

Challenges when designing blue bond financing for Small Island Developing States

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The paper presents the blue economy development in The Bahamas with an analysis of the conditions for using blue bonds as a financing mechanism. As part of the activities to be pursued for the issuance of a blue bond, the paper provides an identification of investment projects that could be financed through blue bonds. In addition to its blue economy activities, the government seeks to enhance the coastal ecosystems' resilience and their capacity to reduce the effects of strong climatic events following the Dorian Hurricane in September 2019. In this context, investments in the protection and restoration of ecosystems that increase public goods are therefore needed, especially in the context of the 30 × 30 target. The paper furthermore highlights the key challenges The Bahamas is facing for the development of suitable blue financial mechanisms, including the need for a robust institutional framework to ensure an efficient implementation of a blue financing scheme. By explicitly reflecting on the challenges for a country like the Bahamas, the paper seeks to provide a realistic account of the role and potential of bonds for financing sustainable development in marine environments.

Keywords: blue bonds, blue economy, blue finance, finance challenges, SIDS development, SIDS finance.

Introduction

Blue bonds have been advanced as a means of financing blue economy developments amidst the fiscal constraints that Small-Island Developing States (SIDS) are facing. The rise of blue bonds follows the proliferation of a series of thematic bonds (such as green bonds) that seek to address various social and environmental challenges. The World Bank defines blue bonds as “a debt instrument issued by governments, development banks, or others to raise capital from impact investors to finance marine and ocean-based projects that have positive environmental, economic, and climate benefits” (World Bank, 2018). The issuance of each blue bond is done based on a per-case basis and case-specific environmental and economic returns, but generally, the criteria for bonds to be considered blue require that the investment be used towards the development of a sustainable blue ocean economy, meaning that the capital is required for oceanic or marine resource development.

The Republic of Seychelles issued the world's first sovereign bond that was officially labelled “Blue” as it is a use-of-proceeds bond that aims to finance sustainable ocean activities (Roth *et al.*, 2019). Using a US\$5 million concessional loan from the Global Environmental Facility (GEF) and a US\$5 million guarantee from the World Bank, the Seychelles Blue Bond sought to reach a price level that could simultaneously satisfy investors' expectations and be brought down to a level that would enable Seychelles to deploy its debt financing productively (Failler 2020a).

While the fundamental principles behind a sovereign bond are simple, their place in the world economy presents complex challenges. In principle, sovereign bonds can be used as an important tool for governments to chart new development paths that promote social justice and environmental sustainability

(Gabor, 2021). In close collaboration with civil society organizations, governments can utilize bond issuance as a means of financing much needed ways forward towards a sustainable blue economy. Sovereign debt (also known as public debt, government debt, and national debt) financing faces particular challenges. Private sector actors govern the labelled bond market and regulate the status of these labels. This makes it difficult to legally sanction labelled bonds that may have potentially dubious environmental benefits and creates the conditions for green washing (Park, 2018; Gabor, 2021). This might change with the future green bond regulations being considered at the EU level). More fundamentally, southern hemisphere governments are encountering a debt crisis, with recent “emergency loans” predominantly serving to roll-over existing debts rather than being used towards public needs and investments that require attention (Munevar, 2020; 2021). Understanding the conditions for financing sustainability initiatives through bonds is thus critically needed.

Thompson (2022) presents an analysis on the intricacies involved with blue bond issuance, how blue bonds work as a financial instrument, as well as the benefits and challenges involved in using blue bonds as a financing mechanism for sustainable blue economy development. Sumaila *et al.* (2021) identifies several key barriers to financing sustainable ocean economy development and propose different approaches to overcoming them. The authors also conclude that current investments are insufficient to support a sustainable ocean economy (Sumaila *et al.*, 2021). The use of blue bonds supports an enabling environment for stimulating the development of a country's blue economy by presenting financial capital to private actors wishing to make sustainable change at low risk to investors (Sumaila *et al.*, 2021).

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Bonds are fixed-income instruments, similar to loans. A bond issuer borrows financial capital from a bond investor, but the capital may only be invested in what was stipulated at the time the bond was listed on the market (Thompson, 2022). Investors receive interest payments (dubbed “coupons”) up until the bond’s maturity date, when the initial capital (“principal”) is repaid in full. Coupons thus provide a return on investment and are not just reimbursed by the principal (Thompson, 2022). Environmental bonds such as blue bonds face challenges such as issuers “cherry picking” the environmental projects and targets to report on, passing off the effected environmental change as more impactful than they actually are (Thompson, 2022). Furthermore, unforeseen negative impacts of project activities may also be overlooked and go unreported, and simplified proxy metrics may be used to indicate environmental “impact” and that these impacts are inaccurately measured. Some scholars have called for a set list of environmental metrics/proxies that are pre-determined and can be reported on, but this will likely be difficult considering the breadth of activities involved with oceanic environmental change (Thompson, 2022). Nonetheless, blue bonds have previously been shown to be effective (Thompson, 2022). Examples of successful blue bonds for other SIDS countries include the Seychelles blue bond and the Fiji blue bond, both of which have been used to develop their respective blue economies and support marginalized groups (Thompson, 2022).

SIDS countries (such as the Bahamas) are inextricably linked to the ocean and reliant on its renewable and non-renewable resources for economic development. Financing an ocean economy and the mechanisms through which that occurs are crucial to promoting the sustainable use of its resources while addressing the historic drivers of environmental decline, such as the depletion of fish stocks and habitat degradation (Sumaila *et al.*, 2021). Inaction towards ocean conservation and sustainable ocean use presents severe economic costs to society, estimated at USD 200 billion—USD 1 trillion globally by 2100 (Teh *et al.*, 2017; IPCC, 2019; de Vos *et al.*, 2020). Noone *et al.* (2013) estimate that the absence of climate change mitigation measures on the ocean would result in an additional annual cost of USD 322 billion by 2050 due to losses from fishing, tourism, storms, and sea-level rise. Furthermore, Sustainable Development Goal (SDG) 14—Life Below Water—has been reported to receive the least amount of investment of all the SDGs (Libes and Eldridge, 2019), further highlighting the need for sustainable ocean development financing.

The aim of this paper is to take the Commonwealth of the Bahamas as a case for exploring conditions of financing sustainable development of the ocean economy of a SIDS country. The perspectives we provide are based on our experience researching sustainable finance and the Commonwealth of the Bahamas’ blue economy, as well as having been commissioned to develop a blue bond concept for the Bahamas. In addition to other researchers’ work on a potential “blue” recovery for the Bahamas following the effects of the COVID-19 pandemic and Hurricane Dorian (Bethel *et al.*, 2021), we hypothesize the potential challenges that a blue bond issuance for SIDS faces by building on our knowledge of sustainable finance and the specific Bahamian context. Like many other countries in the Caribbean, the Bahamas faces challenges of high debt, high unemployment, stagnant population growth, geographic economic inequalities, an inefficient public sector, and insufficient infrastructure. The Bahamas are highly dependent on

their tourism sector which accounts for an estimated 60% of national GDP, and is largely based on its aquatic resources (Failler, 2020b). In an attempt to counter this, the Bahamas has been pursuing economic diversification and a blue economy strategy since 2015 (Failler, 2020b).

The current paper therefore presents an analysis of the implementation of blue bonds in a SIDS country with an inside perspective and a clear identification of the implementation challenges as a blue financing mechanism for the development of sectors within the developing blue economy. The paper is structured into three sections. The first section contextualizes the Bahamas’ existing blue economy activities and their planned future development. The second section outlines the opportunities and challenges of using the blue bond concept for financing projects in the Bahamas. The section explores different potential structures for the Bahamian Blue Bond, the identification of a pipeline for investment projects, and quantifying the economic, social, and environmental impacts of identified projects. The paper concludes with a recommendation for developing countries hoping to finance sustainable blue economy development.

Towards a blue economy of the Bahamas

Steps towards a blue economy for the Bahamas

The blue economy in the Caribbean is already being promoted by several key actors in the region (Patil *et al.*, 2016; Phang *et al.*, 2023). The emergence of the blue economy concept in the Caribbean first became prominent at the Samoa conference in 2014 and covers several sectors that either use the ocean as input or impact the ocean. The blue economy can be defined as “one in which the sustainable use of ocean and coastal resources generates equitably and inclusively distributed benefits for people, protects and restores healthy ocean ecosystems, and contributes to the delivery of global ambitions for a sustainable future” (UNEP, 2021). Since 2014, the United Nations Development Programme (UNDP) and the Caribbean Development Bank (CDB) have promoted the term in the region (IDB, 2019). Echoing how norms and policies move from “the global” to a national setting (Sassen, 2008.), the Bahamas have embraced, adapted, and co-developed the idea of the blue economy for their own national development policy. The Bahamas promote an integrated management approach to ocean governance that rethinks and rearranges its ocean resources for optimal and sustainable blue economy development, such as the blue economy strategies of the Seychelles (Failler *et al.*, 2020a) and the Bahamas (Failler, 2020b).

The Commonwealth of the Bahamas has already made significant steps towards promoting its blue economy and related environmental and economic activities. One of these steps was the Bahamas National Maritime Policy of 2015, which aimed to support on-going economic activities, expand the maritime sector domestically and internationally, safeguard the marine environment from potential environmental threats, and protect vessels transiting the Bahamas’ and nearby international waters. Furthermore, it includes streamlining procedures in areas such as fisheries and port operations through the introduction of digital solutions, facilitating economic transactions for the Family Islands, and proposing reforms to promote a stronger framework for coastal resilience, better management of marine resources, and reduce ocean pollution. Currently, the Bahamas is promoting reforms that align with

the “five tipping points” for a healthy and productive ocean that are envisioned by the UN Global Compact (2019). These five tipping points include: (1) traceable sustainable seafood; (2) zero-carbon shipping; (3) offshore renewable energy; (4) ocean mapping and data collection; and (5) ending pollution entering the ocean (UN Global Compact, 2019). The Bahamas are also promoting reforms that enable private investment in the marine sector. In addition, it has been suggested that the Bahamas could further its blue economy by (1) developing a circular economy, which promotes sharing, reusing, repairing, renovating, and recycling of existing resources; (2) developing a framework of good governance that can enable sustainable use of the Bahamas’ marine EEZ; (3) promoting environmental and social sustainability through ecosystems and community resilience; and (4) creating inclusive decision-making that mobilizes a broad group of ocean resource-users.

The Bahamas is already a blue-economy frontrunner in the Caribbean. Coastal tourism, aquaculture, fishing, and shipping—four sectors that are key in the blue economy—have constituted >20% of the Bahamas’ GDP for most of the last decade. Compared to many of its neighbouring countries (such as Barbados, Guyana, Suriname, and Trinidad and Tobago), the Bahamas has similarly been leading in the “absolute value gains” from the blue economy, as the GDP contributions of coastal tourism, aquaculture, fishing, and shipping have consistently contributed >US\$2000 million to the Bahamas’ GDP (MCRIT, 2020), which equates to an estimated 17.8% of the 2020 Bahamian GDP.

The national economy of the Bahamas is dominated by the service industry. Tourism and financial services are key parts of the Bahamian economy. Tourism (and related sectors) account for 60% of the Bahamas’ GDP and employ more than half of the Bahamas’ labour force. Despite the country’s three decades of consecutive growth, the country continues to face vulnerabilities due to its lack of diversification and the threat of hurricanes (World Bank, 2021). To adapt to the latter, the Bahamas has become part of the Caribbean Catastrophe Risk Insurance Facility, which insures Bahamas against catastrophes (CCRIF, 2020). However, moving towards a diversified economy with high value addition remains critical if the Bahamas is to continue the economic growth from previous decades.

Part of this value comes from the Bahamas’ natural resources. Within its territory, the Bahamas controls 3.580 km² of corals with a yearly income value of US\$1.002 million, 1.400 km² of mangroves with a yearly dollar value of US\$560 million, and 2.261 km² of seagrass with a yearly dollar value of US\$4.296 million (MCRIT, 2020). The Commonwealth of the Bahamas has played an active role in preserving and promoting its natural resources. For example, the Bahamas introduced a Master Plan for the Bahamas National Protected Area System (BNPAS) in 2012 and committed to conserve 20% of its coastal marine resources and effectively manage at least 50% of the already designated marine protected areas (MPAs). Bahamas MPAs are estimated to contribute US\$67.6 million in tourism expenditures as well as creating valuable spiny lobster nursery habitats (Arkema et al, 2017).

The impact of COVID-19 on the Bahamian economy

There is an increasing call for ensuring that the ocean economy enables low- and middle-income countries the opportunity to recover from the COVID-19 pandemic (Eugui et al., 2021). Such a call fits the Bahamian situation, since the COVID-19 pandemic has massively impacted the Bahamian

economy. The Bahamas now face high debt levels, declining GDP, rising unemployment, and balance-of-payment issues. All of these challenges can be traced back to the profound impact of the COVID-19 pandemic on the Bahamas’ small, tourist-focused economy. It is within this context that we were commissioned to survey the possibilities of a Bahamas Blue Bond.

While the Bahamas is one of the wealthiest countries in the Caribbean, its national economy was hit hard by the COVID-19 pandemic. Growth in 2020 declined by 14.5% in 2020. The decline in growth meant that the Bahamas’ 2020 GDP was less than the total GDP of the Bahamas in 2015 (UNCTAD, 2021). Given that the Bahamas is highly dependent on tourism, the decline in GDP can be attributed to the restrictions on human movement during the COVID-19 pandemic, which disrupted tourism globally. In 2020, there were only 422000 stopover visitors to the Bahamas, whereas there were 1.8 million visitors in 2019 (Bethel et al., 2021). The economic impact of COVID-19 is reflected in total services exports: in 2020 the total services exports were US\$1288 million compared to US\$2896 million in 2015, a 2020 equivalent of US\$3157 million.

The COVID-19 pandemic has meant that the previous government of the Bahamas has found it necessary to seek out loans from the World Bank and the International Monetary Fund (IMF). During June 2020, the IMF issued an emergency loan to the Bahamas of US\$250 million. The loan had three objectives. It would help the Bahamas meet critical balance-of-payment issues, it would help recover the national economy (especially in the face of the previous economic impact of Hurricane Dorian in September 2019), and it would mitigate the socio-economic impact of the COVID-19 pandemic. Less than a year after the Bahamas applied for an emergency loan from the IMF, they received an exceptional loan of US\$100 million from the International Bank for Reconstruction and Development (IBRD).

Despite having a high-income economy, the Bahamas faced a significant increase in public debt due to the pandemic. Based on calculations by the IMF, it was projected that the public debt of the Bahamas relative to its GDP would increase by 20% in the period 2019–2023. This meant that the Bahamas would have had one of the largest percentage increases in public debt relative to GDP of any country receiving IMF support (Munevar, 2020, p. 7). The IMF warned that public debt would amount to as much as 90% of GDP in 2021.

The COVID-19 pandemic’s economic impacts on the Bahamian economy have spilled over into the country’s credit ratings. Prior to the COVID-19 pandemic, in 2018 the Bahamas was rated BB + by Standard and Poor’s (S&P) and Baa3 by Moody’s. However, the latest rating by S&P was BB-, and Moody’s rated the Bahamas as Ba3 (FXEMPIRE, 2021). In other words, both rating agencies consider the Bahamas’ rating below investment grade. The downgrading of this credit rating implies that, although the Bahamas might need credit more than ever due to the economic impacts of COVID-19, the cost-of-capital on international capital markets for the Bahamas has increased.

Developing a blue bond for the Bahamas

Potential structures for a Bahamian blue bond

The quantitative expansion of green, sustainable, and social bonds has been accompanied by innovations in types of bond

financing. When considering a bond issuance, it is critical that the bond structure is fit for purpose, ensures the highest degree of environmental and social impact, and that the issuer receives the lowest possible cost-of-capital. Three different bond structures are considered: catastrophe bonds, environmental impact bonds, use-of-proceeds bonds issued by multilateral development organizations or by a sovereign body (see also Adams *et al.*, 2020; Mehta *et al.*, 2021).

The increasing risk of catastrophes (like hurricanes) has created a further need for resilience. Low-income countries in particular face increased risks associated with increased global warming. Meanwhile, they lack the economic resources and planning capacity to effectively ameliorate the impacts of disastrous climate events. In the face of increased climate risks, vulnerable countries are likely to have their public financial positions worsen (Volz *et al.*, 2020). Catastrophe bonds (based on insurance) have been proposed as a solution to low-income countries' increased vulnerability to climate change. The general principle for such bonds is quite simple: a trigger level, e.g. the wind speed of a hurricane within a specific geography (polygon), is defined in advance. If a hurricane enters the polygon with a wind speed above the threshold, the insurer makes a pay-out to the insured party. This bond differs from insurance in that it pays out before the catastrophe has struck, whereas insurance pays out afterwards.

Despite the simplicity of catastrophe bonds, some challenges still remain. A central issue is the so-called “basis risk”. Basis is the misalignment between trigger and actual damage because the two are not perfectly correlated. In our example, a hurricane with a wind speed below the trigger level may cause significant damage for the insured party (Christophers *et al.*, 2020). Other challenges include the fact that insurance is based on historical data, but increases in global warming may render these products economically unviable in the future for either insurers or insured parties. Insurance often needs to be subsidized to ensure demand and it has been difficult to combine these insurance approaches with build resilience strategies, such as offering lower costs for insured parties that invest in protective green infrastructure (Weinkle and Pielke, 2017). These challenges create difficulties for integrating catastrophe bonds in broader resilience strategies and for public uptake as well (see also Christiansen, 2021 and Kousky and Light, 2019 for discussions of the challenges of integrating these insurance approaches with protection of natural infrastructures). Given that the Commonwealth of the Bahamas is already a member of the Caribbean Catastrophe Risk Insurance Facility Segregated Portfolio Company (CCRIF SPC), designing a Bahamian Blue Bond as a catastrophe bond would be redundant.

Environmental impact bonds raise capital, but unlike regular bond issuances, the return on investment is based on the success of a programme or project. This could be an investor making a loan to a public entity whose interest payments are determined by whether the public entity underperforms, performs as expected, or performs above expected as defined by key performance indicators (KPIs). In principle, these bonds have the potential to create better synergies between economic and environmental outcomes. However, while defining KPIs too narrowly can create unintended environmental outcomes (as some potentially environmentally harmful activities are left unmonitored), defining too many KPIs can be administratively strenuous. Furthermore, these bonds are still emerging, and the benefit of these products in developed markets

may be limited: there are examples of underperformance in returns for investors that are close to market rates (Christophers, 2018). These challenges make an environmental impact bond difficult to implement. Before considering this structure, the development of a sector needs to have clearly defined KPIs to provide added confidence and clarity for a potential investor.

Use-of-proceeds bonds, issued by either a multilateral development bank or a sovereign, raise up-front proceeds and result in coupon payments for investors, where the principal investment is returned to the investor upon maturity. These can be labelled green or blue bonds and follow the reporting guidelines of the green bond principles (GBP, 2021), or be certified according to the Climate Bonds Initiative's taxonomy. The principal condition for issuing such a blue bond would be the up-front promise of a blue use of proceeds (proceeds get invested into further development of the blue economy). Unlike environmental impact bonds, environmental, and economic outcomes are dissociated, which puts them at risk of so-called “environmental non-performance” (Jones *et al.*, 2020), where returns for the benefit of the environment do not materialize but the economic returns do. Given the constraints that emerging markets face (such as sovereign credit ratings below investment grade and a limited pipeline of projects in the “blue economy”), multilateral development banks are in a better position to issue these types of bonds due to their credit ratings and ability to compile multiple projects (Banga, 2019). The Commonwealth of the Bahamas has suffered from credit downgrading and has an S&P sovereign credit rating of B+, which is below the BB-Seychelles had when they issued their blue bond, largely due to the COVID-19 pandemic. This increases the need for cheaper sources of financing for potential investments for blue economy development.

Pipeline and classification of projects

Given that use-of-proceeds bonds are likely to be the easiest to implement, we used our previous knowledge of the Bahamas' Blue Economy sectors to map whether the sectors could be supported by a blue bond issuance. The pipeline of activities that can be financed through a blue bond can be divided into three major categories (for a review of potential development projects in the Bahamas, see Bethel *et al.*, 2021). First, there are activities that directly finance natural ecosystems: biodiversity and conservation have gained increased attention as potential return- and revenue-generating activities that finance can support. Second, there are opportunities to invest in renewable energy technologies, which can help the Bahamas expand sustainable energy resources. Third, there is an increased emphasis on making traditional marine activities less environmentally damaging and more socially inclusive. Moving forward, it will be necessary to further quantify the extent to which these sectors support social, environmental, and economic goals through stakeholder consultations and quantitative research. A summary of the assessment of each sector's development potential from blue bond support is presented in Table 1, followed by further elaboration on the rationale for each sector's classification.

Marine and coastal tourism

The tourism industry is a critical component of the Bahamas' overall economy, but it is not providing as much revenue as it

Table 1. Summary of sectors of the blue economy with development potential from blue bond proceeds.

Sector	Economic importance and developmental stage	Potential for blue bond support (low/medium/high)
Marine and coastal tourism	High economic importance Mature development stage	High
Maritime transport	Moderate economic importance Mature development stage	Medium
Shipbuilding and repair	Moderate economic importance Mature development stage	Low
Capture fisheries	Moderate economic importance Mature development stage	Medium
Water desalination	Moderate economic importance Under development stage	Low
Aquaculture and algal-culture	Negligible economic importance Under development stage	Low
Mineral resources and deep-sea mining	Negligible economic importance Under development stage	Low
Offshore wind, tidal and wave power	Negligible economic importance Under development stage	High
Offshore oil and gas	Negligible economic importance Under development stage	Low
Bio-prospecting and biotechnology	Negligible economic importance Under development stage	Low
Marine protected areas (MPAs) and natural capital	High economic potential but assessment missing. Under development stage, including for the 30% target.	High

could. This is partly due to the Bahamas receiving lower revenues from tourism relative to other Caribbean islands. When potentially issuing a blue bond, the tourism industry would benefit from investments in conservation and natural capital (eco-tourism). However, it can be challenging to generate revenue streams directly from conservation. An alternative is ensuring that beneficiaries from the tourism sector are willingly or legally required to pay for the services generated by ecosystems. Another alternative use of proceeds would be to channel proceeds as low(er)-interest loans to the tourism sector if loans are earmarked for lowering the carbon dioxide (CO₂) emissions from the tourism industry (by implementing low-emission or renewable technologies at resorts, for example). The increased risk of hurricanes due to global warming and the potential occurrence of pandemics like the COVID-19 pandemic continue to pose a long-term threat to the industry. Blue bond issuance could be directed at increasing resilience to the effects of such potential threats to the sector. The tourism industry has high development potential with blue bond support.

Maritime transport

Shipping companies that may want to invest in low-carbon shipping may find that loaning money for such ventures increases economic risks or that other projects may provide better returns. If a bond dedicated (at least partly) to decarbonizing shipping can have relatively low coupon payments (the annual interest rate paid on a bond until maturity), it is possible that the lower cost-of-capital that a dedicated bond may provide could incentivize investment. The decarbonization of shipping is a quickly developing field that can potentially form part of a Climate Bonds Initiative (CBI) certified bond issuance (bonds issued specifically for climate change action) once the certification standard is updated. As such, the maritime transport sector has a medium level of development potential from blue bond support.

Shipbuilding and repair

The shipbuilding and repair sector is of moderate economic importance to the Bahamian economy. High input costs, relative to the largest industry competitor (the state of Florida), put Bahamian shipbuilding and repair at a competitive disadvantage. Insofar as any Bahamian shipbuilders may need further leverage, proceeds from a blue bond may offset their relative disadvantage if bond proceeds can enable shipbuilders to have better lending conditions relative to existing bank lending loan structures. However, better lending conditions in the short-term will not address the long-term disadvantages of high input costs that shipbuilders face. As such, this sector has low development potential from blue bond support.

Capture fisheries

Fishing (capture fisheries) is a culturally important industry in the Bahamas and an important source of employment, despite the industry's contribution to GDP remaining small, resulting in its being of moderate economic importance. There are several factors that could increase the added value in the fishing sector: certification, traceability, transitioning overexploited resources toward sustainable use, quality improvements, and increasing ease of market access. Efforts that increase traceability (which could also be through certifications) would be aligned with one of the five UN Global Compact tipping points, but they would not comply with CBI standards. How to make value addition socially inclusive and environmentally sustainable remains a challenge. On the producer side, maintaining access to a historically important resource is critical, as is making sure any certifications and traceability measures do not involve further costs that small operators are unable to overcome. On the side of the consumer, value-addition and ease of access new markets, both need to be structured such that local consumers are not hindered from accessing seafood as an important food source. The capture fisheries sector thus has medium development potential from blue-bond investment.

Water desalination

Water desalination is of moderate economic importance to the Bahamian economy. Providence, Exuma, Bimini, Inagua, the Long Islands, and most recently, Eleuthera and Reuter Island, have reverse osmosis plants. Some tourist resorts have their own desalination plants. Companies and public entities that may want to install desalination plants may find that loaning money for such ventures increases economic risks or that other projects may provide better returns than investing in desalination. If a bond dedicated (at least partly) to desalination project development can have relatively low coupon payments, the lower cost of capital could incentivize investment in desalination. CBI certification suspended water desalination from certification in February 2021. Certification would thus be pending on a re-introduction of desalination. Water desalination is also not part of the UN Global Compact's five tipping points, but it does not appear that the production of potable water contradicts the five tipping points, especially not if plants are powered by renewables. This sector has low development potential from blue-bond support.

Aquaculture and algal culture

While there may be potential for developing aquaculture in the Bahamas, aquaculture has a tainted track record due to unsustainable resource use (Hasan *et al.*, 2010) and irresponsible growth practices that lead to environmental degradation (Pillay, 2008). Despite also being intended as part of the Seychelles' Blue Bond issuances (a fellow SIDS country), aquaculture is unlikely to support the sustainability of the Bahamas' Blue Economy in a sufficiently impactful way. The sector thus has low development potential from blue-bond support, relative to other sectors.

Mineral resources and deep-sea mining

Deep-sea mining is controversial because the exact environmental impacts are uncertain but have the potential to be substantial. Proceeds from a potential blue bond issuance should therefore not support extractive industries and deep-sea mining, as such practices are unsustainable.

Offshore wind, tidal, and wave power

Offshore wind, tidal, and wave power has the potential to accommodate the UN Global Compact's five tipping points as well as the highest green bond standards as of the present day (since the support for renewable energy is covered by the Climate Bonds Initiative's certification programme). It can further support the Bahamas' otherwise fragile international balance-of-payment position as it may reduce the need to import current projected volumes of fossil-fuel energy sources. Public opinion on offshore energy can however vary, from aesthetic preferences to territorial conflicts with other sectors. Public consultation is therefore key. Critically, the increasing likelihood of risk of hurricane occurrences due to climate change, continue to pose a threat to renewable energy infrastructures. The sector, although of negligible economic importance, has high development potential with blue-bond support.

Offshore oil and gas

While the extractive industry in the Bahamas may be under development, it is not compatible with a blue bond issuance under any circumstances due to being unsustainable. It is in opposition to the five tipping points of the UN Global Com-

pact. On a fundamental level, supporting fossil fuel extraction whilst claiming to be leading a blue economy is an inconsistency in policy-making, which has led to criticism in the case of Seychelles (Schutter and Hicks, 2019). Continuing the exploration of fossil fuels in the Bahamas whilst arguing that the Bahamas is promoting a blue economy could result in similar criticism. This sector thus has low developmental potential from blue-bond support.

Bioprospecting and biotechnology

There is a lack of knowledge of the potential value of bioprospecting for the Bahamas specifically. Bioprospecting could potentially be covered by one of the five UN Global Compact tipping points, "Mapping the Ocean". It is also unlikely that bioprospecting will lead to socially or environmentally adverse results or conflict with other industries. However, it is an economically uncertain venture. Despite the vast economic sums that have been spent on bioprospecting globally, the results have been disappointing (Laird *et al.*, 2020). The bioprospecting and biotechnology sector is thus of negligible economic importance and has low developmental potential with blue-bond support.

Marine protected areas (MPAs) and natural capital

MPAs can generate potential revenues mainly through user fees and eco-tourism. The sector is thus of high economic importance to the Bahamian economy. However, due to the challenges of developing financially sustainable, self-sustaining MPAs, it is likely that MPA management will continue to rely on donations and grants even if new revenue streams are developed (Failler *et al.*, 2019). A blue bond issuance could support such developments. Another area of investment in natural capital could be in defensive natural infrastructure, which protects coastal communities against adverse weather events. However, natural infrastructure is less standardized than conventional infrastructure projects (Thiele *et al.*, 2020). This sector thus has very high development potential from blue-bond support.

The above review of sectors that could be supported by blue bond proceeds indicates some of the challenges of issuing a blue bond. Even if there are limits to blue bond issuances due to the green bond standards currently being regulated by the private sector itself, few projects would live up to CBI certification. The CBI standards are varied for each of the different sectors; however, they all share a few key features: (1) Full alignment with the Green Bond Principles, the Green Loan Principles, the proposed EU Green Bond Standard, the ASEAN Green Bond Standards, Japan's Green Bond Guidelines, and India's disclosure and listing requirements for green bonds; (2) Clear mandatory requirements for use of proceeds, selection of projects and assets, management of proceeds and reporting; (3) Sector criteria for determining the low-carbon and climate resilient credentials of projects and assets; (4) An assurance framework with independent verifiers and consistent procedures; (5) Certification awarded by the Climate Bonds Standard Board; (6) Certification is confirmed after issuance of the bond or loan with mandatory independent verification and annual reporting for the term of the investment (CBI, 2019). With regards to certification, energy sustainability technologies have the potential to be the most promising, but some of these technologies are challenged by potentially increasing hurricane risk. Another area could be natural capital, but the scale and scope of potential revenue-generating activities may

be limited. They would have to either be part of a much bigger pipeline that includes other types of projects as well to achieve a large enough impact to make a bond issuance viable, or they would have to consider public investments that support a well-functioning national economy but do not generate revenue themselves. Without certification, driving sustainable investments in capture fisheries is a possibility (such as in the Seychelles), but this is likely to include the government as the coordinator of activities to ensure the management of a nationally and culturally important resource in a legitimate way.

Conclusion

Our analysis revealed that marine tourism, offshore renewable wind and wave energy, and marine protected areas have the greatest potential for successful blue bond investment (Table 1). Marine tourism should be prioritized and is of particular interest as it is responsible for a considerable fraction of the national GDP (60%, Failler, 2020b)—this sector thus offers the greatest potential investment impact to the Bahamian blue economy. These three sectors offer the greatest potential for positive economic, environmental, and societal impact, and development in these sectors would contribute to the development of a sustainable blue-ocean economy in the Bahamas.

Our analysis further reveals that not all the sectors of the Bahamian blue economy have equal potential to offer development improvement; however, these sectors are still viable for blue bond financing for sustainable ocean economy development. Sectors that do not align with the five tipping points of the UN Global Impact (offshore mining, oil, and natural gas) should not be prioritized for blue bond financing as these sectors are not conducive to a sustainable ocean economy. Instead the sectors that offer development of coastal resilience to climate change effects should be prioritized (MPAs, responsible aquaculture, blue ecotourism).

Given the modelling complexities and transaction costs involved in catastrophe bonds and impact bonds, a use-of-proceeds bond issued either by an International Development Bank (IDB) that supports local private or state-owned activities is most likely to satisfy the economic requirements of the involved parties. Alternatively, it could be structured like the Seychelles Blue Bond: a sovereign bond structured with the instruments of an IDB to comply with the risk, return, and liquidity requirements of the involved parties. In the case of the Seychelles, this was fundamentally necessary to make project financing economically feasible but also to lower the long-term debt burden of the Seychelles (Christiansen, under review). These two possibilities afford agency to the respective governments if they adhere to the practical and political terms and conditions of IDBs.

Given that there is not yet any jurisdiction that provides hard governmental regulation of the green and blue bonds market, there are no legally binding standards. While we wait for the EU Green Bond Standard, the CBI's certification provides the most rigorous standards as of the time of writing. However, the CBI certification allows for relatively few blue investments and may lead to further transaction costs relative to the size of the bond issuance. Even if CBI certification is not possible, it is important to ensure that investments are made towards sustainable and socially inclusive economic activities—both as an aim, but also as a means of maintaining credibility. As a result of the COVID-19 pandemic, the Bahamas has faced an even greater need for low cost-of-capital

and diversification. To its great advantage, the Bahamas has a strong civil society that supports its natural capital which forms the foundation of its blue economy.

Given the high debt levels of vulnerable countries (like SIDS), we recommend continuing to develop political solutions to ease state debt, which can lead to lowering public debt, particularly for countries that face the threats of climate change and potential biodiversity loss. Low- and middle-income countries face a debt crisis in which debt is continuously rolled over in order to repay creditors, rather than the much-needed relief of such debt (Munevar, 2020). However, the prospects of debt relief are made all the more difficult due to the heterogeneous and powerful private actors involved in sovereign bond markets (Munevar, 2021). The Commonwealth of the Bahamas is an example of how the continued development of one of the high-income SIDS has been impeded by debt. Many SIDS will rely on having their debt forgiven to be able to have the financial leeway to invest in development initiatives and sustainability. While this does not render all new debt financing off the table, it does gesture at the need for structural change in the long run.

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability statement

No new data were generated or analysed in support of this research.

Author contributions statement

AM: conception, data collection, drafting, and revisions; MB: data collection, revisions, and synthesis; PF: conception and supervision.

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