# Supporting Information



Figure S1. Graphical schematic representing the different kinds of relationships, with examples.

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| --- | --- | --- | --- | --- |
| Number of Experts Agreeing | 3 experts | medium | high | high |
| 2 experts | low | medium | high |
| 1 expert | low | low | medium |
|  |  | comment of uncertainty provided by topic specialist expert | no comment or literature provided by topic specialist expert | supportive comment and/or supportive literature provided by topic specialist expert |
|  |  |  |  |  |
|  |  | Subject Area Expert Support | | |

Figure S2. Framework of certainty of expert responses. For example, if the final relationship determined by a topic specialist was not agreed on by other experts but the topic expert provided literature or a specific rationale supporting their assessment then the resulting certainty score would be “medium”, whereas if no supporting statement or literature was provided the certainty score would be “low”. In contrast, if all three experts agree with a relationship classification and no supporting literature or comment was provided by the topic expert the certainty in the relationship would be classified as “high”, whereas if the topic expert provided a specific comment underscoring their uncertainty the resulting certainty classification would be “medium”.

Table S1. A description of the ecosystem services used in our literature review. Ecosystem service categories and descriptions are based on the TEEB framework. The search terms used Boolean Logical operators (OR and AND) to find papers using searches of “Climate Change OR Climate Impacts AND” the terms used in the column “search terms”.

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| --- | --- | --- | --- |
| Ecosystem Service Category | Ecosystem Service | Definition/Explanation | Search Terms |
| Provisioning Services | Food | Ecosystems provide the conditions for growing food. Food comes principally from managed agro-ecosystems but marine and freshwater systems or forests also provide food for human consumption. We are focused on wild and cultivated food from marine/coastal areas | Food OR Fisheries OR Aquaculture |
| Raw Materials | Ecosystems provide a great diversity of materials for construction and fuel including wood, biofuels and plant oils that are directly derived from wild and cultivated plant species. We are focused on raw materials from marine areas | Raw Materials OR Natural Resources OR Mining OR Pharmaceuticals OR Cosmetics OR Sand |
| Fresh Water | Ecosystems play a vital role in the global hydrological cycle, as they regulate the flow and purification of water. Vegetation and forests influence the quantity of water available locally, and salt intrusion from the ocean can contaminate water. We are focused on coastal areas and freshwater | Fresh Water |
| Medicinal resources | Ecosystems and biodiversity provide many plants used as traditional medicines as well as providing the raw materials for the pharmaceutical industry. All ecosystems are a potential source of medicinal resources, but we focus on marine and coastal | Medicine OR Medicinal |
| Regulating Services | Local Climate and Air Quality | Trees provide shade whilst plants (and marine primary producers) influence rainfall and water availability both locally and regionally. Trees or other plants also play an important role in regulating air quality by removing pollutants from the atmosphere. We are particularly interested in coastal and marine settings | Air Quality OR Regional Climate OR Microclimate |
| Carbon sequestration and storage | Ecosystems regulate the global climate by storing and sequestering greenhouse gases. As trees and plants grow, they remove carbon dioxide from the atmosphere and effectively lock it away in their tissues. In this way forest ecosystems are carbon stores. Biodiversity also plays an important role by improving the capacity of ecosystems to adapt to the effects of climate change. We are particularly interested in coastal and marine, or "blue" carbon such as from mangroves and seagrasses | Carbon Sequestration OR Carbon Storage |
| Moderation of extreme events | Extreme weather events or natural hazards include floods, storms, tsunamis, avalanches and landslides. Ecosystems and living organisms create buffers against natural disasters, thereby preventing possible damage. For example, wetlands can soak up flood water whilst trees can stabilize slopes. Coral reefs and mangroves help protect coastlines from storm damage. | Extreme Event OR Extreme Event Mitigation |
| Waste-water treatment | Ecosystems such as wetlands filter both human and animal waste and act as a natural buffer to the surrounding environment. Through the biological activity of microorganisms in the soil, most waste is broken down. Thereby pathogens (disease causing microbes) are eliminated, and the level of nutrients and pollution is reduced. | Waste Water Treatment OR Filtration |
| Erosion prevention | Soil erosion is a key factor in the process of land degradation and desertification. Vegetation cover provides a vital regulating service by preventing soil erosion. Soil fertility is essential for plant growth and agriculture and well functioning ecosystems supply the soil with nutrients required to support plant growth. We are particularly interested in erosion having to do in coastal systems, such as with sedimentation | Erosion |
| Biological control | Ecosystems are important for regulating pests and vector borne diseases that attack plants, animals and people. Ecosystems regulate pests and diseases through the activities of predators and parasites. Birds, bats, flies, wasps, frogs and fungi all act as natural controls. We are particularly interested in marine controls | Biological Control OR Top down regulation |
| Habitat or Supporting Services | Habitats for species | Habitats provide everything that an individual plant or animal needs to survive: food; water; and shelter. Each ecosystem provides different habitats that can be essential for a species’ lifecycle. Migratory species including birds, fish, mammals and insects all depend upon different ecosystems during their movements. | Habitat |
| Maintenance of genetic diversity | Genetic diversity is the variety of genes between and within species populations. Genetic diversity distinguishes different breeds or races from each other thus providing the basis for locally well-adapted cultivars and a gene pool for further developing commercial crops and livestock. Some habitats have an exceptionally high number of species which makes them more genetically diverse than others and are known as ‘biodiversity hotspots’. | Genetic Diversity |
| Cultural Services | Recreation and mental and physical health | Walking and playing sports in green space is not only a good form of physical exercise but also lets people relax. The role that green space plays in maintaining mental and physical health is increasingly being recognized, despite difficulties of measurement. | Recreation OR Health |
| Tourism | Ecosystems and biodiversity play an important role for many kinds of tourism which in turn provides considerable economic benefits and is a vital source of income for many countries. In 2008 global earnings from tourism summed up to US$ 944 billion. Cultural and eco-tourism can also educate people about the importance of biological diversity. | Tourism |
| Aesthetic appreciation and inspiration for culture, art and design | Language, knowledge and the natural environment have been intimately related throughout human history. Biodiversity, ecosystems and natural landscapes have been the source of inspiration for much of our art, culture and increasingly for science. | Aesthetics OR Cultural Inspiration |
| Spiritual experience and sense of place | In many parts of the world natural features such as specific forests, caves or mountains are considered sacred or have a religious meaning. Nature is a common element of all major religions and traditional knowledge, and associated customs are important for creating a sense of belonging. | Spiritual Experience OR Sense of Place |

Table S2. A list of the experts involved in the expert elicitation, and their areas of expertise

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| Expert Number | Expert Category | Expertise (based on background, training, publication record) |
| 1 | Ecosystem Service General Expert | marine ecosystem services, impacts on ecosystem service, ecosystem service approaches |
| 2 | Marine Ecosystem Services and Marine Planning | marine ecosystem services, marine planning with ecosystem services |
| 3 | Topic specialist | fisheries management and economics, marine tourism, marine industries and the blue economy |
| 4 | Topic specialist | natural capital accounting, consequences of climate change, industrial emission and pollution |
| 5 | Topic specialist | spiritual ecology, sense of place, sacred values |
| 6 | Topic specialist | coastal ecosystem ecology, land-sea interface |
| 7 | Topic specialist | natural resource economics, consequences of environmental toxins, air and water toxins |
| 8 | Topic specialist | coral reef ecology, multiple stressors on marine systems |
| 9 | Topic specialist | marine management and economics, vulnerability and adaptation of coastal systems to climate change |
| 10 | Topic specialist | environmental social science, sense of place and identity, cultural and amenity values |
| 11 | Topic specialist | physical geography, coastal ecology, nutrient and chemical flows |
| 12 | Topic specialist | marine economics and finance, marine tourism, coral reefs |
| 13 | Topic specialist | marine biogeography, marine biodiversity and climate change |
| 14 | Topic specialist | public health and epidemiology, climate change impacts on health |
| 15 | Topic specialist | environmental economics, socioeconomic impacts of climate change, seafood security |
| 16 | Topic specialist | environmental economics, natural capital and development |
| 17 | Topic specialist | fisheries ecology and management, fishing and climate change on marine systems |

Table S3. Description of the terms used in the hierarchical relationship characterization process

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| Decision Stage | Term | Description |
| 1 | Neutral | Change (positive or negative determined by literature) to an ecosystem service is not associated with a change in an SDG target |
| 1 | Relationship | Change (positive or negative determined by literature) to an ecosystem service is associated with a change in an SDG target |
| 2 | Positive | Change (positive or negative determined by literature) to an ecosystem service is most likely to increase the probability of a positive effect on an SDG target in aggregate across the planet |
| 2 | Negative | Change (positive or negative determined by literature) to an ecosystem service is most likely to increase the probability of a negative effect on an SDG target in aggregate across the planet |
| 2 | Either | Change (positive or negative determined by literature) to an ecosystem service has an equal liklihood of increasing the probability of either a positive or negative association with an SDG target. There is too much uncertainty or variation to give a definitive directional answer |
| 3 | Proximal | The positive or negative effect on the SDG target is proximately caused by the change to the ecosystem service (directly or through a mediating variable). Strong empirical or expert knowledge (cite literature or strong reasoning) should accompany this designation |
| 3 | Distal | The positive or negative effect on the SDG target is potentially distally related to change the ecosystem service. There are other more proximal variables and causal links which could mitigate the effect of the change in ecosystem service but there is a potential distal causal chain. A hypothetical/conceptual multi-step linkage can support this designation. For example, having enough to eat and drink as well as having good air quality can all contribute to conditions that lead up to having the stability needed to develop institutions and encourage inclusive participation in decision making, but there are many social and political factors that are more proximal and may regulate whether inclusive participation occurs |
| 4 | Direct | An SDG target is directly affected by a change to an ecosystem service. For example, decreasing food supply will directly reduce our chances of achieving the target of ending hunger as food is directly tied to hunger reduction |
| 4 | Indirect | The causal relationship between ecosystem service change and effects on an SDG target is mediated through a third variable that is affected by the ecosystem service and effects the SDG target. For example, if medicinal resources are impacted, the cost for medicine can increase which would make lifting people out of poverty more difficult as illness or increased cost would hamper them. |