K4D | Knowledge, evidence and learning for development

Marine biodiversity and poverty alleviation

Sophie Plagerson
Centre for Social Development in Africa, University of Johannesburg
1 July 2020

Questions

1. *What are the linkages between poverty and marine biodiversity?*
    a. *How and to what extent do poverty levels impact marine biodiversity?*
    b. *How and to what extent does marine biodiversity affect or influence poverty levels?*
    c. *What examples are there where increased or protected marine biodiversity contributed to poverty reduction and enhanced livelihoods? What were the poverty or livelihood effects achieved and how?*

Contents

1. Summary

The scope of the relationship between marine biodiversity and poverty is very significant. Hundreds of millions of people depend on the quality of the marine environment and the availability of living marine resources for their well-being, with the majority located in the Global South. Poor and marginalised people are usually directly dependent on environmental services, such as local fisheries and other food sources, employment from coastal tourism, coastal forests for fuel etc., and the steady degradation of the natural resource base therefore impacts their lives and livelihoods disproportionately.

The relationship between marine biodiversity and poverty is complex, context-specific and dynamic. Marine conservation/poverty is characterised as an interface of competing imperatives and obligations towards human and non-human nature, and the resulting trade-offs are contested and debated, within the broader field of environment and development. Importantly, findings from around the world suggest that the trends and changes which are influencing ecosystem services such as population growth, industrial development and climate change are also having profound impacts on the poor, in both positive and negative ways (Brown et al., 2008). Understanding trade-offs between these trends is necessary to evaluate the impact of dynamics, as well as to inform difficult policy choices.

Poverty (or factors associated with poverty) can lead to both conservation and biodegradation, but they play a relatively small role in both these processes. Marginalised communities may develop and maintain protective measures that can help minimise the negative impact of environmental degradation on their ecosystems and associated livelihoods (Chen et al., 2020). At a macro-level, poverty is rarely identified as a significant threat to biodiversity. Generally, the poor place the least burden on the environment, but tend to receive a disproportionately small share of the benefits of ecosystem services in coastal and marine systems while shouldering many negative impacts. However, harmful practices are present in some areas such as destructive fishing practices resulting in overfishing and habitat degradation. National and local governments in low-income countries may lack the governance and technical capacity to enforce sustainable practices, for example in relation to waste management.

Marine biodiversity can create poverty traps (for example where higher value resources are captured by more powerful non-poor groups) but primarily supports the livelihoods of millions of coastal populations. Globally, more than 775 million people are dependent on marine ecosystems for food security, livelihoods and environmental protection (Selig et al., 2019). The high diversity of coastal species provides for access by a wide spectrum of social groups (of different genders and ages), and a safety net in times of stress (Campbell and Townsley, 2012). Fishing and aquaculture are important ocean-related livelihoods. Women are typically more involved in the downstream activities, such as the post-harvest handling, selling fresh fish, processing, storage, packaging and marketing.

Small island developing states face particular challenges in accessing the benefits of biodiversity due to their remote locations, narrow resource base, small domestic markets, vulnerability to natural disasters, and dependence on international assistance and trade. Poor communities may be excluded from the economic benefits derived from Exclusive Economic Zones (World Bank and United Nations Department of Economic and Social Affairs, 2017).

Marine interventions increasingly seek to achieve socioeconomic outcomes, though these may be simplistically defined. Several types of marine conservation interventions have rapidly expanded in scale, extent, and scope. Conservation schemes include access limitation initiatives (such as Marine Protected Areas); Compensation for livelihood loss (decommissioning and payment for ecosystem services (PES) schemes); Community-based management; Livelihood alternatives and Eco-certification programmes. Broader emerging initiatives include ocean governance, spatial planning, sustainable supply chain programmes and integrated blue economy approaches (some examples are included in the Section 6). As conservation interventions continue to increase in size and number around the world to meet global targets, there is considerable debate on whether conservation and environmental interventions result in social and environmental benefits or instead produce tradeoffs (Gill et al., 2019).

Stakeholder participation, types of programme governance, implementation processes, spatial planning and appropriate use of technology are key components of programmes in order to ensure poverty alleviation impacts. Perceptions of impacts by resource users vary according to visibility of benefits, associated levels of social conflict, effectiveness and regularity of communication channels and timescales.

Emerging examples of interventions which seek to integrate social and environmental outcomes include community-based programmes supported by international financial and technical assistance to address environmental issues, promote livelihoods, and empower local communities; Fishery and aquaculture supply chain approaches; multi-component programmes to address harmful practices in ways that promote livelihoods and other initiatives such as economic valuations of marine resources and finance schemes to support transitions to sustainable practices. Some recent interventions are mainstreaming gender-sensitive approaches to planning and implementation.

The COVID-19 pandemic has acted as a major disrupter with pervasive effects on livelihoods as well as marine ecosystems. Impacts on the health of the ocean have largely been positive due to the reduction in pollution, overfishing, habitat loss/conversion, and the impacts of climate change on the ocean. The livelihoods and food security of many millions of people have been critically affected.

The evidence base

Research on the relationship between poverty and marine biodiversity has evolved over the past two decades, from a narrow concern with the negative bi-directional links (often at a local level) to a broader consideration of the complex and dynamic outcomes of the interactions between society, the economy and the oceanic environment (Holmes et al., 2017).

There has been a dramatic increase in publications concerned with the socio-economic impacts of marine conservation interventions, particularly of Marine Protected Areas (Roe et al., 2014, Gill et al., 2019). There is variation in study design, selection of outcome indicators and social groups of interest. More systematic reviews are currently underway (Brooks et al., 2020). While there is a growing awareness of the multiple impacts on both marine biodiversity and poverty as a result of ocean-based industries and marine degradation (and of the opportunities for sustainable development and conservation), the scientific evidence base about these impacts is still limited (GSDR, 2015).

The evidence presented in this rapid review is not exhaustive but seeks to represent some of the recurring themes in the literature and to describe emerging approaches to addressing both biodiversity and poverty alleviation.

2. What are the linkages between poverty and marine biodiversity?

2.1 The scope of the relationship

Global scope and importance of the relationship. Oceans and their marine resources are the base upon which the economies of many small island developing states (SIDS) and coastal least developed countries are built, and they are central to their culture and sustainable development, to poverty reduction, and to achieving the Sustainable Development Goals. There are 54 lower and lower-middle income coastal and island countries for whom oceans represent a significant jurisdictional area and a source of opportunity (World Bank and United Nations Department of Economic and Social Affairs, 2017). It is estimated that 40% of the global population live within coastal communities and coastal population growth is expected to continue (Brooks et al., 2020). By some estimates, 3 billion people rely on the ocean for their food security and livelihoods (Chen et al., 2020).

The marine biodiversity/poverty relationship is complex. Theoretical as well as empirical evidence shows that biodiversity has an impact on the welfare and livelihoods of households, especially those of the poor. However, the links between biodiversity conservation and poverty alleviation are complex, context-specific and dynamic, and the intense debate on this nexus demonstrates that there are no simple causal relationships (Billé et al., 2012).

2.2 Current pressures on the relationship

There is rapidly increasing pressure on the relationship from industrial and sectoral development. Coastal marine ecosystems are vulnerable to both increased and intensified development activity and related environmental change, affecting both marine biodiversity and poverty. Oceans-related economic activities are developing against a backdrop of soaring global population, growing consumption, and the ever growing need for new sources of food, energy, and minerals (World Bank and United Nations Department of Economic and Social Affairs, 2017). Established and emerging ocean-based industries (such as shipping, fishing, aquaculture, offshore oil and gas, offshore wind, maritime and coastal tourism, marine biotechnology) were valued in 2010 at USD 1.5 trillion, and are predicted to increase to USD 3 trillion by 2030 (OECD, 2016). Offshore wind capacity is forecast to rise to become the leading power generation technology by 2030, and seaborne trade is expected to quadruple by 2050. On land, the oceans-related economy will experience a surge in investment in coastal infrastructure, industry, and tourism as the global migration to cities and coasts deepens (World Bank and United Nations Department of Economic and Social Affairs, 2017).

There is rapidly increasing pressure on the biodiversity/poverty intersection from marine degradation and climate change. Habitat coverage and quality have declined across habitat types (e.g. oyster reefs, salt marshes, coral reefs, seagrasses, and mangroves) and climate change and associated sea level rise are predicted to exacerbate already increasing rates of degradation. In tropical regions, habitats which provide extensive ecosystem services have experienced declines in habitat quality and spatial extent. For example, 35% of mangroves have

been lost and the global rate of mangrove forest loss is estimated as 5 times the average rate of global forest loss. Seagrasses have declined globally by 29%. Although 27% of coral reefs are protected, 75% are considered threatened and over 50% have been lost (Brooks et al., 2020). The risks to coastal populations from rising sea levels and storm surges as a result of climate change will drive the need for a wave of defensive infrastructure development (World Bank and United Nations Department of Economic and Social Affairs, 2017). These changes and losses dynamically affect coastal livelihoods and the need for biodiversity conservation (see Section 4).

2.3 Normative narratives on the marine conservation-poverty nexus

Discourses on poverty and marine biodiversity shape approaches to poverty alleviation (Fisher et al., 2020). Contemporary debates within academic, donor and NGO communities orbit around whether conservation should be primarily anthropocentric or ecocentric. The mission and public policy statements of most international conservation organisations show increasing attention to local livelihood issues, indigenous rights and poverty. 94.7% of a global sample of 9,264 conservationists are in favour of people-centred conservation. Yet, ongoing concerns about the social impacts of conservation suggest that genuine commitments to poverty alleviation are more demanding, requiring more effort to achieve, than a generalised orientation towards people. There are also important distinctions between discourses about whether poverty is characterised as a driver of degradation, or more emphasis is placed on overconsumption and affluence in perpetuating conservation threats.

3. How and to what extent do poverty levels impact on marine biodiversity?

3.1 The impacts of poverty on marine conservation

There is some geographical overlap between biodiversity and poverty. At the global level there is a geographical overlap between biodiversity and poverty but it becomes less pronounced the more ‘the South’ is disaggregated. At regional/national scales, many countries and regions with high biodiversity also have high levels of poverty, particularly in sub-Saharan Africa and Asia. At subnational scales, patterns of overlap differ from place to place and between different elements of poverty and biodiversity. The most acute poverty is often in remote or inaccessible areas of low human population density where biodiversity is most intact. Arguments regarding the existence of a spatial link between biodiversity and poverty are sometimes presented as a rationale for why biodiversity conservation and poverty reduction can or cannot be pursued jointly or separately. Various authors argue that governance factors are generally more significant than geography in determining where biodiversity prevails, where poor people live and how the two interact (Billé et al., 2012, Roe et al., 2014, Holmes et al., 2017).

Poor communities contribute to biodiversity conservation. Traditional ecological knowledge has been highlighted for its role in underpinning historical management systems that could be highly successful in establishing sustainable resource use and responses to climate change. These can be strategies that are analogous to “Western” policies, such as temporary restrictions on harvest (e.g., rotating use of fishing and hunting areas by groups from Oceania to the Arctic), limitations on fishing methods (e.g., the Seri of Mexico allowing only hand collection by women on clam beds that are exposed at low tide), or tenure rights over resources (including systems combining area types and familial groups throughout Pacific Island Indigenous peoples). Other

recent examples of newly implemented management actions by Indigenous communities include habitat restoration (e.g., of mangrove forests by communities in the Saloum Delta, Senegal). In the South Pacific island of Vanuatu, villagers create 'giant clam gardens' with fishers gathering giant clams into discrete areas on reef flats for their exclusive use in times of need. This also served to increase the reproductive success of clams by maintaining a close proximity of a breeding population dependent on external fertilisation (Cisneros-Montemayor and Ota, 2019).

3.2 The impacts of local/national poverty on marine degradation

The poor play a small part in biodiversity loss. At a macro-level, poverty is rarely identified as a significant threat to biodiversity, even when the full extent of human determinants are considered (e.g. https://www.nationalgeographic.com/environment/habitats/ocean-threats/). Broadly, while poor people often place the least burden on the environment, they tend to receive a disproportionately small share of the benefits of ecosystem services in coastal and marine systems while largely shouldering the harmful impacts of a rapidly deteriorating environment (Chen et al., 2020, Brown et al., 2008). At the local level, the constraints of poverty may be a factor which contributes to biodiversity loss. Whether poor people conserve or over exploit biodiversity is dependent on specific circumstances and contexts—and particularly on the influence of external governance factors—and is not a question to which a generalised answer can be given (Billé et al., 2012).

Types of harmful interactions with coastal and ocean ecosystems. In particular locations, the unsustainable use by poor stakeholders who have limited options is a driver of degradation of ecosystem services at the expense of their future benefits (Chen et al., 2020). In response to many changing ecosystems, harmful examples of the impact of poor communities on coastal ecosystem services may include: coastal people resorting to agriculture on marginal land, impacting sediment load on marine ecosystems; declining catches compelling the use of smaller meshed nets and even destructive fishing practises resulting in growth overfishing and habitat degradation; selected harvest of high value or easily accessible species, e.g. sea urchins can lead to cascade effects such as excessive algal growth; overexploitation of mangrove and coastal forests for fuelwood and building materials in the light of lack of access to or ability to afford alternatives (Brown et al., 2008). Several of the programmatic examples listed (Section 6) below take these activities into account, as well as the broader institutional, economic and ecological factors (for example the Tanzanian case study seeking to address the use of destructive fishing gear).

Within the fishing sector, the relative impacts on biodiversity vary by size of economic operations. The 2015 Global Sustainable Development Report (UN, 2015) compares artisanal and large-scale fisheries, showing that over 12 million fishermen were employed in small-scale fisheries, producing 30 million tonnes of fish for human consumption, with about 0.5 million tonnes are discarded at sea. Per capita they received ±400 US$ in government subsidies. In contrast, only 0.5 million fishermen were employed in large-scale fisheries, and caught 40 million tonnes of fish for human consumption and an additional 25 million tonnes of fish which is reduced to meals and oils. They discarded 20 million tonnes of fish at sea (40 times more than small-scale fisheries), they consumed 5 times more fuel than 12 million artisanal fishermen together and per capita receive 50,000 US$ of government subsidies. The report concluded that most high seas fishing is carried out by just 10 nations, most of them developed countries. If it were not for state subsidies, these high seas fishing industries would not be financially viable.

These comparisons give a sense of scale in terms of the relatively small contribution of poverty (local/national) to biodegradation.

There is weak capacity in many small island states and developing countries to enforce biodiversity regulation. Illegal, unregulated and unreported (IUU) fishing is a main contributor to overfishing and marine ecosystem damage (Harris and Gove, 2015). Dynamite fishing, use of nets with small mesh size, and fishing in critical/prohibited/protected habitats are common in coastal fisheries, while in offshore fisheries, violation of fishing zones and underreporting by the industrial fishing fleets are common features. It is estimated that IUU fishing cost up to US$1.5 to 2 billion/year for Sub-Saharan African countries (Harris and Gove, 2015). Developing countries, particularly small island developing countries and other developing coastal countries, are among those that suffer the most from IUU fishing. Many developing countries lack the resources and infrastructure to monitor and enforce fishery rules effectively. As a result, IUU fishers often conduct their operations in waters of developing countries, using vessels registered in the developing countries themselves (fishing without licenses or in violation of license restrictions) and vessels registered in other countries (poaching or fishing in violation of access restrictions) (WWF, 2020). Exploitative and abusive working conditions including human trafficking and forced labour have been reported within IUU fishing networks, in fish processing plants and on board fishing vessels, where working conditions are more difficult to monitor (FAO, 2020).

Coastal pollution as a result of poorly managed municipal waste management. With a growing number of mega-cities in the East Asian region (Cambodia, People's Republic of China, Indonesia, Lao PDR, Malaysia, Philippines, Thailand, Vietnam), waste management systems are frequently inadequate to cope with the increased volume of waste generated by a rapidly growing coastal population. Almost 90 percent of the region's municipal wastewater is released into the marine environment untreated, and large quantities of industrial wastes are directly discharged. Seventy percent of the original coral reefs bordering the South China Sea have been destroyed (UNESCO, 2017). Loss of biodiversity and ecological goods and services, including fish habitat and wave attenuation have resulted (UNESCO, 2017) (an intervention to address waste management is described in Section 6).

3.3 Causes of resistance to conservation programmes

The poor may resist marine biodiversity conservation programmes. Findings from focus groups in communities affected by Marine Protected Areas (MPAs) in Mozambique and Tanzania highlighted that the failure of local people to support ecosystem conservation measures is often understood as a lack of understanding of the benefits of conservation (Rosendo et al., 2011). However, taking account of the uncertainties in benefits, short time horizons, prioritisation of provisioning services, dominance of large-scale drivers and difficulty of the poor in benefiting from other ecosystem services, resistance to conservation may be seen as a rational and informed response based on their situation. In the case of MPAs in the Quirimbas in Mozambique, the lack of benefits in the short-term, combined with inadequate co-management led to fishers feeling alienated and tension between government departments, setting back MPA development in Mozambique (Rosendo et al., 2011). Cisneros-Montemayor et al. (2019) similarly note that a breach of social trust in just one of the sectors under the multi-sectoral 'Blue Economy' umbrella, can undermine trust in the entire term and approach. This is evident in wary or hostile attitudes towards the term from artisanal fishers fearing dispossession of resources as a result of Blue Economy frameworks that could be interpreted as 'ocean-grabbing' (Cisneros-Montemayor et al., 2019).

4. How and to what extent does marine biodiversity affect or influence poverty levels?

4.1 The impacts of marine biodiversity on poverty

Characteristics of marine and coastal poverty. Poor people dependent on ecosystem services of marine and coastal resources live in a wide diversity of environments, from the flood-prone slum regions of coastal megacities such as Manila, to small islands such as Songo Songo off the Tanzanian coast. These locations can be remote from social services and markets for their products, but are vulnerable to local resource and global environmental degradation. The poor may experience the negative by-products of industrial development – when for example waste disposal takes precedence over requirements for healthy living conditions and safe food. The poor may also be alienated from the beaches and reefs they fish from by tourists and wealthy residents who can generate higher aggregate economic benefits from the same ecosystems. Thus poverty is closely connected to the distribution patterns and levels of degradation of coastal ecosystems (Brown et al., 2008).

Marine biodiversity and poverty traps. This is not a question commonly addressed by the (recent) literature, and this review did not identify studies in the marine biodiversity area evaluating this question. However, there are studies which theorise the linkages between biodiversity and 'poverty traps' (Barrett et al., 2011). Where precarious and interdependent natural-human ecosystems coevolve in response to subtle shifts in any of several subsystems, lack of resources, institutions, and governance structures can leave local people ill-equipped to institute mechanisms to ensure long-term resource maintenance (Barrett et al., 2011). If this dependence is reproducing or reinforcing existing patterns of poverty, it may be important to examine alternative livelihood strategies in order to benefit these economically marginalised groups. The notion of poverty traps is relevant to conservation efforts in cases where increasing the value of biodiversity-based resources means that the benefits generated are likely to be captured by non-poor elites, since this scenario would leave the poor worse-off than prior to an intervention (Roe et al., 2013, Gill et al., 2019).

4.2 The multiple ways in which marine biodiversity supports the poor

Mapping human dependence (nutritional, economic and coastal) on marine ecosystems. A large proportion of the literature is concerned with how biodiversity supports (poor) populations through the provision of ecosystem services. Understanding where and how people are most dependent on marine resources is essential to guide improved large-scale management, prioritise investments, and inform policies. A study by Selig et al (2019) mapped global nutritional, economic, and coastal protection dependence (see Figure 1).

See: Figure 1. Degree of human dependence on marine ecosystems for (A) nutritional, (B) economic (fisheries); (C) coastal protection. Source: Selig et al. 2019, p.4, https://conbio.onlinelibrary.wiley.com/doi/full/10.1111/conl.12617

Pacific and Indian Ocean island nations, several countries along the west coast of Africa, and some countries in Southeast Asia ranked highest for nutritional and economic dependence. Coastal protection showed relatively distinct patterns from both nutritional with the highest values along cyclone-prone coasts. When data for all three types of dependence were available, countries with highest mean dependence were Kiribati, the Maldives, and Tuvalu. Table 2 below

shows the countries with the greatest numbers of people with high nutritional, economic and coastal protection dependence on marine ecosystems (Selig et al., 2019).

See: Table 1. Top 5 countries with the greatest numbers of people with high nutritional, economic or coastal protection dependence. Source: Selig et al. 2019, p.7, https://conbio.onlinelibrary.wiley.com/doi/full/10.1111/conl.12617

Globally, more than 775 million people were found to be relatively highly dependent on marine ecosystems in the top 10% of one of the dependence types (nutritional, economic, environmental). Of these, 525 million people were found to be relatively highly dependent on marine ecosystems for nutrition, illustrating the importance of marine fisheries to food security (Selig et al., 2019). In 2017, fish provided 3.3 billion people with almost 20 percent of their protein. Fish consumption per capita is increasing in developing countries (FAO, 2020). In Bangladesh, Cambodia, the Gambia, Ghana, Indonesia, Sierra Leone, Sri Lanka and some SIDS, fish contributed 50 percent or more of total animal protein intake (FAO, 2020). Fish also provide critical micronutrients and are especially important in the diets of residents of small island developing states. More focus on these places may be needed, both in local management and in supply chains originating there, to ensure sustainable resource management and a continuation of these benefits in the face of increased human needs and pressures on marine resources (Selig et al., 2019).

Marine biodiversity supports the wellbeing of the poor through various mechanisms. Coastal biodiversity gives rise to a wide diversity of ecosystem services that are used by the poor for food security and health, income generation and livelihoods, reduced vulnerability to shocks and cultural and spiritual values. Chaigneau et al (2019a) conducted focus groups in eight coastal sites in northern Mozambique and Kenya, ranging from remote to peri-urban settings, with proximity to mangrove and/or coral reef ecosystems, and dependence on coastal ecosystem services such as fish and octopus, as well as tourism. Table 2 captures the variety of wellbeing domains (health, education, physical security, water, autonomy, shelter, food, economic security, participation, sanitation, relationships and respect) affected by available ecosystem services.

See: Table 2. Mechanisms through which ecosystem services contribute to human wellbeing domain. Note. (+) denote positive effects and (−) denote negative effects. Source: Chaigneau et al, 2019, p. 7, https://researchportal.northumbria.ac.uk/files/20600130/1_s2.0_S2212041618303723_main.pdf

The multidimensional description of deprivation within communities can open up new avenues for resource management or poverty alleviation. Fishing households, for example, had higher likelihood of meeting income security and education needs but often had lower or no greater chance of meeting other needs such as shelter, sanitation, and food security. This indicates that the higher incomes of fishing households may not translate into relief of multidimensional poverty (Chaigneau et al., 2019b).

Dependence patterns vary between and within communities (Chaigneau et al., 2019b)**.** Ecosystem-derived benefits across sites in northern Mozambique and Kenya were diverse and subject to trade-offs. For example, shell picking was perceived to be important for education at most sites by both men and women because income obtained from harvesting and selling shells contributed to school fees, uniforms, and equipment. However, it was also perceived to have a negative effect on the education of girls in Mozambique who regularly miss school at low tides to pick shells. Although fish and octopus were both perceived as very important for different needs

across both countries, in Mozambique a greater importance was attributed to them for certain specific needs, in particular food security, economic security, and relationships (Chaigneau et al., 2019b). Gender has a strong effect on the perception of ecosystem-service benefits and their contribution to needs (Fortnam et al., 2019). Women's focus groups perceived mangrove firewood of particular importance to education, due to its role in cooking and hence food and nutrition security of children and importance as a source of income to be used for buying school uniforms. Men, however, perceived mangrove firewood to be predominantly important for physical security because it can be used for self-defence to protect oneself and one's family in the event of an intruder (Chaigneau et al., 2019b).

Biodiversity provides regulating ecosystem services and can help to mitigate the effects of climate change. Regulating ecosystem services, such as water purification through coastal wetlands, coastal protection from reefs and mangroves and coastal micro-climates that can encourage precipitation that ensures the availability of drinking water in underground lenses, is also key in many areas. Whilst these ecosystem services are available to all, they are disproportionately important to the poor because ecosystem service alternatives are often prohibitively expensive for them or simply not available (Campbell and Townsley, 2012). There is evidence of the role of coastal vegetation (like mangroves and coral reefs) in mitigating coastal storms and cyclones (IIED, 2010, Ferrario et al., 2014). Coral reefs can reduce wave heights by up to 70%. Where these ecosystems are declining, poor coastal populations often become more vulnerable. In Bangladesh, the disappearance of swamp forests, which have served as a natural barrier in the past against the monsoon waves, has led to severe erosion. As a result, poor households have been compelled to increase spending to protect their tiny homesteads every year. Poor coastal people are often highly vulnerable to shocks and stresses associated with climatic events.

Challenges faced by small island developing states in capturing the benefits of biodiversity. Small island developing states face particular challenges to their sustainable development, including remote locations, small populations, narrow resource base, small domestic markets, vulnerability to natural disasters and external shocks, and on development assistance and international trade (especially commodities) (World Bank and United Nations Department of Economic and Social Affairs, 2017, Dwyer, 2017). Their growth and development is often hampered by high transportation and communication costs, disproportionately expensive public administration and infrastructure due to their small size, and little or no opportunity to create economies of scale. Exclusive Economic Zones, areas in which a state has sovereign rights over exploration and use of marine resources, are crucial to the economies of small island developing states and often dwarf their corresponding land mass and government's administrative capacity (in Tuvalu, example, the EEZ is more than 26,000 times the size of the land mass). However, in the case of fishing agreements allowing access to an EEZ, there is usually a low appropriation of fisheries export revenues by national operators and insufficient transfer to national stakeholders of specific fishing knowledge by foreign fishing companies, so the potential for national exploitation of those resources is reduced in the long run (World Bank and United Nations Department of Economic and Social Affairs, 2017).

4.3 Impacts of biodiversity on livelihoods

Marine biodiversity supports a breadth of opportunities and livelihoods. The diverse ecosystems encompassed by the coastal environment provide many opportunities for the poor that can help them to deal with seasonal changes and variations. The high diversity of coastal

species provides for access by a wide spectrum of social groups (of different genders and ages), and a safety net in times of stress (Campbell and Townsley, 2012). Similarly, the availability of a wide diversity of natural resources often helps to mitigate the potentially negative effects of competition, an important factor for poor people who are inevitably less able to deal with competition because of their lack of influence and limited investment potential. Examples include Micronesian fishers' knowledge of the seasonal rhythms of coastal fish behaviour and adaptations of their fishing practices so as to provide some degree of livelihood stability through the year. Rich biodiversity can also help to create alternative market opportunities which can offset adverse changes in prices for some species and allow the poor to modify their livelihood strategies and substitute for products that are less in demand (Campbell and Townsley, 2012).

The poor are more likely to access low value biodiversity benefits. Discussing the findings of a review of the linkages between biodiversity (including but not limited to marine biodiversity) and poverty (Roe et al., 2013), the authors conclude that the poor depend disproportionately on biodiversity for their subsistence needs—both in terms of income and insurance against risk. They also observe that it is often the relatively low value or 'inferior' goods and services from biodiversity that are most significant to the poorest members of the community. The poor often have limited access to the sort of capital which allows them to exploit resources further away from the coast (Billé et al., 2012). Resources of higher commercial value, or resources which complement existing assets such as land and livestock, attract the attention of the more affluent groups, often crowding out asset-poor households in the process. In other cases, notably coastal small-scale fisheries, the concentration of economic activity in coastal fishing communities can act as a growth pole which stimulates a wide range of other economic activities, micro-enterprises and services, increasing the diversity of income-earning opportunities. These growth poles will often create spin-off opportunities for the poor. Where higher value resources are involved, much of the surplus value from these resources may be captured by better off sections of communities, but this can still leave important opportunities in service provision (food vending and fish handling) and maintenance work (net mending) (Campbell and Townsley, 2012).

The ocean-related livelihoods of the poor are not static. There is evidence of shifting patterns of dependence on ecosystem services and shifting vulnerabilities to change in ecosystem services. This relates to where poor people live – for example increasing number of people concentrated in urban coastal areas in many countries and regions; how people construct their livelihoods – related to patterns of diversification and specialisation and movements in and out of fishing; processes of globalisation and changing access and exploitation, particularly penetration by global markets (e.g. aquaculture transforming coastline, and industrial fishing exploiting sea), each of which potentially puts poor people at risk (Brown et al., 2008).

Marine biodiversity or biomass – assessing the relative importance for the poor. Findings vary. In relation to biodiversity in general, Roe et al. (2013) find that in most cases, it is *biomass* rather than *biodiversity* per se that determines the poverty alleviation potential of a conservation intervention – although it should be noted that biodiversity is often important for generating high biomass. However, in relation to marine biodiversity, diversity is key to livelihood management. Particularly for the poor involved in small-scale production, fish diversity is as important as its biomass. For example, in the Solomon Islands, most of the 400 locally named reef fish species are used (Campbell and Townsley, 2012). Diversity also allows for unforeseen adverse changes in livelihood strategies, for example a sudden loss of productive assets does not necessarily mean exclusion from resource exploitation because, often, alternative harvestable species are available. A diversity of species, which are sometimes only available for short periods of time in

relatively limited habitats, allows people of different ages and sex, with different skills, different levels of wealth and different physical abilities to participate in harvesting resources in ways that best suit their needs and capacities. For women in particular, diversity of species supports fish processing and trade activities, enabling them to access different markets at different times of the year (Campbell and Townsley, 2012).

Fishing as a livelihood (FAO, 2020). In 2018, an estimated 59.51 million people were engaged in the primary sector of fisheries and aquaculture, 14 percent of them women. Overall, the highest numbers of fishers and aquaculture workers are in Asia (85 percent of the world total), followed by Africa (9 percent), the Americas (4 percent) and Europe and Oceania (1 percent each). Small-scale and artisanal fisheries contribute about half of global fish catches and employ more than 90 percent of people employed in fisheries, about half of them women (mainly engaged in marketing and processing). An estimated 97 percent of all these fishworkers live in developing countries, with many small-scale fishing communities experiencing high levels of poverty and being overlooked with regard both to resource management. Forms of employment or engagement vary from occasional to full-time and between seasonal, temporary and permanent occupations. Workers in fisheries and aquaculture are often engaged in more precarious types of employment, and at the far end of the spectrum there is forced labour and slavery.

Gender and fishing-related livelihoods (FAO, 2020). Globally, the proportion of women in the total work force in aquaculture (19 percent) is larger than that in fisheries (12 percent). Overall, women play a crucial role throughout the fish value chain, providing labour in both commercial and artisanal fisheries. Where appropriate technologies and capital are at their disposal, they also act as small-scale entrepreneurs, particularly in household-level cottage operations. In most regions, women are less involved in offshore and long-distance capture fishing. In African fisheries, men are predominantly involved in fishing, while women are more actively involved in the downstream activities, such as the post-harvest handling, selling fresh fish, processing, storage, packaging and marketing. Women make up 58 percent of the actors in the post-harvest activities of the seafood value chain. Typically, small-scale fisheries processing is characterised by hot smoking and drying processes, with damaging health effects for women. A gender sensitive programme in Cote d'Ivoire designed the FTT-Thiaroye processing technique in collaboration with FAO to significantly improve working conditions, product quality and safety and food security. The technique also significantly reduces post-harvest losses while extending the storage life of smoked fish products by up to 5–6 months, and it also reduces the use of fuelwood.

Lack of tenure may facilitate access to resources but also increases vulnerability. Where tenure arrangements are poorly defined or not formalised, or where open access systems are predominant, the poor may directly exploit coastal resources, particularly when it involves work which better off people are unwilling to undertake. The collection of shrimp fry in coastal waters to service coastal aquaculture is an example of this. The characteristics of inshore coastal habitats, such as rocky shores, highly dynamic and unpredictable coastal waters, shallow seas and poor communications and market access, often provide livelihood niches for the poor but have typically made exploitation by commercial operators unattractive (Campbell and Townsley, 2012, Billé et al., 2012). This commercial marginalisation of some highly diverse coastal areas has also meant that formal institutions have played less of a role in regulating resource access. However, areas that may previously have been regarded as 'underutilised' or 'wasteland', such as saline land, sand dunes and beaches, and coastal swamps and wetlands, are increasingly

attractive for tourism, real estate, industry and aquaculture development. This has resulted in access to resources being effectively open or characterised by poorly defined tenure arrangements leaving them for the poor to exploit without the associated transaction costs (Campbell and Townsley, 2012).

Increasing pressure on ocean-related livelihoods of the poor. Development activities and competing land uses such as tourism, industrial development, and agriculture are in some cases undermining the ability of poor people to access and benefit coastal and marine ecosystem services. For example in Kenya and Tanzania, local people lost access to the beach for launching fishing boats due to the beachside privatisation and tourism development. In the Philippines, land reclamation projects encroach on the fishing grounds for local fishers and fishers report significantly reduced number of spawning fishes and shells previously harvested (Brown et al., 2008). Development of coastal infrastructure is forcing those engaging in near-shore mariculture to vacate the area (Brown et al., 2008). Unplanned and unregulated development in the narrow coastal interface and nearshore areas has led to significant externalities between sectors, suboptimal siting of infrastructure, overlapping uses of land and marine areas, marginalisation of poor communities, and loss or degradation of critical habitats (World Bank and United Nations Department of Economic and Social Affairs, 2017).

4.4 Impacts of marine degradation

Marine biodegradation disproportionately affects the poor (UN, 2015). The poor are more vulnerable when biodiversity is degraded or lost because of their ability to purchase substitutes or to offset local losses of ecosystem services by shifting production and harvest to other regions. Impact on fish stocks from biodiversity and habitat loss changes the dynamics of coastal communities, forcing change in employment, reduction in overall income levels, and ultimately contributing to poverty-related issues. Fish stocks which are important for commercial fisheries are reduced by loss of biodiversity and habitat, ultimately impacting entire coastal communities that depend on fishing for livelihoods. The following sections describe the specific livelihood impacts derived from industrial development as well as climate change in particular sectors or geographical areas.

Mangrove degradation and its impacts on costal livelihoods (Seary, 2019). Mangrove forests occur in the coastal saline environments of 105 tropical and subtropical nations. Biodiversity of fish and invertebrates within mangroves make them important locations for direct capture fisheries (prawn, crab, and oyster). Mangroves enhance fisheries production through providing nursery habitat for juvenile fish and invertebrates. Mangrove fishing can provide both income and subsistence as well as back-up or last resort occupations to fishing communities, making them important even where mangrove fishing is not the dominant fishing industry in a local area. Globally, there has been significant mangrove loss. An estimated 2.3 million km^2 of mangrove forest was lost worldwide between 2000 and 2012. Associated changes to ecosystem service provision are disproportionately felt by coastal communities, especially in developing countries. Destruction of mangrove forests for alternate human uses with perceived higher revenue, such as aquaculture ponds, rice agriculture, and oil palm plantations are some of the leading causes of mangrove loss. In SE Asia aquaculture is responsible for 30% of mangrove forest loss. Failed inactive aquaculture ponds are common in SE Asia as are fisheries losses as a result. Conversion for shrimp aquaculture in Southern Thailand, which was destroying 30 km of mangrove annually between 1990 and 1993, was estimated to have cost as much as US $408,000 in welfare losses from artisanal fisheries (consumer or producer surplus).

Climate change will change marine fisheries in Africa (World Bank, 2019). Climate change is likely to have a significant impact on Africa's marine fisheries. Tropical West African countries stand to be the most affected, whereas higher-latitude countries are less likely to be affected and, in some limited instances, could see some benefits. The simulation models show that the maximum catch potential will decrease by 30 percent or more as early as 2050 in many tropical West African countries, including the Democratic Republic of Congo, Côte d'Ivoire, Equatorial Guinea, Gabon, Liberia, and São Tomé and Príncipe. At higher latitudes, by contrast, catch potential is projected to decrease only moderately or even increase (e.g., in the waters off Senegal, The Gambia, and Cabo Verde). The impacts of climate change on marine fisheries will make it difficult for many countries that depend on these fisheries to achieve SDG 1 (No poverty), SDG 2 (Zero hunger), and SDG 3 (Good health and well-being) in fishing communities that are especially vulnerable to climate change because of their economic dependence on fisheries for their livelihoods and for food and nutrition security. The study also highlights margins of adaptation, where countries with high ecological risk do not necessarily face equally high socioecological risk depending on their adaptation capacity (e.g., the extent to which marine resources—including fisheries—are under effective management, or whether alternatives to affected fisheries are available).

Climate change and 'environmental refugees' (Brown et al., 2008) Climate change is likely to increase the scale of forced migration and the problem of environmental refugees. Environmental stresses will in some cases lead to relocation within and between countries, exacerbating migration and conflicts. Except in extreme cases where populations are displaced by sea-level rise (a real threat for small island developing states), the impacts of climate change on migration are difficult to predict given the different abilities of societies to adapt.

4.5 Impacts of COVID-19

COVID-19 impacts on marine ecosystems and on livelihoods. The global pandemic has acted as a major disrupter with pervasive effects on jobs, economies and governments as well as marine ecosystems. A blog entry on the UNDP website reflects on the interdependent outcomes in the short-term and potentially in the medium term (Hudson, 2020). The article notes that impacts of COVID-19 on the health of the ocean have largely been positive due to the reduction in various sectoral pressures that lead to pollution, overfishing, habitat loss/conversion, invasive species introductions and the impacts of climate change on the ocean. On the other hand, the livelihoods and food security of many millions of people may be seriously affected. There is already evidence that significant slowdowns are occurring in fisheries, shipping, coastal tourism, coastal development, and oil and gas extraction. A survey conducted in April 2020 by the UNDP Global Environment Facility showed significant reductions in demand for shrimp, octopus, crab, snapper, grouper, squid and mahi-mahi (SFP, 2020). This is due to lower demand from export markets, the challenge of practicing sanitary measures on fishing boats, difficulties accessing supplies and labour shortages. In the United States, two-thirds of commercial fish go to restaurants, many of which are now closed, so this demand has plummeted. In Ecuador, decreased demand for mahi mahi, mainly due to the complete collapse of tourism, led to a significant reduction in prices and has made fishing unprofitable. Moving forward, benefits for the livelihoods of the poor may derive from replenished fish stocks. Attention will need to be paid to how governments respond in support of renewable energy and energy efficiency - there is the risk that continued low oil prices may discourage the industry in its commitments to move to a much

lower carbon footprint through improved energy efficiency in both ship operation and design (Hudson, 2020).

5. What is the evidence about the socio-economic impacts of marine conservation initiatives?

5.1 Overview of the evidence

A range of marine conservation initiatives are intended to also alleviate poverty. Several types of marine conservation interventions have rapidly expanded in scale, extent, and scope. Conservation schemes include access limitation initiatives (such as Marine Protected Areas); Compensation for livelihood loss (decommissioning and payment for ecosystem services (PES) schemes); Community-based management; Livelihood alternatives and Eco-certification programmes (Campbell and Townsley, 2012, Gill et al., 2019). Protected areas currently cover 15% of the world's land and 7.3% of the ocean surface. The Marine Stewardship Council accounts for 14% of the world's wild marine catch production (Gill et al., 2019). Broader emerging initiatives include ocean governance, spatial planning, sustainable supply chain programmes and integrated blue economy approaches (some examples are included in the Section 6). As conservation interventions continue to increase in size and number around the world to meet global targets, there is considerable debate on whether conservation and environmental interventions result in social and environmental benefits or instead produce tradeoffs (Gill et al., 2019).

Social impact reporting: main themes and gaps. Since the year 2000, there has been a burgeoning literature regarding the social impacts of marine conservation initiatives, however the scope and rigour with which evaluations are conducted (if at all), is not yet systematic. A synthesis of MPA evaluation studies from the South Pacific based on 52 studies found that only eight reported socio-economic outcomes (Smallhorn-West et al., 2020). Of the 2,619 articles screened in a review conducted by Gill et al (2019), less than 3% reported multiple social impacts from marine conservation, and only a subset of these intentionally assessed heterogeneity as part of the study objectives. The review highlighted that MPAs are the most frequently evaluated intervention, arguably reflecting the rapid increase in the number and extent of these interventions in the past few decades and their prominence in the global conservation and development agenda (e.g.10% MPA coverage target in UN Sustainable Development Goal 14.5). MPA literature represented 85% of the sample (n = 64 of 75 studies), including nine assessing MPAs that were part of a community based management intervention. Research is more thinly spread on other programme types. Very little research has been done on the social impacts of certification schemes (Gill et al., 2019). The studies in the sample focused heavily on interventions in Southeast Asia (36% of studies), Eastern Africa (13%), and Central America (12%). Understudied regions include West Africa and the Middle East. Almost all studies focused on local-scale interventions (93%), and were predominantly located in or near tropical nearshore environments such as coral reefs and their associated ecosystems (e.g., sea grass, mangroves) (53%). Understudied ecosystems include offshore and temperate ecosystems. User groups such as non-fishing actors also feature rarely in scientific literature (Gill et al., 2019).

Measuring impact is complex. As interest in the socio-economic impacts of marine conservation increases, various lessons are emerging regarding what should be measured and gaps in research. First, understanding the heterogeneity of socioeconomic impacts of protected areas among social subgroups is important for gaining a comprehensive picture of how protected

areas affect people. Understanding how protected areas can differentially affect social subgroups is particularly critical because social inequity can create conflict and impede poverty reduction, thus jeopardising social and biological goals. A study conducted in in North Sulawesi, Indonesia found that the socioeconomic impacts of marine protected areas (MPAs) differed according to age, gender or religion in associated villages (Gurney et al., 2015). A lack of understanding of how biodiversity generates ecosystem services for different groups of poor people, at different times of the year or at different stages of their lives, can result in using over-simplistic indicators of success. Second, the heterogeneity of socioeconomic impacts of protected areas varies across space and time (Gurney et al., 2015, Rasheed, 2020). For instance, regulations restricting fishing may harm local fishers in the short-term but provide long-term socio-ecological benefits. Third, the adaptive responses of nature and people to ecosystem or conservation changes mean that dynamic models are needed to predict and explain socio-economic impacts beyond the boundaries of a particular programme. For instance, fishers may redistribute efforts adjacent to the established marine reserve that has a spill-over effect (Di Lorenzo et al., 2016). In Papua New Guinea, a study found that as key access mechanisms across the value chain of marine provisioning services evolve, customary institutions may lose or gain legitimacy over time (Lau et al., 2020).

The range of socio-economic measures considered in biodiversity studies is growing. Earlier research focused on how conservation influences individual outcomes, such as levels of overall economic wealth or poverty. Recent studies and reviews describe the diversity of ways environmental policies and practices impact human wellbeing, extending beyond a traditional focus on income and other material indicators including subjective and relational variables (Gill et al., 2019, Rasheed, 2020). A comprehensive evaluation of the diversity of impacts from marine conservation interventions considers the direction, magnitude, and distribution of impacts across groups/individuals and scales, but also the synergies and trade-offs that may occur between various domains of wellbeing. Knowledge regarding contextual factors, the role of shifting property rights, power asymmetries, individual capabilities, and resource dependency in shaping socio-economic outcomes is also needed to support the wellbeing of vulnerable and marginalised groups (Gill et al., 2019)

5.2 Socio-economic impacts of marine conservation initiatives,

Marine Protected Areas (MPAs) and evidence on their poverty alleviation impacts. Marine protected areas are widely recognised as having considerable potential to provide conservation benefits but the evidence on livelihood benefits is quite mixed. The reallocation of property rights over marine resources, typically generates a diversity of synergies and trade-offs among different aspects of human wellbeing (Gill et al., 2019). A review of MPA evaluation studies found commonly reported synergies between increased income and food security (mostly catch rates), for example in the Chumphon Archipelago Marine National Park, Thailand. Negative synergies were reported in a study conducted in south-eastern Tanzania, where the loss of access to fishing grounds and gear confiscation reduced fishing activity and subsequently led to hunger and malnourishment in the affected communities (Gill et al., 2019). Despite the potential benefits of MPAs, prohibiting extractive uses can have socio-economic costs such as the loss of income from fishing, and/or the increased costs of having to fish further away (da Silva et al., 2015). Perceptions regarding impacts by resource users and community stakeholders are important and may diverge from quantitative indicators (Bennett and Dearden, 2014). Interviews conducted in rural communities in 17 National Marine Parks in Thailand recoded perceived limited to negative impacts on fisheries and agricultural livelihoods and negligible benefits for tourism livelihoods.

Perceptions of park governance and management processes were generally negative. An evaluation of an MPA in the Sagay Marine Reserve, in the Philippines observed that when they had received conservation training and projects, and an additional number of boats, both fishers and non-fishers perceived that they were alleviated from poverty. However in reality they remained food-poor and under the national poverty line (Manejar et al., 2019).

The process of implementation affects its degree of success. Rushed MPA initiatives are more likely to meet with resistance (Burbano et al., 2020). Incremental approaches are receiving popularity in marine reserve practices to lower socio-economic burdens on fishers and management budgets (Li et al., 2020). These include gradually increasing closed months of a marine reserve and incrementally expanding the coverage of marine reserves. For example, many studies suggest that seasonal closures of reserves are more acceptable to fishers than year-round closures; and periodically-harvested closures have been employed as a predominant fisheries conservation strategy through a community-based approach (Li et al., 2020). A study on resource user perceptions in 40 MPA communities in the Philippines observed that positive perceptions of the MPA benefits when these were still small, led to support for scaling up of marine reserve areas (Wagner, 2012).

Which types of MPAs or components influence socio-economic outcomes? MPAs may have different governance structures (community based or centrally governed) as well as multiple components (e.g. no-take areas, spill-over effects, alternative livelihoods etc…). In studies identified in review by Smallhorn-West et al. (2020) the proportion of positive impacts was comparable between community-based and centrally governed MPAs, suggesting that both governance approaches are viable options in the region. No-take areas and spillover effects can generate benefits for poor populations in the medium term (Roe et al., 2013), although the effects are mediated by the number of fishermen and fishing intensity, and the extent and visibility of the spillover effect are critical to the acceptance of marine reserves by fishermen (da Silva et al., 2015). Examples from the Philippines and East Africa suggest that establishment of MPAs can increase flows of provisioning services by enhancing the production or value of catches in neighbouring ground through spill-over or protecting breeding populations as well as provide opportunities for tourism development. However, poor people who have immediate provisioning needs for cash and food, may not be able to wait for up 5-10 years benefits of MPAs to accrue and may not be able to profit from tourism or other benefits which arise. In addition, the Philippines case studies showed that in order to realise the expected benefits from sanctuaries, there needs to be a network of such protected areas, rather than isolated geographically scattered sanctuaries. This is because intensive fishing effort adjacent to no-take areas can negate the fish abundance generated by MPAs.

Spatial planning and the inclusion of socioeconomic data in the initial stages affect its poverty alleviation outcomes. Socioeconomic factors that influence whether MPA placement has an impact on biodiversity and/or livelihoods include stakeholder engagement, poverty levels, population density, and strong leadership, but the direction of impact (i.e., positive or negative) can be context-dependent (Li et al., 2020). A Philippines case study documents the systematic design of an MPA network that aims to minimise and distribute costs equitably for small scale fisheries whilst achieving representation targets for biodiversity conservation. In the data-poor region, participatory mapping workshops were conducted with fishers in 79 communities to collect data on the spatial distribution patterns of different fisheries and communities. Remote sensing techniques were employed to define coastal habitats, which were targeted for inclusion in MPAs. The datasets were integrated with decision-support tools scenarios that met

representation targets with similar area coverage. Scenarios that did not include minority fisheries or variations between communities, led to inequitable costs. These results highlight the need to incorporate detailed data on SSF at appropriate resolutions, and how this can be achieved through participatory approaches (Kockel et al., 2020).

Compensating people for the loss of access to ecosystem services – socio-economic benefits are hard to achieve (Campbell and Townsley, 2012). Decommissioning and Payment for Ecosystem Services (PES) is growing in use and includes fisheries decommissioning schemes and payments for ecosystem services (PES). Whilst decommissioning schemes have the potential to reduce overall fishing pressure, they tend to fail for reasons linked to the political economy. There are few documented cases where decommissioning schemes have been shown to work for the poor. To be effective they will, in the main, need to be used in association with other mechanisms (such as closed access systems or alternative livelihood schemes), otherwise they may encourage occupational migration into resource harvesting. Marine reserve use fees, fishing nursery protection charges and tourism levies offer opportunities for paying local communities for maintaining coastal resources in good condition, but the processes of linking buyers and sellers of ecosystem services often involve payments moving through formal and informal systems where political interference can redirect those funds. In a socially differentiated society where the poor have a limited say in decision making and few formal rights over resources, they will find it extremely difficult to benefit from such systems.

Developing livelihood alternatives for poor people has often been seen as a solution to conserving coastal resources whilst achieving poverty reduction. The success of these efforts has been low (though more recent positive examples are included in Section 6). Often, alternative livelihood initiatives are components of wider environmental programmes where they are used simplistically to address very complex change processes. Very few systematic approaches have been developed to support livelihood change for communities dependent on natural resources (Campbell and Townsley, 2012). A review of the alternative livelihoods component of an MPA in Tanzania reported that the overwhelming majority of survey respondents (90%) reported that the projects were allocated inappropriately, that the purpose of alternative projects was not sufficiently clear and that many beneficiaries perceived that these projects were initiated simply to comply with regulations. Overall,70% of survey respondents stated that the project activities could not compete with the income gained (Katikiro, 2016).

Stakeholder engagement. The type and quality of stakeholder engagement is consistently reported as key to MPA achievements (and that of other initiatives) or as a critical determinant of programme failure (Campbell and Townsley, 2012). Much depends on *how* conservation projects are designed and carried out, how poor and marginalised people are consulted, involved in and associated with the conservation objectives and activities in biodiversity projects and policies (Billé et al., 2012). Stakeholder involvement in governance and management is also crucial, particularly since restrictions in access to natural resources may cause conflict (Burbano et al., 2020). Local communities or resource users are more willing to participate and commit themselves to long-term conservation strategies when their knowledge and opinions are included in decision-making, and when stakeholders are engaged directly—not merely consulted—by public agencies (Burbano et al., 2020). The need for stakeholder engagement to be sustained over time was demonstrated in a case study conducted in the Galapagos Marine Reserve (Burbano et al., 2020). This documented how an initial process of stakeholder engagement was derailed because of leadership changes and then shifted to a top-down declaration of a no-take MPA, that caused social conflicts delaying the implementation of the new zoning plan more than

three years after its official declaration. Effective stakeholder engagement is challenging to achieve. A review of socioeconomic benefits of MPA schemes identified cases where increased management rights led to greater income from fishing and/or tourism, but also to increased conflict with groups with restricted access (Gill et al., 2019). Users of the traditionally managed areas in the Diani-Kinondo area in Kenya reported that the community-managed areas supported their cultural fishing practices as well as good catch rates. However, the perpetuation of the traditional management systems also contributed to conflict between the elders who practice traditional spiritual practices and younger Muslim fishers (Gill et al., 2019). In larger scale projects, multi-stakeholders' partnerships involving civil society, the government institutions, the private sector and other key stakeholders are also fundamental to successful implementation and scaling up of projects (Chen et al., 2020). The case studies below (Section 6) by Chen et al. (2020) provide helpful examples of community participation and management.

5.3 Challenges and opportunities going forward

The need for integrated approaches (World Bank and United Nations Department of Economic and Social Affairs, 2017). Despite a range of actors and large investments, current attempts to overcome challenges have mostly been piecemeal, with no comprehensive strategy (for example, disparate efforts centred on fisheries governance, improving ports, marine litter efforts, and so on). Even when one sectoral policy achieves some success, these results are often undermined by externalities from activities in another sector. For example, coastal zone management efforts, or support to coastal fishers, tend to be undermined by unbridled sand mining, ill-sited ports or aquaculture farms, or unregulated tourism development. In coastal zones, declines in mangrove forest habitat resulting from habitat conversion, wood harvest, sea-level rise, destruction of dune systems from sand mining, and changes in sediment and pollutant loading from river basins combined with land reclamation for agriculture or infrastructure have serious negative impacts on fisheries by reducing or degrading spawning and feeding habitats. Loss of mangrove forests, for instance, threatens profits from seafood harvests in excess of US$4 billion per year; in Belize, mangrove-rich areas produce on average 71 percent more fish biomass than areas with few mangroves (World Bank and United Nations Department of Economic and Social Affairs, 2017).

6. What examples are there where increased or protected marine biodiversity contributed to poverty reduction and enhanced livelihoods? What were the poverty or livelihood effects achieved and how?

The previous section highlighted recurring aspects of programmes where scientific evidence is available, particularly for different aspects of MPAs (e.g. stakeholder participation, community management and spatial planning for MPAs). A selection of examples in this section give a range of established and emerging innovative approaches including large-scale, sectoral and local initiatives which have shown early signs of success (but many do not give details of robust and independent evaluations). The case studies highlight stakeholder participation, inter-stakeholder platforms, commitment to trust-building between stakeholders, appropriate use of technology, and complementary interventions (such as community financing schemes) as key elements of successful interventions.

6.1 Blue economy - Community solutions

Chen et al. (2020) review and compare three case studies of blue economy practices initiated and implemented by local coastal communities in China, Samoa, and Vietnam (a large mid-income country, a Small Island Developing States (SIDS) and an emerging economy). These projects are part of the Global Environment Facility (GEF)—Small Grants Programme (SGP) which supports innovative local and community-based actions to address global environmental issues, promote livelihoods, and empower local communities.

The cases demonstrate that effective management can be achieved through local self-governance, with international financial and technical assistance. Table 3 below gives an overview of the three projects, and their primary environmental and socio-economic outcomes. Key components for the sustained positive impacts included community ownership and community participation; strong and regular communication fora and visible benefits to the community. More details are highlighted in the text below.

Project Title	Country	Duration	Project Funding	Co-Financing	Environmental Results	Socio-Economic Results
Restoration and sustainable use of seagrass beds for sea cucumber aquaculture	Shandong, China	Oct 2013–Sep 2015	$50,000	$39,492	• Restoration of 3050 ha of seagrass bed • Increased density of *Zostera marina* to 110 plants per square meter	• The sea-cucumber cultivation has brought more than US$70,000 per year to the local community with about 500 people • More than US$7000 has been generated from eco-tourism per year
Coral reef restoration and sustainable fisheries	Lefagaoalii, Samoa	Jun 2015–Mar 2018	$30,000	$10,000	• Expanding MPA from 400 metres to 5 ha • Increase in Coral Growth • Increase in Fish Stock • Seawall construction	• 100% Increase in fishing incomes • Creation of new partnerships • Planning for Ecotourism approaches • Long term and sustainable process for biodiversity conservation
Community-based management of coastal and marine resources for livelihood improvement	Thuan Quy, Bhin Thuan, Viet Nam	Oct 2014 - Jun 2017	$48,000	$31,060	• sup>· Restoration of seabed ecosystem and habitat recovery for 20 aquatic species on a project surface of 500 m^2 • Full rehabilitation and maintenance of Anadara antiquate (clam) population in the same area	• 40% income increase for fishers due to new production models • 66% income increase for local population due to livelihood diversification through agriculture, ecotourism, and small-scale trading

Table 3. Summary of GEF-SGP project cases and results. Source: Chen et al, 2020, p.3, licensed under Open Access License

China seagrass conservation: The project has raised public awareness on marine biodiversity conservation, seagrass use and protection. It has enhanced local capacity in marine conservation, and alternative livelihood development. All the participants are local fishermen and their families. The project has involved and empowered women with its female project team leader. Sea cucumber cultivation has brought about 500,000 RMB ($70,000) per year to the local community of about 500 local people. The project also assisted local communities in designing and developing aquatic recreational activities and recreational fishing. About 50,000 RMB ($7000) has been generated from tourism per year, boosting fishers' enthusiasm for seagrass-bed restoration and protection. Seagrass restoration also contributed to the local culture of seaweed houses, which helps the local community to develop tourism around local features of cultural interest.

Samoa: The evaluation found that the Lefagaoalii MPA has had a positive impact on villagers' wellbeing. The people of Lefagaoalii had traditionally relied on its coastal area and marine resources to support their livelihood through consumption and income earning. In the years before the establishment of the MPA, villagers observed a massive decline in numbers of fish, invertebrates and sea grapes in their inshore coastal area and reef system. Now that the corals

and marine species in the MPA are growing in abundance, the fishers are catching bigger fish in larger numbers from the lagoon surrounding the MPA and reef area. On average, there has been a 100% increase in their weekly income, from $160 to $320. The village is considering ecotourism development and the conservation of mangroves (since the MPA is adjacent to the mangrove area). The project committee continues to build the capacity and awareness of villagers; conduct ongoing meetings and cooperate with villagers for monitoring the MPA. A significant policy outcome for Lefagaoalii is the establishment of partnerships with the Ministry of Natural Resources and Environment, the Samoa Tourism Authority, and the Small Business Enterprise Center.

In ***Vietnam*****,** by allocating fishing rights, the livelihoods of the local fishing communities improved and stabilised. The project also developed new production models for fishing (e.g., the use of gill nets for catching clams instead of diving and squid fishing) and other economic activities such as small trading, agriculture (particularly by planting dragon fruits) and ecotourism (by organising recreational fishing tours for tourists) that helped diversify the livelihoods of the fishing community. The new fishing practices increased the income of the local fishers from around $15 to $25 per day, while gains from alternative livelihoods rose from $8 to $15 per day. The project mobilized the participation of many local stakeholders and the developed legal and institutional foundations that informed local policies and regulations in Binh Thuan province. Because the association agreed to reserve 20 percent of its revenue for social welfare purposes, such as the establishment of a library for children, a kindergarten, a village house, and student scholarships, the project indirectly benefited the entire community of Thuan Quy. The establishment of a financial mechanism (revolving fund) with contributions of the fishers' association, is a step towards potentially establishing the long-term financial sustainability of the work.

Co-management and tenure rights in the Volta river clam fishery in Ghana (FAO, 2020). Communities and clam harvesters in the Volta River estuary have worked together to secure individual rights and tenure of clam miners and farmers. As an innovation, a project piloted the FAO Open Tenure tool for mapping underwater clam farms. Open Tenure has been developed as a tool for communities to assess and clarify their tenure regimes in order to protect the individual and collective rights of their members. Mobile devices provide for in-the-field capture of legitimate tenure rights with boundary mapping. Data are then uploaded to a web-based community server. The tool has been successfully adapted to allow for formal recording of customary and informal rights where recognised by law. A step-by-step approach was used to analyse current traditional tenure rights arrangements in the clam fishery, spatial mapping of main clam fishing areas, and the development and distribution of maps showing competing uses, including: navigation and local transport, recreation, hospitality (including a new hotel), real estate, and aquaculture. The process identified key stakeholders and potential for fishers associations to develop a co-management programme, with options for the administration of user rights, tenure needs and sustainability. Documentation and dissemination of best practices and lessons learned were discussed with the traditional authority and the local government to inform the devolution for securing user rights.

6.2 Fishery and aquaculture supply chain approaches

There is a growing focus among international institutions on approaches which engage with key governmental, industry and consumer stakeholders of the fisheries and aquaculture sector. The aims are to build consensus around international guidance and provide technical assistance to developing countries, especially the least developed ones, while creating platforms for the voices

of fishers and fishworkers. Desired outcomes are adherence to international guidelines for sustainable fishing, dissemination of the latest developments on bycatch and discard reduction, fishing technologies, fisheries finance, safety at sea, social security and decent employment (FAO, 2020).

Sustainable Supply Chains for Marine Commodities (GMC) Project (Orellana and Seager, 2020). The Global Sustainable Supply Chains for Marine Commodities (GMC) Project is an interregional initiative implemented by the Ministries and Bureaus of Fisheries, Production and Planning of Costa Rica, Ecuador, Indonesia and Philippines, with technical support from the United Nations Development Programme (UNDP) and facilitated by the Sustainable Fisheries Partnership (SFP). The GMC Project contributes to the transformation of international seafood markets by mainstreaming sustainability in seafood supply chains originating in developing countries. The project uses emerging market-based tools such as seafood ecolabelling programs, international retailer corporate purchasing policies, Sustainable Marine Commodity Platforms (SMCPs), and Fishery Improvement Projects (FIPs) to integrate sustainability in fishery management and supply chain operations. After two years of implementation, the project has facilitated new fisheries policy consultation forums in Costa Rica, Ecuador, and Indonesia and has strengthened the fisheries management Technical Working Groups in the Philippines. These forums have generated the Costa Rica Large Pelagic National Action Plan (NAP) which aims to scale up and integrate smaller Fishery Improvement Programmes. In the report on early findings, a case study is included from Ecuador, where an ancestral and artisanal fishing technique (Tuna Pole and Line fishing) is considered a more sustainable alternative than other tuna fishing methods because of its selectivity, with lower bycatch levels and lower environmental impacts. The Ecuadorian “Cañeros de Manta” Pole and Line Association has four active boats and provides direct employment to at least 90 people, most of them, older fishers. The GMC programme facilitated the introduction of artisanal fisheries to international buyers and helped them gain insights on product requirements and quality standards requested by international buyers and connections with sustainable seafood markets. Additionally, GMC projects have mainstreamed a gender strategy to dedicate specific resources to address gender gaps and challenges in its fishery improvement projects and to ensure that projects contribute to gender equality and women’s empowerment in the four target countries, for example in the Blue Swimming Crab and Tuna Pole and Line FIPs in Indonesia.

Regional support for sustainable small-scale fisheries in North Africa. Created in 2014, the Maghreb Platform for Sustainable Small-Scale Fisheries brings together the national small-scale fisheries networks of Algeria, Mauritania, Morocco and Tunisia. With the support of the FAO, it has been playing a significant role in advocating for achieving the objectives of Sustainable Development Goal (SDG) Target 14.b (Provide access for small-scale artisanal fishers to marine resources and markets), by implementing field projects and promoting the small scale fishery guidelines. Other related sub-regional activities are supporting countries in the socio-economic characterisation of small-scale fisheries, the spatial mapping of fishing activities, and the involvement of small-scale fisheries in a multi-stakeholder discussion toward fisheries management based on the ecosystem approach to fisheries.

Strengthening regional cooperation for the coordination of fisheries and conservation projects (Harris and Gove, 2015). At the pan-African level, the work on fisheries has gained recently recognition at the highest political level, with the adoption in 2014, by the African Head of States, of the Africa Fisheries and Aquaculture Policy Framework and Reform Strategy. This changed dramatically the way fisheries had been previously addressed in the continent, to be

currently considered one of the main economic areas to be focused, and to secure food security and alleviate poverty. At the regional level, the South West Indian Ocean region is organised in several Regional Economic Communities, which include fisheries, as one of their priority areas, including the promotion of regional fisheries cooperation, through agreed strategies and protocols. The region is currently witnessing the implementation of several regional fisheries initiatives which are important for strengthening regional cooperation and coherence among the countries for ensuring improved fisheries management. These include the Smartfish Project, SWIO Fish Project (both at national and regional levels), WWF fisheries work, which are addressing important aspects for regional fisheries management, including regional Minimum Terms and Conditions. The regional partnership is also concerned with the impacts climate change on occurrence, distribution, seasonality and abundance of fisheries resources. For example, variations on runoff are linked with recruitment and catches of shallow water shrimp in Mozambique. For the small scale fishers this aspect is crucial as it directly affects their subsistence.

6.3 Addressing harmful ecological practices in ways that promote livelihoods

Sustainable Management of Bycatch in Latin America and Caribbean Trawl Fisheries (FAO, 2020). Since 2015, the FAO/GEF Project has worked with partners across the region (Brazil, Colombia, Costa Rica, Mexico, Suriname and Trinidad and Tobago) to test, adapt, support and disseminate socio-economic policies, technologies and best practices that reduce bycatch in bottom trawl fisheries. The main gear improvements introduced and disseminated by the project have been: squaremesh panels; fisheye devices; and increases in mesh size. These three measures have gained wide acceptance and resulted in bycatch reductions in industrial and semi-industrial fleets of 25–50 percent, with acceptable levels of target species losses. To support the uptake of such devices and measures, all project countries have established institutional structures for participatory management, with bycatch management being integrated into management plans or normative measures. This has resulted in an engaged fishing sector and increased trust between government agencies and fisheries stakeholders. The establishment of spatial and temporal closures, as well as fleet zoning regulations, have contributed to a significant reduction in overall bycatch from trawl fisheries. The beneficiary countries report clear improvements in their ability to implement the ecosystem approach to fisheries, as demonstrated in a series of management plans and regulations with high degrees of ownership from fishing communities, particularly in Brazil and Colombia. Moreover, the project has helped local communities and vulnerable groups of women increase the use and value of bycatch and participate in fisheries decision-making processes.

Marine Protected Area Management, alternative livelihoods and the use of destructive fishing gear in Tanzania (da Silva et al., 2015). Coastal resources in Tanzania have come under increasing pressure over the past three decades, which has led to a significant decline in the biodiversity and productivity of coastal ecosystems. The livelihoods of coastal communities that directly depend on these resources are consequently under increasing threat and vulnerability. The empirical study is based on household survey data from a sample of villages located along the coast of mainland Tanzania and Zanzibar. Some aspects of poverty increased the likelihood of using destructive fishing gear. MPAs did not directly affect household choice of fishing gear. However, households participating in alternative livelihood component were less likely to use destructive fishing gear, suggesting that MPA support to these activities in Tanzania has a positive influence on household choice of fishing gear.

The South China Sea Fisheries Refugia initiative to reduce bycatch of blue crabs, a Global Environment Facility-backed effort led by the UN Environment Programme (UNEP), aims to build the resilience of Southeast Asian fisheries and reduce marine degradation at the intersection of the South China Sea and Gulf of Thailand. The industry accounts for 10 per cent of total global fisheries production every year. One of the key species in the project is the blue swimming crab. The crabs are a top export for Thailand, with the country ranking as the world's fourth largest exporter over the past two decades. But they are under threat. Traditionally caught by small-scale and commercial fishermen using crab traps and bottom gillnets, the blue swimming crab population has suffered from large scale trawling operations, with the species frequently caught as bycatch by trawlers in both coastal and offshore areas. The Fisheries Refugia project identified the need to protect the crabs –particularly the egg-bearing females. The project has used social media platforms (Facebook and Line) as a tool to help change the attitude of trawler crews platforms, with many fishermen now recording and sharing videos of themselves releasing crabs back into the sea, helping to spread the word on the importance of releasing bycatch, as well as providing data on the numbers of crabs released. By December 2019, crews from 45 trawlers were participating in the release programme in Thailand's Surat Thani Province. At the village level, the project has built on existing local practices to create 'crab banks'. Female crabs caught by small-scale fishermen are deposited in the local crab bank until they spawn, after which the adults are sold at market and the eggs or crab larvae returned to the sea. With fishermen earning 50% of every sale, and the remainder going to the 'bank' to cover cage maintenance and operating costs, the model of improving both livelihoods and environmental management has been positive and has recently been expanded other coastal areas of Thailand, as well as to other ASEAN nations (https://www.unenvironment.org/news-and-stories/story/banking-sea).

Providing sewage services for improved health and sanitation outcomes. In 2007, the GEF and the World Bank initiated the US$80 million Partnership Investment Fund for Pollution Reduction in East Asia to replicate cost-effective pollution reduction technologies and techniques while promoting private investment and public-private partnerships, and streamlining investments and activities designed to reduce land based sources of pollution throughout the seas of East Asia. The Partnership Fund's investments, through seven national-level projects, were aimed at reducing pollution inputs. Partnership Fund seed financing encouraged project authorities to contribute nearly US$1 billion of co-financing. For example, the Manila Third Sewerage Project assisted the Government of the Philippines by identifying reforms to attract private investments in the wastewater sector, increasing the effectiveness of the agencies responsible for water pollution control, and promoting innovative and effective wastewater treatment techniques. By 2013, the project had provided sewage services to 20 percent of the 12 million residents of the Metropolitan Manila Area. The project provided sanitation services to 57 percent of the population.

6.4 Other initiatives

Financial services to support the transition to more sustainable and responsible fishing (FAO, 2020). The fisheries sector requires access to financial services (e.g. savings, credit and insurance) and investments to support the transition to more sustainable and responsible fishing, as well as to address climate change adaptation and mitigation. Investment programmes recognise that small-scale fisheries often operate within overfished coastal areas, with open-access regimes. FAO has partnered with the Asia-Pacific Rural and Agricultural Credit Association to build capacity among rural finance institutions on doing business with the fisheries

sector and to increase access by small-scale fishers to microfinance, credit and insurance services. Capacity-building programmes and pilot projects are being conducted in several countries in Asia in 2020.

Economic valuations as a route to increasing returns to marine livelihoods. Many of the services provided by marine and coastal ecosystems – such as coastal protection, fish nursery, water purification, marine biodiversity and carbon sequestration – are not reflected in the prices of traditional goods and services on the market (OECD, 2016). While there is often a lack of scientific information to clearly understand the complex links between these marine ecosystem services and their economic value, this undervaluation of marine ecosystem services results in under-investment in their conservation and sustainable use, and lost opportunities for economic growth and poverty reduction (OECD, 2016). The Marine Ecosystem Services Partnership provides information on more than 1000 valuation-oriented studies worldwide, by ecosystem type. In Sri Lanka, for example, greater conservation efforts of its salt water marsh, a natural buffer against flooding, were prompted when its ability to protect cities was valued at USD 5 million annually (OECD, 2016). In Mauritania, following a study which showed that the value of fisheries and renewable marine resources was much greater than mineral resources, the government adopted an alternative approach to development based on realising the long-term potential for blue growth (World Bank and United Nations Department of Economic and Social Affairs, 2017).

7. References

BARRETT, C. B., TRAVIS, A. J. & DASGUPTA, P. 2011. On biodiversity conservation and poverty traps. *Proceedings of the National Academy of Sciences of the United States of America,* 108**,** 13907-13912.

BENNETT, N. J. & DEARDEN, P. 2014. Why local people do not support conservation: Community perceptions of marine protected area livelihood impacts, governance and management in Thailand. *Marine Policy,* 44**,** 107-116.

BILLÉ, R., LAPEYRE, R. & PIRARD, R. 2012. Biodiversity conservation and poverty alleviation: A way out of the deadlock? *Sapiens,* 5.

BROOKS, W., RUDD, M., CHENG, S., SILLIMAN, B., GILL, D., AHMADIA, G., ANDRADI-BROWN, D., GLEW, L. & CAMPBELL, L. 2020. Social and ecological outcomes of conservation interventions in tropical coastal marine ecosystems: a systematic map protocol. *Environmental Evidence,* 9.

BROWN, K., DAW, T., ROSENDO, S., BUNCE, M. & CHERRETT, N. 2008. *Ecosystem Services for Poverty Alleviation: Marine & Coastal Situational Analysis*, Ecosystem Services for Poverty Alleviation programme, Natural Environment Research Council and Economic and Social Research Council , UK Department for International Development.

BURBANO, D. V., MEREDITH, T. C. & MULRENNAN, M. E. 2020. Exclusionary decision-making processes in marine governance: The rezoning plan for the protected areas of the 'iconic' Galapagos Islands, Ecuador. *Ocean & Coastal Management,* 185**,** 105066.

CAMPBELL, J. & TOWNSLEY, P. 2012. Biodiversity and Poverty in Coastal Environments. *In:* ROE, D., ELLIOTT, J., SANDBROOK, C. & WALPOLE, M. (eds.) *Biodiversity Conservation and Poverty Alleviation: Exploring the Evidence for a Link.* Oxford, UK: Wiley-Blackwell.

CHAIGNEAU, T., BROWN, K., COULTHARD, S., DAW, T. M. & SZABOOVA, L. 2019a. Money, use and experience: Identifying the mechanisms through which ecosystem services contribute to wellbeing in coastal Kenya and Mozambique. *Ecosystem Services,* 38**,** 100957.

CHAIGNEAU, T., COULTHARD, S., BROWN, K., DAW, T. M. & SCHULTE-HERBRÜGGEN, B. 2019b. Incorporating basic needs to reconcile poverty and ecosystem services. *Conservation Biology,* 33**,** 655-664.

CHEN, S., DE BRUYNE & BOLLEMPALLI, M. 2020. Blue Economy: Community Case Studies Addressing the Poverty–Environment Nexus in Ocean and Coastal Management. *Sustainability,* 12.

CISNEROS-MONTEMAYOR, A. M., MORENO-BÁEZ, M., VOYER, M., ALLISON, E. H., CHEUNG, W. W. L., HESSING-LEWIS, M., OYINLOLA, M. A., SINGH, G. G., SWARTZ, W. & OTA, Y. 2019. Social equity and benefits as the nexus of a transformative Blue Economy: A sectoral review of implications. *Marine Policy,* 109**,** 103702.

CISNEROS-MONTEMAYOR, A. M. & OTA, Y. 2019. Chapter 30 - Coastal indigenous peoples in global ocean governance. *In:* CISNEROS-MONTEMAYOR, A. M., CHEUNG, W. W. L. & OTA, Y. (eds.) *Predicting Future Oceans.* Elsevier.

DA SILVA, I., HILL, N., SHIMADZU, H., SOARES, A. & DORNELAS, M. 2015. Spillover Effects of a Community-Managed Marine Reserve. *PLoS ONE,* 10**,** e0111774.

DI LORENZO, M., CLAUDET, J. & GUIDETTI, P. 2016. Spillover from marine protected areas to adjacent fisheries has an ecological and a fishery component. *Journal for Nature Conservation,* 32.

DWYER, L. 2017. Emerging Ocean Industries: Implications for Sustainable Tourism Development. *Tourism in Marine Environments,* 13.

FAO 2020. *The State of World Fisheries and Aquaculture 2020. Sustainability in action* Rome, Food and Agriclture Organization https://doi.org/10.4060/ca9229en.

FERRARIO, F., BECK, M. W., STORLAZZI, C. D., MICHELI, F., SHEPARD, C. C. & AIROLDI, L. 2014. The effectiveness of coral reefs for coastal hazard risk reduction and adaptation. *Nature communications,* 5**,** 3794-3794.

FISHER, J. A., DHUNGANA, H., DUFFY, J., HE, J., INTURIAS, M., LEHMANN, I., MARTIN, A., MWAYAFU, D. M., RODRÍGUEZ, I. & SCHNEIDER, H. 2020. Conservationists' perspectives on poverty: An empirical study. *People and Nature*, 1-15 https://doi.org/10.1002/pan3.10098.

FORTNAM, M., BROWN, K., CHAIGNEAU, T., CRONA, B., DAW, T. M., GONÇALVES, D., HICKS, C., REVMATAS, M., SANDBROOK, C. & SCHULTE-HERBRUGGEN, B. 2019. The Gendered Nature of Ecosystem Services. *Ecological Economics,* 159**,** 312-325.

GILL, D., CHENG, S., GLEW, L., AIGNER, E., BENNETT, N. & MASCIA, M. 2019. Social Synergies, Tradeoffs, and Equity in Marine Conservation Impacts. *Annual Review of Environment and Resources,* 44**,** 347-372.

GURNEY, G. G., PRESSEY, R. L., CINNER, J. E., POLLNAC, R. & CAMPBELL, S. J. 2015. Integrated conservation and development: evaluating a community-based marine protected area project for equality of socioeconomic impacts. *Philos Trans R Soc Lond B Biol Sci,* 370.

HARRIS, A. & GOVE, D. 2015. *Ten Years Promoting And Strengthening Regional Cooperation For Securing Sustainable Fisheries In South West Indian Ocean (SWIO) Region*, SOUTH WEST INDIAN OCEAN FISHERIES COMMISSION (SWIOFC); FAO, WWF.

HOLMES, G., SANDBROOK, C. & FISHER, J. A. 2017. Understanding conservationists' perspectives on the new-conservation debate. *Conservation Biology,* 31**,** 353-363.

HUDSON, A. 2020. The ocean and COVID-19. Blog entry posted on 8 June 2020. https://www.undp.org/content/undp/en/home/blog/2020/the-ocean-and-covid-19.html.

IIED. Linking Biodiversity Conservation and Poverty Alleviation: A State of Knowledge Review. Linking Biodiversity Conservation and Poverty Reduction: What, Why and How?, April 28th and 29th 2010, 2010 Zoological Society of London. International Institute for Environment and Development (IIED).

KATIKIRO, R. E. 2016. Improving alternative livelihood interventions in marine protected areas: A case study in Tanzania. *Marine Policy,* 70**,** 22-29.

KOCKEL, A., BAN, N. C., COSTA, M. & DEARDEN, P. 2020. Addressing distribution equity in spatial conservation prioritization for small-scale fisheries. *PLOS ONE,* 15**,** e0233339.

LAU, J. D., CINNER, J. E., FABINYI, M., GURNEY, G. G. & HICKS, C. C. 2020. Access to marine ecosystem services: Examining entanglement and legitimacy in customary institutions. *World Development,* 126**,** 104730.

LI, Y., SUN, M., EVANS, K. S., REN, Y. & CHEN, Y. 2020. Rethinking marine conservation strategies to minimize socio-economic costs in a dynamic perspective. *Biological Conservation,* 244**,** 108512.

MANEJAR, A. J. A., SANDOY, L. M. H. & SUBADE, R. F. 2019. Linking marine biodiversity conservation and poverty alleviation: A case study in selected rural communities of Sagay Marine Reserve, Negros Occidental. *Marine Policy,* 104**,** 12-18.

OECD 2016. *The Ocean Economy in 2030,* Paris, OECD Publishing.

ORELLANA, D. & SEAGER, M. 2020. *Global Marine Commodities. Our model and early results,* New York, UNDP.

RASHEED, A. R. 2020. Marine protected areas and human well-being – A systematic review and recommendations. *Ecosystem Services,* 41**,** 101048.

ROE, D., ELLIOTT, J., SANDBROOK, C. & WALPOLE, M. 2013. Linking Biodiversity Conservation and Poverty Alleviation: What, Why and Where? *In:* ROE, D., ELLIOTT, J., SANDBROOK, C. & WALPOLE, M. (eds.) *Biodiversity Conservation and Poverty Alleviation: Exploring the Evidence for a Link.* Oxford: Wiley-Blackwell.

ROE, D., FANCOURT, M., SANDBROOK, C., SIBANDA, M., GIULIANI, A. & GORDON-MACLEAN, A. 2014. Which components or attributes of biodiversity influence which dimensions of poverty? *Environmental Evidence,* 3**,** 3.

ROSENDO, S., BROWN, K., JOUBERT, A., JIDDAWI, N. & MECHISSO, M. 2011. A clash of values and approaches: A case study of marine protected area planning in Mozambique. *Ocean & Coastal Management - OCEAN COAST MANAGE,* 54**,** 55-65.

SEARY, R. 2019. Chapter 27 - The future of mangrove fishing communities. *In:* CISNEROS-MONTEMAYOR, A. M., CHEUNG, W. W. L. & OTA, Y. (eds.) *Predicting Future Oceans.* Elsevier.

SELIG, E. R., HOLE, D. G., ALLISON, E. H., ARKEMA, K. K., MCKINNON, M. C., CHU, J., DE SHERBININ, A., FISHER, B., GLEW, L., HOLLAND, M. B., INGRAM, J. C., RAO, N. S., RUSSELL, R. B., SREBOTNJAK, T., TEH, L. C. L., TROËNG, S., TURNER, W. R. & ZVOLEFF, A. 2019. Mapping global human dependence on marine ecosystems. *Conservation Letters,* 12**,** e12617.

SFP 2020. *Impacts of COVID-19 in Target 75 Fisheries. Summary of preliminary findings.,* Honolulu, Sustainable Fisheries Partnership Foundation. https://www.undp.org/content/dam/undp/library/covid19/Indonesia%20-%20GMC_Impacts_of_COVID_19_final.pdf.

SMALLHORN-WEST, P. F., WEEKS, R., GURNEY, G. & PRESSEY, R. L. 2020. Ecological and socioeconomic impacts of marine protected areas in the South Pacific: assessing the evidence base. *Biodiversity and Conservation,* 29**,** 349-380.

UN 2015. *Global Sustainable Development Report 2015*, Department of Econimc and Social Affairs.

UNESCO 2017. *The Large Marine Ecsystem Approach. An engine for achieving SDG 14*, LME:LEARN Project, United Nations Educational, Scientific and Cultural Organisation.

WAGNER, C. 2012. *Coastal Resource Use, Management, and Marine Protected Areas in the Philippines.* University of Washington.

WORLD BANK 2019. *Climate Change and Marine Fisheries in Africa: Assessing Vulnerability and Strengthening Adaptation Capacity,* Washington, World Bank.

WORLD BANK AND UNITED NATIONS DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS 2017. *The Potential of the Blue Economy: Increasing Long-term Benefits of the Sustainable Use of Marine Resources for Small Island Developing States and Coastal Least Developed Countries,* Washington DC, World Bank

WWF 2020. Destruction of the coastal resources continues to worsen. https://wwf.panda.org/knowledge_hub/where_we_work/east_african_coast/area/index/causes_effects/ Accessed 24/6/2020.

Useful websites

- Global Marine Commodities (GMC) https://globalmarinecommodities.org/en/publications/gmc-project-our-model-and-early-results/
- World Wildlife Fund https://www.worldwildlife.org/initiatives/oceans
- Food and Agriculture Organization http://www.fao.org/state-of-fisheries-aquaculture
- United Nations Development Programme https://www.undp.org/content/undp/en/home/2030-agenda-for-sustainable-development/planet/environment-and-natural-capital/water-and-ocean-governance.html
- World Bank https://www.worldbank.org/en/topic/oceans-fisheries-and-coastal-economies

Suggested citation

Plagerson, S. (2020). *Marine biodiversity and poverty alleviation.* K4D Helpdesk Report 843. Brighton, UK: Institute of Development Studies.

About this report

This report is based on six days of desk-based research. The K4D research helpdesk provides rapid syntheses of a selection of recent relevant literature and international expert thinking in response to specific questions relating to international development. For any enquiries, contact helpdesk@k4d.info.

K4D services are provided by a consortium of leading organisations working in international development, led by the Institute of Development Studies (IDS), with Education Development Trust, Itad, University of Leeds Nuffield Centre for International Health and Development, Liverpool School of Tropical Medicine (LSTM), University of Birmingham International Development Department (IDD) and the University of Manchester Humanitarian and Conflict Response Institute (HCRI).