

Quality Assurance Principles

Explains the quality assurance principles that apply across all ocean accounting work, and how to document and review compiled accounts.

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OUTCOME

After reading this Circular, you will understand the quality assurance principles that apply across all ocean accounting work. These principles cover data quality dimensions, uncertainty categories, and documentation standards, and are referenced by all other circulars in the Technical Guidance.

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ABOUT THIS CIRCULAR

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1. Outcome

¶1 After reading this Circular, you will understand the quality assurance principles that apply across all ocean accounting work. These principles cover data quality dimensions, uncertainty categories, and documentation standards, and are referenced by all other circulars in the Technical Guidance.

2. Requirements

¶1 **Essential prerequisites:**

- ¶2 **TG-0.1 General Introduction to Ocean Accounts** – for the conceptual framework and the three-domain structure of Ocean Accounts

¶3 **Helpful background:**

- ¶4 **TG-0.2 Overview of Relevant Statistical Standards** – for the SEEA EA quality dimensions and statistical standards referenced throughout

3. Guidance Material

3.1 Purpose of Quality Assurance

¶1 Ocean accounts integrate data from diverse sources: environmental monitoring, economic statistics, social surveys, geospatial observations, and customary knowledge systems. Each source has different quality characteristics, and accounts compilation must address those differences systematically through the principles set out in this Circular.

3.2 Six Dimensions of Data Quality

¶1 The SEEA EA identifies six dimensions of data quality relevant to environmental-economic accounting, plus the quality of the institutional environment in which the data are compiled (para. 2.86; see Section 3.3). The six dimensions apply directly to ocean accounts:

3.2.1 Relevance

¶1 **Definition:** The degree to which the data serve to address the purposes for which they are sought by users.

¶2 **Ocean accounts considerations:**

- ¶3 Do the accounts address the policy questions being asked?
- ¶4 Are the spatial and temporal resolutions appropriate for the intended use?
- ¶5 Are the ecosystem types and economic sectors adequately disaggregated?

¶6 **Example:** An ocean account designed to inform marine spatial planning needs fine spatial resolution, whilst one supporting national budget processes may require less geographic detail but more reliable monetary estimates.

3.2.2 Timeliness

¶1 **Definition:** The length of time between the data reference period and availability of the information.

¶2 **Ocean accounts considerations:**

- ¶3 How current are the environmental monitoring data?
- ¶4 Are there lags between economic activity and its recording in accounts?

- ¶5 How frequently are accounts updated?

¶6 **Example:** Satellite-derived ecosystem extent data may be available within months, whilst large-scale economic surveys may have 1–2 year lags.

3.2.3 Accuracy

¶1 **Definition:** The degree to which the data correctly describe the phenomena they were designed to measure.

¶2 **Ocean accounts considerations:**

- ¶3 What are the measurement errors in environmental monitoring?
- ¶4 How reliable are sampling-based estimates of fish stocks or ecosystem condition?
- ¶5 What are the error margins for economic survey data?

¶6 **Example:** Fish stock assessments may have wide confidence intervals. Accounts should report those intervals alongside the point estimate.

3.2.4 Coherence

¶1 **Definition:** The degree to which data from different sources or compiled using different methods can be reliably combined and compared.

¶2 **Ocean accounts considerations:**

- ¶3 Are classifications consistently applied across data sources?
- ¶4 Are spatial boundaries aligned between environmental and economic data?
- ¶5 Are accounting periods synchronised?
- ¶6 Are changes in accounts over time attributable to genuine change rather than methodological or classification revisions? Breaks-in-series should be documented and, where feasible, back-casted (compilers should consult the relevant Section 3 accounts compilation circular for revisions practice specific to each account type).

¶7 **Example:** Economic data by industry may not align perfectly with spatially-defined ecosystem service flows, so bridging tables may be needed.

3.2.5 Interpretability

¶1 **Definition:** The availability of information to help users understand and properly use the data.

¶2 **Ocean accounts considerations:**

- ¶3 Are methods and assumptions clearly documented?
- ¶4 Are metadata standards applied?
- ¶5 Are definitions consistent with international standards?

¶6 **Example:** Accounts should specify how services were measured and which ecosystem service classification is used, for example CICES V5.2 or the SEEA EA Reference List of Ecosystem Services (see SEEA EA Annex 6.1). For SEEA EA accounts, the SEEA EA Reference List is the primary classification, and CICES V5.2 may be used as a complementary mapping.¹

3.2.6 Accessibility

¶1 **Definition:** The ease with which users can access and use the data.

¶2 **Ocean accounts considerations:**

- ¶3 Are accounts published in accessible formats?
- ¶4 Are underlying data available for users who need more detail?
- ¶5 Are there access restrictions (e.g., for confidential business data)?

¶6 **Example:** Accounts may be published in summary form with detailed underlying data available on request or through data portals.

3.3 Institutional Environment

¶1 Beyond the six dimensions of data quality, the SEEA EA emphasises the quality of the institutional environment in which data are compiled (para. 2.86), consistent with the UN Fundamental Principles of Official Statistics (Resolution 2013/21):

- ¶2 **Independence:** Statistical compilation free from political interference
- ¶3 **Mandate:** Clear legal or institutional authority for accounts production
- ¶4 **Resources:** Adequate funding and staffing
- ¶5 **Coordination:** Effective arrangements between data-producing agencies
- ¶6 **Standards:** Adherence to international statistical standards and principles

3.4 Four Categories of Uncertainty

¶1 The SEEA EA identifies four categories of uncertainty particularly pertinent to ecosystem accounting (paras. 2.90–2.94).² All apply directly to ocean accounts:

3.4.1 Physical Measurement Uncertainty

¶1 Uncertainty related to the physical measurement of ecosystem services and ecosystem assets.

¶2 **Sources in ocean accounts:**

- ¶3 Sampling variability in fish stock surveys
- ¶4 Remote sensing classification errors
- ¶5 Spatial interpolation between monitoring stations
- ¶6 Temporal variability between observations

¶7 **Approaches to address:**

- ¶8 Report confidence intervals where available
- ¶9 Document sampling design and coverage
- ¶10 Use ensemble methods or multiple data sources
- ¶11 Distinguish between measurement precision and accuracy

3.4.2 Valuation Uncertainty

¶1 Uncertainty in the valuation of ecosystem services and ecosystem assets.

¶2 **Sources in ocean accounts:**

- ¶3 Choice of valuation method (market prices, replacement cost, stated preference)
- ¶4 Benefit transfer from other contexts
- ¶5 Discount rate selection for asset values
- ¶6 Treatment of non-marginal changes

¶7 Benefit transfer introduces additional uncertainty where the study site and policy context differ substantially from the transfer site, so applicability conditions should be assessed and documented (see Section 3.5.4 Assumptions Made, and SEEA EA paras. 5.38–5.41).

¶8 **Approaches to address:**

- ¶9 Report physical accounts alongside monetary values
- ¶10 Use sensitivity analysis for key assumptions
- ¶11 Document valuation method selection rationale
- ¶12 Present ranges rather than point estimates for contested values

3.4.3 Ecosystem Dynamics Uncertainty

¶1 Uncertainty related to the dynamics of ecosystems and changes in flows.

¶2 **Sources in ocean accounts:**

- ¶3 Non-linear ecosystem responses to pressures
- ¶4 Threshold effects and regime shifts
- ¶5 Cumulative and synergistic impacts
- ¶6 Climate change effects on baselines

¶7 **Approaches to address:**

- ¶8 Use scenario analysis where trends are uncertain
- ¶9 Document known ecological thresholds
- ¶10 Update reference conditions as understanding improves
- ¶11 Link accounts to ecosystem monitoring programmes

3.4.4 Future Prices and Values Uncertainty

¶1 Uncertainty regarding future prices and values.

¶2 **Sources in ocean accounts:**

- ¶3 Future market conditions for ocean products
- ¶4 Changing social preferences for ecosystem services
- ¶5 Policy changes affecting resource access or use
- ¶6 Technological change affecting substitution possibilities

¶7 **Approaches to address:**

- ¶8 Use current prices for flow accounts
- ¶9 Apply sensitivity analysis for asset valuations
- ¶10 Document assumptions about future conditions
- ¶11 Update valuations periodically

3.5 Documentation Requirements

¶1 The SEEA EA closes its discussion of uncertainty by stating that all accounting work should document the scope of measurement, the definitions applied, the methods used, and the assumptions made (para. 2.95). Table 3.5.1 (below) maps these four documentation categories to the phases of the Generic Statistical Business Process Model (GSBPM v5.2).

Documentation category	GSBPM mapping	Key content
Scope of measurement	Phase 1 – Specify Needs	Geographic, temporal, thematic coverage; inclusions and exclusions
Definitions applied	Phase 2 – Design	Ecosystem type definitions; industry/product classifications; alignment with international standards
Methods used	Phase 5 – Process	Data sources; compilation procedures; valuation approaches; spatial analysis; gap-filling
Assumptions made	Phase 5 – Process	Key assumptions underlying estimates; sensitivity of results; known biases; expert judgement basis. Sensitivity analysis results: also Phase 8 – Evaluate

3.5.1 Scope of Measurement

- ¶1 Geographic coverage (EEZ, coastal zone, specific regions)
- ¶2 Temporal coverage (accounting period, time series extent)

- ¶3 Thematic coverage (ecosystem types, economic sectors, asset categories)
- ¶4 What is included and excluded, with rationale

3.5.2 Definitions Applied

- ¶1 Ecosystem type definitions and classification used
- ¶2 Industry and product classifications
- ¶3 Asset boundary definitions (e.g., treatment of aquaculture)
- ¶4 Alignment with international standards (or departures with justification)

3.5.3 Methods Used

- ¶1 Data sources and collection methods
- ¶2 Compilation procedures and algorithms
- ¶3 Valuation approaches (for monetary accounts)
- ¶4 Spatial analysis methods
- ¶5 Gap-filling and estimation procedures

3.5.4 Assumptions Made

- ¶1 Key assumptions underlying estimates
- ¶2 Sensitivity of results to assumption changes
- ¶3 Known biases and their direction
- ¶4 Expert judgement employed and its basis

3.6 Quality Flags for Accounts Tables

¶1 Table 3.6.1 sets out a recommended flagging system for ocean accounts tables.

Flag	Meaning	Description
A	High quality	Based on comprehensive data; low uncertainty
B	Acceptable quality	Based on representative data; moderate uncertainty
C	Use with caution	Limited data; significant uncertainty; may be revised
P	Provisional	Preliminary estimate; will be revised when data available
E	Estimated	Derived from models or benefit transfer; not direct measurement
X	Suppressed	Data withheld for confidentiality or quality reasons
n/a	Not applicable	Concept does not apply to this cell
..	Not available	Data not collected or not yet compiled

¶2 Note: the “n/a” symbol replaces the double-hyphen form used in some earlier drafts. The double hyphen (--) is reserved for em-dashes in circular prose.

¶3 When account aggregates are derived from cells carrying different flags, the aggregate should carry the flag of the lowest-quality input (e.g., an aggregate of A and C cells carries flag C). Where the lowest-quality input contributes less than 5% of the aggregate value, compilers may exercise judgement and document the rationale.

3.7 Quality Improvement Strategies

¶1 Table 3.7.1 summarises four complementary strategies for progressive improvement of ocean accounts over time.

Strategy	Key actions
Prioritised development	Focus initial efforts on highest-priority policy questions; accept provisional estimates where data are limited; build comprehensive accounts progressively.
User feedback	Engage data users in identifying quality priorities; track how accounts are used in decision-making; respond to user-identified gaps and issues.
Data source development	Work with data providers to improve underlying data; coordinate timing of surveys and monitoring; invest in new data collection where gaps are critical.
Method enhancement	Adopt improved methods as they become available; participate in international methodological development; share innovations with other countries.

3.7.1 Global Consultation on the Technical Guidance

¶1 The quality improvement strategies above apply to the ocean accounts that countries compile. The GOAP Technical Guidance itself is subject to an equivalent quality assurance process: each circular is developed and published through a structured Circular Review and Global Consultation that applies the same principles of transparency, attribution, and documentation set out in Section 3.5 to the guidance documents. A circular passes through five phases over approximately eleven weeks (Table 3.7.2).

Phase	Timing	Activities
1 – Draft	Weeks 1–3	A lead author prepares the draft and completes a self-check against the style guide and these quality assurance principles.
2 – Review	Weeks 4–5	A panel of three to five subject reviewers assesses the draft and produces a consolidated review summary.
3 – Comment	Weeks 6–8	The draft is published for open global consultation. Any reader may select a passage and submit a line-anchored comment, tagged by type, optionally proposing an alternative, and attributed to the contributor. Comments are debated through threaded replies with status tags within a time-boxed window, and the lead author responds. A decision gate then checks whether all comments are resolved: unresolved items return to the author, whilst resolved drafts pass to the Secretariat.
4 – Finalise	Weeks 9–10	The Secretariat adjudicates outstanding comments, finalises the text, and locks the version.
5 – Release	Week 11	Contributors are credited, the circular is published, and the comment record is archived.

¶2 Four roles carry the process: the lead author (drafts and responds to comments), the review panel (reviews and summarises), a moderator (routes comments and escalates unresolved items), and the Secretariat (adjudicates, finalises, and publishes). The consultation is conducted openly. Comments are publicly visible while the window is open, and the full comment record is retained as a public archive (logged to an annex of the circular). Escalations are logged, and any rejected suggestion is accompanied by a documented justification. Draft circulars open for consultation are presented with an inline commenting overlay that lets readers select text and submit feedback directly on the page (see, for example, the [TG-0.2 consultation page](#)).

3.8 Tiered Implementation Frameworks

¶1 Throughout the GOAP Technical Guidance, tiered implementation frameworks are used to indicate graduated approaches calibrated to available data and institutional capacity. Tier designations are circular-specific, as each circular defines the tiers appropriate to its subject matter. In all cases Tier 1 represents the minimum viable approach, whilst higher tiers represent more rigorous methods requiring greater capacity or data availability. Compilers should select the tier consistent with their data availability and intended account use, and may progress to higher tiers as capacity develops.

3.9 Circular-Specific QA Guidance

¶1 Table 3.9.1 maps circulars in Sections 3 and 4 to the quality assurance focus of their topic. TG-4.1 to TG-4.6 each include a section on data quality or quality assurance. TG-3.1 to TG-3.5 and TG-4.7 have no dedicated quality assurance section (TG-3.5 discusses uncertainties and risks in its Section 5); for these topics, the principles in this Circular apply directly.

Circular	QA focus
TG-3.1 Asset accounts	Stock measurements
TG-3.2 Flows from environment to economy	Ecosystem service flows
TG-3.3 Economic activity	Ocean economy statistics
TG-3.4 Flows from economy to environment	Pressure data
TG-3.5 Social accounts	Social indicators
TG-4.1 Remote sensing	Geospatial data
TG-4.2 Survey methods	Survey-based data
TG-4.3 Administrative data	Administrative sources
TG-4.4 Citizen science	Community-based monitoring data
TG-4.5 Research data	Integrating research data into official statistics
TG-4.6 Data harmonisation	Data harmonisation and interoperability
TG-4.7 Data coordination	National data coordination architectures

4. Acknowledgements

¶1 **Authors:** [To be confirmed]

¶2 **Reviewers:** [To be confirmed]

¶3 This circular draws on quality assurance frameworks from the SEEA EA (Chapter 2), the UN Fundamental Principles of Official Statistics, and the Generic Statistical Business Process Model (GSBPM).

5. References

- ¶1 United Nations. (2021). *System of Environmental-Economic Accounting – Ecosystem Accounting*, Chapter 2: Principles of ecosystem accounting. Paragraphs 2.86–2.95.
- ¶2 United Nations Economic and Social Council. (2013). Resolution 2013/21: Fundamental Principles of Official Statistics.
- ¶3 UNECE. (2025). *Generic Statistical Business Process Model (GSBPM)*, Version 5.2.
- ¶4 SEEA. (2022). *SEEA Ecosystem Accounting Glossary*.

FOOTNOTES

1. ¶1 CICES V5.2 is available at <https://cices.eu> (<https://cices.eu>). The SEEA EA Reference List of Ecosystem Services appears in SEEA EA Annex 6.1 and is the standard classification for SEEA ecosystem accounts.
2. ¶2 The four categories correspond to SEEA EA paras. 2.91 (physical measurement), 2.92 (valuation), 2.93 (ecosystem dynamics), and 2.94 (future prices and values) respectively.

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