

Deep Sea and ABNJ Accounting

Provides emerging guidance on accounting for deep sea ecosystems and areas beyond national jurisdiction (ABNJ).

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DRAFT

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ABOUT THIS MANAGEMENT

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This Circular provides emerging guidance on accounting for deep sea ecosystems and areas beyond national jurisdiction (ABNJ). ABNJ, comprising the high seas and the international seabed Area, fall outside exclusive economic zones (EEZs) and are governed by distinct international legal frameworks. Their treatment poses substantial challenges for the country-based structure of the System of National Accounts and SEEA. This Circular supports four primary decision use cases. Deep-sea mining impact assessment requires baseline ecosystem accounts to evaluate environmental costs of seabed mineral exploitation against economic benefits, and those accounts inform national positions on International Seabed Authority (ISA) licensing decisions. BBNJ marine protected area designation depends on extent and condition accounts for deep-sea ecosystems to identify priority areas for area-based management tools under the Agreement on Biodiversity Beyond National Jurisdiction.

Hydrothermal vent conservation needs accounts for chemosynthetic-based ecosystems to balance bioprospecting potential against preservation of unique genetic resources. ISA environmental management plans use ecosystem condition monitoring to set performance standards and track cumulative impacts across exploration contract areas. These decision contexts connect directly to [TG-2.10 MEA Indicators](#) and [TG-1.3 Marine Spatial Management](#). This Circular is classified as Emerging: methodology is still developing, and readers should anticipate that guidance will evolve as scientific understanding improves, governance frameworks mature, and practical implementation experience accumulates. The BBNJ Agreement creates new governance structures and information requirements that will shape ABNJ accounting in coming years. This Circular should be revised following COP1 (see Section 3.6 for review schedule). Asset accounts for seabed minerals (described in [TG-3.1 Asset Accounts](#)) inform national natural capital budgets. Ecosystem extent accounts for deep-sea protected areas feed MEA indicator reporting against SDG 14.5.1 and GBF Target 3 (see [TG-2.10 MEA Indicators](#)). Condition accounts for chemosynthetic ecosystems connect to valuation frameworks in [TG-1.9 Valuation](#). The conceptual framework is established in [TG-0.1 General Introduction to Ocean Accounts](#) and methodological foundations of asset accounting in [TG-3.1 Asset Accounts](#).

❗ Framework Position

This Circular owns the accounts for IUCN GET biome M3 deep sea floors and, for the publication as a whole, the jurisdictional framework: the UNCLOS maritime zones, the SEEA CF asset boundary for areas beyond national jurisdiction, the extended continental shelf claim states, and the BBNJ Agreement provisions. Other circulars cross-refer here rather than restating them.

It cross-refers for the account structure ([TG-3.1](#)), condition measurement ([TG-4.8](#), [TG-4.9](#)), seabed mineral asset accounts ([TG-3.10](#)) and MEA indicator derivation ([TG-2.10](#)).

Offshore energy activity within the EEZ and on the continental shelf is [TG-6.9](#). The pelagic water column above these seabed types is [TG-6.5](#).

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¶5 ⓘ Framework Position

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¶8 Offshore energy activity within the EEZ and on the continental shelf is **TG-6.9**. The pelagic water column above these seabed types is **TG-6.5**.

2. Requirements

¶1 This Circular requires familiarity with:

- ¶2 **TG-0.1 General Introduction to Ocean Accounts** – provides the conceptual framework and key components of Ocean Accounts, including the relationship between accounting boundaries and jurisdictional frameworks essential for understanding the boundary challenges posed by ABNJ.
- ¶3 **TG-3.1 Asset Accounts** – for the methodological foundations of physical and monetary asset accounts, ecosystem extent and condition accounts, and the concepts of depletion and degra-

dition that this Circular applies to deep sea and ABNJ contexts.

¶4 Readers may also benefit from **TG-0.2 Overview of Relevant Statistical Standards** for grounding in the international statistical standards context relevant to the UNCLOS and BBNJ legal frameworks discussed here.

¶5 **Readiness and sequencing.** Whether a country is positioned to compile this account at all – mandate, data architecture, capacity and the order in which to build – is assessed under **TG-0.8 Implementation Readiness Assessment**, and is not restated here.

3. Guidance Material

¶1 The 2025 SNA explicitly acknowledges that “accounts are usually compiled for countries and hence the geographic scope is limited to the economic territory of a country including its Exclusive Economic Zone (EEZ)... there is a significant amount of natural capital, in particular concerning oceans, that may be excluded”². Para. 35.129 adds that “where there is interest in organising data about these types of natural capital outside of the scope of the integrated framework of the SNA in a manner that can be directly related to country based measures, the accounting definitions and treatments of the integrated framework of the SNA and the SEEA can be applied”³. Paragraphs 35.128–35.129 represent new text in the 2025 revision and provide the primary conceptual justification for extending accounting frameworks to ABNJ.

3.1 Jurisdictional Framework

¶1 UNCLOS establishes the legal framework governing ocean jurisdiction and defines distinct maritime zones with different rights and obligations⁴. For countries that have not ratified UNCLOS, many key provisions are considered to reflect customary international law and remain relevant to accounting boundary determination.

¶2 As of 17 January 2026, the BBNJ Agreement has entered into force (UN Treaty Collection). That date is the single point of reference for the Agreement’s operational status throughout this Circular.

Maritime zones under UNCLOS

¶1 **Territorial Sea** extends up to 12 nautical miles from baselines. Coastal States exercise full sovereignty over the territorial sea, including the seabed and subsoil⁵.

¶2 **Exclusive Economic Zone (EEZ)** extends up to 200 nautical miles from baselines. Coastal States have sovereign rights for exploration, exploitation, conservation and management of natural resources, both living and non-living⁶. The SEEA CF notes that “a country’s EEZ may extend up to 200 nautical miles from the country’s normal baselines”⁷.

¶3 **Continental Shelf** may extend beyond 200 nautical miles to the outer edge of the continental margin, subject to limits defined in UNCLOS Article 76. Coastal States exercise sovereign rights for exploring and exploiting natural resources, including sedentary species⁸. The Commission on the Limits of the Continental Shelf (CLCS) reviews submissions from coastal States.

¶4 **The High Seas** comprise all parts of the sea not included in the EEZ, territorial sea, or internal waters of a State⁹, and are open to all States subject to obligations for conservation of living resources¹⁰.

¶5 **The Area** designates the seabed, ocean floor and subsoil beyond the limits of national jurisdiction¹¹, declared “the common heritage of mankind”¹² and administered by the ISA¹³.

Implications for accounting boundaries

¶1 The SEEA CF states that “the SEEA Central Framework includes all natural resources, cultivated biological resources and land within a country of reference (including resources within a country’s

exclusive economic zone)”¹⁴. Resources in ABNJ are explicitly excluded from individual country asset boundaries.

¶2 Several mechanisms nevertheless create accounting connections to national economies:

1. ¶3

Quota-based fish stocks: Where international agreements allocate fishing quotas in ABNJ, the quota right itself may be recorded as a national asset where economic ownership is established. The 2025 SNA notes that “if economic ownership can be established for natural resources, for instance via internationally agreed quotas, these resources are within scope of the integrated framework of national accounts”¹⁵. SEEA CF paras. 5.397–5.400 distinguish the quota instrument (potentially recordable) from the underlying biological resource (which remains outside the national asset boundary)¹⁶. See **TG-6.7 Fisheries Stock Assessment** for guidance on recording quota-based fish stocks.

2. ¶4

Seabed mining contracts: Entities holding ISA exploration or exploitation contracts conduct activities in the Area on behalf of sponsoring States, generating economic flows attributable to national economies. See **TG-3.10 Offshore Energy Accounts** for methodological parallels.

3. ¶5

Flagged vessels: Production by vessels flagged to a country is attributed to that country’s economy regardless of where in the ocean the activity occurs¹⁷. See **TG-6.10 Maritime Transport and Ports** for the residency and flag-attribution treatment.

¶6 The treatment of research vessels, environmental monitoring activities, and non-extractive uses in ABNJ remains an area requiring further methodological development.

¶7 Figure 6.6.1 shows ABNJ governance across six bodies spanning seabed minerals, fisheries, shipping, cetacean management, scientific research, and biodiversity – each generating data flows with distinct accounting implications¹⁸.

Instruments ↓ Implications →	Ecosystem extent & asset delineation	Service supply & use measurement	Monetary & asset valuation	National attribution & residual account
International Seabed Authority ISA · seabed minerals, the Area	Area mandate	Extraction flow	Royalty basis	
Regional Fisheries Mgmt Orgs RFMOs / UNFSA · access, effort, TACs		TAC data	Depletion basis	Flag-state split
International Maritime Org. IMO · shipping, pollution, routing		Routing data		Port-state rule
International Whaling Commis IWC · cetacean populations	Range data			
IOC / UNESCO Ocean Science Ocean data infrastructure	<i>Data platform</i> Data link, not a mandate			
BBNJ Agreement (UNCLOS) Marine biodiversity; ABMTs, EIAs	<i>BBNJ — cross-cutting: applies across all four accounts</i>			

Governance instrument (row)
 Accounting implication (column)
 Data link (not a mandate)
 ABNJ / cross-cutting

Figure 6.6.1 Sparse matrix mapping six ABNJ governance instruments to four accounting implications; filled cells name feed mechanisms; blanks mean none. Sparse (11 of 24); BBNJ is cross-cutting.

Source: TG-6.6 Deep Sea and ABNJ Accounting, Section 3.1; BBNJ Agreement (2023), Arts. 11–16 (ABMTs), 22–35 (EIAs); ISA Regulations on Prospecting and Exploration (2013); UNFSA (1995), Art. 10.

Extended continental shelf: accounting treatment of CLCS claim states

¶1 Compilers should distinguish three states of extended continental shelf (ECS) claims when delineating accounting boundaries. The distinction is a methodological choice made on prudential grounds, and it does not determine legal rights. UNCLOS Article 77(3) recognises that coastal-State rights exist ab initio and do not depend on a CLCS recommendation, and the accounting treatment recommended here does not contest that legal position. It reflects the principle that assets should be included in national balance sheets only when their extent is sufficiently certain to support reliable measurement and inter-country comparability. Pending final CLCS confirmation, compilers should apply a conservative framing and disclose the uncertainty per SEEA EA para 5.20.

- ¶2 **Approved CLCS recommendations:** The ECS area is included within the national accounting boundary in the same way as the EEZ seabed.
- ¶3 **Submitted but pending claims:** The ECS area should be excluded from the core national accounting boundary and disclosed only as a memorandum item with a clear note on jurisdictional uncertainty.
- ¶4 **No submission:** The area is treated as ABNJ for accounting purposes.

¶5 Compilers should seek legal advice on the status of any ECS claim before including the area in compiled accounts.

BBNJ Agreement implications

¶1 The BBNJ Agreement establishes new frameworks for conservation and sustainable use of marine biodiversity in ABNJ¹⁹. Key provisions relevant to ocean accounting are summarised in Table 3.1.1 below.

Provision	Description
Marine genetic resources	Mechanisms for access to and benefit-sharing from marine genetic resources of ABNJ, including digital sequence information ²⁰ . Creates potential for recording benefit flows as resource rent equivalents.
Area-based management tools	Including MPAs in ABNJ, requiring delineation and condition monitoring ²¹ . MPA boundaries could serve as ecosystem accounting units.
Environmental impact assessments	Mandatory assessments for activities affecting ABNJ environments ²² . Generate baseline data potentially usable for accounting purposes.
Capacity-building and technology transfer	Supporting developing States' participation in ABNJ research and governance ²³ .

¶2 The development of monitoring frameworks for BBNJ-designated MPAs could provide baseline data for ecosystem extent and condition accounts in ABNJ. This Circular should be updated following COP1.

3.2 Deep Sea Ecosystems

¶1 Deep sea ecosystems are classified within the IUCN GET across two biomes: **M3 Deep Sea Floors** (benthic ecosystems)²⁴ and **M2 Pelagic Ocean Waters** (water column ecosystems extending to depth)²⁵. For the GET realm/biome/EFG hierarchy and the national crosswalk obligation, see **TG-4.1 Remote Sensing and Geospatial Data** Section 3.2.4.

M3 Deep sea floors biome

¶1 **M3.1 Continental and island slopes** extend from the shelf break (~250 m) to abyssal basins (4,000 m), characterised by strong depth gradients in pressure, temperature, light and food availability²⁶, ²⁷. Continental slopes within EEZs fall within national accounting boundaries, whilst slopes on the extended continental shelf may also be attributable to coastal States.

¶2 **M3.2 Submarine canyons** function as “dynamic flux routes for resources between continental shelves and ocean basins”²⁸. They enhance nutrient transport and support dense communities of cold-water corals and sponges.

¶3 **M3.3 Abyssal plains** extend between 3,000 and 6,000 m and are “covered by thick layers... of fine sediment”²⁹. They host high biodiversity despite low productivity³⁰. The vast majority of abyssal plains lie in ABNJ.

¶4 **M3.4 Seamounts, ridges and plateaus**: approximately 171,000 seamounts documented world-wide, covering 2.6% of the sea floor, with ridges covering approximately 9.2%³¹. Many seamounts are targets for fishing and potential mining activities.

¶5 **M3.5 Deepwater biogenic beds** are formed by sessile suspension-feeders such as cold-water corals, sponges, and bivalves that create structurally complex habitats³². These slow-growing systems are particularly vulnerable to physical disturbance. See **TG-6.1 Coral Reef Accounts** for cold-water coral characteristics. Energy source and growth dynamics differ between the two systems.

¶6 **M3.6 Hadal trenches and troughs** extend from 6,000 to 11,000 metres depth, comprising 27 disjoint deep-ocean trenches and 20 additional features³³. Endemism in these systems is high.

¶7 **M3.7 Chemosynthetic-based ecosystems (CBEs)** include hydrothermal vents, cold seeps, and organic falls. These systems derive primary productivity from chemoautotrophy using reduced compounds such as hydrogen sulphide and methane³⁴, characterised by “high faunal biomass” but “low diversity and high endemism”³⁵. CBEs are of particular interest for bioprospecting. The BBNJ Agreement’s marine genetic resources provisions may alter how chemosynthetic-based ecosystems are valued.

M2 Pelagic ocean waters (deep component)

¶1 **M2.3 Bathypelagic ocean waters** (1,000–4,000 m depth) are characterised by permanent darkness, low temperatures (1–3°C), and dependence on organic matter flux from surface waters³⁶.

¶2 **M2.4 Abyssopelagic ocean waters** (4,000 m to near the seafloor) receive “less than 1% of the primary production of the euphotic zone”³⁷ with low biological productivity³⁸. For shallower pelagic ecosystems, see **TG-6.5 Pelagic and Open Ocean Accounts**.

3.3 Extent and Condition Accounting

¶1 Compilers should treat this section as a target framework for structuring accounts as data become available. It is not operational guidance. The Emerging badge reflects the implementation gap between the account structures described and the data currently available to populate them. The measurement protocols for the variables themselves – how each is observed, at what frequency and to what tolerance – are owned by **TG-4.8 Physical Condition Measurement** and **TG-4.9 Biological Condition Measurement**; this Section selects and interprets them for deep sea ecosystems, where almost every protocol is constrained by platform access rather than by method.

Mapping challenges

¶1 “Less than 1% of the seafloor has been investigated biologically”³⁹. Key challenges include:

1. ¶2 **Inaccessibility**: Most deep sea ecosystems cannot be observed directly except through expensive submersibles and ROVs.
2. ¶3 **Scale**: The deep sea floor covers approximately 300 million km², so full mapping is impractical with current technology.
3. ¶4 **Ecosystem delineation**: Many deep sea ecosystems grade into one another along environmental gradients, which complicates boundary definition.
4. ¶5 **Temporal variability**: Some features, particularly hydrothermal vents, are geologically ephemeral, with active venting occurring on timescales of years to decades.

¶6 For guidance on remote sensing and spatial data sources, see **TG-4.1 Remote Sensing Data**. The Seabed 2030 initiative aims to complete global bathymetric mapping by 2030.

Deep sea data priority assessment

Data Gap	Economic Importance	Data Availability	Priority
Seamount extent mapping	Medium	Low	High
Deep-sea mineral deposits	High	Medium	High
Hydrothermal vent extent	Low	Very low	Medium
Deep-sea fish stocks	Medium	Low	High
Abyssal plain condition	Low	Very low	Low

¶11 *Table 1: Indicative data priorities for deep sea accounting*

Extent account structure

¶11 For deep sea ecosystem types within national jurisdiction (EEZ and extended continental shelf), the extent account structure follows SEEA EA methodology as described in **TG-3.1 Asset Accounts**. For ABNJ, similar structures could be applied at regional or global scales.

Accounting entry	Abyssal plains	Seamounts	Hydrothermal vents	...	Total
Opening extent (km ²)					
Additions					
– Natural expansion					
<i>Total additions</i>					
Reductions					
– Natural reduction					
– Anthropogenic reduction					
<i>Total reductions</i>					
Net change					
Closing extent (km ²)					

¶12 *Table 2: Structure of deep sea ecosystem extent account*

¶13 For hydrothermal vents and other ephemeral features, “natural expansion” and “natural reduction” may be substantial as geological processes create and extinguish active vent sites. Anthropogenic reductions may occur through seabed mining, bottom trawling (on seamounts), or other human activities.

¶14 The accounting treatment of ephemeral ecosystems raises classification questions under SEEA EA paras. 5.50–5.55, which classify extent changes along three axes: managed versus unmanaged, natural versus anthropogenic, and catastrophic versus gradual. Para. 5.54 reserves the “catastrophic loss” classification for sudden, large-scale events such as volcanic eruptions. Applying these criteria:

- ¶15 **Gradual decline in venting activity over years to decades** (the typical case) should be recorded as **natural unmanaged reduction**: geologically driven (natural), not the result of management action, and gradual rather than sudden.
- ¶16 **Sudden cessation of a large vent field** following a major tectonic or volcanic event within a single accounting period should be classified as **catastrophic loss** consistent with para. 5.54.

¶17 Compilers should document the basis for classification (rate of change, scale of affected field) in account metadata.

Condition variables

¶1 Relevant condition variables by ECT class include:

¶2 **Physical state:** hydrostatic pressure, temperature, substrate type and stability, sedimentation rates.

¶3 **Chemical state:** oxygen concentration, pH and carbonate saturation (relevant for cold-water corals), nutrient concentrations, pollutant concentrations.

¶4 **Compositional state:** species richness and endemism, community composition, presence/absence of indicator taxa, microbial diversity (particularly for CBEs).

¶5 **Structural state:** megafaunal biomass, structural complexity (coral framework, vent chimneys), bioturbation indicators.

¶6 **Functional state:** chemosynthetic productivity (for CBEs), organic matter flux and remineralisation rates, carbon sequestration in sediments.

¶7 For guidance on selecting condition variables and constructing indicators, see **TG-2.1**

Biophysical Indicators.

¶8 Establishing reference conditions is particularly challenging given limited historical baseline data. The SEEA EA concept of ecosystem integrity⁴⁰ may be operationalised by reference to undisturbed areas. Research on “natural laboratories”, meaning areas protected from human impact, should be prioritised.

3.4 Compilation Procedure for Deep Sea Accounts

¶1 Due to the Emerging status of deep sea accounting, this procedure is aspirational and documents the workflow that would be followed as data become available.

Step 1: Identify accounting area and jurisdictional boundaries

¶1 Define the spatial scope, distinguishing:

- ¶2 Deep sea areas within the EEZ (depths >250m)
- ¶3 Extended continental shelf areas subject to CLCS claims
- ¶4 Adjacent ABNJ areas (if compiling experimental accounts)

¶5 For ECS areas, apply the three-state CLCS treatment described in Section 3.1. Obtain legal advice on the status of any ECS claim before including the area in compiled accounts.

Step 2: Acquire bathymetric and geomorphology data

¶1 Obtain the best available bathymetric data. Priority sources:

- ¶2 National hydrographic surveys (where available)
- ¶3 GEBCO global compilation
- ¶4 Multibeam sonar surveys from research expeditions
- ¶5 Satellite-derived bathymetry for depths <1000m

¶6 Use geomorphometric analysis to delineate ecosystem types following IUCN GET categories: identify continental slopes (depth gradient analysis), detect seamounts and ridges (topographic prominence algorithms), delineate abyssal plains (slope <0.1 degrees, depth 3000–6000m), and map submarine canyons. For guidance on geospatial data processing, see **TG-4.1 Remote Sensing and Geospatial Data**.

Step 3: Compile ecosystem extent baseline

¶1 For each ecosystem type, measure opening extent in km². Assign a data quality rating following **TG-0.7 Quality Assurance** protocols:

- ¶2 High: Multibeam survey with ground-truthing
- ¶3 Medium: Satellite-derived bathymetry or predictive modelling validated by samples
- ¶4 Low: GEBCO compilation or unvalidated predictive models

¶5 Populate the opening stock row of the extent account (Table 2 structure).

Step 4: Identify and record extent changes

¶1 Classify changes as:

- ¶2 **Natural expansion:** New hydrothermal vent fields discovered and confirmed active
- ¶3 **Natural reduction:** Documented cessation of vent activity, seamount colonisation retreat
- ¶4 **Anthropogenic reduction:** Seabed disturbance from mining, trawling damage to seamounts, cable/pipeline impacts

¶5 For data-scarce environments, extent changes will commonly be zero or unobservable during typical accounting periods.

Step 5: Compile condition variable measurements

¶1 For ecosystem types where condition monitoring data exist, compile condition variables following the SEEA EA Ecosystem Condition Typology structure. Priority variables by ecosystem type:

¶2 **Seamounts (M3.4):**

- ¶3 Physical: Substrate type, current speed
- ¶4 Chemical: Dissolved oxygen at summit depth
- ¶5 Compositional: Megafaunal taxa richness (from ROV transects)
- ¶6 Structural: Cold-water coral cover (%), sponge density

¶7 **Hydrothermal vents (M3.7):**

- ¶8 Physical: Vent fluid temperature, flow rate
- ¶9 Chemical: H₂S concentration, Fe/Mn concentrations
- ¶10 Compositional: Indicator taxa presence (vent-endemic species)
- ¶11 Structural: Chimney structure area, tubeworm aggregation density
- ¶12 Functional: Chemosynthetic productivity (where measured)

¶13 Where baseline data are insufficient to establish reference values, expert judgement or regional comparisons may be used, and the limitation should be documented.

Step 6: Calculate condition indices

¶1 Transform condition variables into standardised indicators following **TG-2.1 Biophysical Indicators** methodology. For each variable:

$$\text{Indicator} = (V - VL) / (VH - VL)$$

¶2 Where V is the observed value, VH is the reference (high) value, and VL is the degraded (low) value. For inverse variables (e.g., pollutant concentrations, disturbance percentage): $(VL - V) / (VL - VH)$, where the denominator must be evaluated using the actual reference value of VH for the variable in question (which is 0 only for variables whose reference state is zero). See Section 3.7 Table 4 for a worked example with VH explicitly stated.

¶3 Aggregate indicators into composite condition indices using equal weighting or expert-weighted aggregation. Document the aggregation method.

Step 7: Populate extent and condition accounts

¶1 Enter compiled data into the account structures in Section 3.3. Ensure the closing stock = opening stock + additions - reductions. Document all data sources, measurement dates, quality ratings, and estimation methods in metadata.

Step 8: Link accounts to policy frameworks

¶1 Cross-reference compiled accounts to decision use cases:

- ¶2 For deep-sea mining assessment: highlight extent and condition for areas subject to ISA exploration contracts
- ¶3 For BBNJ MPA designation: identify ecosystem types with high endemism or low condition scores as priority conservation areas
- ¶4 For MEA reporting (via **TG-2.10 MEA Indicators**): extract protected area coverage and condition trends for SDG 14 and GBF indicators

3.5 Ecosystem Services from the Deep Sea

Provisioning services

¶1 **Genetic resources:** Deep sea organisms, particularly from extreme environments such as hydrothermal vents, harbour unique genetic resources with potential applications in biotechnology and pharmaceuticals⁴¹. The BBNJ Agreement establishes frameworks for access and benefit-sharing related to marine genetic resources from ABNJ, which may enable future monetary valuation. The CEPA classification includes “Scientific, cultural and educational services” (CEPA division 15) which may encompass genetic resources.

¶2 **Fisheries resources:** Some commercial fish stocks occur on or near deep sea features, particularly seamounts. High seas fish stocks subject to RFMOs may be attributed based on quota allocations⁴². See **TG-6.7 Fisheries Stock Assessment** and **TG-3.1 Asset Accounts** for detailed guidance.

¶3 **Mineral resources:** The Area contains large mineral deposits, including polymetallic nodules, cobalt-rich ferromanganese crusts, and seafloor massive sulphides⁴³. UNCLOS defines “polymetallic nodules” as “one of the resources of the Area consisting of any deposit or accretion of nodules, on or just below the surface of the deep seabed, which contain manganese, nickel, cobalt and copper”⁴⁴. The ISA has issued exploration contracts covering approximately 1.5 million km² of seabed, though no commercial exploitation has yet occurred. See **TG-3.10 Offshore Energy Accounts** for methodological parallels.

Regulating services

¶1 **Carbon sequestration:** Abyssal sediments are a major long-term carbon sink via the biological carbon pump. Deep sea carbon sequestration contributes to global climate regulation but is not currently quantified in ecosystem service accounts. For carbon-related accounting approaches, see **TG-6.2 Mangrove and Coastal Wetland Accounting**, which sets the blue carbon pricing rule for the publication.

¶2 **Climate regulation:** Deep water formation and thermohaline circulation influence global climate patterns at scales not readily attributed to specific ecosystem assets.

¶3 **Nutrient cycling:** Deep sea ecosystems contribute substantially to global biogeochemical cycles. Remineralisation of organic matter returns nutrients that eventually upwell to support surface productivity.

Challenges in service valuation

¶1 Monetary valuation of deep sea ecosystem services is at an early stage. The SEEA EA valuation chapters (8–11) are designated as “internationally recognized recommendations” rather than full

statistical standard, and for deep sea ecosystems data scarcity adds further uncertainty to their application. Key challenges:

1. ¶2 **Spatial attribution:** Many deep sea services operate at global scales that cannot be attributed to discrete ecosystem assets. See **TG-2.2 Macro Dependencies** for macro-scale service flow approaches.
2. ¶3 **Temporal scales:** Carbon sequestration benefits may extend over millennia, challenging NPV discounting approaches. See **TG-1.9 Valuation** for discount rate selection.
3. ¶4 **Non-use values:** Much deep sea value may be non-use value (existence, bequest, option values) not captured in market transactions.
4. ¶5 **Irreversibility:** Deep sea ecosystems are slow to recover from disturbance, and losses may therefore be irreversible.

¶6 Monetary valuation of deep sea ecosystem services should be treated as experimental, with transparent documentation and appropriate caveats.

3.6 Accounting Challenges and Methodological Gaps

Attribution challenges

1. ¶1 **The commons problem:** ABNJ resources are not owned by any country. Whilst activities in ABNJ can be attributed to countries based on flag state, sponsoring state, or quota allocation, the underlying assets remain collective.
2. ¶2 **Migratory species:** Highly migratory species transit between EEZs and high seas areas. Current conventions attribute stocks to countries “during the period when those stocks inhabit its EEZ”⁴⁵, creating discontinuous records.
3. ¶3 **Transboundary flows:** Ecosystem services from ABNJ (e.g., carbon sequestration, nutrient cycling) benefit all countries but cannot be attributed to specific beneficiaries.

¶4 One partial treatment of the third challenge exists in practice. In the preliminary ecosystem accounts for the OSPAR maritime area, carbon sequestration was recorded in the use table against “government”, defined for that purpose as the collective of OSPAR Contracting Parties, on the grounds that the service is non-exclusive and benefits the Contracting Parties as a whole⁴⁶. The device records the flow without apportioning it, and keeps the use table balanced at the regional level. It does not resolve attribution to individual States, and the entry cannot be carried into a national account without a further allocation rule that the accounts themselves do not supply. Compilers adopting it should name the collective of parties as the accounting entity in the table header and state in metadata that no inter-State apportionment has been made.

Governance gaps

¶1 ABNJ governance is fragmented across ISA (mineral resources), regional fisheries management organisations (specific fish stocks), IMO (shipping and pollution), IWC (cetacean management), IOC/UNESCO (marine scientific research), and the BBNJ Conference of the Parties (biodiversity conservation). There is no single body responsible for integrated environmental-economic accounting for ABNJ.

Regional seas conventions as a compiling entity

¶1 Although no institution holds a global ABNJ accounting mandate, a regional seas convention whose convention area extends past the outer limit of member EEZs already has the three things a compiler needs: a standing accounting area that spans the jurisdictional boundary, a data platform, and a periodic reporting cycle. Where an ABNJ area falls inside such a convention area, compilers should treat the convention rather than any single coastal State as the natural compiling entity, consistent with the “regional sea” jurisdictional basis listed under *Experimental ABNJ accounts* below.

¶2 The only published attempt to compile SEEA EA accounts across an area spanning both national jurisdiction and ABNJ is the preliminary account for the OSPAR maritime area⁴⁶. That area covers over 13.5 million km² of the North-East Atlantic in five regions, comprising the internal waters, territorial seas and EEZs of fifteen Contracting Parties and the European Union, and extending into ABNJ across the Wider Atlantic (OSPAR Region V) and Arctic Waters (OSPAR Region I). Compilation was driven by an operational objective of the North-East Atlantic Environment Strategy 2030, which commits OSPAR to “start accounting for ecosystem services and natural capital” by 2025⁴⁷. Four findings from that exercise bear on the guidance in this Circular:

1. ¶3 **The deep sea dominated the accounted extent and contributed almost nothing to the accounted value.** Deep-sea bed habitat was the most extensive ecosystem type recorded, at 46% of the area for which seabed data existed, while extent coverage reached only 68% of the convention area. Of the services compiled, fish provisioning could not be assigned to individual ecosystem types at all – landings reported through FAO were attributable only to the seabed classes as a group – and the carbon sequestration estimate was built from littoral and sublittoral sediments alone. Compilers should expect the deep sea and ABNJ share of a regional accounting area to be large in extent and near-empty in service and monetary terms, and should report the unmapped residual as an explicit line rather than narrowing the accounting area to the mapped part.
2. ¶4 **A condition account could not be compiled from an abundant indicator series.** OSPAR holds long monitoring time series and publishes condition indicators through its Quality Status Reports, but those indicators are reported as aggregates for the convention area and its five regions and could not be disaggregated to the ecosystem types used in the extent account. Data abundance did not overcome the mismatch in spatial unit. This is the *Data scarcity* failure mode below arising from reporting geometry rather than from absent measurement, and it is the reason this Circular treats Section 3.3 as a target framework. See **TG-4.12 Transboundary Data Sharing**.
3. ¶5 **Regional habitat classifications did not align with the IUCN GET.** The exercise used EUNIS seabed classes from EUSeaMap rather than the GET typology endorsed by SEEA EA, because no GET-aligned dataset covered the area. EUNIS classes as then published described abiotic substrate, so extent could be recorded but the biotic ecosystem types to which services attach could not. A compiler working from a regional habitat map should record the crosswalk to the GET classes used in Section 3.2, and the residual that does not cross-walk, in account metadata rather than asserting equivalence.
4. ¶6 **A first compilation is worth producing before the data support it.** The accounts were published as a preliminary and experimental snapshot, with no extent time series (source seabed data were aggregated across years), service flows measured in different years from one another, and an asset value acknowledged as an underestimate. Their stated value was in locating the gaps and setting the data priorities, which is the same purpose served by the priority assessment in Section 3.3 above.

Data scarcity

¶1 Data scarcity is the principal challenge for deep sea accounting. Compilers should not attempt to produce deep sea accounts without first addressing data availability. Key gaps:

1. ¶2 **Baseline gaps:** For most deep sea ecosystems, no baseline inventory of extent or condition exists.
2. ¶3 **Monitoring gaps:** Ongoing monitoring is minimal, so changes over time are difficult to track.
3. ¶4 **Taxonomic gaps:** Many deep sea species remain undescribed, and biodiversity assessment is correspondingly limited.
4. ¶5 **Economic data gaps:** Limited information on economic activities occurring in ABNJ or their values.

Experimental ABNJ accounts: presentation guidance

¶1 The 2025 SNA (para. 35.129) authorises application of SNA and SEEA accounting definitions and treatments to ABNJ⁴⁸. Compilers preparing experimental ABNJ accounts should observe the following:

1. ¶2 **Satellite/supplementary status:** Experimental ABNJ accounts must be presented as clearly labelled satellite or supplementary tables, separate from the core national accounts. They should not be aggregated into headline natural capital, GDP, or NDP measures without explicit disclosure.
2. ¶3 **Recommended table headers:** Experimental ABNJ tables should display the accounting area (with geographic delineation), the jurisdictional basis for inclusion (e.g., flag state, sponsoring state, quota allocation, regional sea, ISA contract area), and a data quality rating consistent with **TG-0.7 Quality Assurance**.
3. ¶4 **Methodological labelling:** Each experimental table should carry a “supplementary – experimental ABNJ account” label and a footnote citing 2025 SNA para. 35.129 and SEEA EA para. 1.17 (satellite accounts).
4. ¶5 **International consultation:** Before publication, compilers should engage the SEEA technical working groups and the GOAP technical network to confirm methodology and align with concurrent country efforts.

Emerging opportunities

Development	Implication for accounting
BBNJ implementation	Monitoring, reporting, and assessment requirements will generate new data on ABNJ ecosystems.
Seabed mapping initiatives	Seabed 2030 aims to map the entire ocean floor by 2030, providing improved baseline data for extent accounts.
Remote sensing advances	New satellite and autonomous vehicle technologies are expanding observation capabilities. See TG-4.1 Remote Sensing Data .
ISA reporting requirements	Environmental impact assessments and monitoring under ISA contracts generate data on areas subject to mineral exploration.
Digital sequence information	Databases of genetic information from deep sea organisms may enable valuation of genetic resources.

¶1 This Circular should be reviewed on a 2-year cycle (next review: early 2028), with key triggers for interim updates including the adoption of monitoring frameworks at BBNJ COP, approval of a first commercial seabed mining contract by ISA, and publication of major deep sea mapping advances.

3.7 Worked Example: Deep-Sea Mining Impact Assessment

¶1 This worked example demonstrates compilation of deep sea ecosystem accounts for a hypothetical 200,000 km² deep-sea area (depths exceeding 1,000 m) within a coastal State’s extended continental shelf and adjacent ABNJ. Given the Emerging status of this Circular and severe data limitations, compilers should treat the methods and values below as illustrative only.

Setting and decision context

¶1 **Accounting area:** A deep-sea accounting area of 200,000 km² spanning the continental slope and adjacent abyssal plain (bathymetry 1,000–4,500 m), including 12 mapped seamounts (M3.4, total area 3,200 km²), 3 confirmed active hydrothermal vent fields (M3.7, total area 8 km²), and extensive abyssal plain sediments (M3.3). Of the total, 140,000 km² lies within the State’s extended continental shelf claim (approved by CLCS), and 60,000 km² lies in ABNJ. One seamount hosts an ISA exploration contract for polymetallic sulphides.

¶2 **Decision context:** The sponsoring State is evaluating whether to support progression of the ISA exploration contract to the exploitation phase, requiring assessment of: (1) the economic value of mineral resources, (2) the environmental cost of ecosystem degradation from mining, and (3) the opportunity cost of foregone ecosystem services.

Step 1: Extent account (year t to t+1)

¶1 Extent data compiled from multibeam bathymetry (seamounts, abyssal plains) and ROV surveys (hydrothermal vents). Extent changes reflect discovery of a new vent field (natural expansion), cessation of one known vent (natural reduction confirmed by temperature monitoring), and seabed disturbance from mineral exploration test mining (anthropogenic reduction).

Accounting entry	Abyssal plains (M3.3)	Seamounts (M3.4)	Hydrothermal vents (M3.7)	Total
Opening extent (km ²)	196,792	3,200	8	200,000
Additions				
– Natural expansion (new vent field discovered)	0	0	2	2
<i>Total additions</i>	0	0	2	2
Reductions				
– Natural reduction (vent cessation)	0	0	1	1
– Anthropogenic reduction (exploration disturbance)	3	0.5	0	3.5
<i>Total reductions</i>	3	0.5	1	4.5
Net change	-3	-0.5	+1	-2.5
Closing extent (km ²)	196,789	3,199.5	9	199,997.5

¶2 *Table 3: Extent account for deep-sea accounting area*

¶3 **Interpretation:** The 3 km² abyssal plain reduction represents sediment disturbance from environmental baseline surveys and small-scale test mining under the ISA exploration contract. The 0.5 km² seamount reduction reflects localised disturbance from geological sampling on the seamount hosting the mineral deposit. The +1 km² net change in vent extent reflects discovery of a larger new vent field (2 km²) offset by cessation of a smaller known vent (1 km²). The vent cessation is recorded as natural unmanaged reduction (gradual geological process) consistent with the classification criteria in Section 3.3.

Step 2: Condition account

¶1 Condition indicators derived from ROV surveys (structural variables), water column sampling (chemical variables), and ISA exploration contract environmental monitoring data. Reference conditions drawn from undisturbed control sites within the same depth range and biogeographic province. Variables are classified against the SEEA EA Ecosystem Condition Typology (ECT) variable classes as set out in SEEA EA Chapter 5⁴⁹.

Condition variable	ECT class	Observed value	VH (reference)	VL (degraded)	Indicator score
Benthic disturbance (% area with visible tracks)	Physical (inverse)	0.8%	0%	15%	0.95
Species discovery rate (new spp. per 100 samples)	Compositional	12	18	3	0.60
Water chemistry (dissolved oxygen, ml/L at 1500m)	Chemical	4.2	4.8	2.5	0.74

Condition variable	ECT class	Observed value	VH (reference)	VL (de-graded)	Indicator score
Connectivity index (larval dispersal potential)	Structure ⁵⁰	0.65	0.90	0.20	0.64

¶12 *Table 4: Condition account for deep-sea accounting area*

¶13 **Calculation notes:** For benthic disturbance (inverse variable), $VH = 0\%$ and the indicator is: $(VL - V) / (VL - VH) = (15 - 0.8) / (15 - 0) = 14.2 / 15 = 0.95$. The denominator reflects the actual reference value of VH and is not a default substitution. For variables whose reference value is non-zero, VH must be inserted explicitly. For species discovery rate: $(V - VL) / (VH - VL) = (12 - 3) / (18 - 3) = 0.60$.

¶14 **Composite condition index:** $(0.95 + 0.60 + 0.74 + 0.64) / 4 = 0.73$

¶15 **Interpretation:** The composite index of 0.73 indicates relatively good condition (73% of reference condition), consistent with limited human disturbance to date. The species discovery rate indicator (0.60) suggests biodiversity may be less intact than other condition dimensions, potentially due to historical fishing impacts on seamounts. Compilers should note that even small condition reductions may be effectively irreversible on human timescales due to slow deep-sea recovery rates.

Step 3: Ecosystem services (annual flows)

¶11 Ecosystem service flows estimated from scientific literature, ISA environmental baseline reports, and expert judgement. Values carry substantial uncertainty and should be interpreted as illustrative orders of magnitude.

Service	Physical quantity	Monetary value (USD)
Genetic resources (bioprospecting potential)	~1-2 novel compounds/yr (annual discovery rate)	300,000-600,000 (estimated annual research/licensing value)
Carbon sequestration (sediment burial)	600,000 t CO ₂ /yr (at 3.0 t CO ₂ /km ² /yr)	30,000,000-90,000,000 (at USD 50-150/t CO ₂ e, market reference range)
Mineral potential (polymetallic sulphides, nodules)	ISA exploration phase – not yet exploited	– (potential future value)
Research and scientific use value – experimental (research expeditions, data generation)	4 research cruises/yr	3,200,000 (research expenditure; experimental – subject to methodological review, see note below)
Total valued services (midpoint)		~63,650,000 (range: ~33.5M - ~93.8M)

¶12 *Table 5: Ecosystem service flows from deep-sea accounting area*

¶13 **Valuation notes:**

• ¶14

Genetic resources: The annual flow of approximately 1-2 novel compounds per year is extrapolated from cumulative expedition discoveries. Earlier drafts reported eight cumulative compounds, but using a cumulative stock as an annual flow conflates stock and flow concepts. Compilers should distinguish annual resource rent-equivalent flows (appropriate for ecosystem service accounting) from non-recurring research expenditure, per SEEA EA paras. 8.16 and 9.4. The BBNJ Agreement's benefit-sharing provisions may alter how these values are recorded in future accounts.

• ¶15

Carbon sequestration: Estimated at 3.0 t CO₂/km²/yr based on sediment trap studies in similar deep-sea environments. Total = 200,000 km² × 3.0 t CO₂/km²/yr = 600,000 t CO₂/yr. Valued

using a market carbon price range of USD 50–150/t CO₂e, consistent with SEEA EA paras. 9.23–9.31 (para. 9.31 on carbon prices) and Section 6.4.3⁵¹. The social cost of carbon may be used only with explicit methodological justification and disclosure. The deep-sea sediment carbon sink operates over geological timescales, and attribution to discrete ecosystem assets is methodologically uncertain.

¶6

Mineral potential: Recorded qualitatively only, as no commercial exploitation has commenced. Geologic surveys estimate 8 million tonnes of polymetallic sulphide ore (gross in-situ value approximately USD 3–4 billion at current commodity prices). Net present value to the State depends on extraction costs, ISA benefit-sharing arrangements, and discount rates. Detailed feasibility assessment is required.

¶7

Research and scientific use value (experimental): Under SEEA EA paras. 8.16 and 9.4, research expenditure is not an ecosystem service flow in the strict sense. Compilers who follow SEEA EA strictly should reclassify this row as a memorandum item and exclude it from the ecosystem service total and from asset valuation inputs.

Step 4: Asset valuation

¶1 Asset values calculated as the net present value of expected future ecosystem service flows using a 4% real discount rate. For deep-sea ecosystems dominated by carbon sequestration, a single 25-year horizon understates the carbon benefit substantially. This example presents two horizons – 25 years (conventional) and 100 years (long-horizon sensitivity). Consult **TG-1.9 Valuation** on discount-rate and horizon choice.

¶2 The carbon sequestration component is held at the midpoint of the market reference range (USD 100/t CO₂e × 600,000 t CO₂/yr = USD 60,000,000/yr) to isolate horizon sensitivity.

¶3 **Conservative service flow (carbon sequestration midpoint + scientific value) = USD 63,200,000/yr Including genetic resource potential (midpoint) = USD 63,650,000/yr**

Scenario	Annual flow (USD)	Horizon	PV annuity factor (4%)	Asset value (USD)
A1 – Conservative	63,200,000	25 years	15.62	987,200,000
A2 – Conservative	63,200,000	100 years	24.50	1,548,400,000
B1 – Incl. genetic	63,650,000	25 years	15.62	994,200,000
B2 – Incl. genetic	63,650,000	100 years	24.50	1,559,400,000

¶4 *Table 6: Asset value sensitivity to projection horizon (4% real discount rate)*

¶5 **Sensitivity:** Extending the horizon from 25 to 100 years increases asset value by approximately 57% under either scenario. This reflects the dominant share of long-horizon carbon sequestration in total asset value. The difference between scenarios that include or exclude genetic resource potential (less than 1% at either horizon) is small relative to horizon sensitivity. The choice of valuation horizon, together with the underlying carbon price, is therefore the dominant driver for deep-sea asset values. If scientific value is reclassified as a memorandum item, the A-scenario annual flow drops to USD 60,000,000/yr and the B-scenario to USD 60,450,000/yr, with corresponding reductions in asset value.

Step 5: Decision support analysis

¶1 **Mining impact projection:** If the ISA exploration contract progresses to commercial exploitation, projected impacts over a 20-year mining operation include:

- ¶2 **Extent loss:** 85 km² of abyssal plain directly disturbed (0.043% of total area), plus 120 km² in-direct disturbance from sediment plume
- ¶3 **Condition decline:** Composite condition index projected to decline from 0.73 to 0.52 in mined area, and to 0.68 in indirectly affected area
- ¶4 **Service flow reduction:** Annual service losses of USD 61,500 (carbon sequestration in the 205 km² of disturbed sediments: 615 t CO₂/yr at 3.0 t CO₂/km²/yr and the USD 100 midpoint, an upper bound that assumes burial stops entirely) + USD 240,000 (lost scientific value from altered community composition) = approximately USD 301,500/yr

¶5 **Ecosystem degradation cost (SEEA EA-compliant method):** SEEA EA paras. 6.44–6.48 define ecosystem degradation cost as the change in ecosystem asset value attributable to a decline in condition below a sustainable reference level. The correct measure is the NPV difference in service flows between the mining and no-mining scenarios, not the sum of a proportional asset share and a separately capitalised service loss (which would double-count, because the asset value is itself the NPV of those service flows. See SEEA EA para. 7.14).

¶6 Applying this method using the 25-year conservative horizon (Scenario A1):

¶7 Degradation cost (NPV of foregone flows, 4%, 25 years) = USD 301,500 × 15.62 ≈ **USD 4,700,000**

¶8 Under the 100-year horizon (Scenario A2): USD 301,500 × 24.50 ≈ USD 7,400,000. The “proportional asset share” term (85 km² / 200,000 km² × asset value) is omitted because it is derived from the same service flow stream as the asset value itself, and including both would double-count the loss.

¶9 ⓘ **Corrected 24 September 2026**

¶10 The carbon-service loss was given as USD 1.4 million/yr, which the stated inputs cannot reproduce (it implies about 68 t CO₂/km²/yr against the stated 3.0); on those inputs the loss is at most USD 61,500/yr, so the degradation cost falls from USD 25.6 million to USD 4.7 million at 25 years and from USD 40.2 million to USD 7.4 million at 100 years.

¶11 **Economic benefit from mining:** Gross in-situ ore value of USD 3–4 billion minus extraction costs (estimated 70% of gross value for deep-sea mining) yields net value of USD 900M–1.2B. The ISA’s benefit-sharing regime for exploitation remains unadopted as of the publication date of this Circular⁵². Three illustrative State-share scenarios:

Scenario	State share (illustrative)	State benefit (USD, 20-year operation)
Low	20%	180M – 240M
Central	40%	360M – 480M
High	60%	540M – 720M

¶12 *Table 7: Illustrative State benefit from mining under hypothetical ISA benefit-sharing scenarios. No ISA benefit-sharing regime has been finalised, so figures are presented to support sensitivity analysis only.*

¶13 **Trade-off assessment:** Even under the high State-share scenario (USD 540M–720M), the ecosystem degradation cost on the 100-year horizon (~USD 7.4M) is small relative to mining revenue under standard cost-benefit analysis. Under the low State-share scenario the ratio narrows substantially. However, this comparison omits:

1. ¶14 **Irreversibility:** Deep-sea recovery timescales exceed 100 years, so the 25-year and 100-year degradation cost horizons are lower bounds. Under strict irreversibility, the perpetuity-equivalent degradation cost (USD 301,500/yr ÷ 4%) would be approximately USD 7,500,000 – consistent with the 100-year estimate. See SEEA EA paras. 6.44–6.48 and 7.20–7.22.

2. ¶15 **Option value:** Delaying mining preserves future options for genetic resource discovery or alternative uses.
3. ¶16 **Existence value:** Non-use values are not captured in service flow valuation.
4. ¶17 **Risk:** Sediment plume impacts may exceed projections.

¶18 The accounting framework transparently presents trade-offs but does not prescribe the decision.

Step 6: Upward connections to policy frameworks

¶1 **TG-1.1 National Ocean Budgets:** The degradation cost (USD 4.7M at 25-year horizon and USD 7.4M at 100-year horizon) informs natural capital budgeting. If mining proceeds, this cost should be deducted from gross mineral revenues when calculating environmentally adjusted NDP.

¶2 **TG-2.10 MEA Indicators:** Extent accounts feed SDG 14.5.1 (MPA coverage) if the deep-sea area includes protected zones. The 0.8% benthic disturbance metric supports SDG 14.2.1. Condition index trends inform BBNJ monitoring requirements.

¶3 **TG-1.3 Marine Spatial Management:** The spatial distribution of high-condition areas (seamounts, vent fields) versus disturbed areas guides MPA designation and mining exclusion zones. The connectivity index (0.65), classified as a structure ECT variable, informs network design for deep-sea MPAs.

¶4 **TG-3.1 Asset Accounts:** Mineral resources (USD 3–4B gross value) are recorded as non-renewable natural assets. The ecosystem asset value (Table 6, ~USD 1.0B at 25 years to ~USD 1.5B at 100 years under the conservative scenario) is recorded separately.

4. Acknowledgements

¶1 **Authors:** [To be confirmed]

¶2 **Reviewers:** [To be confirmed]

FOOTNOTES

1. ¶1 The Agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction (BBNJ Agreement), adopted June 2023; entry-into-force date is stated in Section 3.1 as the single reference point.
2. ¶2 2025 SNA, para 35.128
3. ¶3 2025 SNA, para 35.129
4. ¶4 United Nations Convention on the Law of the Sea (UNCLOS), 1982
5. ¶5 UNCLOS, Article 2
6. ¶6 UNCLOS, Article 56
7. ¶7 SEEA CF, footnote 63 (para 5.248)
8. ¶8 UNCLOS, Article 77
9. ¶9 UNCLOS, Article 86
0. ¶10 UNCLOS, Article 87
1. ¶11 UNCLOS, Article 1(1)
2. ¶12 UNCLOS, Article 136
3. ¶13 UNCLOS, Article 157. "The Authority is the organization through which States Parties shall... organize and control activities in the Area, particularly with a view to administering the resources of the Area."
4. ¶14 SEEA CF, para 29 (Preface)
5. ¶15 2025 SNA, para 35.128
6. ¶16 SEEA CF, paras. 5.397–5.400 (treatment of fishery quotas and underlying biological resources under the Central Framework – not an ecosystem-accounting treatment). The quota instrument may be recorded as a national asset where economic ownership is established; the underlying biological resource in ABNJ is not recorded as a national asset.
7. ¶17 SEEA CF, para 5.433. "Following the principles of the SNA, the location of the aquatic resource is not the key determinant of the attribution of economic production. Production is allocated instead to the country of residence of the harvesting operation."
8. ¶18 Figure adapted from UNCLOS Part XI, BBNJ Agreement, UNCLOS Part XIII (marine scientific research), UNCLOS Article 65 (cetaceans), and relevant institutional mandates.

9. ¶19 BBNJ Agreement, Article 1
0. ¶20 BBNJ Agreement, Part II (Marine Genetic Resources)
1. ¶21 BBNJ Agreement, Part III (Area-Based Management Tools)
2. ¶22 BBNJ Agreement, Part IV (Environmental Impact Assessments)
3. ¶23 BBNJ Agreement, Part V (Capacity-Building and Transfer of Marine Technology)
4. ¶24 IUCN GET, M3 Deep sea floors biome introduction
5. ¶25 IUCN Global Ecosystem Typology, Version 2.0
6. ¶26 IUCN GET, M3.1 Continental and island slopes
7. ¶27 IUCN GET, M3.1 Continental and island slopes, Ecological Traits
8. ¶28 IUCN GET, M3.2 Submarine canyons, Ecological Traits
9. ¶29 IUCN GET, M3.3 Abyssal plains, Ecological Traits
0. ¶30 IUCN GET, M3.3 Abyssal plains. "Many species have so far been sampled only as singletons (only one specimen per species) or as a few specimens."
1. ¶31 IUCN GET, M3.4 Seamounts, ridges and plateaus, Distribution
2. ¶32 IUCN GET, M3.5 Deepwater biogenic beds
3. ¶33 IUCN GET, M3.6 Hadal trenches and troughs, Key Ecological Drivers
4. ¶34 IUCN GET, M3.7 Chemosynthetic-based ecosystems
5. ¶35 IUCN GET, M3.7 Chemosynthetic-based ecosystems, Ecological Traits
6. ¶36 IUCN GET, M2.3 Bathypelagic ocean waters
7. ¶37 IUCN GET, M2.3 Bathypelagic ocean waters, Key Ecological Drivers
8. ¶38 IUCN GET, M2.4 Abyssopelagic ocean waters
9. ¶39 IUCN GET, M3.3 Abyssal plains
0. ¶40 SEEA EA, para 5.10
1. ¶41 BBNJ Agreement, Part II addresses access to and benefit-sharing from marine genetic resources
2. ¶42 SEEA CF, para 5.398
3. ¶43 UNCLOS Part XI and ISA regulatory framework
4. ¶44 UNCLOS Final Act, Resolution II, para. 1(d). See also UNCLOS Article 133(a), which includes polymetallic nodules within the definition of "resources of the Area."
5. ¶45 SEEA CF, para 5.398
6. ¶46 Alarcon Blazquez, M.G., van der Veeren, R., Gacutan, J. and James, P.A.S. (2023). 'Compiling preliminary SEEA Ecosystem Accounts for the OSPAR regional sea: experimental findings and lessons learned'. *One Ecosystem*, 8, e108030. doi:10.3897/oneeco.8.e108030.
7. ¶47 OSPAR Commission, *North-East Atlantic Environment Strategy 2030* (OSPAR Agreement 2021-01), Strategic Objective on ecosystem-based management. Quoted in full in Alarcon Blazquez et al. (2023), see ⁴⁶.
8. ¶48 2025 SNA, para 35.129
9. ¶49 SEEA EA, Chapter 5 (Ecosystem Condition Typology). The ECT comprises six variable classes – physical, chemical, compositional, structure, function, and landscape state – organised under abiotic, biotic, and landscape-level groups (SEEA EA para. 5.32 and Table 5.1).
0. ¶50 Connectivity (larval dispersal potential) is classified here as a "structure" ECT variable, as a proxy for the structural integrity of the ecosystem network. The 0.20-0.90 reference range is illustrative, drawn from emerging deep-sea connectivity literature; this variable is treated as an experimental indicator pending consolidation of the underlying methodology.
1. ¶51 SEEA EA paras. 9.21-9.31 set the preference order for valuation methods; para. 9.31 covers prices from emission trading systems, marginal abatement costs and the social cost of carbon for global climate regulation services. The carbon sequestration component is defined in Section 6.4.3 (paras. 6.109-6.115).
2. ¶52 International Seabed Authority, Draft Regulations on Exploitation of Mineral Resources in the Area, Further Revised Consolidated Text, ISBA/31/C/CRP.1/Rev.2, 15 February 2026. Regulations remain unadopted as of the publication date of this Circular; the cited document supersedes earlier drafts (including ISBA/25/C/WP.1).