Global biodiversity loss results from decades of unsustainable use of the marine environment and represents a major threat to the ecosystem services on which we, and future generations, depend. In the past century, overexploitation of fisheries and the effects of bycatch have caused species to decline whilst coastal reclamation and land-use change—together with pollution and, increasingly, climate change—have led to vast losses of many valuable coastal habitats, estimated at an average of 30–50 percent.

Despite advances in understanding how marine species and habitats are distributed in the ocean, trends in marine biodiversity are difficult to ascertain. This results from the very patchy state of knowledge of marine biodiversity, which leads to biases in understanding different geographic areas, groups of species, habitat distribution and patterns of decline.

To address the data gap in our understanding of marine biodiversity and ecosystem integrity, it is crucial to establish the capacity to assess current baselines and trends through survey and monitoring activities. Only increased knowledge and understanding of the above will be able to inform ocean management and conservation strategies capable of reversing the current loss trend in marine biodiversity.

A new paper commissioned by the High Level Panel for a Sustainable Ocean Economy increases our understanding of these trends by analysing the links between biodiversity and ecosystem functioning (including tipping points for degradation) and unpacks the link between protection and gross domestic product (GDP). In doing so, the paper provides an updated catalogue of marine habitats and biodiversity and outlines five priorities for changing the current trajectory of decline.

More than half of the ocean is heavily impacted by human activities, and this includes more than half of the hot spots of marine species richness. The higher the biodiversity of an area, the more intense the anthropogenic pressures (e.g., fishing, development, pollution, drilling) on that area (see Figure 1). The reason for this is not entirely clear, but historic concentration of human populations along the coastline and overexploitation of marine resources in geographic areas such as Asia may be partially responsible.
The analysis undertaken in the paper indicates that the GDP of coastal states has a small effect on the marine protection they have implemented, and the levels of biodiversity in their waters have no relationship to MPA coverage (Figure 2). This has major implications for global ocean conservation efforts. All coastal states must manage their waters sustainably and implement fully or highly protected marine protected areas (MPAs) to conserve biodiversity. The achievement of global biodiversity targets must be based on international cooperation, including targeted financial aid and capacity building for coastal developing states.

Figure 1: Marine Biodiversity in Relation to Human Impacts

Figure 2: Relationships between Biodiversity, GDP and MPAs

Note: Panel A shows the gross domestic product (GDP) that a country has relative to the world and the amount of their exclusive economic zone (EEZ) that is covered by marine protected areas (MPAs). Panel B reveals that the relative size of a country’s MPAs are not correlated with their biodiversity. The grey region in Panel B represents the countries with less than 30% of their EEZ with MPA coverage. EEZ = exclusive economic zone; GDP = gross domestic product; MPA = marine protected area. Source: Authors.
Data indicate that the implementation of MPAs has been far greater in coastal waters than in areas beyond national jurisdiction (ABNJ). This is partially because no global legal framework protects marine biodiversity or establishes MPAs in international waters. It is therefore imperative that current UN negotiations on ABNJ reach a successful conclusion quickly and establish an effective MPA designation mechanism.

Only a tiny fraction of the declared MPAs are fully or highly protected, and only a small proportion of them have reported management plans. Detailed spatial analysis of the distribution of MPAs indicates that, on paper, some coastal ecosystems, such as kelp forests, have 30–40 percent of their area protected. However, a much lower proportion of these ecosystems lie within MPAs with management plans and a tiny fraction are located in fully or highly protected MPAs (about 1 percent in the case of kelps).

Many aspects of the relationship between biodiversity and ecosystem functioning lack quantification. However, this relationship can be described via a biodiversity and ecosystem function (BEF) curve, and it is generally understood that increasing biodiversity levels boost ecosystem functioning. These studies provide some scientific understanding of the mechanisms that may underlie the degradation of ecosystem services when biodiversity is lost, including biomass production, resilience to disturbance and biological invasions. The shape of the BEF curve describes the impact of a gain or loss of biodiversity on the ecosystem function, and it may have a saturating, linear or accelerating profile (Figure 3).

**Figure 3: The Biodiversity and Ecosystem Functioning Curve**

Note: The graph illustrates the three types of profiles—saturating, linear and accelerating—for biodiversity (A) and biodiversity loss (B). Source: Modified from Naeem 2002; Strong et al. 2015.

The impacts of biodiversity loss on ecosystem services are multi-faceted. Regional changes in biodiversity have been shown to affect fisheries and other services, and they may lead to harmful blooms, oxygen depletion, coastal flooding, and species invasions. As such, biodiversity loss results in inferior climate change resilience as well as social and economic disruptions.
Opportunities for Action

To reverse the trend of marine biodiversity loss and ensure the continued provision of marine ecosystem services, the paper proposes five priority opportunities for action:

**Technology for mapping.** Increased spatial and temporal resolution of data captured would represent a greater opportunity to further enhance our understanding of the status and trends in marine habitats and ecosystems, the drivers of change and the impacts of degradation on their contribution to people. This would also improve visualization and maps to support the decision-making process. Effective management requires governments to know where, what, why and how much of an activity is sustainable as anthropogenic impacts expand further offshore. By accomplishing this goal, there would be numerous additional benefits beyond increasing our understanding of the planet, including improved management plans, technological advancements, training of new generations of scientists from diverse backgrounds and increased collaboration between stakeholders.

**Addressing the biodiversity data gap.** There is a pressing need for greater coordination in gathering information on marine biodiversity and extinction risk, from baselines of diversity and ecosystems to long-term monitoring of population genetics, species, habitats and ecosystems. By establishing such networks, states will be able to establish a baseline of marine biodiversity in their waters and in ABNJ, allowing the subsequent monitoring of changes in biodiversity through time. This will enable states to continually assess the success of measures to reduce biodiversity loss and will allow them to actively manage their activities to mitigate or reverse biodiversity loss. For developing states, assistance in capacity building will be required.

**Citizen science and education programs.** Citizen science provides a great opportunity to increase public participation in science, overcome significant barriers to the scientific process and improve natural resource management. Biodiversity-related projects have been shown to span greater geographic and temporal ranges than conventional academic research, engaging millions of volunteers and generating great income annually. By accomplishing this goal, we see a future defined by increased scientific literacy around the world, improved efficiency of moving conservation science into conservation action, and higher awareness and knowledge of the planet around us.

**Well-enforced, green-listed, fully protected marine reserves.** There is strong evidence that the implementation of well-enforced, fully or highly protected MPAs that include 30–40 percent of key marine habitats will conserve biodiversity, enhance biomass and abundance of marine life and improve the resilience of marine ecosystems. Marine protected areas can also benefit fisheries, provide coastal protection and improve resilience of ecosystems against the impacts of climate change. The next two years offer an opportunity to adopt a new target beyond the 10 percent of marine protection and to accelerate the slow progress made to date (e.g., the Biodiversity beyond National Jurisdiction Agreement and the Convention on Biological Diversity’s Conference of Parties). Whatever targets for biodiversity protection are set, they must represent the full range of marine ecosystems and species. The aims should include no net loss of important habitats which structure marine ecosystems, such as coral reefs, mangrove forests, seagrass beds, saltmarshes and others.
Ecosystem-based fisheries management. Eliminating illegal, unreported and unregulated (IUU) fishing and accelerating the reform of fisheries management to reflect modern ecosystem-based concepts, where biodiversity is managed sustainably alongside target stocks, is of extreme urgency. By following an ecosystem-based management approach to fisheries, overfishing and IUU fishing will be eliminated, and fish stocks and associated ecosystems should be able to rebuild. Besides the estimated US$83 billion per annum financial benefits in fisheries revenue, broader benefits will include increasing fish catches and securing both livelihoods and food supplies as well as increasing their resilience to climate change impacts for the future.

The speed at which marine species and habitats are declining requires an urgent and globally coordinated response. The level of response required is comparable to that of climate change—spanning all countries and all sectors as well as the global and regional implementing organisations involved in ocean management. The five priority actions outlined in this paper offer a pathway to expedite such action with the speed required.
The High Level Panel for a Sustainable Ocean Economy (Ocean Panel) is a unique initiative by 14 world leaders who are building momentum for a sustainable ocean economy in which effective protection, sustainable production and equitable prosperity go hand in hand.

Co-chaired by Norway and Palau, the Ocean Panel comprises members from Australia, Canada, Chile, Fiji, Ghana, Indonesia, Jamaica, Japan, Kenya, Mexico, Namibia, Norway, Palau and Portugal and is supported by the UN Secretary-General’s Special Envoy for the Ocean.

The Ocean Panel gathers input from a wide array of stakeholders, including an Expert Group and an Advisory Network. The Secretariat, based at World Resources Institute, assists with analytical work, communications and stakeholder engagement.

The Blue Paper that this brief summarises is an independent input to the Ocean Panel process and does not necessarily represent the thinking of the Ocean Panel, Sherpas or Secretariat.

For more information, including the full report, visit www.oceanpanel.org