Assessing the Economic Impact of Protected Area Tourism on Local Economies in Brazil

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Scuba diver in a tropical coral reef / Photo: blue-sea.cz

Executive Summary

Brazil is the most megadiverse country in the world. It is home to one-third of the world's tropical rainforests, 20 percent of the world's freshwater, and has the world's most biodiverse terrestrial, freshwater and marine ecosystems. These assets fall within an extensive system of 3,201 terrestrial protected areas which cover approximately 30 percent of the country's land, and 158 marine protected areas covering 26.82 percent of its oceans and 9,000 km coastline, which hosts 3,000 km of coral reefs and the longest stretch of mangrove forest globally. Brazil thus exceeds its Aichi Target 11 of protecting 10 percent of its coastal and marine areas.

On the World Economic Forum's Travel and Tourism Competitiveness Index Brazil ranked second in the world on natural resources, and its terrestrial and marine protected areas underpin an important travel and tourism economy. In 2018, these sectors generated US$55.8 billion, or 3 percent of the country's GDP, and in 2016, 16.8 million tourists visited 209 national and state parks.

However, tourists visit only a small number of the parks in Brazil's protected area network, and federal and state parks are substantially underfunded. Indeed, to maintain protected areas in Brazil would require budget increases of R$ 540 million for federal protected areas, and R$ 360 million for state parks. Estimated investment costs to consolidate state and federal protected areas are R$ 1.2 billion and R$ 610 million, respectively. Together, such shortfalls severely constrain protected area managers from meeting conservation objectives, and leave conservation areas vulnerable. Brazil's Marine Protected Areas, in particular, face multiple challenges. In addition to environmental degradation, other challenges include poor management and institutional coordination, lack of staff and operational infrastructure, poor decision-making capacity, and weak stakeholder engagement and governance objectives. The challenges facing coastal and marine conservation are pressing, as these areas also contribute to the country's GDP; Brazil's coastal zones are home to 26.6 percent of its people, an estimated 3.5 million of whom directly or indirectly depend on coastal and inland fisheries, and aquaculture.

For these reasons, there is much potential for Brazil's protected areas to improve their performance, further contribute to development, and to maintain the country's rich natural assets. Its protected areas and biodiversity are equally a major tourism asset in an industry which attracts eight billion visitors a year to protected areas, provides one-in-ten jobs globally, and contributes up to 10 percent of global GDP.

This unrealized potential mirrors that of many countries in which governments value protected areas in conservation strategies but overlook them in economic development plans. This oversight is of concern, as countries, globally, struggle to contain unprecedented biodiversity losses while trying to address development setbacks inflicted by COVID-19. In Brazil, between March and November 2020, the tourism sector lost approximately R$ 228 billion and shed nearly 500,000 formal jobs, affecting 13.5 percent of the country's workforce. Awareness is growing that these two challenges – precipitous declines in global biodiversity, and the imperative for a green recovery from the pandemic – must be addressed as one: neither problem can be solved without solving the other.

Additionally, these challenges must be met in the vast and often isolated rural regions in which many of Brazil's protected areas are found.

Through the economic benefits it generates, protected area tourism is often one of the few means through which governments can support livelihoods, stimulate economic development, and cultivate local community support for conservation. In this context, the importance of protected area tourism cannot be overstated, because of its potential to address losses to economies, promote development, and support biodiversity conservation.

Despite this context, however, governments often lack evidence for the economic impacts of protected area tourism on local and national economies, and fail to see the development gains which result from public funding of protected areas. Thus, **the objective of this study is to make the economic case for public investment in protected areas by estimating tourism's direct and indirect benefits to local economies around protected areas in Brazil.**

How was the study done?

The study site is the Abrolhos Marine National Park, which was established in 1983, covers over 91,000 hectares, and is roughly 67 kilometers off the southern coast of Bahia State, with its populated coastline, the Costa das Baleias (or Whale Coast). The region hosts major townships south of and including the city of Prado, namely Alcobaça, Caravelas and Teixeira de Freitas. The Park includes the five volcanic islands in the Abrolhos Archipelago, the largest whale nursery in the South Atlantic Ocean.

The tourism driven by the park requires hotels, guesthouses, and tourist businesses along the coast, and data were gathered, over a single season, through surveys of tourists, lodges and resorts, local businesses, and local households. The surveys gathered information on production, income, and expenditures, and the locations of transactions (i.e., whether inside or outside the local economy). These data were used to quantify and trace the economic pathways through which protected area tourism stimulates local economies. A general equilibrium model for local economy-wide impact evaluation (LEWIE) was used to describe direct and indirect impacts of tourism by integrating models of actors (businesses and households) within a local economy, based on the survey data. Direct impacts refer to monies spent directly by tourists in protected areas; indirect impacts describe the knock-on effects of this spending, via production linkages which grow to support expanding tourism markets, and consumption linkages, through which wages and profits trigger fresh rounds of spending which ripple through local economies (Figure ES-1).

What did the study find

The study affirms that investment in protected areas pays off, and is good for biodiversity conservation and the development of the local economy. The study found that the economic return per Real of government spending in protected areas is significantly greater than 1: economic returns of 6.2 Reais per Real of government spending are estimated for Abrolhos Marine National Park. Findings also show that spending by tourists visiting Abrolhos Marine National Park and the Whale Coast generates significant income multipliers for households in the local economy (Figure ES-2).

The multiplier is defined as the change in local household incomes per Real of tourist spending at local retail stores, and on local services and transport. The study estimates that a Real spent by visitors at Abrolhos raises the income of households around the park by 1.74 Reais, a multiplier that is positive, and large, and reflects the penetration of tourist spending into local economies, creating new income in communities around the park. This multiplier benefits households directly involved in the tourism sector and those not, and both poor and non-poor households, and is striking, given that hotels and other tourism businesses in the region purchase many of their inputs outside the local economy.

FIGURE ES-1. Economic Impact Pathways of Protected Area Tourism

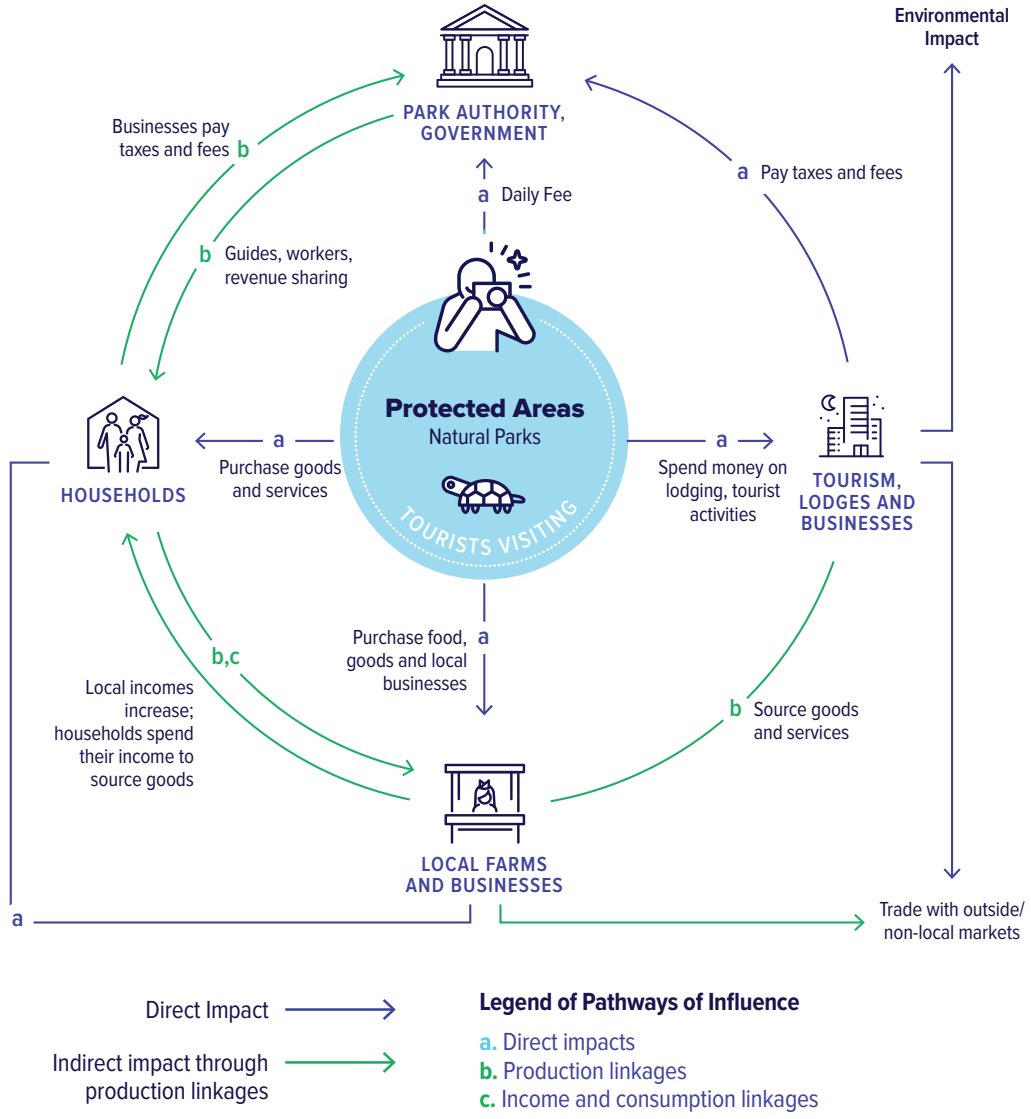


FIGURE ES-2. Real-income multipliers for an additional Real or US$ of tourist spending

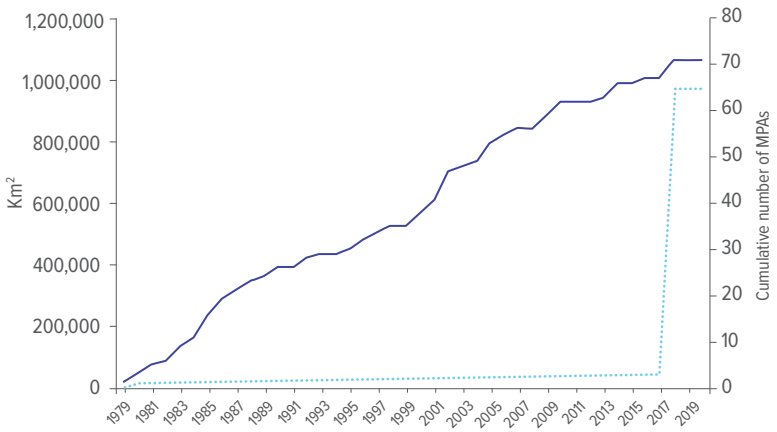


FIGURE ES-3. Distribution of Multiplier Across Poor and Non-Poor Populations

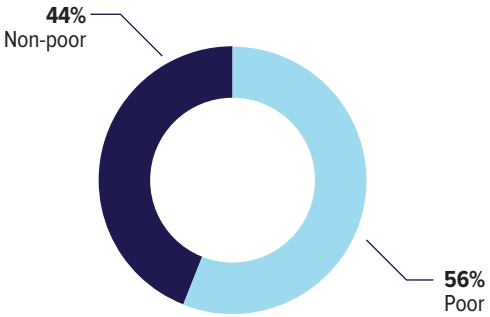


Figure ES-3 shows how income from tourist spending benefits poor and non-poor households in the local economy. Most benefits accrue to non-poor households which are better placed to increase production in response to growing demand generated through tourism. For each Real spent by a tourist in the local economy, an additional R$ 1.44 of income is generated for non-poor households, while poor households receive R$ 0.30.

However, despite the large portion of the multiplier going to non-poor households, the economic contribution to local communities appears to benefit poor residents more than non-poor residents, and normalizing multiplier shares by these populations, as shown in figure ES-3, shows that the multiplier share *per resident* is higher for poor residents than for non-poor.

Tourism also generates a significant number of jobs, directly and indirectly. The study estimates that tourism to the Abrolhos Marine National Park adds 300 jobs to the local economy, while tourism to the Whale Coast as a whole supports 46,800 jobs, employing approximately 12.1 percent of the local population.

The study also flags losses inflicted on the sector by the COVID-19 pandemic i.e., shocks which produce negative income multipliers in local economies in the same way that tourism produces positive multiplier effects. In Brazil, the pandemic has caused substantial losses in tourism, including a shutdown of Abrolhos Marine National Park. Tourism losses linked to Park closure in an average month reduced local real income by R$ 2.75 million (US$0.70 million) – local poor households lose R$ 0.47 million (US$0.12 million) and local non-poor households lose R$ 2.28 million (US$0.58 million); regionally, our simulations show that a complete loss of tourist revenue along the Whale Coast reduces real income (GDP) by R$ 247.5 million (US$62.7 million), with each month without tourism reducing the income of local poor households by R$ 73.3 million (US$18.6 million) and local non-poor households by R$ 357.1 million (US$90.4 million). All production activities suffer, with sales losses ranging from R$ 13.0 million (US$3.3 million) in fishing to R$ 239.6 million (US$60.7 million) in retail businesses. These impacts indicate the support which protected areas will need to recover from these losses, and to realise their potential to assist a green economic recovery.

A man holds fish he caught. Credit: Carlos Eduardo Young

What lessons can policy makers draw from the study?

Protected areas visited by tourists protect biodiversity, develop local economies, and provide jobs for poor and non-poor households, and for those directly involved in the tourism sector, and those not. While roughly 30 percent of its land and 27 percent of its marine and coastal areas are protected, tourists visit a small number of protected area sites overall, and there is thus great potential for Brazil to grow and diversify its tourism sector. However, the primary need is to fund, secure, and manage protected areas and to share the benefits described in this report with local communities. These approaches – grow the tourism sector, secure conservation assets, and share benefits – form the three pillars of a strategy to jointly address biodiversity loss, development challenges, and a green, post-COVID recovery, and as the most mega-diverse country in the world, Brazil is well-placed to pursue this development path.

1. PROTECT THE NATURAL ASSET BASE

To promote biodiversity conservation and secure the natural assets which attract visitors, it is critical that protected areas be conserved, restored to reverse degradation, and well-managed. To address the poor performance of Brazil's protected areas, the report identifies the following actions: increase public investment in protected area management and use emerging, conservation-specific financial instruments; consolidate the expanding Marine Protected Area system through improved connectivity and integration; build capacity of protected area managers; engage broadly with stakeholders; regularly assess the effects of tourist spending at the National level.

2. DIVERSIFY AND GROW THE TOURISM SECTOR

Brazil's tourism sector needs to expand beyond the small number of parks currently visited by tourists, and this will require policies, programs, and investments that transcend protected areas to address broader challenges faced by the tourism sector. Brazil's protected areas need to be assessed, and ranked by their tourism potential to select priority sites for development and diversification. A strong commercial services/concessions program will be needed to develop new sites, attract tourists, and generate revenue, and Brazil needs to build on the promising start made by ICMBio, the Semia Institute BNDES and other partners.

3. SHARE BENEFITS WITH LOCAL COMMUNITIES

Development of local communities around protected areas is a goal in-and-of itself, but at present Brazil has no formal mechanisms to share protected area benefits with these communities, and such mechanisms should be put in place, and informed by international best practices. Benefit sharing advances development goals and incentivizes local communities to resist encroachment, poaching, and other activities which degrade protected areas. Thus, benefit sharing which is equitable, transparent, and sustainable is critical to biodiversity conservation. While the income multiplier for local households at Abrolhos is significant, Governments can enhance the impacts of protected area tourism through their policies and programs to further benefit local economies; these opportunities, such as strengthening linkages between tourism value chains and stakeholders in the local economy, upskilling women, and supporting local producers need to be explored.

In conclusion, and in the wake of the COVID-19 pandemic, Brazil needs to address losses to its protected area tourism sector in order to regain regional and park-specific benefits, and to secure the conservation status of its significant natural assets. To do this, Brazil should champion sustainable and inclusive tourism in protected areas. It should increase public and private investment in protected areas on a growing evidential basis for attractive and far-reaching returns which support both conservation and sustainable, green/blue development strategies. Finally, in response to a pandemic which has caused development setbacks, Brazil's protected area tourism and Blue Economy sectors should enact mechanisms to distribute its benefits fairly in the face of poverty and losses incurred by local communities.

1

Introduction

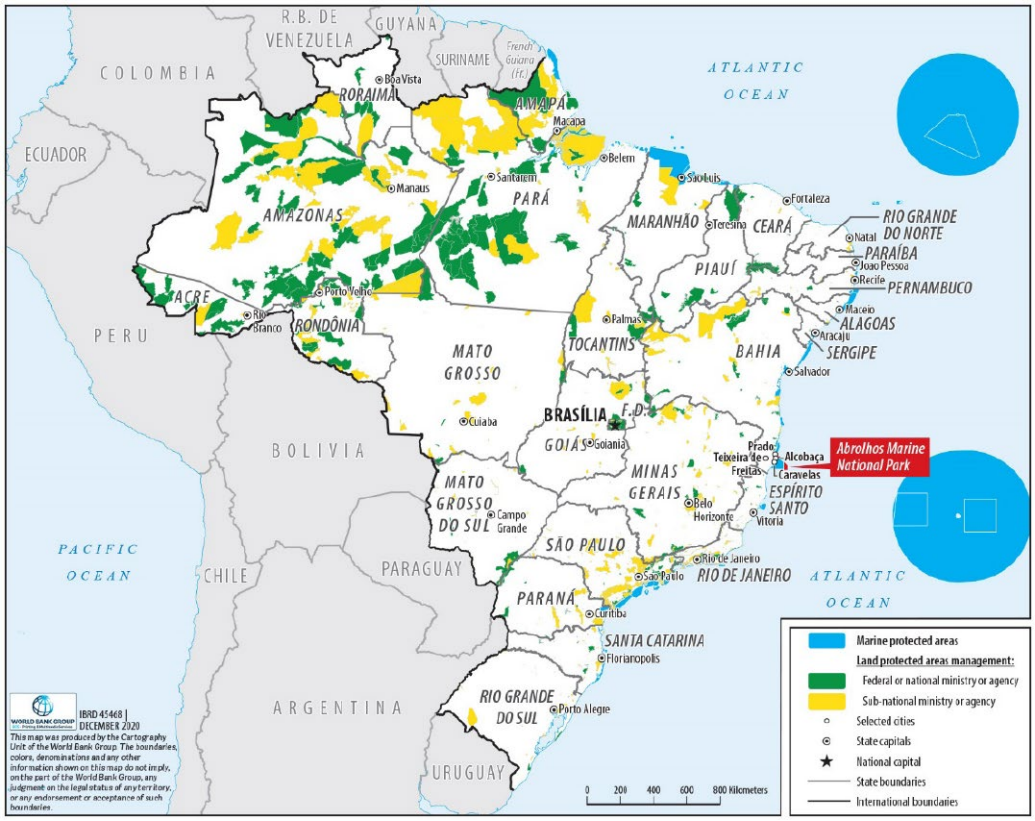
Aerial image of Rio do Fogo, Natal, Rio Grande do Norte / Image: Bernardo Emanuelle / Photo: XXX

Brazil is the most megadiverse country in the world (Butler, 2019; CBD, n.d.). It is home to one-third of the world's tropical rainforests, 20 percent of the world's freshwater supply, and has the world's most biodiverse terrestrial, freshwater and marine ecosystems (Forzza et al., 2012) 989 species; 18,932 endemic. It has an extensive system of protected areas to preserve this biodiversity – 3,201 terrestrial protected areas covering 30.28 percent (2,582,478 km2) of its land area and 158 marine protected areas which cover 26.82 percent (985,042 km[2)] of marine and coastal areas (UNEP-WCMC, 2020); see Map 1. Brazil thus exceeds its Aichi Target 11 of protecting 10 percent of its coastal and marine areas[1].

Brazil's extensive coastline (~9,000 km) provides a wide range of ecological services. It provides habitat for an immense variety of wildlife, including endemic species, and has 3,000 km of coral reefs and 12 percent, the longest continuous stretch, of the world's mangroves, which are important nursery sites, biological filters, and carbon sinks (Abreu, 2015). Coastal and marine ecosystems are also important for flood prevention, storm protection, and recycling of nutrients and polluting substances (Prates et al., 2012).

Coastal and marine areas also contribute to the country's GDP. The coastal zones are home to 50.7 million inhabitants, or 26.6 percent of the national population (IBGE, 2013).[2] Moreover, an estimated 3.5 million people directly or indirectly depend on coastal and inland fisheries and aquaculture (FAO, 2019). Marine fisheries were responsible for 39% of total catch in 2016 (1.02 million tons), almost the same mass as inland aquaculture (1.01 million tons) (Pereira et al., 2018). Brazil's economically important travel and tourism sector similarly depends on marine and terrestrial protected areas. In 2018, Brazil's travel and tourism sector generated US$55.8 billion, or 3 percent of the country's GDP. On

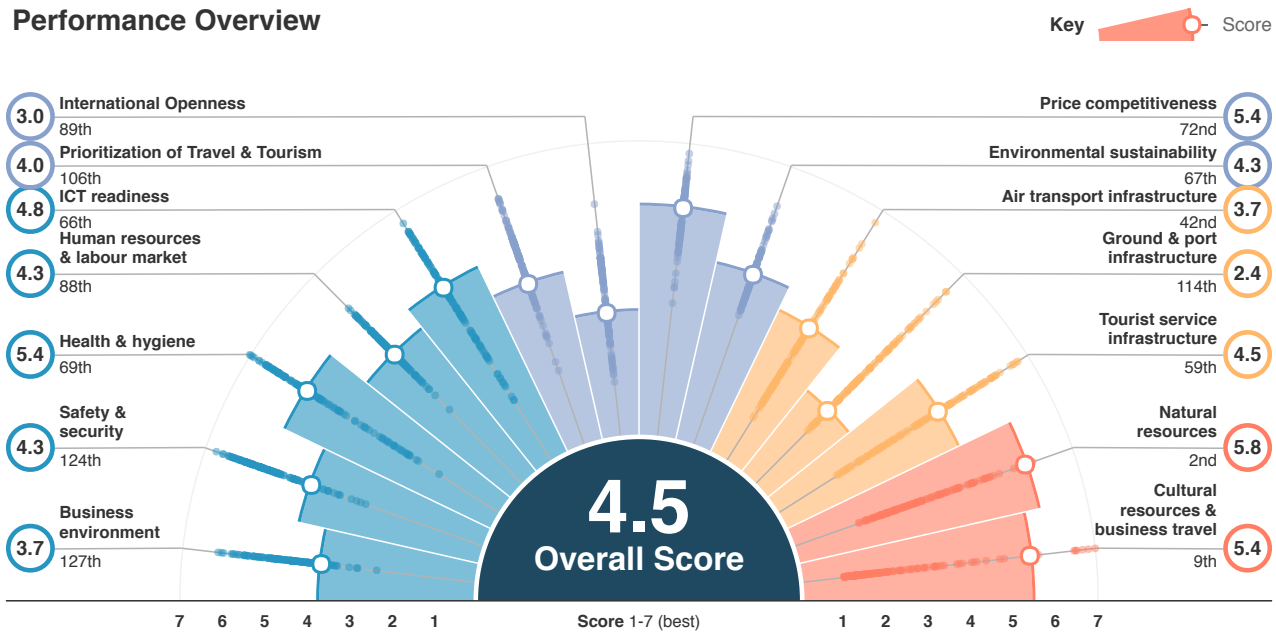
MAP 1. Brazil's Protected Area Network



1 In 2018, with the support of the Protected Marine and Coastal Areas (GEF Mar) project, four new federal conservation units (UCs) were created, increasing marine protected area coverage from 1.5 percent to 26.3 percent. GEF Mar is a project coordinated by the Brazilian Ministry of the Environment, financed by GEF through the World Bank with FUNBIO as its financial manager.

2 Most of the Portuguese settlements were established along the coasts, where they established sugar cane and other plantations. This region also received the majority of Africans forced into slavery, and the interaction between European, African, and native American populations resulted in an extremely rich and diverse culture along the coast.

FIGURE 1. **Brazil Travel & Tourism Competitive Index Score, World Economic Forum (2019)**



the World Economic Forum's Travel and Tourism Competitiveness Index (see Figure 1), Brazil ranked second in the world (behind Mexico) on natural resources and ninth in the world on cultural resources, a testament to Brazil's natural and cultural assets (World Economic Forum, 2019).[3] Rodrigues et al. (2018) estimated that in 2016, 16.8 million tourists visited 209 National (Federal), State Parks, and other types of conservation units.[4]

There are many challenges to the sustainability of marine and coastal resource use in Brazil. Loss of habitat due to the lack of regulations for the use of natural resources, conversion of natural areas for aquaculture and coastal development, and deterioration of aquatic habitat quality mainly due to the damming of rivers[5] are putting pressure on the fragile marine environment (Tedesco et al., 2017). Pollution from aquaculture, particularly the growing shrimp farming industry, likewise threatens mangrove ecosystems and their associated biodiversity. Other pressures affecting Brazil's Exclusive Economic Zone (EEZ) include unsustainable maritime port activities (e.g., unsustainable ballast discharge) and contamination of marine waters through the release of untreated sewage (it is estimated that only 14 to 46 percent of the sewage generated is treated) and solid waste. These anthropogenic pressures are compounded by the impacts of climate change.

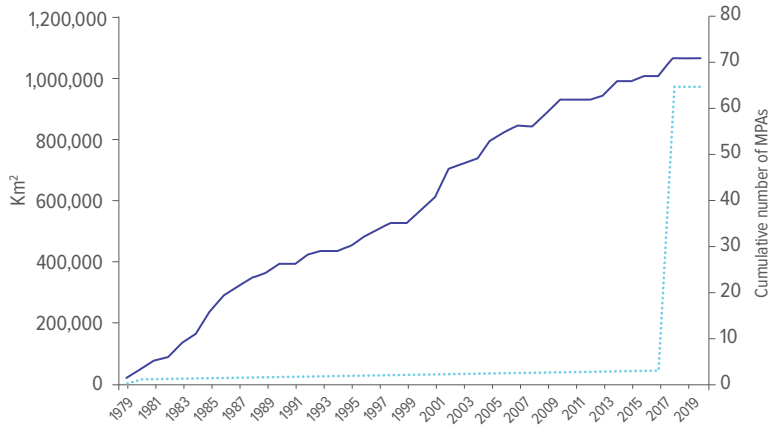
In addition, overfishing, unsustainable fishing practices, and lack of fisheries management are reducing fish stocks and jeopardizing local livelihoods that are dependent on the fisheries sector (Brazil, Ministry of the Environment, 2015). It is estimated that 2.87 percent of fisheries in Brazil are at very high risk, 22.6 percent at high risk and 74.5 percent at moderate risk (Pauly & Zeller, 2017) e.g., China, Myanmar. Also, concerns are raised as to why FAO chose to ignore the well-documented data 'reconstruction' process, which fills the gaps that exist in data reported by countries to FAO. It is being ignored despite its importance for governance and resource conservation being well known. This process and its findings could be used by FAO to encourage countries to improve their data reporting, including retroactive corrections. This is important in view of successive analyses of the status of fisheries resources undertaken by FAO (published in current and past SOFIAs.

3 Over 6.3 million international tourists visited Brazil in 2019. Brazil's domestic tourism, however, is more important economically than international tourism, accounting for an estimated 90 percent of total tourism spending (Lopez, 2020).

4 Rodrigues et al. (2018) highlight that there are 784 Federal and State protected areas not included in the "Parks" category. Therefore, they considered that their study analyzed only 9 percent of Federal and State protected areas in Brazil (Castro, Correa, Costa, Costa, Medeiros & Young. n.d.).

5 Brazil's energy sector is heavily dependent on hydroelectricity produced by some 1,127 small and large-scale hydroelectric power plants spread throughout the national territory (Brazil, Ministry of the Environment, 2015)

FIGURE 2. Legal Establishment of Marine Protected Areas in Brazil



Source: Mills et al. 2020

One hundred fish species are at risk of extinction because of targeted fishing and by-catch related losses (Maretti et al., 2019) Brazil has advanced significantly with the expansion and improvement of its national system of protected areas. Until recently most of the expansion was concentrated in the Amazon region (with useful lessons.

COVID-19 has impacted the tourism sector in Brazil, with reported losses of R$ 228 billion between March and October 2020, during which time the sector generated only 29 percent of its monthly revenue. Employment data show that between March and September 2020 almost five hundred thousand formal jobs were lost in the sector - equivalent to 13.5 percent of the workforce (CNC, 2020). Beyond the economic losses, it has been reported that capacity to monitor illegal fishing during the lockdowns has also been reduced, causing a surge in illegal fishing (Campos Lima, 2020).

In 2018, the Government created the Brazilian Blue Initiative ('Iniciativa Azul do Brasil'), a strategic framework for sustainable development and conservation of marine and coastal resources expressed through national and international commitments, goals, and targets. The strategy was initiated through two projects – the Brazilian Mangroves Project (GEF Mangue) and the Brazilian Coastal and Marine Protected Areas project (GEF MAR) with components to develop sustainable financing mechanisms for protected areas.

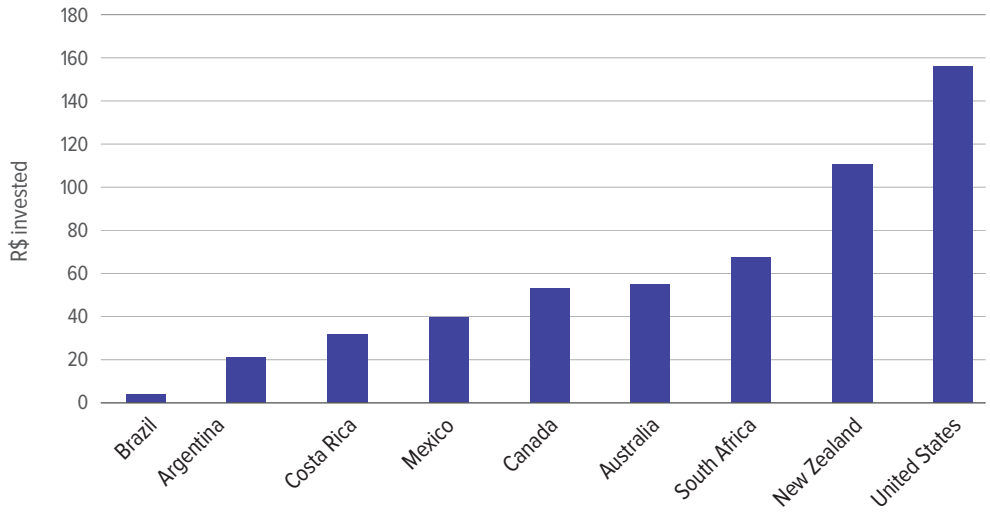
As in other parts of the world, marine and coastal protected areas in Brazil are essential to conserve biodiversity and maintain critical ecosystem services, and to generate jobs and improve livelihoods of many traditional and local communities. The first Brazilian marine protected area, the Atol das Rocas Biological Reserve, was established in 1979. While the number of these areas has steadily increased (see Figure 2), the increase in marine area under protection was modest until 2018, when four large offshore protected areas were declared (Mills et al., 2020).

An assessment of federal protected areas found that about 30 percent of these areas had low management effectiveness due to poor inter-institutional coordination of coastal and ocean governance, poor management of marine protected areas, including lack of staff and resources (operational infrastructure support), lack of capacity to effectively implement decisions, and weak participatory decision making and planning due to the erosion of stakeholder engagement (Gerhardinger et al., 2011). Additionally, only 40 percent of marine protected areas have management plans, and of these, none have monitoring programs linked to their ecological, social or governance objectives (Mills et al. 2020). Also, marine protected areas are based on species data and do not take account of other facets of biodiversity, such as habitat/community diversity, ecosystem services (Fonseca & Venticinque, 2018).

Insufficient and varying funding for protected area management is yet another challenge. ICMBio provides the majority of protected area system financing (SEMEIA, 2014). Adequately maintaining federal protected areas in Brazil would require a budget increase of R$ 540 million (US$136.7 million);[6] at the state level the financial shortfall was R$ 360 million (US$91.1 million) (OECD, 2015). In addition, an estimated R$ 610 million (US$ 154.4 million) in investment would be needed to adequately consolidate federal protected areas (e.g. to put in place the necessary infrastructure), along with some R$ 1.2 billion (US$303.8 million) for state protected areas (OECD, 2015). Figure 3 below shows the investments made by Brazil to maintain its protected area network compared to other countries. The lack of financial resources heavily constrains protected area managers from meeting conservation objectives and from hiring staff (Chiaravalloti et al., 2015). The Marine

6 Throughout this report, US$1 = 3.95 Real (R$; 2019 average).

FIGURE 3. Comparison of investment per hectare of protected areas across countries, 2010 (R$)



Source: Medeiros et al., 2011

Fund, created under GEF MAR, and established to promote long-term financial sustainability for marine and coastal protected areas, is the first of its kind in Brazil, and will partly address the funding gap.

Governments all over the world face competing demands over limited public finances, and often do not prioritize investments in marine protected areas, in part because these investments are seen to generate conservation benefits but not to further development goals. But marine protected areas can provide development opportunities and generate returns on public investments which far exceed the amounts that governments spend. In the United States, in 2017, an annual investment of US$3 billion of public resources in the National Parks System resulted in a contribution to GDP of US$23.4 billion through visitor spending. Similarly, Parks Canada, in 2018, generated a contribution to GDP of US$3.1 billion and tax revenues of almost US$0.4 billion for a public investment of approximately US$1 billion. In the Galapagos Islands, tourism generated US$62.9 million to income on the island and US$113.9 million in mainland Ecuador (Taylor et al., 2003). The Great Barrier Reef in Australia contributes US$6.4 billion to the Australian Economy and provides 64,000 jobs (Deloitte Access Economics, 2017). Moreover, investments in protected areas can generate significant benefits for local economies through job creation and income generation, lifting households out of poverty and providing them with incentives to support conservation. US Parks are estimated to support 329,000 jobs in gateway communities, and Parks Canada 40,469 jobs.

Governments often lack evidence for the economic impacts of protected area tourism on local and national economies, and therefore fail to see the development gains which result from public funding of protected areas. **The objective of this study is to make the economic case for public investment in protected areas by estimating tourism's direct and indirect benefits to local economies around protected areas in Brazil.** Direct benefits include the money tourists spend at lodges and other tourism businesses, and indirect benefits include the money spent by these tourism businesses and those employed in the tourism sector. These estimates of economic impacts can strengthen the economic case for public investment in protected areas, much like public investments in roads and other infrastructure and assets. The study also estimates benefits to local communities from poor and non-poor households in order to understand how protected area tourism may provide incentives to communities to support conservation, and how protected areas can improve household incomes. Moreover, this study builds on two previous studies which have estimated the economic impacts of protected areas in Brazil (see Box 1).

Box 1. Previous studies of the impacts of tourism in protected areas

There are two notable studies: Beraldo Souza et al. (2019) and Young & Alvarenga Junior (2017).

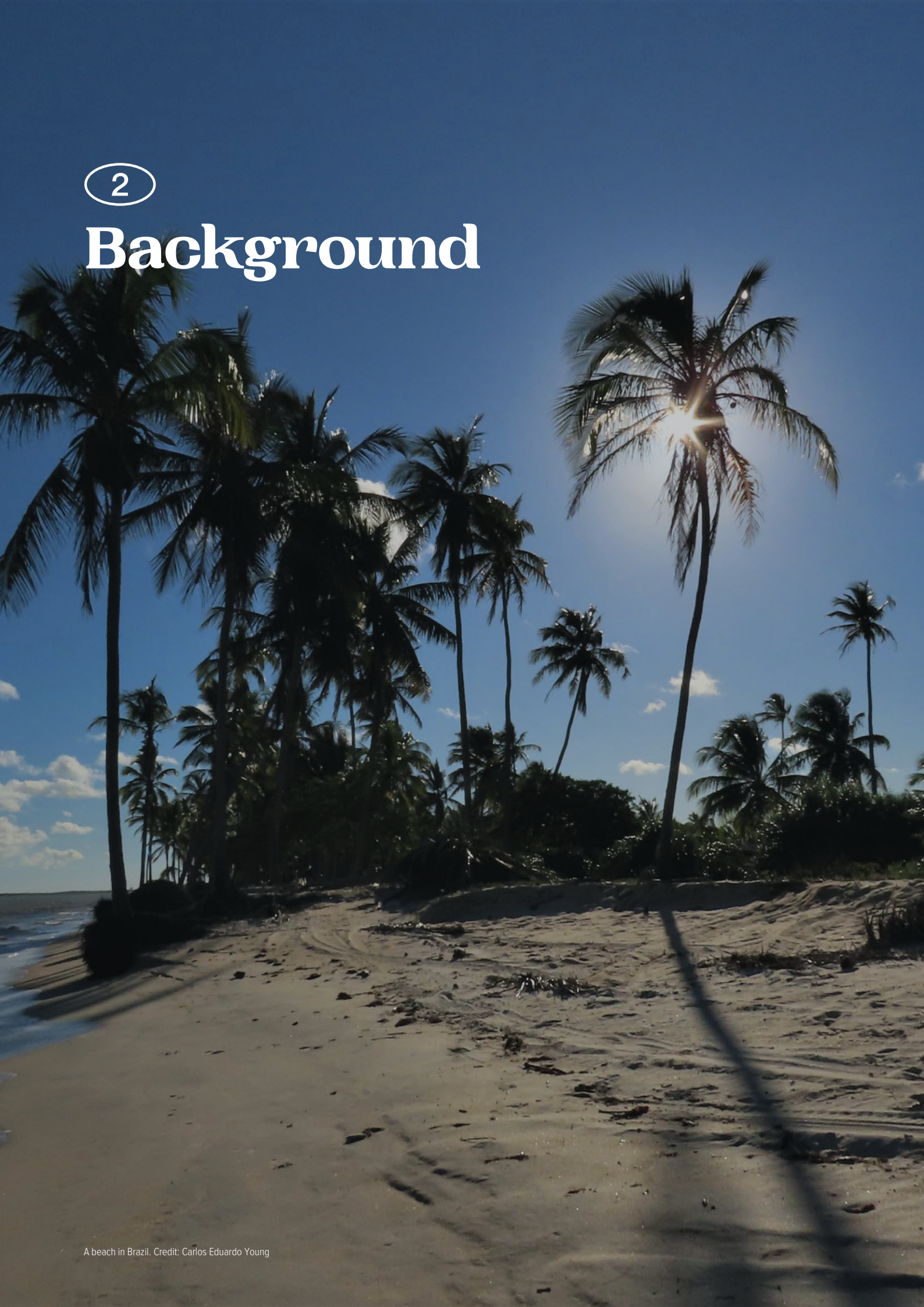
Beraldo Souza et al. (2019) estimated that tourism around federal protected areas in Brazil generated more than US$1.3 billion in total sales, US$342 million in personal income, US$473 million in value added to the GDP, and created 43,602 jobs nationally. The authors estimated that a dollar invested in the terrestrial protected area system produced US$7 in economic benefits. The methodology employed by the authors was based on the Money Generation Model 2 (previously used by the US NPS), and used an assumed value for the income multiplier, and not an estimated value. Moreover, the study used a higher value for the multiplier than those used in previous studies.

Young & Alvarenga Junior (2017) estimated the economic impacts of a concession held by Cataratas do Iguaçu in the Iguaçu National Park. They found that the concession supported output valued at between R$ 40.1 and R$ 46.3 million per year, most of which was retained locally -- 69% in municipalities surrounding the Park, and 77% in the State of Paraná. The amount of taxes collected was estimated between R$ 17.8 and $ 19.0 million per year. In addition, the company transferred R$ 14.3 million to ICMBio for granting the concession, corresponding to 25% of the revenues received in 2015 for visitation in Federal protected areas. The activities of other concessioners were not considered, nor were tourism's effects on other sectors of the economy such as hotel, food, transportation, and other services to tourists. Therefore, the figures in the study considerably underestimate the economic effects of tourism in the park.

People diving in a natural pool on the beach of Taipu de Fora, in Barra Grande district, Marau / Image: Joa Souza

2

Background



A beach in Brazil. Credit: Carlos Eduardo Young

2.1 POLICY AND INSTITUTIONAL CONTEXT

The government of Brazil has established policies on coastal and marine management to tackle the rising concerns of environmental degradation and the economic relevance of marine resources. The first of these was Law N. 6,938/1981 or the National Environmental Policy (PNMA) to preserve and restore environmental quality. This law established the National Environmental System (SISNAMA), composed of federal, state, and municipal organizations responsible for the protection and improvement of environmental quality. The Federal Constitution, enacted in 1988, conferred on the Coastal Zone the status of "National Heritage"; thus, the use of coastal areas, including natural resources, must preserve the environment (Abreu, 2015).

In 2000, the Government of Brazil passed Law Nº. 9,985/2000 (SNUC Law) regulated by Decree Nº. 4,340/2002, which established a National System of Protected Areas (SNUC), or National System of Conservation Units. SNUC integrates protected areas established by federal, state, and municipal governments, and those proposed by private stakeholders into one national system. Federal and state protected areas account for 76 percent of the total area under protection (UNEP-WCMC, 2020). SNUC is complemented by 'other effective area-based conservation measures' such as indigenous lands (referred to as *latu sensu* protected areas) *and quilombola*[7] territories under the Law for the Protection of Native Vegetation (Forest Code Law 12.651/2012).

The National Commission on Biodiversity (CONABIO), in line with CBD targets, has approved the national goal of 10 percent of marine and coastal zones in protected areas under any category, of which at least one percent is required to be under strict biological protection status and/or no-fishing zones (CONABIO Resolution 3 of 2006). While there are 12 categories of protected areas in the national system, that vary based on primary objectives (e.g. sustainable use or strict conservation) and governance structure or management regimes, they can be divided into two broad groups: (i) "Strict Protection" (i.e. no-take), in which only specific non-extractive activities are allowed (e.g. National Parks, Biological Reserves and Ecological stations) and (ii) "Sustainable Resource Use" in which some extractive activities are allowed and regulated, as long as they maintain conservation and cultural objectives. Extractive Reserves that serve local needs while conserving biodiversity fall into the sustainable use group, as do environmental protection areas, national and state municipal forests, sustainable development reserves, fauna reserves, private natural heritage reserves, among others. Pereira et al. (2018) estimated the output of artisanal fishing from Brazilian "Marine Extractive Reserves" (MERs) to be between 14,015 and 34,006 tons/year, producing an annual income of between R$ 37.1 – 86.6 million. Most of the protected areas lie in the sustainable use category.

The Government agencies which create and maintain federal protected areas are the Ministry of Environment (MMA) and its executive agency, the Chico Mendes Institute for Biodiversity Conservation (ICMBio). These agencies have state and municipal counterparts responsible for state and municipal protected areas. In addition, these arms of government work with the Brazilian Navy to protect and sustainably manage Brazil's EEZ. Civil society and NGOs play a complementary role to establish and manage

Box 2. Marine protected area-related terms

Marine Protected Area (MPA) - any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment (IUCN, 1999).

Exclusive Economic Zone (EEZ) is an area of the sea in which a sovereign state has special rights to use and explore marine resources, including energy production from water and wind (prescribed by the 1982 United Nations Convention on the Law of the Sea). Brazil's EEZ includes areas around the Fernando de Noronha Islands, Saint Peter and Saint Paul Archipelago, and the Trindade and Martim Vaz Islands. It is called the "Blue Amazon".

Extractive Reserves (ERs) are a category of protected areas that explicitly aims to safeguard the livelihoods and cultures of traditional populations, and to conserve natural resources and biodiversity. **Marine Extractive Reserves (MERs)** are government-supported efforts to protect the common property resources upon which traditional small-scale fishers depend. MERs allow traditional extractive practices by local communities, such as artisanal fishing.

No-Take Marine Protected Areas – areas in which fishing and mining are prohibited.

Brazilian National System of Protected Areas - The legal framework for protected areas in Brazil created in 2000 with the establishment of the National System of Protected Areas (SNUC) by Law No. 9985/2000.

7 A quilombola is an Afro-Brazilian resident of quilombo settlements first established by escaped slaves in Brazil. They are the descendants of Afro-Brazilian slaves who escaped from slave plantations that existed in Brazil until abolition in 1888.

protected areas and support local communities living around them. The SNUC Law requires that decisions regarding protected areas are overseen by management committees composed of government officials, civil society, and the private sector.

The SNUC Law requires all parks to have specific master management plans which outlines possible uses or activities for different park areas (pristine, extensive use, intensive use, recovery). These plans are used to determine which commercial activities (for example, food and beverage, extreme sports, ecotourism) are allowed in specific areas.

The SNUC Law does not regulate commercial activities in parks, however. Nor does it provide for concessioning, other than to invoke separate statutes i.e. the general concession law (Law 8,987) used for all sectors of government and the economy, and Law 13,668, which authorizes the use of this law in protected areas. The three most common levels of contracts permitted under the law are: (i) Concessions: used for large, complex projects with multiple services in one park, and which can authorize concessions; (ii) Permissions: used for smaller projects, typically a single service, under which structures may be assigned to a concessioner, who may be expected to maintain them, but no construction is authorized; and (iii) Authorizations – a simple permit to operate a service such as guiding, catering or transportation. Additional contract regimes include partnerships with not-for-profit organizations (Law 13.019/2014) and concessions exclusively based on government payments (Law 11.079/2004). Concession tenders are prepared by ICMBio but selection (evaluation and award) is conducted by the Brazilian Procurement Authority and contracts are managed by ICMBio.

ICMBio is developing public-private tourism partnerships in protected areas. Currently, there are 11 major concession contracts, 5 of which are at Iguacu. Franchise fees to the government were R$ 15.9M in 2019 (based on 11 contracts). The SNUC Law requires that 25-50 percent of concession revenues come back to the budget of the protected area used by the concessioner; however, these franchise fees go directly into the National Treasury, and are only returned through appropriations.

Similarly, legislation (Law 9985/2000, Art. 35.) on the use of park visitor fees includes using benefits toward land tenure regularization of conservation areas but does not establish formal rules for sharing park fees and concession revenues with communities adjacent to protected zones. However, there are other mechanisms to benefit local populations. The most important is the Ecological ICMS (*imposto sobre circulação de mercadorias e serviços*), a tax redistribution system in some states which increases transfers to municipal governments with protected areas in their territory or other environmental performance criteria. Castro et al. (2019) and Young & Medeiros (2018) show that municipal governments tend to react positively to Ecological ICMS legislation by expanding protected areas and the budgets allocated to environmental management. This, however, does not establish a direct mechanism for communities to benefit from tourism in protected areas.

The number of visitors to Brazilian protected areas was steadily increasing before the COVID-19 pandemic. Between 2012 and 2018, ICMBio recorded significant increases in visitors to Federal protected areas (Figure 4).

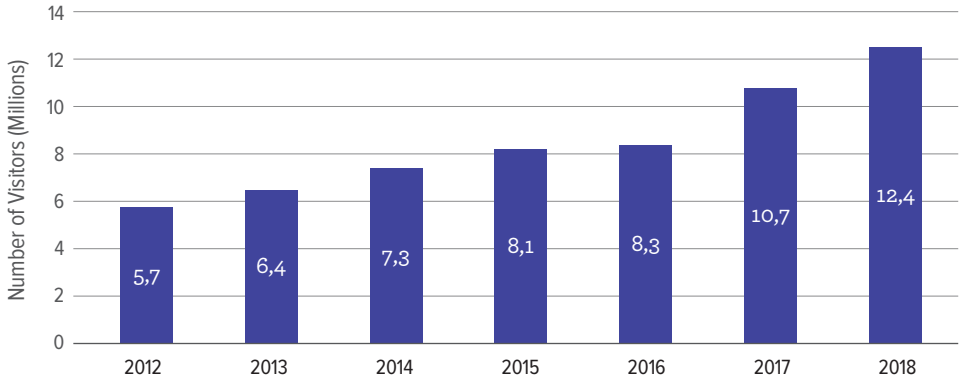
2.2 Study Site

The study site is the Abrolhos Marine National Park, and its populated coastline which runs along the southern tip of the Brazilian state of Bahia, known as the Costa das Baleias (or Whale Coast). This region includes major townships south of and including the city of Prado, namely Alcobaça, Caravelas and Teixeira de Freitas (see Map 2).

Abrolhos Marine National Park covers over 91,000 hectares and is located roughly 67 kilometers off the southern coast of Bahia State. It was established in 1983 and covers the five volcanic islands in the Abrolhos Archipelago. The park is part of the Abrolhos reef complex, the largest known reef in the South Atlantic (RAMSAR, 2012). The largest of the five islands, Santa Barbara Island, is outside the confines of the park and used as a military facility. The

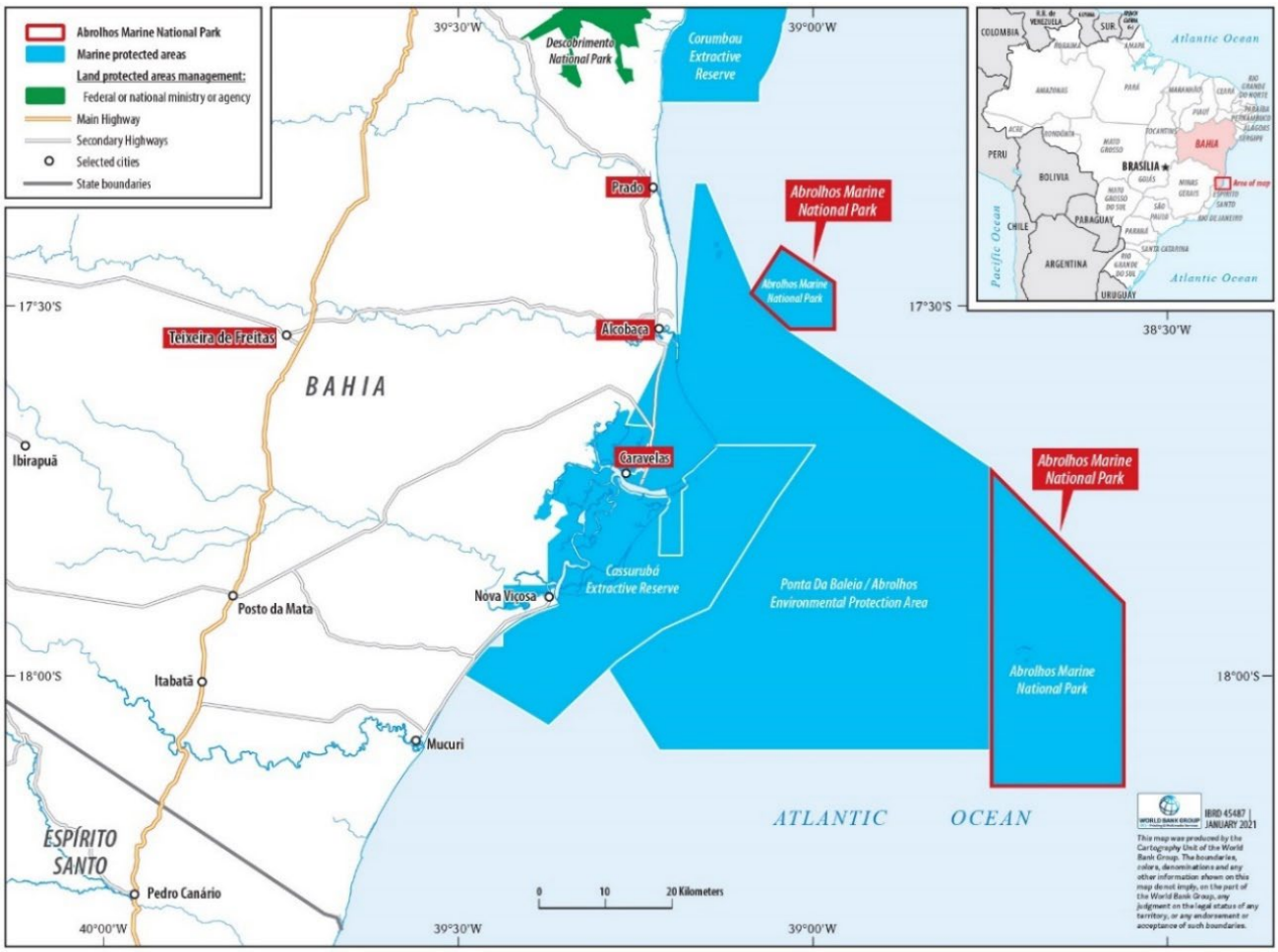
other islands in the archipelago are uninhabited. Presently, only one of the five islands, Siriba, is open to visitors, and can only be reached by boats, which are mainly launched from the township of Caravelas. The Park is home to a rich diversity of marine species and provides important nurseries for endangered species such as the humpback whale and green sea turtles. The Abrolhos archipelago is the largest whale nursery in the South Atlantic (Agencia EFE,

FIGURE 4. Visitors to Federal Protected Areas (Millions), 2012–2018



Source: ICMBio (2019)

MAP 2. Abrolhos Marine National Park and surrounding towns that are a part of the local economy



Box 3. What Is the Local Economy?

For any local economy impact evaluation, one of the first questions to ask is "What is the local economy?" A local economy could be a village, a collection of villages, a town, region, or even a country. The wider the geographic net, the more economic activity and economic benefits will likely be captured, and how the "local economy" is defined depends on the goals of the study. To be effective, conservation policies that create marine protected areas rely on neighboring communities to act as stewards of biodiversity, and these communities need to benefit—including economically—from preserving wildlife and fisheries. For our study, the local economy is composed of Costa das Baleias (or Whale Coast), which includes the city of Prado and the townships of Alcobaça, Caravelas and Teixeira de Freitas.

2018). The park is perhaps best known for its unique mushroom-shaped corals, which rise upwards of six meters off the sea floor and balloon into a 50-meter diameter cap. The Archipelago harbors what may be the highest known marine biodiversity in the south Atlantic, and are a refuge which maintains healthy fish stocks in nearby waters. In addition to providing a refuge for a wide variety of species, the marine area supports the livelihoods of an estimated 20,000 fisherfolk whose main source of income is from small-scale fishing.

At the same time, with a large population of commercially valuable fish in the surrounding waters, overfishing by local and commercial fisherfolk has become an issue. The coastal region is also under threat from civil construction for infrastructure, burgeoning "summer houses", and oil extraction.

Regional tourism, a fraction of which can be attributed to the presence of Abrolhos Marine National Park, fuels hotels, guesthouses, and tourist businesses along the coast. These, in turn, provide employment for the local community. Market linkages transmit the economic impacts of tourism through the coastal economy, creating local income multipliers while stimulating trade with other parts of the region and country. The local economic impacts of international and domestic visitors to the southern region of Bahia are captured through both direct and the indirect economic linkages.

This study focuses on the impacts of tourism around a single site in Brazil during a single season, and is not generalizable to all protected areas. Caution should be taken in applying recommendations from this study to other parks and protected areas; and differences, for example, in domestic and international tourist levels, infrastructure, accessibility, natural capital, and type of IUCN protection category should be considered. However, the study uses a methodology to assess the economic impact of protected areas on the local economy, and this approach may be replicated in other protected areas, and eventually the country.

Fishing boats on the Caravelas River in the city of Caravelas, south of Bahiaa / Photo: Joa Souza

2.3 Government Expenditures

Table 1 below summarizes Government of Brazil expenditures for 2019 on Abrolhos Marine National Park. Over 60 percent of expenditures or US$164,075 went to salaries and staff costs, followed by ~20 percent, or US$114,027 on administration and transportation. The total expenditures (wage and non-wage) for 2019 were R$ 1,822,420 (US$461,372).

Table 1. Government of Brazil expenditures on Abrolhos Marine National Park in 2019

	No. of workers	Annual costs (R$)	Annual costs (US$)	Classification
1. Staff Costs (wages)				
Outsourced Employees				
Hostess	6	327,937.32	83,022.11	Wage
Ship Commander	2	163,216.32	41,320.59	Wage
Deck Manager	1	42,361.92	10,724.54	Wage
Watchmen	8	80,783.28	20,451.46	Wage
General Helper	1	33,796.44	8,556.06	Wage
Subtotal	**18**	**648,095.28**	**164,074.75**	
Employees				
Government Employees	3	480,000.00	121,518.99	Wage
Researchers (GER-MAR Program)	24	84,000.00	21,265.82	Wage
Subtotal	**27**	**564,000.00**	**142,784.81**	
2. Administration costs (non-wages)				
Electricity		25,217.05	6,384.06	Non-Wage
Water treatment		20,034.61	5,072.05	Non-Wage
Water and Gas		21,272.16	5,385.36	Non-Wage
Phone Service		237.27	60.07	Non-Wage
Transportation		383,649.13	97,126.36	Non-Wage
Subtotal		**450,410.22**	**114,027.90**	
3. Equipment and Materials (non-wages)				
Office Supplies		11,813.01	2,990.64	Non-Wage
Subtotal		**11,813.01**	**2,990.64**	
4. Environmental / management Programs (wages and non-wages) GEF-MAR Program				
Legal Staff Services (maintenance, advertising material, transportation, uniform)		26,672.80	6,752.61	Non-Wage
Nature Staff Services: Maintenance, residential painter, archivist, cook, watchmen, performer)		58,658.20	14,850.18	Non-Wage
Materials and Equipment (construction material, PPE, car equipment)		23,739.95	6,010.11	Non-Wage
Meal-Tickets (market)		22,680.98	5,742.02	Wage
Meal-Tickets (restaurant)		4,350.00	1,101.27	Wage
Fuel-Tickets		12,000.00	3,037.97	Wage
Subtotal		**148,101.93**	**37,494.16**	
Total Wage Expenditures		**1,251,126.26**	**316,740.83**	
Total Non-Wage Expenditures		**571,294.18**	**144,631.44**	
Total Expenditures		**1,822,420.44**	**461,372.26**	

3

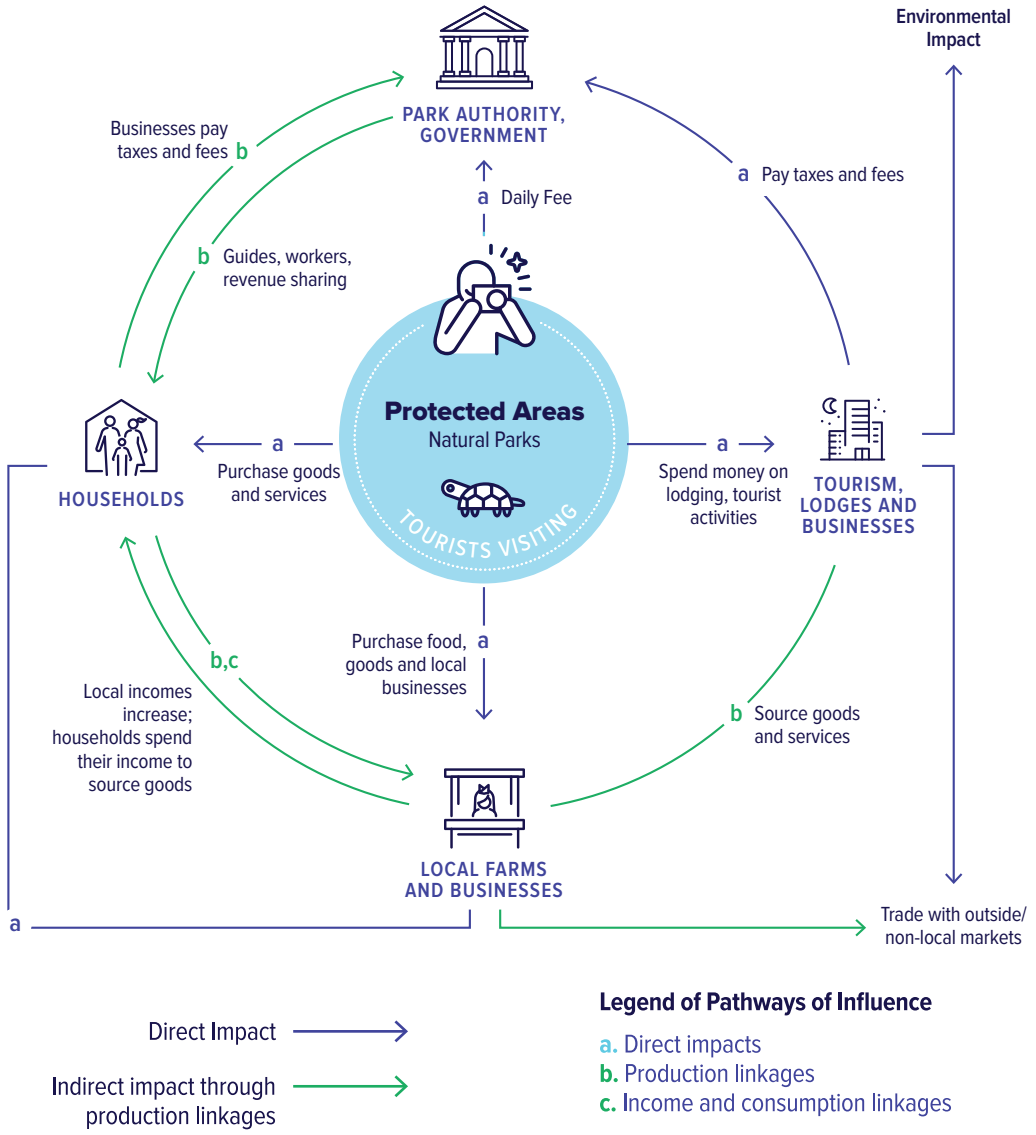
Methodology

A tourist takes photos of a whale's tail on Garopaba beach, Santa Catarina. Photo: A. M. Teixeira

3.1 Avenues for Economic Impacts of Protected Areas

Tourism in protected areas can impact local economies through direct (shown by **arrows a** in Figure 5) and indirect channels. Indirect channels can, in turn, be broadly classified into: production linkages (shown by **arrows b** in Figure 5) and income and consumption linkages (shown by **arrows c** in Figure 5).

Figure 5. Economic pathways



3.1.1 Direct impacts

Marine protected areas attract tourists and trigger spending on tourism services. Tourists spend money to visit Abrolhos Marine National Park and on various tourism activities in the park and along the coast (accommodation, restaurants, diving, surfing, adventure tours, etc.) which support local businesses. Tourists also pay fees and taxes which increase revenues for the government, some of which remain in the local economy. To visit Abrolhos Marine National Park, the daily fee is R$ 46 (US$11.6) for Brazilians and R$ 93 (US$23.5) for foreigners.[8] As noted, these fees go entirely to the federal government. In addition, boat operators, hotels, and restaurants pay a services tax (Imposto sobre Serviços – ISS), which is defined and charged by local municipal governments. Revenues from services taxes remain in the local economy. Taxes on goods (fuel, food, souvenirs and other marketed goods), on the other hand, are imposed as per the Tax on Circulation of Goods and Services (ICMS), which is defined and collected by the State of Bahia. Similarly, formal sales of fish are taxed according to the State ICMS.

A survey of tourists, together with the marine protected area's effect on the number and types of tourists, make it possible to estimate these direct impacts. A tourism impact analysis based only on tourist expenditures would stop here, because it would only consider the amount of money tourists spend on lodging and meals, and not the additional rounds of income this spending creates.

However, marine protected areas also influence local economies by affecting resource extraction—in the case of Brazil's no-take marine protected areas, through restrictions on fishing. By regulating these activities, marine protected areas may have an adverse effect on incomes of households that otherwise would traditionally fish. On the other hand, promoting the recovery of over-exploited common property resources (fish stocks) can lead to population recovery, increased catches, and better prospects for sustainable use. The overall direct impact on income from fisheries management on incomes is therefore ambiguous. While the impacts of Marine Extractive Reserves on fishing communities are not assessed in this study, these are important as well, and need to be estimated alongside the direct impacts of tourism for a fuller understanding of local marine protected area tourism impacts.

3.1.2 Indirect impacts through production linkages

If tourism activities expand while resource extraction contracts, these activities' demand for intermediate inputs will change, producing a first round of indirect effects in the local economy. For example, more tourists increase the demand for accommodation and restaurants, and thus everything from ingredients (meat, fish, fruits vegetables, etc.) to beverages, restaurant and hotel equipment, and workers. To the extent that these inputs are supplied locally, these increases in demand will have positive linkage effects on the local economy, while purchases from outside the project area will create positive linkages for other parts of the country. Similarly, if governments hire people from the community for conservation work, their wages are in turn used to employ local people or to source local goods, and this spurs another round of spending and increase in economic activity. Finally, when municipal governments spend tourism-related Services Tax revenues on the local economy to hire local labor or source local goods, this too generates additional rounds of economic activity. When tourism service activities and conservation management expand, they create positive indirect impacts on the local economy. A contraction in resource extraction activities on the other hand could have the opposite effect, to the extent that these activities rely on local inputs. An input-output (IO) analysis would stop here, and only capture direct impacts and indirect impacts through production linkages.

A critical issue when analyzing these production linkages is whether the local supply of goods and services can expand to meet the new demand. If not, growth in demand around protected areas may place upward pressure on prices. This reduces the real or inflation-adjusted income gains from protected areas. Estimation of indirect impacts must take these potential inflationary effects into account.

3.1.3 Indirect impacts through income and consumption linkages

In addition, all production activities in the local economy generate incomes in the form of

8 Official Park Entry fees for Abrolhos Marine National Park: General public (R$ 93), domestic visitors (R$ 46), visitors from Mercosur member states (R$ 69) and visitors from surrounding regions (R$ 9). Source: DIÁRIO OFICIAL DA UNIÃO, Ministério do Meio Ambiente/Instituto Chico Mendes de Conservação da Biodiversidade, 2019.

wages and profits. Wages paid to workers in the tourism sector potentially also have a positive indirect effect on the local economy. Wages and profits from locally owned tourism companies and from local businesses that supply tourism businesses flow into households, which in turn spend income in the local economy. The increase in household incomes, and stimulus to household demand for goods and services are represented by (two-headed) **arrows c** in Figure 5. If limits are imposed on resource extraction then the indirect income effects of the marine protected area will be negative. However, resource users may be able to shift to other activities associated with the protected area; for example, fisherfolk may provide tourists with transportation or guiding services.

As local services expand to supply new household demands, new rounds of increased input demand, income, and household expenditures follow, creating additional increases in income and demand in the local economy. Successive rounds of impacts become smaller and smaller, and the total (direct and indirect) effect of the expansion in tourism eventually converges to an income multiplier, defined as the change in local household incomes per unit of fresh infusion of cash into the economy through tourist spending as they visit the park. If local market linkages are strong, each dollar of tourist spending may increase local income by more than a dollar. Local income multipliers are not necessarily greater than one, because the new demand created by tourist spending may be met by purchases from other parts of Brazil or abroad. In such cases, the income "leaks out" from the local economy to other places, creating benefits there instead. If the supply of goods and services in the local economy is elastic, prices will not change much as local demand increases. However, rising local demand can place upward pressure on prices, causing real or price-adjusted multipliers to diverge from nominal (cash income) ones. The general equilibrium (GE) model will capture all of these effects, the direct impacts and both channels of indirect impacts.

3.2 LEWIE MODEL

Quantifying the direct and indirect impacts of tourism in marine protected areas on local economies therefore requires an applied general-equilibrium (GE) approach. For this study, a GE method called "local economy-wide impact evaluation—LEWIE" was used.[9]

LEWIE uses simulation methods to estimate the direct and indirect (or "spillover") effects of marine protected area-induced tourism. LEWIE uses a structural approach that integrates models of actors (businesses and households) within a general-equilibrium (GE) model of the local economy. Businesses include locally owned businesses and businesses not owned by locals but typically employing some local workers and purchasing some locally supplied inputs. There is a well-established precedent in economics of using micro survey data to construct models of agricultural households that are both producers and consumers of food (Singh et al., 1986). LEWIE begins by using micro-survey data and econometric methods to construct models of firms, households, and household-farms within local economies. These micro-models are "nested" within a GE model of the local economy, drawing from an established practice of GE modelling in economics (Dixon & Jorgenson, 2012). The models of firms describe how businesses combine various factors (e.g., hired labor, family labor, land, capital) and intermediate inputs (fertilizer, seed, and a variety of purchased inputs) to produce an output (corn, prepared meals, a service), which may be consumed locally or sold to others. The household and household-farm models describe each household group's productive activities, income sources, and consumption/expenditure patterns. In a typical model, households participate in activities such as crop and livestock production, resource extraction (e.g., fishing), retail, and other business activities, as well as in the labor market. Production functions turn inputs into outputs by piecing together each activity as parts of the whole economy.

9 A basic reference for this methodology, and examples of recent studies using the LEWIE methodology can be found at http://beyondexperiments.org/ (Taylor & Filipski, 2014).

Micro survey data are required to populate the LEWIE model and play two main roles in its construction. They provide initial values for all variables in the model (inputs and outputs for each production activity, household expenditures on each good and service). The data are also used to econometrically estimate model parameters for each household group and sector, together with standard errors on these estimates. The initial values and parameter estimates are entered into a spreadsheet designed to interface with Generalized Algebraic Modeling System (GAMS) software used to program the LEWIE model.

3.3 Data Collection

To build the LEWIE model, data are gathered through surveys of tourists, lodges and resorts, local businesses, and local households. The surveys gathered information on production, income, and expenditures, and the locations of transactions (i.e., whether they are inside or outside the local economy). The household and local business surveys were programmed onto tablets using the Open Data Kit (ODK) platform for Android. A team of 16 Brazilian enumerators were trained to carry out the business and household surveys (see Box 4). Data collection for households, businesses, tourists, and some hotels took place during and around the month of January 2020.

Communities from the area constituting the local economy – coastal villages and cities near the township of Caravelas, the main launching site for boats carrying visitors to Abrolhos Marine National Park[10] and extending from Nova Viçosa in the south to the south-west of Caravelas and to Prado in the North – were selected randomly from a master list.[11] In each sampled village, roughly 45–55 households were randomly selected using an every-nth household sampling strategy based on the size and geographical dispersion of the community. Overall, an average of 50 households were sampled each day from each village/village cluster, resulting in a total sample of 590 households. Additional businesses in the villages and nearby market towns were surveyed using the business questionnaire. Lacking access to a master list of businesses, the survey team adopted an every-nth business strategy, a simple procedure given that businesses typically are lined up along the main street. As with the household surveys, the business surveys were subject to the owner/operator's willingness to participate. Hotel and tourist surveys were administered by a local partner trained in the survey methods.

The household surveys and non-tourism businesses were completed prior to the pandemic (end of January 2020); however, the lockdowns severely affected the completion of surveys of tourists and tourism businesses. To compensate, information from previous tourist surveys conducted by other researchers was used to supplement the data from the tourist surveys.[12] Specifically, average expenditure information from other studies was used to calculate the average expenditure for tourists in the Costa das Baleias region, while the limited tourist surveys that could be completed were used to disaggregate expenditure shares for key categories of goods and services. The lockdown also restricted hotel surveys, and a combined approach was adopted, complementing collected survey data with outside studies to generate hotel expenditures for the LEWIE model. To estimate the numbers of tourists attracted to the Whale Coast because of the benefits of the marine protected area (including those that do not visit it) would require additional region-wide data collection.

10 The other launching site is Prado in the north.

11 Villages in the region were randomly selected for surveys. The most isolated rural communities were avoided due to concerns for enumerator safety and other complications implementing the questionnaire. Isolated villages are not tourist destinations.

12 Information from two previous studies was used: 1.) **SEBRAE's Pesquisa de Perfil da Demanda Turistica – Costa das Baleias/BA, Brazil 2019, and 2.)** The Ministry of Tourism International tourist demand Studies 2012–2018.

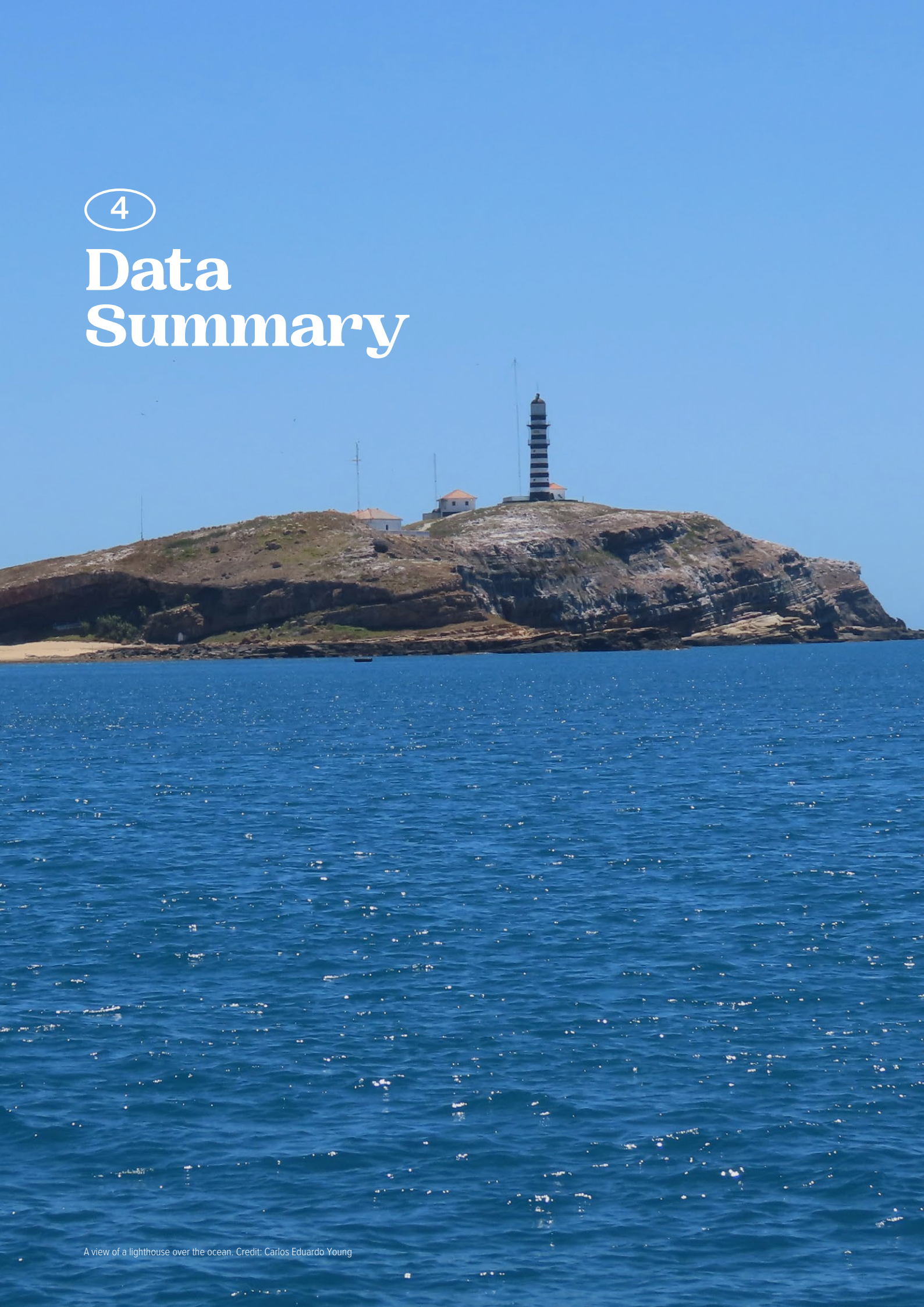
Box 4. Building capacity while doing research

A team of 16 Brazilian students (11 men and 5 women) from the Federal University of Rio de Janeiro were trained to carry out the fieldwork for this study. This included a one-week, face-to-face course on the LEWIE methodology, how to conduct detailed household and business surveys with questionnaires, and programming survey questionnaires on tablets using ODK. After a pilot, the team spent two weeks at the project sites collecting data. All enumerators were awarded certificates of completion of the LEWIE survey training course and fieldwork.

A Nazca booby. Credit: Carlos Eduardo Young

4

Data Summary



A view of a lighthouse over the ocean. Credit: Carlos Eduardo Young

4.1 Tourists and Tourism Businesses (Hotels)

Table 2. Hotel Summary Statistics (R$)

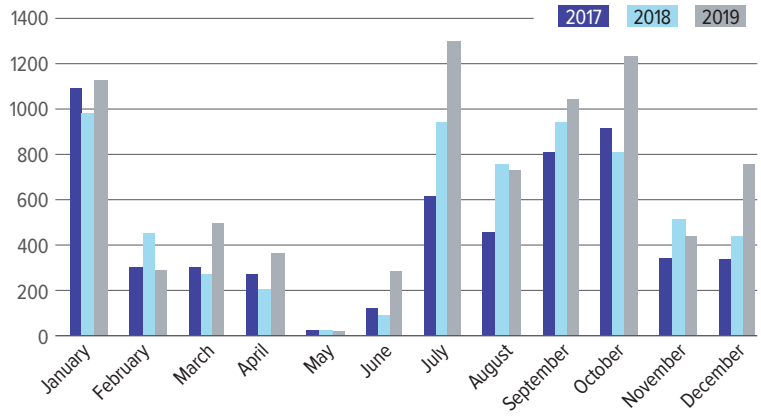
	Total expenditures	Wage	Capacity	Leakage
Mean	2,722,359	1,055,608	206.8	0.23
SD	2,956,475	1,303,390	105.3	0.05

Table 3. Number of Annual Visitors to Abrolhos Marine National Park

	2017	2018	2019
Total Visitors	5563	6403	8044

Source: ICMBio (2019)

Figure 6. Number of Visitors to Abrolhos Marine National Park by Month, 2017-2019



Source: Abrolhos Marine National Park management (2017 and 2018); ICMBio (2019)

Table 2 presents summary characteristics for hotels in the study area. Due to the disruptions caused by the economic fallout of the COVID-19 pandemic, it was only possible to gather information from surveys of seven hotels, with estimated expenditures used where missing. Within this sample, the average hotel capacity is just over 200 beds. The average annual expenditure for wages and purchase inputs was R$ 2.7 million (US$0.69 million), with substantial differences between hotels, as expected. Inputs purchased by hotels include all items required to operate a hotel such as food (vegetables, livestock, fish, etc.), retail purchases (water, alcohol, etc.), and services (utilities). Expenditure on upkeep or renovation of the hotels is not included. On average, hotels spend R$ 1.06 million (US$0.27 million) on wages. The data also show that roughly 23 percent of hotel purchases of inputs (by value) are outside the local economy.

The estimated number of visitors to the Whale Coast in 2019 was 1.2 million, most of whom are domestic visitors[13], and only some of whom come to visit the Abrolhos Marine National Park, or visit the region because of the presence of the park. Among the dozen tourist surveys conducted prior to the pandemic, one third reported that their primary reason for visiting the region was to enjoy the beaches and diving sites. This fraction may differ in winter during the whale watching season, when a larger share of visitors is likely coming to enjoy marine biodiversity.

To protect the park from excessive use, the number of daily visitors is limited to 225. Moreover, only accredited boats can bring visitors to the park.[14] In 2019, 8,044 tourists visited Abrolhos Marine National Park, less than 10 percent of the allotted capacity.

While still well under capacity, the number of visitors to Abrolhos Marine National Park is rising (Table 3). Official records show that tourist numbers increased from 5,563 in 2017 to 8,044 in 2019, a 45 percent increase in two years.

The peak season for tourism in Abrolhos Archipelago runs from July to January (Figure 6), and a key attraction is whale watching during the winter months (July to November). Other draws to the region are the beaches and marine life, which draws tourists during the summer months of December and January when whales are absent.

Tourist expenditures from the limited surveys are summarized in Table 4 below. The average party size was 2.9, with an average stay of 6.82 days. The average tourist spent approximately R$ 500 (US$127) per day, with the majority of expenditures, R$ 306 (US$78) going to hotels. On average, each tourist spent R$ 49.7 (US$12.6) and R$ 55.4 (US$14.2) on retail and service

13 Estimates of tourist numbers are made by extrapolating data from previous years by the growth rate of tourism in the region and crosschecking with available data. A study titled *Plano de Desenvolvimento Integrado do Turismo PIDTS (2001)* conducted by the Getilio Vargas Foundation (FGV) estimates that the number of tourists was around 490,000 in that year, with most being domestic tourists.

14 In 2018 the number of visitors to Abrolhos Marine National Park was 5,439, of which fewer than 3 percent were foreign tourists.

TABLE 4. Summary Statistics of Tourist Expenditure (survey data)

Party Size	Mean	2.91	
	SD	(1.76)	
Nights Stayed	Mean	6.82	
	SD	(3.3)	
Per-Capita-Per-Day Tourist Expenditures			
		R$	US$
Total	Mean	499.6	126.5
	SD	(290.9)	(72.4)
Hotels	Mean	306.3	77.5
	SD	(220.4)	(54.9)
Retail Shops	Mean	49.7	12.6
	SD	(36.5)	(9.1)
Services (incl. tour cost)	Mean	55.4	14.2
	SD	(51.6)	(12.8)
Other*	Mean	2.5	0.6
	SD	(4.5)	(1.1)
N		12	

*Other expenditures include direct purchases from local markets

purchases, respectively. Service purchases include the cost of boat trips and other tourism related transportation costs. These expenditures represent injections of tourist spending into the local economy.

Representativeness is a concern given the small sample size and limited area of the survey. To address this concern, tourist expenditure estimates from a previous, larger-scale survey were used, which also provided information on total expenditures per tourist: *Pesquisa de Perfil da Demanda Turistica – Costa das Baleias/ BA, Brazil,* conducted by SEBRAE/BA (Brazilian Micro and Small Business Support Service), and COMTUR and Bahia's Tourism secretariat in 2019.[15] These surveys, however, did not provide breakdowns across expenditure types, as needed for the LEWIE model. Expenditure share information from the tourist surveys as presented above was used for these breakdowns.

4.2 HOUSEHOLDS [16]

The household survey provides a rich set of data on household characteristics and economic activities. Using the World Bank defined poverty line of US$1.90 (ppp-adjusted) per-capita per-day resulted, however, in a sample of poor households which was too small to estimate production and demand parameters for this group. To address this issue, the poverty cut-off was increased to expand the poor household sample by 10 percent.[17]

Socio-demographic characteristics are given in Table 5, together with a summary of household income-earning activities. The average household size for the sample was just over four individuals. Poorer households tend to be larger, with slightly younger and less educated household heads. Roughly 22 percent and 29 percent of non-poor and poor households, respectively, grew crops in the twelve months prior to the survey. Poorer households tend to be in more rural areas. A higher percentage of poor than non-poor households owned some livestock (18 percent vs 30 percent) and over 65 percent of households had at least one wage earner. Around 17 percent of non-poor households and

TABLE 5. Household Demographics

				HH Head		Income Generating Activities				
		HH size	Dependency Ratio	Age	Educ (years)	Crop	Live-stock	Wage Work	Business	Fishing
Non-poor	Mean	3.44	0.198	49.86	8.12	0.22	0.18	0.65	0.36	0.17
	SD	(1.57)	(0.21)	(14.80)	(5.11)	(0.42)	(0.39)	(0.48)	(0.48)	(0.37)
Poor	Mean	4.20	0.266	45.04	6.88	0.29	0.3	0.68	0.23	0.07
	SD	(2.03)	(0.23)	(13.37)	(4.66)	(0.46)	(0.46)	(0.47)	(0.42)	(0.26)

15 The SEBRAE survey asked respondents why they visited the Whale Coast, only 12 percent mentioned "natural areas" as the reason for their visit. The majority (67 percent) reported visiting for beaches and popular festivals.

16 Additional summary statistics from the household survey are provided in Annex 1.

17 In practice this raises the definition of poverty to those living under US$5.8/person/day.

7 percent of poor households reported fishing at least once a month. The overall percentage of households fishing in the sample is 16 percent. The non-poor were more likely to own a small business (36 percent, compared with 23 percent for poor households).

Most workers employed in the town of Caravelas worked full time (see Table 6).

Fifty-three percent of the poor were employed for over 150 days in 2019, compared with 73 percent of the non-poor. Around 10 percent of households, poor or otherwise, worked a second job. The average annual wage income for 2019 was R$ 16,793 and R$ 10,324, respectively, for the non-poor and poor.

4.3 Businesses

Between one-quarter and one-third of households in the sample owned and operated some form of business. The business surveys attached to the household surveys supplemented the data with 126 independent business surveys for a total of 318 observations.

Table 7 provides a breakdown of the types of businesses surveyed.

Most businesses operated by households were vendors, grocery shops and other retail-type businesses that operated close to year-round. Only 3 percent of the businesses surveyed were directly related to tourist activities, including lodges, hotels, and boat and transportation operators.

Table 6. Wage Work

		Days Worked	Share working >150 days	Average Wage Income	Average Daily Wages	Share with 2nd job	Tourism-related Activities	
							Days Worked	Average Wage
Non-poor	Mean	204.6	0.73	16,792.8	79.5	0.10	153.3	71.0
	SD	(83.3)	(0.44)	(24,018)	(106.4)	(0.30)	(137.0)	(57.9)
Poor	Mean	165.0	0.53	10,323.9	56.9	0.11	210.0	48.8
	SD	(96.9)	(0.50)	(10,471)	(40.2)	(0.31)	(71.7)	(9.5)

Table 7. Business Types

Business Type	Count	%
Vendor/Grocery/Corner Shop	130	41
Livestock/Fish seller	12	4
Other retail	87	27
Services	81	25
Tourism Business*	8	3
Sample	318	

Source: World Bank Survey

Note*: Tourism businesses include Lodges/Guest houses/Boat and Vehicle Transportation

5

LEWIE Model Findings

Anchored fishing boats. Credit: Carlos Eduardo Young

As noted above, the LEWIE model can be used to estimate the direct and indirect impacts of tourism in protected areas on the local economy. There are many pathways through which these direct and indirect impacts manifest, and data availability determines in large part the extent to which these avenues can be captured through the LEWIE model. A summary of the avenues and the extent to which they are modeled within LEWIE is provided in Table 8.

Once built, the LEWIE model can be used to estimate the impacts of protected area tourism on a local economy. Because the model parameters have been estimated econometrically, Monte Carlo methods are used to perform significance tests and construct confidence intervals around the simulated impact results (see Taylor and Filipski, 2014). For this study, 500 iterations of the simulations for Abrolhos Marine National Park were conducted. Additionally, the LEWIE model accounts for nonlinearities and local price effects. Simulations require making judgements, based on the survey data, about where and how prices are determined (that is, market closure, which is not known with certainty). Sensitivity analyses were performed, combined with the Monte Carlo method described above, to test the robustness of simulated impacts to market-closure assumptions.

The impact of tourism in protected areas on the local economy is estimated in two steps. Step one entails simulating the impact of *an additional tourist* on the local economy. This step also estimates the income multiplier for an additional dollar of tourist spending. The total impact is estimated in the second step by multiplying the per-tourist estimate by the number of tourists who visit the national park. Comparing these impacts with public investment in the park also provides an estimate of the rate of return on public investment.

TABLE 8. Avenues of Impact Captured by LEWIE

Impact	Avenue	Included in LEWIE?	Comment
Direct	Tourist spending at local businesses	Yes	
	Restrictions on resource extraction and positive spillovers from Park to local area	Yes	These impacts are built into the base run of the model. It is important to note though that this version of LEWIE is static and therefore does not account for changes in resource availability and their effects on resource use patterns.
Indirect – production linkages	Hiring and local sourcing of goods by tourism establishments	Yes	These linkages are included for hotels but not for other tourism service providers due to data limitations.
	Hiring and local sourcing of goods by park managers	Partially	Jobs offered by the park are captured in the household section of the surveys. However, operational costs of park management are not included due to a lack of information.
	Municipal government expenditures	No	Because the expenditure categories needed by LEWIE were unavailable, local impacts of tax revenues from tourism were not included in the analysis.
	Input use spillover effects of resource use restriction	Yes	
Indirect – consumption linkages	Expenditures by households based on wages and profits earned through tourism sector linkages	Yes	

5.1 Impact of an Additional Tourist on the Local Economy

Table 9. Local Income Impacts of an Additional Tourist

	One additional tourist	
	Results (R$)	Results (US$)
Amount spent by an average tourist	812.0	205.6
Change in local income		
Real income	1,411.9	357.4
95% CI Interval	[2,000; 1,065]	[506.3; 269.6]
Poor Households	240.6	60.9
Non-poor Households	1,171.3	296.5
Real multiplier in local economy	**1.74**	**1.74**

Table 9 presents the impacts of an additional average tourist on household incomes, including the income spillovers that tourist spending creates. Simulations find that an additional tourist adds R$1412 (US$357) to real local incomes in the economy surrounding Abrolhos Marine National Park. The income effects are much larger than the average amount of money tourists spend, which is given in the first row of the table. The result is striking, given that hotels and other tourism businesses purchase a substantial amount of their inputs outside the local economy.[18] Most local income gain goes to non-poor households, amounting to R$ 1,171 (US$297) per additional tourist in total, while poor households in the region receive a total of R$ 240 (US$61).

Table 10. Production Effects of One Additional Tourist

Production Effects (in monetary value)	Results (R$)I	Results (US$)
Local crops	46.0	11.6
Local livestock	70.8	17.9
Fish	42.3	10.7
Local Retail	786.2	199.0
Local services	521.6	132.1
Hotels	181.1	45.8
Change in Employment*	**722.3**	**182.9**

* Change in total payments made to labor.

Tourist spending creates these income impacts by stimulating local demand for goods and services, either directly (as when tourists or hotels buy goods and services from local businesses and households), or indirectly (as when hotels pay wages to local households, which in turn spend this income on locally-supplied goods and services). Table 10 summarizes the effects of a tourist on production (in value) by local households and businesses. The largest impact is on retail activities, mostly small family-owned stores in which households around the marine park spend most of their incomes. The total value of retail sales increases by R$ 786 (US$199) while gross revenue in service-type activities increases by R$ 522 (US$132). Impacts on crops, livestock and fish outputs are smaller, but still substantial. The study estimates that each additional tourist generates an increase in production of crops/agricultural produce of R$ 46 (US$12), livestock of R$ 71 (US$18), and fishing of R$ 42 (US$11). As production in these activities expands, households hire labor, purchase inputs, and generate profits that add further to local incomes.

18 We estimate that 20.1 percent of operational expenditures (all expenditures excluding large scale investments) go to goods and services purchased from outside the local economy.

Figure 7 shows the income multipliers, that is, impacts on local incomes from each additional dollar of tourist spending. Note that this money is spent by tourists primarily at hotels, and does not add to local income until it circulates through the local economy. These multipliers are adjusted for price inflation and thus represent real-income effects. *An additional Real spent by visitors raises local incomes in the local economy by 1.74 Real.* The vertical lines at the top of the bar give a 95 percent confidence interval around these multipliers, which are obtained by running 500 iterations of each simulation. The estimated multiplier is positive and large, indicating that each Real spent by tourists creates *significantly more than one additional* Real of new income in communities around the park.

Figure 8 shows how much of the additional income from tourist spending benefits poor and non-poor households within the local economy.

The majority of benefits accrue to non-poor households which have larger capacity to increase production and take advantage of growing demand generated through tourism. For each Real spent by a tourist in the local economy, an additional R$ 1.44 of income is generated for non-poor households, while households classified as poor receive R$ 0.30.

Although a larger share of the multiplier goes to non-poor households, the economic contribution to local communities appears to benefit poor residents more than non-poor residents. Normalizing multiplier shares by these populations (i.e., dividing the share of the multiplier by the share of poor or non-poor residents; see Figure 9) shows that the multiplier share *per resident* is higher for poor residents than for non-poor, with 56 percent of the per-resident multiplier share going to poor individuals.

FIGURE 7. Real-income multipliers of an additional R$ or US$ of tourist spending

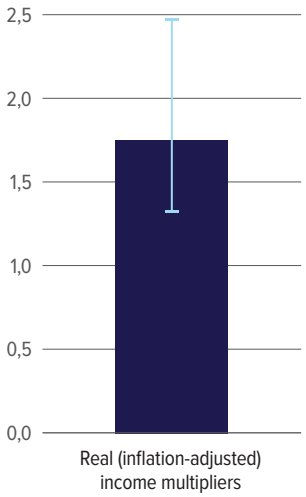


FIGURE 8. Multiplier Share by Household

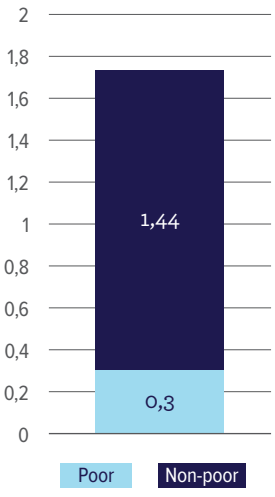
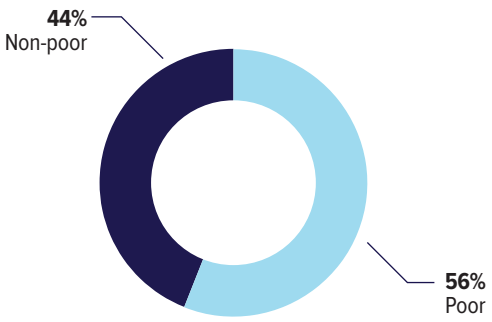


FIGURE 9. Distribution of Multiplier Across Poor and Non-Poor Populations



5.2 Impacts of Nature Tourism on the Local Economy

The total impact of nature-based tourism on incomes around Abrolhos Marine National Park can be approximated by multiplying the impact per additional tourist by the number of tourists who visit the Abrolhos Marine National Park. The number of tourists who visited the Park in 2019 is 8,044 (ICMBio, 2019) and this number is used to estimate the impact on the local economy. We estimate that tourism adds R$ 11.4 million (US$2.8 million) to total income or GDP in the coastal communities adjacent to the park (Column A of Table 11). Monte Carlo simulations are used in the LEWIE model to construct 95 percent confidence bounds around this estimate of impact, which in effect is a detailed sensitivity analysis of the findings.

Table 11. Estimated Impact of Tourism (US$)

	A	B	C	D
	Total Estimated Economic Impact of Tourism	**Total Expenditure on Non-wages (park maintenance)**	**Total Expenditure on Wages**	**Rate of Return**
Abrolhos Marine National Park (R$)	11,357,324	571,294	1,251,126	6.2
Abrolhos Marine National Park (US$)	2,875,272	144,631	316,740	6.2
95% CI bounds (US$) [upper; lower]	[4,000,683; 2,073,824]	-	-	[8.8; 4.6]

Table 12. Peak Season Maximum Capacity Estimates

	Total Estimated Economic Impact of Tourism	Local Jobs Added
Abrolhos Marine National Park (R$)	47,651,625	1,259
Abrolhos Marine National Park (US$)	12,063,702	1,259
95% CI bounds (US$) [upper; lower]	[16,785,563; 8,701,088]	[1,774; 920]

Dividing the total economic impacts by the sum of wage and non-wage expenditures by the government on the National Park provides estimates of the returns on government spending. Government spending on Abrolhos Marine National Park generates an estimated economic return of 6.2 Reais per 1 Real of government spending (Table 11).[19]

This is a conservative estimate of the Park's impact, as the number of visitors to the National Park is likely to be an underestimate of the Park's influence on tourism to the region, because the existence of the park, including the ecological spillovers it creates (most notably, on the whale population) is likely to affect tourists' decisions in a number of difficult-to-quantify ways. Given the challenge of understanding the role of Abrolhos Marine National Park's conservation efforts in drawing tourists to the Whale Coast, the park's potential impact on the local economy was approached through a simulation that answers the question: what would be the impact if Abrolhos National Park operated at full capacity during the five-month-long peak season?

Table 12 reports the results of this calculation. A total of 33,750 visitors (225 per day over 150 days) are assumed to visit the Park, with no visitors in other months. Under these assumptions, the total economic impact of tourism to Abrolhos Marine National Park is estimated at R$ 47.7 million (US$12.1 million) annually, and the Park directly contributes to 1,259 local jobs. Abrolhos Marine National Park's potential to generate benefits for the local community is substantial.

The impact of tourism on employment around the park includes employment in tourist activities and indirect employment impacts from tourism. These employment effects can be estimated by dividing the total labor value-added by the average local wage.[20] Based on this method, we estimate that *tourism to the Abrolhos Marine National Park adds an estimated 300 jobs to the local economy. Tourism to the Whale Coast as a whole generates 46,800 jobs, representing employment for around 12.1 percent of the local population in the tourism sector.*

19 Approximately R$ 148,100 (US$37,000) of park expenditures was spent on local contract work, which we classify as part of wage expenditures (payments to labor in the local economy).

20 The total effect of labor value-added is estimated in the LEWIE model as the returns to labor, a productive asset, and represents the total wage income gains to the local economy. Dividing by wages allows us to estimate the extra employment generated through tourist spending.

Governments can create additional benefits for local populations by hiring local people to work at parks as guards, guides, etc. Local labor hiring would increase labor income in and around Abrolhos Marine National Park and generate multipliers through increased demand and spending. The model estimates that an additional worker hired by the park generates an increase in local real income of R$ 94,977 (US$24,045). The cost to government of hiring an additional local worker is R$ 35,405 (US$8,963), which is considerably less than the local income gains which follow from this action (see Table 13 below).[21] This park-hiring impact can also be expressed in terms of an income multiplier. A Real spent by the government on park wages creates a local economy real (inflation-adjusted) multiplier of 2.68 Reais. These park employment multipliers are higher than tourist spending multipliers because all wages paid to locally hired park personnel go directly to local households, whereas a fraction of tourist spending does.

5.3 Impacts of Complementary Investments and Outside Shocks

Besides estimating the economic impacts of tourism, the LEWIE model can be used to simulate the local economy impacts of government interventions and economic shocks.

5.3.1 Local Economy-Wide Impact of a 5 Percent Increase in Local Input Purchases by Businesses

Governments can also increase local benefits from tourism by encouraging businesses to source more inputs locally. The LEWIE model was used to simulate the impact of a 5 percent increase in the amount of goods sourced locally by businesses. This was done by increasing the number of local purchases by businesses (both services and retail) by 5 percent while holding outside purchases constant. The results are shown in Table 14.

A 5 percent increase in local purchases boosts local incomes by R$ 403,076 (US$102,045). Most benefits accrue to non-poor households, which increase their incomes by R$ 350,365 (US$88,700) compared to

R$ 52,711 (US$13,345) for poor households. Poor households see substantially fewer benefits due to their lack of productive capacity to take advantage of such an intervention.

Table 13. Estimated Impact of an Additional Fulltime Hire by Abrolhos Marine National Park

	Additional Hired Worker (fulltime) by Abrolhos Marine National Park	
Income effects	**Results in R$**	**Results in US$**
Changes in local economy incomes		
Real (inflation-adjusted) Income	94,977	24,045
Changes in household incomes, by location		
Poor Households	39,007	9,875
Non-poor Households	55,970	14,170
Increase in labor supply	**14,170**	**3,587**

Table 14. A 5 Percent Increase in Local Input Purchases by Businesses

	5% productivity increase in local businesses	
Income effects	**Results in R$**	**Results in US$**
Changes in local economy incomes		
Real (inflation-adjusted) Income	403,076	102,045
Changes in household incomes, by location		
Poor Households	52,711	13,345
Non-poor Households	350,365	88,700

21 The annual wage was calculated using the average wage of full-time employees in 2019.

5.3.2 Local Economy-Wide Losses Due to COVID-19

Just as growth in tourism and tourist spending have positive multiplier effects, negative shocks produce negative income multipliers in local economies. The COVID-19 pandemic has resulted in substantial losses in tourism and tourism income, including a shutdown of Abrolhos Marine National Park. We used the LEWIE model to simulate the impact of a complete loss of tourism for one month on the local economies around Abrolhos Marine National Park. We present two simulations, a conservative one that considers only the lost tourism directly related to the Park's closure, and a more general one that considers lost tourism to the Abrolhos region, regardless of whether or not tourists visited the park.

Table 15 and Table 16 present the estimated impacts on income and production, respectively, of one average month without tourism to Abrolhos Marine National Park. In light of the annual nature of our model and data collection, we present monthly losses assuming an average number of monthly visitors to the park. In actuality, monthly losses would vary substantially; for example, we calculate that losses incurred by the absence of visitors during the peak month of July (1,298 visitors) may be as high as R$ 3.06 million or US$0.77 million.

The simulations reveal that, for an average month, a loss of tourism to Abrolhos Marine National Park reduces local real income (GDP) by R$ 2.75 million (US$0.70 million) for each month that the park is closed. This includes both the lost tourism spending and the income spillovers this spending creates along the Whale Coast. Each month without tourism to the park reduces the income of local poor households by R$ 0.47 million (US$0.12 million) and local non-poor households by R$ 2.28 million (US$0.58 million). All production activities lose, with total sales losses ranging from R$ 0.08 million (US$0.02 million) in fishing to R$ 1.53 million (US$0.39 million) in retail businesses. Local retail and services are most heavily impacted. They are the two largest income-generating activities in the region, and are highly sensitive to changes in demand for the goods and services they offer.

The model simulates the monthly impacts of a loss of tourism to the Whale Coast, which includes visits to Abrolhos Marine National Park and activities outside the park (e.g., excursions, beach activities, etc.). The results appear in Table 17 and Table 18.

Our simulations show that a complete loss of tourist revenue along the Whale Coast reduces real income (GDP) by R$ 247.5 million (US$62.7 million) in the region. Each month without tourism in the coastal region adjacent to Abrolhos Marine National Park reduces the income of local poor households by R$ 73.3 million (US$18.6 million) and local non-poor households by R$ 357.1 million (US$90.4 million). All production activities suffer, with sales losses ranging from R$ 13.0 million (US$3.3 million) in fishing to R$ 239.6 million (US$60.7 million) in retail businesses. Local retail and services are the most heavily impacted as they are the two largest income-generating activities in the region, and are highly sensitive to changes in demand for the goods and services they offer.

The simulations reported in Table 11 and Table 14 show short-term impacts of lost tourism. In the long term, changes to tourism would likely alter the structure of the local economy in ways that cannot be addressed with a pre-COVID model.

TABLE 15. Monthly Income Loss from No Tourism to Abrolhos Marine National Park

	Results in R$ millions	Results in US$ millions
Tourism Expenditure Loss	1.58	0.40
Change in Village-level income		
Real income	2.75	0.70
Std. dev.	[3.44; 2.06]	[0.87; 0.52]
Change in Real Household incomes (mean)		
Poor Households	0.47	0.12
Non-poor Households	2.28	0.58

TABLE 16. Monthly Production Loss from No Tourism to Abrolhos Marine National Park

Production Effects (in monetary value)	Results in R$ millions	Results in US$ millions
Local crops	0.09	0.02
Local meat	0.14	0.04
Local Fishing	0.08	0.02
Local retail	1.53	0.39
Local services	1.02	0.26

TABLE 17. Monthly Income Loss from No Tourism to the Whale Coast

	Results in R$ million	Results in US$ million
Tourism Expenditure Loss	**247.5**	**62.7**
Change in Village-level income		
Real income	430.4	109.0
SD	107.7	27.3
Change in Real Household incomes (mean)		
Poor Households	73.3	18.6
Non-poor Households	357.1	90.4

TABLE 18. Monthly Production Loss from No Tourism to the Whale Coast

Production Effects (in monetary value)	Results in R$ million	Results in US$ million
Local crops	14.0	3.5
Local meat	21.6	5.5
Local Fishing	13.0	3.3
Local retail	239.6	60.7
Local services	159.0	40.3

Fishermen near the beach. Credit: Carlos Eduardo Young

Conclusions and Policy Recommendations

Sunset behind the palm trees. Credit: Carlos Eduardo Young

The study set out to make the case for greater investment of public resources in protected area management by estimating the economic impacts of tourism – direct and indirect – in biodiversity-rich areas on the local economy, through the application of the LEWIE model. The focus on the local economy – defined as the households and businesses in the vicinity of the protected areas and in the main market towns – was maintained to understand the potential benefits from protected areas for local households. These households often suffer the negative impacts of restrictions on natural resource use in protected areas, and their co-operation is critical to maintain protected areas by discouraging illegal fishing, and other threats. Development of the local economy is a goal in and of itself, warranting both this local focus and greater investment.

One of the key findings of this study is that the economic return per Real of government spending in protected areas is significantly greater than 1: *economic returns of 6.2 Reais per Real of government spending are estimated for Abrolhos Marine National Park*. Public investment in protected areas not only helps to conserve biodiversity, it also helps to make these protected areas more attractive to tourists – for example, by securing marine resources through investments to prevent illegal fishing or by restoring coral reefs. When tourists visit protected areas, they pay park entry fees, and spend money on lodging, meals, transportation, souvenirs, and other tourism services. These expenditures directly benefit the tourism sector, but the benefits do not stop there. Tourism service providers hire labor and source goods and services from the local economy, and trigger a chain of benefits for local businesses and households that are not directly connected with the tourism sector. It is the sum of these direct and indirect benefits that result in the high economic return per Real of investment by the government. **Investment in protected areas is therefore good for biodiversity conservation and for the development of the local economy.**

It is important to note that this is a conservative estimate of the economic return per Real of government spending. Firstly, only benefits to the local economy have been estimated. Tourists who visit protected areas also spend money outside the local economy – for example, when traveling to the protected area – and tourism businesses are likely to source goods and services from outside the local economy. Both these channels add to the economic return per Real of government spending. Furthermore, data limitations mean that not all mechanisms through which tourist spending benefits the local economy have been accounted for, including the impact on the local economy when park authorities employ people from local households or source local goods.

Another key finding of the study is that expenditures by tourists visiting Abrolhos Marine National Park and the Whale Coast generate significant income multipliers for households in the local economy. The study estimates that an additional Real spent by visitors raises local incomes in the region by 1.74 Reais. This reinforces findings from four other sites studied as part of this World Bank project. Tourists spend money at local retail stores, on local services, and on local transportation, generating incomes for households in the local economy. These transactions directly link tourists to the local economy, but they are only a part of the benefit generated for the local economy. Households additionally benefit indirectly through production and income linkages, when tourism operators hire local households and source local goods, and when households spend wages and businesses spend profits earned through the tourism sector. Thus, not only households directly engaged in the tourism sector benefit but so do households who are not directly involved. Moreover, both poor and non-poor households benefit. *For each Real spent by a tourist in the Abrolhos region, an additional R$ 1.44 of income is generated for non-poor households, while households classified as poor receive R$ 0.30.*

Because the local economic impacts of protected area tourism are both direct and indirect, it follows that studies which look only at how tourists spend money will underestimate impacts on the local economy, and overemphasize leakage from tourism spending outside the local economy.

Tourism generates a significant number of jobs, directly and indirectly. *While the 8,044 tourists to the national park generate 300 jobs along the Whale Coast, tourism to the region, much of which can be attributed to the pristine marine environment anchored by the marine protected area, has a much larger footprint, providing 46,800 jobs which employ 12.1 percent of the local population.*

In summary, the analysis in the report finds that protected areas visited by tourists not only protect biodiversity, develop local economies, and

provide jobs for poor and non-poor households, and for those directly involved in the tourism sector, and those not.

With over 30 percent of its land area and almost 27 percent of its marine and coastal areas under protection, there is great potential for protected areas in Brazil to contribute to development goals while maintaining the country's rich biodiversity asset base. Currently, tourists visit a relatively small number of protected areas. ICMBio (2020) report that the most visited national parks in 2019 were Tijuca National Park, with 2.95 million visitors, followed by Iguaçu National Park (2.02 million) and Petrópolis Environmental Protection Area (2.00 million). The most visited federal marine protected areas in 2019 were Arraial do Cabo Marine Extractive Reserve (0.97 million visitors) and Fernando de Noronha Marine National Park (0.61 million). Given this situation, there is a need to better secure and manage Brazil's protected areas, grow and diversify its tourism sector, and share benefits with local communities, as these actions underpin the goals of both development and biodiversity conservation.

Protect Natural Assets

To promote biodiversity conservation and secure the natural assets which attract visitors, it is critical that protected areas be conserved, restored to reverse degradation, and generally well-managed. There is a need to address the underlying factors that are contributing to poor performance of Brazil's protected areas, and the following actions are identified in this report:

Increase public investment in protected area management: As indicated in this study, publicly funding protected areas results in a high return on investment. Using public funds for park management is especially important as the conservation of these parks and their biodiversity is what attracts tourists and promotes a sustainable industry and source of livelihoods for local communities.

Strengthen the Marine Protected Area System: In the last few years, Brazil significantly expanded its protected areas. There is understanding of the need for better connectivity and integration of protected areas into subregions and seascapes. It is important that the protected area system is effectively and equitably managed, ecologically representative, well-connected, and integrated into the wider seascape (See Box 5 on transitioning to a blue economy). It is critical to promote the governance, and the institutional and legal framework of the system as a whole to enable conditions for improved management of the set of protected areas. This may include pilots for integrated and participatory management approaches such as community co-management, ecological mosaics, Ramsar Convention sites, and ecological corridors; and implementation of national plans for exotic, threatened, or endangered species/ecosystems, and participatory fisheries management plans.

Build Capacity of Protected Area Managers: It is important that protected area managers are trained and have the experience to be effective. To manage commercial and business operations, managers should understand both protected area laws and policies, and the business needs of tourism operators, and must manage commercial entities in accordance with protected area needs. While these needs may vary depending on the protected area, generic skills are needed to run a commercial services program, including: understanding the legal framework for operators; develop contracts, authorizing instruments and bid solicitations; monitor and evaluate operators; data collection and analysis; business acumen; negotiation skills, and asset management training if government facilities are used by operators. By developing training and on-the-job education in a commercial services program, managers can develop these skills in their staff.

ICMBio's program to develop public-private tourism partnerships in protected areas is led by a "Concession Coordinator," a trained biologist, and a team of 12–15 people. The team is organized within the General Department for Public Use and Tourism. Contracts are currently administered by a team at ICMBio – a "President" and 4 others – 1 technical person in the park, 1 architect, 1 financial analyst and 1 economist, and the team is hiring lawyers and financial analysts to strengthen the program.

Broader Engagement with Stakeholders: Given Brazil's extensive coastline and the need for better integration and connectivity of protected areas, a new model for protected area management and governance with greater engagement of different stakeholders is needed (Maretti et al. 2019)Brazil has advanced significantly with the expansion and improvement of its national system of protected areas. Until recently most of the expansion was concentrated in the Amazon region

Box 5. Financing Beyond the Public Sector

While asset protection is largely a public sector responsibility, government investment in protected areas demonstrates a commitment which makes private sector funding more likely. Table 19 provides an overview of financial instruments, and the report, "Mobilizing Finance for Nature" provides detailed guidance on financing mechanisms for biodiversity conservation (World Bank Group 2020). Robust strategies may involve several of these mechanisms in a systems approach to protected area finance.

Table 19. Financial Instruments for Protected Areas

Instruments	Description
Conservation Trust Funds	Conservation Trust Funds are legally independent institutions (i.e., non-government) managed by an independent board of directors, which provide long-term, sustainable funding for conservation and/or protected area agencies through local grants. Trust funds can be endowments, sinking funds, or revolving funds.
Government budget/ revenues	Government revenue allocations come from local, regional, and national bodies, and/or authorities' public budgets. They also include earmarked government taxes on tourism, and on commodities such as gasoline, structured debt relief earmarked for conservation, and government bonds.
Carbon Finance	Carbon markets are a new opportunity for protected area funding but are usually inadequate to meet full management costs.
Revenues from tourism and recreation	Mechanisms include protected area entry and recreation fees, sport hunting and "green" safari fees, hotel and airport taxes, tourist and tourism operator contributions, and public land and tourism concessions, among others. Revenues should ideally be channeled to protected area management.
Compensation payments	Compensation payments are instruments to hold companies accountable for their impacts on ecosystems and biodiversity. They finance conservation by collecting fines for pollution, royalties for natural resource use, compensation for environmental impacts, or even voluntary contributions. Although compensation payments don't necessarily reflect actual environmental impacts, or provide one-for-one compensation, they pay for the use of a natural resource by investing in the conservation of another. They are typically calculated as a percentage of project development costs and pertain to bioprospecting, royalties from resource extraction, fines for environmental damage, voluntary and mandatory payments, mitigation banking and biodiversity offsets.
Revenues from the sale and trade of wildlife	Revenue comes from the legal sale and trade of plants and wildlife products for conservation. International conventions, such as CITES and associated national laws govern and monitor the legality of such trade. Financing mechanisms such as fines, wildlife auctions, loans, and in-situ-ex-situ partnerships contribute funding to species conservation.
Innovative financing mechanisms	Financial instruments can design and incubate mechanisms to raise and invest new capital which finances conservation and pays for results. These include Wildlife Conservation Bonds such as the Rhino Impact Bond, Lion's Share Fund, and Conservation Capital's Umiliki Investment fund, among others.
Collaborative Management Partnerships (CMP)	CMPs between state wildlife agencies and NGOs can attract investment and technical capacity to improve protected area performance. The three main CMP models - financial and technical support, co-management, and delegated management - yield median funds that are 1.5, 2.6 and 14.6 times greater, respectively, than baseline state budgets for protected area management (Lindsey et al. 2021).

(World Bank Group, 2020) (Lindsey et al., 2021)

(with useful lessons. Special focus is needed to strengthen partnerships with civil society, NGOs, local and traditional communities, the private sector, and academia, and to engage more broadly with tourism stakeholders in protected areas. Ideally, these stakeholders should collectively support protected areas, which may mobilize resources for their protection and sustainable use through a wider participatory process.

Undertake Regular Visitor Spending Effects Assessments at the National Level: This study presented a methodology to assess the economic impact of protected area tourism on the local economy of one national park in Brazil. To make the case for regular allocation of public resources, and to support planning and program design; for example, to identify where tourism services can be improved, it is important that national level assessments are regularly conducted by the government. This will require systematic collection of data on tourists, tourism businesses, local economies, and park management. Therefore, a complementary recommendation is to: *implement regular visitor surveys for monitoring and evaluation.* A challenge for this study was the lack of such information, and visitor surveys are crucial to understand the impacts of tourism and how it may change over time. Information on the number of visitors to each park, and their spending habits are important for planning, and surveys should ideally also capture seasonal trends in tourism activities, and be administered at the end of a visitor's trip.

Box 6. Transitioning to a Blue Economy

Strengthening the management of Brazil's marine and coastal protected areas will support its transition to a blue economy. It is important to have a vision for these areas as an arena for sustainable, equitable, and diverse economic development. More specifically, policy and regulatory environments should mainstream blue economy principles, including those related to finance, into public policies for conserving and using coastal and marine resources. Well-managed marine protected areas can deliver multiple benefits and adopt multisectoral planning, such as Coastal and Marine Spatial Planning (CMSPs) to nurture the blue economy.

Strengthening governance through coastal and marine spatial planning (CMSP): Coastal and Marine spatial planning are tools for a coordinated and forward-looking vision of the blue economy which recognizes the multiple economic uses of the oceans while preserving the marine ecosystem. The development of CMSPs in Brazil would support decision-making for sustainable management at national and subregional levels. They are important to guide decision-making over ocean spaces and reduce conflicts over multiple uses such as marine tourism, recreation, conservation of biodiversity, fisheries, gas/oil, mining, transport, etc. CMSPs improve the regulation of these activities by helping to establish more effective geographical patterns of uses in a given area. This results in a more secure framework for sustained investment in the blue economy.

Grow and Diversify the Tourism Business

To grow and diversify tourism beyond the few parks currently visited will require policies, programs, and investments that go beyond protected areas. To address the challenges faced by the tourism sector, it will also be important to assess the tourism potential of Brazil's protected areas and prioritize sites for development in order to diversify the tourism portfolio. A recent World Bank publication provides guidance on identifying private sector opportunities and prioritizing tourism development (see Box 7).

Another intervention to promote tourism in protected areas relates to *concessions policy.* As noted, Brazil's protected area law, *SNUC*, is strong, particularly in protecting natural and cultural resources, but it does not go into detail regarding the regulation of commercial activities in parks. ICMBio concessions account for around one-third of all park concessions currently being structured in Brazil. ICMBio, working with the Semeia Institute BNDES and other partners, have implemented a strong protected area concession program with some progressive policies. One highlight is their methodology for establishing franchise fees using a sliding scale: Franchise fees (returns to the government) are set using a financial analysis (net present value) which takes into account all of the expenses required to run the concession, including construction costs, if any. The contracts usually allow for franchise fees based on revenue share (a preset percentage of a concessionaire's gross revenue), which can be lowered in case of exceptional performance. The Concession Law 8,987 also contains rare but important provisions. One is a provision protecting the intellectual property of the concession i.e., reserving it for the Brazilian government. The second provision of interest to many countries developing concession law is a government agreement to ensure all necessary licenses and authorizations are issued. While Brazil has a good concessions program, some regulatory components can be improved by:

Seeking best practices from other sectors using the concession law

One of the advantages of using the general concession law in protected areas is that each sector using the law has benefited from those using it before them, and prior learning and ongoing use generates the emergence of best practices, which should continue.

Formalizing policies and regulations: ICMBio has introduced many concessions best practices via policies or contracts. The program could be strengthened if these policies or contractual provisions are placed into regulation or law. These include, for example:

- Contract terms are set by policy, not by law or regulation.

- The contract length is based on the financial feasibility analysis (FFA) and is the shortest practicable under the FFA (minimum term for the project to be feasible). Establishing an upper limit on the contract length in the law or regulation is common practice, and allows the administering agency to set term lengths based on whether specific contract terms and conditions, such as required capital investment, warrant a longer term. The USNPS has found that contract terms of 20 years or less for most visitor service operations are most effective. Other countries, such as New Zealand, use longer terms for certain types of projects (particularly leases) when the investments make it necessary. Shorter term contracts place a greater administrative burden on protected area managers through more frequent contract renewals. On the other hand, shorter term contracts can foster competition between bidding companies, and may be coupled with contractual requirements for industry best practices, resulting in better visitor services.

- The law does not require a franchise fee, but it does protect concessioners from exorbitant fees. Typically, each commercial services/concession opportunity, based on its unique circumstances, has a different return on investment. The commercial service/concession law should require a return to the government. The return does not have to be money; it could be the construction of a facility or other item of value to the government. The regulations should specify how to determine a fair franchise fee which allows the operator/concessioner to generate a reasonable profit. The regulations should also specify what the protected area can do with revenues from commercial service/concessions and how this money will be made available to the agency. Best practice is to invest such monies in visitor services and other park needs.

- For-profit concessions under Law 8,987 do not allow for preferential selection of concessions based on special status, i.e., indigenous populations; nor does it require hiring local people. Certain contracts, however, provide for purchasing local goods and services. Not-for-profit concessions under Law 13,019 do allow for preferential treatment through complementary legislation, for example exempting associations representing traditional populations from some bidding processes under Law 13,668. Regulations favoring local citizens when awarding contracts and/or employment are important to grow local economies and establish community support for parks, particularly if park regulations restrict resource use.

- Regulations should allow concessioners to sell their contracts before expiry of the contract term if contract transfers are approved by the agency. Where concessioners wish to encumber their contracts to obtain loans (exercising rights or expressing interest in property, including through contracts), protected areas should retain the right to approve or deny such encumbrances, and should obtain legal counsel in doing so. A lack of oversight in this area has caused problems in the past, and provisions are now included in the concession contracts

Fast tracking protected area management plans: Law 9,984, the environmental law which established protected areas, Decree 43, requires management plans to be in place before a park can pursue commercial visitor services. However, many parks have not completed their management plans, and without them they cannot put a concession contract in place, hindering visits and economic development.

Returning franchise fees to protected areas - SNUC required that 25-50 percent of concession revenue earned from entrance fees and services come back to protected area budgets, which go directly into the National Treasury, and are returned through appropriations. Because franchise fees are not directly returned to protected areas, managers seek to benefit from concessions by inserting contractual requirements to perform park maintenance work, such as invasive species removal or trail work, or other tasks not associated with the concession. This causes the concessioner to incur greater expenses and reduces the franchise fee to the government. A review of this policy and related procurement procedures is needed so that parks benefit more directly through laws requiring the return of concession fees to protected areas, with specific portions allocated to the units where they were earned. This will protect

the integrity of concession contracts (providing services to visitors, not the government) and provide additional money (appropriations) to the park to pay for park (government) expenses.

Share Benefits with Local Communities

Development of local communities around protected areas is a goal in and of itself, and sharing the benefits of protected area tourism helps further this goal. Moreover, local communities which benefit in this way are incentivized to support conservation and discourage encroachment, poaching, and other activities which degrade protected areas. Engaging stakeholders and designing benefit sharing mechanisms which are equitable and sustainable is critical to this effort (Snyman & Bricker, 2019).

At present there are no formal mechanisms for protected areas to share benefits with local communities, and such mechanisms should be put in place, and informed by a review of international best practices.

Table 20 provides an overview of benefit sharing arrangements along with examples that can be used by park authorities in discussions with communities.

While the income multiplier for local households from visitor spending at Abrolhos Marine National Park is significant, governments can enhance the impacts of protected area tourism through their policies and programs to further stimulate local economies.

Strengthen linkages between the tourism value chain and local economy: The government can strengthen linkages across the tourism value chain to improve income multipliers by:

» Supporting local producers and households to provide more of the goods and services sourced by tourism businesses. The study found that a 5 percent increase in local purchases increases local incomes by R$ 403,076 (US$102,045). Most benefits accrue to non-poor households, which increase their incomes by R$ 350,365 (US$88,700), while poor households increase their incomes by R$ 52,711 (US$13,345) due to their lack of productive capacity to take advantage of the intervention.

» Additionally, training women may increase labor productivity and inclusivity. Women often make up a significant portion of the tourism labor force. Moreover, they often perform low-skilled, menial tasks rather than managerial positions. Formally training women to participate in community-level committees and encouraging their roles as managers in other segments of the tourism industry could help engage women in higher-value economic activities with higher incomes.

Finally, as shown in the previous section, the COVID-19 pandemic has resulted in substantial losses in tourism revenues along the Whale Coast. The study finds that a complete loss of tourist revenue along the Whale Coast reduces real income (GDP) by R$ 247.5 million (US$62.7 million) in the region. Each month without tourism in the coastal region adjacent to Abrolhos

TABLE 20. Benefit Sharing Arrangements with Local Communities

Benefit Sharing Arrangement	Examples
Direct and indirect employment	Direct: restaurant employees, wait staff, gardeners, taxi/boat drivers, park guides, and handicraft. Indirect: Construction, food/goods for restaurants etc.
Revenue sharing mechanisms of protected area authorities	Refers to tourism revenues from concessions and partnerships, and income from levies, permits, hunting fees and/or taxes which are allocated to local communities. Such funds may be distributed through organized/formal trusts and used to finance local public goods and community development initiatives such as schools, clinics, small scale infrastructure, energy projects, environmental protection, etc. (Spenceley et al., 2019)
Revenue sharing schemes from tourism businesses and partnerships	Approaches or partnership models include public-community initiatives, public-private partnerships, community-owned-and-run enterprises, community-private partnerships, and public-private-community-partnerships. Information on roles, responsibilities, challenges and limitations for each of these approaches are detailed in the World Bank report, "Supporting Sustainable Livelihoods through Wildlife Tourism" (Twining-Ward et al., 2018).
Sustainable harvesting of plants and animals	Many communities depend upon natural resources for their livelihoods. Allowing local people to sustainably harvest these resources can improve community support for protected areas.
Shared decision-making and capacity building	Local consultation on tourism development and protected area access, and support for communities to start small businesses and conservation enterprises.

Park reduces the income of local poor households by R$ 73.3 million (US$18.6 million) and local non-poor households by R$ 357.1 million (US$90.4 million). All production activities lose, with total sales losses of R$ 13 million (US$3.3 million) in fishing to R$ 239.6 million (US$60.7 million) in retail businesses. Local retail and services are the most heavily impacted, as they are the largest income-generating activities in the region, and are highly sensitive to changes in demand for their goods and services.

Economic Recovery

Transitioning to a blue economy may help mitigate the risks of the COVID-19 outbreak. Well managed natural capital, through a blue lens, will incentivize tourism and other local coastal economies to continue productive trends and support nutritious seafood production during this time of crisis. The Brazilian population, including vulnerable groups who live along the Brazilian coast will stand to benefit from enhanced livelihoods supported by a healthy coastal and marine environment. As the government works to promote a safe economic recovery, there is a unique opportunity for the country to 'build back better'. This entails continuing efforts in coastal and marine protected area management to protect natural assets. Creating jobs through labor-intensive civil works to build sustainable infrastructure around national parks and provide alternative livelihoods for people who have lost their jobs or businesses will stimulate economic activity and improve environmental outcomes – a green/blue recovery.

Crabs. Credit: Carlos Eduardo Young

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ANNEX 1
Summary Statistics

Crops

Poor and non-poor households cultivate similar crops. Grain (primarily maize) and fruit production are most common (Figures A1 & A2). Owing to the relatively urban nature of the region and sample, agricultural production plays a relatively small role in the livelihoods of communities in the local economy. Tables A1 and A2 below summarize key agricultural statistics at the plot level.

On average, poorer households owned or farmed less land and had lower harvest values than non-poor households. Hiring agricultural workers is not a common practice, though a degree of labor exchange/cooperation exists within villages. Use of pesticides was extremely low at 1–3 percent of plots, and fewer than 10 percent of plots were fertilized.

Poorer households accounted for around half the land and output of non-poor households that participated in agriculture. Nevertheless, the share of households selling crops at markets was very similar for the two groups. On average, 42–44 percent of the total harvest value was sold at local markets. Only three households reported selling their crops to a hotel or lodge directly. Households retained approximately a third of their harvest for home consumption. Around 9 percent of crops were lost to spoilage.

TABLE A1. Crop Production and Inputs (Plot level)

	Average Plot Size (acres)	Average Harvest Value	Family Labor days	% Hiring Labor	Inputs	
					Pesticides	Fertilizer
Poor	2,962.3	1,732.2	230.6	0.01	0.03	0.09
N=83	(4,253.8)	(4,230.4)	(201.9)	(0.11)	(0.19)	(0.28)
Non-poor	4,641.5	2,318.7	262.1	0.03	0.01	0.06
N=502	(5,997.6)	(8,879.4)	(219.7)	(0.18)	(0.12)	(0.25)

Source: World Bank Survey

Note: Information presented at the plot level

TABLE A2. Crop use and sales (Household level)

		Share Selling	Share of Crop Sold	Share Consumed	Spoilage	Share to Gifts and Storage
Poor	**Mean**	0.87	0.44	0.35	0.09	0.13
N=40	**SD**	(0.34)	(0.39)	(0.34)	(0.17)	(0.23)
Nonpoor	**Mean**	0.86	0.42	0.34	0.09	0.13
N=207	**SD**	(0.35)	(0.40)	(0.35)	(0.19)	(0.21)

Source: World Bank Survey

FIGURE A1. Crop type distribution

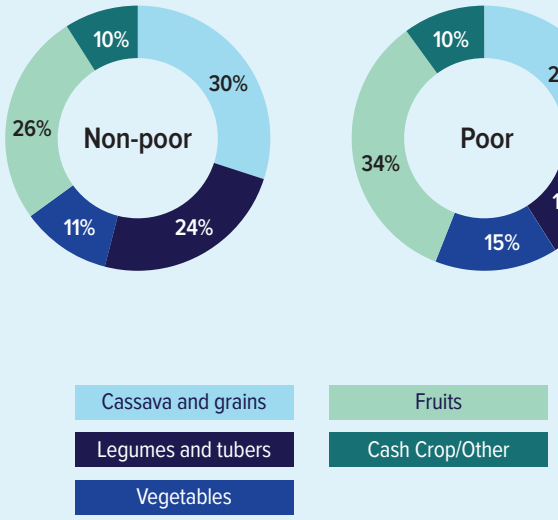
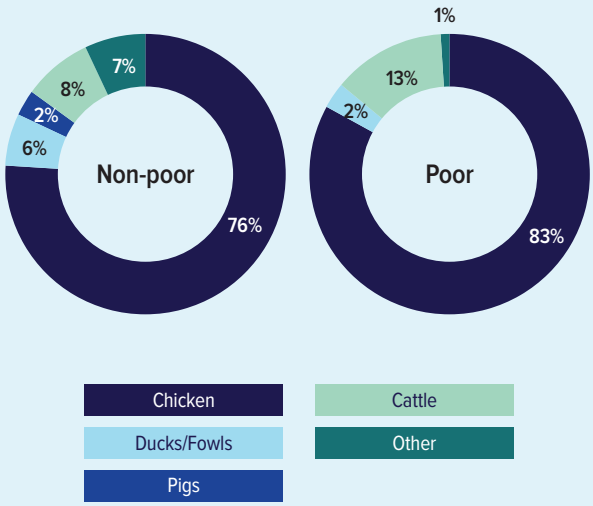


FIGURE A2. Livestock distribution



Source: World Bank Survey

Livestock

The main livestock in the coastal region of Bahia were chicken and cattle. Figures A3 and A4 give a snapshot of the distribution of livestock types. Bahia state has rich pastureland for cattle (Vilela et al., 2018), and its herds are valued at an estimated 10–15 times that of chicken production.[22]

Table A3 summarizes key livestock rearing statistics. On average, poor and non-poor households rearing livestock had R$ 6,350 and R$ 17,170 worth of livestock holdings, respectively. Only 12–13 percent of livestock output was consumed by households; around 10–12 percent was sold during the year. Besides being a production activity, livestock are often a means of savings and asset accumulation.

Most livestock are purchased locally by both poor and non-poor households. Poorer households were less likely to sell livestock locally; however, this may reflect the small sample size for poorer households. Less than 20 percent of households classified as poor owned livestock.

TABLE A3. Livestock and Inputs

				Sales		Purchase		Input value (R$)		
		Total value	Share consumed	Share sold	Local %	Share purchasing	Local %	Pens (maintenance)	Vet	Feed
Poor	Mean	6,350	0.1	0.1	0.2	0.1	0.8	15.5	49.6	131.7
	SD	(10,541.9)	(0.19)	(0.31)	(0.45)	(0.33)	(0.45)	(63.0)	(165.0)	(206.8)
Non-poor	Mean	17,170	0.1	0.1	0.8	0.1	0.8	59.3	65.9	201.6
	SD	(33,336.1)	(0.19)	(0.22)	(0.42)	(0.45)	(0.42)	(161.7)	(207.6)	(326.1)

Source: World Bank Survey

22 To estimate the value of herds, we multiplied the reported number of animals by the median price.

Fishing

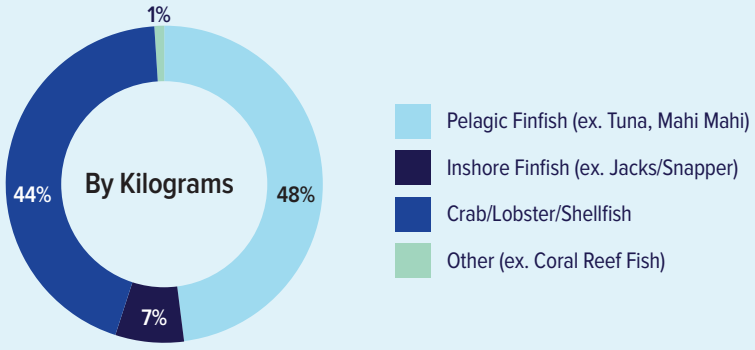
More than one-fifth of residents in the sample participated in fishing and fishing related activities for their livelihoods, with non-commercial, small-scale household operations concentrated in the coastal cities of Caravelas, Nova Viçosa and Alcobaça, where most fishing is focused on near-shore catch. Table A4 summarizes key fishing statistics. Fifty-three percent of fisherfolk owned a boat, and the average value of a fishing boat and engine was R$ 34,200 (US$8,550); the value of other fishing equipment (hooks, poles, nets, cages, etc.) was around R$ 10,700 (US$2,675). On average, just over 3 persons crewed the ship, including the survey respondent. The average interviewee made a trip almost every other day (153 trips per year). The reported average catch per trip was around 32.5 kilograms.

Figure A3 gives a snapshot of catch distribution by kilograms and Figure A4 summarizes the frequency of fishing trips to various habitats. The most commonly chosen fishing sites were in the open ocean (52 percent), and approximately a quarter of trips were in rivers. Fisherfolk were asked the type of catch they primarily caught for each fishing trip. Pelagic finfish are the most commonly caught by weight (48 percent), followed by crabs, lobster, and shellfish (44 percent). Trips to catch pelagic and nearshore finfish are around 22 percent and 12 percent of all trips, respectively.

The average business size was small, consisting of 2.37 individuals for retail type businesses and 1.61 individuals for services. Table A5 summarizes key business statistics. Most businesses operated full time with family labor. Monthly wages were higher for retail businesses. On average, retail and service businesses brought in R$ 56,710 and R$ 48,327 (US$13,400 and US$11,400) in annual revenue and earned R$ 12,535 and R$ 14,311 (US$2,950 and US$3,370) in net income, respectively.

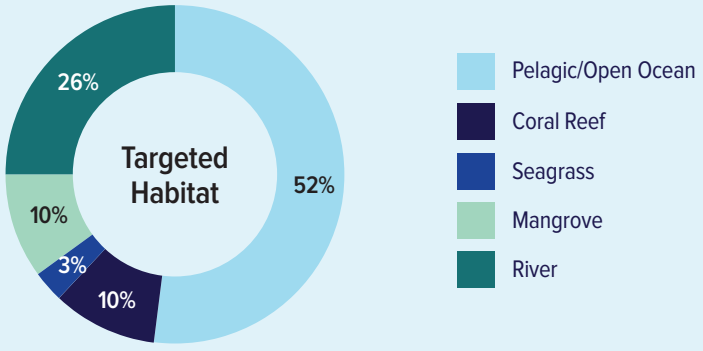
Table A6 summarizes key expenditures for businesses. On average, service type businesses had larger monthly rents (R$ 82 vs R$ 65) and lower transportation costs (R$ 51 vs R$ 93) than retail businesses. Most purchases of retail items, crops, livestock, and fish products were local, while around a quarter of services hired (construction, repair, maintenance, etc.) were from outside the local economy.

FIGURE A3. Distribution of Catch (by Kgs)



Source: World Bank Survey

FIGURE A4. Fishing Habitats by Trip (Targeted Habitat)



Source: World Bank Survey

TABLE A4. Fishing Summary Statistics

	% Fisherfolk with boats	Average vessel value (R$)	Average equipment value (R$)	Average labor per trip	Average annual trips	Average catch per trip (kg)
Mean	0.5	34,206.0	10,733.0	3.1	153.0	32.5
SD	(0.5)	(31,155.0)	(22,937.0)	(1.5)	(106.1)	(40.4)

TABLE A5. Business Operations

		Months Operated	Labor			Asset Value	Revenue	Profit
			# Hired	Monthly Wage	# Family			
Retail N=202	Mean	10.8	0.83	1,782.30	1.54	16,742	56,710	12,535
	SD	(2.9)	(4.1)	(2,625)	(2.5)	(31,788)	(93,788)	(15,345)
Services N=106	Mean	10.4	0.47	1,269.90	1.14	18,954	48,327	14,311
	SD	(3.3)	(2.0)	(1,963)	(1.1)	(30,400)	(77,656)	(16,630)

TABLE A6. Business input purchases (monthly)

				Crop purchases		Livestock purchases		Fish purchases		Services hired		Retail goods purchased	
		Rent	Transport	R$	% out	R$	% out	R$	% out	R$	% out	R$	% out
Retail	Mean	64.6	92.8	341	0.04	56.3	0.01	8.7	0.01	511.7	0.23	20.8	0.01
N = 202	SD	(196.3)	(182.2)	(867.1)	(0.19)	(271.4)	(0.1)	(58.6)	(0.08)	(993.9)	(0.42)	(93.3)	(0.08)
Service	Mean	82	50.7	96.1	0.01	90.7	0.02	15.1	0	906	0.26	19.1	0.03
N = 106	SD	(210.0)	(129.6)	(293.9)	(0.01)	(348.2)	(0.14)	(62.6)	-	(1,391.0)	(0.42)	(69.3)	(0.17)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