FREDERICK S. PARDEE CENTER FOR INTERNATIONAL FUTURES
JOSEF KORBEL SCHOOL OF INTERNATIONAL STUDIES
UNIVERSITY of DENVER

UNDP

TRENDS REPORT

02

GUINEA-BISSAU:

Exploring Alternative Futures of Development

The Cost of Not Going Green

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Suggested citation: Willem Verhagen, Mark E. Meziere, David K. Bohl, Bailey Howe, Jonathan D. Moyer (2022). Guinea-Bissau: Exploring Alternative Futures of Development. Report 2: The Cost of Not Going Green. UNDP Guinea Bissau & Frederick S. Pardee Center for International Futures. Bissau, Guinea Bissau and Denver, USA.

CONTENTS

PATHWAYS FOR SUSTAINABLE GROWTH

In a country with enormous potential as Guinea-Bissau, the visualization of alternative development futures is important. But also, to put the sometimes-uncomfortable questions on the table: what if we do not go green and blue when designing solutions for economic development, especially in a SIDS context? What are the costs for future generations of Bissau Guineans if we missed the chance to revert the current approach?

This series of reports, which we publish in collaboration with the Pardee Center for International Futures at the University of Denver, is a testimony to reimagined development paths. While the first document looked at how the current development trends impact the economy and human development in Guinea-Bissau by 2040, this volume sheds light on how green growth may help the country achieve better development results, combining inclusive human development and sustainable economic growth.

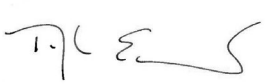
Guinea-Bissau has a vast potential to capitalize on its many rich natural and human resources and to opt for a path towards economic diversification through the lens of the green and blue economy approach. Developing inclusive strategies for the blue economy for a diverse array of stakeholders, investing in human capital as the basis for sustainable livelihoods and economic prospects for communities, promoting pathways for the financial inclusion of all, doubling the efforts on the right energy mix, while tapping more intensively into rather new economic activities like ecotourism is vital to allow for developmental leaps while preserving ecosystems and the vast biodiversity of the country. These are some of the programs that we developed together with the government and the people and communities of Guinea-Bissau. The statistics show that there is much potential not only for tapping into new sources of financing, but also of how to steer the process of economic growth in a balanced and sustained way.

The base case scenario outlined in the first report is now complemented by two alternative development paths specifically linked to human development and green growth, geared towards the acceleration of attaining the Sustainable Development Goals (SDGs). It is an offer to reimagine the country's economic and human development between now and 2040 and a basis for implementing a green growth strategy while taking a serious step in assuring inclusivity and equity.

The cost of not going green is simply too high. The dependency on one crop and the ecological impact of monoculture leave their marks on communities. The country's geographical position and morphology put it at the top of the vulnerability list for climate change impact. It is time to start designing and implementing public policy choices grounded on the whole government approach.

The main contribution of this second report is the proposal of alternative policy strategies that could lead to a more equitable and sustainable development. Our collective efforts in country might be guided by some of the conclusions that we draw here. It is paramount that the process of economic development in a country with high poverty levels is carried out under the premise of inclusion of vulnerable groups, with a special focus on youth and women.

I hope that this contribution is useful not only in terms of a continued conversation but for political and social consensus-building around the foundations that might guide us into the future development path for Guinea-Bissau. Enjoy the reading!



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ACKNOWLEDGMENTS

This report is the result of a collaboration between the United Nations Development Programme (UNDP) Guinea-Bissau and the Frederick S. Pardee Center for International Futures. From UNDP, we want to specifically thank Tjark Egenhoff, José Levy, Duhitha Wijeyratne, Ahmed Moustafa, Anders Brudevoll, Christopher Lilyblad, Adjombi Té, Aguide Gomes Sa, Elena Touriño Lorenzo, Sarvesh Singhal, Santa Alves Cardoso and Inacio Ie for input and discussions on this report. Willem Verhagen (WV), Mark E. Meziere (MM), David K. Bohl (DB), and Jonathan D. Moyer (JM) worked on the design of the analysis. Bailey Howe (BH), WV, and MM conducted the literature review. WV, DB, and MM designed the scenarios. WV worked on model development for the economic growth trajectories and the agriculture and fisheries sector, MM worked on model development for energy, DB worked on tourism model development and Mohammod T. Irfan (MI) worked on model development for infrastructure and education. MM and WV conducted the data analysis and figure and table design. WV, DB, BH, and MM authored the report. All authors reviewed the report. In addition, from Pardee, we would like to thank prof. Barry B. Hughes for advice on designing the scenarios and revisions of the economic model, Dan Wilkins for literature review support on renewable energy in Guinea-Bissau, Wondemneh Pawlose for literature review support on the mining sector, Caio C. Pereira for a literature review on green growth in Guinea Bissau, Yutang Xiong together with MM and MI for bringing in new data series on education, energy, and infrastructure for Guinea-Bissau, and Emily Slusser and Rebecca Stephan for project coordination and feedback on the report. We would also like to thank Christopher J. Kingsley from the United Nations Children's Fund and Eng. Mamadu Jassi from the Guinea-Bissau Department of Planning and Statistics provided education data to inform the scenarios. Additionally, participants in a Pardee-UNDP workshop held in Guinea-Bissau provided critical insights to inform the scenario development and policy recommendations. Lastly, we would like to thank all the administrative support from UNDP and Pardee that provides the foundation to making this research possible.

LIST OF ABBREVIATIONS

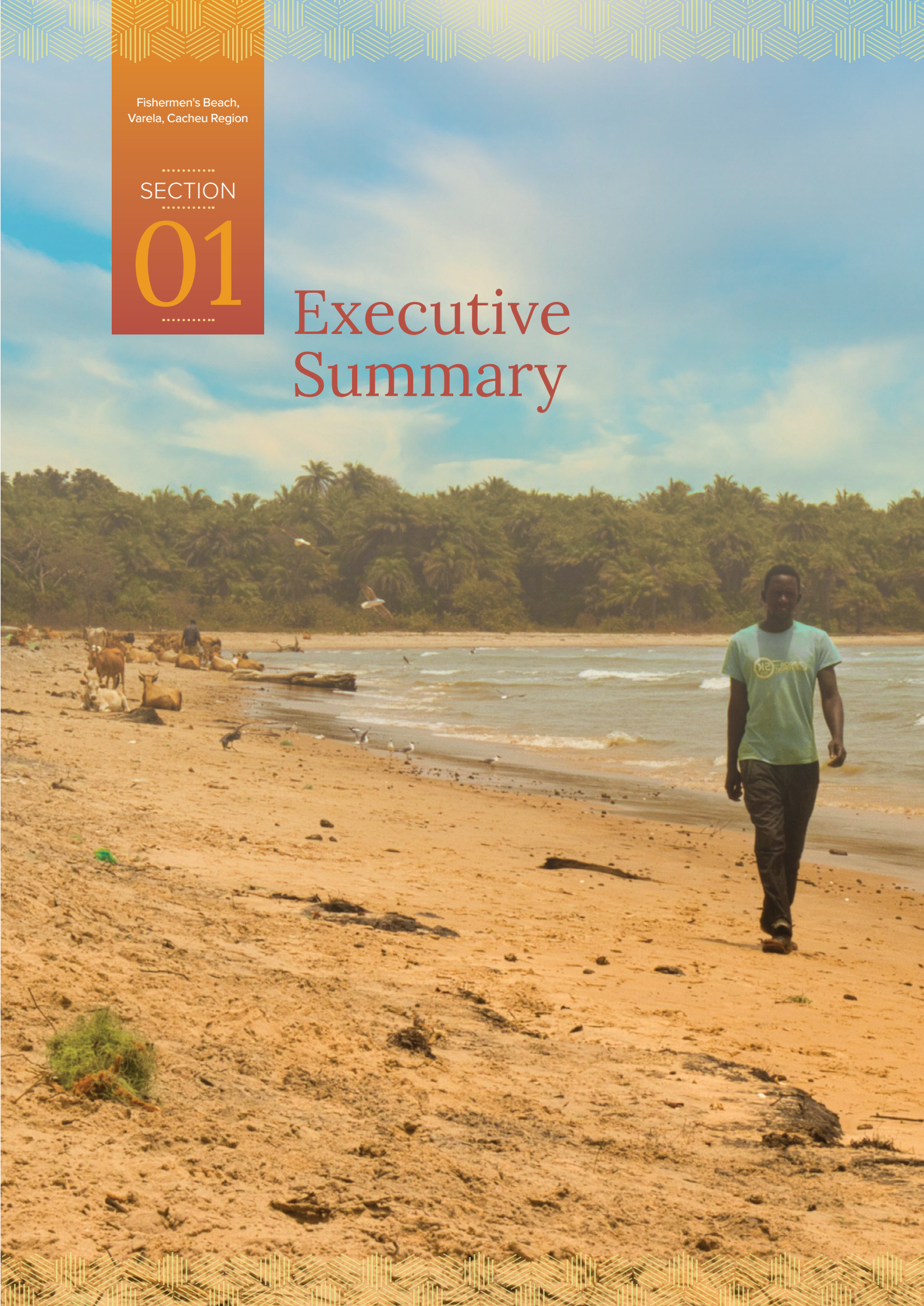
CO_2	Carbon dioxide
CP	*Current Path*
CSO	Civil Society Organizations
EE	*Enabling Environment*
ECOWAS	Economic Community of West African States
EU	European Union
FAO	Food and Agriculture Organization
FDI	Foreign direct investment
GDP	Gross domestic product
GG	*Green Growth*
HDI	Human Development Index
IFs	International Futures
KWh	Kilowatt hour
LME	Large Marine Ecosystem
MW	Megawatt
MWh	Megawatt hour
MWp	Megawatt peak
OECD	Organisation for Economic Co-Operation and Development
PPA	Power purchase agreement
PV	Photovoltaic
REEEP	Renewable Energy and Energy Efficiency Partnership
SDG	Sustainable Development Goal
SIDS	Small Island Developing States
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	US dollar

Fishermen's Beach,
Varela, Cacheu Region

SECTION

01

Executive Summary



Transport of goods in Bubaque Island, Bijagós archipelago

Guinea-Bissau is a country rich in natural resources, with fertile soils, rich fishing grounds, and potential for eco-tourism. Previous policy reports have highlighted the opportunities for implementing a long-term economic strategy centered around green growth. But what would the long-term benefits of a green growth strategy be for economic and human development in Guinea-Bissau? And how can a green growth strategy be best applied to a low-income country meeting both needs for economic, human, and environmental sustainability?

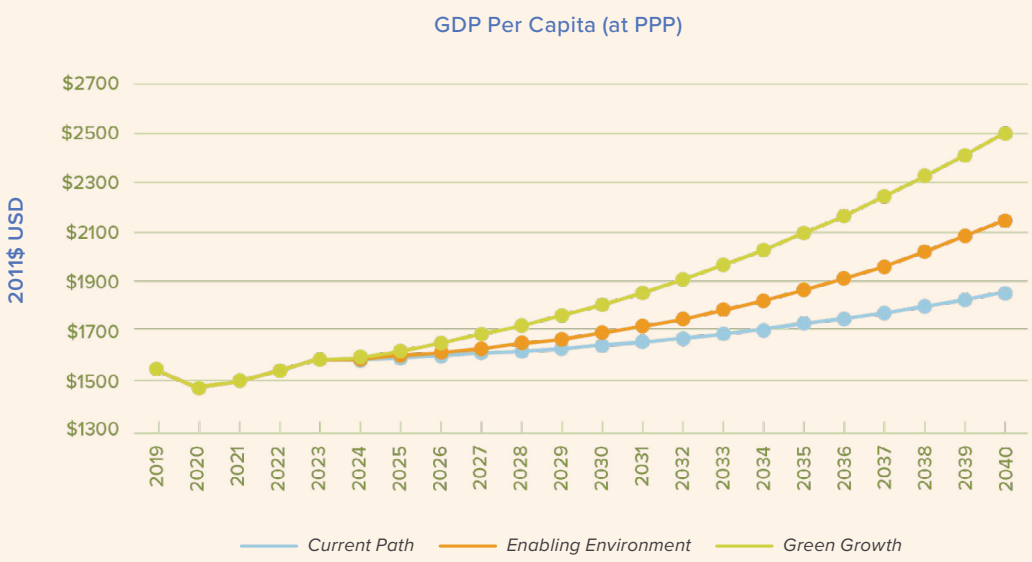
The term *Green Growth* originated in an Organisation for Economic Co-operation and Development (OECD) *Green Growth* declaration (OECD, 2009). Since then, multiple definitions have been used that focus on decoupling economic growth and climate emissions, minimizing future risks and damage (precautionary principle), and fostering inclusive growth based on a sustainable use of natural resources for current and future generations. A challenge with these concepts for Guinea-Bissau is that *Green Growth* has been mostly studied in the high-income context. For example, decoupling of growth and CO_2 emissions as well as minimizing risk has limited use in Guinea-Bissau, given its low share of global CO_2 emissions. Therefore, we primarily use the last definition of an inclusive *Green Growth* that integrates green economic growth within a broader context of economic and human development needs in a less-developed country.

In this report, we quantify the cost of not going green for Guinea-Bissau through 2040 on indicators of economic development, education, health, infrastructure, and the impacts thereof on extreme poverty, undernourishment, and child stunting. This report is part of a UNDP-Pardee series of reports on Guinea-Bissau. The first report studied the *Current Path* of economic and human development in Guinea-Bissau to 2040. This second report focuses on alternative policy strategies to accelerate green and inclusive growth. The policy strategy scenarios were developed by the Pardee Center and were further discussed and refined during a multi-day participatory workshop in Guinea-Bissau.

The scenarios included in this report are:

- ***Current Path* (CP).** Developed in the first report, this scenario describes a future in which Guinea-Bissau continues its current trajectory of economic and human development, without any major policy actions to alter this course.
- ***Enabling Environment* (EE).** Focused on creating the necessary conditions and capabilities for an inclusive *Green Growth* strategy, this scenario describes a future in which Guinea-Bissau makes progress on indicators of education, governance, and infrastructure. In addition, policies successfully lower existing inequalities between income groups, between genders[1] (i.e., education for girls), and between rural-urban communities. This scenario creates the necessary conditions for a *Green Growth* strategy to benefit economic and inclusive human development in the context of a less-developed country.
- ***Green Growth* (GG).** This scenario combines the interventions of the *Enabling Environment* with a green sectoral economic strategy aimed at sustainable use of the existing natural capital. In this case, Guinea-Bissau can improve its agricultural sector by sustainably raising production while limiting forest conversion and moving up the value-added chain for agricultural crops. Additionally, in this scenario, Guinea-Bissau grows a domestic fishing industry, grows an eco-tourism sector, expands electricity access, and introduces greater domestic solar photovoltaic (PV) energy production.

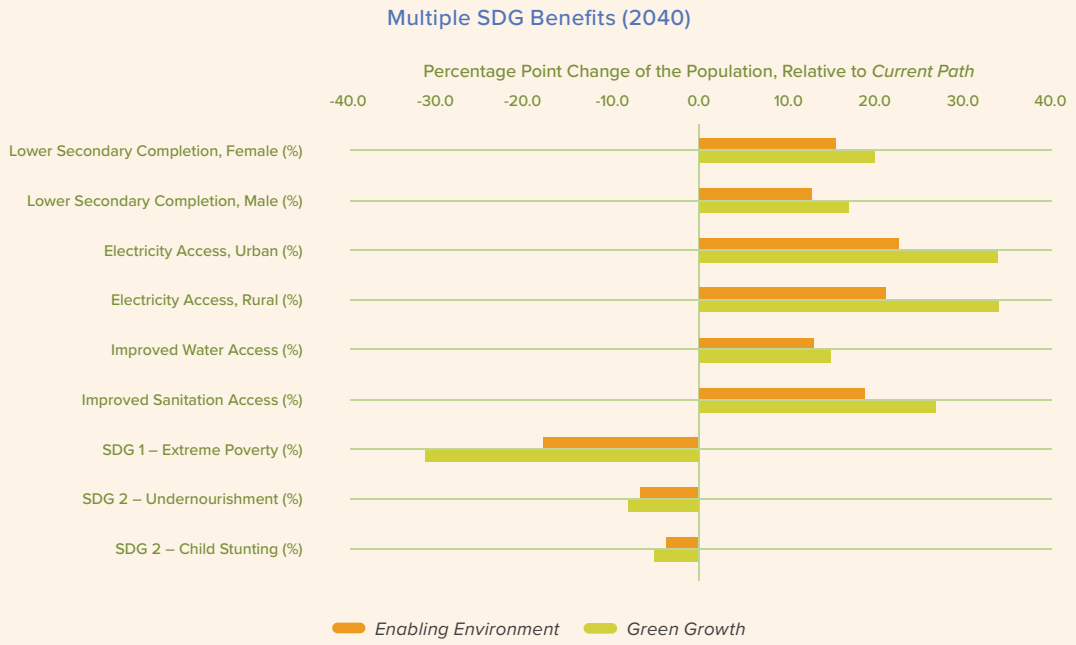
Figure 1 *GDP per Capita at purchasing power parity from 2019 to 2040 in Guinea-Bissau for the Current Path, Enabling Environment, and Green Growth scenarios.*



The *Enabling Environment* and *Green Growth* scenarios show progress on both economic and human development indicators in 2040 relative to the *Current Path*. In the *Current Path* scenario GDP per capita reaches 1,857 USD[2] in 2040, 21 percent above 2022 values (**Figure 1**). In the *Enabling Environment* scenario, the country reaches an average income level of 2,144 USD per person, 39 percent above levels in 2022, while in the *Green Growth* scenario average income reaches 2,495 USD, or 62 percent higher than today. There are thus significant potential long-term economic gains from implementing a combined human development strategy (*Enabling Environment*) with a green economic strategy (*Green Growth*).

Figure 2

The benefits across a wide range of SDGs on education, infrastructure, poverty, undernourishment and child stunting for the Enabling Environment and the Green Growth scenario. Benefits are quantified in percentage point change for 2040 relative to the Current Path scenario.



Additionally, there is broad progress across other Sustainable Development Goals (SDGs) in 2040 (**Figure 2**). In the *Enabling Environment* lower secondary education completion rates for females increases by 15.7 percentage points, rural electricity access increases by 21.3 percentage points, and extreme poverty drops by 17.9 percentage points relative to the *Current Path*. Similarly, *Green Growth* results in a rise in rural electricity access (34.2 percentage points), access to improved sanitation (26.9 percentage points), and a drop in extreme poverty (-31.2 percentage points relative to the *Current Path*). With both scenarios, progress towards achieving multiple SDGs is accelerated in Guinea-Bissau.

Guinea-Bissau needs to pursue a joint strategy for promoting human development and green economic growth to achieve multiple SDGs. For example, the *Enabling Environment* accounts for the majority of the progress in lower secondary education for females, improved water access, child stunting, and undernourishment. On the other hand, a green economic strategy makes stronger progress on electricity access, sanitation access, and extreme poverty. So, while both scenarios make progress towards SDG achievement relative to the *Current Path*, a combined strategy of human development and green economic policy is most beneficial across all SDGs.

The results of this modeling work, the previous report, and workshops with stakeholders lead us to a set of policy strategies that can help achieve long-term green and inclusive human development:

For Guinea-Bissau and low-income countries in general, a green growth strategy can only be successful if embedded within a broader strategy on human development.

The full benefits of a *Green Growth* transition can only be achieved if Guinea-Bissau simultaneously makes improvements in education, governance, and infrastructure

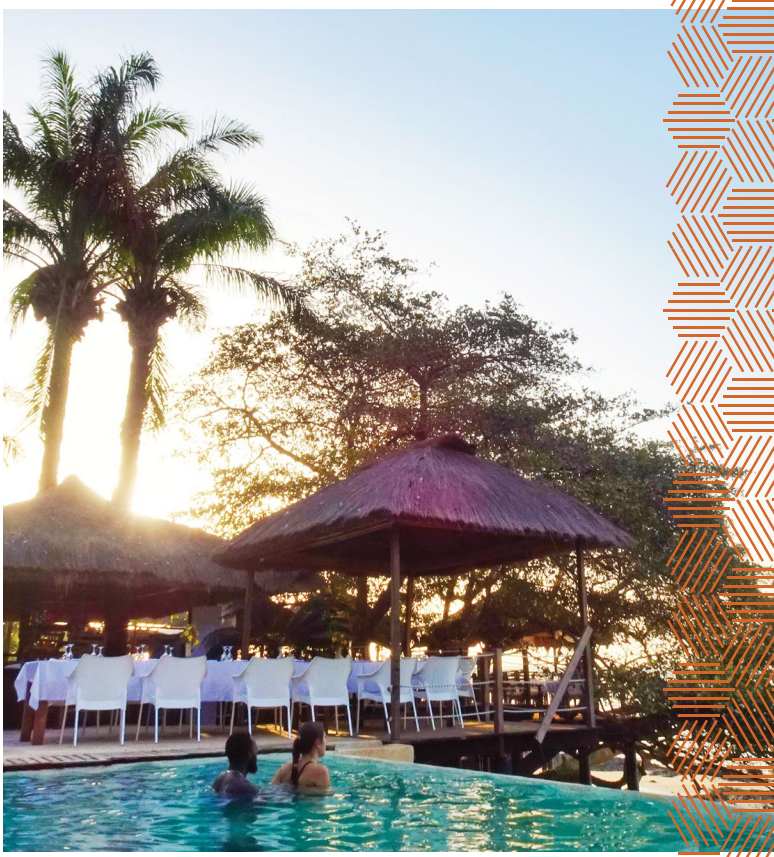
for the entire population. During the workshop, participants in Bissau continuously highlighted the need for these improvements to be able to implement a *Green Growth* strategy. For example, governance stability is critical for attracting tourists and creating an enabling business and investment environment. Workshop participants also highlighted the need for education to provide the labor for higher-skilled jobs in a green economy, and the ability to speak foreign languages in the tourism sector. Better infrastructure is required to support the implementation of national development plans (UN Habitat, 2021), and improvements in access to water, sanitation, roads and electricity have beneficial impacts for economic and human development. For example, infrastructure improvements in the Bijagós archipelago and beyond are important for the development of tourism in these areas. While implementing only the green economic strategy has the potential to create additional economic benefits for Guinea-Bissau, it will fail to achieve an inclusive economic and human development for all. Failing to integrate a *Green Growth* strategy within a broader economic and human development plan aimed at creating the *Enabling Environment* will likely result in dissatisfactory outcomes for Guinea-Bissau.

Diversification of the economy and the agricultural sector is required to achieve sustainable, green economic growth.

Today Guinea-Bissau remains heavily reliant on cashew nut production for income but exports these nuts for processing. As such, being able to move up the value chain in cashew production by domestic processing of cashew nuts will be important in a green economy. However, agricultural diversification beyond cashew nuts to grow more staple crops and vegetables and increase domestic fish catch and consumption is also important. This strategy reduces dependence on a single crop, expands food sources beyond the agricultural sector, and raises dietary diversity in Guinea-Bissau. Additionally, the economy needs to transition away from relying on agricultural commodity exports. The *Green Growth* scenario outlines a multi-sectoral strategy with an economy built around agriculture and cashew production, coupled with revenues from fisheries, eco-tourism, and green energy production. In addition, many of the improvements in the *Enabling Environment* on education, governance, and infrastructure create the necessary conditions for a competitive business environment and international financial investments. So, while improving cashew nut production is critical, it needs to be embedded in a broader economic diversification strategy. Diversification will be beneficial for the domestic economy and for international trade opportunities, as one of the critical conditions for success of the African Continental free trade area is economic diversification and increasing economic and export complementarity between countries (Kabandula et al., 2020).

Guinea-Bissau must try to secure investments and support from the international community to achieve the benefits of green growth.

An economic transition requires considerable investments from governments and firms. The current economy in Guinea-Bissau does not have the domestic funds available to achieve this transition and pulling resources towards education and infrastructure risk comes at the cost of investments in health and other areas. Therefore, a green economic transition would depend partly on the international community and require support from international donors and businesses. For example, farmer training, agricultural capacity-building, and access to farm



Ecolodge on Rubane Island, Bijagós archipelago

equipment would be needed to raise productivity in agriculture. In addition, income from cashew nuts currently depends on exporting them to other countries for processing. In order to move up the value chain, creating facilities to process cashew nuts in Guinea-Bissau would require foreign direct investment (FDI). Improvements in fisheries would require international help in building capacity to regulate international fish catch and renegotiating existing international fish contracts. International tourists would also need to visit Guinea-Bissau and spend money locally to support eco-tourism growth. Overall, the envisioned transition towards a green economy would be partly dependent on the international community through investments, capacity-building, and tourist visits, with additional potential to involve the large diaspora community in this process.

A systems approach can help identify and prioritize synergistic policies across multiple policy domains.

The *Enabling Environment* and *Green Growth* combine a wide range of policy strategies and actions. However, policymakers need to prioritize certain policies in the face of limited resources. Using a systems perspective can help in identifying the interactions among various policy components, and the synergies and trade-offs among such components. Using this perspective, one can identify the policies with the most synergies across economic and human development and prioritize those over others that may benefit only a single indicator. Only by looking across multiple subject areas and policy domains is it possible to identify these synergies and construct a joint strategy for Guinea-Bissau.

Infrastructure rehabilitation works, Bissau, Autonomous Sector of Bissau

Smart agriculture gardens, Bubaque island, Bijagós archipelago

SECTION

02

Introduction: Sustainable, Economic, and Human Development in Guinea-Bissau

Infrastructure rehabilitation works, Bissau, Autonomous Sector of Bissau

Guinea-Bissau is a country abundant in natural resources with fertile soils, rich fishing grounds, and potential for eco-tourism and green energy development. However, unsustainable use of resources along with climate change poses long-term risks to the sustainable use of this natural capital through overfishing, land degradation, mono-cropping, and sea-level rise. Guinea-Bissau, while having contributed almost nothing to climate change, is one of the countries most vulnerable to climate change impacts. Inclusive, green economic development is thus a necessity for Guinea-Bissau.

However, today, the country is one of the poorest in the world, with low levels of education, issues around government stability, limited infrastructure, and an economy heavily reliant on cashew nut production. This requires developing an economic strategy that simultaneously addresses environmental sustainability and sustainable use of the rich natural capital and raises economic and human development. Building a sustainable future for Guinea-Bissau thus requires a *Green Growth* perspective that aligns inclusive economic and human development needs with environmental sustainability.

This report is part of a UNDP-Pardee series of reports on long-term sustainable human development in Guinea-Bissau. The previous report in this series focused on identifying current trends in development through economic growth, SDG achievement on poverty, undernourishment, child stunting, and the underlying enabling conditions for development in infrastructure, education, and governance (Verhagen et al., 2022). The previous report concluded that a continuation of past economic growth would improve the human condition in Guinea-Bissau but would be insufficient to fundamentally transform economic and human development in the country by 2040. For example, while progress is made in relative terms (e.g. a reduced percentage of the population in poverty), the absolute number of people suffering from poverty, undernourishment, and child stunting would increase in 2040 relative to today. In addition, the report showed that economic growth is an important means of accelerating progress in human development, but that economic growth alone remains insufficient to transform broader human development trends without addressing issues around education, governance, infrastructure, and existing inequalities in society.

Here we present the second and last report in this series that focuses on alternative trajectories of development. Specifically, we focus on exploring the benefits and costs associated with alternative scenarios in which Guinea-Bissau can reach ambitious and achievable progress on education, governance, and infrastructure. This progress is required for a successful implementation of a *Green Growth* strategy. In addition, we quantify the benefits of

a strategy aimed at building a green economy with progress in agriculture, fisheries, eco-tourism, and the energy sector. By combining these improvements in the *Enabling Environment* with green sector approaches, this report lays out strategies for economic and human development in Guinea-Bissau and quantifies the cost of not going green across a wide spectrum of indicators on macro-economic development, human development, and SDG achievement.

We start by providing background on the concept of *Green Growth* and how it can be applied in the context of Guinea-Bissau. Section 3 provides an overview of the scenarios used in this report to explore policy strategies. Section 4 quantifies the costs and benefits of each alternative policy strategy for long-term economic and human development in Guinea-Bissau. The last chapter, Section 5, provides a discussion and interpretation of the results and a set of policy recommendations following both the findings of this report and insights from workshops[3] held in Bissau with government officials, NGOs (Non-Governmental Organizations), academics, and the private sector.

WHAT IS GREEN GROWTH?

The concept of *Green Growth* originated in an Organisation for Economic Co-operation and Development (OECD) *Green Growth* declaration (OECD, 2009). Since then, the concept has been promoted and adopted by the OECD, World Bank, and United Nations Environment Program (UNEP). In its most direct definition, *Green Growth* is a form of economic growth that minimizes negative environmental side effects. However, there is no single definition of *Green Growth*, and across different entities various elements of *Green Growth* are emphasized:

- **Decoupling:** The decoupling of economic growth and environmental pollution, especially carbon emissions (particularly emphasized by the OECD).
- **Precautionary Principle:** Economic growth that maintains natural capital for future generations with a focus on trade-offs between current economic growth versus future natural assets. The precautionary principle can also refer to growth that is resilient by accounting for natural hazards and the role of environmental management and natural capital in preventing physical disasters (particularly emphasized by the World Bank).
- **Inclusivity:** An inclusive green economy is one that improves human well-being and builds social equity while reducing environmental risks and scarcities (particularly emphasized by UNEP).

The above definitions of *Green Growth* focus on aspects of climate mitigation (decoupling), climate adaptation (resilience/precautionary), and, more broadly, traditional sustainable development (inclusive) with both a focus on trade-offs within a generation and trade-offs between generations.

A challenge in realizing *Green Growth* in low-income country settings is that the concept has been mostly applied and studied in OECD and middle to high-income countries, and less to study economic transitions and development in low-income states. This line of *Green Growth* research primarily focuses on decoupling CO_2 emissions from economic growth. For example, the decoupling of growth and environmental harm has been a concept primarily used in OECD countries with a list of indicators to keep track of progress (OECD, 2017). A challenge in high-income countries is that practical data shows that decoupling of growth and CO_2 emissions has hardly occurred in the past two decades (Hickel & Kallis, 2020). These findings indicate that decoupling is challenging and has not been successfully achieved in higher-income countries, let alone in low-income countries.

A second challenge for implementing *Green Growth* strategies in low-income countries relates to their small contribution to overall global CO_2 emissions. They suffer the impacts of rising temperatures and sea levels as emissions rise and amplify climate change but have limited means to fundamentally lower global emissions. Thus, decoupling in low-income countries is unlikely to fundamentally alter the impacts they suffer from climate change and other environmental damages. A third challenge in implementing *Green Growth* is related to the distribution of costs. The burden of environmental

Children catching fish, Buba, Quinara region

damage will primarily affect the poorest countries and the poorest in society that rely strongly on the use of natural resources and live in places most vulnerable to environmental damage (OECD, 2021). However, *Green Growth* measures to offset climate change will also disproportionately affect the poorest population and can result in increasing rather than decreasing inequalities (Dercon, 2014; Hasegawa et al., 2018; OECD, 2021). This pertains to measures to decouple economic growth and carbon emissions, as well as to precautionary measures that aim to minimize the negative impacts of climate change and environmental disasters. *Green Growth* development in low-income countries should explicitly address the possible trade-offs between inclusive development and a *Green Growth* strategy while focusing on options that promote inclusivity to prioritize a people-centered green transition.

To overcome potential trade-offs between economic growth, environmental sustainability, and human development, we primarily focus on a definition of *Green Growth* that aims to create an inclusive green economy with a focus on the environment. This definition is most applicable to developing countries and is supported by a growing knowledge base through case studies on the *Green Growth* Knowledge Partnership from UNEP (UNEP, 2021). Such a strategy aims to build an inclusive and green economy around the sustainable use of natural capital for current and future generations with the potential to also partly decouple CO_2 emissions from economic growth. It works toward an inclusive green economy that aims to sustainably use existing natural capital, limit fossil-fuel-based economic development, and increase economic and population-wide resilience to deal with the negative impacts of climate change.

GREEN GROWTH IN GUINEA-BISSAU

The implementation of a *Green Growth* strategy will be specific to individual countries and needs to be tailored to existing natural capital, economic structure, and human development challenges. Recently, several policy documents have highlighted the need for a *Green Growth* transition, or elements of it, in Guinea-Bissau (Government of Guinea-Bissau, 2020; UNDP et al., 2022; World Bank, 2015). The “Terra Ranka” development plan lays out a strategy for Guinea-Bissau that combines growth in agriculture, fisheries, eco-tourism, and energy with the need to strengthen human development and protect the natural environment (World Bank, 2015). The more recent “Hora Tchiga” further develops these notions by focusing on economic reforms, improving governance, infrastructure, and human capital while simultaneously preserving biodiversity, fighting climate change, and building and restoring natural capital (Republic of Guinea-Bissau & UNDP Guinea-Bissau, 2020). Similarly, several reports studied sustainable transformation in the cashew nut and fishery sector in Guinea-Bissau with a particular interest in increasing the contribution of these sectors to economic and human development (Akadiri & Akadiri, 2021; Belhabib & Pauly, 2015; Catarino et al., 2015; Government of Guinea-Bissau, 2020; IRENA, 2019; UN Guinea-Bissau, 2020; UNDP et al., 2022; UNDP Guinea-Bissau, 2020b). For example, the UNDP Leave No One Behind document focuses on who is being excluded from *Green Growth* and development so that everyone can benefit from sustainable development plans (UNDP Guinea-Bissau, 2020b). The ongoing UNDP Blue Economy as a Catalyst to Green Recovery project in Guinea-Bissau focuses on the creation of a national Blue Economy strategy, in collaboration with the government, civil society organizations (CSO), and the private sector. This strategy aims to strengthen key economic sectors of the blue economy like fisheries, agriculture and eco-tourism (Government of Guinea-Bissau, 2020; UN Guinea-

Bissau, 2020; UNDP et al., 2022). Lastly, the most recent National Determined Contributions report of the UNFCCC focuses on mitigation and adaptation challenges in Guinea-Bissau highlighting the combined challenges of climate change, gender inequality and socioeconomic development. Mitigation efforts focus on improving the energy sector, with a stronger focus on renewable energy sources, minimizing land use emissions from land use change, and lowering emissions from the agriculture and fisheries sector compared to a baseline development scenario. Similarly, adaptation measures are focused on agriculture, fisheries, energy sectors, and forested areas alongside adaptation focused on sanitation, human health, and critical infrastructure.

Together, these national plans from the government of Guinea-Bissau, research organizations, and inter-governmental organizations have begun to identify a broader *Green Growth* strategy for a country that relies on natural resources to promote growth in primary sectors coupled with energy and tourism development. At the same time, these reports acknowledge the need to move beyond a sectoral strategy and integrate *Green Growth* within a broader human development strategy (UNDP et al., 2022; UNDP Guinea-Bissau, 2020b). Ensuring sustainable development requires economic sustainability, environmental sustainability, and social sustainability to be achieved (World Bank, 2012). This report follows these previous policy documents by presenting an integrated approach, on the one hand identifying a *Green Growth* sectoral strategy in Guinea-Bissau across agriculture, fisheries, eco-tourism, and green energy, while also addressing improvements in general human and country-level development in infrastructure, governance, and education. In the next sections, we identify *Green Growth* strategies for individual sectors and then move on to consider broader human development needs.

AGRICULTURE AND GREEN GROWTH

The agricultural sector in Guinea-Bissau is the main contributor to its economy and the primary source of labor and income for its population. Combined, agriculture and fisheries make up between 35–45 percent of GDP (Government of Guinea-Bissau, 2020; UN Guinea-Bissau, 2020; UNDP et al., 2022; Verhagen et al., 2022). Most households are employed in agriculture, with cashew nut production being the main source of income for two out of three households in Guinea-Bissau (Santos et al., 2014; World Bank Group, 2020a). However, the agricultural sector and wider economy suffer from mono-cropping, low productivity, and limited value added of raw cashew nut production.

There are challenges to improving the agricultural sector in Guinea-Bissau. Agricultural productivity is severely limited by a lack of farmer education, low levels of electricity access, poor infrastructure, and market access, limited storage capacity, a lack of access to finance, and a young labor force leaving rural areas to pursue better futures in the city (World Bank Group, 2015). Improvement of productivity and land management thus requires improvements to the agricultural sector as well as wider country-level development.

A second issue is the lack of diversification in both the agricultural sector and the whole economy. Today, Guinea-Bissau produces rice, cotton, peanuts, sorghum, palms, and cashew nuts, with the majority being cashew nuts. Cashew nuts get exported while vegetables and staple crops for consumption are imported (Government of Guinea-Bissau, 2020; UN Guinea-Bissau, 2020). Because the economy relies heavily on cashew nut

Woman cultivating the land, Bissau, Autonomous Sector of Bissau

Smoked fish, Bubaque island, Bijagós archipelago

production and exports, its export portfolio is the second least diversified in Sub-Saharan Africa, making Guinea-Bissau highly vulnerable to price shocks (Catarino et al., 2015; Hanusch, 2016; Verhagen et al., 2022). Moreover, both income and labor are highly seasonal in the cashew nut sector. Diversifying agricultural production by diversifying crops and improving the fisheries sector, as well as improvements to the overall economy, are critical for economic development and for food security.

A third challenge pertains to specific issues in the cashew nut sector. The country currently lacks processing facilities for cashews. Thus, most of the raw cashews are exported, primarily to India (OEC, 2020), where they get processed for consumption. Processing cashews in Guinea-Bissau would strongly increase the value of cashew exports, thus generating more income from the main source of production (FAOSTAT, 2021). It would also open opportunities for economic integration with the ability for Guinea-Bissau to export directly to European, U.S., and Asian consumer markets.

The challenge in the agricultural sector will be to expand and diversify agricultural production while limiting the negative impacts of intensification and expansion on natural areas and biodiversity. Previous research has highlighted that prioritizing improved raising yields over land expansion tends to be most beneficial for biodiversity (Beckmann et al., 2019; Phalan et al., 2011; Seppelt et al., 2016). Alternatives are focusing on sustainable land management techniques and increasing biodiversity within production landscapes. However, these management techniques often require access to finance, resources, and farmer education (Cowie et al., 2018; Esch et al., 2021; Tscharntke et al., 2012), and therefore tend to be difficult to implement and maintain in low-income environments. A third challenge will be to continue diversifying the economy to not be reliant on a sole source of income. Installing cashew nut processing facilities and increasing crop yields more generally is a logical step, given the heavy reliance of the economy and income on cashews today. However, this process needs to be accompanied by a broader strategy for economic diversification to move away from a mono-crop economy (Hanusch, 2016).

FISHERY AND GREEN GROWTH

Across West Africa, fisheries account for between 5 percent (Cote d'Ivoire) to over 20 percent (Mauritania) of value add in the primary sector (FAO, 2006). In Guinea-Bissau, agriculture, fisheries and forestry made up 44% of GDP between 2001–2017, and jointly accounted for 80% of labor (Republic of Guinea-Bissau & UNDP Guinea-Bissau, 2020). The jobs provided by this sector allow people to purchase important high-calorie food items such as rice and wheat (Belhabib, Sumaila, Lam, et al., 2015). In addition, subsistence fishing provides a direct source of high-protein food and is the main animal protein in the Guinea-Bissau diet. Guinea-Bissau is located near the Guinea Current Large Marine Ecosystem (LME) and the Canary Current LME. The continental shelves off the coast of Guinea-Bissau are home to approximately one million tons of fishery resources, of which an estimated 350,000 to 500,000 tons can be extracted annually (Belhabib & Pauly, 2015).

The fishery sector in Guinea-Bissau can be divided into foreign industrial fleets and domestic artisanal catch

(UNDP et al., 2022). Legal foreign fishing began in 1978, in agreement with the Soviet Union, which paved the way for other agreements with countries and organizations such as the European Union (EU). Most industrial fishing is conducted by foreign vessels. For example, the total foreign vessels catch along the western African coast exceeds the catch from African vessels (Belhabib 2015). Guinea-Bissau is no exception, with domestic artisanal and subsistence catch accounting for less than 10 percent of total fish catch (Intchama et al., 2018). However, a major issue with foreign fleets is that many of these vessels that fish industrially have illegal, unreported, and unregulated catches. Most of the foreign vessels are considered illegal in the sense that they lack a valid fishing authorization and fail to report their catches (Intchama et al., 2018). The industrial fleets operating in Guinea-Bissau reported around 41 percent of catches to the government between 2011–2017 (Intchama et al., 2018). The lack of government enforcement on illegal catches results in increased risks for overexploitation and to low contributions of foreign fishing to government revenue and the overall economy of Guinea-Bissau.

The domestic fisheries are dominated by artisanal and subsistence catch. The fleet consists of two vessel categories: Senegalese Nhominka pirogues, or canoes, and local dugout canoes, also called pailão (Intchama et al., 2018). Since fishing in the artisanal sector is conducted on a seasonal basis, and not during the agricultural and rainy season, there is limited reported data accounted for in official statistics (Belhabib & Pauly, 2015). Reconstructions of artisanal catches between 1950 and 2010 estimate levels of catch to have grown from 7,100 tons in 1950 to 32,000 tons in 2000, and then declined to 15,000 by 2010 (Intchama et al., 2018). In 2010, the contribution of small-scale fisheries to the Bissau-Guinean economy in terms of revenue was 14.9 million USD, a 6 percent contribution to GDP (Belhabib, Sumaila, & Pauly, 2015).

The artisanal sector provides an important source of subsistence food and animal protein in Guinea-Bissau. In 2000, 60 percent of animal protein consumed came from fish (Commission of the European Communities, 2000). Given the rich fishing grounds, further modernizing the domestic fisheries sector holds the potential to contribute to food security, poverty alleviation, and economic growth in Guinea-Bissau. However, due to current over-exploitation and illegal fishing practices, small-scale fisheries are unable to contribute to poverty alleviation.

According to the Food and Agriculture Organization (FAO) in 2006, all West African fishing grounds were either fully exploited or over-exploited (FAO, 2006). Therefore, strategies to grow a domestic fishing sector should aim to increase domestic catch while simultaneously lowering foreign catch. Reduction in marine resources from fishing ground exploitation can lead to severe effects on employment opportunities and standards of living for artisanal or subsistence fishing households (Belhabib, Sumaila, & Pauly, 2015). In turn, this can lead to severe environmental degradation due to fishers' behavior as they adapt to the declining catch by intensifying and expanding the fishing effort (Belhabib, Sumaila, & Pauly, 2015). Declines in artisanal fish catch also result in rising costs and a reduction in income earned. However, there is still an increasing reliance in West Africa's coastal population on fisheries for subsistence, which could further aggravate the poverty level in coastal populations (Belhabib, Sumaila, & Pauly, 2015). Climate change could also threaten the long-term sustainability of fisheries in Guinea-Bissau, with projections showing that it may lead to a substantial reduction in marine fish production and a decline in fish protein supply in this region by the 2050s (Lam et al., 2012).

ECO-TOURISM AND GREEN GROWTH

Guinea-Bissau's National Strategic Development Plan "Terra Ranka" describes tourism as an essential pillar for socio-economic development (World Bank, 2015). However, despite the country's vast natural beauty, tourism remains an underdeveloped sector of the economy. Since 2005, tourist arrivals in Guinea-Bissau have increased by an average of 4,000 people per year, with a recorded 52,400 international tourists in 2019 (World Bank Group, 2022a). In 2011, tourists spent an average of 1,050 USD per person,[4] accounting for just over 5 percent of total exports (World Bank Group, 2022b). In 2016–2017, the sector's contribution to the economy was estimated to be less than 2 percent of GDP and 4.4 percent of total exports.

If the tourism sector continues to expand at a rate similar to that of the past 15 years, it is unlikely to become a significant engine of growth for the country. Nevertheless, data on tourist arrivals suggests that the top five Small Island Developing States (SIDS) with the most significant increases in tourism have maintained average annual arrival growth rates of above 10 percent over the last 10 years, with a few able to maintain similar levels for

two decades (Table 4). Within this group, several countries have increased the number of arrivals more than five-fold over a 13-to-14-year period (Akadiri & Akadiri, 2021; OECD, 2020; Pratt, 2015; Roudi et al., 2019; Wanhill, 1994; World Bank Group, 2022a).

However, Guinea-Bissau faces many challenges in achieving similar successes, such as inadequate infrastructure, including transportation between prime destinations, and basic utilities such as water, sanitation, and electricity (Government of Guinea-Bissau, 2020; UN Guinea-Bissau, 2020; UN Habitat, 2021; UNDP et al., 2022). Further, a lack of hospitality-oriented skills, limited governance (in terms of security and capacity), and a lack of clear and coordinated strategy may pose an obstacle to the competitiveness of the sector (UNDP/Pardee Scenario Workshop Bissau, personal communication, March 2022).

If the country is successful in harnessing their potential and undergoing a tourism-led transformation, like that of some of its peers, a coordinated strategy may be essential to ensure that those gains do not come at the cost of their natural resources and that they are more equitably distributed. If improperly managed, tourism can have detrimental effects on the local environment, particularly in terms of biodiversity loss (Hall, 2010), as well as negative impacts on traditions and culture. However, an ecologically minded tourism strategy can also serve to protect the environment and biodiversity through conservation, sustainable practices, and political support for sustainable policies (Hall, 2010). Studies have also found that tourism often increases inequality, by creating jobs for skilled workers and tourism infrastructure being owned by domestic and foreign wealthier households (Alam & Paramati, 2016). Guinea-Bissau is currently in the top 20 most unequal countries in the world, meaning gains derived from greater growth will do far less to benefit those most in need than wealthier households. Under these conditions, increased inequality from tourism could potentially offset the returns to poor and vulnerable households from tourism. Therefore, a sectoral strategy to promote eco-tourism needs to be combined with policies aimed at ensuring more equitable distributions to bring tourism in line with poverty reduction strategies.

ENERGY SECTOR AND GREEN GROWTH

Access to electricity in Guinea-Bissau is generally low, and this is even more true for rural communities (Government of Guinea-Bissau, 2020; UN Guinea-Bissau, 2020; UN Habitat, 2021; UNDP Guinea-Bissau, 2020b; Verhagen et al., 2022). According to the World Bank, only 29 percent of the population of Guinea-Bissau has access to any form of electricity, which is significantly below the 48 percent average in countries in Sub-Saharan Africa (World Bank Group, 2020b). In 2012, the Renewable Energy and Energy Efficiency Partnership (REEEP) authored a report on Guinea-Bissau's use of energy. The findings of this report stated that Guinea-Bissau was one of the lowest countries in the world in terms of energy use, at 0.3 ktoe (thousand tonne of oil equivalent) per person per year (REEEP, 2012). Guinea-Bissau also has one of the lowest electrification rates and highest electric service costs in Africa.

The total generation capacity of the nation, depending on the data source, varies from 11–21 megawatts (MW) (World Bank Group, 2020b). Since the Guinea-Bissau civil war in 1998–1999, the public power system has been lowering its generation capacity. Due to political instability, poor management, lack of planning, and vested interests, the electricity sector was trapped in that downward spiral for several years, thus lowering the generation capacity in total. However, in recent years much progress has been made. The most recent data from 2019 stated that the power supply has improved drastically due to an agreement with a 30 MW heavy fuel oil power ship, although the reliability of power supply remains an issue. Under a power purchase agreement (PPA), a private operator supplies the electricity and because of this PPA, diesel theft has been eliminated, the available generation capacity has increased, and the unit generation cost has been reduced (World Bank Group, 2020b). However, the power supply remains centered on Bissau with limited-to-no access to electricity in rural communities (UN Habitat, 2021). Outside of these official statistics, the production of energy in Guinea-Bissau relies on biofuels for traditional energy generation.

Guinea-Bissau is hoping to increase electricity access and production through renewable resources, rather than oil. Due to its abundance in annual sunshine, Guinea-Bissau has the potential to derive much of its electricity generation from solar (IRENA, 2019). Solar has the highest potential of success in implementation and adoption of any renewable energy source in Guinea-Bissau. According to ESMAP (2020), most of the land evaluated within the country has an average theoretical potential to generate 5.6 kWh of electricity from solar PV per square meter, falling in the upper range of all countries analyzed. This potential is currently underutilized, with a total capacity of only 1 mega-watt peak (MWp) of combined

on-grid and off-grid solar PV electricity as of 2018 (ESMAP, 2020). Currently, there is a 20 MW solar PV power plant as well as several hybrid mini-grid and off-grid solutions under development in Guinea-Bissau, showing that this potential is beginning to be realized (ECREE, 2019; Mandela, 2021). Similar trends can be observed in the region with Senegal expanding its solar power generation, and the construction of hydropower dams in Guinea.

ENABLING ENVIRONMENT AND GREEN GROWTH

There are strong synergies between a *Green Growth* strategy and broader human development in Guinea-Bissau. However, it is critical for Guinea-Bissau to develop a joint approach linking human development to *Green Growth* to avoid the risks of 1) not maximizing the benefits from a *Green Growth* strategy and 2) not achieving an inclusive economic growth strategy. The need to embed a green sectoral growth strategy into a broader human development strategy has been highlighted across several reports (Government of Guinea-Bissau, 2020; UN Guinea-Bissau, 2020; UN Habitat, 2021; UNDP et al., 2022; UNDP Guinea-Bissau, 2020b). In addition, participants at a recent scenario workshop in Bissau (UNDP/Pardee Scenario Workshop Bissau, personal communication, March 2022) continuously highlighted the importance of creating an *Enabling Environment* to successfully implement a green sectoral strategy. These synergies are mutual. Green sectoral growth can raise income and increase resources available to invest in education, infrastructure, and health. However, successful implementation of green sectoral policies requires improvements in governance, infrastructure, and education.

Education levels in Guinea-Bissau are low compared to regional counterparts and other SIDS (UN Guinea-Bissau, 2020; UNDP Guinea-Bissau, 2020b). Besides low overall levels of education, female education is also considerably lower compared to that of males (UNDP Guinea-Bissau, 2020b). Many of the transitions toward a *Green Growth* economy require skilled labor. However, the few professional courses related to skilled labor topics that are available in Guinea-Bissau are in urban centers, making access to skills courses difficult for rural communities (UNDP Guinea-Bissau, 2020b). For example, technological innovation, the use of machinery and equipment in agriculture, and the adoption of new land management techniques all require farmer education. Similarly, the use of industrial fishing boats, cashew nut processing facilities, and installation and maintenance of green energy solar plants all require skilled labor. Eco-tourism will require communication in English, Portuguese, French, and other languages. A higher and more diversely educated working population both through education in schools and through education at work will be an important condition to maximize the benefits of a *Green Growth* strategy.

Mobile phone antenna, Bubaque island, Bijagós archipelago

Political instability has been another major challenge in Guinea-Bissau (UN Guinea-Bissau, 2020; UNDP et al., 2022; UNDP Guinea-Bissau, 2020b; Verhagen et al., 2022). Political stability is necessary to create an *Enabling Environment* for *Green Growth*. Among other things, political instability creates uncertainty for business and FDI, hampering the business environment for *Green Growth*. *Green Growth* also requires enough government capacity to implement policies such as new taxation schemes and the ability to enforce legislation (Government

of Guinea-Bissau, 2020). Currently the government lacks the capacity to enforce fishing contracts, resulting in high illegal catch and lower revenues from fishing contracts. There is also a gap between production and recorded statistical data, making it hard to use data for reference (UNDP Guinea-Bissau, 2020b). Furthermore, limited governance (in terms of security and capacity) and the lack of a clear and coordinated strategy may pose an obstacle to the competitiveness of the eco-tourism sector (UNDP/ Pardee Scenario Workshop Bissau, personal communication, March 2022). Implementing a sustainable *Green Growth* strategy thus requires improvements in governmental stability and capacity in Guinea-Bissau.

There are also several elements of infrastructure that are critical for a *Green Growth* strategy (UN Habitat, 2021). Improvements in access to clean water and sanitation are often used as a direct measure of progress on *Green Growth* (OECD, 2017). Additionally, improved water infrastructure and water management can create a better business environment in both the agricultural sector and in other sectors. Roads, seaports, and airports are critical infrastructure to create market access, allow in-country transportation for eco-tourism, and efficiently import and export goods and services. Electricity access is also an important condition to improve the business environment and to allow for the use of tools and equipment across economic sectors. Improving transportation infrastructure, water and sanitation, and electricity will also be critical to promote a better health sector. Therefore, much of the *Green Growth* transition relies on improvement in infrastructure.

Finally, creating an inclusive economic *Green Growth* path requires addressing existing inequalities (UN Guinea-Bissau, 2020; UN Habitat, 2021; UNDP et al., 2022; UNDP Guinea-Bissau, 2020b). Today, income inequalities in Guinea-Bissau are among the highest in the world. As a result, economic growth benefits a smaller portion of the population and has a limited impact on raising people out of extreme poverty. Similarly, gender inequality in education means that, on average, females and girls are less likely to go to school and stay in school, and adult females, on average, have fewer years of education than males. This inequality has long-lasting impacts on the social and economic roles that females play in a society (UN Guinea-Bissau, 2020; UNDP Guinea-Bissau, 2020b, 2020a). There are also clear differences in the services of urban and rural communities, including levels of education and income, as well as access to infrastructure for roads, electricity, water, and sanitation (UN Habitat, 2021; UNDP Guinea-Bissau, 2020b). The agriculture sector consists of a large portion of low-skilled and low-income households. Raising revenues in this sector thus primarily benefits unskilled poorer households and has the potential to lower inequality. At the same time, studies have also found that a rise in tourism often increases inequality (Alam & Paramati,2016). If a *Green Growth* strategy does not explicitly address these inequalities, the resulting growth and human development is unlikely to be inclusive, and will contribute less to raising the economic, social, and human development conditions for everyone in the country.

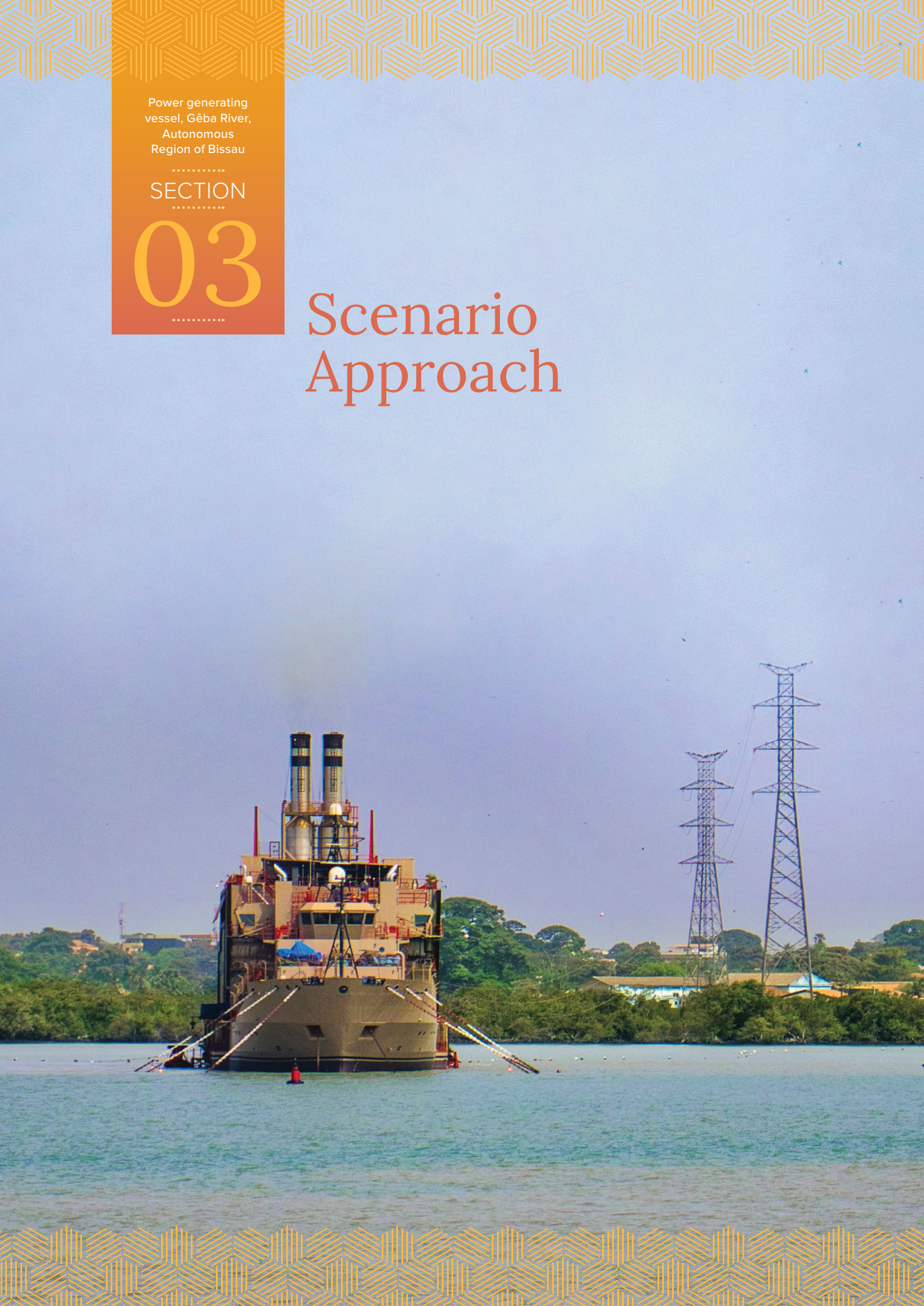
Solar panels for power generation,
Bubaque island, Bijagós archipelago

Power generating vessel, Gêba River, Autonomous Region of Bissau

SECTION

03

Scenario Approach



Ilhéu do Rei, Bissau, Autonomous Sector of Bissau

We explore alternative development futures in Guinea-Bissau by constructing three scenarios: *Current Path*, *Enabling Environment*, and *Green Growth*.

The *Current Path* scenario is built on the previous report and describes a world in which development in Guinea-Bissau follows historical trends, without any deliberate policy strategies to alter the course of development (Verhagen et al., 2022). We use this scenario as a base against which we quantify the costs and benefits of alternative policy strategies. The *Enabling Environment* scenario models a future in which Guinea-Bissau achieves ambitious yet realistic progress on indicators of education, governance, gender, income and spatial inequality, and infrastructure. This scenario describes the necessary improvements needed to provide the basis for successful and inclusive implementation of a green sectoral strategy.

Lastly, the *Green Growth* scenario combines the policy strategies in the *Enabling Environment* scenario with green sectoral growth policies in Guinea-Bissau to accelerate economic growth and human development and enhance economic diversification. We then implement these scenario interventions in the International Futures (IFs) model and quantify the long-term costs and benefits to economic and human development in Guinea-Bissau. Below we describe the scenario narratives and the IFs model. The interested reader can also find the technical implementation of the scenarios in the Appendix.

THE INTERNATIONAL FUTURES (IFs) MODEL

The IFs model is a long-term integrated modeling platform to explore and quantify alternative futures in economic and human development (Hughes, 2019). The IFs model operates for 186 countries, including Guinea-Bissau, and integrates a wide range of sub-models such as agriculture, economy, energy, demographics, education, infrastructure, and governance. It allows for the quantification of a wide set of outcome indicators on economic development, demographics, and SDG achievement. It represents the world as a set of interconnected systems allowing for exploration of questions related to both direct interactions (e.g., how much do investments in education affect the gender gap in education years of adults 20 years from now) and indirect interactions (e.g., how much and through which pathways does investment in education affect extreme poverty 20 years from now). The IFs model is fully open-source and can be used by anyone with a Windows operating system, and all underlying documentation is freely available. In addition, the previous report of this series provides a detailed technical overview of some of the main components of the IFs model of relevance to Guinea-Bissau (Verhagen et al., 2022), and we also provide a Portuguese version of the model, as well as a Portuguese guide on constructing scenarios in IFs.[5]

CURRENT PATH SCENARIO

The *Current Path* scenario describes a world in which Guinea-Bissau continues to follow historic development trends, without any deliberate policy strategies to further accelerate progress on human development or "green" economic sectors. Since the last report, some small updates have been made to the *Current Path* scenario. First, we use an updated version of the IFs model (V7.84 compared to V7.73). Updates include both new data to initialize a wide range of data series for Guinea-Bissau, the latest information on GDP growth rates in the pandemic period, and adjustments to the agriculture and energy sector to better represent these specific sectors in Guinea-Bissau. Second, and more importantly, we have updated specific data series for Guinea-Bissau on education,[6] energy production, and fisheries catch

Boat on Fishermen's Beach, Varela, Cacheu Region

Woman selling vegetables, Bubaque island, Bijagós archipelago

(Belhabib, Sumaila, & Pauly, 2015; Belhabib & Pauly, 2015; Intchama et al., 2018; IRENA, 2018, 2019), and fisheries' share in diets and income (Belhabib, Sumaila, & Pauly, 2015). Table 5 provides a comparison of this scenario in the old and new reports. Overall, the effect of the new data on differences in outcome indicators in 2040 between the old and updated report is small.

ENABLING ENVIRONMENT SCENARIO

The *Enabling Environment* scenario describes a world in which Guinea-Bissau achieves progress on education, governance, and infrastructure indicators. Table 3 provides an overview of the main interventions in the scenario. For example, investments in infrastructure increase access to safe water from 77.6 percent in 2040 in the *Current Path* scenario to more than 90 percent in the *Enabling Environment* scenario. Similarly, primary education completion for children increases from 54.6 percent to 67.4 percent. This scenario specifically focuses on improving SDG 4 on quality education, SDG 6 on clean water and sanitation, and SDG 16 on peace, justice, and strong institutions. Additionally, the *Enabling Environment* scenario aims to focus on inclusive development by closing gender gaps in education; increasing access to road, water, sanitation, and electricity infrastructure for rural communities; and decreasing inequalities in income and caloric consumption. As such, the scenario specifically targets SDG 5 on gender equality, SDG 8 on inclusive and sustainable economic growth, and SDG 10 on reduced inequality within countries.

GREEN GROWTH SCENARIO

The *Green Growth* scenario describes a future in which Guinea-Bissau achieves inclusive economic growth by implementing a strategy that sustainably uses its natural capital. It represents economic growth and diversification,

with progress in agriculture, fisheries, eco-tourism, and green energy sector on top of the interventions in the *Enabling Environment*. The improvements in the *Green Growth* scenario are implemented at the sectoral level and represent a green economic strategy. The *Green Growth* scenario thus describes combined green progress in economic sectors with improvements in human development.

Specifically, the agriculture sector can attract FDI to process agricultural products such as cashew nuts and other crops while increasing value add in agriculture by generating higher benefits from exports. Additionally, training and educating farmers, adopting more efficient production techniques, and improving access to agricultural markets increase the productivity of agriculture, resulting in a rise in agricultural production. Agricultural expansion of land is minimal-to-none to protect remaining forest areas and biodiversity. In the resulting scenario, deforestation is limited to 0.1 million hectares between 2017 and 2040, or 3.8 percent of existing forests. By 2040, 68.5 percent of the land in Guinea-Bissau is forested, well above international global biodiversity goals such as Half Earth (Kok et al., 2020). This land use change falls within the mitigation strategy outlined in the NDC for Guinea-Bissau that allows for a stronger deforestation in the ambitious scenario (Republic of Guinea-Bissau & UNDP Guinea-Bissau, 2020). In addition, the economy of Guinea-Bissau can diversify by unlocking potential in fisheries and eco-tourism while increasing electricity access and renewable energy production. In fisheries, Guinea-Bissau can construct a domestic fishing fleet that will partly replace fish catch from foreign vessels. To remain within sustainable catch limits, this scenario assumes no increase in total fish catch but a shift from international to domestic fish catch. In addition to increases in total domestic fish catch, better enforcement of fishing rights and landings will increase government revenue from fishing rights for Guinea-Bissau.

Eco-tourism under this scenario is focused on the natural beauty of the Bijagos Archipelago with a simulated increase in the numbers of visitors from abroad and constant expenditures per tourist visit. The tourism sector will primarily focus on high-end sustainable eco-tourism using this UNESCO Biosphere reserve as the main attraction. Over time additional tourism opportunities can be developed around mangroves, inland forest areas, sustainable beach tourism in Cacheu, and cultural sightseeing in Bolama following expansion of general and specific tourism infrastructure.

For green energy, Guinea-Bissau can implement a strategy to domestically produce renewable energy by investing in both large-scale solar PV plants and off-grid, small-scale solar PV plants. Together these interventions increase domestic energy production and access to energy in rural communities that are not reached by the country's main power grid while reducing the need for energy imports. Across all scenarios we scaled interventions to the level of regional peers such as other SIDS, Economic Community of West African States (ECOWAS) countries, and specific regional peers (Senegal and Cabo Verde). By using these comparisons, the historical progress achieved in these countries and the current levels of development serve as a guide for what is ambitious but achievable in Guinea-Bissau.

Woman participating in the consultation process for the preparation of the Voluntary National Review, Buba, Quinara region

The Appendix provides a more detailed technical overview of the scenario interventions. It also points readers to the literature on which the scenario interventions are based and the technical implementation in IFs for replication. Table 3 provides an overview of each scenario intervention in the *Green Growth* and *Enabling Environment* scenarios.

OUTCOME INDICATORS

Economic and human development for all requires an integrated, inclusive, and holistic perspective across a wide range of indicators. To allow for a comparison between scenarios in this and the previous report, we follow a similar structure. First, we quantify the outcomes of each scenario for macro-economic development on indicators such as GDP, GDP per capita, average economic growth, and population growth. These broad indicators of development help to contextualize development across countries and provide the necessary means to invest in furthering the human condition. In addition, we quantify progress on broad indicators of human development including education, infrastructure, governance, and inequality. While these are direct interventions in the *Enabling Environment* scenario, they provide an inclusive overview of human development in Guinea-Bissau.

We then quantify the outcomes of all interventions for SDG 1 for extreme poverty and SDG 2 for population-wide undernourishment and child stunting. These indicators provide insight into the progress made in achieving SDGs across these different policy strategies. In addition, many SDGs are broadly associated with human development. For example, progress on child stunting is driven by economic progress, progress on inequality, specific progress in the agriculture sector, access to safe water and sanitation, and levels of maternal education (Verhagen et al., 2021). As such, SDGs not only provide a framework to quantify progress across countries but also provide a useful set of indicators to measure progress across economic and human development. Together the macro-economic indicators, the SDG indicators on extreme poverty and undernourishment, and the broader progress on human development provide a full picture of the costs and benefits associated with a *Green Growth* strategy for Guinea-Bissau.

Bissau-Guinean women

WORKSHOPS

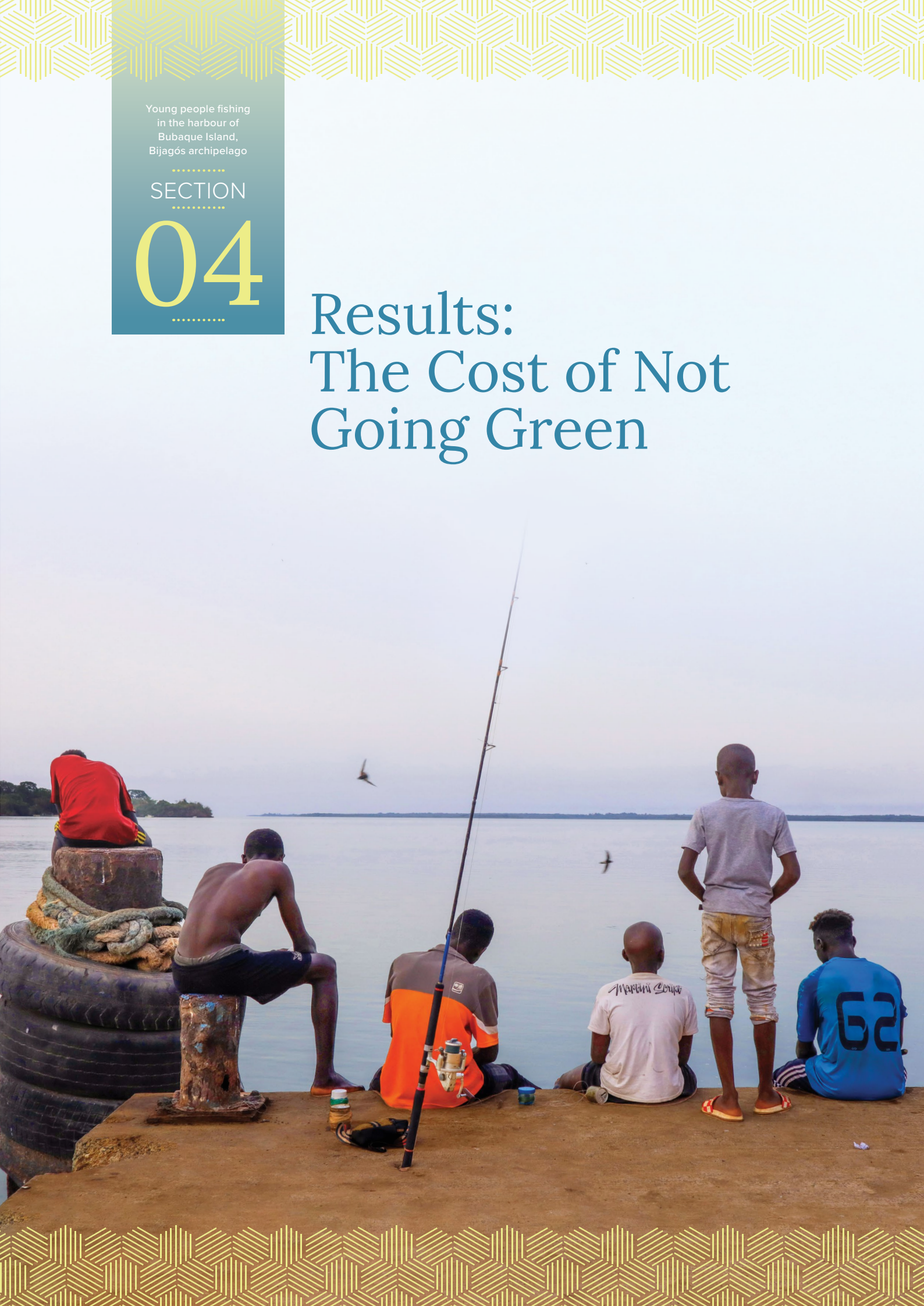
In March 2022, the Pardee Center and UNDP organized a five-day participatory workshop in Guinea-Bissau with government officials, NGOs, the private sector, and members of academia where preliminary scenarios were presented and discussed. This feedback was integrated into the scenario set up for this report and resulted in the revision of individual scenario elements and the general approach. We will reference insights from the workshop on an anonymous basis (UNDP/Pardee Scenario Workshop Bissau, personal communication, March 2022). During the participatory workshop, we also discussed policy recommendations, which are reflected in the Policy Strategies section (Section 5).

Young people fishing in the harbour of Bubaque Island, Bijagós archipelago

SECTION

04

Results: The Cost of Not Going Green



Woman selecting freshly caught fish in port, Bubaque Island, Bijagós archipelago

Economic growth is not an end goal but provides the resource base to accelerate inclusive growth and human development.

Here we look at broad macro-economic trends in GDP, GDP per capita, economic growth, domestic economic structure, government finance, and international relations. Table 1 provides an overview of macro-economic indicators and population dynamics.

In the *Current Path* scenario between 2023–2040 average GDP growth is three percent, or close to the historical average growth over the last 20 years (3.4 percent). In *Enabling Environment*, the 2023–2040 average growth rises to 4.3 percent, whereas in the *Green Growth* scenario the long-term average growth reaches 5.5 percent. Both scenarios thus describe a substantial acceleration of economic progress compared to the *Current Path*. The long-term average growth in *Green Growth* also exceeds the projected long-term economic growth in the *Current Path* for Sub-Saharan Africa (4.4 percent) and ECOWAS (4.9 percent) from 2023–2040.

GDP per capita is an important indicator that captures economic performance across countries (Figure 3). While it is an incomplete measure of economic and human well-being, it does serve as an important indicator to compare levels of development over time and between countries. Average income in Guinea-Bissau increases in both the *Enabling Environment* and *Green Growth* scenarios, relative to the *Current Path*. In the *Current Path*, GDP per capita reaches 1,857 USD by 2040, or 21 percent above GDP per capita in 2022. In the *Enabling Environment* income per capita reaches 2,144 USD, or 39 percent above levels in 2022, and in *Green Growth* it reaches 2,495 USD, 62 percent higher than what it is today. Even though the level of GDP per capita in *Green Growth* results in significant gains by 2040, it is still lower than the GDP per capita of six countries in the ECOWAS region in 2022. Across the 30 SIDS included in IFs, Guinea-Bissau today has the lowest GDP per capita. The GDP per capita reached in the *Green Growth* in 2040 still only ranks 28th out of 30 SIDS in 2022.

There is an important difference in the growth trajectory of the *Enabling Environment* and *Green Growth*. In *Green Growth* the economic sector policies result in direct positive effects on economic growth, with a 17 percent rise in GDP per capita by 2030 relative to 2022. In the *Enabling Environment*, the gains to economic growth are initially small, with only 10 percent growth in GDP per capita by 2030, relative to 7 percent in the *Current Path*. Thus, initially, the policies implemented in the *Enabling Environment* do not result in a strong divergence from the *Current Path*, whereas *Green Growth* immediately results in economic gains. However, after 2030 the economic growth trajectory in the *Enabling Environment* accelerates and diverges more significantly from the *Current Path*. Thus, the benefits from the *Enabling Environment* for economic growth and average income take time to manifest. Together, the policy strategies in *Green Growth* result in direct economic gains from agriculture, fisheries, eco-tourism, and green energy interventions, and additional economic gains after 2030 from the combined benefits of investments in infrastructure, education, and governance.

Many policies that improve human development take time to produce economic gains. For example, improvements in the education of boys and girls have direct benefits to school-aged children, which builds human capital.

Figure 3 *GDP per Capita at purchasing power parity from 2019 to 2040 in Guinea-Bissau for the Current Path, Enabling Environment, and Green Growth scenarios.*

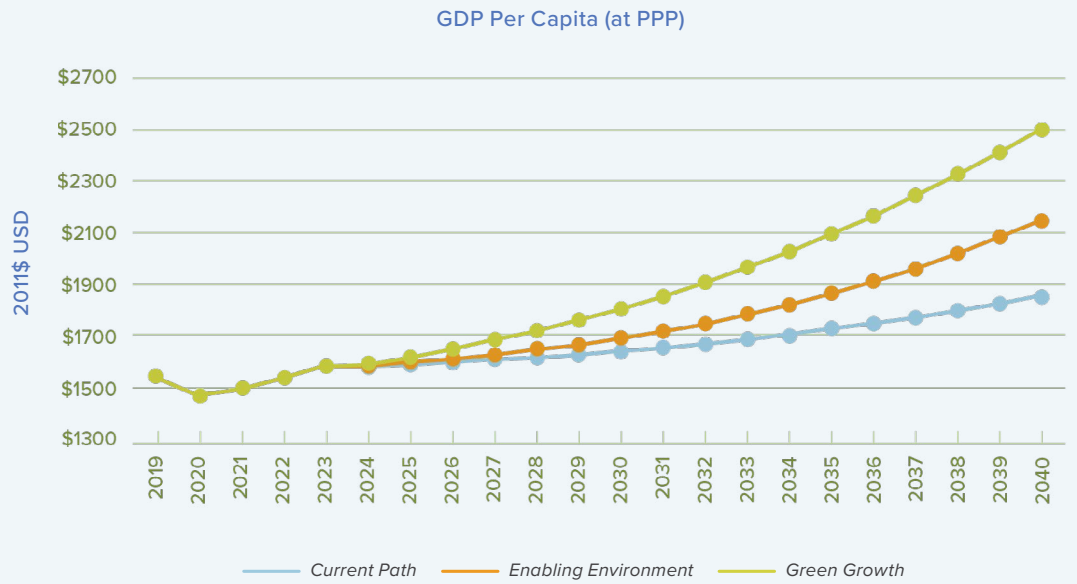


Table 1

Macro-economic projections for Guinea-Bissau's (2030 and 2040) for Current Path, Enabling Environment, and Green Growth scenarios across indicators including GDP (MER), GDP per Capita (PPP), agricultural sector's contribution to GDP (%), services sector's contribution to GDP (%), value of exports (Billion 2011 USD$), FDI inflows (% of GDP), and population. Projection for average GDP growth rate between 2023 and 2040.

Macroeconomic Table

		2030			2040		
SECTOR	MEASURE	CURRENT PATH	ENABLING ENVIRONMENT	GREEN GROWTH	CURRENT PATH	ENABLING ENVIRONMENT	GREEN GROWTH
GDP (at MER)	Billion 2011 USD	1.9	1.9	2.1	2.6	3.2	3.9
GDP Per Capita (at PPP)	Thousand 2011 USD	1.6	1.7	1.8	1.9	2.1	2.5
GDP Growth	Average % (2023–2040)				3.0	4.3	5.5
Population	Millions	2.5	2.5	2.5	3.1	3.1	3.1
Agriculture Sector	% of GDP	39.8	38.2	36.9	32.8	26.9	24.8
Services Sector	% of GDP	38.3	39.3	43.2	40.0	43.5	51.5
Exports	Billion 2011 USD	0.4	0.5	0.6	0.7	0.9	1.4
FDI	% of GDP	2.1	2.3	8.9	2.4	2.8	7.0

However, it takes time for these children to complete their schooling, join the labor force, and contribute higher human capital to realize economic growth. A second important consideration is the financial resource base. Investments in education, infrastructure, and health all come from the same limited government budget. In the initial years, investments in education might result in lowering spending on health and infrastructure and potentially introduce trade-offs or unintended negative consequences. Over time, a growing economy from both human development and growth in agriculture, fisheries, and other sectors provide additional resources for all government expenditures thus increasing the overall government budget and minimizing trade-offs between different

government expenditure categories. This highlights the mutually beneficial interaction in simultaneously improving the *Enabling Environment* and combining it with green sectoral policies (*Green Growth*). Combined, these strategies increase both the resource base for investments in education, infrastructure, health, and other areas while creating the needed governance stability, human capital, and infrastructure required to benefit from a transition to a green economy.

A *Green Growth* strategy not only changes patterns of economic growth but also shifts the structure of the economy, both domestic and international. The two sectors that contribute the most to GDP are agriculture (including fisheries) and services (including tourism). As of 2022, agriculture contributes around 43.5 percent to total GDP in Guinea-Bissau. Economic modernization and economic diversification result in the share of the agricultural sector dropping to 32.8 percent in *Current Path* by 2040. The share of the agricultural sector in the total economy drops even further in the *Enabling Environment* (26.9 percent) and *Green Growth* (24.8 percent). So, while economic growth in *Green Growth* is partly driven by a flourishing agricultural sector, the rise of other sectors such as green energy and eco-tourism diversifies the economy, resulting in a smaller contribution of the agricultural sector to overall GDP.

Similarly, the *Enabling Environment* and *Green Growth* alter the international economic relations of Guinea-Bissau to the outside world. Agricultural exports increase from 6 percent of GDP (*Current Path*) in 2040 to 17 percent (*Green Growth*), and the exports in the services sector increase from 2.6 percent (*Current Path*) to 9.2 percent (*Green Growth*) of GDP. The changing export and import patterns have important implications for food self-sufficiency. Agricultural import dependence measures the difference between imports and exports relative to total demand. A positive and increasing value means that a country becomes increasingly dependent on imports to feed its population. The agricultural import dependence of Guinea-Bissau in 2022 is 13 percent. The rise in population coupled with rising GDP per capita results in strong expected increases in agricultural demand for many countries in Sub-Saharan Africa and an increasing agricultural import dependence, even with rising agricultural production in many African countries (van Ittersum et al., 2016; Verhagen et al., 2021). Guinea-Bissau is no exception, with the import dependence on agriculture rising to 30 percent of total consumption in the *Current Path* and *Enabling Environment*.

Solar panels for power generation

In *Green Growth*, rising economic growth results in even higher total demand, but is accompanied by a growing domestic agriculture and fisheries sector. Combining these interventions results in a stabilization of the agricultural import dependence at 13.7 percent of total consumption in 2040.

The economic transition described across these scenarios is heavily reliant on the international community and business increasing the foreign inward money flow. The total value of exports increases from 0.7 billion USD in 2040 (*Current Path*) to 0.9 billion USD (*Enabling Environment*) and 1.4 billion USD (*Green Growth*). Similarly, the *Green Growth* interventions are funded partly by FDI rising from 2.4 percent of GDP in 2040 (*Current Path*) to 2.8 percent and 7 percent in the *Enabling Environment* and *Green Growth*, respectively. This requires a significant effort by the international community to support green and inclusive human and economic development in Guinea-Bissau. This partly depends on internal political stability to create the critical conditions for businesses to invest and grow (*Enabling Environment*). It also means that the *Green Growth* transition and accompanied accelerated economic growth heavily relies on foreign money through foreign firm investment, government aid, spending of tourists, and visits and remittances from the diaspora community. Without these additional resources, it will be hard for Guinea-Bissau to realize the progress outlined in the *Enabling Environment* and *Green Growth* scenarios.

ENABLING ENVIRONMENT AND IMPROVEMENTS IN EDUCATION, HEALTH, AND HUMAN DEVELOPMENT

There are many people in Bissau that have a decent income, but they cannot buy food to feed their family. They have no access to water, to electricity, cannot send their kids to good quality schools, and cannot afford health care. How can you tell me that person is not poor?

— UNDP/Pardee Scenario Workshop Bissau, personal communication, March 2022

Young people participating in a training on entrepreneurship, Bissau, Autonomous Sector of Bissau

Economic growth, adequate public spending, and increased household income can be used to promote broader human development. In the *Enabling Environment* and *Green Growth* scenarios, interventions focus on improving governance, education, and infrastructure, as well as ensuring that economic growth and progress is inclusive across income, gender, and rural-urban divides. Table 2 provides an overview of key indicators across these dimensions. While the scenarios sometimes directly intervene on these outcomes, it is nonetheless helpful to study these outcomes as they provide a much broader picture of pathways for socio-economic and human development in Guinea-Bissau, both through direct changes and long-term indirect effects.

Adult education years measures the average number of years that either females or males have been in formal schooling and is used as a component of the UN Human Development Index. The mean years of schooling in Guinea-Bissau for a person 15 years and older increases from 4.2 years in 2022 to 4.8 years in 2040 (*Current Path*). The *Enabling Environment* and *Green Growth* improve the average education years by half a year, to 5.2 and 5.3 average years of education, respectively (Table 2). On average, females have less education than males. This gender gap in education is projected to reduce over time. As of 2022, the average male (age 15–24) has one more year of education than the average female. By 2040, this gender education gap reduces to 0.7 years in both the *Enabling Environment* and *Green Growth*.

A second important dimension of the human development index is the ability to live a healthy life. Average life expectancy in the Guinea-Bissau *Current Path* is projected to reach 63.5 years in 2040, and 64.7 and 65.3 years in the *Enabling Environment* and *Green Growth* scenarios. This improvement is achieved without any direct interventions in the health sector, but simply by governments allocating more money toward education and infrastructure improvements. In the *Enabling Environment*, cumulative government spending (2023–2040 period) on health is nearly the same as in the *Current Path*. However, additional investments in water and sanitation infrastructure result in health gains for children and adults, leading to net positive benefits on life expectancy. In *Green Growth*, the government in Guinea-Bissau spends an additional 145 million USD on healthcare cumulatively between 2023 and 2040. This additional spending is a result of economic growth that results in increases in overall government spending. Therefore, in both scenarios synergies between education, health, and infrastructure result in net positive health gains. However, in the initial years, careful management of possible trade-offs between health and other government spending categories is required to minimize these risks.

Improvements in infrastructure are important to create an *Enabling Environment* for green economic growth and provide health benefits. Access to improved water sources increases to 93 percent of the population by 2040 (*Green Growth*), relative to 78 percent in *Current Path*. Similarly, access to improved sanitation rises to just

Table 2 *Progress in indicators of education, health, governance, and infrastructure in projections for Guinea-Bissau's (2030 and 2040) Current Path, Enabling Environment, and Green Growth scenarios.*

HDI Table

		2030			2040		
SECTOR	MEASURE	CURRENT PATH	ENABLING ENVIRONMENT	GREEN GROWTH	CURRENT PATH	ENABLING ENVIRONMENT	GREEN GROWTH
Education	Adult Mean Education Years (15+)	4.4	4.5	4.5	4.8	5.2	5.3
	Adult Mean Education Years (25+)	3.7	3.8	3.8	4.0	4.2	4.4
	Adult Mean Education Years (15–24)	5.7	5.8	5.9	6.6	7.3	7.5
	Primary Enrollment, Boys (%)	82.9	87.3	87.8	87.0	93.6	94.2
	Primary Enrollment, Girls (%)	81.2	85.3	85.8	86.5	91.8	92.5
	Secondary Enrollment, Boys (%)	30.9	36.5	37.3	46.7	58.1	59.5
	Secondary Enrollment, Girls (%)	29.7	36.3	37.2	46.2	58.9	60.4
Health	Life Expectancy	61.1	61.5	61.8	63.5	64.7	65.3
	Infant Mortality (deaths per 1000 live births)	44.2	41.8	39.7	36.0	29.0	25.9
Infrastructure	Access to Improved Water (%)	73.9	79.9	80.5	77.6	90.7	92.6
	Access to Improved Sanitation (%)	29.1	34.0	36.9	42.5	61.5	69.4
	Access to Electricity, Total (%)	33.4	40.5	44.7	41.8	63.8	76.0
	Access to Electricity, Rural (%)	15.6	20.3	23.7	23.3	44.6	57.5
	Access to Electricity, Urban (%)	53.0	62.7	67.8	59.8	82.5	93.8
Governance	Government Effectiveness (0–5)	1.1	1.5	1.5	1.3	2.4	2.5
	Health Spending	$29 million	$25 million	$32 million	$47 million	$54 million	$72 million
	Education Spending	$63 million	$61 million	$76 million	$110 million	$150 million	$203 million
	Infrastructure Spending	$95 million	$137 million	$155 million	$112 million	$195 million	$229 million
	Government Debt (% of GDP)	17.2	17.2	19.3	22.9	23.9	27.8

under three-quarters of the population by 2040 (*Green Growth*: 70 percent), relative to less than half of the population in *Current Path* (43 percent). This increased access has important consequences for food security, child stunting, and reductions in infant mortality (Figure 4). The combination of economic growth and health gains from increased access to water and sanitation provide health benefits on both life expectancy and infant mortality, relative to *Current Path*. These health benefits occur without direct scenario interventions on health, instead resulting from a synergy between education, governance, and infrastructure improvements.

Achieving inclusive economic growth requires overcoming existing inequalities and implementing policies to make sure the benefits from achieved progress are enjoyed by all. Inequality has many dimensions, and here we focus on a limited example without claiming to provide a full picture. In the previous section, we already showed that the *Enabling Environment* and *Green Growth* scenarios reduce gender gaps in education. A second dimension of inequality relates to the rural-urban divide. Total electricity access in Guinea-Bissau increases from 27.5 percent in 2022 to 41.8 percent in 2040 in the *Current Path*. However, the progress achieved in the *Enabling Environment* is much faster, reaching a level of 63.8 percent while *Green Growth* further increases this level to 76 percent by 2040. In urban areas, access to electricity doubles in *Green Growth*, whereas access to electricity in rural areas increases five-fold in the same scenario.

Awareness-raising djumbai on social inclusion of persons with disabilities, Cumura, Biombo region

A third dimension of inequality relates to the distribution of resources (food and income) within a population. According to the Gini index, income inequality in Guinea-Bissau is amongst the highest in the world and increases slightly along the *Current Path* scenario. In both the *Enabling Environment* and *Green Growth* income inequality decreases through a combination of direct scenario interventions and changing patterns of economic growth and employment. The high inequality means that benefits from additional country-wide economic growth would do less to benefit those most in need. As a result, much higher economic growth would be needed to reduce levels of extreme poverty and undernourishment relative to a scenario in which the distribution of income and food is more equal. Combined, these scenarios address several dimensions of inequality and enable greater progress on overcoming inequalities between gender, rural-urban divides, and income classes.

The improvements in the *Enabling Environment*, critical for creating a space in which the benefits from a green sectoral strategy, are more impactful in addressing some of the most pressing obstacles that the country faces. *Green Growth* is most beneficial for accelerating economic progress with less than half of the progress in GDP per capita being attributed to the *Enabling Environment* (Figure 3), focusing exclusively on the areas of agriculture, fisheries, ecotourism, and energy means that other important opportunities could be missed. Progress on education, governance, infrastructure stems mostly from the *Enabling Environment*, with smaller additional benefits from the green economic growth. Clearly, both are needed, with the most beneficial outcome achieved by combining enabling conditions with green sectoral progress (*Green Growth*). Combining these interventions results in synergies, on the one hand achieving economic progress and on the other hand making sure this economic progress is inclusive and benefits the human condition in Guinea-Bissau.

GREEN GROWTH AND PROGRESS TOWARDS SDG ACHIEVEMENT

SDG 1 aims to end poverty in all its forms. Extreme poverty is measured by the number of people consuming less than 1.90 USD per day. In the *Current Path* economic progress and rising average income hardly results in progress toward achieving this goal. Extreme poverty falls from 64.6 percent in 2022 to 60 percent in 2040. This small drop in relative poverty levels is accompanied by a strong population rise. As a result, the number of people in extreme poverty in Guinea-Bissau rises from 1.3 million in 2022 to 1.9 million by 2040 (*Current Path*).

Both the *Enabling Environment* and *Green Growth* improve extreme poverty and make more progress towards achieving SDG 1. By 2040, extreme poverty falls to 42 percent in the *Enabling Environment* and 28.2 percent in *Green Growth*. This is equivalent to 570,000 to 1 million fewer people in extreme poverty by 2040, relative to the *Current Path*. Extreme poverty falls in these scenarios through a combination of improvements in average income and a more equal distribution of resources. Greater equality in the *Enabling Environment* accounts for 570,000 fewer people in extreme poverty. Combining the *Enabling Environment* with a green sectoral strategy that enhances economic growth can result in an additional 430,000 fewer people in extreme poverty relative to the *Current Path*.

Women horticulturists, Bubaque Island, Bijagós archipelago

Figure 4

Percent of Bissau-Guineans living in extreme poverty over time from 2019 to 2040. The lines depict the Current Path, Enabling Environment, and Green Growth scenarios. Extreme poverty is defined as the population living at or below 1.90 USD per day.

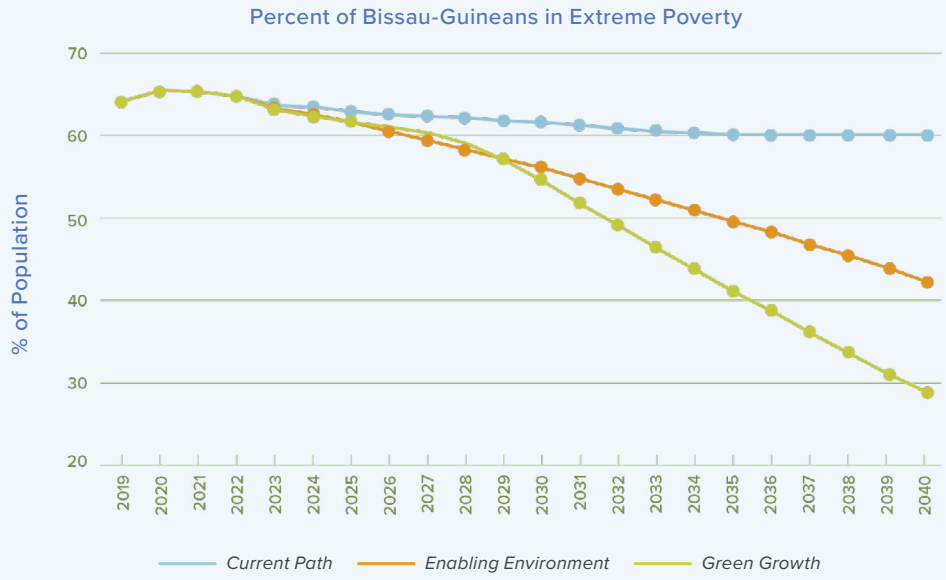
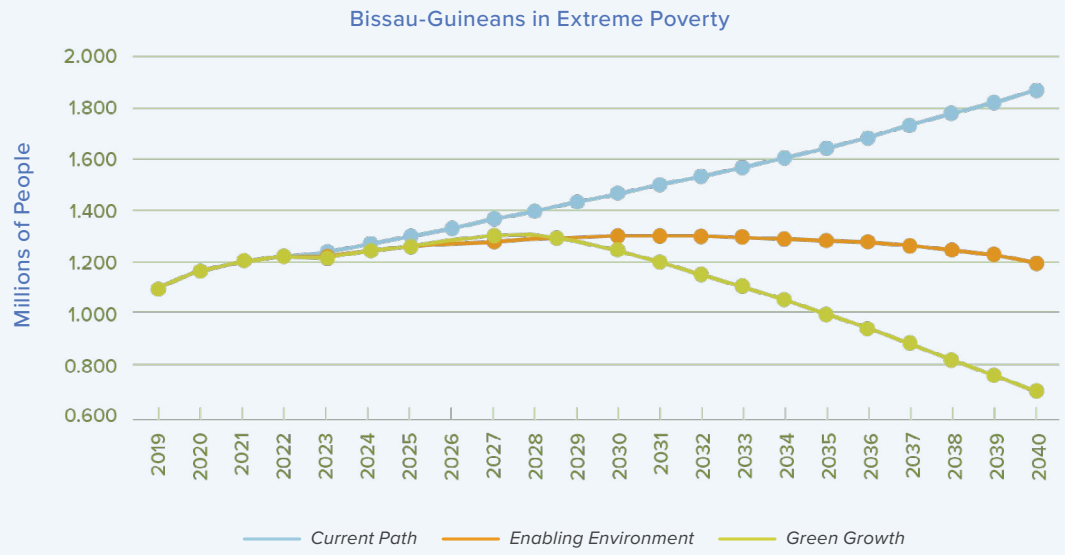


Figure 5

Headcount of Bissau-Guineans living in extreme poverty over time from 2019 to 2040. The lines depict the Current Path, Enabling Environment, and Green Growth scenarios. Extreme poverty is defined as the population living at or below 1.90 USD per day.



SDG 2 aims to end hunger in all its forms, with a specific focus on ending hunger for children. Here we look at undernourishment at the population level and child stunting for children aged 0–5. Undernourishment is a chronic state in which daily caloric intake falls below a certain caloric threshold. Undernourishment depends on progress in average caloric consumption and the distribution of caloric consumption within a population, as well as population age-sex dynamics altering the prevalence over time. Over long-time horizons, caloric intake is driven by economic growth. For shorter-term variations, caloric intake also depends on food prices and dietary shifts that occur as a response to changes in prices, household income, and production in the agricultural sector. In the *Current Path* scenario, undernourishment affects 280,000 people in Guinea-Bissau in 2022 and rises to 410,000 in 2040. Like extreme poverty, the interventions in the *Enabling Environment* and *Green Growth* result in a decrease in undernourishment over time, with 215,000 and 260,000 fewer people suffering from undernourishment relative to the *Current Path*.

Undernourishment and extreme poverty respond in similar ways driven by economic growth and changes in inequality. Over time, the *Current Path* models a rise in people affected by undernutrition, and both the *Enabling Environment* and *Green Growth* make considerable progress towards SDG achievement for that indicator. However, the absolute level of people affected by undernourishment is lower compared to extreme poverty. This observation is also true at the global level with fewer people undernourished in 2017 than in extreme poverty. Why is this the case? Households with little money to spare often prioritize food consumption and aim to maintain a minimum level of caloric intake. In addition, in Guinea-Bissau, many households have direct subsistence access to food, either through subsistence fishing or farming, as well as solidarity in food sharing between individuals. This does not contribute to income, as food is directly consumed, but might maintain a minimum level of caloric intake.

Policies on *Green Growth* should also pay close attention to price dynamics for food. Several research articles have shown that policies aimed at mitigating climate change in the food sector through restricting land use change could have adverse effects on food prices. In the scenarios presented here food prices are almost identical, but care should be taken nonetheless in implementing well-intended *Green Growth* measures that make domestic agricultural production more expensive, resulting in increasing prices, and rising undernourishment.

Figure 6

Undernourishment rate of population from 2019 to 2040 in Guinea-Bissau. The lines depict the Current Path, Enabling Environment, and Green Growth scenarios. Undernourishment is defined as not receiving the minimal level of dietary energy consumption.

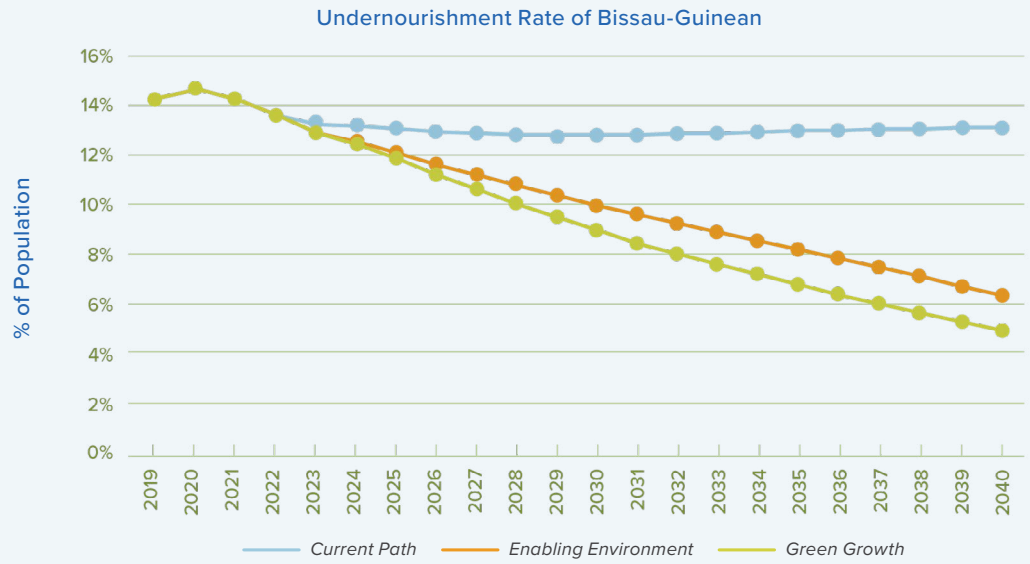


Figure 7

Stunting rate of children ages 0–5 from 2019 to 2040 in Guinea-Bissau. The lines depict the Current Path, Enabling Environment, and Green Growth scenarios. Stunting in a child under age five is defined as a height for age that is more than two standard deviations below the median for the international reference population ages 0–59 months.

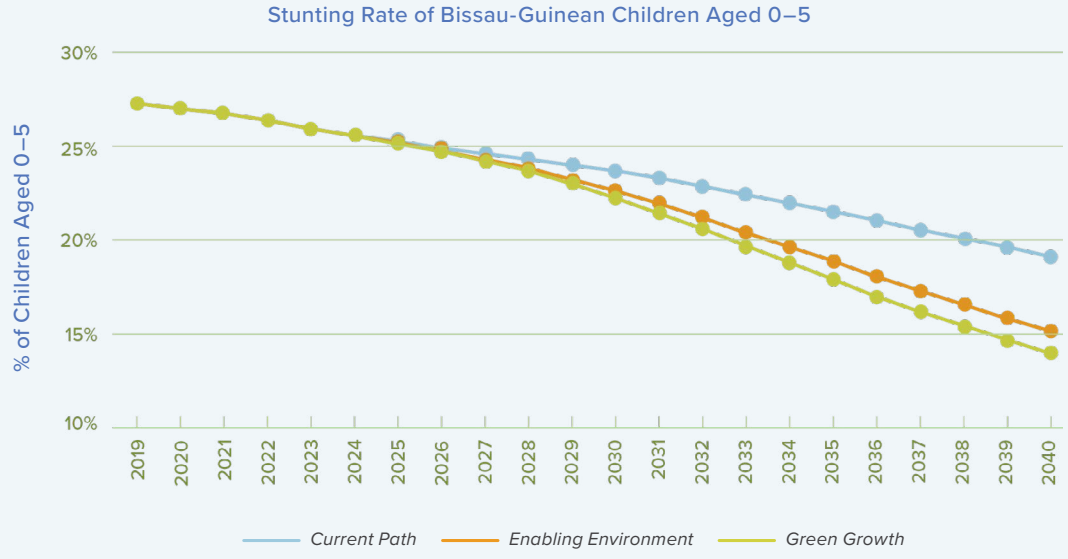


Figure 8

The benefits across a wide range of SDGs on education, infrastructure, poverty, undernourishment, and child stunting for the Enabling Environment and Green Growth scenario. Benefits are quantified in percentage points change for 2040 relative to the Current Path scenario.

Child stunting is another indicator related to SDG 2. Child stunting is driven by changes in caloric consumption as well as female education levels and access to water and sanitation. As such, child stunting is driven by economic progress and progress on human development indicators. In the *Current Path*, child stunting drops from 26.3 percent in 2022 to 19.2 percent in 2040. In the *Enabling Environment*, this drops further to 15.2 percent in 2040, and to 14 percent in *Green Growth.* The difference between the *Enabling Environment* and *Current Path* (-4 percentage point) is, therefore, smaller than the additional reduction achieved in *Green Growth* (-5.2 percentage point relative to the *Current Path*; -1.2 percentage point relative to the *Enabling Environment*). Ending child stunting is both critical for children's wellbeing and contributes to long-term child development and the buildup of human capital.

The above results quantify the long-term costs of not going green for SDG achievement. More generally progress across different SDGs in 2040 is visualized in Figure 8, with progress on education, infrastructure, extreme poverty, and food security in 2040 relative to the *Current Path*. Importantly, both the *Enabling Environment* and *Green Growth* show progress across all indicators relative to the *Current Path*. However, the relative contribution of the *Enabling Environment* and the *Green Growth* scenario depends on the indicator assessed. For extreme poverty, the impacts are nearly equal between the *Enabling Environment*, resulting in a 570,000-person drop in extreme poverty, and *Green Growth*, which results in an additional 430,000-person reduction in extreme poverty. For undernourishment, the majority of the progress can be attributed to the *Enabling Environment*, with limited additional gains from the *Green Growth* scenario. Similarly, for child stunting, most progress can be attributed to the *Enabling Environment*. Thus, these results highlight the need for a combined strategy to achieve multiple SDGs. *Green Growth* coupled with progress on education, governance, infrastructure and gender, income, and spatial inequalities is the most beneficial strategy to realize green inclusive economic and human development.

Varela Beach,
Cacheu region

SECTION

05

Policy Strategies

Woman entrepreneur gives a talk on entrepreneurship, Bissau, Autonomous Sector of Bissau

A green economy has the potential to create benefits for economic and human development. This report highlights the possible benefits of a green economic transition for Guinea-Bissau in agriculture, fisheries, eco-tourism, and energy.

Relative to the *Current Path* scenario, *Green Growth* increases average income, diversifies the economy away from solely relying on agriculture, and reduces the number of people in extreme poverty by 2040. Unlocking the potential of a green economy thus has multiple reinforcing benefits.

A green economic transition needs to be combined with human development improvements.

The full benefits of a *Green Growth* transition can only be achieved if Guinea-Bissau simultaneously makes improvements in education, governance, infrastructure, gender, income, and spatial inequality. During the workshop, participants in Bissau continuously highlighted the need for these improvements (UNDP/Pardee Scenario Workshop Bissau, personal communication, March 2022). Governance stability is critical for attracting tourists and creating an enabling business and investment environment. Education is needed to provide the labor for higher skilled jobs in a green economy. Infrastructure improvements are required to allow tourists to visit Guinea-Bissau, to transport goods and services within the country and between other countries, and to provide water for agriculture and business. Making sure that these improvements benefit all is critical. Infrastructure improvements need to quicken transport times to rural areas and improve rural access to electricity, water, health, and sanitation for people and businesses to thrive. Girls need to receive the same level of education as boys. Green economic jobs need to provide more income to both skilled and unskilled laborers. All these interventions are part of the *Enabling Environment* scenario. Even without a green economic transition, the *Enabling Environment* raises average income; reduces extreme poverty, undernourishment, and child stunting; improves life expectancy and years of education; and accelerates access to water, sanitation, and electricity in rural communities.

Economic diversification is critical, with a smaller reliance on cashew nuts and agriculture.

A green economic diversification is critical for sustainable economic growth. Today the country is heavily reliant on cashew nut production. As such, being able to move up the value chain in cashew production will be important in a green economy. However, without diversification Guinea-Bissau remains dependent on international cashew markets, continues agricultural practices that harm the environment, and remains dependent on imports for most of its consumed food. Diversification in agriculture is important to grow more staple crops, raise domestic fish catch and consumption, and grow vegetables. This will result in less dependence on the agricultural sector and raise the dietary diversity of food in Guinea-Bissau. Besides agricultural diversification, the country also needs to diversify between economic sectors to become less dependent on agriculture. Increasing domestic fishing, raising revenue from tourism and services, and becoming less dependent on

oil imports for energy all contribute to a more sustainable economic structure.

The international community has a critical role in supporting a green economic transition through capacity building, revisiting existing fishing contracts and investments.

The economic transition in Guinea-Bissau requires financial investment and needs to be supported by international governments, donors, and businesses. For example, income from cashew nuts currently depends on exporting cashews for processing and developing facilities in Guinea-Bissau to process cashew nuts in-country that could move the country up the value chain will require additional investment. Improvements in fisheries will require international help in regulating fish catch and renegotiating existing international fish contracts. International tourists will also need to visit Guinea-Bissau and spend money locally. Many of these transitions also require capacity-building efforts to better regulate fisheries and build up necessary skills through farmer training and other forms of education. All these transitions require significant investments from governments and businesses. This money is not currently available in Guinea-Bissau and thus, implementation of these strategies would require international resources from governments, donors, and businesses. Without this international support, the transition to a green economy in Guinea-Bissau will likely be slower and result in fewer gains for economic and human development.

Implementing a green economy requires identifying and managing trade-offs through a systems perspective.

The *Green Growth* and *Enabling Environment* scenarios show synergies between outcome indicators of economic development and human development. These scenarios show the results of "successful policy implementation." This means that these scenarios do not always consider the actions needed to achieve the transition outlined in the scenarios, nor do they consider whether trade-offs will occur in the implementation of these policies to achieve the outcomes. There are several potential trade-offs that need to be managed. For example, allocating more government money to education and infrastructure could lower the budgets for military spending and health care, with unintended consequences for political stability and health services. More specifically, *Green Growth* policies on mechanization in agriculture, mechanization in fisheries, targets for fish catch, and minimization of land expansion can be beneficial for improving sustainable agricultural growth and increasing production, but they also run the risk of raising food prices and negatively affecting undernourishment. Using a systems perspective in policy implementation that focuses on identifying the connections between policies across a wide range of economic and human development indicators can help in identifying and managing these trade-offs. Moreover, a systems perspective can further help identify policy options to avoid because of negative side effects, and policy options to pursue because of positive side effects.

FROM POLICY STRATEGIES TO POLICY ACTIONS

The scenarios outlined in this report focus on long-term economic and human development at a strategic level. It does not address how to achieve these outcomes. Examples from literature and the workshops held in Bissau of how to achieve this transition include:

Raising agricultural productivity, with a specific eye to rural communities and females.

Current agricultural land management in Guinea-Bissau is often inefficient. Agricultural productivity can be improved by providing education to farmers and increasing access to financial resources (micro-credits)

Woman selecting smoked fish, Bubaque Island, Bijagós archipelago

and physical resources. Improving water management through increasing access to water sources and electricity in rural areas is also critical. Special attention should be given to the position of females and female farmers, including securing land tenure rights for females, and increasing crop diversification as vegetable farming is often led by females (UN Guinea-Bissau, 2020; UNDP Guinea-Bissau, 2020b).

Reform and move up the cashew nut value chain, with a need to improve infrastructure and governance.

Cashew nut production remains a critical component of the economy of Guinea-Bissau. On one hand, economic diversification is needed to lower dependence on cashew nut production, but reforms are also needed to increase the income to cashew nut farmers (UN Guinea-Bissau, 2020; UNDP Guinea-Bissau, 2020b). Investment in cashew nut processing facilities is critical to move up the value chain and export cashew nuts for a higher value. This requires better infrastructure to transport cashew nuts internally, store them, and export them to European and other markets. In addition, this shift requires international certification of cashew nut processing in Guinea-Bissau, as well as the ability to meet international standards to guarantee food safety and quality by improving the regulatory environment and implementation of these standards in food production and processing. Throughout these efforts special attention to environmental degradation is necessary to ensure cashew production in Guinea-Bissau is done sustainably to avoid setbacks to *Green Growth*. While greater crop diversification in the agricultural sector beyond cashew nut production is also needed, efforts to move up the value chain for cashew nut production can increase returns from this significant crop for Guinea-Bissau.

Ecolodge on Bubaque Island, Bijagós archipelago

Building a domestic fishing fleet and regulating existing fish catch.

The domestic fishing fleet largely consists of non-industrial vessels and subsistence catch. Expanding the domestic fishing fleet requires investments in fishing vessels and training for fishers. In addition, there are high levels of illegal catch from foreign fleets that require better regulation both in developing new contracts and in building government capacity to regulate existing contracts. Improving fishing regulation and domestic fish catch will likely require renegotiating contracts, as well as securing support from the EU or China to build a domestic fleet, train local fishers, and assist in enforcing fishing contracts to reduce illegal catch. Additionally, improvements are needed in fish storage capacity to be able to export fish; in sea harbors to be able to better export product and goods, including fish, to the outside world; in access and capacity-building to more sustainable fishing tools in Guinea-Bissau; and in road networks to better connect producers and consumers in Guinea-Bissau.

Building a sustainable eco-tourism sector.

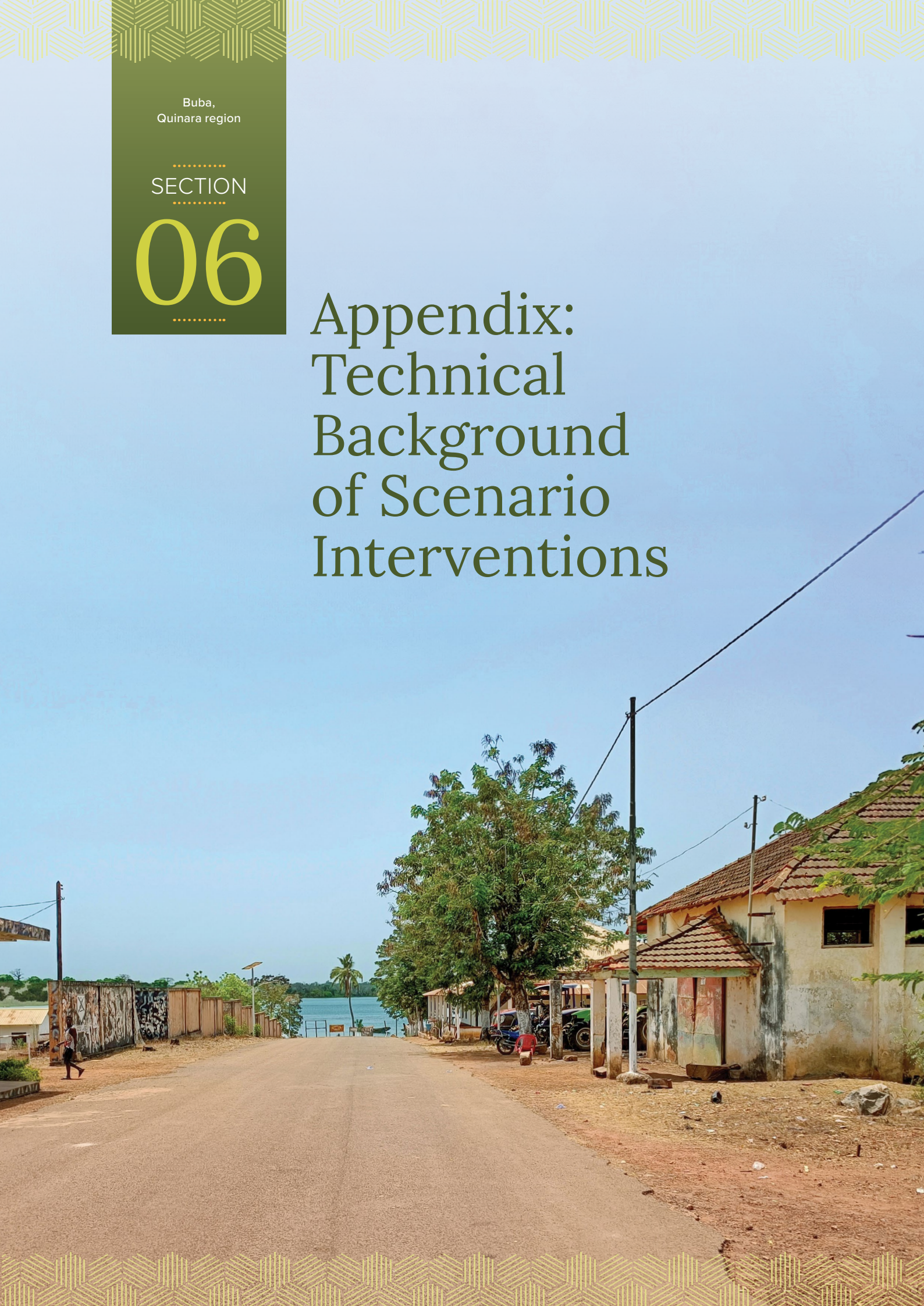
The Bijagos archipelago holds great potential for sustainable eco-tourism. However, tourism today is hindered by political instability, limited incoming and outgoing flights, poor connectivity between the archipelago and the city of Bissau, and a lack of tourism facilities such as restaurants and hotels. A tourism strategy in Guinea-Bissau would focus first on improving the facilities and connectivity between Bissau and the Bijagos archipelago. In the long run, opening other parts of the country for cultural and nature-tourism through improved road networks and building tourism infrastructure is a second step. These could include sustainable beach tourism in Cacheu, cultural visits to Bolama, and visits to Dulombi-Boe National Park. Current feasibility studies on tourism in Guinea-Bissau should focus on identifying what facilities already exist and where and how improvements in hotels, roads, and tourism information would be most beneficial. Previous reports have already identified strategic investment in infrastructure to support national development, but doing so with an eye towards eco-tourism specifically will further assist growth in this sector (UN Habitat, 2021). Expansion of skills, language, and general levels of education for people in Guinea-Bissau to better participate in the tourism labor force are required to make sure that the local population benefits from an increase in tourism.

Buba,
Quinara region

SECTION

06

Appendix: Technical Background of Scenario Interventions



Indicator plate on a Bissau-Guinean road

This background section describes the technical implementation and justification for the scenario interventions in the *Green Growth* and the *Enabling Environment* scenarios. This section is intended for anyone interested in understanding the scenarios in more detail, as well as for those interested in replicating and adjusting the scenarios for future analysis. All scenarios were run using IFs version 7.84, and the scenario files and IFs version can be found online. Please contact the authors for more instructions and details about the analysis.

Table 3 provides an overview of all scenario interventions in both the *Green Growth* and the *Enabling Environment* scenarios as well as a short justification for each. We provide more detail on the scenario interventions specifically for the *Green Growth* scenario across the sectors, as this constitutes the core of this analysis.

Table 3a *Descriptions and rationales of the interventions imposed on the model in both the Green Growth and Enabling Environment scenarios*

Description and Rationales of the Interventions on the *Green Growth* Scenario

SEGMENT	ISSUE	DESCRIPTION	RATIONALE
GREEN GROWTH	General Investment	FDI reaches 9.7 percent of GDP by 2024, then slowly reduces over time, resulting in a cumulative 1 billion USD in investments across all major green growth projects (eco-tourism, agriculture and fisheries, and green energy) by 2030.	
		By 2024, additional investment is split largely between tourism/services (39 percent), agriculture (22 percent), energy (20 percent), and manufactures (14 percent). By 2040, nearly 60 percent of additional investment (relative to Current Path) is in tourism/services, 16 percent in agriculture, 12 percent in manufacturing, and 7 percent in energy.	
	Eco-tourism	An 8-percentage point expansion of service sector labor demand by 2040 relative to the Base.	Between 8 and 19 percent of the labor forces of Seychelles, Cabo Verde, and Mauritius are in the tourism sector. In this scenario, services labor as a percent of total labor increases relative to the Current Path by 8 percentage points over the full horizon.
		An increase in services exports to appropriately account for the gains from tourism.	We assume a doubling of arrivals by 2030 relative to a linear interpolation of recent data and an average 1,050 USD spent per arrival (based on historical data). Literature suggests that the most successful tourism strategies see around a 1-to-1 impact of expenditures to tourism value add and exports.
	Green Energy	A gradual ramp up of renewable energy production to 2 million barrels of oil equivalent by 2040. As renewable energy production is less labor-intensive, additional interventions were included to adjust growth in the energy sector labor force to better represent the difference between fossil fuel and green energy development.	We assume that with a green growth push and adequate FDI, Guinea-Bissau will be able to support 250 MWh of solar PV generated electricity by 2040. We assume that this will be generated by a combination of larger scale on-grid PV plants, as well as off-grid and mini-grid solutions in rural regions. This equates to around 400,000 barrels of oil equivalent.
	Extending Electricity	Urban regions reach an electrification of 94% (from near 47% in 2022). Rural regions reach an electrification rate of around 58 percent (from near 12 percent in 2022). Total electrification rate increases to 76 percent (from near 27 percent in 2020).	Laos, Cabo Verde, Eswatini, Kenya, and Comoros saw an increase in total electrification rates of near 50 percentage points over a 20-year period from a similar level to that of Guinea-Bissau today. Lesotho and Botswana saw an increase in urban electrification rates of near 50 percentage points over a 20-year period. Cabo Verde, Comoros, and Eswatini saw an increase in rural electrification rates of near or greater than 50 percentage points over a 20-year period.
	Fisheries	Guinea-Bissau improves its fish catch capacity, resulting in an increase in landings of 82,000 metric tons by 2040. During this time, a push to adopt aquaculture practices increases fish production by an additional 3,000 metric tons.	Around 2010 the reconstructed domestic fish catch accounts for 10 percent of catch relative to industrial fishing by China and the EU (based on data from FAOSTAT, 2021; Intchama et al., 2018). By 2040 this amount increases to 50 percent of total catch being domestic.
		Improved enforcement and international cooperation results in foreign fleets adequately compensating the government for landings from within Bissau-Guinean waters. This is approximated through a 1.5 billion USD cumulative increase in debt-free foreign aid by 2040.	Today, around 40 percent of government revenue stems from fishing contracts. However, illegal fish catch combined with inadequate compensation in fishing contract means that Guinea-Bissau receives 20 percent and 8 percent of actual compensation from EU and Chinese fleets (Belhabib et al. 2015) respectively. This increases to full compensation by 2040. This type of effective governance can only be achieved with improvements in governance capacity and regulation (Intchama et al. 2018). This governance intervention is accounted for in EE.
	Agriculture	The cashew nut refinement capacity assumed in this scenario increases the value per ton crop exports by a factor of 2.4. Given the shift from raw to processed cashews, economic gains from greater trade openness are assumed to be similar to those seen in other sectors.	Based on difference in export value per ton from FAOSTAT between shelled and unshelled cashew nuts, and with Guinea-Bissau being able to process 50 percent of cashew exports as unshelled exports (FAOSTAT, 2021).
		Cropping intensification and capital investments improve yields to the average level of other SIDS by 2040.	Assumed that around one-third of the yield increase comes from increased agricultural investment, and two-thirds comes from adoption of better practices and land management through education, knowledge spread, capital dissemination, and others.

Table 3b *Descriptions and rationales of the interventions imposed on the model in both the Green Growth and Enabling Environment scenarios*

Description and Rationales of the Interventions on the *Enabling Environment* Scenario

SEGMENT	ISSUE	DESCRIPTION	RATIONALE
ENABLING ENVIRONMENT	Inequality	The distribution of income and calories (measured by the Gini Index and the Coefficient of Variation) improve by roughly 15 percentage points by 2040, resulting in a more equitable distribution of economic and nutritional gains.	*EE* aims for a reduction in inequality by 2040 in both caloric distribution and income distribution, close to the Gini-index of Senegal. This intervention gets further enhanced in the combined GG scenario because of additional interventions. Burkina Faso reduced Gini-index by 15 points between 1994-2014.
		Female participation in economic and political processes (as measured by the Gender Empowerment Measure) improves by roughly 15 percent by 2040. Over this time, female participation in the labor force increases by 7.4 percentage points (around 4.7 percent relative to the *Current Path*).	By 2040 Guinea-Bissau reaches the level of gender empowerment of Cabo Verde.
		A push to provide greater integration for the formal and informal sector leads to a 30 percent reduction of the share of the informal labor force in total employment by 2040.	Informal labor share reaches the level of Senegal by 2040.
	Governance	By 2040, government transparency improves to around the level of Zambia today and effectiveness reaches a level similar to Namibia today.	By 2040, government transparency improves to around the level of Zambia today and effectiveness reaches a level similar to Namibia today.
		With these improvements as well as additional emphasis on security and capacity, government risk improves by roughly 30 percent by 2040.	Improving stability in governance was highlighted as a critical condition to create an enabling environment.
	Infra-structure	The road network in Guinea-Bissau is extended by an additional 1000 km by 2040. Over this time, the share of paved roads increases to around 46 percent.	Equivalent to the average level of paved roads percentage across all SIDS in 2017.
		Access to safe water (piped and other improved) increases to over 90 percent and improved sanitation reaches 70 percent by 2040.	Equivalent to the average level of the ECOWAS region by 2040.
		Infrastructure projects receive a greater allocation of spending. This comes, to some degree, at the expense of the military budget.	Calculated additional spending needs on infrastructure to minimize trade-offs between spending in health and education.
	Education	Student throughput accelerates throughout the horizon, with a particular emphasis on female enrollments. By 2040, boys and girls are enrolled at similar rates. Spending per student across all levels increases by around 10 percent relative to the Current Path by 2030 to also improve education quality.	SDG ambition to close gender gaps in education, at least in enrollment and graduation.

TECHNICAL BACKGROUND OF AGRICULTURE INTERVENTIONS

Here we describe the technical interventions of the agricultural sector in the *Green Growth* scenario. The agricultural interventions focus on three main components. First, agricultural yields over time increase as a combination of an agricultural investment increase (*aginvm*) and an exogenous yield increase (*ylm*). From the workshop and literature, it was concluded that agricultural production in Guinea-Bissau, among other things, suffers from poor land management, a lack of farmers' education, and a lack of farmers' access to finance and resources (UNDP/Pardee Scenario Workshop Bissau, personal communication, March 2022; Verhagen et al., 2022). This means that additional investments are needed to boost the agricultural sector and that many improvements in production can be made without many additional resources (e.g., tools and knowledge sharing between farmers; indirect increased access to resources for surrounding areas and farms; crop diversification with higher yielding crops; and implementation of already existing techniques). Therefore, we assign an arbitrary 66–33 percent split, with 33.3 percent of yield improvements coming from increased agricultural investments and 66.7 percent of improvements coming from general increases in production without additional investments, assuming that a lot of progress can already be achieved by implementing existing plans and practices over additional investments. Average yield intensity for agricultural production in SIDS is approximately 25 percent higher in 2030, and 15 percent higher in 2040 (authors own calculation from IFs), and the combined scenario interventions aim to reach this value. Second, we use data on export quantity and value from FAO (FAOSTAT, 2021) to inform the increased export value of cashew nut production. On average, between 2014–2020, the value of processed cashews represents 1 percent of total cashew nut value exported. We assume that by 2040 50 percent of exported cashews are processed in Guinea-Bissau, resulting in a 2.4 times increase in agricultural export value (*agxvaluem*), without raising the agricultural export quantity between the scenarios. Given that 98.8 percent of total crop value exports in 2020 were cashews, we assign this increase to total crop export value (OEC, 2020). Third, we increase investment in manufacturing through FDI to simulate growth in cashew nut production facilities per ton processed from data on cashew investment needs in Tanzania (Nsehe, 2016), resulting in a 10 percent increase in investment in the manufacturing sector totaling 140 million USD between 2023 and 2040.

View from the harbour, Bubaque island, Bijagós archipelago

Together these interventions simulate a world in which Guinea-Bissau improves the agriculture sector through raising agricultural yields, investing in processing facilities for cashew nuts, and improving the value of exports. On top of this, some technical model interventions were required to appropriately represent the improvement of agricultural exports in the economic model and the improvement of economic trade integration, making sure increased FDI is allocated to the manufacturing sector. Together these interventions raise the income generated in the agricultural sector without expanding agricultural land at the cost of forests. While crop diversification is another important strategy in the agriculture sector for Guinea-Bissau (UNDP/Pardee Scenario Workshop Bissau, personal communication, March 2022), IFs currently has a single-crop agricultural model, meaning that crop diversification cannot be represented in our scenarios.

Young women selling fish, Bubaque island, Bijagós archipelago

TECHNICAL BACKGROUND OF FISHERY INTERVENTIONS

For fisheries, a total of three main scenario interventions and updates were implemented in the *Green Growth* scenario. First, we updated the data initialization across all scenarios to better reflect the actual domestic catch in Guinea-Bissau. The domestic catch for many West African countries is often unregistered and underreported in FAO statistics (Belhabib, Sumaila, Lam, et al., 2015; Belhabib, Sumaila, & Pauly, 2015; Belhabib & Pauly, 2015). This reconstructed catch data for Guinea-Bissau comes from Belhabib and Pauly (2015). We also updated the share of fish consumption in the total diet, using information from Belhabib, Sumaila, and Pauly (2015).

Second, this updated data was used to calculate the share of domestic fish catch (*fiscatchm*) relative to total fish catch in Guinea-Bissau from EU and Chinese vessels (data from Belhabib, Sumaila, Lam, et al. (2015)). This share of domestic catch was 10 percent and is assumed to increase to 50 percent of total catch by 2040 in the *Green Growth* scenario. To limit total catch we initially planned to lower fish catches of the main international patterns such as China and the EU. Since the increase in domestic fish catch in Guinea-Bissau was less than 0.5 percent of total fish catch for China and EU, we did not lower their total fish catch as this did not affect the results of the scenarios. Third, fishing contracts make up around 40 percent of government income (Verhagen et al., 2022). However, there is a big gap between the compensation paid and the compensation that should be paid based on catch value, with the share of revenues relative to actual catch being approximately 20.5 percent for EU catch and 8.5 percent for Chinese vessels (Belhabib, Sumaila, Lam, et al., 2015). In the scenario we assumed that Guinea-Bissau is able to receive full compensation from fish catch by foreign vessels by 2040. This specific raise in government revenue is implemented through raising government income using foreign aid in IFs (*aidrecm*). Currently, foreign aid is the only means to increase foreign revenue to governments.

Together these interventions simulate a world in which Guinea-Bissau improves the fisheries sector through growing the share of domestic catch and improving government control over foreign catch to increase revenue. In addition, technical interventions were required to allocate increased fishing contracts to government revenue (decreasing the loan portion of foreign aid (*aidlp*), slightly increasing aquaculture (*aquaculm*), and representing an increase in government effectiveness to improve control over foreign fish catch (*goveffectm*)). When combined, these interventions raise the income generated in fisheries by raising domestic catch without raising the overall catch and thus aim to stay within carrying capacity.

TECHNICAL BACKGROUND OF ECO-TOURSIM INTERVENTIONS

Since 2005, tourism in Guinea-Bissau has increased by an average of 4,000 people per year. If this trend continues, we could expect around 95,000 tourists by 2030 and 130,000 by 2040.[7] In 2011, tourists spent an average of 1,050 USD per person.[8] Combining our projection of arrivals with an assumption of constant per capita expenditures moving forward, we estimate total tourist expenditures to be nearly 100 million USD in 2030 and 136 million USD by 2040, or 4–5 percent of GDP through the horizon. These stylized estimates provide us with a foundation to build our tourism scenario. Data on tourist arrivals suggests that the top five SIDS with the most significant increases in tourism have maintained average annual arrival growth rates of more than 10 percent over the last 10 years, with a few able to maintain similar levels for two decades. Within this group, several countries have increased the number of arrivals by more than five-fold over a 13–24-year period.

Table 4

*Tourist arrivals in thousands. "Avg. Pct. Change" is the percent change in arrivals between 2019 and 2010, divided by the number of years over that period. *Sao Tome and Principe do not have 2019 data, so calculations are based on 2018 data.*

Tourist Arrivals

	2010	2019	Change	Avg. Pct. Change
Cabo Verde	336.0	758.0	422	14.0
Comoros	15.3	45.1	30	21.6
Cuba	2,532.0	4,276.0	1,744	7.7
Guinea-Bissau	22.3	52.4	30	15.0
Maldives	792.0	1,703.0	911	12.8
São Tomé and Príncipe*	8.0	33.4	25	39.7
Seychelles	191.0	428.0	237	13.8
St. Kitts and Nevis	624.0	1,107.0	483	8.6
Timor-Leste	40.0	74.8	35	9.7

In this scenario, we doubled the number of arrivals relative to the *Current Path* by 2030. This results in an average 9.5 percent annual growth and a five-fold increase in th e number of arrivals between 2020 and 2040. If we assume the same spending-per-arrival value (1,050 USD) this equates to nearly 170 million USD in annual tourist spending in 2030, and 368 million USD by 2040. Assuming this spending translates directly to an increase in services value add and exports, these values provide us with a rough benchmark used to calibrate the economic impact of our interventions.

To simulate a strategy that can successfully quintuple the number of tourist arrivals over the next two decades, we start with the key factors of production: labor and investment. Between 7 and 25 percent of the labor forces of Seychelles, Cabo Verde, and Mauritius are in the tourism sector. Therefore, in this scenario, services labor as a percent of total labor increases relative to the *Current Path* by 8 percentage points over the full horizon, at the lower end of labor increases in these SIDS as Guinea-Bissau aims to limit mass tourism and focus on eco-tourism.[9]

Solar panels for power generation, Bubaque island, Bijagós archipelago

While capital investment is essential for tourism sector investment, and in lower-income countries, this is known to come primarily from FDI, little information is available on the amount of FDI a burgeoning tourism sector attracts or requires. Therefore, we have implemented FDI (in conjunction with the sectorial investment parameters used to direct investment towards services) as a tuning parameter, used to match projected increases in tourist expenditures with increases in service sector value add. The OECD (2020), finds that "[e]very USD 1 of expenditure by international tourists in OECD countries, on average, generates an estimated 89 cents of domestic value-added, compared with 81 cents for overall exports." Other studies find tourism expenditure income multipliers in SIDS of 0.4–1.6 with an average of 0.9 (Wanhill, 1994) and 0.4–0.9 with an average of 0.7 (Pratt, 2015). These suggest that while a (roughly) 1-to-1 ratio of tourist expenditures to value add[10] and exports is not the norm, it is plausible. To remain consistent with this finding, we applied a multiplier on services export (*xsm*) with a schedule that resulted in an increase in export that tracks with the expenditures of additional tourist arrivals assumed in this scenario.

Taken together, these interventions simulate a future in which Guinea-Bissau launches a strategy to expand its tourism sector, with a strong focus on eco-tourism. With the support of international organizations like UNDP and the United Nations World Trade Organization (UNWTO) the effort can attract significant investment from foreign entities, and new opportunities with potentially higher-paying wages to attract labor from typically lower-skill sectors. While this shift slightly reduces labor-driven growth in other segments of the economy and makes exports less competitive, the spillover effects from the burgeoning tourism sector result in long-term economy-wide benefits.

TECHNICAL BACKGROUND OF GREEN ENERGY INTERVENTIONS

Essential to green growth are increases in both renewable energy power sources and electrification rates. As solar PV-generated power has the greatest potential for successful implementation and adoption, it is the primary form of renewable energy that is implemented into the *Green Growth* scenario. Developing a realistic yet ambitious

Solar panels for power generation, Bubaque island, Bijagós archipelago

intervention for solar energy in Guinea-Bissau is reliant upon both benchmarking against what other countries have been able to achieve as well as the conceptual understanding of the future of solar energy. According to IRENA (2019), the cost of electricity generated by solar PV declined by 77 percent between 2010 and 2018 and is expected to continue falling. Falling costs and improvements in technology are an opportunity for Guinea-Bissau to invest in this newly affordable energy source. Just as many developing countries largely adopted the use of mobile phones before landline telephones were widespread due to rapid improvements in technology, this intervention conceptualizes that Guinea-Bissau will adopt solar PV renewable energy in lieu of the continued development of fossil fuel-dependent thermal generated power plants. To develop a reasonable yet ambitious level of energy to be generated by solar PV in Guinea-Bissau we benchmarked against other countries in the region. Senegal currently generates the equivalent of around 400,000 barrels of oil in renewable energy (excluding hydro and nuclear). In our scenario, Guinea-Bissau reaches this level of renewable energy production from solar by 2040. By 2030, Guinea-Bissau reaches renewable energy production levels of around the level of Mauritius, Mauritania, and Namibia today. We estimate that by 2040 Guinea-Bissau can support a combined 250MW of solar power in the form of large solar PV plants as well as mini and off-grid solar plants that will help bring electricity to rural regions. As of 2020, Senegal has a 246 MW capacity in the form of solar, wind, and bioenergy sources (IRENA, 2021). Our assumption is that a cumulative 500 million USD would be required between 2023 and 2040 to support Guinea-Bissau in achieving this level of solar PV energy production. In the scenario, this 500 million USD is brought into the country through FDI and is directed to the energy, services, and manufacturing sectors.

Like determining what is realistic yet ambitious for solar energy in Guinea-Bissau, advances in electrification are also determined by benchmarking against what other countries have been able to achieve in a similar time frame. In the *Green Growth* scenario, total electrification increases by 49 percentage points between 2023 and 2040 while urban and rural electrification rates increase by 47 percentage points and 46 percentage points, respectively. Laos, Cabo Verde, Eswatini, Kenya, and Comoros saw an increase in total electrification rates of near 50 percentage points over a 20-year period from a

similar level of that of Guinea-Bissau today. Lesotho and Botswana saw an increase in urban electrification rates of near 50 percentage points over a 20-year period. Cabo Verde, Comoros, and Eswatini saw an increase in rural electrification rates of near or greater than 50 percentage points over a 20-year period. While, in the *Green Growth* scenario, Guinea-Bissau is expected to achieve similar results over a period of 17 years, this effort will be possible due to off-grid and mini-grid solar solutions, which will bring affordable electricity to rural regions that are currently not reached by the country's main grid. Much of these gains in electricity access are brought on by the *Enabling Environment* scenario which has no direct intervention to electricity access built in. In the *Enabling Environment* scenario, total electrification reaches 64% by 2040, while urban and rural electrification rates reach 82% and 43%, respectively. In this scenario, these gains are driven primarily by improvements to governance and overall advancement of the Bissau-Guinean economy. In the *Green Growth* scenario, there is a direct intervention on energy investment with the urban electricity access multiplier being interpolated from 1 to 1.1 between 2023 and 2040 and the rural electricity access multiplier being interpolated from 1 to 1.15 in this same time frame.

COMPARISON OF *CURRENT PATH*

Table 5

Comparison of Current Path outcomes in 2040 from the first report in this series, "Exploring Alternative Futures of Development: Economic and Human Development Trends to 2040," and this report, "Exploring Alternative Futures of Development: The Cost of Not Going Green."

Comparison of *Current Path* Outcomes in 2040

	REPORT 1	REPORT 2
GDP	2.8 billion USD	2.6 billion USD
GDP Per Capita	2.0 thousand USD	1.9 thousand USD
Average GDP Growth (2024–2040)	3.1%	3.0%
Population	3.1 million	3.1 million
Extreme Poverty (%)	56.3%	59.9%
Extreme Poverty (millions)	1.8 million	1.9 million
Undernourishment (%)	14.9%	13.0%
Child Stunting (age 0–5, %)	18.4%	19.2%

ENDNOTES

1 We acknowledge the wide range of gender-identifiers used in societies and by individuals. For this report we focus primarily on a binary classification of gender, using boys-girls and female-male, as this binary classification is often used in international across-country data series related to development. While gender and sex refer to both overlapping and different issues, the term "gender" is used more widely in international development efforts to describe both gender and sex-related issues. Thus, in this report, sex-related data using "female" and "male" terms is primarily used to inform gender issues.

2 USD stands for US dollar. Throughout the report we report USD in 2011 constant dollar units. GDP per capita is report at Purchasing Power Parity (PPP), whereas GDP is reported at market exchange rate (MER).

3 Several online and in-person workshops were organized in Bissau to present intermediate findings of the report, discuss scenario approaches and discuss policy actions and main obstacles to achieve economic and human development and green growth in Guinea-Bissau. Throughout the report we will refer to the findings from these workshop on an anonymous basis (UNDP/Pardee Scenario Workshop Bissau, personal communication, March 2022).

4 Calculated using arrivals data and ***https://data.worldbank.org/indicator/ST.INT.XPND.CD?locations=GW.*** Since (1) expenditures per capita shows a decline followed by a stabilization and (2) expenditure data is in current USD, we've elected to use the 2011 value for this study.

5 A Portuguese version of the IFs model is ready for download ***here***. In addition, any model of IFs can be set to Portuguese in future use. We also provide a ***guide*** to scenario analysis of the IFs model in Portuguese. The previous ***report*** (Verhagen et al. 2022) also has a description of the IFs model in Portuguese.

6 We received updated education data on national attendance and dropout rates from UNESCO.

7 A linear extrapolation technique obviously will overestimate the impact of COVID-19 on tourism, and implicitly assumes a full post-pandemic recovery.

8 Calculated using arrivals data and ***https://data.worldbank.org/indicator/ST.INT.XPND.CD?locations=GW.*** Since (1) expenditures per capita shows a decline followed by a stabilization and (2) expenditure data is in current USD, we've elected to use the 2011 value for this study.

9 This is implemented as a doubling of services labor demand (*labdemsm*) over 10 years.

10 While this method was employed for the first round of scenario calibrations, after interventions were combined, FDI and investment parameter tuning was done more generally to ensure that key sectors received adequate investment. Final parametrizations included exogenously increasing FDI stocks (*xfdistockm*) such that inflows reached roughly 10 percent of GDP by 2024, then slowly declined to around 7 percent by 2040. We used parameters applied to investment by destination (*aginvm, eninvadd,* and *idsm*) to ensure that FDI reached the appropriate sectors.

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