

Nature dependency analysis and the contributions to assessing nature-related risks

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Abstract

Human dependency on natural capital and ecosystem services (ES) present significant risks to wellbeing and economic prosperity, which are poorly understood. While tools, such as the Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE) database, provide valuable global dependency information, translating these insights into country-specific contexts remains challenging. Here, we present the Natural Capital Dependency Framework (NCDF), which advances dependency analysis by mapping specific relationships between ecosystem types and economic activities within countries. The NCDF uses existing data, and integrates global ecosystem classifications, and environmental and economic accounting standards to map direct dependency pathways with unprecedented specificity. Application to Australia and the Maldives demonstrates the framework's capability to reveal both direct and indirect dependencies despite vast differences in the granularity of available data. Direct nature-economy dependencies, concentrated in the primary industries (agriculture, fisheries, forestry, water, mining), are underpinned by 45 Australian and 21 Maldivian ecosystem types, predominantly through provisioning ES. Indirectly, all industries in both nations depend on ecosystems within three degrees of separation. Beyond economic dependencies, communities directly depend on ecosystems for essential health and safety services. By specifying dependency relationships in the context of national ecosystem information, the NCDF enables more accurate risk assessment and targeted policy responses – transforming natural capital dependency from an intangible problem to actionable national intelligence.

Keywords

Nature dependency risk | Final ecosystem services | Intermediate ecosystem services | Natural capital accounting | Critical Natural Capital | Intermediate consumption | Integrated systems network

1. Introduction

The degradation of natural capital threatens wellbeing, prosperity, and resilience through declining ecosystem services (ES) (IPBES, 2019). Global consumption patterns now exceed the Earth's regenerative capacity (WEF, 2020; Dasgupta, 2021; Trust et al., 2025), with resource use surpassing population growth as the primary driver of the triple planetary crisis - climate change, pollution, and biodiversity loss (UNEP, 2024). Globally, nature-related risks rank highest for the coming decade, and they manifest nationally as countries face environmental degradation while their economies depend heavily on nature (UNEP, 2024; ADB, 2025).

Australia exemplifies this paradox: initial assessments indicate that while nearly half its Gross Domestic Product (GDP) depends on nature (Pelle et al., 2022), its natural capital is in poor condition and deteriorating (Cresswell et al., 2022). With 1.7% annual population growth projected through 2032 (ABS, 2023) and world-leading per capita overconsumption (Hickel et al., 2022), pressure on Australian natural capital and ES is likely to intensify. Yet, countries lack systematic and standardised frameworks to assess and track nationally-relevant dependency risks, resorting to bespoke modelling approaches constructed from impact estimates or global dependency data (ECB, 2023; FSB, 2024; Pelle et al., 2022; Ceglar et al., 2025).

Nature-related risks comprise physical risks, which may manifest from chronic and acute declines of ES (e.g. unable to grow sufficient food to meet domestic needs), and transition risks from policy changes or market shifts (e.g. new regulation of impacts on native vegetation or changed consumer preferences) (NGFS & INSPIRE, 2021; NGFS, 2023). The Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE) database (Natural Capital Finance Alliance, 2021) has provided global leadership in nature dependency analysis, forming the basis of nature-related risk assessments for the Netherlands (Van Toor et al., 2020), France (Svartzman et al., 2021), Brazil (Calice et al., 2021), Malaysia (World Bank & Bank Negara Malaysia, 2022), Mexico (Martinez et al., 2023), and the United Kingdom (Ranger and Oliver, 2024). ENCORE's strength lies in establishing global dependency data for internationally consistent industry categories, but it struggles with the treatment of multiple ES that are relied upon in different ways and enables only broad dependency rankings (e.g. very high, medium, low) derived from a total number of linked ES (Ranger and Oliver, 2024).

Building on ENCORE's foundation, the future of nature dependency analysis requires country-specific granularity and a standardised approach to tracing dependencies through environmental and socio-economic systems. While ENCORE identifies what ES industries rely upon, national decision-makers need to know which domestic ecosystems in relevant locations provide these ES and how particular economic activity within their borders depend on them (FSB, 2024). Similarly, complementary resources like guidance materials for the Taskforce on Nature-related Financial Disclosures (TNFD) (TNFD, 2023a; TNFD, 2023b; TNFD, 2024), the Science Based Targets Network Materiality Screening Tool (Science Based Targets Network, 2024), and environmentally extended input-output analysis (Kitzes, 2013) provide valuable perspectives, though primarily focus on impacts rather than dependencies. If we are to enact the transformational change required to address the triple planetary crisis, we must face the challenge of national specificity and make dependency analysis sufficiently tangible and relevant for in-country decision-making.

Global accounting standards now enable specific dependency mapping within and between environmental and economic systems. The interoperability of the United Nations System of Environmental-Economic Accounting (SEEA) (United Nations et al., 2014; United Nations et al., 2024) and the System of National Accounts (SNA) (European Commission et al., 2025) makes

integrated and reproducible analysis possible. Here, we present the Natural Capital Dependency Framework (NCDF) which operationalises these standards to identify specific nature-economy dependencies at national scales using in-country data infrastructure. We apply the framework to two contrasting cases – Australia (large, developed, diverse) and the Maldives (small, developing, specialised).

1.1 Analytical framework

Figure 1a illustrates the conceptual components of the NCDF, which is inspired by previously established ES cascade models (EPA, 2015; Potschin-Young et al., 2018; Gacutan et al., 2019) and is consistent with the new systems model of sustainability (Obura et al., 2026). The NCDF distinguishes: (1) direct nature-wellbeing dependencies independent of economic activity, (2) two types of direct nature-economy dependencies (material and conditional), (3) indirect nature-economy dependencies flowing through supply chains (intermediate consumption), and (4) indirect nature dependencies outside of the economy, which apply to both nature-wellbeing and nature-economy dependency pathways. The latter is achieved by differentiating intermediate from final ES, recognising that final ES often rely on intermediate ES from other ecosystems, and intermediate ES indirectly benefit people or economic activities (see **Methods**).

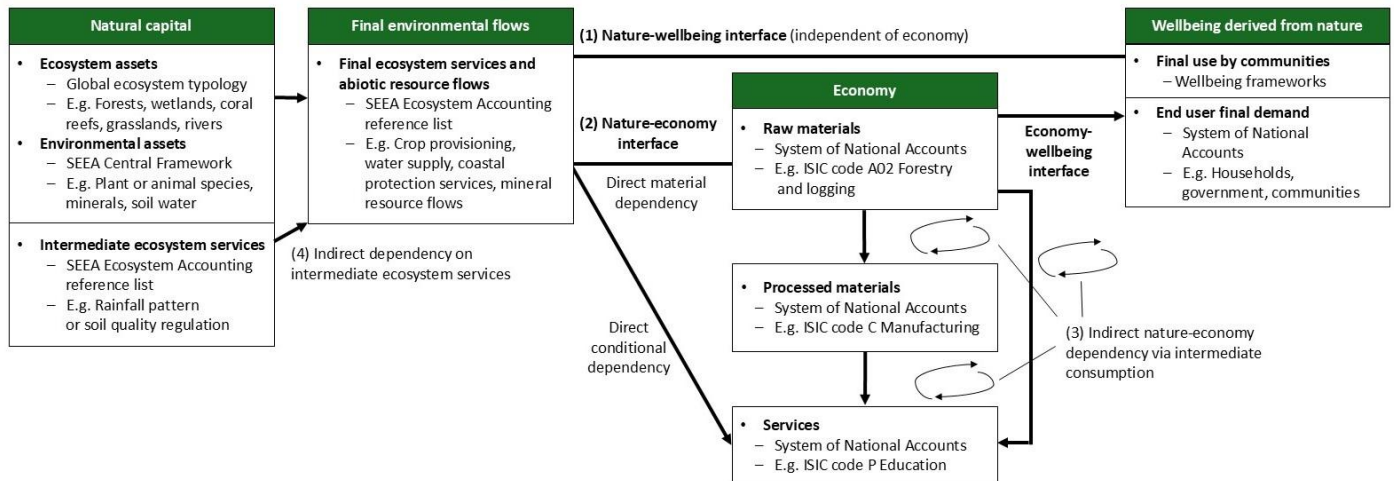


Figure 1a. Natural Capital Dependency Framework for conducting nature dependency analysis, including relevant global typologies, accounting standards and classifications, and examples. Source: Authors.

The NCDF represents nature-economy dependencies as a multi-level directed systems network (**Figure 1b**) with two node types: natural capital assets and economic activities, and three relationship types: (*Tie 1*) Intermediate ES representing key dependency relationships between ecosystems that contribute to final ES, (*Tie 2*) Final ES and abiotic resource flows representing direct nature-economy dependencies, and (*Tie 3*) Intermediate consumption representing dependencies between economic activities (Xu and Liang, 2019) and indirect nature dependencies.

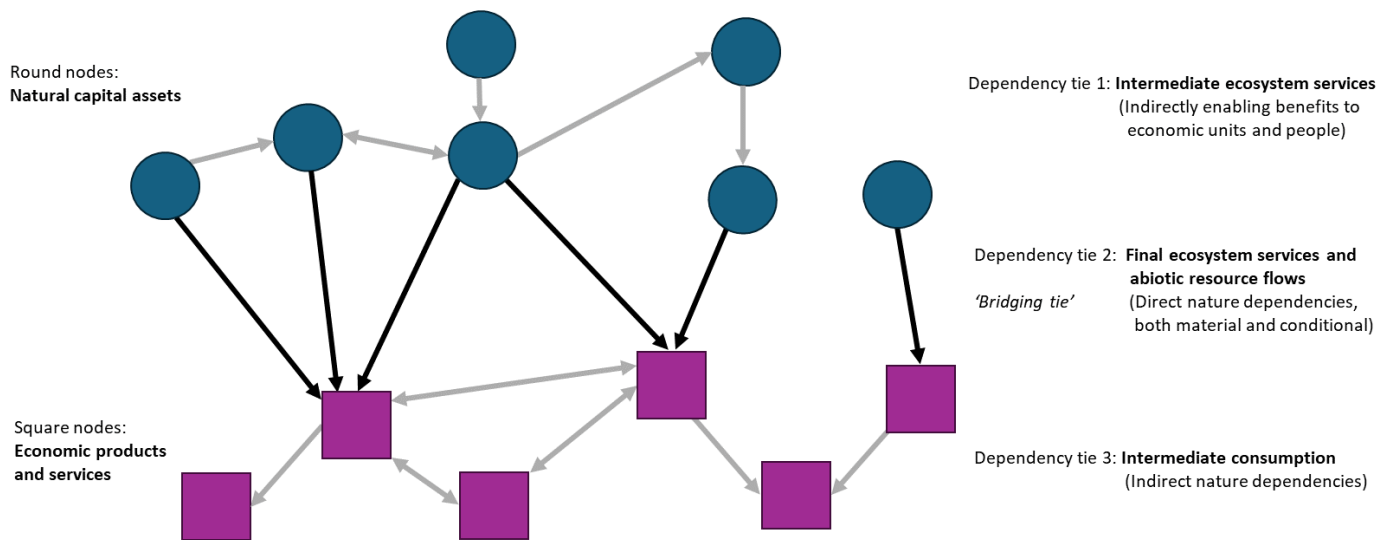


Figure 1b. Illustration of the multi-level directed systems network of nature-economy dependency relationships underpinning the NCDF. Receiving nodes are reliant on the source nodes and some relationships are reciprocal. Source: Authors.

Below, we demonstrate key NCDF components through national-scale applications according to the availability of country-specific data, examining nature-economy interfaces for the Maldives and Australia (**Section 3**), and nature-wellbeing interfaces for Australia (**Section 4**). We also assess ES importance to wellbeing for Australia using an importance hierarchy to distinguish between essential and non-essential ES use (Bradley et al., 2026); high-level economic account aggregation precluded this analysis for the Maldives. Most indirect nature dependencies outside of the economy are also out of scope due to lack of data availability. We show how precise nature-economy dependency mapping is possible with highly granular economic accounts like in the Australian case, explore the implications for enhancing nature-related risk assessments (**Section 5**) and discuss the utility of enhanced nature dependency and risk analyses for decision-making across sectors (**Section 6**).

2. Methods

Implementing the NCDF requires development of SEEA and SNA-aligned country-specific logic chains – sequences in which an ecosystem asset supplies an ES to an economic unit as an input to production or consumption benefiting people (United Nations et al., 2024). This produces a schema of dependency relationships that are internationally consistent and comparable, while also being tailored to each country's environmental and socioeconomic context. The schema enables nature dependency analysis across relevant spatial and temporal scales when combined with existing environmental and economic data.

We identified direct nature-economy dependencies by connecting economic product and service categories to the ecosystem types present in-country through relevant final ES or abiotic flows (United Nations et al., 2024). Connections were made, in the form of logic chains, between the globally aligned classification systems outlined in **Methods Table 1**. For example, domestically produced 'farmed fish' (IOPC 02000060) in Australia uses 'aquaculture provisioning ecosystem services' (SEEA EA class 1.4), which is provided by 'marine aquafarms' (GET Ecosystem Functional Group M4.2). Due to highly aggregated data available for the Maldives, nature-economy dependency analysis should be considered indicative only. Further

reflections on methodological limitations are discussed in **Supplementary methods information**.

Direct nature-wellbeing dependencies, relevant at a national scale, were identified in Australia by connecting a subset of final ES (**Methods Table 2**) to present ecosystem types. Where logical dependency relationships were not overt, as in the above aquaculture example, logic chains were supported by literature and in some cases verified by existing national ecosystem account structures (ABS, 2025) (explanations in **Supplementary tables 3, 6 and 7**). Logic chains were compiled into country-specific, point-in-time, dependency relationship databases (**Supplementary tables 1 – 6**). Indirect nature-economy relationships were mapped using in-country intermediate consumption data. Key methodological details for making these connections are outlined in **sections 2.1 – 2.5**.

Analyses of dependency relationships, including the status of ecosystems (i.e. increased, declined, stable), and implications for flows of final ES, economic production and jobs, were conducted using dplyr and tidyr libraries in R Studio for Australia (version 2025.09.0+387). Proportions of GDP exposed were calculated based on the total GDP in 2021-22 (ABS, 2024a) and proportions of jobs exposed were calculated based on the number of jobs across relevant industries for the same period (ABS, 2024b). R code was developed with the assistance of ChatGPT5.0. The ecosystem map (**Figure 8**) was created from the spatial Global Ecosystem Typology (GET) data (Macfarlane et al., 2024a), where Ecosystem Functional Group classes were filtered by the results from the analysis of status and their contribution to economic and wellbeing needs. Spatial analysis was performed in Google Earth Engine. Analyses of Maldives dependency relationships were conducted manually. Sankey diagrams (**Figures 2 and 3**) were created with SankeyMATIC (Bogart, 2025). Further information on the organisation of economic activity, identification of ecosystems present in-country and analysis of degradation, hazards and exposures for Australia is available in **Supplementary methods information**.

2.1 Direct nature-economy dependencies

We assessed all economic activity categories for Australia (923) (ABS, 2024c) (**Supplementary Table 7**) and the Maldives (15) (MBS, 2024) to determine whether economic production was dependent on a final ES or abiotic flow. With consideration of country context and data availability, this approach excludes economic activity that may benefit from final ES but does not depend upon it to carry out the activity. For example, visual amenity was considered necessary for accommodation services nationally in the Maldives, given the level of tourism-associated production (Hassan et al., 2017), whereas in Australia it was considered a benefit to production at a national level. Regionally, the relevance of tourism associated production may differ in Australia, and with such spatially explicit information, more detailed analysis of sub-national portions of dependent production may be conducted.

We identified direct flows of final ES to the economy as either raw material or conditional inputs to economic production. We identified raw material categories in Australia (115) and the Maldives (3), which are at the beginning of supply chains, compared with immediate derivatives which were identifiable for Australia only, and were considered ‘processed materials’. All ‘processed materials’ were indirectly dependent on ecosystems via supply chains leading back to raw materials (except for hydroelectricity in the Australian case). This means that only economic services had potential for a direct conditional dependency, noting that water supply activity, typically considered an economic service, was treated as a raw material for both countries in this analysis. With additional data, more direct conditional dependencies could be

identified (e.g. spatially explicit business level data could elicit coastal protection ES or flood protection ES being relied upon by portions of industry classes).

Products and services listed in national accounts as being waste products or having zero domestic production were excluded from analysis (e.g. Scrap waste from food manufacturing, and Tobacco production in Australia). Weak potential conditional dependencies were also excluded, including economic production somewhat related to nature (e.g. ‘gardening services’ and ‘meteorology services’) or occurring fully or partially outdoors (e.g. ‘residential construction’, ‘police services’ and ‘sports ground operation’), because they are not reliant on the provision of a specific ES.

To focus on dependencies of national significance, only ‘essential’ dependency relationships were included in Australian analysis, effectively operationalising the identification of critical natural capital (CNC). A hierarchical importance framework (Bradley et al., 2026) was used to discern essential from non-essential by assigning directly dependent raw materials and economic services as used for either basic needs (food, nutrition, cold storage, water for drinking and sanitation), health and safety, other essential needs or non-essential uses. The natural capital providing essential environmental flows are considered CNC (Bradley et al., 2026). Non-essential ES were out of scope of analysis (e.g. Noise attenuation, visual amenity, leisure-based recreation and decorative material provisioning). **Supplementary Table 7** and **Methods Table 2** outlines those considered essential or non-essential.

2.2 Indirect nature-economy dependencies

Due to the highly granular economic accounts available, the difference between direct and indirect material dependencies could be determined more accurately for Australia (as raw materials or their immediate derivatives). For example ‘whole milk - untreated’, enabled by the livestock provisioning ES of ‘dairy cattle’, is not included as a direct material dependency. This is because, at the beginning of the supply chain, the grazed biomass provisioning ES of semi-natural pastures can be recognised for enabling the supply of ‘dairy cattle’ (**Supplementary Table 1**). Including both ES would be considered double counting for monetary valuation purposes under the SEEA EA, and this flows to best quality dependency analysis as well given that economic production using ‘dairy cattle’ as an input would also be counted in detailed intermediate consumption accounts (ABS, 2024d).

For the Maldives, a country with less granular accounts, economic activities one step later in the supply chain (and higher in the classification hierarchy) were captured. For example, directly reliant economic products such as growing plantations, plus their immediate derivatives – timber logs, were considered direct dependencies occurring within ‘agricultural’ production. The approach taken in the Maldives aligns with the concept of ‘domestic extraction’ (comprised of biomass and mining material) in global material flow accounting standards (Eurostat, 2018).

Indirect nature dependencies were inferred from a systems analysis of intermediate consumption accounts for Australia and the Maldives where there was confirmation of domestic production (ABS, 2024c; MBS, 2024), intermediate consumption, and a use relationship with a directly dependent product or service (ABS, 2024e; NBS, 2014). Specifically:

1. There was domestic production of an economic product or service (i.e. it is reasonable to expect domestically produced inputs to intermediate consumption, and that intermediate consumption is not reliant on imports alone).

2. There was intermediate consumption of the same product or service (i.e. any domestic production does not flow entirely to final demand by households, governments or exports, noting that imports may still contribute to intermediate consumption).
3. A subset of domestically produced economic products or services were identified for their direct dependence on natural capital.

We used *igraph*, *dplyr*, *gplots* and *pheatmap* libraries in R to analyse the inter-industry dependencies in Australia. R code was developed with the assistance of ChatGPT5.0. Manual calculations, presented as extended logic chains, were conducted for the Maldives (**Supplementary Table 5, Figure 3**). For Australia, we created a network graph of intermediate consumption relationships (as per economic nodes in **Figure 1b**) and calculated the network density from square, symmetrical supply use tables (ABS, 2024e). We then calculated and visualised the geodesic distance from directly dependent economic activity to all other economic product and service categories. Finally, the network density of the combined multi-level network (as per both node types in **Figure 1b**) was calculated and visualised (**Figure 5**) by combining direct dependency data with intermediate consumption dependency data and creating a combined network graph.

2.3 Intermediate ecosystem services as indirect dependencies outside the economy

Another form of indirect nature dependency is represented by intermediate ES enabling flows of final ES. Counting both final and intermediate ES would lead to double-counting of direct dependencies. For example, for native forests we identify only two final ES (wood provisioning and other provisioning) relied on to produce four economic activities: production of honey, hardwood logs, and facilitation of forest logging and support services. In contrast, the Australian forestry industry as a whole was identified as directly dependent on two final ES and 11 intermediate ES, such as disease control, mass stabilisation and erosion control, through the ENCORE database (Pelle et al., 2022). While these intermediate ES support flows of final ES, they are not direct industry dependencies and their inclusion may lead to overstating nature dependency risks. Flows of intermediate ES are often reflected in the condition of natural and semi-natural ecosystems, and are more relevant to assessing nature degradation than direct nature dependencies. We focus on final ES provision and, consistent with the SEEA, identify key ecosystems providing intermediate ES when relevant to management (see **Supplementary methods information**).

2.4 Monetary value of economic exposures

By working from economic product and service categories, we applied the ‘production boundary’ outlined in the SNA as well as the relevant classifications and definitions for economic industries, activities and products, accounting identities and structures (European Commission et al., 2025). This approach recognises that when products are generated by the economy, they are either consumed by households and governments or exported (final demand), or used to produce more products (intermediate consumption), potentially by becoming manufactured capital assets (fixed assets) (**Methods Table 1**).

The logic chains connect ecosystems to economic activity, which has a regularly measured production value in the national accounts. But that production value does not necessarily reflect the monetary value of the associated ES. While they can be used as proxies for valuation, there is an entire discipline of ES valuation which should be considered. In this study, the production value (ABS, 2024c) of nature dependent economic activity was used to quantify the potential and likely economic exposure associated with ecosystems that have declined or have the potential to decline (focusing on natural and semi-natural ecosystems that need to be in

good condition to provide ES). This was calculated through the sum of directly dependent economic activities (see **R code**). This study did not seek to place a monetary value on the ES identified in logic chains, nor assess the full economic impact of ES decline, such as impacts on labour.

2.5 Uncertainty and fitness for purpose

The NCDF assembles and counts logic chains documenting the connections between an ecosystem asset, the final ES or abiotic flow it supplies, and the economic activity that depends on it from existing SEEA- and SNA-based classifications and data, rather than producing new statistical estimates. The quality of the analysis should therefore be judged on whether it is fit for its intended purpose, which is to identify where dependencies on nature concentrate across an economy and so direct nature-related risk screening and policy attention, and not against the measures of precision appropriate for statistical estimation.

Because the outputs are counts of connections rather than sampled quantities, there is no sampling distribution from which confidence intervals, error bars or out-of-sample tests would follow, and reporting them would imply a precision the method does not have. Assessed against the quality dimensions used for official statistics, the analysis sits at the data development and policy analysis tier of assurance (Vardon, 2026), where the appropriate checks are the transparency of the method (the logic chains are documented and openly available), coherence with the underlying ecosystem and economic accounts, and the sensitivity of the results to the classification choices and assumptions made. Because the analysis draws on existing accounts, it also inherits their data quality, which is why the highly aggregated inputs available for the Maldives yield results that are indicative only.

The assurance required rises with the stakes of the intended use. The results reported here are fit for screening dependencies at the national scale and for indicating where risk management effort should be directed. They are not intended to be read as precise sub-national, sectoral or business level figures, which would require further work and data of matching quality.

3. Findings for nature dependencies of national economies

The NCDF identifies three types of nature-economy dependencies by connecting economic activity to natural capital through ES (**Figure 1a**):

- (1) Direct material dependency: Economic products at the beginning of supply chains and that require final ES or abiotic flows as material inputs (e.g., dairy cattle rely on grazed biomass provisioning ES from semi-natural pastures).
- (2) Direct conditional dependency: Economic products and services requiring non-material conditions provided by final ES or abiotic flows (e.g., logging services require wood provisioning ES from plantation ecosystems; reef diving requires visual amenity ES from coral ecosystems).
- (3) Indirect nature-economy dependency: Economic products and services whose production processes or supply chains rely on directly dependent products or services (e.g., untreated whole milk relies on dairy cattle; primary education services rely on school infrastructure and supplies, many of which are wood-based products).

In Australia, granular national economic accounts produced by the Australian Bureau of Statistics enabled equivalently detailed nature dependency connections. We found direct material dependencies constituted the primary nature-economy interface in Australia, particularly in agriculture, fisheries, forestry, water supply, and mining. We also identified direct conditional dependencies, though less extensively. Specifically, the Australian economy directly relies on 45 ecosystem types through 11 final ES plus abiotic flows. Combined with human and manufactured capital, these natural capital assets and ES enable production of 128 economic products and services (of 923 total): 107 with material dependencies and 21 with conditional dependencies (**Figure 2**). By contrast, the Maldives' more aggregated national accounts yield less specific dependency connections, providing only indicative results. The Maldives economy relies on 21 ecosystems through seven final ES, directly enabling productivity in six of 15 industries (**Figure 3**).

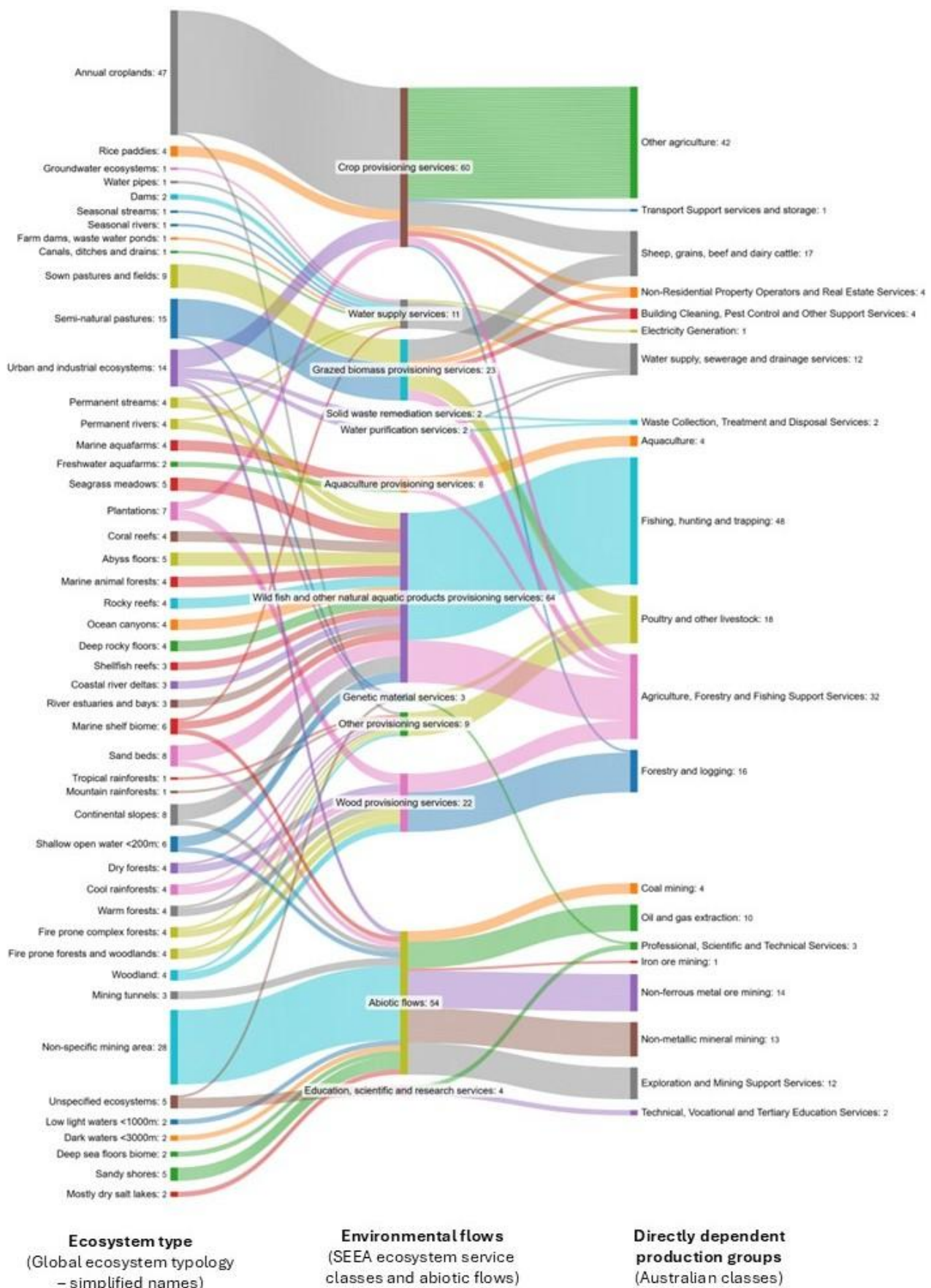


Figure 2. Direct nature dependency relationships with the Australian economy. Ecosystem types and mineral resources (left) provide abiotic and ES flows (middle), directly enabling production of 128 economic products and services (summarised into 21 categories, right). Values indicate the number of dependency relationships. Source: Authors.

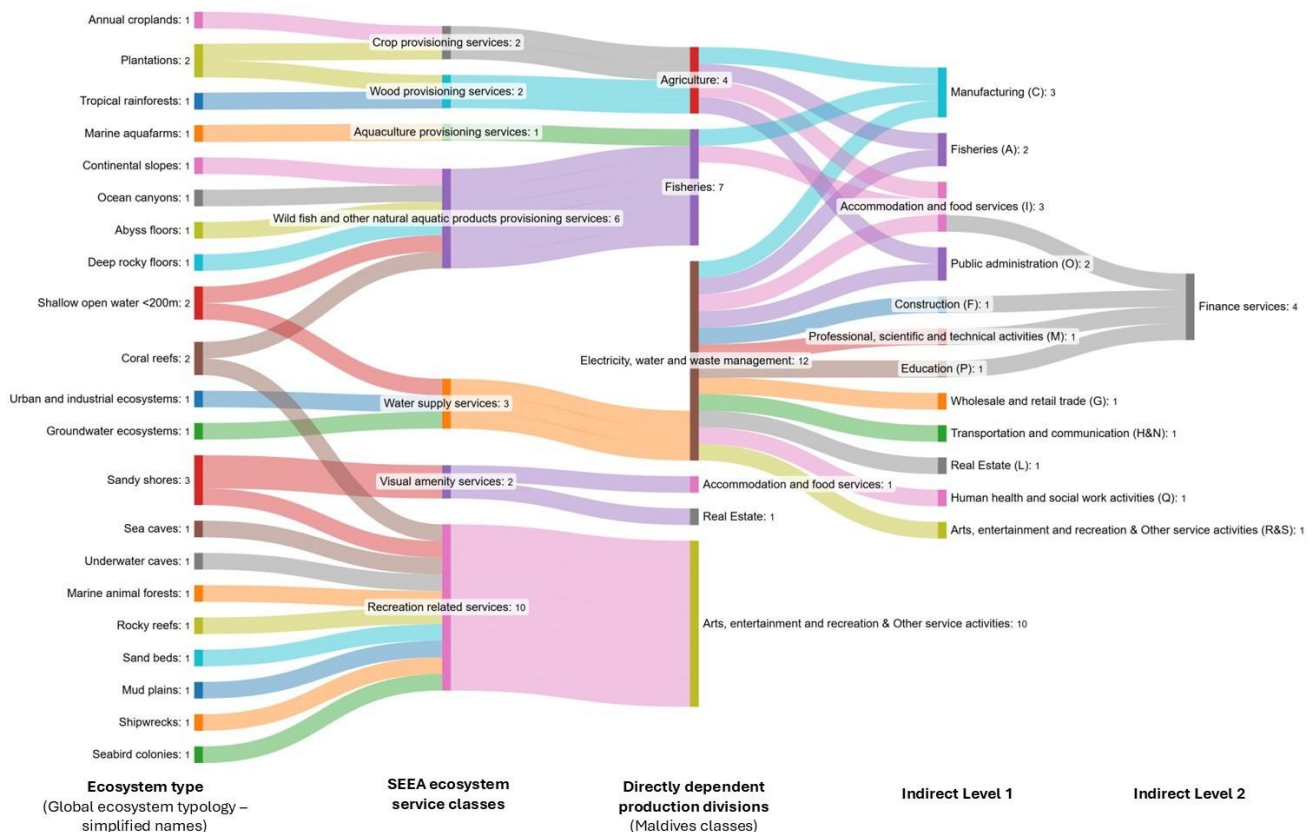


Figure 3. Direct and indirect nature dependency relationships with the Maldives economy. From left: Ecosystem assets provide flows of final ES, directly enabling production in six industries and indirectly enabling production in 12 industries (from a material input perspective only), four of which enable production in one final industry. Values indicate the number of dependency relationships. Source: Authors.

3.1 Direct material dependency

The NCDF defines direct material dependencies as relationships between natural capital and economic products at the beginning of supply chains, following SEEA Ecosystem Accounting guidance to avoid double-counting of ES flows (see **Methods**). Highly granular economic accounts enable precise differentiation between direct and indirect material dependencies. Otherwise, less granular accounts allow broader identification aligned with 'domestic extraction' definitions from global material flow accounting (Eurostat, 2018).

With Australia's highly granular production data, the NCDF reveals that domestic natural capital is a key factor of economic production. Products from the agriculture, fisheries, forestry, water, and mining industries directly rely on 45 ecosystem types and mineral deposits, which provide abiotic flows and eight final provisioning services (**Figure 2**). This includes 107 essential raw materials (of 115 raw materials in total, e.g. food products), with six raw materials also forming manufactured capital (**Supplementary Table 1**). Non-essential raw materials, considered decorative, also rely on ES but were excluded from figures (e.g. flowers, gemstones) (**Supplementary Table 7**). Ten additional economic products immediately derived from raw materials (e.g. untreated whole milk, eggs) (**Supplementary Table 2**) could be considered to have a direct material dependency on nature if included as part of broader 'domestic extraction'. While potentially useful for certain analyses, the NCDF clarifies that immediate derivatives do not result from direct ES flows.

By comparison, the Maldives' less granular application broadly indicates direct dependency of economic products in three industries: agriculture; fisheries; and electricity, water, and waste management (**Figure 3**). According to the presence of global ecosystem types in-country, these industries rely on crop provisioning from croplands, wood provisioning from plantations, aquaculture provisioning from marine aquafarms, and wild fish provisioning and water supply from various marine and other ecosystem types (**Supplementary Table 3**).

3.2 Direct conditional dependency

Beyond the need for a terrestrial or marine surface area to carry out economic activities (e.g. a stable landmass), the NCDF identifies the unique conditions required for production of individual economic services and the direct role of natural capital through ES provision or abiotic flows. Australia's disaggregated economic data for primary industries enabled more specific identification of direct conditional dependencies than was possible for the Maldives. Twenty-one essential economic services (of 324 total) rely on 37 ecosystem types in Australia through 10 final ES and abiotic flows. These include services associated with primary industries (such as forestry, fishing, and mining support), hydroelectricity, waste management, agricultural brokering and leasing, storage and packaging of crops, and technical, professional and education services (**Figure 2, Supplementary Table 4**). An additional six non-essential economic services, such as nature-based recreation, also rely on ES but are not shown in figures (see **Supplementary Table 7**). In the Maldives, only three service industries (of 10) – accommodation; real estate; and arts, entertainment, and other services – have partial direct conditional dependencies on 10 ecosystem types through two cultural ES. These ES are associated with tourism, which is a substantial component of national economic activity in-country (**Figure 3, Supplementary Table 3**).

3.3 Indirect dependencies within economies

Natural capital, either domestic or overseas, underpins every supply chain. Applying the NCDF requires evidence to demonstrate indirect dependencies by identifying actual domestic contributions to supply chain inputs. Systems analysis of intermediate consumption accounts (use tables) can reveal these dependencies under certain conditions (see **Methods**).

Our analysis suggests the entire Maldives economy depends directly or indirectly on natural and semi-natural ecosystems. Intermediate consumption data shows 12 industries rely on the three directly material dependent industries. The remaining industry, financial services, relies on four of these 12 indirectly dependent industries (**Supplementary Table 5**). Thus, all industries in the Maldives economy are directly dependent or indirectly dependent within only two degrees of separation (**Figure 3**). Australia shows similar dependency patterns, though with larger and more complex economic activity.

Like the Maldives, Australia's dependencies reveal the primary industries' integral role in the economy. The directly dependent industries described above supply all other Australian industries within only three degrees of separation, including manufacturing, construction, and service industries (**Figure 4**). This reflects high interdependence within the Australian economy, where most activities contribute to or rely on numerous others through intermediate consumption (high network density of the economy: 0.61, versus the less dense overall multi-level network: 0.32) (**Figure 5**). Ultimately, Australia's entire economy is directly or indirectly dependent on natural capital, including natural and semi-natural ecosystems, and minerals.



Figure 4. Indirect natural capital dependencies of the Australian economy, based on production and intermediate consumption data from 2020-21. The shortest path (geodesic distance of 1, 2 or 3 steps) from directly dependent economic products and services (bottom) to all other economic activity (right) is shown in purple. Self consumption is shown in white. Source: Authors.

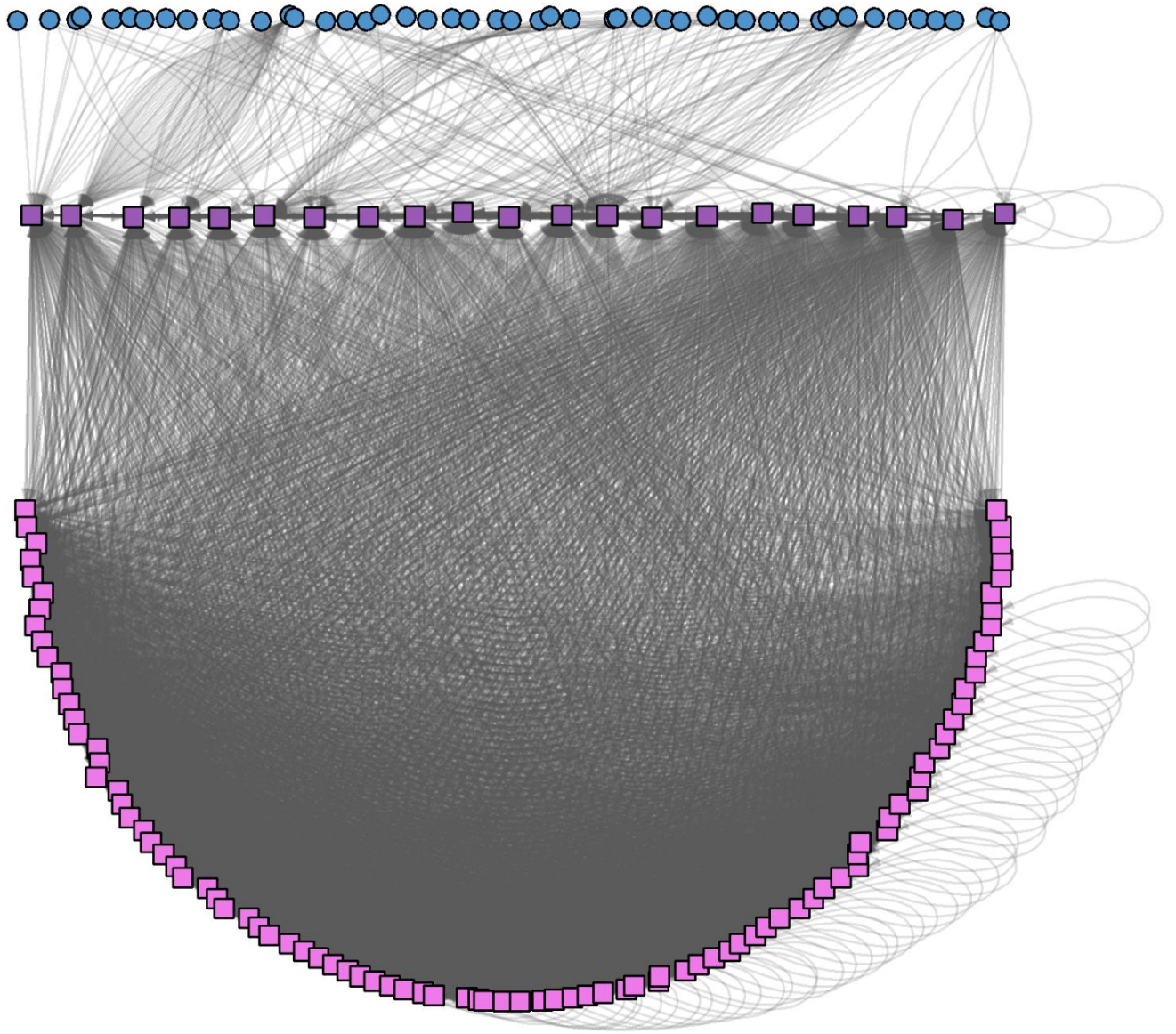


Figure 5. Multi-level directed systems network diagram of Australian nature-economy dependencies. Blue round nodes are ecosystem types; dark purple square nodes are directly dependent input-output product groups (IOPGs); and pink square nodes are indirectly dependent IOPGs. Intermediate consumption within the economy is shown in addition to direct dependencies on ecosystems. Intermediate ES are not represented. Source: Authors.

4. Findings for nature dependencies outside of economies

The NCDF incorporates nature-wellbeing dependencies that are often hidden or taken for granted due to limited economic interaction and absence of market signals. They represent direct ES flows from natural capital to people, occurring independently of economic activity.

In Australia, 48 ecosystem types provide health and safety benefits of national interest through 11 provisioning, regulating, and cultural ES outside the economy (**Figure 6**). These include water supply and wood provisioning through end-user collection (e.g. households with wells, and collecting firewood and rainwater), and essential recreation services associated with mental health benefits of green and blue spaces (**Supplementary Table 6**). As demonstrated in the case of urban and industrial ecosystems providing water supply and recreation ES, the NCDF enables recognition of dependencies that do, or do not, require good ecosystem condition. That is, for urban ecosystems, recreation ES relies on ecosystem condition, while water supply via roof top collection does not. Overall, forests are most relied upon for wellbeing, through wood provisioning (firewood collection), air filtration, landslide mitigation, peak flow flood mitigation, and climate regulation services.

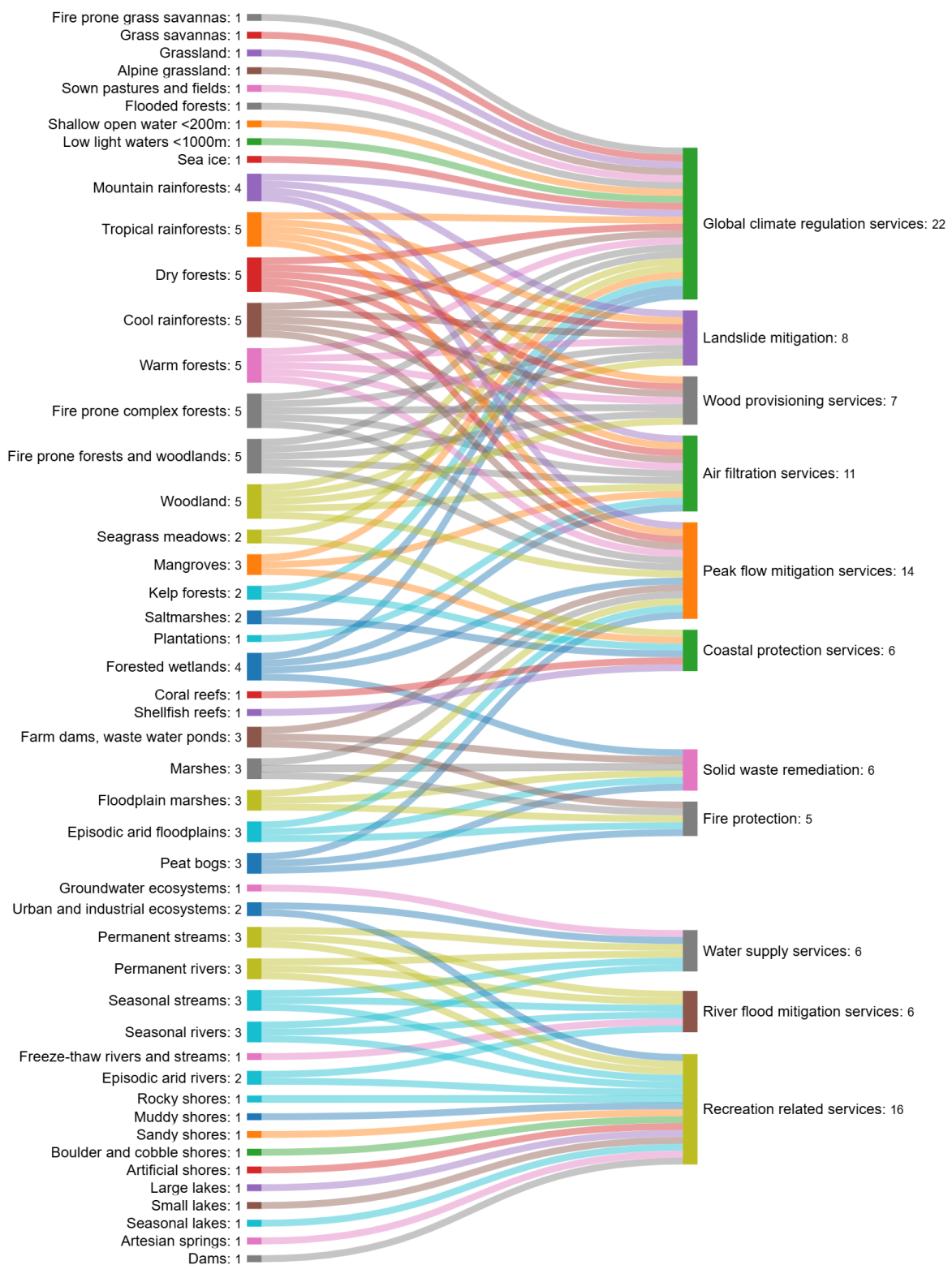


Figure 6. Final ES provided to Australians independent of the economy. Source: Authors.

5. Contribution to nature-related risk assessments

The NCDF makes two key contributions to nature-related risk assessments:

First, the NCDF clarifies and expands nature-related risk transmission channels established by the Network for Greening the Financial System (NGFS) (NGFS, 2023) (**Figure 7**), supporting identification of cascade effects across systems (Loureiro et al., 2023). Risk transmission begins with natural capital degradation through decreased quantities, or reduced condition of natural and semi-natural ecosystems. This degradation reduces the capacity of natural capital to provide final ES and abiotic flows (**Figure 7**). Physical risks are then determined by hazards, exposures, and vulnerabilities, which are defined below in a nature risk context for the first time. They complement the determinants in a climate risk context (IPCC, 2022) and are associated with chronic and acute declines in final ES and abiotic flows:

- Hazard (potential ES decline) – Potential chronic or acute declines of final ES and abiotic flows that may be detrimental to wellbeing, including through economic activity. Example: Crop provisioning supporting nutrition needs via inputs to the economy.
- Exposure (reliance on ES) – Direct and indirect dependencies on final ES and abiotic flows by people, with consideration of their importance. Example: High dependency counts for crop provisioning, or homes and critical infrastructure benefiting from coastal protection ES.
- Vulnerability (propensity to be adversely affected) – Predisposition to be adversely affected by declines in final ES and abiotic flows, including substitutability, accessibility, domestic and overseas sources, and ability to secure alternatives. Example: Industries lacking supply chain substitutes, populations without access to green spaces, or countries with restricted trade from reliable sources.

These physical risks generate micro and macroeconomic risks at multiple scales that ultimately translate to financial risks. For example, changes to material or conditional production inputs affect prices, supply chain stability (shown in **Figure 7**), productivity, and loan portfolio stress.

Second, the NCDF facilitates assessment of nature degradation and two determinants of physical risk: hazard identification, and exposure levels, explicitly linking them to economic activities. This connectivity supports integrated risk assessments by uniting otherwise siloed analyses of nature degradation, ES dependencies, and economic and financial implications. We demonstrate the NCDF's contribution to integrated nature-related risk assessment through the Australian example below, noting the contribution does not extend to the third determinant of physical risk, vulnerability, nor transition risk, largely influenced by impacts on nature. Examination of transition risks and vulnerability would be important components of a comprehensive risk assessment process, which is out of scope of this paper. Because the NCDF measures the breadth of reliance on ES (exposure) rather than the severity of identified risks, a single dependency on a critical, non-substitutable ES may carry greater risk than many dependencies on substitutable ones. As such, the dependencies should be read together with the importance, substitutability and other aspects of vulnerability associated with ES decline during risk analysis.

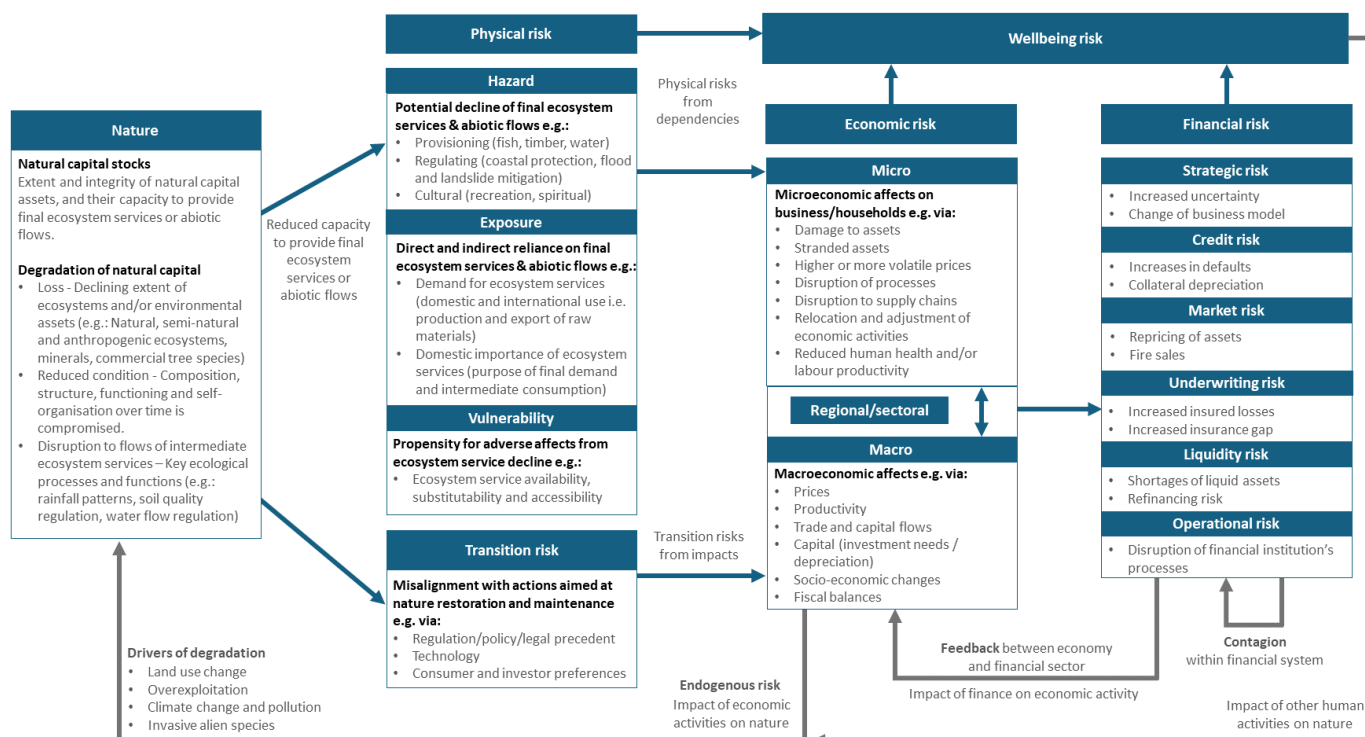


Figure 7. Clarified and expanded transmission channels of nature-related risk (adapted from NGFS (2023)). People may experience physical risks directly, such as the loss of coastal protection ES, or via the economy, such as through reduced crop provisioning ES and higher food prices. Impacts of finance, economic and other human activities (shown in grey) are key contributors to nature degradation.

5.1 Degradation - reducing extent and condition of nature

Due to limited availability and suitability of ecosystem condition data, analysis of degradation was largely constrained to changes in ecosystem extent. Analysis of nature dependencies with national ecosystem accounts from the Australian Bureau of Statistics (ABS, 2025) reveals that only one third of the ecosystems (natural and semi-natural) relied upon by Australians have maintained or increased in extent (24 of 69); another third have declined (23) and the status of the remaining 22 are unknown (**Figure 8** and **Supplementary Figure 1**). An interactive map of these ecosystems is provided at: <https://mitchest.users.earthengine.app/view/aus-neap-cnc>. Natural ecosystems declined by up to 3% between 2015–16 and 2020–21. The largest absolute decline was 45,000 hectares of dry forest. The smallest proportional decline (0.008%) represented 62 hectares of cleared rainforest, equivalent to 30 football fields. Australia's rivers and streams' condition deteriorated by approximately 4%. The area of plantations and annual croplands, key semi-natural ecosystems, declined by 5% and 1% respectively, while other semi-natural ecosystems substantially increased: rice paddies (47%), freshwater aquafarms (11%), urban and industrial ecosystems (5%), and sown pastures and fields (2%), reflecting land use change patterns in Australia. Natural ecosystems have been primarily converted to sown pastures and fields, annual croplands, and urban and industrial ecosystems. Annual croplands have mainly converted to sown pastures and fields, and urban and industrial ecosystems. Plantations have undergone similar conversions, plus conversion to fire-prone forests and woodlands.

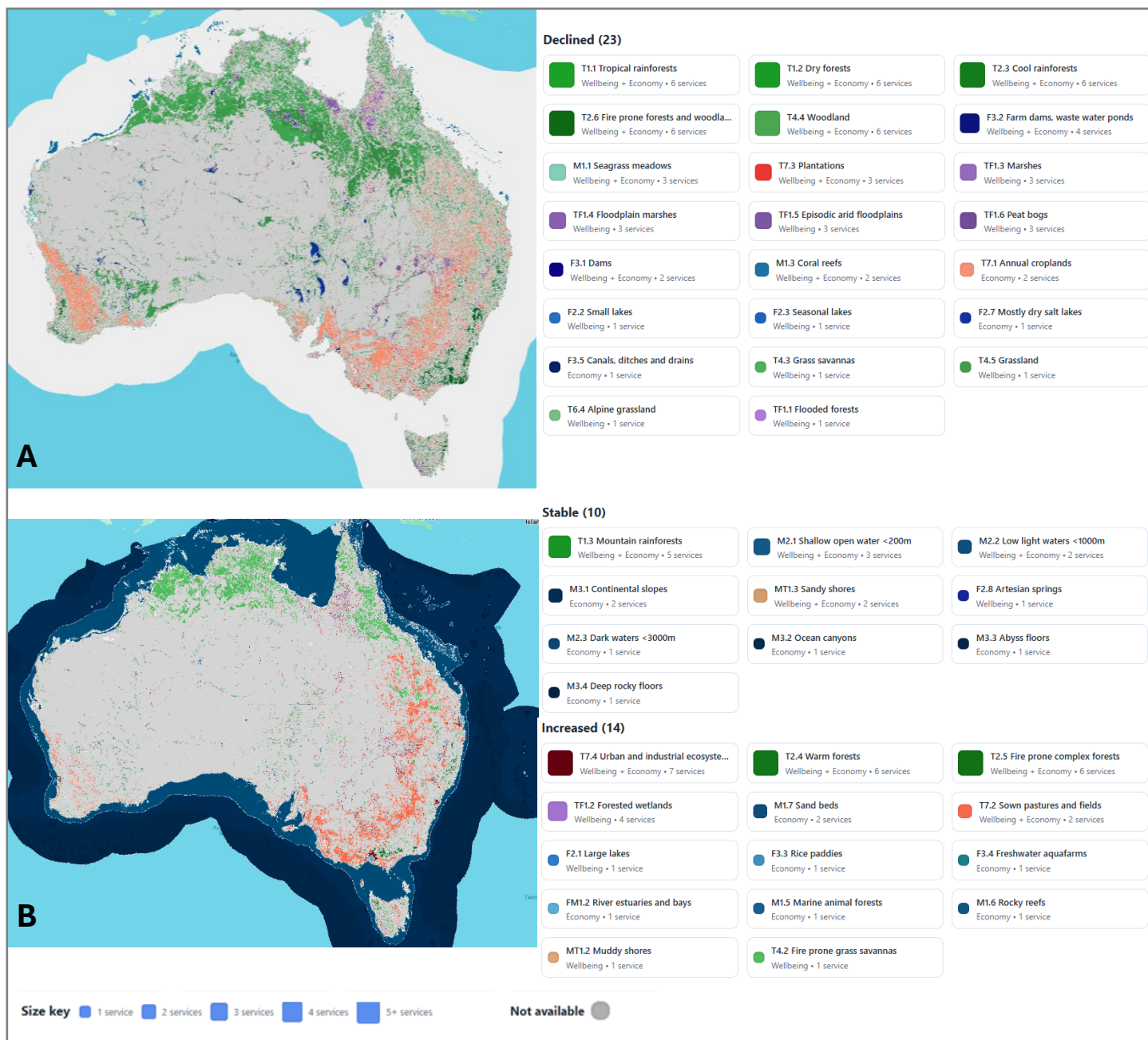


Figure 8. Map of Australia's natural and semi-natural ecosystems, and their status, between 2015-16 to 2020-21. For ecosystems with net change information available, their distribution is shown relative to their contribution to the economy and for wellbeing needs (size according to number of ecosystem services). Map A shows declined ecosystems. Map B shows ecosystems that were stable or had increased. Source: Authors.

5.2 Hazard – potential decline of ecosystem services

Loss of natural and semi-natural ecosystems creates hazards through consequent decline in ES supply. ES flows in **Figures 2 and 6** (direct nature dependencies) represent all final ES that could gradually decline or abruptly cease. **Figure 8** shows the location of these ecosystems and highlights those in decline (Map A), which may lead to hazards in the form of declines in crop provisioning, wood provisioning, climate regulation, landslide mitigation, air filtration, peak flow mitigation, river flood mitigation, coastal protection, solid waste remediation, and fire

protection. Water supply is also compromised due to reduced condition of Australia's rivers and streams (ABS, 2025) (not mapped).

Overseas-based ES hazards are the ES that could decline and is of relevance to Australia. These hazards are partially inferred from the proportion of imported raw materials. In 2020–21, more than half of kiwi fruit (73%), peanuts (59%), and other nuts, fruits, and spices (56%) were imported, compared with domestic production value (ABS, 2024c). This indicates direct reliance on overseas natural capital for some crop provisioning services.

5.3 Exposure – reliance on ecosystem services and their importance

Direct and indirect ES dependencies reveal economic and wellbeing exposures, encompassing both domestic and overseas demand. ES flows relied upon for production in **Figures 2 and 4** (direct and indirect economic dependencies) and by people in **Figure 6** (direct wellbeing dependencies) represent all potential domestic exposures. Direct economic exposures from potential degradation of 43 natural and semi-natural ecosystems (of 45 ecosystem types in total) relied upon by the economy include 81 essential raw materials and 21 essential economic services in the agriculture, forestry, fisheries, electricity, mining and other service industries. The value of these products and services is substantial, \$276 billion in 2021–22, equivalent to 11% of GDP, and supporting over 2.9 million jobs (14% of jobs). This exposure is similar to the highest levels of dependencies observed using the ENCORE database (excluding ‘moderately directly dependent’ assets). In the UK, 10% of financial assets were identified as ‘highly’ and ‘very highly’ directly dependent (Ranger and Oliver, 2024), and earlier in Australia 16% of GDP was identified as ‘very highly directly dependent’ (Pelle, 2022). However, excluding production that does not require ecosystems to be in good condition in Australia, such as lettuce in greenhouses in urban ecosystems and mineral extraction from deep-sea floors, we estimate total potential exposure reduces to half of the ENCORE-based estimate, \$210 billion (8% of GDP) and 2.8 million jobs, demonstrating the precision and clarity enabled by the NCDF.

Exposure from overseas dependency on Australian ES can also be partially inferred from the proportion of exported raw materials. Australia's greatest raw material exports, relative to domestic production value, rely on crop provisioning services and annual cropland ecosystems for table grapes (92% exported), various grains (74–94%), beverage and spice crops (62%), and almonds and macadamias (53%) (ABS, 2024c).

The NCDF further enables assessment of economic exposures, specific to those associated with ecosystem declines. In Australia, current exposure from 13 declined ecosystems is valued at \$66 billion (2.7% of GDP) based on the reliant economic production. This exposure is associated with direct reliance on crop and wild fish provisioning (e.g. for food supply), wood provisioning (e.g. for housing and fuel), and water supply (for drinking, sanitation, and production). Determining more precise exposure levels requires additional information about specific croplands, plantations and fisheries in decline (e.g., wheat, sugar cane, vegetables, cotton, natural rubber, timber, lobster or fish species), locations of rivers and streams in poor condition, and changes in ES provision efficiency (per hectare) to meet growing population needs. However, inter-industry dependency analysis indicates 90% of all economic activity directly relies on water supply, largely enabled by water supply ES, and this demand has increased. Other agriculture is directly relied upon by 61% (70 of 115 categories) of economic activity (1 degree of separation), and 83% (96 categories) of economic activity indirectly relies on forestry and logging (by 2 degrees of separation) (**Figure 4**).

Outside the economy, the wellbeing of Australians directly depends on ten ES that may be compromised due to ecosystem decline: climate regulation, landslide mitigation, air filtration, peak flow flood mitigation, river flood mitigation, coastal protection, wood provisioning (firewood collection) solid waste remediation, recreation services and fire protection. This affects direct health and safety benefits nature provides to people. For climate regulation services, over 34 million kilotonnes of current carbon retention is compromised by declines in native forests, savannas, and grasslands (ABS, 2025). For flood and landslide mitigation, coastal protection, and fire protection services, declines are relevant to locations of households, critical infrastructure, and business operations. For example, in 2021 more than 149,000 homes and 280,000 people received coastal protection from saltmarsh and mangroves (ABS, 2021). However, this service flow has not previously been quantified for other ecosystems known to be in decline (e.g. coral reefs and seagrasses) and other compromised ES are not yet monitored.

6. Discussion

Nature dependency risks drive community choices about managing natural capital and ES, and these choices will determine short and long-term prosperity. The NCDF addresses critical limitations of existing approaches to nature dependency analysis by using existing ecosystem and economic data and generating the specificity needed for national-scale nature risk assessments and decision-making. The precision and clarity provided about direct, indirect, material and conditional dependencies, and whether good ecosystem condition is required, enables management of specific ecosystems for different purposes according to the ES they provide. While global tools, such as ENCORE, establish broad dependency patterns across industries, they cannot distinguish the actual ecosystem types, ecosystem locations, types of dependency relationships or economic activities present in individual countries, which is the granularity necessary for operational risk management and policy intervention.

Our applications to the Maldives and Australia demonstrate the NCDF's utility across diverse contexts, from small island states to large continental economies. Both revealed similar macroeconomic dependency patterns. Most were material dependencies of primary industries, with indirect dependencies flowing through entire economies within only three degrees of separation, despite vast differences in economic and ecological complexity, and account granularity. As shown by our Maldives application using 15 aggregated industries versus Australia's 923 detailed product categories, implementation is possible at different levels, and the NCDF provides a reason to increase granularity given the analytical specificity that is consequently enabled. This suggests the NCDF could provide internationally comparable and nationally actionable insights with different geographies, development contexts and data sources, which is crucial given the extent of global trade and supply chains underpinned by natural capital. The results presented here are national in scope and do not capture the ES dependencies embodied in imported goods and services; incorporating these trade-embodied dependencies, for example through multi-region input-output data, is an important extension beyond the scope of this paper.

The capability to establish quantitative NCDF logic chains already exists in the data infrastructure managed by national statistical offices producing both ecosystem and economic accounts. The most robust logic chains would be derived from accounts using global ecosystem typologies and economic classifications consistently across accounting systems. For countries planning delivery of ecosystem accounts and associated data inputs, qualitative

logic chains can support identification of priority, policy relevant nature dependencies that require measurement and tracking. As more data becomes available, capability can then grow through mapping further conditional dependencies, and intermediate ES contributions to final ES flows, to strengthen long-term ES supply management. Implementation across diverse geographic and development contexts, ideally as part of international standardisation processes, would help refine methodology and build global capability while preserving flexibility for national adaptations to country contexts.

In the same way economic accounting standards provide for interoperability between firm level accounting and national aggregates, the NCDF's foundation in both the SEEA and SNA standards positions it for parallel integration across public and private sectors, key to the mainstreaming of nature envisaged by Tallis et al (2024). For the public sector, the NCDF provides dependency analysis supporting identification of nature-related risks of national significance. This enables strategic decision-making across ministries to safeguard nature's contributions to wellbeing, economic prosperity and country resilience – consistent with Global Biodiversity Framework (GBF) commitment (Target 11) to restore, maintain and enhance these contributions (CBD, 2022). Finance, treasury, environment and foreign affairs ministries can incorporate natural capital dependencies into sovereign risk assessment and threshold settings, fiscal and intergenerational planning, and economic modelling – recognising that domestic and overseas ecosystem degradation undermines economic productivity directly and indirectly (**figures 2 - 4**). In Australia, dependency relationships reveal substantial potential economic exposure, of \$276 billion (11% of GDP), and with one third of ecosystems in decline, may already be exposed by \$66 billion (2.7% of GDP), highlighting the need for a comprehensive national nature-related risk assessment. These values indicate the scale of exposure under the classification and condition assumptions set out in the **Methods**, and are order-of-magnitude estimates rather than precise valuations.

For both sectors, the NCDF's distinction between direct and indirect nature dependencies leads to meaningful insights. The NCDF clarifies complex dependency pathways occurring within and between environmental and economic systems according to the location of interactions from a single system structure viewpoint (**Figures 1b** and **Figure 5**). By adopting the concepts of intermediate ES and intermediate economic consumption, indirect dependencies are more accurately discerned and identification of direct dependencies is more precise. This avoids nature dependency risks being overstated (through double counting) and being conflated with the causes of risk (by mistreating intermediate ES as direct dependencies). For financial regulation and disclosures, the clarification enabled by the NCDF can help operationalise the NGFS conceptual guidance on nature-related financial risks, supporting hazard identification and exposure assessment needed by countries to meet the GBF commitment to assess and disclose nature dependencies (Target 15) (CBD, 2022); and that central banks and supervisors need to construct risk appetite frameworks, prepare financial stability analysis and undertake risk management. Central banks could therefore better anticipate and mitigate systemic risks, complementing supervisory expectations of financial institutions to assess and manage environmental risks at firm levels (ECB, 2020).

For the private sector, the NCDF can integrate with advancements in enterprise-level global supply chain tracing (Katafuchi et al., 2025), and facilitate reporting frameworks to standardise methodologies for considering nature-related risk. The NCDF provides country-specific dependency data that the TNFD recommendations require in order to assess dependencies, but do not specify how to generate, again with organisations relying on global ENCORE data

(DCCEEW, 2023; Barclays, 2025). Similarly, as the International Sustainability Standards Board (ISSB) (and their national equivalents like the Australian Accounting Standards Board) extends beyond climate disclosures to develop nature-related guidance (IFRS, 2025a; IFRS, 2025b), the NCDF contributes methodological infrastructure for the biodiversity metrics and dependency disclosures that will be required.

As nature loss accelerates and exposures to ecosystem degradation mount, opportunities for proactive risk management warrant urgent attention. The NCDF illustrates how direct dependency risks are inherently high, when considering the resilience of national economies, as they occur at the beginning of supply chains and cascade or compound downwards (Acemoglu et al., 2012; Anufriev et al., 2016). Countries implementing the NCDF would hold transparent evidence bases for natural capital management and economic planning, reducing their reliance on bespoke, *ad hoc* analysis, and potentially gaining competitive advantages in sovereign natural capital risk management and strategic dependency transitions.

Like the development of the SNA in the mid-20th century provided the essential infrastructure for modern economic policy, nature-integrated accounting frameworks are foundational for 21st-century economic and sustainability policy (Gleeson-White, 2012). From public and private sector perspectives, they support evolution of a whole of system transition (Obura et al., 2026), from addressing ‘what are my profits?’ to addressing ‘how can my profits be sustained?’. Through application of integrated accounting, the NCDF supports expanded understanding of nature risk transmission, and provides for international consistency and practical transition pathways. Crucially, nature dependency risk can shift from conceptual frameworks and peripheral, unspecified environmental concerns, to being a tangible, economic and financial stability issue embedded in cross-sectoral operational reality.

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Declaration of competing interests

The authors declare no competing interests.

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Data availability

The logic chain connections and compilations of existing data analysed during this study are available at <https://doi.org/10.5281/zenodo.21764968>.

Requests for additional data should be directed to the corresponding author.

Code availability

R code used for analysis is available at <https://doi.org/10.5281/zenodo.21764968>.

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Supplementary methods information

Limitations of logic chain connections

Globally aligned, national classification systems were used to make logic chain connections, however inconsistencies within classifications systems limited the precision of connections. For example, the classifications in Australia's economic accounts included two lettuce categories (grown outdoors or undercover), three grape categories (wine, table and for drying), but only one category for all types of fresh and dried stone fruits. Similarly, some GET classifications incorporate ecosystem use (e.g. freshwater aquafarms) while others do not (e.g. cool rainforests) (Keith et al., 2020). Also, the economic classifications in national accounts reflect only the economic activity measured at a point in time (e.g. intermediate consumption accounts available for the Maldives were over 10 years old), not necessarily all the economic activity occurring.

The granularity of economic accounts also affected the accuracy of logic chains. This means dependency analysis based on highly aggregated accounts, like the Maldives, should be considered indicative only. Granularity affected the ability to discern products from services, and therefore distinguish between material and conditional dependencies. It also affected identification of raw materials from their immediate derivatives, and therefore the distinction between direct and indirect material dependencies. A network analysis of intermediate consumption accounts for Australia (ABS, 2024e) and the Maldives (NBS, 2014) outlined how indirect nature dependencies flowed through from the beginning of supply chains to the entire economy. Indirect nature dependency analysis for Australia was constrained by more aggregated intermediate consumption accounts (21 categories) than the detailed accounts available for direct dependency analysis (128 categories) (ABS, 2024d).

Ecosystem types providing final ES that are essential to wellbeing, independent of the economy (outside of the production boundary), were assessed for Australia, producing a subset relevant at a national scale (**Methods Table 2**). A wider range of accessible ecosystem types may also be considered essential by First Nations Australians due to important cultural benefits of wild fish and animal hunting, and plant foraging services. However, such ecosystem identification should involve First Nations participation, preferably building from local scales, and as such was not within scope of this study.

Economy activity

The NCDF identifies three key categories of economic activity, or production, to help distinguish between direct, indirect, material and conditional nature dependencies (**Figure 1a, Methods Table 1**):

- 1) Raw materials - both abiotic and biotic products (or goods) at supply chain origins (e.g. iron ore or sheep).
- 2) Processed materials – products (or goods) later in supply chains (e.g. Iron rails or Knitted apparel), including immediate derivatives of raw materials (e.g. Wool).
- 3) Services (e.g. mining support services or shearing services).

Economic classifications, aligned with the International Standard Industrial Classification of All Economic Activities (ISIC) (United Nations, 2008), were used to organise economic activity into these categories in the case studies presented, and most other economic classification systems can be mapped to ISIC.

Ecosystem presence

Ecosystem types present in Australia (92) and the Maldives (33) (**Methods tables 3 and 4**) were primarily identified from the online GET (Keith et al., 2020). Two Australian ecosystem types were identified from a national data product on global ecosystem types (Macfarlane et al., 2024b) (in Tables 1 and 4)). Evidence of ecosystem type presence in the Maldives was also sought when there were mismatches between domestic production (e.g. marine aquaculture products) and GET presence information (e.g. marine aquafarms not present). This led to two ecosystem types to be identified independent of the GET: marine aquafarms needed for marine aquaculture ES and groundwater ecosystems needed for water supply ES, in addition to desalination and roof top collection sources (see **Supplementary Table 3**).

Intermediate ecosystem services relevant to management

We identified key ecosystems providing intermediate ES when relevant to management. In the Australian case, three coastal ecosystem types were emphasised (mangroves, saltmarshes and kelp forests) as they were not directly relied upon by the economy but did provide nursery population and habitat maintenance services, a key intermediate ES enabling commercial fishing. Therefore, these ecosystems are still important for the purpose of managing nature-economy dependencies and this is reflected in their inclusion in **Supplementary Table 1**. In the Maldives case, the same intermediate ES are acknowledged for their role in commercial fishing. Additionally, the role of coral reef ecosystems in supporting island formation is also acknowledged for facilitating crop and wood provisioning, and water supply (**Supplementary Table 3**). Further analysis of indirect dependencies was limited by a lack of comprehensive data on intermediate ES flows.

Degradation, physical hazards and exposures

Data from National Ecosystem Accounts (ABS, 2025) were used to analyse nature degradation (limited primarily to loss in extent) occurring in Australia from 2015-16 to 2020-21. The percent net change of each ecosystem type was calculated from the hectares of net changes in ecosystem extent compared with the hectares of opening extent in 2015-16 (Account Table 1.1). **Supplementary Figure 1** presents the net change in hectares. The percent of overall decline in river and stream condition was already presented as a key finding of the accounts and no other condition data was available or suitable for use. The greatest losses in extent, due to conversions between ecosystem types, were identified from the change matrix of ecosystem extent (Account Table 1.2).

ES likely to be compromised were determined from the logic chains connected to ecosystem types shown to decline between 2015-16 and 2020-21 (ABS, 2025). Carbon retention values obtained from national ecosystem accounts were identified as exposures due to declines in supplying ecosystem types (ABS, 2025). Similarly, the quantity of exposed coastal protection ES⁶¹ may be impacted by declines in ecosystems not yet tracked in national accounts. Economic exposure to reduced water supply ES was calculated based on the number of industries using 'water supply' shown in detailed use tables (ABS, 2024d), as compared to the broader category of 'water supply, sewage and drainage services' used for other indirect dependency analysis. For *other agriculture* and *forestry and logging*, inter-industry use was calculated based on the number of industries using these inputs within geodesic distance levels 1 and 2 respectively (**Figure 4**). Increased demand of water supply ES for use as a material in production was identified in national ecosystem accounts (ABS, 2025). The percent of raw material imported and exported was calculated from the proportion of import and export

values compared with domestic production values (ABS, 2024c). This import and export data provides an indicator of overseas hazards and exposures, however more detailed trade data, such as from the enterprise-level global supply chain database (Katafuchi et al., 2025), Global Material Flows Database (UNEP & IRP, 2025) or EXIOBASE, an environmentally extended multi-regional input-output (EE-MRIO) database (Stadler et al., 2018), would strengthen future dependency analysis by specifying which countries are relevant to the hazards and exposures.

Additional methods references

Haines-Young, R. & Potschin, M., 2018. Common International Classification of Ecosystem Services (CICES) V5.1 Guidance on the Application of the Revised Structure, Fabis Consulting Ltd, United Kingdom.

Keith, R. et al., 2020. IUCN Global Ecosystem Typology v2.0. IUCN; <https://global-ecosystems.org/explore> Accessed: 19 September 2024 (Australia) and 6 April 2025 (Maldives).

Macfarlane, C. et al., 2024b. Methods for developing spatial extent of IUCN ecosystem functional groups at 250 m resolution for freshwater, terrestrial, marine and transitional realms for Australia: pre-1750, 2010-11, 2015-16 and 2020-21. A report for the National Ecosystem Accounting Project. CSIRO, Australia.

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United Nations, 2008. International Standard Industrial Classification of All Economic Activities (ISIC), Revision 4. United Nations, New York.

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Supplementary Table 1 | Direct material logic chains – essential raw materials (Australia)

Fixed capital highlighted blue; key intermediate ecosystem services highlighted orange

Ecosystem type (Global ecosystem typology)			Environmental flow (SEEA EA Reference list)		Raw material (ANZSIC IOPC)	
IOPG 2801 – Water Supply, Sewerage and Drainage Services						
SF1.2	Groundwater ecosystems	Groundwater ecosystems	1.9	Water supply services	28110010	Water supply
F1.1	Permanent upland streams	Permanent streams	1.9	Water supply services		
F1.2	Permanent lowland rivers	Permanent rivers	1.9	Water supply services		
SF2.1	Water pipes and subterranean canals	Water pipes	1.9	Water supply services		
F3.1	Large reservoirs	Dams	1.9	Water supply services		
M1	Marine shelf biome	Marine shelf biome	1.9	Water supply services		
F1.4	Seasonal upland streams	Seasonal streams	1.9	Water supply services		
F1.5	Seasonal lowland rivers	Seasonal rivers	1.9	Water supply services		
F3.2	Constructed lacustrine wetlands	Farm dams, waste water ponds	1.9	Water supply services		
F3.5	Canals, ditches and drains	Canals, ditches and drains	1.9	Water supply services		
IOPG 0101 – Sheep, Grains, Beef and Dairy Cattle						
T7.2	Sown pastures and fields	Sown pastures and fields	1.2	Grazed biomass provisioning services	01400010	Sheep and lambs
T7.5	Derived semi-natural pastures and oldfields	Semi-natural pastures	1.2	Grazed biomass provisioning services		
T7.2	Sown pastures and fields	Sown pastures and fields	1.2	Grazed biomass provisioning services	01400050	Beef cattle and calves
T7.5	Derived semi-natural pastures and oldfields	Semi-natural pastures	1.2	Grazed biomass provisioning services		
F3.3	Rice paddies	Rice paddies	1.1	Crop provisioning services	01400070	Rice - in the husk
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01400080	Wheat (incl spelt) and meslin – unmilled
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01400090	Barley - unmilled
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01400100	Oats - unmilled
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01400110	Sorghum - for grain
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01400120	Lupins - white or yellow for grain
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01400130	Oilseeds (incl canola)
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01400140	Legumes for grain nec
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01400150	Cereal grains nec
T7.2	Sown pastures and fields	Sown pastures and fields	1.2	Grazed biomass provisioning services	01600020	Dairy cattle
T7.5	Derived semi-natural pastures and oldfields	Semi-natural pastures	1.2	Grazed biomass provisioning services		
IOPG 0102 – Poultry and other livestock						
T7.5	Derived semi-natural pastures and oldfields	Semi-natural pastures	1.2	Grazed biomass provisioning services	01710010	Poultrv - for slaughtering

T7.5	Derived semi-natural pastures and oldfields	Semi-natural pastures	1.2	Grazed biomass provisioning services	01720020	Poultry - for eggs
T7.5	Derived semi-natural pastures and oldfields	Semi-natural pastures	1.2	Grazed biomass provisioning services	01800010	Deer
T7.2	Sown pastures and fields	Sown pastures and fields	1.2	Grazed biomass provisioning services		
T7.5	Derived semi-natural pastures and oldfields	Semi-natural pastures	1.2	Grazed biomass provisioning services	01910010	Thoroughbred horses
T7.5	Derived semi-natural pastures and oldfields	Semi-natural pastures	1.2	Grazed biomass provisioning services	01920010	Pigs
T7.1	Annual croplands	Annual croplands	1.10	Other provisioning services	01930010	Unblended honey and beeswax
T1.1	Tropical-subtropical lowland rainforests	Tropical rainforests	1.10	Other provisioning services		
T1.2	Tropical-subtropical dry forests and thickets	Dry forests	1.10	Other provisioning services		
T1.3	Tropical-subtropical montane rainforests	Mountain rainforests	1.10	Other provisioning services		
T2.3	Oceanic cool temperate rainforests	Cool rainforests	1.10	Other provisioning services		
T2.4	Warm temperate laurophyll forests	Warm forests	1.10	Other provisioning services		
T2.5	Temperate pyric humid forests	Fire prone complex forests	1.10	Other provisioning services		
T2.6	Temperate pyric sclerophyll forests and woodlands	Fire prone forests and woodlands	1.10	Other provisioning services		
T4.4	Temperate woodlands	Woodland	1.10	Other provisioning services		
T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems	1.8	Genetic material services	01990010	Pet breeding and live animals nec
IOPG 0103 – Other Agriculture						
T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems	1.1	Crop provisioning services	01110010	Nursery plants - grown undercover nec
T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems	1.1	Crop provisioning services	01120010	Nursery plants - grown outdoors nec
T7.3	Plantations	Plantations	1.1	Crop provisioning services	01120020	Orchard and vineyard growing
T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems	1.1	Crop provisioning services	01210010	Mushrooms - fresh or chilled
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01130010	Turf
T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems	1.1	Crop provisioning services	01210020	Mushroom spawn
T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems	1.1	Crop provisioning services	01220010	Lettuces - grown undercover
T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems	1.1	Crop provisioning services	01220020	Tomatoes - grown undercover
T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems	1.1	Crop provisioning services	01220030	Vegetables nec - grown undercover

T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01230010	Lettuces - grown outdoors
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01230020	Tomatoes - grown outdoors
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01230030	Potatoes, sweet potatoes and edible roots and tubers nec - grown outdoors
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01230040	Beans, french and runner; peas - green or blue grown outdoors
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01230050	Cabbages, brussels sprouts, cauliflowers and headed broccoli - grown outdoors
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01230060	Carrots - grown outdoors
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01230070	Onions - grown outdoors
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01230080	Vegetable seeds
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01230090	Other vegetables (incl melons) - fresh or chilled grown outdoors
			2.17	Pollination services		
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01310010	Grapes - table
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01310030	Grapes - sun-dried or for drying
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01320010	Kiwi fruit
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01330010	Strawberries
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01330020	Berries nec - fresh and sun-dried
			2.17	Pollination services		
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01340010	Apples - fresh and sun-dried
			2.17	Pollination services		
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01340020	Pears and quinces - fresh and sun-dried
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01350010	Stone fruit - fresh and sun-dried
			2.17	Pollination services		
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01360010	Citrus fruit - fresh and sun-dried
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01370010	Olives - fresh and sun-dried
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01390010	Bananas - fresh and sun-dried
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01390020	Orchard fruit nec - fresh and sun-dried
			2.17	Pollination services		
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01390030	Almonds and macadamias
			2.17	Pollination services		
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01390040	Edible nuts (excl peanuts) nec; Fruit nec - fresh and sun-dried
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01510010	Sugar cane - for planting or crushing
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01520010	Cotton (excl ginned)
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01590010	Forage sorghum
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01590040	Beverage and spice crops
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01590050	Grass, lucerne and clover seed
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01590060	Hay, cereal grasses and fodder
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01590090	Peanuts

T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01590110	Natural rubber
T7.3	Plantations	Plantations	1.1	Crop provisioning services		
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	01590120	Crops nec
IOPG 0201 - Aquaculture						
M4.2	Marine aquafarms	Marine aquafarms	1.4	Aquaculture provisioning services	02000010	Farmed oysters (incl pearl), pearls, paua and molluscs nec; cultured pearls
M4.2	Marine aquafarms	Marine aquafarms	1.4	Aquaculture provisioning services	02000040	Farmed prawns and crustaceans nec
M4.2	Marine aquafarms	Marine aquafarms	1.4	Aquaculture provisioning services	02000060	Farmed fish, fish hatchery products and seaweed; aquaculture nec
F3.4	Freshwater aquafarms	Freshwater aquafarms	1.4	Aquaculture provisioning services		
IOPG 0401 - Fishing, hunting and trapping						
M1.1	Seagrass meadows	Seagrass meadows	1.6	Wild fish and other natural aquatic products provisioning services	04110010	Rock lobsters and crabs
M1.3	Photic coral reefs	Coral reefs	1.6	Wild fish and other natural aquatic products provisioning services		
M1.7	Subtidal sand beds	Sand beds	1.6	Wild fish and other natural aquatic products provisioning services		
M3.1	Continental and island slopes	Continental slopes	1.6	Wild fish and other natural aquatic products provisioning services		
M3.3	Abyssal plains	Abyss floors	1.6	Wild fish and other natural aquatic products provisioning services		
M1.7	Subtidal sand beds	Sand beds	1.6	Wild fish and other natural aquatic products provisioning services	04120010	Prawns
M3.1	Continental and island slopes	Continental slopes	1.6	Wild fish and other natural aquatic products provisioning services		
M1.1	Seagrass meadows	Seagrass meadows	2.20	Nursery population and habitat maintenance services		
M1.1	Seagrass meadows	Seagrass meadows	1.6	Wild fish and other natural aquatic products provisioning services	04130010	Fish and squid - line fishing
M1.5	Photo-limited marine animal forests	Marine animal forests	1.6	Wild fish and other natural aquatic products provisioning services		
M1.6	Subtidal rocky reefs	Rocky reefs	1.6	Wild fish and other natural aquatic products provisioning services		
M1.7	Subtidal sand beds	Sand beds	1.6	Wild fish and other natural aquatic products provisioning services		
M2.1	Epipelagic ocean waters	Shallow open water <200m	1.6	Wild fish and other natural aquatic products provisioning services		
M3.1	Continental and island slopes	Continental slopes	1.6	Wild fish and other natural aquatic products provisioning services		
M3.2	Submarine canyons	Ocean canyons	1.6	Wild fish and other natural aquatic products provisioning services		
M3.3	Abyssal plains	Abyss floors	1.6	Wild fish and other natural aquatic products provisioning services		
M3.4	Seamounts, ridges and plateaus	Deep rocky floors	1.6	Wild fish and other natural aquatic products provisioning services		

MFT1.2	Intertidal forests and shrublands	Mangroves	2.20	Nursery population and habitat maintenance services		
MFT1.3	Coastal saltmarshes and reedbeds	Saltmarshes	2.20	Nursery population and habitat maintenance services		
M1.1	Seagrass meadows	Seagrass meadows	2.20	Nursery population and habitat maintenance services		
M1.2	Kelp forests	Kelp forests	2.20	Nursery population and habitat maintenance services		
M1.3	Photic coral reefs	Coral reefs	2.20	Nursery population and habitat maintenance services		
M1.1	Seagrass meadows	Seagrass meadows	1.6	Wild fish and other natural aquatic products provisioning services	04140010	Fish - trawling or netting
M1.5	Photo-limited marine animal forests	Marine animal forests	1.6	Wild fish and other natural aquatic products provisioning services		
M1.6	Subtidal rocky reefs	Rocky reefs	1.6	Wild fish and other natural aquatic products provisioning services		
M1.7	Subtidal sand beds	Sand beds	1.6	Wild fish and other natural aquatic products provisioning services		
M2.1	Epipelagic ocean waters	Shallow open water <200m	1.6	Wild fish and other natural aquatic products provisioning services		
M3.1	Continental and island slopes	Continental slopes	1.6	Wild fish and other natural aquatic products provisioning services		
M3.2	Submarine canyons	Ocean canyons	1.6	Wild fish and other natural aquatic products provisioning services		
M3.3	Abyssal plains	Abyss floors	1.6	Wild fish and other natural aquatic products provisioning services		
M3.4	Seamounts, ridges and plateaus	Deep rocky floors	1.6	Wild fish and other natural aquatic products provisioning services		
MFT1.2	Intertidal forests and shrublands	Mangroves	2.20	Nursery population and habitat maintenance services		
MFT1.3	Coastal saltmarshes and reedbeds	Saltmarshes	2.20	Nursery population and habitat maintenance services		
M1.1	Seagrass meadows	Seagrass meadows	2.20	Nursery population and habitat maintenance services		
M1.2	Kelp forests	Kelp forests	2.20	Nursery population and habitat maintenance services		
M1.3	Photic coral reefs	Coral reefs	2.20	Nursery population and habitat maintenance services		
M1.4	Shellfish beds and reefs	Shellfish reefs	1.6	Wild fish and other natural aquatic products provisioning services	04190010	Oysters and aquatic invertebrates nec - live, fresh or chilled (excl farmed); natural pearls
M1	Marine shelves	Marine shelves	1.6	Wild fish and other natural aquatic products provisioning services	04190020	Coral and similar; shells of molluscs; natural animal sponges; algae - fresh or dried (excl farmed)
M1.3	Photic coral reefs	Coral reefs	1.6	Wild fish and other natural aquatic products provisioning services		
MFT1.1	Coastal river deltas	Coastal river deltas	1.6	Wild fish and other natural aquatic products provisioning services	04190030	Freshwater fish and aquatic animals nec

FM1.2	Permanently open riverine estuaries and bays	River estuaries and bays	1.6	Wild fish and other natural aquatic products provisioning services		
F1.1	Permanent upland streams	Permanent streams	1.6	Wild fish and other natural aquatic products provisioning services		
F1.2	Permanent lowland rivers	Permanent rivers	1.6	Wild fish and other natural aquatic products provisioning services		
IOPC 0301 – Forestry and Logging						
T7.3	Plantations	Plantations	1.1	Crop provisioning services	03010010	Natural gums and resins (incl oleoresins)
T7.3	Plantations	Plantations	1.5	Wood provisioning services	03010020	Softwoods (conifers) - growing
T7.3	Plantations	Plantations	1.5	Wood provisioning services	03010030	Hardwoods, brushwoods and scrubwoods - growing
T4.4	Temperate woodlands	Woodlands	1.5	Wood provisioning services	03020020	Hardwoods, brushwoods and scrubwoods - logs; hewn timber and timber nec (incl firewood)
T1.2	Tropical-subtropical dry forests and thickets	Dry forests	1.5	Wood provisioning services		
T2.3	Oceanic cool temperate rainforests	Cool rainforests	1.5	Wood provisioning services		
T2.4	Warm temperate laurophyll forests	Warm forests	1.5	Wood provisioning services		
T2.5	Temperate pyric humid forests	Fire prone complex forests	1.5	Wood provisioning services		
T2.6	Temperate pyric sclerophyll forests and woodlands	Fire prone forests and woodlands	1.5	Wood provisioning services		
IOPG 0601 - Coal mining						
S2.1	Anthropogenic subterranean voids	Mining tunnels		Abiotic flows	06000010	Black coal
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows		
S2.1	Anthropogenic subterranean voids	Mining tunnels		Abiotic flows	06000020	Brown coal/lignite and peat (excl horticultural)
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows		
IOPG 0701 - Oil and gas extraction						
M1	Marine shelf	Marine shelf		Abiotic flows	07000010	Crude oil (incl condensate)
M2.1	Epipelagic ocean waters	Shallow open water <200m		Abiotic flows		
M2.2	Mesopelagic ocean waters	Low light waters <1000m		Abiotic flows		
M2.3	Bathpelagic ocean waters	Dark waters <3000m		Abiotic flows		
M3	Deep sea floors biome	Deep sea floors biome		Abiotic flows		
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows		
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	07000020	Liquefied natural gas
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	07000030	Natural gas - in the gaseous state
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	07000050	Coal seam gas
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	07000070	Liquefied petroleum gas from the well head
IOPG 0801 - Iron ore mining						
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	08010090	Iron ore (incl treatment)
IOPG 0802 - Non ferrous metal ore mining						
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	08020010	Bauxite and Aluminium Ores
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	08030010	Copper concentrates, oxides and ores

N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	08040010	Gold ores
MT1.3	Sandy shores	Sandy shores		Abiotic flows	08050010	Beneficiated ilmenite, ilmenite and leucoxene concentrates
MT1.3	Sandy shores	Sandy shores		Abiotic flows	08050020	Rutile concentrates
MT1.3	Sandy shores	Sandy shores		Abiotic flows	08050030	Monazite, xenotime and zircon concentrates; mineral sand ores nec
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	08060010	Nickel ores and concentrates
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	08070010	Lead ores and concentrates
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	08070030	Silver ores and concentrates
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	08070040	Zinc ores and concentrates (incl silver-lead-zinc combined concentrates)
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	08090010	Tin, tin-copper and tin-tantalite concentrates
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	08090020	Uranium concentrates
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	08090030	Manganese ores
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	08090040	Non-ferrous metallic ores and concentrates nec (incl tungsten)
IOPC 0901 - Non metallic mineral mining						
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	09110010	Gravel
MT1.3	Sandy shores	Sandy shores		Abiotic flows	09110020	Sand
M1.7	Subtidal sand beds	Sand beds		Abiotic flows		
M3.1	Continental and island slopes	Continental slopes		Abiotic flows		
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	09190020	Pebbles, broken or crushed stone and macadam; tarred macadam; granules, chippings and powder of stone
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	09190030	Limestone (incl shell and coral)
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	09190040	Clays nec (incl brick, pipe, tile and shale)
T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems		Abiotic flows	09900010	Salt
F2.7	Ephemeral salt lakes	Mostly dry salt lakes		Abiotic flows		
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	09900030	Gypsum; anhydrite; calcareous stone of a kind used for the manufacture of lime or cement (excl limestone)
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	09900040	Silica
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	09900050	Natural phosphates and phosphate rock – unground
N/A	Non-specific mining area	Non-specific mining area		Abiotic flows	09900090	Chemical and fertiliser minerals nec; non-metallic minerals nec

Supplementary Table 2 | Processed materials immediately derived from essential raw materials (Australia)

Raw material (ANZSIC IOPC and IOPG)			Processed material (immediately derived) (ANZSIC IOPC and IOPG)		
01400010	Sheep and lambs	0101	01400030	Sheep and lamb products nec	0101
01400010	Sheep and lambs	0101	01400020	Wool - shorn and dead	
01400050	Beef cattle and calves	0101	01400060	Beef cattle and calves products (excl milk) nec	
01400010	Sheep and lambs	0101	01600010	Whole milk - chilled but otherwise untreated	
01600020	Dairy cattle	0101	01990020	Livestock products nec	0102
01720020	Poultry - for eggs	0102			
01600020	Dairy cattle	0101			
01710010	Poultry - for slaughtering	0102			
01720020	Poultry - for eggs	0102			
01800010	Deer	0102			
01910010	Thoroughbred horses	0102			
01400010	Sheep and lambs	0101			
01400050	Beef cattle and calves	0101			
01920010	Pigs	0102			
01590010	Forage sorghum	0103	01590020	Forage products nec	0103
03010010	Natural gums and resins (incl oleoresins)	0301	03010040	Forest products nec	0301
03010020	Softwoods (conifers) - growing	0301			
03010030	Hardwoods, brushwoods and scrubwoods - growing	0301			
03010020	Softwoods (conifers) - growing	0301	03020010	Softwoods (conifers) - logs	
03010030	Hardwoods, brushwoods and scrubwoods - growing	0301	03020020	Hardwoods, brushwoods and scrubwoods - logs; hewn timber and timber nec (incl firewood)	

Supplementary Table 3 | Direct logic chains (Maldives economy)

Key intermediate ecosystem services highlighted orange

Ecosystem type (Global ecosystem typology)			Ecosystem service (SEEA EA Reference list)		Economic activity (Quarterly GDP reporting categories - ISIC divisions)			Explanation for logic chains	
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	Agriculture	A	Primary	Two ecosystem types present in Maldives that can support terrestrial agriculture.	
T7.3	Plantations	Plantations						Coral reef ecosystems play a key role in dynamic island formation, enabling terrestrial final ES – crop provisioning.	
M1.3	Photic coral reefs	Coral reefs	2.6 & 2.7	Soil and sediment retention services				Two forest ecosystems present in country. Wild coconut used for food and timber, various tree species for timber and fire wood https://www.fao.org/4/ac792e/AC792E02.htm	
T7.3	Plantations	Plantations	1.5	Wood provisioning services				Coral reef ecosystems play a key role in dynamic island formation, enabling terrestrial final ES – wood provisioning	
T1.1	Tropical-subtropical lowland rainforests	Tropical rainforests							
M1.3	Photic coral reefs	Coral reefs	2.6 & 2.7	Soil and sediment retention services					
M4.2	Marine aquafarms	Marine aquafarms	1.4	Aquaculture provisioning services	Fisheries	A	Primary	Active marine aquafarms despite absence in Global ecosystem mapping https://enaca.org/?id=895	
M2.1	Epipelagic ocean waters (shallow <200m)	Shallow open water <200m	1.6	Wild fish and other natural aquatic products provisioning services				Fishing occurs via line and pole in 1) coral lagoons, 2) the outer coral shelf, and 3) the deep ocean https://factsanddetails.com/south-asia/Maldives/Economics_and_Agriculture_Maldives/entry-8051.html#:~:text=The%20use%20of%20nets%20is,in%20tropical%20and%20subtropical%20waters	
M1.3	Photic coral reefs	Coral reefs							
M3.1	Continental and island slopes	Continental slopes							
M3.2	Submarine canyons	Ocean canyons							
M3.3	Abyssal plains	Abyss floors							
M3.4	Seamounts, ridges and plateaus	Deep rocky floors							
MFT1.2	Intertidal forests and shrublands	Mangroves	2.2	Nursery population and habitat maintenance services			Ecosystems providing nursery services play a key role in wild fish provisioning		
M1.1	Seagrass meadows	Seagrass meadows							
M1.3	Photic coral reefs	Coral reefs							
N/A					Manufacturing		C	Secondary	Indirect dependencies at Supplementary Table 5.
T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems	1.9	Water supply services	Electricity, water and waste management	D&E	Secondary	Roof top collection, groundwater reliance and desalination plants	

SF1.2	Groundwater ecosystems	Groundwater ecosystems						https://www.lowyinstitute.org/the-interpreter/fight-freshwater-maldives
M2.1	Epipelagic ocean waters (shallow <200m)	Shallow open water <200m						
M1.3	Photic coral reefs	Coral reefs	2.6 & 2.7	Soil and sediment retention services				Coral reef ecosystems play a key role in dynamic island formation, enabling terrestrial final ES – water supply
N/A					Construction	F	Secondary	Indirect dependencies at Supplementary Table 5.
N/A					Wholesale and retail trade	G	Tertiary	Indirect dependencies at Supplementary Table 5.
MT1.3	Sandy shores	Sandy shores	3.2	Visual amenity services	Accommodation and food services	I	Tertiary	Ecosystem and visual amenity is particularly relevant to economic activity associated with tourism.
N/A					Transportation and communication	H&N	Tertiary	Indirect dependencies at Supplementary Table 5.
N/A					Financial services	K	Tertiary	Indirect dependencies at Supplementary Table 5.
MT1.3	Sandy shores	Sandy shores	3.2	Visual amenity services	Real Estate	L	Tertiary	Ecosystem and visual amenity is particularly relevant to economic activity associated with tourism.
N/A					Professional, scientific and technical activities	M	Tertiary	Indirect dependencies at Supplementary Table 5.
N/A					Public administration	O	Tertiary	Indirect dependencies at Supplementary Table 5.
N/A					Education	P	Tertiary	Indirect dependencies at Supplementary Table 5.
N/A					Human health and social work activities	Q	Tertiary	Indirect dependencies at Supplementary Table 5.
SM1.3	Sea caves	Sea caves	3.1	Recreation related services	Arts, entertainment and recreation & Other service activities	R & S	Tertiary	Tour services for diving, snorkelling, bird watching, sea cave diving, mud baths https://wanderlustfuvahmulah.com/index.php/sights-seeing/ ; sea bird watching; https://www.rockjumperbirding.com/tour-info/the-maldives-cetacean-seabird-cruise-2022/47756/
SM1.1	Anchialine caves	Underwater caves						
M1.3	Photic coral reefs	Coral reefs						
M1.5	Photo-limited marine animal forests	Marine animal forests						
M1.6	Subtidal rocky reefs	Rocky reefs						
M1.7	Subtidal sand beds	Sand beds						
M1.8	Subtidal mud plains	Mud plains						
M4.1	Submerged artificial structures	Shipwrecks						
MT2.2	Large seabird and pinniped colonies	Seabird colonies						
MT1.3	Sandy shores	Sandy shores						

Supplementary Table 4 | Direct conditional logic chains – essential products and services (Australia)

Ecosystem type (Global ecosystem typology)			Environmental flow (SEEA EA classification)		Economic products and services (ANZSIC IOPC and IOPG category)		
T7.2	Sown pastures and fields	Sown pastures and fields	1.2	Grazed biomass provisioning services	01400040	Sheep and beef cattle agistment services	0101
T7.5	Derived semi-natural pastures and oldfields	Semi-natural pastures	1.2	Grazed biomass provisioning services			
T7.5	Derived semi-natural pastures and oldfields	Semi-natural pastures	1.8	Genetic material services	01910020	Horse stud and breeding services; horses nec	0102
T7.5	Derived semi-natural pastures and oldfields	Semi-natural pastures	1.2	Grazed biomass provisioning services	01910030	Horse agistment services	
T7.3	Plantations	Plantations	1.5	Wood provisioning services	03020030	Logging services	0301
T1.2	Tropical-subtropical dry forests and thickets	Dry forests	1.5	Wood provisioning services			
T2.3	Oceanic cool temperate rainforests	Cool rainforests	1.5	Wood provisioning services			
T2.4	Warm temperate laurophyll forests	Warm forests	1.5	Wood provisioning services			
T2.5	Temperate pyric humid forests	Fire prone complex forests	1.5	Wood provisioning services			
T2.6	Temperate pyric sclerophyll forests and woodlands	Fire prone forests and woodlands	1.5	Wood provisioning services			
T4.4	Temperate woodlands	Woodlands	1.5	Wood provisioning services			
M1.4	Shellfish beds and reefs	Shellfish reefs	1.6	Wild fish and other natural aquatic products provisioning services	04200080	Hunting and trapping services; raw skins from hunting or trapping; game meat from hunting or trapping	0401
M1.1	Seagrass meadows	Seagrass meadows	1.6	Wild fish and other natural aquatic products provisioning services			
M1.3	Photic coral reefs	Coral reefs	1.6	Wild fish and other natural aquatic products provisioning services			
M1.5	Photo-limited marine animal forests	Marine animal forests	1.6	Wild fish and other natural aquatic products provisioning services			
M1.6	Subtidal rocky reefs	Rocky reefs	1.6	Wild fish and other natural aquatic products provisioning services			
M1.7	Subtidal sand beds	Sand beds	1.6	Wild fish and other natural aquatic products provisioning services			
M2.1	Epipelagic ocean waters	Shallow open water <200m	1.6	Wild fish and other natural aquatic products provisioning services			
M3.1	Continental and island slopes	Continental slopes	1.6	Wild fish and other natural aquatic products provisioning services			

M3.2	Submarine canyons	Ocean canyons	1.6	Wild fish and other natural aquatic products provisioning services			
M3.3	Abyssal plains	Abyss floors	1.6	Wild fish and other natural aquatic products provisioning services			
M3.4	Seamounts, ridges and plateaus	Deep rocky floors	1.6	Wild fish and other natural aquatic products provisioning services			
M1	Marine shelf biome	Marine shelf biome	1.6	Wild fish and other natural aquatic products provisioning services			
MFT1.1	Coastal river deltas	Coastal river deltas	1.6	Wild fish and other natural aquatic products provisioning services			
FM1.2	Permanently open riverine estuaries and bays	River estuaries and bays	1.6	Wild fish and other natural aquatic products provisioning services			
F1.1	Permanent upland streams	Permanent streams	1.6	Wild fish and other natural aquatic products provisioning services			
F1.2	Permanent lowland rivers	Permanent rivers	1.6	Wild fish and other natural aquatic products provisioning services			
T7.3	Plantations	Plantations	1.5	Wood provisioning services	05100010	Forestry support services nec	0501
T1.2	Tropical-subtropical dry forests and thickets	Dry forests	1.5	Wood provisioning services			
T2.3	Oceanic cool temperate rainforests	Cool rainforests	1.5	Wood provisioning services			
T2.4	Warm temperate laurophyll forests	Warm forests	1.5	Wood provisioning services			
T2.5	Temperate pyric humid forests	Fire prone complex forests	1.5	Wood provisioning services			
T2.6	Temperate pyric sclerophyll forests and woodlands	Fire prone forests and woodlands	1.5	Wood provisioning services			
T4.4	Temperate woodlands	Woodlands	1.5	Wood provisioning services			
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	05210010	Cotton - ginned; cotton seed, waste from cotton and cotton ginning services	
T7.2	Sown pastures and fields	Sown pastures and fields	1.2	Grazed biomass provisioning services	05220010	Shearing services	
T7.5	Derived semi-natural pastures and oldfields	Semi-natural pastures	1.2	Grazed biomass provisioning services			

M1.4	Shellfish beds and reefs	Shellfish reefs	1.6	Wild fish and other natural aquatic products provisioning services	05290030	Fishing support services nec	
M1	Marine shelf biome	Marine shelf biome	1.6	Wild fish and other natural aquatic products provisioning services			
M1.1	Seagrass meadows	Seagrass meadows	1.6	Wild fish and other natural aquatic products provisioning services			
M1.3	Photic coral reefs	Coral reefs	1.6	Wild fish and other natural aquatic products provisioning services			
M1.5	Photo-limited marine animal forests	Marine animal forests	1.6	Wild fish and other natural aquatic products provisioning services			
M1.6	Subtidal rocky reefs	Rocky reefs	1.6	Wild fish and other natural aquatic products provisioning services			
M1.7	Subtidal sand beds	Sand beds	1.6	Wild fish and other natural aquatic products provisioning services			
M2.1	Epipelagic ocean waters	Shallow open water <200m	1.6	Wild fish and other natural aquatic products provisioning services			
MFT1.1	Coastal river deltas	Coastal river deltas	1.6	Wild fish and other natural aquatic products provisioning services			
FM1.2	Permanently open riverine estuaries and bays	River estuaries and bays	1.6	Wild fish and other natural aquatic products provisioning services			
F1.1	Permanent upland streams	Permanent streams	1.6	Wild fish and other natural aquatic products provisioning services			
F1.2	Permanent lowland rivers	Permanent rivers	1.6	Wild fish and other natural aquatic products provisioning services			
M3.1	Continental and island slopes	Continental slopes	1.6	Wild fish and other natural aquatic products provisioning services			
M3.2	Submarine canyons	Ocean canyons	1.6	Wild fish and other natural aquatic products provisioning services			
M3.3	Abyssal plains	Abyss floors	1.6	Wild fish and other natural aquatic products provisioning services			
M3.4	Seamounts, ridges and plateaus	Deep rocky floors	1.6	Wild fish and other natural aquatic products provisioning services			
M4.2	Marine aquafarms	Marine aquafarms	1.4	Aquaculture provisioning services			

F3.4	Freshwater aquafarms	Freshwater aquafarms	1.4	Aquaculture provisioning services			
T7.2	Sown pastures and fields	Sown pastures and fields	1.2	Grazed biomass provisioning services	05290060	Agriculture support services nec	
T7.5	Derived semi-natural pastures and oldfields	Semi-natural pastures	1.2	Grazed biomass provisioning services			
F3.3	Rice paddies	Rice paddies	1.1	Crop provisioning services			
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services			
S2.1	Anthropogenic subterranean voids	Mining tunnels		Abiotic flows			
M1	Marine shelf biome	Marine shelf biome		Abiotic flows	10900010	Mining support services nec	1001
N/A	Non-specific mining area	Non-specific mining area	N/A	Abiotic flows			
M2.1	Epipelagic ocean waters	Shallow open water <200m		Abiotic flows			
M2.2	Mesopelagic ocean waters	Low light waters <1000m		Abiotic flows			
M2.3	Bathypelagic ocean waters	Dark waters <3000m		Abiotic flows			
M3	Deep sea floors biome	Deep sea floors biome		Abiotic flows			
MT1.3	Sandy shores	Sandy shores		Abiotic flows			
M1.7	Subtidal sand beds	Sand beds		Abiotic flows			
M3.1	Continental and island slopes	Continental slopes		Abiotic flows			
T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems		Abiotic flows			
F2.7	Ephemeral salt lakes	Mostly dry salt lakes		Abiotic flows			
F3.1	Large reservoirs	Dams	1.9	Water supply services	26120010	Hydro-electricity	2601
T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems	2.8	Solid waste remediation services	28120010	Sewerage and drainage services	2801
T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems	2.9 2.10	Water purification services			

T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems	2.8	Solid waste remediation services	29000010	Waste collection (incl skip and portable toilet hire), treatment disposal remediation and materials recovery services	2901
T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems	2.9 2.10	Water purification services			
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	53010010	Grain storage services	5201
T7.2	Sown pastures and fields	Sown pastures and fields	1.2	Grazed biomass provisioning services	67200020	Agricultural or pastoral property broking, leasing, renting or valuing	6702
T7.5	Derived semi-natural pastures and oldfields	Semi-natural pastures	1.2	Grazed biomass provisioning services			
F3.3	Rice paddies	Rice paddies	1.1	Crop provisioning services			
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services			
	Unspecified ecosystems	Unspecified ecosystems	3.3	Education, scientific and research services	69000210	Research and development services	6901
	Unspecified ecosystems	Unspecified ecosystems	1.8	Genetic material services	69000230		
	Unspecified ecosystems	Unspecified ecosystems	3.3	Education, scientific and research services			
T7.1	Annual croplands	Annual croplands	1.1	Crop provisioning services	73200020	Packaging of fresh produce or groceries; bottling or rebottling services and packaging services nec	7310
T7.2	Sown pastures and fields	Sown pastures and fields	1.2	Grazed biomass provisioning services			
T7.5	Derived semi-natural pastures and oldfields	Semi-natural pastures	1.2	Grazed biomass provisioning services			
F3.3	Rice paddies	Rice paddies	1.1	Crop provisioning services			
	Unspecified ecosystems	Unspecified ecosystems	3.3	Education, scientific and research services	81010010	Technical, vocational and non-tertiary education services nec	8110
	Unspecified ecosystems	Unspecified ecosystems	3.3	Education, scientific and research services	81020010	Tertiary higher education services (incl undergraduate and postgraduate)	

Supplementary Table 5 | Maldives indirect dependency network

From industry with direct nature dependency	To first level indirectly dependent industry	To second level indirectly dependent industry
Electricity, water and waste management	Fisheries	Not relevant
	Manufacturing	Not relevant
	Construction	Finance services
	Wholesale and retail trade	Not relevant
	Accommodation and food services	Finance services
	Transportation and communication	Not relevant
	Real Estate	Not relevant
	Professional, scientific and technical activities	Finance services
	Public administration	Not relevant
	Education	Finance services
	Human health and social work activities	Not relevant
	Arts, entertainment and recreation & Other service activities	Not relevant
Agriculture	Fisheries	Not relevant
	Manufacturing	Not relevant
	Accommodation and food services	Not relevant
	Public administration	Not relevant
Fisheries	Manufacturing	Not relevant
	Accommodation and food services	Not relevant

Supplementary Table 6 | Direct wellbeing logic chains – essential ecosystem services (Australia)

Ecosystem type (Global ecosystem typology)			Ecosystem service (SEEA EA classification)		Explanation for logic chains
T1.1	Tropical-subtropical lowland rainforests	Tropical rainforests	1.5	Wood provisioning services	Firewood collection on public and private land generally permitted, except in QLD (therefore excludes mountain forests) https://www.vic.gov.au/collecting-firewood https://www.wa.gov.au/service/environment/conservation/view-maps-domestic-firewood-gathering-areas https://www.environment.sa.gov.au/goodliving/posts/2016/05/collecting-firewood https://www.desi.qld.gov.au/our-department/news-media/mediareleases/2022/dont-go-bush-for-firewood https://www.service.nsw.gov.au/transaction/apply-for-a-firewood-permit
T1.2	Tropical-subtropical dry forests and thickets	Dry forests			
T2.3	Oceanic cool temperate rainforests	Cool rainforests			
T2.4	Warm temperate laurophyll forests	Warm forests			
T2.5	Temperate pyric humid forests	Fire prone complex forests			
T2.6	Temperate pyric sclerophyll forests and woodlands	Fire prone forests and woodlands			
T4.4	Temperate woodlands	Woodland			
SF1.2	Groundwater ecosystems	Groundwater ecosystems	1.9	Water supply services	Self-extraction from private groundwater bores, roof tops and accessible rivers and streams, including seasonal rivers and streams consistent with national water supply ecosystem service accounts https://www.abs.gov.au/statistics/detailed-methodology-information/information-papers/measuring-and-valuing-australias-ecosystems#appendices
F1.1	Permanent upland streams	Permanent streams			
F1.2	Permanent lowland rivers	Permanent rivers			
F1.4	Seasonal upland streams	Seasonal streams			
F1.5	Seasonal lowland rivers	Seasonal rivers			
T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems			
T1.1	Tropical-subtropical lowland rainforests	Tropical rainforests	2.1	Global climate regulation services	Forest and blue carbon ecosystems are identified due to the key role in sequestration and storage. Grasslands are also identified due to the volume of carbon sequestration and storage, consistent with national ecosystem accounts. Ocean waters, to the depth of light penetration (photosynthesis capability) are identified due to direct carbon dioxide and heat absorption. Sea ice reflect heat. https://www.chiefscientist.gov.au/2009/12/which-plants-store-more-carbon-in-australia-forests-or-grasses https://www.dccew.gov.au/environment/marine/coastal-blue-carbon-ecosystems https://www.abs.gov.au/methodologies/national-ecosystem-accounts-experimental-estimates-methodology/2020-21 https://www.un.org/en/climatechange/science/climate-issues/ocean https://oceanservice.noaa.gov/facts/sea-ice-climate.html
T1.2	Tropical-subtropical dry forests and thickets	Dry forests			
T1.3	Tropical-subtropical montane rainforests	Mountain rainforests			
T2.3	Oceanic cool temperate rainforests	Cool rainforests			
T2.4	Warm temperate laurophyll forests	Warm forests			
T2.5	Temperate pyric humid forests	Fire prone complex forests			
T2.6	Temperate pyric sclerophyll forests and woodlands	Fire prone forests and woodlands			
T4.2	Pyric tussock savannas	Fire prone grass savannas			

T4.3	Hummock savannas	Grass savannas			
T4.4	Temperate woodlands	Woodland			
T4.5	Temperate subhumid grasslands	Grassland			
T6.4	Temperate alpine grasslands and shrublands	Alpine grasslands			
T7.2	Sown pastures and fields	Sown pastures and fields			
TF1.1	Tropical flooded forests and peat forests	Flooded forests			
TF1.2	Subtropical/temperate forested wetlands	Forested wetlands			
MFT1.2	Intertidal forests and shrublands	Mangroves			
M1.1	Seagrass meadows	Seagrass meadows			
M1.2	Kelp forests	Kelp forests			
MFT1.3	Coastal saltmarshes and reedbeds	Saltmarshes			
M2.1	Epipelagic ocean waters	Shallow open water <200m			
M2.2	Mesopelagic ocean waters	Low light waters <1000m			
M2.5	Sea ice	Sea ice			
T1.1	Tropical-subtropical lowland rainforests	Tropical rainforests	2.4	Air filtration services	Mainly provided by forests and woodlands as per the SEEA ES logic chain supplement (https://seea.un.org/sites/seea.un.org/files/documents/EA/seea_ea_online_supplement_ecosystem_services_logic_chains.xlsx) All Australian forests and woodlands included.
T1.2	Tropical-subtropical dry forests and thickets	Dry forests			
T1.3	Tropical-subtropical montane rainforests	Mountain rainforests			
T2.3	Oceanic cool temperate rainforests	Cool rainforests			
T2.4	Warm temperate laurophyll forests	Warm forests			
T2.5	Temperate pyric humid forests	Fire prone complex forests			
T2.6	Temperate pyric sclerophyll forests and woodlands	Fire prone forests and woodlands			
T4.4	Temperate woodlands	Woodland			
T7.3	Plantations	Plantations			

TF1.2	Subtropical/temperate forested wetlands	Forested wetlands			
MFT1.2	Intertidal forests and shrublands	Mangroves			
T1.1	Tropical-subtropical lowland rainforests	Tropical rainforests	2.7	Landslide mitigation services	Most relevant to forested areas with steep slopes (greater than 20 degrees). All Australian forests and woodlands included, noting slope is not accounted for in the logic chains. https://svs.gsfc.nasa.gov/4631 ; https://earthobservatory.nasa.gov/images/89937/a-global-view-of-landslide-susceptibility ; https://www.kgs.ku.edu/Current/2000/ohlmacher/ohlmacher7.html
T1.2	Tropical-subtropical dry forests and thickets	Dry forests			
T1.3	Tropical-subtropical montane rainforests	Mountain rainforests			
T2.3	Oceanic cool temperate rainforests	Cool rainforests			
T2.4	Warm temperate laurophyll forests	Warm forests			
T2.5	Temperate pyric humid forests	Fire prone complex forests			
T2.6	Temperate pyric sclerophyll forests and woodlands	Fire prone forests and woodlands			
T4.4	Temperate woodlands	Woodland			
F3.2	Constructed lacustrine wetlands	Farm dams, waste water ponds	2.8	Solid waste remediation	Natural and constructed wetlands play a key role in this service, otherwise the normal functioning of other ecosystem types are considered intermediate ES. Watson et al 2016 https://doi.org/10.1016/j.ecoser.2016.06.011 Dell' Anno et al 2021 https://doi.org/10.3390/microorganisms9081695 Duke et al 1999 https://www.amsa.gov.au/sites/default/files/1999-07-mp-research-article-bioremediation-oil-spills.pdf https://www.dcceew.gov.au/water/wetlands/publications/factsheet-wetlands-water-quality
TF1.2	Subtropical/temperate forested wetlands	Forested wetlands			
TF1.3	Permanent marshes	Marshes			
TF1.4	Seasonal floodplain marshes	Floodplain marshes			
TF1.5	Episodic arid floodplains	Episodic arid floodplains			
TF1.6	Boreal, temperate and montane peat bogs	Peat bogs			
F3.2	Constructed lacustrine wetlands	Farm dams, waste water ponds	2.12	Peak flow mitigation services	Regarding the regulation of river flooding, the most relevant ecosystems are wetlands and forests in watersheds (https://seea.un.org/sites/seea.un.org/files/discussion_paper_7_-_water_flow_regulation_final.pdf)
TF1.2	Subtropical/temperate forested wetlands	Forested wetlands			
TF1.3	Permanent marshes	Marshes			
TF1.4	Seasonal floodplain marshes	Floodplain marshes			
TF1.5	Episodic arid floodplains	Episodic arid floodplains			
TF1.6	Boreal, temperate and montane peat bogs	Peat bogs			
T1.1	Tropical-subtropical lowland rainforests	Tropical rainforests			
T1.2	Tropical-subtropical dry forests and thickets	Dry forests			

T1.3	Tropical-subtropical montane rainforests	Mountain rainforests			
T2.3	Oceanic cool temperate rainforests	Cool rainforests			
T2.4	Warm temperate laurophyll forests	Warm forests			
T2.5	Temperate pyric humid forests	Fire prone complex forests			
T2.6	Temperate pyric sclerophyll forests and woodlands	Fire prone forests and woodlands			
T4.4	Temperate woodlands	Woodland			
MFT1.2	Intertidal forests and shrublands	Mangroves	2.13	Coastal protection services	The most relevant ecosystems are mangroves, coral reefs and dunes, as well as kelp forests, oyster beds, seagrass, and unvegetated sediment, noting sand dunes are not classified in the GET. https://seea.un.org/sites/seea.un.org/files/discussion_paper_7_water_flow_regulation_final.pdf https://www.ramsar.org/sites/default/files/documents/library/services_03_e.pdf
M1.1	Seagrass meadows	Seagrass meadows			
M1.2	Kelp forests	Kelp forests			
M1.3	Photic coral reefs	Coral reefs			
M1.4	Shellfish beds and reefs	Shellfish reefs			
MFT1.3	Coastal saltmarshes and reedbeds	Saltmarshes			
F1.1	Permanent upland streams	Permanent streams	2.14	River flood mitigation services	Riparian vegetation associated with river ecosystems (https://seea.un.org/sites/seea.un.org/files/documents/EA/seea_ea_online_supplement_ecosystem_services_logic_chains.xlsx)
F1.2	Permanent lowland rivers	Permanent rivers			
F1.3	Freeze-thaw rivers and streams	Freeze-thaw rivers and streams			
F1.4	Seasonal upland streams	Seasonal streams			
F1.5	Seasonal lowland rivers	Seasonal rivers			
F1.6	Episodic arid rivers	Episodic arid rivers			
F3.2	Constructed lacustrine wetlands	Farm dams, waste water ponds	2.21	Other regulating and maintenance services (Fire protection)	Wetland ecosystems included for their potential to provide fire protection services. Other ecosystem types of low combustibility, or those comprising other factors of reduced fire risk, such as fuel loads, tree density, grassland buffers and diversity in landscapes and uses (Depietri and Orenstein, 2019) are not included in logic chains. https://doi.org/10.3389/fenvs.2019.00107
TF1.3	Permanent marshes	Marshes			
TF1.4	Seasonal floodplain marshes	Floodplain marshes			
TF1.5	Episodic arid floodplains	Episodic arid floodplains			
TF1.6	Boreal, temperate and montane peat bogs	Peat bogs			
T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems	3.1	Recreation related services	Services provided by 'green and blue spaces' are important for mental health and are identified consistent with Li et al (2023) who defined the spaces as statistical mesh blocks labelled as 'parkland' or 'water', such as parks, open space, nature reserves, sporting facilities, lakes and rivers. Parklands are often part of urban ecosystems, however nature reserves correspond to many potential ecosystem types and are not individually listed in the logic chains. https://doi.org/10.1016/j.healthplace.2023.103103
MT1.1	Rocky shores	Rocky shores			
MT1.2	Muddy shores	Muddy shores			
MT1.3	Sandy shores	Sandy shores			

MT1.4	Boulder and cobble shores	Boulder and cobble shores			
MT3.1	Artificial shores	Artificial shores			
F1.1	Permanent upland streams	Permanent streams			
F1.2	Permanent lowland rivers	Permanent rivers			
F1.4	Seasonal upland streams	Seasonal streams			
F1.5	Seasonal lowland rivers	Seasonal rivers			
F1.6	Episodic arid rivers	Episodic arid rivers			
F2.1	Large permanent freshwater lakes	Large lakes			
F2.2	Small permanent freshwater lakes	Small lakes			
F2.3	Seasonal freshwater lakes	Seasonal lakes			
F2.8	Artesian springs and oases	Artesian springs			
F3.1	Large reservoirs	Dams			

Supplementary Table 7 | Explanation for Australian nature-economy logic chains

Assessment of all economic product and service categories (2020-21), type of nature dependency and the importance, with supporting information. Immediate derivatives are highlighted blue, Services are highlighted pink, Out of scope categories are highlighted grey.

Primary industries

IOPC	Description	IOPG	Production type	Dependency type	Importance hierarchy level	Importance reason	Final environmental flow	Explanation for logic chains
01110010	Nursery plants - grown undercover nec	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in nurseries
01120010	Nursery plants - grown outdoors nec	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in nurseries
01120020	Orchard and vineyard growing	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit to plantations
01130010	Turf	0103	Raw material	Direct material	2 – Essential	Mental health – access to green space	Crop provisioning	Overt logical fit, grown in turf farms
01140010	Flowers (incl cut flowers) and flower seeds - grown undercover	0103	Raw material	Direct material	4 – Non-essential	Discretionary comfort	Crop provisioning	Overt logical fit, grown in flower farms
01150010	Flowers (incl cut flowers) and flower seeds - grown outdoors	0103	Raw material	Direct material	4 – Non-essential	Discretionary comfort	Crop provisioning	Overt logical fit, grown in flower farms
01210010	Mushrooms - fresh or chilled	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit to grow rooms
01210020	Mushroom spawn	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit to grow rooms
01220010	Lettuces - grown undercover	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in nurseries
01220020	Tomatoes - grown undercover	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in nurseries
01220030	Vegetables nec - grown undercover	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in nurseries
01230010	Lettuces - grown outdoors	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01230020	Tomatoes - grown outdoors	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01230030	Potatoes, sweet potatoes and edible roots and tubers nec - grown outdoors	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01230040	Beans, french and runner; peas - green or blue grown outdoors	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms

01230050	Cabbages, brussels sprouts, cauliflowers and headed broccoli - grown outdoors	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01230060	Carrots - grown outdoors	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01230070	Onions - grown outdoors	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01230080	Vegetable seeds	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, harvest from farms
01230090	Other vegetables (incl melons) - fresh or chilled grown outdoors	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01310010	Grapes - table	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, annual croplands provide best fit for vineyards
01310020	Grapes - wine	0103	Raw material	Direct material	4 – Non-essential	Discretionary comfort	Crop provisioning	Overt logical fit, annual croplands provide best fit for vineyards
01310030	Grapes - sun-dried or for drying	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, annual croplands provide best fit for vineyards
01320010	Kiwi fruit	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, annual croplands provide best fit for vineyards
01330010	Strawberries	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01330020	Berries nec - fresh and sun-dried	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01340010	Apples - fresh and sun-dried	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, annual croplands provide best fit for orchards
01340020	Pears and quinces - fresh and sun-dried	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, annual croplands provide best fit for orchards
01350010	Stone fruit - fresh and sun-dried	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, annual croplands provide best fit for orchards
01360010	Citrus fruit - fresh and sun-dried	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, annual croplands provide best fit for orchards
01370010	Olives - fresh and sun-dried	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, annual croplands provide best fit for orchards
01390010	Bananas - fresh and sun-dried	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01390020	Orchard fruit nec - fresh and sun-dried	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, annual croplands provide best fit for orchards
01390030	Almonds and macadamias	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, annual croplands provide best fit for orchards
01390040	Edible nuts (excl peanuts) nec; Fruit nec - fresh and sun-dried	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, annual croplands provide best fit for orchards
01400010	Sheep and lambs	0101	Raw material	Direct material	1 – Essential	Food	Grazed biomass provisioning	Overt logical fit, livestock raised in managed pastures and fields

01400020	Wool - shorn and dead	0101	Immediate derivative	Indirect	1 – Essential	Food	N/A	N/A
01400030	Sheep and lamb products nec	0101	Immediate derivative	Indirect	1 – Essential	Food	N/A	N/A
01400040	Sheep and beef cattle agistment services	0101	Service	Direct conditional	1 – Essential	Food	Grazed biomass provisioning	Overt logical fit to managed pastures and fields
01400050	Beef cattle and calves	0101	Raw material	Direct material	1 – Essential	Food	Grazed biomass provisioning	Overt logical fit, livestock raised in managed pastures and fields
01400060	Beef cattle and calves products (excl milk) nec	0101	Immediate derivative	Indirect	1 – Essential	Food	N/A	N/A
01400070	Rice - in the husk	0101	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit to rice paddies
01400080	Wheat (incl spelt) and meslin - unmilled	0101	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01400090	Barley - unmilled	0101	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01400100	Oats - unmilled	0101	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01400110	Sorghum - for grain	0101	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01400120	Lupins - white or yellow for grain	0101	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01400130	Oilseeds (incl canola)	0101	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01400140	Legumes for grain nec	0101	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01400150	Cereal grains nec	0101	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01510010	Sugar cane - for planting or crushing	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01520010	Cotton (excl ginned)	0103	Raw material	Direct material	3 – Essential	Clothing	Crop provisioning	Overt logical fit, grown in farms
01590010	Forage sorghum	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01590020	Forage products nec	0103	Immediate derivative	Indirect	1 – Essential	Food	N/A	N/A
01590030	Tobacco	0103	Raw material – zero production	Direct	N/A	N/A	N/A	N/A
01590040	Beverage and spice crops	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01590050	Grass, lucerne and clover seed	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms

01590060	Hay, cereal grasses and fodder	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01590090	Peanuts	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, annual croplands provide best fit for orchards
01590110	Natural rubber	0103	Raw material	Direct material	2 – Essential	Medical uses	Crop provisioning	Overt logical fit, grown in farms as per: https://www.agric.wa.gov.au/export-services/dryland-natural-rubber-grower-group-rd-grants-program ; and https://www.business.qld.gov.au/industries/farms-fishing-forestry/forests-wood/properties-timbers/rubberwood
01590120	Crops nec	0103	Raw material	Direct material	1 – Essential	Food	Crop provisioning	Overt logical fit, grown in farms
01600010	Whole milk - chilled but otherwise untreated	0101	Immediate derivative	Indirect	1 – Essential	Food	N/A	N/A
01600020	Dairy cattle	0101	Raw material	Direct material	1 – Essential	Food	Grazed biomass provisioning	Overt logical fit, livestock raised in managed pastures and fields
01710010	Poultry - for slaughtering	0102	Raw material	Direct material	1 – Essential	Food	Grazed biomass provisioning	Overt logical fit, partially raised in managed pastures
01720010	Eggs	0102	Immediate derivative	Indirect	1 – Essential	Food	N/A	N/A
01720020	Poultry - for eggs	0102	Raw material	Direct material	1 – Essential	Food	Grazed biomass provisioning	Overt logical fit, partially raised in managed pastures
01800010	Deer	0102	Raw material	Direct material	1 – Essential	Food	Grazed biomass provisioning	Overt logical fit, livestock raised in managed pastures and fields
01910010	Thoroughbred horses	0102	Raw material	Direct material	2 – Essential	Law enforcement	Grazed biomass provisioning	Overt logical fit, raised in managed pastures
01910020	Horse stud and breeding services; horses nec	0102	Service	Indirect	2 – Essential	Law enforcement	Genetic material	Breeding occurs in managed pastures
01910030	Horse agistment services	0102	Service	Direct conditional	2 – Essential	Law enforcement	Grazed biomass provisioning	Overt logical fit to managed pastures
01920010	Pigs	0102	Raw material	Direct material	1 – Essential	Food	Grazed biomass provisioning	Overt logical fit, livestock raised in managed pastures
01930010	Unblended honey and beeswax	0102	Raw material	Direct material	1 – Essential	Food	Other provisioning	Overt logical fit, commercial bees may occur in annual croplands, and all forest and woodland ecosystems. Around 70% of honey is produced from native flora, with NSW and QLD being the largest producers of commercial honey

								https://www.agriculture.gov.au/agriculture-land/farm-food-drought/hort-policy/honeybees; https://qbabees.org.au/beekeeping-in-queensland/
01990010	Pet breeding and live animals nec	0102	Raw material	Indirect	2 – Essential	Service animals	Genetic material	Breeding occurs in rural/urban ecosystems
01990020	Livestock products nec	0102	Immediate derivative	Indirect	1 – Essential	Food	N/A	N/A
02000010	Farmed oysters (incl pearl), pearls, paua and molluscs nec; cultured pearls	0201	Raw material	Direct material	1 – Essential	Food	Aquaculture provisioning	Overt logical fit to marine aquafarms
02000040	Farmed prawns and crustaceans nec	0201	Raw material	Direct material	1 – Essential	Food	Aquaculture provisioning	Overt logical fit to marine aquafarms
02000060	Farmed fish, fish hatchery products and seaweed; aquaculture nec	0201	Raw material	Direct material	1 – Essential	Food	Aquaculture provisioning	Overt logical fit to marine aquafarms
02031980	General government consumption of fixed capital (0201-0203)	0201	Out of scope	N/A	N/A	N/A	N/A	N/A
03010010	Natural gums and resins (incl oleoresins)	0301	Raw material	Direct material	2 – Essential	Medical uses	Crop provisioning	Overt logical fit to plantations
03010020	Softwoods (conifers) - growing	0301	Raw material	Direct material	2 – Essential	Health and housing	Wood provisioning	Overt logical fit to plantations
03010030	Hardwoods, brushwoods and scrubwoods - growing	0301	Raw material	Direct material	2 – Essential	Health and housing	Wood provisioning	Overt logical fit to plantations only as growing native forests are outside the production boundary
03010040	Forest products nec	0301	Immediate derivative	Indirect	2 – Essential	Health and housing	N/A	N/A
03020010	Softwoods (conifers) - logs	0301	Immediate derivative	Indirect	2 – Essential	Health and housing	N/A	N/A
03020020	Hardwoods, brushwoods and scrubwoods - logs; hewn timber and timber nec (incl firewood)	0301	Raw material and Immediate derivative	Direct material and indirect (depending on capital)	2 – Essential	Health and housing	Wood provisioning	Native forest logs inside the production boundary have an overt logical fit to all forest and woodland ecosystems except NSW and QLD-based rainforests, where logging is prohibited: https://www.researchgate.net/publication/39729723_Tropical_rainforest_logging_in_north_Queensland_Was_it_sustainable ; https://www.epa.nsw.gov.au/Your-environment/Native-forestry/Private-native-forestry/Old-growth-forest-and-rainforest Plantation logs are an immediate derivative of growing hardwoods, already identified above.
03020030	Logging services	0301	Service	Direct conditional	2 – Essential	Health and housing	Wood provisioning	Overt logical fit as per wood provisioning raw materials
03021980	General government consumption of fixed capital (0301-0302)	0301	Out of scope	N/A	N/A	N/A	N/A	N/A

04110010	Rock lobsters and crabs	0401	Raw material	Direct material	1 – Essential	Food	Wild fish and other natural aquatic products provisioning	Overt logical fit of wild flows from ecosystem types according to National ecosystem accounts https://www.abs.gov.au/statistics/environment/environmental-management/national-ecosystem-accounts-experimental-estimates/2020-21
04120010	Prawns	0401	Raw material	Direct material	1 – Essential	Food	Wild fish and other natural aquatic products provisioning	Overt logical fit of wild flows from ecosystem types according to National ecosystem accounts https://www.abs.gov.au/statistics/environment/environmental-management/national-ecosystem-accounts-experimental-estimates/2020-21
04130010	Fish and squid - line fishing	0401	Raw material	Direct material	1 – Essential	Food	Wild fish and other natural aquatic products provisioning	Overt logical fit of wild flows from ecosystem types according to National ecosystem accounts https://www.abs.gov.au/statistics/environment/environmental-management/national-ecosystem-accounts-experimental-estimates/2020-21
04140010	Fish - trawling or netting	0401	Raw material	Direct material	1 – Essential	Food	Wild fish and other natural aquatic products provisioning	Overt logical fit of wild flows from ecosystem types according to National ecosystem accounts https://www.abs.gov.au/statistics/environment/environmental-management/national-ecosystem-accounts-experimental-estimates/2020-21
04190010	Oysters and aquatic invertebrates nec - live, fresh or chilled (excl farmed); natural pearls	0401	Raw material	Direct material	1 – Essential	Food	Wild fish and other natural aquatic products provisioning	Overt logical fit to shellfish reefs supported by https://assessments.iucnrl.org/assessments/124
04190020	Coral and similar; shells of molluscs; natural animal sponges; algae - fresh or dried (excl farmed)	0401	Raw material	Direct material	2 – Essential	Medical uses	Wild fish and other natural aquatic products provisioning	Overt logical fit to coral reefs and the broader marine shelf biome
04190030	Freshwater fish and aquatic animals nec	0401	Raw material	Direct material	1 – Essential	Food	Wild fish and other natural aquatic products provisioning	Logic chains based on reliably running rivers and streams to support commercial fishing
04200080	Hunting and trapping services; raw skins from hunting or trapping; game meat from hunting or trapping	0401	Service	Direct conditional	1 – Essential	Food	Wild fish and other natural aquatic products provisioning	As per wild fish raw material logic chains

04201980	General government consumption of fixed capital (0411-0420)	0401	Out of scope	N/A	N/A	N/A	N/A	N/A
05100010	Forestry support services nec	0501	Service	Direct conditional	2 – Essential	Health and housing	Wood provisioning	As per wood provisioning raw material logic chains
05210010	Cotton - ginned; cotton seed, waste from cotton and cotton ginning services	0501	Service	Direct conditional	3 – Essential	Clothing	Crop provisioning	As per cotton raw material logic chains
05220010	Shearing services	0501	Service	Direct conditional	1 – Essential	Food	Grazed biomass provisioning	As per sheep raw material logic chains
05290030	Fishing support services nec	0501	Service	Direct conditional	1 – Essential	Food	Wild fish and other natural aquatic products provisioning	As per wild fish and marine and freshwater aquaculture raw material logic chains
05290060	Agriculture support services nec	0501	Service	Direct conditional	1 – Essential	Food	Crop provisioning and Grazed biomass provisioning	As per crop provisioning and grazed biomass raw material logic chains
05291980	General government consumption of fixed capital (0510-0529)	0501	Out of scope	N/A	N/A	N/A	N/A	N/A
06000010	Black coal	0601	Raw material	Direct material	2 – Essential	Electricity, steel making for health applications	Abiotic flow	Overt logical fit to mining tunnels and non-specific mining area
06000020	Brown coal/lignite and peat (excl horticultural)	0601	Raw material	Direct material	3 – Essential	Electricity	Abiotic flow	Overt logical fit to mining tunnels and non-specific mining area
07000010	Crude oil (incl condensate)	0701	Raw material	Direct material	3 – Essential	Transport, asphalt	Abiotic flow	Mining occurs in various environments across the marine shelf biome https://www.researchgate.net/publication/353560265_Decommissioning_Research_Needs_for_Offshore_Oil_and_Gas_Infrastructure_in_Australia , including over 2000m deep https://www.smh.com.au/environment/conservation/australia-s-deepest-offshore-well-approved-amid-call-for-transparency-20190619p51z7o.html
07000020	Liquefied natural gas	0701	Raw material	Direct material	1 – Essential	Heating, hot water, cooking, electricity	Abiotic flow	Overt logical fit to non-specific mining area
07000030	Natural gas - in the gaseous state	0701	Raw material	Direct material	1 – Essential	Heating, hot water, cooking, electricity	Abiotic flow	Overt logical fit to non-specific mining area
07000050	Coal seam gas	0701	Raw material	Direct material	1 – Essential	Heating, hot water, cooking, electricity	Abiotic flow	Overt logical fit to non-specific mining area

07000060	Other naturally occurring gases	0701	Raw material – zero production	Direct	N/A	N/A	N/A	N/A
07000070	Liquefied petroleum gas from the well head	0701	Raw material	Direct material	1 – Essential	Heating, hot water, cooking, electricity	Abiotic flow	Overt logical fit to non-specific mining area
08010090	Iron ore (incl treatment)	0801	Raw material	Direct material	2 – Essential	Steel making for health, transport and telecommunication applications	Abiotic flow	Overt logical fit to non-specific mining area
08020010	Bauxite and Aluminium Ores	0802	Raw material	Direct material	1 – Essential	Aluminium making for food storage applications	Abiotic flow	Overt logical fit to non-specific mining area
08030010	Copper concentrates, oxides and ores	0802	Raw material	Direct material	1 – Essential	Refrigeration, electricity, transport applications	Abiotic flow	Overt logical fit to non-specific mining area
08040010	Gold ores	0802	Raw material	Direct material	2 – Essential	Health applications	Abiotic flow	Overt logical fit to non-specific mining area
08050010	Beneficiated ilmenite, ilmenite and leucoxene concentrates	0802	Raw material	Direct material	2 – Essential	Titanium making for health and defence applications	Abiotic flow	Found on beaches in heavy mineral sand deposits https://www.ga.gov.au/data-pubs/data-and-publications-search/publications/critical-commodities-for-a-high-tech-world/surficial-mineral-systems .
08050020	Rutile concentrates	0802	Raw material	Direct material	2 – Essential	Titanium dioxide making for sunscreen	Abiotic flow	Found on beaches in heavy mineral sand deposits https://www.ga.gov.au/data-pubs/data-and-publications-search/publications/critical-commodities-for-a-high-tech-world/surficial-mineral-systems .
08050030	Monazite, xenotime and zircon concentrates; mineral sand ores nec	0802	Raw material	Direct material	2 – Essential	Yttrium making for medical applications	Abiotic flow	Found in sand deposits https://en.wikipedia.org/wiki/Xenotime#:~:text=Xenotime%20is%20used%20chiefly%20as,from%20the%20finest%20xenotime%20crystals
08060010	Nickel ores and concentrates	0802	Raw material	Direct material	2 – Essential	Stainless steel making for medical applications and renewable energy	Abiotic flow	Overt logical fit to non-specific mining area
08070010	Lead ores and concentrates	0802	Raw material	Direct material	3 – Essential	Roofing and telecommunication applications	Abiotic flow	Overt logical fit to non-specific mining area
08070030	Silver ores and concentrates	0802	Raw material	Direct material	2 – Essential	Medicinal and solar panel applications	Abiotic flow	Overt logical fit to non-specific mining area
08070040	Zinc ores and concentrates (incl silver-lead-zinc combined concentrates)	0802	Raw material	Direct material	3 – Essential	Used to galvanise steel, in construction and telecommunication	Abiotic flow	Overt logical fit to non-specific mining area

08090010	Tin, tin-copper and tin-tantalite concentrates	0802	Raw material	Direct material	1 – Essential	Fire retardants, making PVC for water supply and medical applications	Abiotic flow	Overt logical fit to non-specific mining area
08090020	Uranium concentrates	0802	Raw material	Direct material	2 – Essential	Nuclear medicine	Abiotic flow	Overt logical fit to non-specific mining area
08090030	Manganese ores	0802	Raw material	Direct material	3 – Essential	Steel making used in construction, telecommunication	Abiotic flow	Overt logical fit to non-specific mining area
08090040	Non-ferrous metallic ores and concentrates nec (incl tungsten)	0802	Raw material	Direct material	3 – Essential	Batteries, lighting and tools	Abiotic flow	Overt logical fit to non-specific mining area
09110010	Gravel	0901	Raw material	Direct material	3 – Essential	Concrete for housing and roads	Abiotic flow	Overt logical fit to non-specific mining area
09110020	Sand	0901	Raw material	Direct material	2 – Essential	Glass medical applications	Abiotic flow	Overt logical fit to sandy ecosystems
09190010	Dimension stone	0901	Raw material	Direct material	4 – Non-essential	Discretionary comfort	Abiotic flow	Overt logical fit to non-specific mining area
09190020	Pebbles, broken or crushed stone and macadam; tarred macadam; granules, chippings and powder of stone	0901	Raw material	Direct material	3 – Essential	Crushed stone used for road building	Abiotic flow	Overt logical fit to non-specific mining area
09190030	Limestone (incl shell and coral)	0901	Raw material	Direct material	1 – Essential	Lime for agriculture	Abiotic flow	Overt logical fit to non-specific mining area
09190040	Clays nec (incl brick, pipe, tile and shale)	0901	Raw material	Direct material	3 – Essential	Brick and cement for housing and roads	Abiotic flow	Overt logical fit to non-specific mining area
09190050	Construction materials (mined) nec (incl decomposed rock, residues etc) (excl crushed and broken stone and dimension stone)	0901	Raw material	Direct material	4 – Non-essential	Decorative, discretionary pathways	Abiotic flow	Overt logical fit to non-specific mining area
09900010	Salt	0901	Raw material	Direct material	1 – Essential	Food	Abiotic flow	Overt logical fit to salt lakes and adapted industrial ecosystems
09900020	Precious and semi-precious gemstones (incl garnet concentrate)	0901	Raw material	Direct material	4 – Non-essential	Decorative	Abiotic flow	Overt logical fit to non-specific mining area
09900030	Gypsum; anhydrite; calcareous stone of a kind used for the manufacture of lime or cement (excl limestone)	0901	Raw material	Direct material	1 – Essential	Agricultural applications	Abiotic flow	Overt logical fit to non-specific mining area
09900040	Silica	0901	Raw material	Direct material	3 – Essential	Solar panel applications	Abiotic flow	Overt logical fit to non-specific mining area
09900050	Natural phosphates and phosphate rock - unground	0901	Raw material	Direct material	1 – Essential	Fertiliser, agricultural applications	Abiotic flow	Overt logical fit to non-specific mining area
09900090	Chemical and fertiliser minerals nec; non-metallic minerals nec	0901	Raw material	Direct material	1 – Essential	Fertiliser, agricultural applications	Abiotic flow	Overt logical fit to non-specific mining area
10110010	Petroleum exploration	1001	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service or abiotic flow
10120010	Mineral exploration	1001	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service or abiotic flow

10900010	Mining support services nec	1001	Service	Direct conditional	1 – Essential	As per mineral uses	Abiotic flow	As per raw material logic chains for mineral resources
10901980	General government consumption of fixed capital (1011-1090)	1001	Out of scope	N/A	N/A	N/A	N/A	N/A

Manufacturing

IOPC	Description	IOPG	Production type	Dependency type	Importance hierarchy level	Importance reason	Final Environmental flow	Explanation for logic chains
11110010	Fresh meat - chilled or frozen (excl kangaroo or horse meat, other than for human consumption)	1101	Processed material	Indirect	N/A	N/A	N/A	N/A
11110020	Fresh kangaroo or horse meat, other than for human consumption	1101	Processed material	Indirect	N/A	N/A	N/A	N/A
11110070	Raw hides and skins - from manufacturing	1101	Processed material	Indirect	N/A	N/A	N/A	N/A
11110080	Meat (excl fresh) for human consumption	1101	Processed material	Indirect	N/A	N/A	N/A	N/A
11110160	Edible offals (excl poultry offals) and tallow (excl refined); other animal products nec	1101	Processed material	Indirect	N/A	N/A	N/A	N/A
11110170	Blood meal and inedible meat	1101	Processed material	Indirect	N/A	N/A	N/A	N/A
11110180	Meat products nec	1101	Processed material	Indirect	N/A	N/A	N/A	N/A
11120010	Poultry and poultry products (incl canned)	1101	Processed material	Indirect	N/A	N/A	N/A	N/A
11130090	Cured meat and smallgoods	1101	Processed material	Indirect	N/A	N/A	N/A	N/A
11131700	Meat and meat products - manufacturing services on a commission basis (ANZSIC Classes 1111-1113)	1101	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
11200080	Fish - fresh, canned, frozen or otherwise processed and fish products	1102	Processed material	Indirect	N/A	N/A	N/A	N/A
11200090	Seafood nec - chilled, frozen, preserved or otherwise prepared (incl crustaceans)	1102	Processed material	Indirect	N/A	N/A	N/A	N/A
11201700	Processed seafood - manufacturing services on a commission basis	1102	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
11201980	General government consumption of fixed capital (1120)	1102	Out of scope	N/A	N/A	N/A	N/A	N/A

11310030	Milk and cream	1103	Processed material	Indirect	N/A	N/A	N/A	N/A
11320010	Ice cream and frozen confections	1103	Processed material	Indirect	N/A	N/A	N/A	N/A
11330010	Flavoured whole milk drinks	1103	Processed material	Indirect	N/A	N/A	N/A	N/A
11330020	Sour cream, yoghurt and other cultured milk products	1103	Processed material	Indirect	N/A	N/A	N/A	N/A
11330050	Butter	1103	Processed material	Indirect	N/A	N/A	N/A	N/A
11330060	Cheese and curd	1103	Processed material	Indirect	N/A	N/A	N/A	N/A
11330100	Dairy products nec	1103	Processed material	Indirect	N/A	N/A	N/A	N/A
11331700	Dairy products - manufacturing services on a commission basis (ANZSIC Classes 1131-1133)	1103	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
11400020	Fruit juices - single strength or concentrated	1104	Processed material	Indirect	N/A	N/A	N/A	N/A
11400090	Vegetable juices (incl mixtures, incl tomato); mixtures of vegetable and fruit juices	1104	Processed material	Indirect	N/A	N/A	N/A	N/A
11400180	Preserved fruits (incl dried and jams) and fruit products nec	1104	Processed material	Indirect	N/A	N/A	N/A	N/A
11400190	Vegetables - frozen, prepared (incl salads) or preserved (incl dried or shelled); pickles and chutney; tomato pulp, puree and paste	1104	Processed material	Indirect	N/A	N/A	N/A	N/A
11400200	Fruit and vegetable processing products nec	1104	Processed material	Indirect	N/A	N/A	N/A	N/A
11401700	Fruit and vegetable products - manufacturing services on a commission basis	1104	Processed material	Indirect	N/A	N/A	N/A	N/A
11500020	Refined and processed animal or vegetable oils and fats (incl tallow) (excl neatsfoot, wool grease and lanolin)	1105	Processed material	Indirect	N/A	N/A	N/A	N/A
11500050	Crude vegetable oils (incl crude soya oil, margarine)	1105	Processed material	Indirect	N/A	N/A	N/A	N/A
11501700	Oils and fats - manufacturing services on a commission basis	1105	Processed material	Indirect	N/A	N/A	N/A	N/A
11610010	Wheat and other cereal flours (incl self-raising)	1106	Processed material	Indirect	N/A	N/A	N/A	N/A
11610050	Glucose, glucose syrup (incl dextrose) and modified starches (incl dextrins)	1106	Processed material	Indirect	N/A	N/A	N/A	N/A

11610100	Rice - husked, semi-milled or wholly milled	1106	Processed material	Indirect	N/A	N/A	N/A	N/A
11610110	Rice groats, meals and pellets; worked cereal grains and products nec	1106	Processed material	Indirect	N/A	N/A	N/A	N/A
11610140	Grain mill, root and cereal products nec; prepared baking mixes (excl rice based)	1106	Processed material	Indirect	N/A	N/A	N/A	N/A
11610150	Malt and malt extracts	1106	Processed material	Indirect	N/A	N/A	N/A	N/A
11620010	Cereal foods (incl breakfast foods)	1106	Processed material	Indirect	N/A	N/A	N/A	N/A
11620020	Grain Mill and Cereal products nec (incl custard powder)	1106	Processed material	Indirect	N/A	N/A	N/A	N/A
11620030	Pasta	1106	Processed material	Indirect	N/A	N/A	N/A	N/A
11621700	Grain mill and cereal products - manufacturing services on a commission basis (ANZSIC Classes 1161-1162)	1106	Service – zero production	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
11700010	Bread and bread rolls (excl dough)	1107	Processed material	Indirect	N/A	N/A	N/A	N/A
11700040	Meat pies	1107	Processed material	Indirect	N/A	N/A	N/A	N/A
11700090	Bakery products nec	1107	Processed material	Indirect	N/A	N/A	N/A	N/A
11700100	Bread dough (incl frozen)	1107	Processed material	Indirect	N/A	N/A	N/A	N/A
11701700	Bakery products - manufacturing services on a commission basis (ANZSIC Classes 1171-1174)	1107	Processed material	Indirect	N/A	N/A	N/A	N/A
11810010	Raw and refined sugar in solid form (incl brown sugar) (excl icing sugar)	1108	Processed material	Indirect	N/A	N/A	N/A	N/A
11810090	Sugar nec, molasses, syrups, artificial honey, starch and sugar products	1108	Processed material	Indirect	N/A	N/A	N/A	N/A
11820010	Chocolate confectionery (excl chocolate coated biscuits and white chocolate)	1108	Processed material	Indirect	N/A	N/A	N/A	N/A
11820090	Chewing gums, white chocolate, non-chocolate cocoa products and confectionery nec	1108	Processed material	Indirect	N/A	N/A	N/A	N/A
11821700	Sugar and confectionery - manufacturing services on a commission basis (ANZSIC Classes 1181-1182)	1108	Processed material	Indirect	N/A	N/A	N/A	N/A

11910090	Potato, corn and other crisp products	1109	Processed material	Indirect	N/A	N/A	N/A	N/A
11920011	Dog and cat food	1109	Processed material	Indirect	N/A	N/A	N/A	N/A
11920090	Prepared animal and bird feed (excl dog and cat foods)	1109	Processed material	Indirect	N/A	N/A	N/A	N/A
11990010	Coffee and tea (incl substitutes)	1109	Processed material	Indirect	N/A	N/A	N/A	N/A
11990190	Food products nec (incl jelly crystals, meat pastes, spices and condiments)	1109	Processed material	Indirect	N/A	N/A	N/A	N/A
11990200	Prepared meals and bakers' wares	1109	Processed material	Indirect	N/A	N/A	N/A	N/A
11991700	Other food products - manufacturing services on a commission basis (ANZSIC Classes 1191-1199)	1109	Service – zero production	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
11991970	Scrap waste from the manufacture of food and food products (1111-1199)	1109	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
11991980	General government consumption of fixed capital (1191-1199)	1109	Out of scope	N/A	N/A	N/A	N/A	N/A
12110100	Soft drink, cordial and syrup (incl waters)	1201	Processed material	Indirect	N/A	N/A	N/A	N/A
12111700	Soft drink, cordial and syrup - manufacturing services on a commission basis	1201	Processed material	Indirect	N/A	N/A	N/A	N/A
12120090	Beer, ale and stout	1202	Processed material	Indirect	N/A	N/A	N/A	N/A
12121700	Beer - manufacturing services on a commission basis	1202	Processed material	Indirect	N/A	N/A	N/A	N/A
12130030	Whisky, brandy, rum, gin and other distilled spirits, liqueurs, and other fortified spirits	1203	Processed material	Indirect	N/A	N/A	N/A	N/A
12130040	Alcoholic mixed drinks (excl wine based); distilled alcoholic beverages nec	1203	Processed material	Indirect	N/A	N/A	N/A	N/A
12140030	Vinegar from wine	1203	Processed material – zero production	Indirect	N/A	N/A	N/A	N/A
12140050	Cider, perry, mead and fermented beverages nec	1203	Processed material	Indirect	N/A	N/A	N/A	N/A
12140090	Wine and wine-based mixed drinks	1203	Processed material	Indirect	N/A	N/A	N/A	N/A
12141700	Wine, spirits and other alcoholic beverages - manufacturing services	1203	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service

	on a commission basis (ANZSIC Classes 1213-1214)							
12141970	Scrap waste from the manufacture of beverages (incl alcohol) (1211-1214)	1203	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
12200010	Cigarettes, cigars, cheroots and tobacco	1204	Processed material – zero production	Indirect	N/A	N/A	N/A	N/A
12201700	Cigarette and tobacco products - manufacturing services on a commission basis	1204	Service – zero production	Indirect	N/A	N/A	N/A	N/A
12201970	Scrap waste from the manufacture of tobacco products (1220)	1204	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
13110090	Wool scouring product	1301	Processed material	Indirect	N/A	N/A	N/A	N/A
13120090	Natural textile products	1301	Processed material	Indirect	N/A	N/A	N/A	N/A
13130100	Synthetic textile products	1301	Processed material	Indirect	N/A	N/A	N/A	N/A
13131700	Textiles - manufacturing services on a commission basis (ANZSIC Classes 1311-1313)	1301	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
13131970	Scrap waste from the manufacture of textiles (1311-1313)	1301	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
13200060	Leather or leather substitute articles nec (incl saddlery and harness of any material) (excl leather belts or gloves)	1302	Processed material	Indirect	N/A	N/A	N/A	N/A
13200080	Bags of leather or leather substitute (incl toiletry bags, purses, wallets, excl bags for packaging)	1302	Processed material	Indirect	N/A	N/A	N/A	N/A
13200090	Leather, prepared skins and furs	1302	Processed material	Indirect	N/A	N/A	N/A	N/A
13201700	Tanned leather, dressed fur and leather products - manufacturing services on a commission basis	1302	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
13201970	Scrap waste from the manufacture of dressed fur and leather products (1320)	1302	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
13300040	Carpets, textile and felt floor coverings (excl underfelt)	1303	Processed material	Indirect	N/A	N/A	N/A	N/A
13300050	Textile products nec	1303	Processed material	Indirect	N/A	N/A	N/A	N/A
13300060	Textile tarpaulins (incl canvas), sails, tents, pneumatic mattresses and	1303	Processed material	Indirect	N/A	N/A	N/A	N/A

	motor vehicle covers; rope, cable and products thereof (incl netting)							
13330080	Bags (for packaging), sacks and packets of textile or canvas	1303	Processed material	Indirect	N/A	N/A	N/A	N/A
13340060	Wadding, powder puffs, pads, cotton wool, gauze and bandages	1303	Processed material	Indirect	N/A	N/A	N/A	N/A
13340070	Textile finishing nec (incl binding, printing, garment dyeing) (excl labels, badges)	1303	Processed material	Indirect	N/A	N/A	N/A	N/A
13341700	Textile products - manufacturing services on a commission basis (ANZSIC Classes 1331-1334)	1303	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
13341970	Scrap waste from the manufacture of textile products (1331-1334)	1303	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
13341980	General government consumption of fixed capital (1331-1334)	1303	Out of scope	N/A	N/A	N/A	N/A	N/A
13400070	Knitted or crocheted fabrics (excl wearing apparel)	1304	Processed material	Indirect	N/A	N/A	N/A	N/A
13400080	Knitted or crocheted wearing apparel	1304	Processed material	Indirect	N/A	N/A	N/A	N/A
13401700	Knitted products - manufacturing services on a commission basis	1304	Service – zero production	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
13401970	Scrap waste from the manufacture of knitted products (1340)	1304	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
13510200	Clothing (excl knitted or crocheted)	1305	Processed material	Indirect	N/A	N/A	N/A	N/A
13511700	Clothing - manufacturing services on a commission basis	1305	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
13511970	Scrap waste from the manufacture of clothing (1351)	1305	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
13520100	Footwear	1306	Processed material	Indirect	N/A	N/A	N/A	N/A
13521700	Footwear - manufacturing services on a commission basis	1306	Service – zero production	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
13521970	Scrap waste from the manufacture of footwear (1352)	1306	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
14110010	Undressed sawn timber from logs sawn at same establishment (incl treated) (excl impregnated sleepers or resawn); shooks	1401	Processed material	Indirect	N/A	N/A	N/A	N/A
14110090	Treated wood in the rough (excl sawn timber - dressed or undressed); impregnated railway sleepers; ground bark	1401	Processed material	Indirect	N/A	N/A	N/A	N/A

14120010	Woodchips - softwood	1401	Processed material	Indirect	N/A	N/A	N/A	N/A
14120020	Woodchips - hardwood	1401	Processed material	Indirect	N/A	N/A	N/A	N/A
14130010	Resawn/seasoned timber (incl kiln dried) (excl sleepers, palings and shingles; chemically preserved)	1401	Processed material	Indirect	N/A	N/A	N/A	N/A
14130020	Dressed timber and mouldings of a thickness up to and including 6mm	1401	Processed material	Indirect	N/A	N/A	N/A	N/A
14130030	Dressed timber and mouldings of a thickness exceeding 6mm	1401	Processed material	Indirect	N/A	N/A	N/A	N/A
14130040	Chemically preserved re-sawn or dressed timber.	1401	Processed material	Indirect	N/A	N/A	N/A	N/A
14131700	Sawmill products - manufacturing services on a commission basis (ANZSIC Classes 1411-1413)	1401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
14910010	Prefabricated or transportable wooden buildings	1402	Processed material	Indirect	N/A	N/A	N/A	N/A
14920010	Doors - wooden (excl fire doors)	1402	Processed material	Indirect	N/A	N/A	N/A	N/A
14920020	Roof trusses - wooden	1402	Processed material	Indirect	N/A	N/A	N/A	N/A
14920030	Wooden wall and window (incl complete with glass) frames	1402	Processed material	Indirect	N/A	N/A	N/A	N/A
14920040	Custom made built-in wooden furniture	1402	Processed material	Indirect	N/A	N/A	N/A	N/A
14920050	Wooden builders joinery and carpentry nec	1402	Processed material	Indirect	N/A	N/A	N/A	N/A
14930010	Veneers (incl laminated)	1402	Processed material	Indirect	N/A	N/A	N/A	N/A
14930020	Plywood	1402	Processed material	Indirect	N/A	N/A	N/A	N/A
14930030	Glued laminated lumber	1402	Processed material	Indirect	N/A	N/A	N/A	N/A
14940010	Fibreboard (excl fibre paperboard and particle board)	1402	Processed material	Indirect	N/A	N/A	N/A	N/A
14940020	Cellular wood panels	1402	Processed material	Indirect	N/A	N/A	N/A	N/A
14940030	Particle board (incl laminated) and similar board of wood or other ligneous materials	1402	Processed material	Indirect	N/A	N/A	N/A	N/A
14940040	Laminates of timber and non-timber materials	1402	Processed material	Indirect	N/A	N/A	N/A	N/A

14940050	Boards manufactured from wood nec (incl densified wood in block or other shape)	1402	Processed material	Indirect	N/A	N/A	N/A	N/A
14990010	Parquetry strips etc - assembled into panels; shingles and shakes	1402	Processed material	Indirect	N/A	N/A	N/A	N/A
14990100	Other wood product manufacturing nec	1402	Processed material	Indirect	N/A	N/A	N/A	N/A
14991700	Other wood products - manufacturing services on a commission basis (ANZSIC Classes 1491-1499)	1402	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
14991970	Scrap waste from the manufacture of wood product manufacturing (1411-1499)	1402	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
15100070	Pulp, newsprint and paper stock	1501	Processed material	Indirect	N/A	N/A	N/A	N/A
15100080	Paper and paperboard	1501	Processed material	Indirect	N/A	N/A	N/A	N/A
15101700	Paper - manufacturing services on a commission basis	1501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
15200010	Corrugated paperboard sheeting, paperboard containers and paper bags	1502	Processed material	Indirect	N/A	N/A	N/A	N/A
15200020	Paper stationery products	1502	Processed material	Indirect	N/A	N/A	N/A	N/A
15240090	Sanitary paper products	1502	Processed material	Indirect	N/A	N/A	N/A	N/A
15290010	Paper and paperboard trays, dishes, plates, cups, cones, egg containers and box files	1502	Processed material	Indirect	N/A	N/A	N/A	N/A
15290090	Paper and paperboard products nec	1502	Processed material	Indirect	N/A	N/A	N/A	N/A
15291700	Paper products - manufacturing services on a commission basis (ANZSIC Classes 1521-1529)	1502	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
15291970	Scrap waste from manufacture of pulp and paper product manufacturing (1510-1529)	1502	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
15291980	General government consumption of fixed capital (1521-1529)	1502	Out of scope	N/A	N/A	N/A	N/A	N/A
16110070	Trade advertising material or commercial catalogues printed but not published by this business; printed matter nec	1601	Processed material	Indirect	N/A	N/A	N/A	N/A
16110100	Printing (excl trade advertising material or commercial catalogues)	1601	Processed material	Indirect	N/A	N/A	N/A	N/A

16120090	Printing support services	1601	Processed material	Indirect	N/A	N/A	N/A	N/A
16200090	Reproduced recorded media products	1601	Processed material	Indirect	N/A	N/A	N/A	N/A
16201970	Scrap waste from the printing trade and media reproduction services (1611-1620)	1601	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
16201980	General government consumption of fixed capital (1611-1620)	1601	Out of scope	N/A	N/A	N/A	N/A	N/A
17010010	Automotive petrol; gasoline refining or blending; motor spirit (incl aviation spirit)	1701	Processed material	Indirect	N/A	N/A	N/A	N/A
17010020	Kerosene (incl kerosene type jet fuel)	1701	Processed material	Indirect	N/A	N/A	N/A	N/A
17010050	Liquefied petroleum gas - produced at refineries	1701	Processed material	Indirect	N/A	N/A	N/A	N/A
17010070	Secondary feedstocks and topped/enriched crude for use in further refining and manufacturing (incl bituminous feedstocks) (excl scrap waste)	1701	Processed material	Indirect	N/A	N/A	N/A	N/A
17010120	Diesel (excl biodiesel)	1701	Processed material	Indirect	N/A	N/A	N/A	N/A
17010130	Gas oil or fuel oils nec	1701	Processed material	Indirect	N/A	N/A	N/A	N/A
17090120	Bituminous mixtures and other articles of asphalt	1701	Processed material	Indirect	N/A	N/A	N/A	N/A
17090130	Petroleum and coal products nec	1701	Processed material	Indirect	N/A	N/A	N/A	N/A
17090140	Coal coke and coke products, retort carbon and char (excl bone char)	1701	Processed material	Indirect	N/A	N/A	N/A	N/A
17090150	Pitch, tars, jellies, waxes and other lubricants manufactured from petroleum	1701	Processed material	Indirect	N/A	N/A	N/A	N/A
17090160	Petroleum based solvents and chemical feedstocks	1701	Processed material	Indirect	N/A	N/A	N/A	N/A
17090190	Brake and hydraulic fluid; rust arresting compound	1701	Processed material	Indirect	N/A	N/A	N/A	N/A
17091700	Petroleum and coal products - manufacturing services on a commission basis (ANZSIC Classes 1701-1709)	1701	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
17091970	Scrap waste from the manufacture of petroleum and coal products (1701-1709)	1701	Out of scope – waste	N/A	N/A	N/A	N/A	N/A

18110040	Liquefied natural gas - other than from the well head	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18110090	Industrial gases (excl liquefied natural gas)	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18120070	Ethyl alcohol (incl ethanol)	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18120090	Plasticiser; mixed alkylbenzenes and alkylnaphthalenes nec;	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18120190	Basic organic chemicals nec	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18130010	Hydrochloric, chlorosulphuric, sulphuric (incl oleum), diphosphorous pentaoxide, phosphoric and polyphosphoric acids	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18130020	Nitric, sulphonitric and other inorganic acids; inorganic oxygen compounds of non-metals (excl industrial gases)	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18130090	Other inorganic chemicals nec	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18130100	Basic inorganic chemicals	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18210010	Synthetic rubber	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18210020	Polystyrene	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18210030	Polyethylene	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18210040	Polyvinyl chloride	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18210050	Polypropylene	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18210060	Polyvinyl acetate and synthetic resins nec (excl adhesives) in primary forms, not mixed/compounded (excl regranulated)	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18210070	Rosin and resin acids and derivatives thereof; rosin spirit and rosin oils; run gums	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18210080	Plastics in primary forms, mixed/compounded with other substances; regranulated, single thermoplastic scrap material	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18290010	Cellulose fibre or filament	1803	Processed material –	Indirect	N/A	N/A	N/A	N/A

			zero production					
18290020	Non-cellulose fibre or filament	1803	Processed material – zero production	Indirect	N/A	N/A	N/A	N/A
18290030	Synthetic fibre or filament nec	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18290040	Basic polymers nec	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18310070	Ammonias - for fertilisers	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18310080	Fertilisers	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18310090	Phosphate agrochemicals	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18320010	Insecticides, pesticides, fungicides, weedkillers and pest control chemicals nec	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18321700	Basic chemicals - manufacturing services on a commission basis (ANZSIC Classes 1811-1832)	1803	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
18321970	Scrap waste from the manufacture of basic chemicals (1811-1832)	1803	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
18410010	Pharmaceutical goods for human use (excl wadding, gauze, bandages and surgical sutures)	1801	Processed material	Indirect	N/A	N/A	N/A	N/A
18411700	Human pharmaceutical and medicinal products - manufacturing services on a commission basis	1801	Service – zero production	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
18411970	Scrap waste from the manufacture of pharmaceutical goods for human use (1841)	1801	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
18420090	Veterinary pharmaceuticals and animal feed supplements	1802	Processed material	Indirect	N/A	N/A	N/A	N/A
18421700	Veterinary pharmaceutical and medicinal products - manufacturing services on a commission basis	1802	Service – zero production	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
18421970	Scrap waste from the manufacture of pharmaceutical goods for veterinary use (1842)	1802	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
18500010	Soap, perfumes and toiletry products	1804	Processed material	Indirect	N/A	N/A	N/A	N/A
18510170	Glycerol and candles	1804	Processed material	Indirect	N/A	N/A	N/A	N/A

18510180	Laundry products (incl bleach)	1804	Processed material	Indirect	N/A	N/A	N/A	N/A
18510190	Cleaning compounds nec	1804	Processed material	Indirect	N/A	N/A	N/A	N/A
18521700	Cleaning compounds and toiletry preparations - manufacturing services on a commission basis (ANZSIC Classes 1851-1852)	1804	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
18521970	Scrap waste from the manufacture of cleaning compounds and toiletry preparations (1851 -1852)	1804	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
18910010	Photographic film, cloth, plates (sensitised), photographic chemicals and photographic paper (sensitised)	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18920090	Explosives and blasting systems	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18990090	Chemical products nec	1803	Processed material	Indirect	N/A	N/A	N/A	N/A
18991700	Other basic chemical products - manufacturing services on a commission basis (ANZSIC Classes 1891-1899)	1803	Service – zero production	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
18991970	Scrap waste from the manufacture of other basic chemical products (1891-1899)	1803	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
18991980	General government consumption of fixed capital (1891-1899)	1803	Out of scope	N/A	N/A	N/A	N/A	N/A
19110050	Textile fabrics (excl tyre cord) impregnated, coated, covered or laminated with plastics	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19110090	Polymer film and sheet packaging materials	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19120080	Plastic pipes	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19120090	Plastic fittings for tubes, pipes and hoses (incl joints, elbows and flanges)	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19120120	Polycarbonate sheets	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19120130	Plastic blow moulded products nec	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19120140	Rigid or semi-rigid plastic injection moulded products nec (excl toys, games and fibre reinforced products)	1901	Processed material	Indirect	N/A	N/A	N/A	N/A

19120150	Rigid and semi-rigid polymer products nec (excl fibre reinforced plastic products)	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19120160	Plastic tableware and utensils	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19120170	Plastic domestic furniture and parts	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19120180	Plastic non-domestic (incl medical, dental, surgical and veterinary) furniture and parts	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19120190	Plastic taps, valves, drums and crates	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19130010	Foam and sponge plastic sheets, plates and strip (incl foam insulation and padding)	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19130020	Plastic foam products nec	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19140090	Tyres and tyre products nec (incl pneumatic tyres for buses and lorries)	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19140100	Tyres and tubes - pneumatic (excl for buses and lorries)	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19150010	Adhesives (excl bituminous) and glues	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19160010	Architectural and decorative paints (incl coatings for use on buildings), enamels and clears (excl heavy duty coatings)	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19160040	Inks	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19160050	Filler or putty, caulking compound	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19160090	Paints and coatings nec (incl automotive, industrial, marine and enamels and clears)	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19190030	Plastic wall or ceiling coverings (excl tiles)	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19190040	Linoleum and other floor coverings with a textile base; plastic floor coverings (incl paper or paperboard base), wall or ceiling tiles	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19190060	Rigid fibre reinforced plastic articles (incl swimming pool shells and tanks)	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19190070	Other plastic injection moulded products nec (excl rigid or semi-rigid)	1901	Processed material	Indirect	N/A	N/A	N/A	N/A

19190090	Synthetic rubber products and other polymer products nec (excl rigid or semi-rigid)	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19190150	Other polymer products nec	1901	Processed material	Indirect	N/A	N/A	N/A	N/A
19191700	Polymer products - manufacturing services on a commission basis (ANZSIC Classes 1911-1919)	1901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
19191970	Scrap waste from the manufacture of polymer products (1911-1919)	1901	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
19200030	Rubber tubes, pipes and hose	1902	Processed material	Indirect	N/A	N/A	N/A	N/A
19200040	Rubber sheets, strips, plates, rods, profile shapes and primary forms (excl cellular)	1902	Processed material	Indirect	N/A	N/A	N/A	N/A
19200050	Sponge and foam rubber	1902	Processed material	Indirect	N/A	N/A	N/A	N/A
19200060	Natural rubber products nec	1902	Processed material	Indirect	N/A	N/A	N/A	N/A
19200070	Synthetic rubber products	1902	Processed material	Indirect	N/A	N/A	N/A	N/A
19201700	Natural rubber products - manufacturing services on a commission basis	1902	Service – zero production	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
19201970	Scrap waste from the manufacture of natural rubber products (1920)	1902	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
20100010	Float, surface ground/polished glass - in sheets; cast and rolled glass - in sheets or profiles; but not otherwise worked	2001	Processed material	Indirect	N/A	N/A	N/A	N/A
20100030	Glass containers, bottles or jars; glass stoppers; glass inners for vacuum vessels	2001	Processed material	Indirect	N/A	N/A	N/A	N/A
20100050	Glassware nec	2001	Processed material	Indirect	N/A	N/A	N/A	N/A
20100090	Safety glass (incl windscreens and laminated sheet glass) and rear-view mirrors	2001	Processed material	Indirect	N/A	N/A	N/A	N/A
20101700	Glass and glass products - manufacturing services on a commission basis	2001	Processed material	Indirect	N/A	N/A	N/A	N/A
20210010	Clay bricks (excl refractory bricks)	2002	Processed material	Indirect	N/A	N/A	N/A	N/A
20290010	Refractory products (incl bricks, cement and clay)	2002	Processed material	Indirect	N/A	N/A	N/A	N/A

20290020	Ceramic roofing, flooring and wall tiles (incl terracotta) and ceramic construction goods nec	2002	Processed material	Indirect	N/A	N/A	N/A	N/A
20290030	Ceramic wash basins and permanent fixture type sanitary ware	2002	Processed material	Indirect	N/A	N/A	N/A	N/A
20290040	Tableware, ornamental pottery and domestic ware nec	2002	Processed material	Indirect	N/A	N/A	N/A	N/A
20290050	Ceramic goods nec	2002	Processed material	Indirect	N/A	N/A	N/A	N/A
20291700	Ceramic products - manufacturing services on a commission basis (ANZSIC Classes 2021-2029)	2002	Service – zero production	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
20310010	Cement (incl hydraulic and portland) (excl adhesive or refractory)	2003	Processed material	Indirect	N/A	N/A	N/A	N/A
20310020	Lime (incl hydraulic, quick, hydrated, slaked and agricultural)	2003	Processed material	Indirect	N/A	N/A	N/A	N/A
20320010	Plaster boards, sheets, panels, tiles, cornices and other articles of plaster (excl ornamental)	2004	Processed material	Indirect	N/A	N/A	N/A	N/A
20320020	Plasters (incl plaster of paris) (excl dental plasters)	2004	Processed material	Indirect	N/A	N/A	N/A	N/A
20330010	Ready mixed concrete and mortar (incl dry mix concrete)	2003	Processed material	Indirect	N/A	N/A	N/A	N/A
20331700	Cement, lime and ready-mixed concrete - manufacturing services on a commission basis (ANZSIC Classes 2031, 2033)	2003	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
20340010	Concrete, cement, fibrous-cement or artificial stone pipes; concrete box culverts	2004	Processed material	Indirect	N/A	N/A	N/A	N/A
20340020	Concrete, cement and artificial stone bricks, blocks, building boards and tiles; concrete products nec	2004	Processed material	Indirect	N/A	N/A	N/A	N/A
20340030	Concrete or predominantly concrete prefabricated and transportable buildings	2004	Processed material	Indirect	N/A	N/A	N/A	N/A
20341700	Plaster and concrete products - manufacturing services on a commission basis (ANZSIC Classes 2032, 2034)	2004	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
20900010	Worked monumental or building stone	2005	Processed material	Indirect	N/A	N/A	N/A	N/A
20900020	Glass fibre and glass wool products	2005	Processed material	Indirect	N/A	N/A	N/A	N/A

20900030	Ground limestone	2005	Processed material	Indirect	N/A	N/A	N/A	N/A
20900070	Non-refractory mortars and concretes other than ready mixed; articles of asbestos-cement and cellulose fibre-cement nec	2005	Processed material	Indirect	N/A	N/A	N/A	N/A
20900150	Ground clay (excl limestone), micas	2005	Processed material	Indirect	N/A	N/A	N/A	N/A
20901700	Other non-metallic mineral products - manufacturing services on a commission basis	2005	Service – zero production	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
20901970	Scrap waste from the manufacture of non-metallic mineral products (2010-2090)	2005	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
21100010	Basic iron, pig iron, sponge iron and spiegeleisen; iron or steel granules and powders	2101	Processed material	Indirect	N/A	N/A	N/A	N/A
21100020	Ferro-alloys (incl manganese, silicon or chrome)	2101	Processed material	Indirect	N/A	N/A	N/A	N/A
21100030	Iron or steel primary forms (incl ingots) and semi-finished products	2101	Processed material	Indirect	N/A	N/A	N/A	N/A
21100040	Iron or non-alloy steel flat-rolled products (excl clad, plated or coated)	2101	Processed material	Indirect	N/A	N/A	N/A	N/A
21100050	Clad, plated or coated iron or non-alloy steel flat-rolled products	2101	Processed material	Indirect	N/A	N/A	N/A	N/A
21100060	Alloy steel flat-rolled products	2101	Processed material	Indirect	N/A	N/A	N/A	N/A
21100070	Iron and steel bars, rods, angles, shapes and sections (incl sheet piling)	2101	Processed material	Indirect	N/A	N/A	N/A	N/A
21100080	Iron or steel wire for further processing (excl fencing, stranded or barbed)	2101	Processed material	Indirect	N/A	N/A	N/A	N/A
21100090	Painted, varnished or coated steel sheet, profile decking or cladding (incl steel sheeting for fencing)	2101	Processed material	Indirect	N/A	N/A	N/A	N/A
21100100	Iron or steel rails, rail fastenings or other rail accessories	2101	Processed material	Indirect	N/A	N/A	N/A	N/A
21100110	Iron or steel expanded metal	2101	Processed material	Indirect	N/A	N/A	N/A	N/A
21100190	Organic by-products of iron and steel manufacturing	2101	Processed material	Indirect	N/A	N/A	N/A	N/A
21210090	Cast and iron and steel products	2101	Processed material	Indirect	N/A	N/A	N/A	N/A
21220090	Iron or steel pipes and tubes (excl castings)	2101	Processed material	Indirect	N/A	N/A	N/A	N/A

21221700	Iron and steel - manufacturing services on a commission basis (ANZSIC Classes 2110-2122)	2101	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
21221970	Scrap waste from the manufacture of iron and steel (incl slag, dross, sealings) (2110-2122)	2101	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
21310010	Alumina	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21320010	Aluminium and aluminium alloys (excl purchased scrap)	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21320020	Aluminium secondary recovery from purchased scrap	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21320030	Aluminium castings and die castings	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21321970	Aluminium scrap from the manufacture of alumina, aluminium and aluminium alloys (2131-2132)	2102	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
21330010	Silver primary and secondary recovery (excl from purchased scrap)	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21330020	Copper (incl brass) primary and secondary recovery (excl from purchased scrap)	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21330030	Lead primary and secondary recovery (excl from purchased scrap)	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21330040	Zinc primary and secondary recovery (excl from purchased scrap)	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21330050	Silver, copper (incl brass), lead and zinc recovery from purchased scrap	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21330060	Zinc alloys; copper matte; cement copper; unwrought copper and nickel	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21330070	Sulphuric acid from the smelting of copper, silver, lead and zinc.	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21390010	Platinum primary and secondary recovery (excl from purchased scrap)	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21390020	Nickel and tin primary recovery and secondary recovery from drosses, ashes or other waste materials (excl from purchased scrap)	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21390030	Nickel and tin recovery from purchased scrap	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21390040	Gold - primary and secondary (excl from purchased scrap)	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21390050	Antimony and other non-ferrous basic metals nec - primary and secondary recovery	2102	Processed material	Indirect	N/A	N/A	N/A	N/A

21390090	Other basic non-ferrous metals	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21391700	Basic non-ferrous metals - manufacturing services on a commission basis (ANZSIC Classes 2131-2139)	2102	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
21391970	Scrap waste from the smelting and refining of non-ferrous metals (incl precious) (2133-2139)	2102	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
21410010	Non-ferrous metal (excl aluminium) castings and die castings	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21420010	Aluminium and aluminium alloy bars, rods (incl wire rod) and profiles (incl decking and cladding)	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21420020	Aluminium foil	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21420030	Rolled, drawn or extruded aluminium pipes, tubes, plates, sheets, strip and wire products; aluminium powders and flakes	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21490010	Copper, copper alloy, nickel, lead, zinc and tin rolled, extruded and semi-finished products	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21490090	Non-ferrous metal products nec	2102	Processed material	Indirect	N/A	N/A	N/A	N/A
21491700	Basic non-ferrous metal products - manufacturing services on a commission basis (ANZSIC Classes 2141-2149)	2102	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
21491970	Scrap waste from the manufacture of non-ferrous metal products (incl precious) (2141-2149)	2102	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
22100090	Iron and steel forging	2201	Processed material	Indirect	N/A	N/A	N/A	N/A
22101700	Forged iron or steel products - manufacturing services on a commission basis	2201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
22101900	Repairing and servicing - forged iron or steel products (incl repair of iron or steel valves)	2201	Service – zero production	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
22101970	Scrap waste from the manufacture of forged iron and steel products (2210)	2201	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
22210010	Fabricated and prefabricated construction steel (incl scaffolding,	2202	Processed material	Indirect	N/A	N/A	N/A	N/A

	perforated plate and ready made parts for structures)							
22210020	Reinforcing steel rods or bars	2202	Processed material	Indirect	N/A	N/A	N/A	N/A
22210030	Reinforcing welded steel mesh	2202	Processed material	Indirect	N/A	N/A	N/A	N/A
22220010	Prefabricated metal or metal framed buildings (excl aluminium) and other transportable buildings	2202	Processed material	Indirect	N/A	N/A	N/A	N/A
22220020	Aluminium or aluminium framed prefabricated buildings	2202	Processed material	Indirect	N/A	N/A	N/A	N/A
22230010	Aluminium/aluminium framed doors (incl roller/concertina) and windows (incl glass); door/window frames; roller grilles	2202	Processed material	Indirect	N/A	N/A	N/A	N/A
22230020	Aluminium fire doors	2202	Processed material	Indirect	N/A	N/A	N/A	N/A
22230030	Aluminium combined door-window units	2202	Processed material	Indirect	N/A	N/A	N/A	N/A
22230040	Architectural aluminium products (excl sheet metal) for building nec	2202	Processed material	Indirect	N/A	N/A	N/A	N/A
22230050	Aluminium roofing and guttering	2202	Processed material	Indirect	N/A	N/A	N/A	N/A
22230060	Articles of aluminium (excl ladders) nec	2202	Processed material	Indirect	N/A	N/A	N/A	N/A
22240010	Metal roofing and guttering (excl aluminium)	2202	Processed material	Indirect	N/A	N/A	N/A	N/A
22290010	Iron or steel window-frames; metal (excl aluminium) door or door frames	2202	Processed material	Indirect	N/A	N/A	N/A	N/A
22290020	Wooden fire doors	2202	Processed material	Indirect	N/A	N/A	N/A	N/A
22290030	Iron or steel fire doors; fabricated iron or steel stairs, balustrades and other architectural products (excl aluminium)	2202	Processed material	Indirect	N/A	N/A	N/A	N/A
22291700	Structural metal products - manufacturing services on a commission basis (ANZSIC Classes 2221-2229)	2202	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
22291970	Scrap waste from the manufacture of structural metal products (2221-2229)	2202	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
22310150	Boiler, tank and other heavy gauge metal containers	2203	Processed material	Indirect	N/A	N/A	N/A	N/A
22390090	Metal containers nec	2203	Processed material	Indirect	N/A	N/A	N/A	N/A

22400010	Sheet metal ducting	2203	Processed material	Indirect	N/A	N/A	N/A	N/A
22400020	Sheet metal sinks, wash-basins, baths and other sanitary ware	2203	Processed material	Indirect	N/A	N/A	N/A	N/A
22400040	Sheet metal non-electric tableware, kitchenware or other household articles and parts (excl containers and sanitary ware)	2203	Processed material	Indirect	N/A	N/A	N/A	N/A
22400090	Sheet metal products nec	2203	Processed material	Indirect	N/A	N/A	N/A	N/A
22401700	Metal container and sheet metal products - manufacturing services on a commission basis (ANZSIC Classes 2231-2240)	2203	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
22401970	Scrap waste from the manufacture of sheet metal products (2231-2240)	2203	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
22910040	Nails, tacks, staples, spiked cramps, studs, spikes and pins (incl drawing and cotter pins) (excl metallic dowel pins)	2204	Processed material	Indirect	N/A	N/A	N/A	N/A
22910050	Woven or linked wire fabric (excl mattress supports)	2204	Processed material	Indirect	N/A	N/A	N/A	N/A
22910100	Springs (incl leaves for springs); domestic metal wire products; copper cloth, grill, netting and fencing; barbed wire; wire products nec	2204	Processed material	Indirect	N/A	N/A	N/A	N/A
22910110	Iron or steel fencing wire, cables, wire fabric, gates and chains	2204	Processed material	Indirect	N/A	N/A	N/A	N/A
22920010	Metal nuts, bolts (incl expansion), screws, rivets, washers, dowel pins, masonry anchors and turnbuckles	2204	Processed material	Indirect	N/A	N/A	N/A	N/A
22930010	Metal coating and finishing	2204	Processed material	Indirect	N/A	N/A	N/A	N/A
22990030	Cutlery, kitchen ware and table ware (excl solid silver or gold) nec	2204	Processed material	Indirect	N/A	N/A	N/A	N/A
22990090	Munitions and ammunition (incl cartridges)	2204	Processed material	Indirect	N/A	N/A	N/A	N/A
22990140	Firearms (incl parts)	2204	Processed material	Indirect	N/A	N/A	N/A	N/A
22990200	Fabricated metal products (incl ladders) nec	2204	Processed material	Indirect	N/A	N/A	N/A	N/A
22990290	Fabricated metal hand tools; fire extinguishers	2204	Processed material	Indirect	N/A	N/A	N/A	N/A
22990300	Fabricated metal household goods nec	2204	Processed material	Indirect	N/A	N/A	N/A	N/A

22990310	Fabricated metal products (excl ladders) nec	2204	Processed material	Indirect	N/A	N/A	N/A	N/A
22991700	Other fabricated metal products - manufacturing services on a commission basis (ANZSIC Classes 2291-2299)	2204	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
22991900	Repairing and servicing - Fabricated Metal Products	2204	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
23110010	Finished motor vehicles with less than 10 persons capacity	2301	Processed material	Indirect	N/A	N/A	N/A	N/A
23110020	Finished motor vehicles with 10 or more persons capacity	2301	Processed material	Indirect	N/A	N/A	N/A	N/A
23110030	Finished trucks, truck type vehicles, utilities and panel vans	2301	Processed material	Indirect	N/A	N/A	N/A	N/A
23110090	Unassembled motor vehicles nec; chassis with engines for motor vehicles; engines nec, for motor vehicles or tractors	2301	Processed material	Indirect	N/A	N/A	N/A	N/A
23119000	Second hand motor vehicles	2301	Processed material – zero production	Indirect	N/A	N/A	N/A	N/A
23120090	Motor vehicle body and semi-trailers	2301	Processed material	Indirect	N/A	N/A	N/A	N/A
23120100	Caravans and trailers	2301	Processed material	Indirect	N/A	N/A	N/A	N/A
23120110	Body panels for trucks and buses; parts nec - for motor vehicle trailers and semi-trailers	2301	Processed material	Indirect	N/A	N/A	N/A	N/A
23130100	Automotive electrical component manufacturing products	2301	Processed material	Indirect	N/A	N/A	N/A	N/A
23190070	Motor vehicle and tractor parts and equipment nec	2301	Processed material	Indirect	N/A	N/A	N/A	N/A
23190090	Motor vehicle transmission assemblies and parts, pumps, gaskets and body panels	2301	Processed material	Indirect	N/A	N/A	N/A	N/A
23910010	Vessels of 50 tonnes gross and over (incl floating structures)	2302	Processed material	Indirect	N/A	N/A	N/A	N/A
23920090	Boats and watercraft (under 50 tonnes)	2302	Processed material	Indirect	N/A	N/A	N/A	N/A
23921700	Ships and boats - manufacturing services on a commission basis (ANZSIC Classes 2391-2392)	2302	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
23921900	Repairing and servicing - Ships and Boats	2302	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service

23930010	Locomotives and trams (incl underframes); railway rolling stock	2303	Processed material	Indirect	N/A	N/A	N/A	N/A
23931700	Railway rolling stock - manufacturing services on a commission basis	2303	Service – zero production	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
23931900	Repairing and servicing - Locomotives and trams	2303	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
23940010	Aircraft and aircraft parts	2304	Processed material	Indirect	N/A	N/A	N/A	N/A
23941700	Aircraft - manufacturing services on a commission basis	2304	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
23941900	Repairing and servicing - Aircraft	2304	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
23990030	Repairing and servicing - Motor vehicle manufacturing (incl factory motor vehicle engine repair or replacements) (excl automotive repair services)	2301	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
23990090	Motorised tanks and other armoured fighting vehicles and parts; transport equipment, parts and accessories nec (incl motorcycles and motor scooters)	2301	Processed material	Indirect	N/A	N/A	N/A	N/A
23991700	Motor vehicles, other transport equipment and parts - manufacturing services on a commission basis (ANZSIC Classes 2311-2319, 2399)	2301	Service – zero production	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
23991970	Scrap waste from the manufacture of transport equipment (2311-2399)	2301	Out of scope – waste	N/A	N/A	N/A	N/A	N/A
24110030	Objective lenses, filters and other mounted optical elements; microscopes (excl optical) and diffraction apparatus and parts nec	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24110050	Ophthalmic instruments and appliances	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24110090	Cameras, image projectors and parts; photographic goods nec (excl sensitised photographic film, paper, plates and chemicals)	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24110100	Spectacle and contact lenses; sunglasses and frames	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24120020	X-ray medical equipment and parts or accessories	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24120090	Medical aids, equipment (excl x-ray) and therapeutic appliances (including hearing aids)	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24190040	Watches (incl metal watch straps), watch cases, clocks and parts	2401	Processed material	Indirect	N/A	N/A	N/A	N/A

24190070	Surveying, physical or chemical analysis and other measuring, checking and testing instruments, appliances and parts	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24190090	Optical fibres, fibre bundles and cables (excl insulated)	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24190190	Professional and scientific equipment nec	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24191700	Professional and scientific equipment - manufacturing services on a commission basis (ANZSIC Classes 2411-2419)	2401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
24191980	General government consumption of fixed capital (2411-2419)	2401	Out of scope	N/A	N/A	N/A	N/A	N/A
24210030	Laptops, notebooks, personal digital assistants and other portable computers	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24210040	Desktop computers (PCs)	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24210070	Computer hardware, computer peripherals and accessories nec	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24210130	Printing and photocopying machinery and parts	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24210190	Mainframe, server and super-computers; computer peripheral devices	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24210200	Vending, monetary, office machinery	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24220100	Communication equipment (excl mobile phones)	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24220110	Mobile phones and other phones nec (excl parts)	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24290010	Television receiving sets (excl parts)	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24290190	Telecommunication and audio visual equipment nec	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24290200	Video games, poker machines and other coin or disc operated games; electronic equipment and parts nec	2401	Processed material	Indirect	N/A	N/A	N/A	N/A
24291700	Computer and electronic equipment - manufacturing services on a commission basis (ANZSIC Classes 2421-2429)	2401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
24291980	General government consumption of fixed capital (2421-2429)	2401	Out of scope	N/A	N/A	N/A	N/A	N/A

24310010	Uninsulated copper and aluminium stranded wire, ropes, cables, plaited bands and slings	2403	Processed material	Indirect	N/A	N/A	N/A	N/A
24310090	Electric cable, wire and strip	2403	Processed material	Indirect	N/A	N/A	N/A	N/A
24320010	Electric light or lamp bulbs or tubes (incl filament or fluorescent) (excl automotive)	2403	Processed material	Indirect	N/A	N/A	N/A	N/A
24320020	Light fittings	2403	Processed material	Indirect	N/A	N/A	N/A	N/A
24320030	Cold, discharge, arc, ultra violet, infra-red and other electric lights, torches and fittings nec	2403	Processed material	Indirect	N/A	N/A	N/A	N/A
24320050	Illuminated signs, name-plates and sign-plates having a permanently fixed light source	2403	Processed material	Indirect	N/A	N/A	N/A	N/A
24390020	Automotive wet cell batteries	2403	Processed material	Indirect	N/A	N/A	N/A	N/A
24390060	Electric motors, generators, electric generating sets and rotary converters (incl parts) (excl automotive)	2403	Processed material	Indirect	N/A	N/A	N/A	N/A
24390100	Electrical apparatus to switch, protect or connect circuits (incl boards and cabinets equipped with such) (excl inductors)	2403	Processed material	Indirect	N/A	N/A	N/A	N/A
24390190	Dry cell batteries, batteries nec and battery components	2403	Processed material	Indirect	N/A	N/A	N/A	N/A
24390200	Electrical equipment nec	2403	Processed material	Indirect	N/A	N/A	N/A	N/A
24391700	Electrical equipment - manufacturing services on a commission basis (ANZSIC Classes 2431-2439)	2403	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
24410020	Domestic stoves, ovens and rangehoods (incl gas, electric, solid fuel, oil or spirit fired)	2404	Processed material	Indirect	N/A	N/A	N/A	N/A
24410030	Domestic refrigerators and freezers	2404	Processed material	Indirect	N/A	N/A	N/A	N/A
24410040	Compressors for domestic refrigeration equipment	2404	Processed material	Indirect	N/A	N/A	N/A	N/A
24410050	Domestic clothes washing machines, drying cabinets, tumble driers and dishwashing machines	2404	Processed material	Indirect	N/A	N/A	N/A	N/A
24410090	Solid fuel or gas barbecues; domestic food waste disposal units	2404	Processed material	Indirect	N/A	N/A	N/A	N/A

24490010	Domestic gas, electric, solid fuel, oil, spirit fired space heaters and non-electric warm air furnaces	2404	Processed material	Indirect	N/A	N/A	N/A	N/A
24490020	Domestic soil heating apparatus	2404	Processed material	Indirect	N/A	N/A	N/A	N/A
24490030	Domestic solar hot water collectors, systems and parts (incl systems with conventional backup sources)	2404	Processed material	Indirect	N/A	N/A	N/A	N/A
24490040	Domestic gas and other non-electric water heaters and hot water systems (excl solar) and parts	2404	Processed material	Indirect	N/A	N/A	N/A	N/A
24490050	Domestic electric water heaters or hot water systems and parts	2404	Processed material	Indirect	N/A	N/A	N/A	N/A
24490060	Domestic room air conditioners and coolers (excl fans)	2404	Processed material	Indirect	N/A	N/A	N/A	N/A
24490070	Compressors for domestic air conditioning equipment	2404	Processed material	Indirect	N/A	N/A	N/A	N/A
24490190	Other domestic appliances nec	2404	Processed material	Indirect	N/A	N/A	N/A	N/A
24491700	Domestic appliances - manufacturing services on a commission basis (ANZSIC Classes 2441-2449)	2404	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
24510090	Pump and compressor (excl domestic refrigeration and air conditioning)	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24520010	Complete air conditioning units nec (incl ducting etc); air conditioning compressors or parts (commercial or industrial)	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24520060	Space heating equipment (commercial or industrial) (incl parts) nec	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24520090	Fixed space heating, cooling and ventilation equipment nec	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24610100	Agricultural tractors, harvesting, dairy and dispersing machinery	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24610110	Agricultural machinery; garden tools and equipment (powered)	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24620010	Construction and earthmoving wheeled tractors	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24620020	Front end shovel loaders; mechanical shovels, excavators and shovel loaders with a 360 degree revolving superstructure	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24620030	Bulldozers and other moving, grading, scraping, excavating, compacting or	2405	Processed material	Indirect	N/A	N/A	N/A	N/A

	extracting construction machinery nec							
24620040	Buckets, shovels, grabs, grips, blades, bodies and cabs for construction vehicles and other construction and earthmoving machinery parts	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24620060	Machinery for crushing, grinding, mixing or kneading earth, stones, ores or other mineral substances in solid form	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24620070	Mineral substances sorting, screening, separating, washing, mixing or kneading machinery and parts	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24620080	Mining or drilling machinery and parts (incl coal or rock cutters, boring, sinking or tunnelling machinery)	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24630190	Machine tool and parts	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24690030	Distilling/rectifying plant; heat exchange units; centrifuges nec; gas liquefying or beverages filtering machinery	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24690200	Specialised machinery and equipment nec	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24691700	Specialised machinery and equipment - manufacturing services on a commission basis (ANZSIC Classes 2461-2469)	2405	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
24910090	Lifting equipment	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24910100	Material handling equipment	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24990050	Engines nec, turbines and water wheels and parts	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24990190	Machinery and equipment nec	2405	Processed material	Indirect	N/A	N/A	N/A	N/A
24991700	Other machinery and equipment - manufacturing services on a commission basis (ANZSIC Classes 2451-2452, 2491-2499)	2405	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
25110090	Wooden furniture and upholstered seats	2501	Processed material	Indirect	N/A	N/A	N/A	N/A
25120190	Metal furniture	2501	Processed material	Indirect	N/A	N/A	N/A	N/A

25130090	Mattresses	2501	Processed material	Indirect	N/A	N/A	N/A	N/A
25190090	Furniture nec (excl wooden, metal or plastic)	2501	Processed material	Indirect	N/A	N/A	N/A	N/A
25191700	Furniture - manufacturing services on a commission basis (ANZSIC Classes 2511-2513, 2519)	2501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
25900090	Badges, coins and medals; sheet metal; umbrellas	2502	Processed material	Indirect	N/A	N/A	N/A	N/A
25910100	Jewellery and silverware	2502	Processed material	Indirect	N/A	N/A	N/A	N/A
25920090	Toys, sporting and recreational products	2502	Processed material	Indirect	N/A	N/A	N/A	N/A
25990010	Paint brushes or rollers, accessories and parts	2502	Processed material	Indirect	N/A	N/A	N/A	N/A
25990070	Musical instruments (incl parts and accessories)	2502	Processed material	Indirect	N/A	N/A	N/A	N/A
25990190	Metal ornaments and articles of precious metal (excl jewellery)	2502	Processed material	Indirect	N/A	N/A	N/A	N/A
25990200	Pens, pencils, crayons and chalk; typewriter ribbons and ink pads	2502	Processed material	Indirect	N/A	N/A	N/A	N/A
25990210	Manufacturing products nec	2502	Processed material	Indirect	N/A	N/A	N/A	N/A
25991700	Manufacturing products nec - manufacturing services on a commission basis	2502	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service

Electricity, water, construction and other services

IOPC	Description	IOPG	Production type	Dependency type	Importance hierarchy level	Importance reason	Final Environmental flow	Explanation for logic chains
26110011	Electricity generated from coal	2601	Processed material	Indirect	N/A	N/A	N/A	N/A
26110012	Electricity generated from natural gas	2601	Processed material	Indirect	N/A	N/A	N/A	N/A
26110013	Electricity generated from other fossil fuels	2601	Processed material	Indirect	N/A	N/A	N/A	N/A
26120010	Hydro-electricity	2601	Processed material	Direct conditional	1 – Essential	Heating, hot water, cooking, electricity	Water supply provisioning	Overt logical fit to large dams
26190010	Electricity generation nec	2601	Processed material	Indirect	N/A	N/A	N/A	N/A

26400010	Electricity service income nec	2605	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
26401500	Margin - electricity transmission, distribution and on selling	2605	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
27000010	Gas service income nec	2701	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
27001500	Margin - gas distribution and on selling	2701	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
28110010	Water supply	2801	Raw material	Direct material	1 – Essential	Drinking water and sanitation	Water supply provisioning	Overt logical fit of water supply, as a raw material, to ecosystem types according to National ecosystem accounts https://www.abs.gov.au/statistics/environment/environmental-management/national-ecosystem-accounts-experimental-estimates/2020-21
28120010	Sewerage and drainage services	2801	Service	Direct conditional	2 – Essential	Sanitation	Solid waste remediation and Water purification services	Overt logical fit to typical location of waste water management systems
28121980	General government consumption of fixed capital (2811, 2812)	2801	Out of scope	N/A	N/A	N/A	N/A	N/A
29000010	Waste collection (incl skip and portable toilet hire), treatment disposal remediation and materials recovery services	2901	Service	Direct conditional	2 – Essential	Sanitation	Solid waste remediation and Water purification services	Overt logical fit to typical location of waste management systems
29221980	General government consumption of fixed capital (2911-2922)	2901	Out of scope	N/A	N/A	N/A	N/A	N/A
30100010	Residential building construction	3001	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
30109010	Second hand residential buildings	3001	Service – zero production	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
30200010	Non-residential building construction	3002	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
30201980	General government consumption of fixed capital (3020)	3002	Out of scope	N/A	N/A	N/A	N/A	N/A
30209010	Second hand non-residential buildings	3002	Service – zero production	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
31010010	Road and bridge construction (excl repair and maintenance)	3101	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
31010020	Repair and maintenance - roads and bridges	3101	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
31019010	Second hand roads and bridges	3101	Service – zero production	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service

31090010	Non-building construction nec	3101	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
31090020	Repair and maintenance - non-building construction nec	3101	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
31091980	General government consumption of fixed capital (3101-3109)	3101	Out of scope	N/A	N/A	N/A	N/A	N/A
31099010	Second hand non-building construction nec	3101	Service – zero production	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
32000010	Trade services repair and maintenance	3201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
32000020	Other construction trade services	3201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
32001980	General government consumption of fixed capital (3211-3299)	3201	Out of scope	N/A	N/A	N/A	N/A	N/A
37000010	Non-margin - wholesaling services (excl repairing and servicing)	3301	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
37001400	Margin on reexports - wholesaling services	3301	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
37001500	Margin - wholesaling services	3301	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
38000020	Auction room operations; electronic procurement brokering services	3301	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
38001800	Wholesale services provided on a commission basis	3301	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
38001980	General government consumption of fixed capital (3311-3800)	3301	Out of scope	N/A	N/A	N/A	N/A	N/A
43000010	Non-margin - retailing services (excl repairing and servicing)	3901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
43001500	Margin - retailing services	3901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
43001800	Retail services provided on a commission basis	3901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
43001980	General government consumption of fixed capital (3911-4320)	3901	Out of scope	N/A	N/A	N/A	N/A	N/A
44000010	Accommodation services	4401	Service	Indirect	N/A	N/A	N/A	Production may benefit from visual amenity services of various ecosystem types, but does not directly require an ecosystem service
45000010	Meal preparation and presentation	4501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
45000020	Beverage serving service	4501	Service	Indirect	N/A	N/A	N/A	Production may benefit from visual amenity services of various ecosystem types, but does not directly require an ecosystem service
45000030	Takeaway food	4501	Service	Indirect	N/A	N/A	N/A	Production may benefit from visual amenity services of various ecosystem types, but does not directly require an ecosystem service

45000040	Catering services	4501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
45000050	Net losses from gambling - clubs, pubs, taverns and bars (hospitality)	4501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
45001500	Margin - restaurant hotel and club (food and beverage) services	4501	Service	Indirect	N/A	N/A	N/A	Production may benefit from visual amenity services of various ecosystem types, but does not directly require an ecosystem service
46001600	Margin - transport services	4601	Service – zero production	Indirect	N/A	N/A	N/A	N/A
46100020	Road freight transport services (incl rental or hire of trucks with driver)	4601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
46100030	Road vehicle towing services	4601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
46101600	Margin - road freight transport services	4601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
46210010	Interurban or non-metropolitan bus transport services (incl long distance, charter and rural)	4601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
46220010	Urban or metropolitan bus and tramway transport services (incl short distance, airport and school)	4601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
46230010	Taxi transport services	4601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
46230090	Rental or hire of passenger cars and road vehicles nec (incl buses and coaches) with driver	4601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
46230100	Road passenger transport services nec	4601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
47100020	Railway freight transport services nec (incl rental or hire of train with operator)	4701	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
47101600	Margin - railway freight transport services	4701	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
47200010	Urban railway (incl monorail) passenger transport services	4701	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
47200020	Interurban railway passenger transport services	4701	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
48100020	Ocean and inland water freight transport services	4801	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
48101600	Margin - water freight transport services	4801	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
48200010	Local water transport services for passengers	4801	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
48200020	Long distance water transport services for passengers	4801	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service

48200030	Rental or hire of water vessel with operator	4801	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
49000020	Air and space freight transport services	4901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
49000030	Air passenger transport services	4901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
49000040	Rental or hire of aircraft with operator	4901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
49001600	Margin - air and space freight transport services	4901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
50100010	Scenic and sightseeing transport services	4801	Service	Direct conditional	4 – Non-essential	Leisure	Visual amenity services and recreation services	Ecosystem service required for production, however ecosystem types are unspecified
50210010	Pipeline transport services	4801	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
50211600	Margin - pipeline transport services	4801	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
50290010	Transport services nec (incl ski lift operation)	4801	Service	Direct conditional	4 – Non-essential	Leisure	Recreation services	Overt logical fit to Alpine grasslands for part of economic production associated with ski lift operation
50291980	General government consumption of fixed capital (5010-5029)	4801	Out of scope	N/A	N/A	N/A	N/A	N/A
51000010	Postal services including hire of post boxes and courier services	5101	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
51021980	General government consumption of fixed capital (5101-5102)	5101	Out of scope	N/A	N/A	N/A	N/A	N/A
52100030	Stevedoring and port handling services (5211-5219)	5201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
52100040	Support services to water transport nec (5211-5219)	5201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
52101400	Margin on reexports - services to water transport (5211-5219)	5201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
52101600	Margin - services to water transport (5211-5219)	5201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
52200010	Airport operations and other air transport support services nec	5201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
52910010	Customs agency services	5201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
52920010	Freight forwarding agency services	5201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
52990010	Transport support services nec	5201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service

52990020	Support services for road transport nec (incl taxi radio base and road vehicle driving service)	5201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
52990030	Support services for railway transport nec (incl station and terminal operations)	5201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
52991980	General government consumption of fixed capital (5211-5299)	5201	Out of scope	N/A	N/A	N/A	N/A	N/A
53010010	Grain storage services	5201	Service	Direct conditional	1 - Essential	Food	Crop provisioning	Overt logical fit to croplands
53090010	Warehousing and storage services nec	5201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
53091980	General government consumption of fixed capital (5301-5309)	5201	Out of scope	N/A	N/A	N/A	N/A	N/A
54110030	Newspapers - advertising services	5401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
54110040	Copyright leasing - newspapers	5401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
54110090	Newspaper publishing (incl printed and published by the same business)	5401	Processed material	Indirect	N/A	N/A	N/A	N/A
54120010	Magazine and other periodical publishing (incl printed and published by the same business)	5401	Processed material	Indirect	N/A	N/A	N/A	N/A
54120030	Magazines and other periodicals - advertising services	5401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
54120040	Copyright leasing - magazines and other periodicals	5401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
54130010	Book publishing (incl textbooks, encyclopedias, travel guides and atlases) (incl printed and published by the same business)	5401	Processed material	Indirect	N/A	N/A	N/A	N/A
54130030	Books - advertising services	5401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
54130040	Copyright leasing - books	5401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
54140010	Directory, mailing list, collection or compilation publishing (incl printed and published by the same business)	5401	Processed material	Indirect	N/A	N/A	N/A	N/A
54140030	Directory, mailing list, collection or compilation - advertising services	5401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
54190010	Publishing nec (incl maps, greeting cards, postcards and calendars) (incl printed and published by the same business)	5401	Processed material	Indirect	N/A	N/A	N/A	N/A

54190030	Other publishing - advertising services	5401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
54190040	Copyright leasing nec	5401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
54200010	Software publishing services (non-customised)	5401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
54200020	Copyright leasing - software (non-customised)	5401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
54201980	General government consumption of fixed capital (5411-5420)	5401	Out of scope	N/A	N/A	N/A	N/A	N/A
55110010	Motion picture and video production	5501	Processed material	Indirect	N/A	N/A	N/A	N/A
55120010	Motion picture and video distribution services (incl discs)	5501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
55120020	Copyright leasing - motion pictures and videos	5501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
55130010	Motion picture theatre services	5501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
55140010	Post-production services and other motion picture and video activities	5501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
55210010	Music publishing nec (incl sheet music)	5501	Processed material	Indirect	N/A	N/A	N/A	N/A
55210030	Music copyrights - acquiring, registering and selling	5501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
55220010	Music and other sound recording studios operation (incl pre-recorded radio programming services)	5501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
55221980	General government consumption of fixed capital (5511-5522)	5501	Out of scope	N/A	N/A	N/A	N/A	N/A
56100010	Radio broadcasting services	5601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
56210010	Free-to-air television broadcasting services	5601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
56220010	Cable (pay TV) and other subscription broadcasting services	5601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
56221980	General government consumption of fixed capital (5610-5622)	5601	Out of scope	N/A	N/A	N/A	N/A	N/A
57000010	Internet publishing and broadcasting services (incl radio, television, books, newspapers and magazines)	5701	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
57000020	Internet publishing - advertising services	5701	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
57001980	General government consumption of fixed capital (5700)	5701	Out of scope	N/A	N/A	N/A	N/A	N/A

58000010	Telecommunication network services (excl equipment)	5801	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
58090010	Telecommunications services nec	5801	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
58091980	General government consumption of fixed capital (5801-5809)	5801	Out of scope	N/A	N/A	N/A	N/A	N/A
59100010	Internet access (incl ISPs) and internet search services	5701	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
59210020	Data processing and web hosting services	5701	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
59220010	Information storage and retrieval services	5701	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
59221980	General government consumption of fixed capital (5910-5922)	5701	Out of scope	N/A	N/A	N/A	N/A	N/A
60100010	Library and archive services	6001	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
60200010	Other information services nec (incl radio and television new collection and telephone based recorded information services)	6001	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
60201980	General government consumption of fixed capital (6010-6020)	6001	Out of scope	N/A	N/A	N/A	N/A	N/A
62000010	Bank services - financial intermediation services indirectly measured	6201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
62000020	Bank services nec	6201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
62220020	Building society services nec	6201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
62230020	Credit union services nec	6201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
62290010	Other depository financial services - financial intermediation services indirectly measured	6201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
62290030	Other depository financial services nec	6201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
62300010	Non-depository finance services (incl securitiser services and central borrowing authorities) - financial intermediation services indirectly measured	6201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
62300020	Non-depository finance services nec (incl securitiser services and central borrowing authorities)	6201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service

62400010	Financial asset investors	6201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
63100010	Life insurance provision	6301	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
63210010	Health insurance provision	6301	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
63220010	Fire and industrial special risks insurance provision	6301	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
63220020	Houseowner and household insurance provision	6301	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
63220030	Motor vehicle comprehensive and compulsory third party insurance provision	6301	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
63220040	Public liability, product liability and professional indemnity insurance provision	6301	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
63220060	Marine insurance provision (non-margin); aviation hull/cargo insurance provision	6301	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
63220070	Employers liability insurance provision	6301	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
63220080	Insurance provision (incl travel insurance) nec.	6301	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
63221500	Margin - marine insurance provision	6301	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
63300010	Superannuation fund services	6301	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
63301980	General government consumption of fixed capital (6310-6330)	6301	Out of scope	N/A	N/A	N/A	N/A	N/A
64110010	Financial asset broking services	6401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
64190010	Insurance fund management service	6401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
64190020	Auxiliary services to finance and investment nec	6401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
64200010	Services to insurance nec	6401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
66110010	Passenger car rental or hire (incl cars and minibuses) (excl financial leases)	6601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
66190010	Other motor vehicle rental or hire (incl caravans and trailers) (excl financial leases) nec	6601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
66190020	Transport equipment rental or hire (incl ships and boats) nec	6601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service

66200010	Farm animal and bloodstock leasing	6601	Service – zero production	Direct	N/A	N/A	N/A	N/A
66310010	Heavy machinery and scaffolding (excl erection) rental or hire (excl financial leases)	6601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
66320010	Video and other electronic media rental or hire	6601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
66390010	Goods and equipment rental hire nec (incl art works, household goods and office machinery)	6601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
66400010	Non-financial intangible assets (excl copyrights) leasing	6601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
66401980	General government consumption of fixed capital (6611-6640)	6601	Out of scope	N/A	N/A	N/A	N/A	N/A
67110030	Imputed rent for owner-occupiers	6700	Service	Indirect	N/A	N/A	N/A	Production may benefit from visual amenity services of various ecosystem types, but does not directly require an ecosystem service
67110040	Actual rent for housing	6701	Service	Indirect	N/A	N/A	N/A	Production may benefit from visual amenity services of various ecosystem types, but does not directly require an ecosystem service
67110050	Imputed rent for owner-occupiers: residential caravan park operation and residential property body corporate or strata corporation services	6700	Service	Indirect	N/A	N/A	N/A	Production may benefit from visual amenity services of various ecosystem types, but does not directly require an ecosystem service
67110060	Actual rent for housing: residential caravan park operation and residential property body corporate or strata corporation services	6701	Service	Indirect	N/A	N/A	N/A	Production may benefit from visual amenity services of various ecosystem types, but does not directly require an ecosystem service
67111980	General government consumption of fixed capital (6711)	6701	Out of scope	N/A	N/A	N/A	N/A	N/A
67120010	Non-residential property operator services (incl non-residential property body corporate or strata corporation services)	6702	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
67200010	Real estate agent services	6702	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
67200020	Agricultural or pastoral property broking, leasing, renting or valuing	6702	Service	Direct conditional	1 – Essential	Food	Crop provisioning and Grazed biomass provisioning	As per crop provisioning and grazed biomass raw material logic chains
67201980	General government consumption of fixed capital (6712-6720)	6702	Out of scope	N/A	N/A	N/A	N/A	N/A

69000020	Architectural services	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000030	Surveying and mapping services	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000040	Quantity surveying services	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000050	Engineering design and consulting services	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000060	Commercial art and display services	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000070	Specialised design services nec (incl fashion, interior and jewellery design)	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000080	Scientific testing and analysis services	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000090	Legal services	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000100	Accounting services	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000110	Advertising services	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000120	Market research services	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000130	Statistical services	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000140	Corporate head office management	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000150	Management services (incl business, artists, entertainers and sporting professionals)	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000160	Management advice and consulting services nec (excl financial and computer consulting)	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000170	Veterinary services	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000180	Photography services nec (incl video filming of weddings etc)	6901	Service	Indirect	N/A	N/A	N/A	Production may benefit from visual amenity services of various ecosystem types, but does not directly require an ecosystem service
69000190	Meteorology services	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000200	Interpreting and translating services	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000210	Research and development services	6901	Service	Direct	1 – Essential	Food and health research	Education, scientific and research	Partially conducted in unspecified ecosystem types

69000220	Own account research and development	6901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
69000230	Professional, scientific or technical services nec	6901	Service	Direct	1 – Essential	Food and health services	Genetic material and Education, scientific and research	Partially conducted in unspecified ecosystem types
69001980	General government consumption of fixed capital (6910, 6921-6950, 6961-6999)	6901	Out of scope	N/A	N/A	N/A	N/A	N/A
70000010	Computer systems, hardware and software design and development services	7001	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
70000030	Computer support services	7001	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
70001980	General government consumption of fixed capital (7000)	7001	Out of scope	N/A	N/A	N/A	N/A	N/A
72110010	Employment placement and recruitment services (incl casting agency services)	7210	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
72120010	Labour supply services	7210	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
72200010	Travel agency and tour arrangement services	7210	Service	Direct conditional	4 – Non-essential	Leisure	Recreation and visual amenity	Ecosystem service partially required for production, however ecosystem types are unspecified
72910010	Periodical subscription service	7210	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
72910020	Office administration services nec (incl clerical, billing, record-keeping and payroll services)	7210	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
72920010	Document preparation services nec (incl word processing, stenography, typing, transcription and resume writing)	7210	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
72930010	Credit rating, credit investigation and collection agency services	7210	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
72940010	Call centre operation	7210	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
72990010	Tourist information centre operation	7210	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
72990020	Theatre, concert and sport ticketing and booking services	7210	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
72990030	Event management or promotion (incl sport, art or similar); fund raising	7210	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service

	services (fee based) or administration services nec							
72991980	General government consumption of fixed capital (7211-7299)	7210	Out of scope	N/A	N/A	N/A	N/A	N/A
73110010	Building and industrial cleaning services nec (incl gutters, drains, roads, beaches, swimming pools and toilets)	7310	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
73120010	Pest control services	7310	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
73130010	Gardening services	7310	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
73200010	Crating or packing services for transport	7310	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
73200020	Packaging of fresh produce or groceries; bottling or rebottling services and packaging services nec	7310	Service	Direct	1 – Essential	Food	Crop provisioning and grazed biomass	As per crop provisioning and grazed biomass raw material logic chains
73201980	General government consumption of fixed capital (7311-7320)	7310	Out of scope	N/A	N/A	N/A	N/A	N/A
75000010	Government administration and regulatory services	7501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
75400010	Judicial services (incl operation of law, arbitration, bankruptcy, industrial relations and children's courts; royal, conciliation and arbitration commissions; and judicial authorities)	7501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
75510010	Domestic government diplomatic and consular services	7501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
75521980	General government consumption of fixed capital (7510-7552)	7501	Out of scope	N/A	N/A	N/A	N/A	N/A
76000010	Defence services	7601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
76001980	General government consumption of fixed capital (7600)	7601	Out of scope	N/A	N/A	N/A	N/A	N/A
77110010	Police services	7701	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
77120010	Investigative and security services (incl locksmiths) (excl police)	7701	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
77130010	Fire brigade services (incl forest fire fighting)	7701	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
77140010	Correctional and detention centres (incl juvenile)	7701	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
77190010	Public order and safety services (incl coastwatch and country border) nec	7701	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service

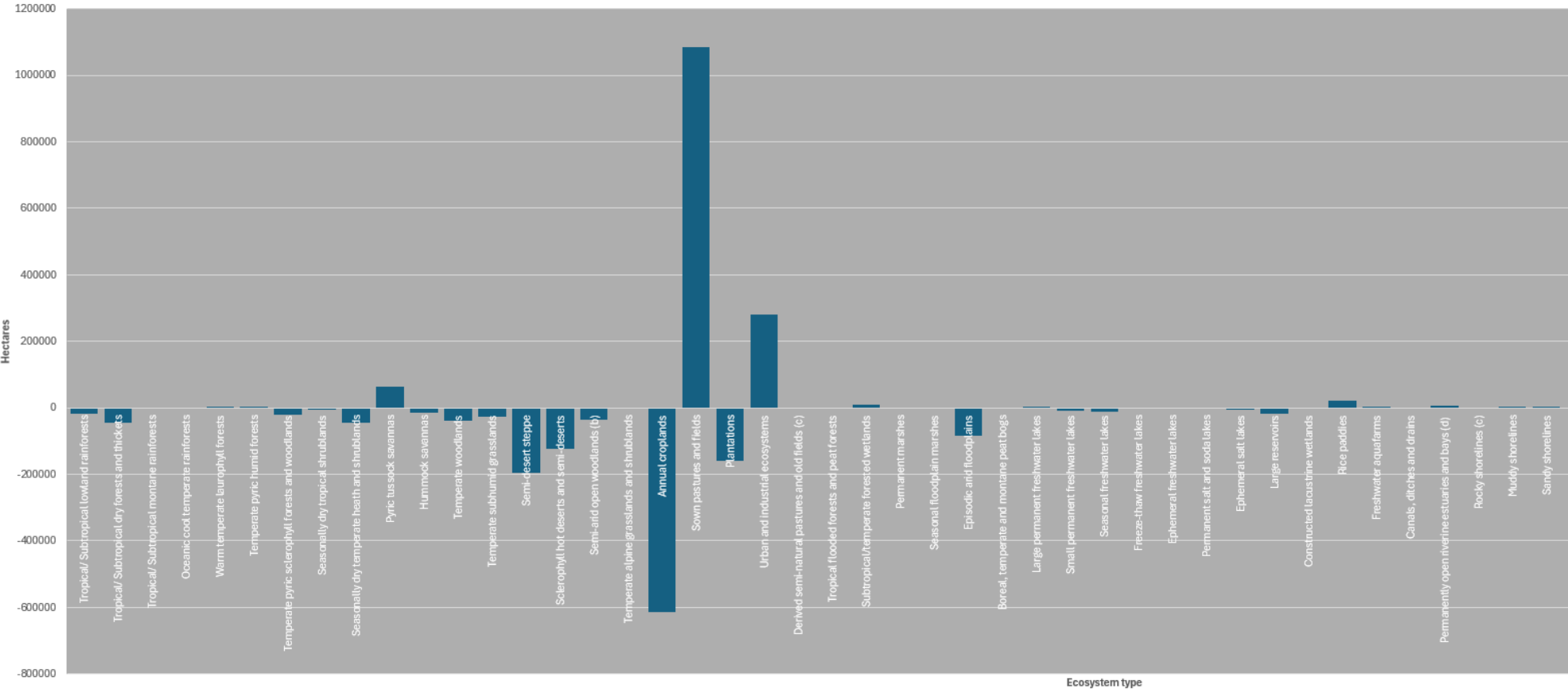
77201980	General government consumption of fixed capital (7711-7720)	7701	Out of scope	N/A	N/A	N/A	N/A	N/A
80100010	Preschool education services	8010	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
80200010	Primary education services	8010	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
80200020	Secondary education services	8010	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
80200030	Special school education services	8010	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
80201980	General government consumption of fixed capital (8010-8024)	8010	Out of scope	N/A	N/A	N/A	N/A	N/A
81010010	Technical, vocational and non-tertiary education services nec	8110	Service	Direct	3 – Essential	Education	Education, scientific and research	Partially conducted in unspecified ecosystem types
81020010	Tertiary higher education services (incl undergraduate and postgraduate)	8110	Service	Direct	3 – Essential	Education	Education, scientific and research	Partially conducted in unspecified ecosystem types
81021980	General government consumption of fixed capital (8101-8102)	8110	Out of scope	N/A	N/A	N/A	N/A	N/A
82110010	Sports or physical recreation instruction services (incl ski or snowboard) nec	8210	Service	Direct conditional	4 – Non-essential	Leisure	Recreation services	Overt logical fit to Alpine grasslands for part of economic production associated with skiing and snowboarding
82120010	Arts education services (excl vocational)	8210	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
82190030	Adult, community and education services nec	8210	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
82200010	Educational support services	8210	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
82201980	General government consumption of fixed capital (8211-8220)	8210	Out of scope	N/A	N/A	N/A	N/A	N/A
84010010	Hospital services (excl psychiatric hospitals)	8401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
84020010	Psychiatric Hospitals services	8401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
85110010	General practice medical services	8401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
85120010	Specialist medical services	8401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
85200010	Pathology and diagnostic imaging services	8401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
85310010	Dental services	8401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
85320010	Optometry and optical dispensing	8401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service

85330010	Physiotherapy services	8401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
85340010	Chiropractic and osteopathic services	8401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
85390030	Allied health services nec	8401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
85910010	Ambulance services	8401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
85990010	Health services nec	8401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
85991980	General government consumption of fixed capital (8401 - 8599)	8401	Out of scope	N/A	N/A	N/A	N/A	N/A
86010010	Residential care services for the elderly (aged care)	8601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
86010020	Residential care services for the disabled	8601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
86090010	Residential care services (incl mental health illnesses or substance abuse) nec	8601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
87100010	Child care services	8601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
87900030	Social assistance services nec (incl elderly, disabled, marriage and adoption services)	8601	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
87901980	General government consumption of fixed capital (8601 - 8790)	8601	Out of scope	N/A	N/A	N/A	N/A	N/A
89100010	Museum and art gallery services	8901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
89210010	Zoological and botanical services	8901	Service	Direct conditional	4 – Non-essential	Leisure	Genetic material	Conducted in urban areas
89220010	Nature reserve and conservation park services	8901	Service	Direct conditional	4 – Non-essential	Leisure	Recreation services	Conducted in various unspecified ecosystem types
89221980	General government consumption of fixed capital (8910-8922)	8901	Out of scope	N/A	N/A	N/A	N/A	N/A
90010010	Performing arts operation nec (incl theatre restaurants and circuses)	8901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
90020010	Services of independent creative artists, writers and performers	8901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
90020020	Theatre lighting, costume design and set design services	8901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
90030010	Performing arts venue operation	8901	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
90031980	General government consumption of fixed capital (9001-9003)	8901	Out of scope	N/A	N/A	N/A	N/A	N/A

91110010	Gymnasia or fitness centre operation	9101	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
91120090	Sports and physical recreation clubs operation and sports professionals	9101	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
91130010	Sports grounds and similar recreational facilities operation nec (excl gymnasia or fitness centres)	9101	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
91140030	Sport and physical recreation administrative services	9101	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
91210010	Horse and dog racing, administration and track operation	9101	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
91290010	Horse or dog training and stable (kennel) operation	9101	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
91310010	Amusement parks and centres operation	9101	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
91390010	Recreational activities nec	9101	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
91391980	General government consumption of fixed capital (9111-9139)	9101	Out of scope	N/A	N/A	N/A	N/A	N/A
92010010	Casinos operation	9201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
92020010	Lottery operation	9201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
92090010	Totalisator agency services	9201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
92090020	Gambling services nec	9201	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
92091980	General government consumption of fixed capital (9201-9209)	9201	Out of scope	N/A	N/A	N/A	N/A	N/A
94110090	Automotive electrical services	9401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
94120010	Car wash and cleaning services	9401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
94120020	Automotive body, paint and interior repair services	9401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
94190010	Automotive repair services nec	9401	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
94191980	General government consumption of fixed capital (9411-9419)	9401	Out of scope	N/A	N/A	N/A	N/A	N/A
94210010	Domestic appliance repair and maintenance	9402	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
94220010	Electronic and precision equipment repair and maintenance (excl domestic appliance)	9402	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service

94290010	Machinery and equipment repair and maintenance nec	9402	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
94910010	Clothing and footwear repair	9402	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
94990010	Repair and maintenance nec	9402	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
94991980	General government consumption of fixed capital (9421-9499)	9402	Out of scope	N/A	N/A	N/A	N/A	N/A
95110010	Hairdressing and beauty services (incl massage services nec)	9501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
95200090	Funeral, crematorium and cemetery services	9501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
95300010	Personal services nec (incl weight reduction centres and prostitution services)	9501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
95310010	Laundry and dry-cleaning services	9501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
95320010	Photographic film processing	9501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
95330010	Parking services	9501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
95391980	General government consumption of fixed capital (9511-9539)	9501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
95400010	Religious services	9502	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
95510010	Business and professional association services	9502	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
95520010	Labour association services	9502	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
95590010	Interest groups nec (incl welfare fundraising services)	9502	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
95590020	Services to students at post-secondary institutions by their sports and student unions	9502	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service
95591980	General government consumption of fixed capital (9540-9559)	9502	Out of scope	N/A	N/A	N/A	N/A	N/A
96000010	Domestic services of private household employees	9501	Service	Indirect	N/A	N/A	N/A	Production does not directly require an ecosystem service

Supplementary Figure 1



Supplementary Figure 1. Net change in ecosystem extent from 2015-16 to 2020-21. Source: authors from national ecosystem account data (ABS, 2025).

Methods Table 1 | Key terms, classifications and typologies

Term	Meaning	Classification or typology used during analysis
Production boundary	Economic activities as outlined in the SNA (European Commission et al., 2025): (a) the production of all goods or services that are supplied to units other than their producers, or intended to be so supplied, including the production of goods or services used up in the process of producing such goods or services; (b) the own-account production of all goods that are retained by their producers for their own final consumption or gross capital formation; (c) the own-account production of knowledge capturing products that are retained by their producers for their own final consumption or gross capital formation but excluding (by convention) such products produced by households for their own use; (d) the own-account production of housing services by owner occupiers; and (e) the production of domestic and personal services by employing paid domestic staff.	International Standard Industrial Classification of All Economic Activities (ISIC) (United nations, 2008) or national equivalent Australia: Australian and New Zealand Standard Industrial Classification (ANZSIC), including the most granular Input-Output Product Classification (IOPC) (e.g. 'Rock lobsters and crabs', and 'Fish and squid - line fishing') and the next level of aggregation Input-Output Product Group (IOPG) (e.g. '0401 Fishing, hunting and trapping'). - Products (or goods): Raw materials (e.g. Sheep and lambs), immediate derivatives (e.g. Wool – shorn and dead) and processed materials (e.g. Knitted or crocheted wearing apparel) - Services: e.g. shearing services Maldives: ISIC divisions (e.g. 'agriculture', 'fisheries', 'manufacturing', 'construction')
Natural capital assets	Inclusive of renewable and non-renewable resources, and natural, semi-natural and anthropocentric ecosystems, these assets are: ecosystem assets and environmental assets (Bradley et al., 2026), as defined in the SEEA. Uncultivated natural capital (i.e. natural ecosystems) are outside the 'production boundary' and are considered within the 'environment boundary' of the SEEA. Cultivated natural capital (i.e. semi-natural ecosystems such as croplands) are included in both the production and environment boundaries (Bradley et al., 2026).	Ecosystem and environmental asset classifications, as below.
Ecosystem assets	Contiguous spaces of a specific ecosystem type characterised by a distinct set of biotic and abiotic components and their interactions. An ecosystem type reflects a distinct set of abiotic and biotic components and their interactions (United Nations et al., 2024).	IUCN Global Ecosystem Typology (Keith et al., 2020)
Environmental assets	The naturally occurring living and non-living components of the Earth (i.e. natural resources), together constituting the biophysical environment, which may provide benefits to humanity. Environmental assets can be components of ecosystems (e.g. fish, timber, soil water) or not (e.g. minerals) (United Nations et al., 2014).	SEEA Central Framework (United Nations et al., 2014)
Ecosystem services	The contributions of ecosystems to the benefits that are used in economic and other human activity, either as intermediate or final services (United Nations et al., 2014; United Nations et al., 2024).	SEEA EA reference list of 36 Ecosystem Services, identified as either or both intermediate or final ecosystem services (United Nations et al., 2024). The SEEA EA reference list is aligned with the Common International Classification of Ecosystem Services (CICES) (Haines-Young and Potschin, 2018)
Final ecosystem services	Those ecosystem services in which the user of the service is an economic unit – i.e., business, government or household' (United Nations et al., 2024).	As above
Intermediate ecosystem services	Ecosystem services occurring within or between ecosystems, where the user of the ecosystem service is an ecosystem asset and where there is a connection to the supply of final ecosystem services (United Nations et al., 2024).	As above
Abiotic flows	Provision of environmental assets not underpinned by, or reliant on, ecological characteristics and processes, such as some geological resources (United Nations et al., 2024).	N/A
Critical natural capital	Natural capital assets that provide ecosystem services and abiotic resource flows for maintaining a prescribed level of essential human wellbeing (Bradley et al., 2026).	As above
Intermediate consumption	Value of goods and services consumed as inputs by a process of production, excluding consumption of fixed assets (European Commission et al., 2025).	ISIC as above

Final demand	Expenditures on all goods and services that are not for intermediate use (European Commission et al., 2025).	ISIC as above
Fixed assets	Produced assets used repeatedly in production for more than one year (European Commission et al., 2025).	ISIC as above

Methods Table 2 | Ecosystem services in scope and their importance (Australia)

Importance hierarchy	SEEA Code	SEEA EA Reference List ¹⁰ of Ecosystem Services		Type of dependency	Australian context and rationale	Included in analysis
Out of scope intermediate ES	2.2	Rainfall pattern regulation services	Ecosystem contributions of vegetation, in particular forests, to maintaining rainfall patterns through evapotranspiration at the subcontinental scale. Forests and other vegetation recycle moisture back to the atmosphere where it is available for the generation of rainfall. Rainfall in interior parts of continents fully depends upon this recycling. These may be final or intermediate ecosystem services.	Indirect	Considered intermediate to water supply.	No
	2.5	Soil quality regulation services	Ecosystem contributions to the decomposition of organic and inorganic materials and to the fertility and characteristics of soils, e.g. for input to biomass production. These are most commonly recorded as intermediate ecosystem services.	Indirect	N/A	No
	2.9	Water purification services: Retention and breakdown of nutrients	Ecosystem contributions to the restoration and maintenance of the chemical condition of surface water and groundwater bodies through the breakdown or removal of nutrients and other pollutants by ecosystem components that mitigate the harmful effects of those pollutants on human use or health. These may be recorded as final or intermediate ecosystem services.	Indirect	Considered intermediate to water supply	No
	2.10	Retention and breakdown of other pollutants				
	2.11	Baseline flow maintenance services (water flow regulation services)	Ecosystem contributions to the regulation of river flows and groundwater and lake water tables. They are derived from the ability of ecosystems to absorb and store water and gradually release it during dry seasons or periods through evapotranspiration and hence secure a regular flow of water. These may be recorded as final or intermediate ecosystem services.	Indirect	Considered intermediate to flood mitigation	No
	2.17	Pollination services	Ecosystem contributions of wild pollinators to the fertilization of crops that maintain or increase the abundance and/or diversity of other species that economic units use or enjoy. These may be recorded as final or intermediate services	Indirect	Considered intermediate to specific crop provisioning.	Noted in Economy only
	2.18	Pest control services	Ecosystem contributions to reductions in the incidence of species that may prevent or reduce the effects of pests on biomass production processes or other economic and human activity. These may be recorded as final or intermediate services	Indirect	Intermediate to crop and other biomass provisioning.	No
	2.20	Nursery population and habitat maintenance services	Ecosystem contributions necessary for sustaining populations of species that economic units ultimately use or enjoy, either through the maintenance of habitats (e.g. for nurseries or migration) or the protection of natural gene pools. These are intermediate services and may be inputs to a number of different final ecosystem services including biomass provisioning and recreation related services.	Indirect	Key contribution to Wild fish and other natural aquatic products provisioning services relevant to the management of associated natural capital	Noted in Economy only
Level 1 – Basic needs	1.1	Crop provisioning services	Ecosystem contributions to the growth of cultivated plants that are harvested by economic units for various uses, including food and fibre production, fodder and energy. These are final ecosystem services.	Direct economy only	Relevant domestic production for food	Economy only

	1.2	Grazed biomass provisioning services	Ecosystem contributions to the growth of grazed biomass that is an input to the growth of cultivated livestock. These services exclude ecosystem contributions to the growth of crops used to produce fodder for livestock (e.g. hay, soybean meal). Those contributions are included under crop provisioning services. These are final ecosystem services but may be intermediate to livestock provisioning services.	Direct economy only	Relevant domestic production for food	Economy only
	1.3	Livestock provisioning services	Ecosystem contributions to the growth of cultivated livestock and livestock products (e.g. meat, milk, eggs, wool, leather) that are used by economic units for various purposes, primarily food production. These are final ecosystem services. No distinct livestock provisioning services are to be recorded if grazed biomass provisioning services are recorded as a final ecosystem service.	Direct economy only	Relevant domestic production, but excluded to prevent double counting (with grazed biomass provisioning) of dependencies within a supply chain.	No
	1.4	Aquaculture provisioning services	Ecosystem contributions to the growth of animals and plants (e.g. fish, shellfish, seaweed) in aquaculture facilities that are harvested by economic units for various uses. These are final ecosystem services.	Direct economy only	Relevant domestic production for food	Economy only
	1.6	Wild fish and other natural aquatic products provisioning services	Ecosystem contributions to the growth of fish and other aquatic biomass that are captured in uncultivated production contexts by economic units for various uses, primarily food production. These are final ecosystem services.	Direct economy and wellbeing	First nations fish catch, intertidal and marine foraging for food, medicine and fibre (excludes recreation)	Economy only
	1.7	Wild animals, plants and other biomass provisioning services	Ecosystem contributions to the growth of wild animals, plants and other biomass that are captured and harvested in uncultivated production contexts by economic units for various uses. The scope includes non-wood forest products (NWFP) and services related to hunting, trapping and bioprospecting activities; but it excludes wild fish and other natural aquatic biomass (included in the class directly above). These are final ecosystem services.	Direct economy and wellbeing	First nations hunting and foraging for food, medicine and fibre (excludes firewood and recreation)	Economy only
	1.9	Water supply	The combined ecosystem contributions of water flow regulation, water purification and other ecosystem services to the supply of water of appropriate quality to users for various purposes, including household consumption. These are final ecosystem services.	Indirect, Direct economy and wellbeing	Abstraction of surface water, groundwater and sea water for desalination by end users (excludes the water storage and distribution industry) and use for drinking and sanitation. Also private self-extraction and roof top rainfall collection for household consumption independent of the economy.	Economy and wellbeing
	1.10	Other provisioning	Not defined in the SEEA EA	Direct economy and wellbeing	Commercial bee keeping for honey production (food). Beekeeping for private use excluded from national analysis.	Economy only
	2.1	Global climate regulation services	Ecosystem contributions to reducing concentrations of GHGs in the atmosphere through the removal (sequestration) of carbon from the atmosphere and the retention (storage) of carbon in ecosystems. These services, which support the regulation of the chemical composition of the atmosphere and oceans, are final ecosystem services.	Indirect, Direct economy and wellbeing	All carbon sequestration and storage relevant to basic air supply and health and safety.	Wellbeing only

	2.4	Air filtration services	Ecosystem contributions to the filtering of airborne pollutants through the deposition, uptake, fixing and storage of pollutants by ecosystem components, particularly plants, that mitigate the harmful effects of those pollutants. These are most commonly final ecosystem services.	Indirect, Direct wellbeing	Filtering of air-borne pollutants through the deposition, uptake, fixing and storage of pollutants by vegetation, mainly by forests and woodlands. Relevant to basic air supply and health.	Wellbeing only
Level 2 – Good health and safety	1.5	Wood provisioning services	Ecosystem contributions to the growth of trees and other woody biomass both in cultivated (plantation) and in uncultivated production contexts that are harvested by economic units for various uses including timber production and energy. These services, which exclude contributions to nonwood forest products, are final ecosystem services.	Direct economy and wellbeing	Mostly via the economy for various timber and energy uses. However also includes firewood collection that bypasses the economy for cooking and heating.	Economy and wellbeing
	1.8	Genetic material	Ecosystem contributions from all biota (including seed, spore or gamete production) that are used by economic units, for example, (a) to develop new animal and plant breeds; (b) in gene synthesis; or (c) in product development directly using genetic material. These are most commonly recorded as ecosystem services intermediate to biomass provisioning.	Indirect, direct economy	Animal breeding (including for service animals) requires genetic material services, but is otherwise intermediate to biomass provisioning.	Economy only
	2.3	Local (micro and meso) climate regulation services	Ecosystem contributions to the regulation of ambient atmospheric conditions (including micro- and mesoscale climates) through the presence of vegetation that improve people's living conditions and support economic production. Examples include evaporative cooling provided by urban trees ("green space"), the contribution of urban water bodies ("blue space") and the contribution of trees to providing shade for humans and livestock. These may be final or intermediate ecosystem services.	Indirect, Direct economy and wellbeing	Evaporative cooling (temperature and humidity regulation) provided by vegetation and water bodies at local scales, such as shade provided by trees in urban landscapes and for agricultural livestock. Inclusion not appropriate for national scale analysis.	No
	2.6	Soil erosion control services	Ecosystem contributions, particularly the stabilizing effects of vegetation, that reduce the loss of soil (and sediment) and support use of the environment (e.g. agricultural activity, water supply). These may be recorded as final or intermediate ecosystem services.	Indirect, Direct economy and wellbeing	Stabilisation of land surfaces and retention of agricultural soil. Fundamental for all habitation directly. Indirectly contributes to final ES. Not appropriate for national scale analysis.	No
	2.7	Landslide mitigation	Ecosystem contributions, particularly the stabilizing effects of vegetation, that mitigate or prevent potential damage to human health and safety and damaging effects to buildings and infrastructure that arise from the mass movement (wasting) of soil, rock and snow. These are final ecosystem Services.	Indirect, Direct wellbeing	Stabilisation of sloped land surfaces and prevention of mass movement (for health and safety), mostly relevant to forests and woodlands.	Wellbeing only
	2.8	Solid waste remediation	Ecosystem contributions to the transformation of organic or inorganic substances, through the action of microorganisms, algae, plants and animals, that mitigate their harmful effects. These may be recorded as final or intermediate ecosystem services.	Indirect, Direct economy and wellbeing	Transformation of landfill waste, compost and other dispersed organic and inorganic substances (for health and safety) through bio-remediation by micro-organisms, algae, plants, and animals, including wetlands. Intensified waste management relies on micro-organism function.	Economy only
	2.12	Peak flow mitigation services (flood mitigation links to 2.14)	Ecosystem contributions to the regulation of river flows and groundwater and lake water tables. They are derived from the ability of ecosystems to absorb and store water and hence mitigate the effects of flood and other extreme water-related events. Peak flow mitigation services are supplied	Direct economy and wellbeing	Absorption and storage of water for the benefit of flood protection (health and safety). Most relevant to wetlands and forests. Local economic benefits.	Wellbeing only

			together with river flood mitigation services in providing the benefit of flood protection. These are final ecosystem services.			
	2.13	Coastal protection services (flood control services)	Ecosystem contributions of linear elements in the seascape (e.g. coral reefs, sand banks, dunes or mangrove ecosystems along the shore) to protecting the shore and thus mitigating the impacts of tidal surges or storms on local communities. These are final ecosystem services.	Direct economy and wellbeing	Shoreline ecosystems (such as coral reefs, sand banks, dunes and mangroves) mitigating the impacts of tidal surges or storms (health and safety). Local economic benefits.	Wellbeing only
	2.14	River flood mitigation services (links to 2.12)	Ecosystem contributions of riparian vegetation, which provides structure and a physical barrier to high water levels and thus mitigates the impacts of floods on local communities. River flood mitigation services are supplied together with peak flow mitigation services in providing the benefit of flood protection. These are final ecosystem services.	Direct economy and wellbeing	Riparian vegetation provides structure and a physical barrier to high water levels (health and safety). Local economic benefits.	Wellbeing only
	2.15	Storm mitigation services	Ecosystem contributions of vegetation, including linear elements, in mitigating the impacts of windstorms, sandstorms and other types of storms (other than water-related events) on local communities. These are final ecosystem services	Direct economy and wellbeing	Storm mitigation services distinct from flood and coastal protection are associated with vegetation mitigating impacts, such as of wind, sand and hail. Given the local and dispersed nature of these services they are not appropriate for national analysis.	No
	2.19	Disease control services	Ecosystem contributions to reductions in the incidence of species that may prevent or reduce the effects of species on human health. These are most commonly final ecosystem services.	Indirect, direct wellbeing	Ecosystems in good condition (through vertebrate diversity) provide disease regulation, reducing the incidence of species that impact human health. Relevant to all natural ecosystem types under specific contexts.	No
	2.21	Other regulating and maintenance services	Not defined in the SEEA EA	Indirect, direct wellbeing	Fire protection supporting health and safety. Local economic benefits.	Wellbeing only
	3.1	Recreation related services	Contributions of ecosystems, in particular through their biophysical characteristics and qualities, that enable people to use and enjoy the environment through direct, in situ, physical and experiential interactions with the environment. These include services both to locals and to non-locals (i.e. visitors, including tourists). Recreation-related services may also be supplied to those engaging in recreational fishing or hunting. These are final ecosystem services.	Direct wellbeing	Access to green and blue spaces considered essential to mental health included. Other recreational experiences and enjoyment are not considered essential (e.g. recreation based hunting, fishing and foraging for food, medicine and fibre).	Wellbeing only (partial)
Levels 3 – Essential	3.3	Education, scientific and research services	Ecosystem contributions, in particular through their biophysical characteristics and qualities, that enable people to use the environment through intellectual interactions with it. These are final ecosystem services.	Direct economy	Places used for scientific and research purposes indiscernible at a national scale.	Economy only
	3.4	Spiritual, artistic and symbolic services	Contributions of ecosystems, in particular through their biophysical characteristics and qualities, that are recognized by people for their cultural, historical, aesthetic, sacred or religious significance. These services may underpin people's cultural identity and may inspire them to	Direct wellbeing	Places recognised for their cultural, historical, aesthetic, sacred or religious significance, not appropriate to include in national analysis.	No

			express themselves through various artistic media. These are final ecosystem services.			
Level 4 – Non-essential	2.16	Noise attenuation services	Ecosystem contributions to reduction of the impact of noise on people that mitigate its harmful or stressful effects. These are most commonly final ecosystem services.	Direct wellbeing	Reduction in the impact of noise that mitigates its harmful or stressful effects considered non-essential.	No
	3.2	Visual amenity services	Ecosystem contributions to local living conditions, in particular through the biophysical characteristics and qualities of ecosystems, that provide sensory benefits, especially visual. These services combine with other ecosystem services, including recreation-related services and noise attenuation services, to underpin amenity values. These are final ecosystem services.	Direct wellbeing	Visual enjoyment of places for living, working and recreation considered non-essential.	No
	4.1	Ecosystem and species appreciation services	Concerns the well-being that people derive from the existence and preservation of the environment for current and future generations, irrespective of any direct or indirect use.	Direct wellbeing	Existence and preservation values considered non-essential.	No

Methods Table 3 | Ecosystem types in Australia

Ecosystem types shown as present in this table are crosswalked to the relevant spatial data used in **Figure 8** according to the data product methods outlined in Macfarlane et al (2024b) (Tables 1 to 4).

Realm	Biome		Ecosystem functional group		Simple label	Present in Australia?	Mapped?
TERRESTRIAL	T1	Tropical-subtropical forests	T1.1	Tropical-subtropical lowland rainforests	Tropical rainforests	Yes	Yes
			T1.2	Tropical-subtropical dry forests and thickets	Dry forests	Yes	Yes
			T1.3	Tropical-subtropical montane rainforests	Mountain rainforests	Yes	Yes
			T1.4	Tropical heath forests	N/A	No	N/A
	T2	Temperate-boreal forests & woodlands	T2.1	Boreal and temperate high montane forests and woodlands	N/A	No	N/A
			T2.2	Deciduous temperate forests	N/A	No	N/A
			T2.3	Oceanic cool temperate rainforests	Cool rainforests	Yes	Yes
			T2.4	Warm temperate laurophyll forests	Warm forests	Yes	Yes
			T2.5	Temperate pyric humid forests	Fire prone complex forests	Yes	Yes
			T2.6	Temperate pyric sclerophyll forests and woodlands	Fire prone forests and woodlands	Yes	Yes
	T3	Shrublands & shrubby woodlands	T3.1	Seasonally dry tropical shrublands	Tropical shrublands	Yes	Yes
			T3.2	Seasonally dry temperate heaths and shrublands	Heaths and shrublands	Yes	Yes
			T3.3	Cool temperate heathlands	N/A	No	N/A
			T3.4	Rocky pavements, screes and lava flows	N/A	No	N/A
	T4	Savannas and grasslands	T4.1	Trophic savannas	N/A	No	N/A
			T4.2	Pyric tussock savannas	Fire prone grass savannas	Yes	Yes
			T4.3	Hummock savannas	Grass savannas	Yes	Yes
			T4.4	Temperate woodlands	Woodland	Yes	Yes
			T4.5	Temperate subhumid grasslands	Grassland	Yes	Yes
	T5	Deserts and semi-deserts	T5.1	Semi-desert steppes	Flat shrub and grassland	Yes	Yes
			T5.2	Succulent or Thorny deserts and semi-deserts	N/A	No	N/A
			T5.3	Sclerophyll hot deserts and semi-deserts	Desert	Yes	Yes
			T5.4	Cool deserts and semi-deserts	N/A	No	N/A
			T5.5	Hyper-arid deserts	N/A	No	N/A

	T6	Polar-alpine	T6.1	Ice sheets, glaciers and perennial snowfields	N/A	No	N/A
			T6.2	Polar-alpine rocky outcrops	N/A	Yes, Not on mainland	N/A
			T6.3	Polar tundra and deserts	N/A	No	N/A
			T6.4	Temperate alpine grasslands and shrublands	Alpine grassland	Yes	Yes
			T6.5	Tropical alpine grasslands and shrublands	N/A	No	N/A
	T7	Intensive land-use systems	T7.1	Annual croplands	Annual croplands	Yes	Yes
			T7.2	Sown pastures and fields	Sown pastures and fields	Yes	Yes
			T7.3	Plantations	Plantations	Yes	Yes
			T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems	Yes	Yes
			T7.5	Derived semi-natural pastures and oldfields	Semi-natural pastures	Yes	Not mapped
SUBTERRANEAN	S1	Subterranean lithic systems	S1.1	Aerobic caves	Caves	Yes	Out of scope
			S1.2	Endolithic systems	Microscopic life in rocks	Yes	Out of scope
			S2.1	Anthropogenic subterranean voids	Mining tunnels	Yes	Out of scope
SUBTERRANEAN-FRESHWATER	SF1	Subterranean freshwaters	SF1.1	Underground streams and pools	Underground streams and pools	Yes	Out of scope
			SF1.2	Groundwater ecosystems	Groundwater ecosystems	Yes	Out of scope
	SF2	Anthropogenic subterranean freshwaters	SF2.1	Water pipes and subterranean canals	Water pipes	Yes	Out of scope
			SF2.2	Flooded mines and other voids	Flooded mines	Yes	Out of scope
SUBTERRANEAN MARINE	SM1	Subterranean tidal systems	SM1.1	Anchialine caves	Underwater caves	Yes	Out of scope
			SM1.2	Anchialine pools	Surface-subterranean pools	Yes	Out of scope
			SM1.3	Sea caves	Sea caves	Yes	Out of scope
FRESHWATER TERRESTRIAL	TF1	Palustrine wetlands	TF1.1	Tropical flooded forests and peat forests	Flooded forests	Yes	Yes
			TF1.2	Subtropical/temperate forested wetlands	Forested wetlands	Yes	Yes
			TF1.3	Permanent marshes	Marshes	Yes	Yes
			TF1.4	Seasonal floodplain marshes	Floodplain marshes	Yes	Yes
			TF1.5	Episodic arid floodplains	Episodic arid floodplains	Yes	Yes
			TF1.6	Boreal, temperate and montane peat bogs	Peat bogs	Yes	Yes
			TF1.7	Boreal and temperate fens	N/A	No	N/A
FRESHWATER	F1	Rivers and streams	F1.1	Permanent upland streams	Permanent streams	Yes	Yes

			F1.2	Permanent lowland rivers	Permanent rivers	Yes	Yes
			F1.3	Freeze-thaw rivers and streams	Freeze-thaw rivers and streams	Yes	Yes
			F1.4	Seasonal upland streams	Seasonal streams	Yes	Yes
			F1.5	Seasonal lowland rivers	Seasonal rivers	Yes	Yes
			F1.6	Episodic arid rivers	Episodic arid rivers	Yes	Yes
			F1.7	Large lowland rivers	N/A	No	N/A
	F2	Lakes	F2.1	Large permanent freshwater lakes	Large lakes	Yes	Yes
			F2.2	Small permanent freshwater lakes	Small lakes	Yes	Yes
			F2.3	Seasonal freshwater lakes	Seasonal lakes	Yes	Yes
			F2.4	Freeze-thaw freshwater lakes	Freeze-thaw lakes	Yes	Yes
			F2.5	Ephemeral freshwater lakes	Shallow depressions	Yes	Yes
			F2.6	Permanent salt and soda lakes	Permanent salt lakes	Yes	Yes
			F2.7	Ephemeral salt lakes	Mostly dry salt lakes	Yes	Yes
			F2.8	Artesian springs and oases	Artesian springs	Yes	Yes
			F2.9	Geothermal pools and wetlands	N/A	No	N/A
			F2.10	Subglacial lakes	N/A	No	N/A
	F3	Artificial fresh waters	F3.1	Large reservoirs	Dams	Yes	Yes
			F3.2	Constructed lacustrine wetlands	Farm dams, waste water ponds	Yes	Yes
			F3.3	Rice paddies	Rice paddies	Yes	Yes
			F3.4	Freshwater aquafarms	Freshwater aquafarms	Yes	Yes
			F3.5	Canals, ditches and drains	Canals, ditches and drains	Yes	Yes
FRESHWATER MARINE	FM1	Semi-confined transitional waters	FM1.1	Deepwater coastal inlets	N/A	No	N/A
			FM1.2	Permanently open riverine estuaries and bays	River estuaries and bays	Yes	Yes
			FM1.3	Intermittently closed and open lakes and lagoons	Intermittent lakes and lagoons	Yes	Mapped as FM1.2
MARINE	M1	Marine shelves	M1.1	Seagrass meadows	Seagrass meadows	Yes	Yes
			M1.2	Kelp forests	Kelp forests	Yes	Mapped as M1.6
			M1.3	Photic coral reefs	Coral reefs	Yes	Yes
			M1.4	Shellfish beds and reefs	Shellfish reefs	Yes	Mapped as M1.6 & M1.7
			M1.5	Photo-limited marine animal forests	Marine animal forests	Yes	Yes
			M1.6	Subtidal rocky reefs	Rocky reefs	Yes	Yes

			M1.7	Subtidal sand beds	Sand beds	Yes	Yes
			M1.8	Subtidal mud plains	Mud plains	Yes	Mapped as M1.7
			M1.9	Upwelling zones	Upwelling zones	Yes	Not mapped
			M1.10	Rhodolith /Maerl beds	Calcified red algae beds	Yes	Mapped as M1.7
	M2	Pelagic ocean waters	M2.1	Epipelagic ocean waters	Shallow open water <200m	Yes	Yes
			M2.2	Mesopelagic ocean waters	Low light waters <1000m	Yes	Yes
			M2.3	Bathypelagic ocean waters	Dark waters <3000m	Yes	Yes
			M2.4	Abyssopelagic ocean waters	Abyss waters > 3000m	Yes	Yes
			M2.5	Sea ice	Sea ice	Yes, Not on mainland	Not mapped
	M3	Deep sea floors	M3.1	Continental and island slopes	Continental slopes	Yes	Yes
			M3.2	Submarine canyons	Ocean canyons	Yes	Yes
			M3.3	Abyssal plains	Abyss floors	Yes	Yes
			M3.4	Seamounts, ridges and plateaus	Deep rocky floors	Yes	Yes
			M3.5	Deepwater biogenic beds	Dark coral reefs	Yes	Not mapped
			M3.6	Hadal trenches and troughs	Deep trenches	Yes	Not mapped
			M3.7	Chemosynthetic-based-ecosystems (CBE)	N/A	No	N/A
	M4	Anthropogenic marine systems	M4.1	Submerged artificial structures	Shipwrecks	Yes	Not mapped
			M4.2	Marine aquafarms	Marine aquafarms	Yes	Not mapped
MARINE TERRESTRIAL	MT1	Shoreline systems	MT1.1	Rocky shores	Rocky shores	Yes	Not mapped
			MT1.2	Muddy shores	Muddy shores	Yes	Yes
			MT1.3	Sandy shores	Sandy shores	Yes	Yes
			MT1.4	Boulder and cobble shores	Boulder and cobble shores	Yes	Not mapped
	MT2	Supralittoral coastal systems	MT2.1	Coastal shrublands and grasslands	Coastal shrublands	Yes	Yes
			MT2.2	Large seabird and pinniped colonies	Seabird colonies	Yes	Yes
	MT3	Anthropogenic shorelines	MT3.1	Artificial shores	Artificial shores	Yes	Not mapped
MARINE FRESHWATER TERRESTRIAL	MFT1	Brackish tidal systems	MFT1.1	Coastal river deltas	Coastal river deltas	Yes	Not mapped
			MFT1.2	Intertidal forests and shrublands	Mangroves	Yes	Yes
			MFT1.3	Coastal saltmarshes and reedbeds	Saltmarshes	Yes	Yes

Methods Table 4 | Ecosystem types in the Maldives

Realm	Biome		Ecosystem functional group		Simple label	Present in Maldives?
TERRESTRIAL	T1	Tropical-subtropical forests	T1.1	Tropical-subtropical lowland rainforests	Tropical rainforests	Yes
			T1.2	Tropical-subtropical dry forests and thickets	N/A	No
			T1.3	Tropical-subtropical montane rainforests	N/A	No
			T1.4	Tropical heath forests	N/A	No
	T2	Temperate-boreal forests & woodlands	T2.1	Boreal and temperate high montane forests and woodlands	N/A	No
			T2.2	Deciduous temperate forests	N/A	No
			T2.3	Oceanic cool temperate rainforests	N/A	No
			T2.4	Warm temperate laurophyll forests	N/A	No
			T2.5	Temperate pyric humid forests	N/A	No
			T2.6	Temperate pyric sclerophyll forests and woodlands	N/A	No
	T3	Shrublands & shrubby woodlands	T3.1	Seasonally dry tropical shrublands	N/A	No
			T3.2	Seasonally dry temperate heaths and shrublands	N/A	No
			T3.3	Cool temperate heathlands	N/A	No
			T3.4	Rocky pavements, scree and lava flows	N/A	No
	T4	Savannas and grasslands	T4.1	Trophic savannas	N/A	No
			T4.2	Pyric tussock savannas	N/A	No
			T4.3	Hummock savannas	N/A	No
			T4.4	Temperate woodlands	N/A	No
			T4.5	Temperate subhumid grasslands	N/A	No
	T5	Deserts and semi-deserts	T5.1	Semi-desert steppes	N/A	No
			T5.2	Succulent or Thorny deserts and semi-deserts	N/A	No
			T5.3	Sclerophyll hot deserts and semi-deserts	N/A	No
			T5.4	Cool deserts and semi-deserts	N/A	No
			T5.5	Hyper-arid deserts	N/A	No

	T6	Polar-alpine	T6.1	Ice sheets, glaciers and perennial snowfields	N/A	No
			T6.2	Polar-alpine rocky outcrops	N/A	No
			T6.3	Polar tundra and deserts	N/A	No
			T6.4	Temperate alpine grasslands and shrublands	N/A	No
			T6.5	Tropical alpine grasslands and shrublands	N/A	No
	T7	Intensive land-use systems	T7.1	Annual croplands	Annual croplands	Yes
			T7.2	Sown pastures and fields	N/A	No
			T7.3	Plantations	Plantations	Yes
			T7.4	Urban and industrial ecosystems	Urban and industrial ecosystems	Yes
			T7.5	Derived semi-natural pastures and oldfields	N/A	No
SUBTERRANEAN	S1	Subterranean lithic systems	S1.1	Aerobic caves	N/A	No
			S1.2	Endolithic systems	Microscopic life in rocks	Yes
			S2.1	Anthropogenic subterranean voids	N/A	No
SUBTERRANEAN-FRESHWATER	SF1	Subterranean freshwaters	SF1.1	Underground streams and pools	N/A	No
			SF1.2	Groundwater ecosystems	Groundwater ecosystems	Yes
	SF2	Anthropogenic subterranean freshwaters	SF2.1	Water pipes and subterranean canals	N/A	No
			SF2.2	Flooded mines and other voids	N/A	No
SUBTERRANEAN-MARINE	SM1	Subterranean tidal systems	SM1.1	Anchialine caves	Underwater caves	Yes
			SM1.2	Anchialine pools	N/A	No
			SM1.3	Sea caves	Sea caves	Yes
FRESHWATER TERRESTRIAL	TF1	Palustrine wetlands	TF1.1	Tropical flooded forests and peat forests	N/A	No
			TF1.2	Subtropical/temperate forested wetlands	N/A	No
			TF1.3	Permanent marshes	N/A	No
			TF1.4	Seasonal floodplain marshes	N/A	No
			TF1.5	Episodic arid floodplains	N/A	No
			TF1.6	Boreal, temperate and montane peat bogs	N/A	No

			TF1.7	Boreal and temperate fens	N/A	No
FRESHWATER	F1	Rivers and streams	F1.1	Permanent upland streams	N/A	No
			F1.2	Permanent lowland rivers	N/A	No
			F1.3	Freeze-thaw rivers and streams	N/A	No
			F1.4	Seasonal upland streams	N/A	No
			F1.5	Seasonal lowland rivers	N/A	No
			F1.6	Episodic arid rivers	N/A	No
			F1.7	Large lowland rivers	N/A	No
	F2	Lakes	F2.1	Large permanent freshwater lakes	N/A	No
			F2.2	Small permanent freshwater lakes	N/A	No
			F2.3	Seasonal freshwater lakes	N/A	No
			F2.4	Freeze-thaw freshwater lakes	N/A	No
			F2.5	Ephemeral freshwater lakes	N/A	No
			F2.6	Permanent salt and soda lakes	N/A	No
			F2.7	Ephemeral salt lakes	N/A	No
			F2.8	Artesian springs and oases	N/A	No
			F2.9	Geothermal pools and wetlands	N/A	No
			F2.10	Subglacial lakes	N/A	No
	F3	Artificial fresh waters	F3.1	Large reservoirs	N/A	No
			F3.2	Constructed lacustrine wetlands	N/A	No
			F3.3	Rice paddies	N/A	No
			F3.4	Freshwater aquafarms	N/A	No
			F3.5	Canals, ditches and drains	N/A	No
FRESHWATER MARINE	FM1	Semi-confined transitional waters	FM1.1	Deepwater coastal inlets	N/A	No
			FM1.2	Permanently open riverine estuaries and bays	N/A	No
			FM1.3	Intermittently closed and open lakes and lagoons	N/A	No
MARINE	M1	Marine shelves	M1.1	Seagrass meadows	Seagrass meadows	Yes
			M1.2	Kelp forests	N/A	No
			M1.3	Photic coral reefs	Coral reefs	Yes

			M1.4	Shellfish beds and reefs	N/A	No
			M1.5	Photo-limited marine animal forests	Marine animal forests	Yes
			M1.6	Subtidal rocky reefs	Rocky reefs	Yes
			M1.7	Subtidal sand beds	Sand beds	Yes
			M1.8	Subtidal mud plains	Mud plains	Yes
			M1.9	Upwelling zones	N/A	No
			M1.10	Rhodolith /Maerl beds	N/A	No
	M2	Pelagic ocean waters	M2.1	Epipelagic ocean waters	Shallow open water <200m	Yes
			M2.2	Mesopelagic ocean waters	Low light waters <1000m	Yes
			M2.3	Bathypelagic ocean waters	Dark waters <3000m	Yes
			M2.4	Abyssopelagic ocean waters	Abyss waters > 3000m	Yes
			M2.5	Sea ice	N/A	No
	M3	Deep sea floors	M3.1	Continental and island slopes	Continental slopes	Yes
			M3.2	Submarine canyons	Ocean canyons	Yes
			M3.3	Abyssal plains	Abyss floors	Yes
			M3.4	Seamounts, ridges and plateaus	Deep rocky floors	Yes
			M3.5	Deepwater biogenic beds	Dark coral reefs	Yes
			M3.6	Hadal trenches and troughs	Deep trenches	Yes
			M3.7	Chemosynthetic-based-ecosystems (CBE)	Chemosynthetic-based-ecosystems (CBE)	Yes
	M4	Anthropogenic marine systems	M4.1	Submerged artificial structures	Shipwrecks	Yes
			M4.2	Marine aquafarms	Marine aquafarms	Yes
MARINE TERRESTRIAL	MT1	Shoreline systems	MT1.1	Rocky shores	Rocky shores	Yes
			MT1.2	Muddy shores	Muddy shores	Yes
			MT1.3	Sandy shores	Sandy shores	Yes
			MT1.4	Boulder and cobble shores	N/A	No
	MT2	Supralittoral coastal systems	MT2.1	Coastal shrublands and grasslands	Coastal shrublands	Yes
			MT2.2	Large seabird and pinniped colonies	Seabird colonies	Yes
	MT3	Anthropogenic shorelines	MT3.1	Artificial shores	N/A	No
MARINE FRESHWATER TERRESTRIAL	MFT1	Brackish tidal systems	MFT1.1	Coastal river deltas	N/A	No
			MFT1.2	Intertidal forests and shrublands	Mangroves	Yes
			MFT1.3	Coastal saltmarshes and reedbeds	N/A	No

