engage with their users.

- User needs and how to engage with users are reflected in the statistical agencies' strategies, such as the strategy for the development of statistical outputs and the dissemination strategy, as well as for NSS-wide relevant strategies such as the National Strategy for the Development of Statistics.
- Service agreements or similar arrangements with the main users of the statistics are in place (e.g., with regard to what will be supplied by the agency, the quality of the statistics, the dissemination format, etc.).
- Statistical agencies have press offices, hotlines and a central email contact who responds to all user inquiries in a timely manner.
- Users can engage with statistical agencies and request information in their preferred means of communication, such as through telephone, email and other common means of communication.
- Processes and arrangements (such as a user committees) are in place so that users can advise statistical agencies about their emerging needs and priorities and during the development of new or review of existing statistics.
- There are subject domain-specific user committees.

See also principle 14 on assuring relevance.

Requirement 2.3: The statistical agencies continuously maintain and develop cooperation with funding agencies, academic institutions and international statistical organizations, as appropriate.

- The statistical agency's workplans and budgets are shared with the funding agency as appropriate to ensure mutual understanding of funding requirements and trade-offs.
- Statistical agencies maintain and develop cooperation with the scientific community to develop new statistics, improve methodology and promote the use of statistics.
- Statistical agencies cooperate with international and regional organizations in the area of statistics and with the statistical organizations of other countries.

See also principle 1 on coordinating the national statistical system.

Requirement 2.4: The national statistical office and, if appropriate, other statistical agencies have the legal authority or some other formal provision to collect data for the development, production and dissemination of official statistics.

- The statistical law provides appropriate provisions to guarantee the NSO and, if appropriate, other statistical agencies the right to collect data for statistical purposes through surveys and censuses.

- Based on the legislation, the statistical agencies are able to apply appropriate sanctions, such as fines, if a response to obligatory statistical surveys or censuses is not received.

Requirement 2.5: The national statistical office and, if appropriate, other statistical agencies have the legal authority or some other formal provision to obtain administrative data and adequate access to those data from other government agencies for statistical purposes.

- The statistical law provides appropriate provisions to guarantee the NSO and, if appropriate, other statistical agencies the right to obtain or access administrative data in a timely manner.
- Where statistical agencies do not have a legal right to obtain administrative data, memorandums of understanding are in place that provide such access.
- Statistical agencies' access to administrative data are free of charge.
- Agreements with owners of administrative data are in place to operationalize data access which describe technical conditions for access and possibilities for linking the data with data from other administrative data sources.
- Statistical agencies are involved in the design and development of administrative data sets in order to make them suitable for statistical purposes; this involvement extends to the possible discontinuation of such data sets.

Requirement 2.6: The national statistical office and, if appropriate, other statistical agencies have the legal authority or some other formal provision and related agreements to access and use data (including big data) maintained by private corporations or other non-governmental organizations for statistical purposes on a regular basis, including for testing and experimentation.

- The statistical law provides appropriate provisions to guarantee the NSO and, if appropriate, other statistical agencies the right to obtain or access, in a timely manner, data held by private corporations or other non-governmental organizations for statistical purposes (e.g., all corporations that provide services to individuals and legal entities residing in the country).
- The statistical law foresees adequate sanctions to ensure access to privately held data where appropriate (such as fines for not granting such access).
- Where statistical agencies do not have a legal right to obtain access to data maintained by corporations or other non-governmental organizations, memorandums of understanding are in place that provide such access.
- Statistical agencies consider the relevance and the scope of data requested.
- The access and use of privately held data follow procedures agreed between the statistical agencies and the owners or holders of the data.

Requirement 2.7: The national statistical office cooperates with and provides support and guidance to data providers.

- The NSO regularly consults with data providers and maintains cooperation with the providers of administrative data and with corporations, businesses and other organizations that hold data to strengthen the statistical value and usage of these sources.
- Quality reports for administrative data are developed in cooperation with the NSO and the data owner and describe accuracy, completeness, timeliness and punctuality, among other things.[90]

[90] See, for example, Piet Daas and others, "Report on methods preferred for the quality indicators of administrative data sources", BLUE-Enterprise and Trade Statistics, 28 September 2011. Available at www.pietdaas.nl/beta/pubs/pubs/BLUE-ETS_WP4_Del2.pdf.

- Holders of administrative data, businesses and other organizations receive feedback on the quality of the data provided, allowing for further improvements.
- Partnership agreements with data providers are in place.

Principle 3: Managing statistical standards

Requirement 3.1: The statistical agencies cooperate in the development and implementation of international, regional and national statistical standards.

- The NSO actively works with other statistical agencies and international and regional statistical organizations in developing, reviewing, promoting and implementing statistical standards.
- The NSO has an organizational unit responsible for facilitating and coordinating the adoption and development of international, regional and national statistical standards and for supporting statistical programmes/domains in their efforts to adopt and develop such standards.
- All relevant staff in statistical agencies are aware of statistical standards and any changes made to them.
- There is a repository and a list of all standard classifications available in all statistical agencies.
- The process for originating, developing and approving statistical standards involves statistics producers, data providers and data users.
- The impact of the adoption of new statistical standards is assessed, documented and communicated to users; where applicable, conversion tables are provided.
- The statistical agencies use conceptual frameworks, such as the System of National Accounts, that provide a basis for integrating statistical information.
- Statistical standards (concepts, definitions, classifications, etc.) are regularly reviewed.

Requirement 3.2: The national statistical office provides support and guidance to all data providers and producers of official statistics in the implementation of statistical standards.

- The NSO monitors the extent to which statistical standards are used by data providers and producers of official statistics.
- Periodic reports are prepared with regard to compliance with international, regional and national statistical standards.
- Statistical standards are communicated and made available to all data providers and producers of official statistics.
- Plans and schedules for the development and application of new standards are communicated in advance.
- The NSO assists other statistics producers and data providers in the implementation of international, regional and national statistical standards as appropriate.

Requirement 3.3: Divergences from the international, regional or national statistical standards are kept to a minimum, and are documented and explained to all stakeholders.

- Concordance tables for international, regional and national standard classifications are developed and made available in cases where diverging standards are used.
- The adopted standards (concepts, definitions, classifications, etc.) are explained to all stakeholders.
- Stakeholders are informed about compliance with international, regional and national statistical standards.

Level B: Managing the institutional environment

Principle 4: Assuring professional independence

Requirement 4.1: A law or other formal provision explicitly declares that statistical agencies are obligated to develop, produce and disseminate statistics without interference from other government agencies or policy, regulatory or administrative departments and bodies, including from within the statistical agencies, private sector or any other persons or entities.

- The professional independence of the NSO and other producers of official statistics, such as statistical units within ministries, departments and agencies at the different levels of governments, is guaranteed by the laws and regulations under which the ministries, departments and agencies operate.
- If there is no law or formal provision declaring the necessity of professional independence, there are traditions or cultures of professionalism, historical precedents or conventions that are clearly recognized as essential to the credibility of the statistical results of the statistical agencies.

Requirement 4.2: The appointment of the heads of the national statistical office, and other statistical agencies where appropriate, is based on professional criteria and follows transparent procedures. Reasons for dismissal cannot include reasons affecting professional independence. The heads of the statistical agencies are of the highest professional calibre.

- National legislation provides a clear and detailed description of the procedure for the appointment and dismissal of the head of the NSO.
- The rules applied for appointing, assigning positions and responsibilities and dismissing the heads of the statistical agencies are based on professional competence and are transparent and free from political considerations.
- Processes are in place to ensure that the heads of the statistical agencies are of the highest professional calibre.
- The head of the NSO has sufficiently high hierarchical standing to ensure access to the political and administrative leadership of government bodies.
- The heads of statistical units within other statistical agencies have the necessary qualifications, knowledge and capacity.
- The basis and process for the termination or removal of the head of the NSO and the heads of the statistical units within government that produce official statistics are specified in the legal framework and administrative regulations. These cannot include reasons related to professional or scientific independence.

Requirement 4.3: The heads of the national statistical office, and other statistical agencies where appropriate, have sole responsibility over the decisions on statistical methods, standards and procedures, and on the content and timing of statistical releases.

- The head of the NSO and the heads of the statistical units within government that produce official statistics decide independently, on the basis of professional considerations, on the statistical methods, standards and procedures for the development, production and dissemination of official statistics.
- The reporting of the NSO to its administratively superordinate government bodies and to ministries, department and agencies does not affect its professional independence.

Principle 5: Assuring impartiality and objectivity

Requirement 5.1: There is a law or formal provision in force, which is publicly available, that specifies that statistical agencies should develop, produce and disseminate statistics following professional standards and treat all users in the same way.

- Professional cultures and traditions assure the impartiality and objectivity of the statistics produced by the statistical agencies independently from the existence or absence of any laws or formal provisions.
- The objectivity and impartiality of official statistics is recognized (and not disputed) by neutral observers and the public (e.g., measured by image studies).

Requirement 5.2: The statistical agencies implement a declaration or code of conduct or ethics which governs statistical practices, and compliance with it is followed up.

- There are ethical guidelines or a code of conduct for assuring impartiality and objectivity.
- The guidelines are available to the public.
- The implementation of the guidelines is followed up.

Requirement 5.3: Data sources and methodologies are chosen on an objective basis.

- Sources, concepts, methods and processes for the development, production and dissemination of data are chosen on the basis of statistical considerations, national and international principles and best practices.

Requirement 5.4: Statistical releases are clearly distinguished from political/policy statements.

- Statistical releases and statements made to the media are objective and based strictly on the available evidence and do not take any position on a political issue.
- Appropriate internal and external communication strategies exist that include recognizable logos, designs or formats for the products of statistical agencies, which identify them as being unaffiliated with any political or policy bodies.

Requirement 5.5: Statistical release dates and times are announced in advance.

- A publicly available and easily accessible release calendar containing information on the releases planned in the upcoming 12-month period exists.
- Statistics are released at a fixed date and time.
- Changes in the release calendar are announced in advance and their reasons are explained.
- The sharing of statistical results ahead of the official release (a "privileged pre-release") is kept to a minimum and is well justified and strictly controlled and documented.

Requirement 5.6: In cases in which errors are detected, they are corrected as soon as possible, and users are informed as to how they affected the released statistics.

- There is an established policy on how to correct published data when errors are discovered. The error treatment policy is publicly available.

Requirement 5.7: The statistical agencies comment publicly on statistical issues, misinterpretation and misuse of official statistics, as appropriate.

- There is a formal policy or well-established custom entitling statistical agencies to comment publicly on statistical issues, criticisms, misinterpretations and misuses of official statistics.
- The statistical agencies respond, as appropriate, to negative media reporting to facilitate fair reporting of their positions.

Principle 6: Assuring transparency

Requirement 6.1: The terms and conditions for producing and disseminating official statistics are available to the public.

- A standard procedure exists for ensuring that respondents understand the legal basis for a survey and the confidentiality provisions for the data that are collected.
- Information on data sources, statistical concepts and methods used for the development, production and dissemination of official statistics are publicly available.
- The information on statistical standards are available to the public.
- Advance notice of major changes in methodology, source data or statistical techniques is given.
- The dissemination policy is shared with the public.
- Privileged pre-releases of statistical results are disclosed.

Requirement 6.2: The terms and conditions for the governance and management of statistical agencies are available to the public.

- The procedures to be followed for the appointment and dismissal of heads of the statistical agencies and the hiring and release of staff are publicly available.
- The reporting and dialogue of statistical agencies with administratively superordinate government bodies is well defined, established and known to the public.
- The work programmes of the statistical agencies and periodic reports to describe progress are made available to the public on a regular basis.

Principle 7: Assuring statistical confidentiality and data security

Requirement 7.1: Statistical confidentiality is guaranteed by law.

- There is a law or some other clear formal provision in force that mandates the proper management of information received from respondents and data providers to ensure statistical confidentiality and data security.

Requirement 7.2: Appropriate standards, guidelines, practices and procedures are in place to ensure statistical confidentiality.

- Guidelines and instructions on the protection of statistical confidentiality throughout the statistical business process are provided to all staff of the statistical agencies.

- There are regular and continuous training programmes for all staff on the concept of statistical confidentiality and best practices to ensure the privacy of the information provided.
- The organizational structure and arrangements for the development and implementation of practices for ensuring statistical confidentiality is adequate to cope with needs.
- Staff sign confidentiality agreements upon their appointment, which are also valid after staff leave the agency.

Requirement 7.3: Strict protocols to safeguard data confidentiality apply to users with access to microdata for research or statistical purposes.

- Clear conditions for granting access by researchers to confidential data for scientific purposes are set in the statistical law or other formal provision.
- Confidentiality rules, disclosure control and microdata access procedures apply throughout the statistical business process.
- The statistical agencies monitor the use of microdata sets to identify any circumstances in which data confidentiality may be breached (e.g., through file matching), and take immediate corrective action to address such a situation.

Requirement 7.4: Penalties are prescribed for any wilful breaches of statistical confidentiality.

- Legal or other provisions are in place that allow administrative, penal and disciplinary sanctions for the violation of statistical confidentiality.
- Information on the provisions that allow sanctions for the violation of statistical confidentiality is shared with all staff and is available to the public.

Requirement 7.5: The security and integrity of data and their transmission is guaranteed by appropriate policies and practices.

- An IT security policy is in place and is known to the staff.
- Following the IT policy, appropriate physical security measures and processes are in place to ensure data and database security, in accordance with best practices and international standards.
- Regular security audits of the data security system are carried out.
- All access to data repositories and transmission channels is monitored.
- While data are being transferred, risk of a breach is assessed and appropriate procedures are applied to eliminate or minimize this risk.

Requirement 7.6: The risk that individual respondents may be identified is assessed and managed.

- There should be a balance between the acceptable level of risk of identification of individual respondents and the usability of the data.
- Appropriate processes are in place to assess the risk of disclosure of sensitive information and the risk that individual respondents can be identified from the public release of statistics or of microdata, and procedures are applied in line with the data dissemination policy to minimize this risk.
- All procedures taken to adequately reduce the risk of identification are properly documented and made available as part of the metadata related to the statistical data set.
- Users are made aware that procedures to reduce the risk of identification have been implemented and that such procedures could lead to a loss of information.

Principle 8: Assuring commitment to quality

Requirement 8.1: There is a quality policy or a statement of the statistical agency's commitment to quality, which is publicly available.

- The statistical agency's policy, declaration or message about its commitment to the quality of statistics is made publicly available and clearly conveys and promotes the shared concern for quality of all of its staff and includes information about trade-offs affecting the statistical work programme.
- The statistical agency has quality guidelines that are made available to external users, at least in a summarized version.

Requirement 8.2: The statistical agencies promote a culture of continuous improvement.

- Methodology and processes are regularly documented.
- Good statistical practices are exchanged among and between statistical agencies.
- Procedures are in place to ensure that the required documentation on quality is regularly updated.
- A quality assurance plan or similar mechanism is in place that describes the work standards, formal obligations (such as laws and internal rules) and quality control actions that prevent, monitor and evaluate errors and control the statistical production process.
- Workplans, schedules and standard forms or templates are used for facilitating the updating of the documentation of quality assurance procedures and actions in a consistent way.
- Statistical agencies use an NQAF as a basis for regular quality assessments (self-assessments and other assessments).
- Statistical agencies use an NQAF which is based on one of the accepted global or regional framework.
- General quality systems or frameworks such as total quality management and ISO 9000 are utilized in conjunction with the NQAF.
- Quality initiatives of international and regional statistical bodies such as the European Statistical System are followed up, as appropriate.

Requirement 8.3: There is a specific body responsible for quality management or the coordination of quality management within the statistical agency, and it receives necessary support to fulfil this role.

- A quality manager, committee, unit or group of coaches or advisers is assigned responsibility for quality management.
- An agency-wide data quality task force is established and meets regularly.
- Quality issues are discussed with and by management regularly (e.g., at an annual quality review meeting).

Requirement 8.4: The national statistical system staff receive training on quality management.

- Staff training and development programmes are in place to ensure that staff are aware of the statistical agency's quality policy, including the use of an NQAF, and that staff have an understanding as to how quality is assured.
- A staff awareness "campaign" is undertaken to emphasize the statistical agency's commitment to quality.

Requirement 8.5: Guidelines for implementing quality management are defined and made available to the public.

- Guidelines for implementing quality management are produced and issued which:
  - Describe the quality principles and framework followed
  - Describe the entire statistical process and identify relevant documentation for each stage of production
  - Describe the methods for monitoring the quality at each stage of the statistical production process
  - Identify the indicators (quality measures) for evaluating the quality of the main stages of production, including indicators for source data
- The guidelines, methodological manuals and handbooks on recommended practices for quality assurance are made available to the public.
- Mechanisms are in place to assure the quality of data collection (including the use of administrative data and other sources) and data editing.

Requirement 8.6: Indicators on statistical output quality are regularly measured, monitored, published and followed up to improve statistical products and processes.

- Quality reports that serve both producer and user perspectives are prepared, published as appropriate and updated regularly.
- Quality indicators are defined, measured and monitored for follow-up and improvements. Examples of quality indicators include:
  - References in media, hits on websites, results from user satisfaction surveys (relevance)
  - Standard deviations and other measures of accuracy, response rates (accuracy)
  - Number and size of revisions (reliability)
  - The length of time between the end of a reference period and the dissemination of the statistics (timeliness)
  - Rate of statistics published when announced (punctuality)
  - Respondent burden

Requirement 8.7: Statistical products and processes undergo periodic reviews.

- Periodic quality reviews of key products and processes to assess adherence to internal guidelines and international standards are performed.
- Reviewing teams are set up in which both internal and external experts can participate.
- The statistical agency's internal reviewers are trained in auditing methods and tools.
- Improvement actions arising from the result of quality reviews are defined and scheduled for implementation.
- Top management is informed of the results of reviews so they can follow up on improvement actions.
- Benchmarking of key statistical processes with other statistical agencies is carried out to identify good practices.
- Procedures are in place to monitor and manage the quality of different stages of the statistical production according to the GSBPM.

- Trade-offs within quality are systematically examined (e.g., trade-offs among accuracy, timeliness and costs).
- External experts (including from international organizations) conduct quality reviews, such as reviews of key statistical domains (e.g., the IMF Reports on the Observance of Standards and Codes) or other reviews, such as peer reviews, external audits and rolling reviews.

Requirement 8.8: Risk analyses addressing the quality of important statistical products and processes are performed.

- Risk and quality management are closely coordinated (e.g., through institutional arrangements and regular meetings if responsibilities for these activities are set out differently).
- Risks linked to core recommendations and principles of the NQAF (e.g., lack of independence and confidentiality breaches) are analysed and measures taken if needed to improve compliance.
- Risk analyses addressing the quality of different stages of the statistical production are conducted according to the GSBPM.
- Risk analyses addressing the quality of important statistical products such as population statistics and censuses, national accounts and consumer price indices are performed (e.g., risk of poor accuracy expressed by errors, poor timeliness and lack of comparability).

Principle 9: Assuring adequacy of resources

Requirement 9.1: Financial, human and technological resources are sufficient to implement the statistical work and development programme.

- A resource mobilization strategy such as a National Strategy for the Development of Statistics is in place.
- The annual workplan is feasible given the available resources.
- Costs (staff costs and other costs) of each stage of the production process are measured.

Requirement 9.2: Planning and management principles are aimed at the optimal use of available resources.

- Information technology is employed to increase efficiency.
- Standardization, integration and automatization of statistical production and dissemination are pursued to increase efficiency of operations and to save costs.

Requirement 9.3: The statistical agencies' use of resources is reviewed.

- Indicators on the use of human and financial resources are monitored centrally and regularly reported to management.
- The use of human resources is evaluated annually on the basis of established guidelines and procedures. The evaluation covers the allocation, performance and training needs of staff.
- Staff opinion/satisfaction surveys are conducted regularly.

Level C: Managing statistical processes

Principle 10: Assuring methodological soundness

Requirement 10.1: The methodologies applied by the statistical agencies are consistent with international standards, guidelines and good practices and are regularly reviewed and revised as needed.

- Organizational structures for the development and application of sound statistical methods are commensurate to needs.
- Review and reporting processes are in place that allow the management of the statistical agency to be assured that sound methodological approaches have been adopted and applied throughout the production process.
- The methodologies of surveys and the use of administrative data and other sources of data are evaluated periodically.
- Sampling design is based on sound methodology.
- Proper follow-up procedures are planned and implemented in cases of non-response.
- Statistical editing procedures and imputation methods are based on sound methodology.
- When statistical modelling is used in the statistical production process (e.g., for seasonal adjustment), the validity of model assumptions is carefully considered and the impact on final estimates is evaluated.
- Statistical agencies review the methods used by external partners for the compilation of data and the production of statistics.

Requirement 10.2: The statistical agencies recruit qualified staff and conduct regular programmes to enhance their methodological skills.

- Staff of the statistical agency are recruited on the basis of their academic background, qualifications and experience.
- Appropriate qualifications requirements are specified for all posts.
- Training and development programmes are in place to ensure the staff acquire and continuously update their methodological knowledge.
- Staff skills are regularly updated so that staff are able to utilize new data sources and tools and can easily change positions.
- Attendance of staff at relevant training courses and/or at national or international conferences is encouraged.

Requirement 10.3: The statistical agencies choose data sources taking into account accuracy and reliability, timeliness, cost, the burden on respondents and other necessary considerations.

- The use of alternative sources of data, including existing surveys and census, administrative data, big data or other sources of data, is constantly evaluated.
- Quality has to be assessed when using administrative data[91] or other data sources. Ideally, when using administrative data, it should be assured that:
  - The population is consistent with the statistical output requirements
  - The classifications are appropriate
  - The underlying concepts are appropriate
  - The records are complete and up to date

[91] See, for example, Piet Daas and others, "Report on methods preferred for the quality indicators of administrative data sources", BLUE-Enterprise and Trade Statistics, 28 September 2011. Available at www.pietdaas.nl/beta/pubs/pubs/BLUE-ETS_WP4_Del2.pdf.

  - The geographical coverage is complete and the measurement units are appropriately defined/identified
- When using other data sources (such as big data), the specific methodological challenges such as those linked to the statistical population and the veracity and volatility of such data have to be considered.

Requirement 10.4: The registers and the frames for surveys are frequently evaluated and adjusted.

- A systematic approach is in place for updating the survey frames to ensure accurate coverage of the target population.
- For all surveys, the appropriate statistical population frames are updated regularly.
- Information gathered during the conduct of surveys is used to assess and improve the quality of the frame, especially with regard to its coverage and the quality of the contact variables and the auxiliary information (variables used in the sampling design).

Requirement 10.5: The statistical agencies cooperate with the scientific community to improve methods and promote innovation in the development, production and dissemination of statistics.

- Collaboration with the scientific community is in place, for example through conferences, workshops, task forces and training/courses, to discuss relevant methodological and technological developments (e.g., with regard to exploiting new data sources).
- There are agreements in place with academic institutions on cooperation and the exchange of qualified personnel.
- Staff collaborate on methodological issues with colleagues at the international level.
- Regular participation and presentations at relevant national and international conferences is encouraged for the exchange of knowledge and experiences.
- National and international conferences, seminars, workshops or similar events with the participation of the scientific community are organized by the statistical agencies.

Principle 11: Assuring cost-effectiveness

Requirement 11.1: The costs of producing all individual statistics are measured and analysed, and mechanisms are in place to assure the cost-effectiveness of statistical activities or processes.

- There is a system for registering cost and time used for all statistical products, and estimating time used on the main processes should be possible.
- The costs of producing the statistics are well documented at each stage of the production process and are regularly reviewed and analysed across statistical products to assess the effectiveness of their production.
- Cost-benefit analyses are carried out to determine the appropriate trade-offs in terms of data quality.
- The cost-effectiveness of every statistical survey is assessed.
- The need for each survey variable to be collected is justified.

- There is an ongoing review process that considers whether a particular programme is still operating in the most cost-effective way to meet its stated requirements.
- Data collection instruments are designed to minimize coding and editing cost and time.

Requirement 11.2: Procedures exist to assess and justify demands for new statistics against their cost.

- Demands for new statistics are regularly registered and assessed by statistical experts with regard to the proposed methodology and associated costs, and are discussed by management, based on inputs from users and in cooperation with other stakeholders.
- Before contemplating a new data collection, there are mechanisms to review whether already available data sources can be utilized with minimal impact on their purpose and quality.
- When introducing new statistics, a cost-benefit analysis is conducted.

Requirement 11.3: Procedures exist to assess the continuing need for all statistics, to determine whether any can be discontinued to free up resources.

- There are regular discussions by management on the usefulness of all statistics; the discussions include inputs from users, such as the results of user satisfaction surveys.
- The usage of different statistical products, including statistical databases, is monitored and assessed to evaluate their relevance.
- Users and stakeholders are informed and consulted about the possible discontinuation of statistical outputs.

Requirement 11.4: Modern information and communication technologies are applied to improve the performance of statistical processes.

- An appropriate IT strategy exists and is regularly reviewed and updated to improve the effectiveness and efficiency of the statistical processes.
- The IT architecture and hardware infrastructure are regularly reviewed and updated, and possibilities for innovation and modernization are identified.
- Routine clerical operations and statistical processes (e.g., data capture, coding, data editing, data validation, data exchange) are automated where possible and are regularly reviewed.
- Centralized IT and methodological units exist and provide possibilities for the pooling of resources and investments.

Requirement 11.5: Proactive efforts are made to improve the statistical potential of administrative data and other data sources.

- Statistical agencies provide input to the legislative process to obtain and maintain access to administrative and other data sources for statistical purposes, if needed.
- Appropriate arrangements (e.g., service-level agreements or national legislation) with owners or holders of administrative data and other data collections are made and updated as needed, specifying the access to and flow of data and metadata and other relevant aspects.
- An assessment of possible administrative data sources is carried out prior to launching any new survey.

- Data linking and integration methods are proactively pursued while ensuring data security and privacy.
- Quality reports for administrative and other data used for official statistics are established by the responsible statistical agency in cooperation with the data owners or holders.

Requirement 11.6: The statistical agencies define, promote and implement integrated and standardized production systems.

- The statistical agencies have developed strategies to move to a more integrated and standardized statistical production system within their organization.
- The statistical agencies promote, share and implement standardized solutions that increase effectiveness and efficiency.
- The statistical business architecture of the statistical agency is based on international standards and tools such as the GSBPM, the GAMSO, the Common Statistical Production Architecture and SDMX.

Principle 12: Assuring appropriate statistical procedures

Requirement 12.1: Statistical processes are tested before implementation.

- The testing strategy is developed as part of the design phase of the statistical business process model.
- Data capture procedures and data collection tools and instruments such as electronic systems are tested to ensure simplicity and minimal intrusion on privacy, and are adjusted if required before their implementation.
- Survey questionnaires are tested using appropriate methods (e.g., pilot survey, focus groups, etc.).
- Collection systems for administrative and other data are tested before use.
- Data treatment and data processing procedures are tested and adjusted, if required and possible, prior to their actual application.
- Test results are taken into account in the implementation of the production process and are approved.
- In the case of integrating data from one or more sources, the quality of the linkage procedures is tested.

Requirement 12.2: Statistical processes are well established and regularly monitored and revised as required.

- The statistical agencies have documented procedures and guidelines that contain recommendations for appropriate methodologies to be used at different steps of the statistical production process.
- Documentation of production processes should follow the GSBPM.
- A policy for archiving data and statistics is in place and is followed.
- Statistical procedures employ internationally recognized statistical techniques.
- Data of all data sources are reviewed and validated to identify potential problems, errors and discrepancies such as outliers, missing data and miscoding.
- When coding is done through an automated process, a team of well-trained coders is assigned to verify the automated coding and to handle un-coded cases.

- The effects of data editing and imputation are analysed as part of assessing the quality of the data collection.
- All statistical databases are designed and arranged in a way that allows and facilitates data linkage, using unique identifiers for statistical units as appropriate while ensuring data security and privacy.

See also principle 10 on assuring methodological soundness and principle 11 on assuring cost-effectiveness.

Requirement 12.3: Procedures are in place to effectively use administrative and other data sources for statistical purposes.

- Statistical agencies use tools and guidelines to assess the quality of the data of administrative and other data sources.
- Appropriate processes and software applications for the collection, processing and analyses of data of administrative and other data sources have been developed and implemented.
- Owners or holders of administrative and other data sources inform the statistical agencies of any changes in the data production process.
- Metadata related to administrative or other data sources are available to the statistical agencies, including concepts and definitions, classifications, coverage compared to target population and other quality aspects.
- Documentation exists that describes how data from administrative and other sources meet the statistical requirements in terms of definitions, concepts and coverage, among other things.

See also principle 11 on assuring cost-effectiveness.

Requirement 12.4: Revisions of statistics follow standard and transparent procedures.

- A revision policy that follows international standards and recommendations exists and is made public.
- Guidelines for revisions exist and are followed.
- Revisions of the published statistics are accompanied by metadata that provide necessary explanations.
- Indicators expressing the amount and types of revisions are computed and evaluated for improvement.

Requirement 12.5: Metadata and documentation of methods and different statistical processes are managed throughout the processes and shared as appropriate.

- There is a policy on metadata documentation linked to the statistical production processes.
- The policies and standards for maintaining and updating metadata are followed.
- Work on preparing statistics and their related metadata should be done in parallel.
- Metadata are captured throughout the statistical business process following the GSBPM and stored in a metadata management system.
- Statistical methods and processes are documented in such a way that allows for the recreation of the entire statistical production process.

See also principle 19 on managing metadata.

Principle 13: Managing the respondent burden

Requirement 13.1: The range and detail of requested information is limited to what is necessary.

- The availability and suitability of existing surveys and administrative or other data sources are explicitly considered before suggesting a new survey.
- Before establishing a new survey, a discussion should take place as to the possibility of producing the required data with less respondent burden by modifying or amending an existing survey or by linking the new survey with an existing survey (integrated survey system).
- The collection of each data item of a survey has to be explained and justified.
- The collection of any data items that are identical or similar to those collected in another survey is limited to what is considered necessary for verification and possible data linkage purposes.
- When possible, surveys or parts of the information to be collected in the surveys are extracted or derived from available administrative registers.
- The burden on respondents is measured and included in a set of quality indicators and in the quality reports.

Requirement 13.2: Mechanisms are in place to promote the value and use of statistics to respondents.

- Information packages that provide respondents with important and necessary information about the survey and explain the value of official statistics are made available.
- Respondents are provided with the final reports or results of the census or sample survey in which they participated.
- Initiatives with community groups, schools, business advocates and others are undertaken to raise awareness of the value of official statistics.
- Electronic products are developed that give necessary statistical information to businesses and individuals, and these products are promoted through initiatives with communities and respondents.
- Social media is used to promote participation in surveys and censuses.
- Standard practices are in place to obtain feedback from respondents and to respond to their requests and complaints in a regular manner.

Requirement 13.3: Sound methods, including IT solutions, are used in surveys to reduce or distribute respondent burden.

- Appropriate sampling techniques are used to minimize sample sizes to achieve the target level of accuracy.
- Sample surveys are coordinated to distribute the burden on respondents.
- Multiple modes of collection are offered to respondents, including electronic surveys.
- Collection of data is done at the most appropriate time of the day and the year.

Requirement 13.4: Data sharing, data linkage and the use of administrative and other data sources are promoted to minimize respondent burden.

- Documentation of data already available within the NSS, including archived data, exists and is shared.
- Procedures and technical tools for data sharing and data linkage within the NSS (e.g., formal agreements, web services, common databases) exist.

- Data repositories are shared among statistical agencies for the production of official statistics and in compliance with confidentiality policies.
- Information on the quality of data to be linked exists (e.g., on coverage and linkage possibilities).
- Use of administrative and other data as an alternative to survey data for producing official statistics is promoted throughout the NSS

See also principle 2 on managing relationships with data users, data providers and other stakeholders, principle 11 on assuring cost-effectiveness and principle 12 on assuring appropriate statistical procedures.

Level D: Managing statistical outputs

Principle 14: Assuring relevance

Requirement 14.1: Procedures are in place to identify users and their needs and to consult them about the content of the statistical work programme.

- There is legislation or some other formal provision which includes an obligation to consult with the main users of the statistics.
- Structured and periodic consultation processes (e.g., advisory councils and committees or working groups) with key stakeholders and users are in place to review the content of the statistical programme and the usefulness of existing statistics, and to identify requirements for new statistics.
- Feedback from a user support service, centre or hotline is analysed to understand and identify user needs.
- Data on the use of statistics (e.g., web analytics, number and types of downloads, subscribers to reports) are collected and analysed to improve statistical outputs.

Requirement 14.2: Users' needs and requirements are balanced, prioritized and reflected in the work programme.

- Users' priority needs are met and reflected in the work programme of the statistical agency.
- Procedures are in place to prioritize various user needs in the work programme and strategic goals.
- Data on the use of statistics are analysed to support the setting of priorities.
- A periodic evaluation of the work programme is carried out to identify emerging needs and lower priorities.
- Processes are in place to monitor and consult with stakeholders on the relevance and practical utility of existing statistics (with regard to scope, level of detail, cost, etc.) according to current and emerging user needs.

Requirement 14.3: Statistics based on new and existing data sources are being developed in response to society's emerging information needs.

- An innovation laboratory is established to consider and experiment with new data sources to meet emerging information needs.
- Cooperation with the scientific community and owners or holders of new data sources is established to experiment with and pioneer the use of these data sources.

- Possibilities of exploiting new data sources are regularly discussed by management.

Requirement 14.4: User satisfaction is regularly measured and systematically followed up.

- User satisfaction surveys and user studies are regularly carried out and analysed.
- Improvement actions arising from the user satisfaction surveys and user studies are identified and implemented.
- User satisfaction surveys include questions on the opinions of users about metadata availability.
- Measures to assess the satisfaction of main users with particular products are in place (e.g., specific user-satisfaction surveys and indicators, including timeliness, etc., at the product level).

Principle 15: Assuring accuracy and reliability

Requirement 15.1: Source data, integrated data, intermediate results and statistical outputs are regularly assessed and validated.

- Systems for assessing and validating source data, integrated data, intermediate results and statistical outputs are developed and managed.
- Data are systematically checked and compared with data from other sources and over time.
- Results of statistics are compared with other existing information in order to ensure validity.

Requirement 15.2: Sampling errors are measured, evaluated and documented. Non-sampling errors are described and, when possible, estimated.

- Procedures and guidelines are available on how to measure and manage (e.g., reduce or balance) errors.
- Sources of possible sampling errors are identified and described.
- Sampling errors are measured and evaluated.
- Non-sampling errors (errors from all sources, such as response errors, coverage errors, errors linked to measurements, processing and analyses, etc.) are identified, described and evaluated.
- Errors are analysed to identify improvement measures.
- Information about the sampling and non-sampling errors is made available to users as part of the metadata.

Requirement 15.3: Studies and analyses of revisions are carried out and used to improve data sources, statistical processes and outputs.

- Preliminary and revised data and statistics are clearly identified.
- Explanations about the timing, reasons for and the nature of revisions are made available.
- The revision policy follows standard and transparent procedures.
- Information on the size and direction of revisions for key indicators is used to improve the statistical processes.
- Information on the size and direction of revisions for key indicators is provided and made public.

Principle 16: Assuring timeliness and punctuality

Requirement 16.1: The timeliness of the statistical agency's statistics comply with international standards or other relevant timeliness targets.

- The timeliness of statistical agency's statistics complies with the dissemination standards of international organizations such as IMF or other relevant timeliness targets (e.g., requirements for the 2030 Agenda for Sustainable Development).
- Divergences from international timeliness targets are monitored and, if the targets are not met, actions are taken to ensure compliance with them.
- The overall trade-offs between timeliness and other dimensions of quality (e.g., accuracy, cost and respondent burden) are given consideration when setting targets.

Requirement 16.2: The relationship with data providers is managed with regard to timeliness and punctuality needs.

- Agreements are in place with data providers on the planned delivery dates and delivery format.
- Procedures are in place to ensure the effective and timely flow of data from providers to statistical agencies.
- Follow-up procedures are in place to ensure the timely receipt of data from providers.

Requirement 16.3: Preliminary results can be released when their accuracy and reliability is acceptable.

- The possibility and necessity of releasing preliminary data for key statistics is evaluated, while also considering data accuracy and reliability.
- When preliminary statistics are released, they are clearly identified as such.
- Users are provided with appropriate information on the quality of the preliminary statistics.
- Preliminary results are revised according to the established revision policy.
- Final results are clearly distinguished from preliminary results.

Requirement 16.4: Punctuality is measured and monitored according to planned release dates, such as those set in a release calendar.

- Punctuality or the rate of punctuality (i.e., rate of statistics published on time) is measured according to the release calendar. The finalization of the release calendar should occur at least 3 months in advance of the publication of the relevant statistics.
- Information on the punctuality of the released statistics is discussed by management and made available to users.

Principle 17: Assuring accessibility and clarity

Requirement 17.1: Statistics are presented in a form that facilitates proper interpretation and meaningful comparisons.

- Statistics are presented in a clear and understandable manner.
- Guidelines that describe the appropriate content and preferred formats and style (layout and clarity of text, tables and charts) of an agency's outputs are available to authors of statistical publications and databases.

- Published statistics are open for free use and redissemination, provided that reference is made to the responsible agency.
- Staff training and development programmes are in place with regard to writing about statistics (for press releases, publication highlights or other explanatory texts).
- Up-to-date methodological documents (on concepts, scope, classifications, basis of recording, data sources, compilation methods and statistical techniques), as well as quality reports and the work programme of the statistical agency, are made available to the public.
- Explanatory texts accompanying the statistics are reviewed for clarity and readability.
- Meaningful comparisons are included in the publications when appropriate.
- Preliminary and revised data are identified and explained in published statistics.
- Metadata needed to understand and use the statistics are published together with the statistics.
- A policy for archiving published statistics is in place.

Requirement 17.2: A data dissemination strategy and policy exists and is made public.

- The public is made aware that custom-designed outputs, statistics not routinely disseminated and longer time series can be provided on request when feasible, and it is instructed on how the data can be ordered. These outputs are made public if possible.
- Catalogues of publications and other services are made available to users.
- While official statistics are normally free and accessible for everyone, statistics that need to be produced on request might have a cost corresponding to the extra work they require. The pricing of special requests is fully transparent.
- A strategy has been developed and agreed upon with stakeholders for the release of anonymized data and microdata.

Requirement 17.3: Modern information and communication technology is used for facilitating easy access to statistics.

- Statistics are disseminated in various ways suitable for all users, with the agency's website providing a central entry point.
- Users are able to extract data from statistical databases through public interfaces in the most appropriate and common formats (xlsx, csv, html, etc.).
- Statistical data can be accessed through an application programming interface.
- Statistics are disseminated in ways that facilitate redissemination by the media.
- The statistical agency consults users on a regular basis to discover the formats of dissemination they most prefer.
- Agreements with key users are established for the efficient and regular transmission of statistics and data.
- Technical solutions for access to anonymized data are available.
- Explicit consideration has been given to trade-offs between accessibility and confidentiality (i.e., level of detail in tables).

Requirement 17.4: Access to microdata is allowed for research purposes, subject to specific rules and protocols on statistical confidentiality that are posted on the statistical agency's website.

- The statistical agency controls or monitors the access of researchers to microdata by providing the microdata in a secure environment.
- Researchers are regularly consulted about the effectiveness of the microdata access arrangements.
- Remote access facilities are available for accessing microdata, with appropriate controls.

Requirement 17.5: Mechanisms are in place to promote statistical literacy.

- The statistical agencies have a strategy to manage media relationships and maintain regular contact with the media.
- The statistical agencies arrange regular training and outreach for journalists.
- The statistical agencies arrange training for students on how to use statistics.
- The publication of articles on statistical issues, and how statistics should be used properly, is encouraged.

Requirement 17.6: The statistical agencies have a dedicated focal point that provides support and responds to inquiries from users in a timely manner.

- Well-known user support services are available to give prompt assistance to users to help them access and interpret the data.
- User support services are appropriately staffed to support a wide range of users.

Requirement 17.7: Users are kept informed about the quality of statistical outputs.

- Standards for quality reports, harmonized for the NSO and adjusted as appropriate for the NSS, and tailored for different users' needs, are defined.
- Published statistics are accompanied by standard quality reports, including information on the periodicity of the statistics, data sources, production methods and quality (i.e., accuracy and reliability, timeliness and punctuality, coherence and comparability, accessibility and clarity).
- Results from quality assessments or reviews are made public.

Principle 18: Assuring coherence and comparability

Requirement 18.1: International, regional and national standards are used with regard to definitions, units, variables and classifications.

- Statistical agencies promote the adoption of national, regional or international statistical standards.
- Guidelines, a common repository of statistical concepts, definitions of units and variables, and classifications and other mechanisms exist.
- Compliance with international, regional or national standards for statistical production is periodically assessed. Any deviations from these standards are identified and included in the publicly available metadata, along with reasons for such deviations.

Requirement 18.2: Procedures or guidelines are in place to ensure and monitor internal, intrasectoral and cross-sectoral coherence and consistency.

- Statistics derived from different sources or with different periodicities (e.g., monthly, quarterly, yearly) are compared and any differences are explained and reconciled, as appropriate.
- Cooperation and the exchange of knowledge among individual statistical programmes and domains is promoted.
- Process-specific procedures and guidelines are available to ensure that outputs are internally coherent.
- Before new statistics or statistical programmes are launched, the conceptual and methodological relationship with existing statistics is analysed.
- Statistical outputs are compared with results of other statistical or administrative sources that provide the same or similar information on the same subject matter, and divergences are identified and explained to users.
- Internal procedures or guidelines are developed in order to ensure and monitor internal coherence and consistency.
- Procedures and guidelines are developed in order to ensure that results from different sources can be combined. Compliance is periodically assessed.

Requirement 18.3: Statistics are kept comparable over a reasonable period of time and between geographical areas.

- Changes in methods of data compilation are clearly identified, described and analysed to facilitate the interpretation of the results.
- Quality reporting includes a section on the assessment of internal consistency and comparability over time and with related statistics.
- Breaks in a series are explained and the methods for ensuring reconciliation over a period of time are made publicly available.
- Effects of changes in methodologies on final estimates are assessed and appropriate information is provided to users.
- Significant changes in the society and phenomena to be measured are reflected by appropriate changes to concepts, classifications, definitions and target populations.
- Differences within geographical areas or at the country level due to different concepts or methodologies are explained.

Principle 19: Managing metadata

Requirement 19.1: The metadata management system of the statistical agency is well defined and documented.

- A strategy, guidelines and procedures are in place for metadata management and dissemination.
- Metadata management is recognized as the responsibility of all staff.

Requirement 19.2: Metadata are documented, archived and disseminated according to internationally accepted standards.

- International, regional, national or internal standards are used for metadata documentation, management and archiving.
- Procedures are in place to ensure that metadata are documented according to standardized metadata systems, and are regularly updated.

- Metadata are made available at the same time as the data and statistics to which they pertain.
- The dissemination of metadata is tailored to different needs, such as those of producers and users of statistics.
- A systematic way to archive metadata is available that also ensures that the metadata are accessible for reuse in the future.
- A glossary of statistical concepts is publicly available.

Requirement 19.3: Staff training and development programmes are in place on metadata management and related information and documentation systems.

- Process managers are trained to properly document the data and describe the relevant processes.
- Statistical agency staff participate in international metadata forums.

The United Nations National Quality Assurance Frameworks Manual for Official Statistics was adopted by the Statistical Commission of the Economic and Social Council of the United Nations in March 2019, and welcomed as an important contribution for guiding countries in the implementation of a national quality assurance framework, including for new data sources, new data providers, and data and statistics on the Sustainable Development Goal indicators. Building on and replacing the generic template and guidelines adopted in 2012, the *Manual* contains recommendations on quality assurance for official statistics, the United Nations National Quality Assurance Framework and practical guidance for developing and implementing a national quality assurance framework. The *Manual* is intended for use by anyone interested in or working on quality assurance of official statistics.

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