



SOUTH ASIA

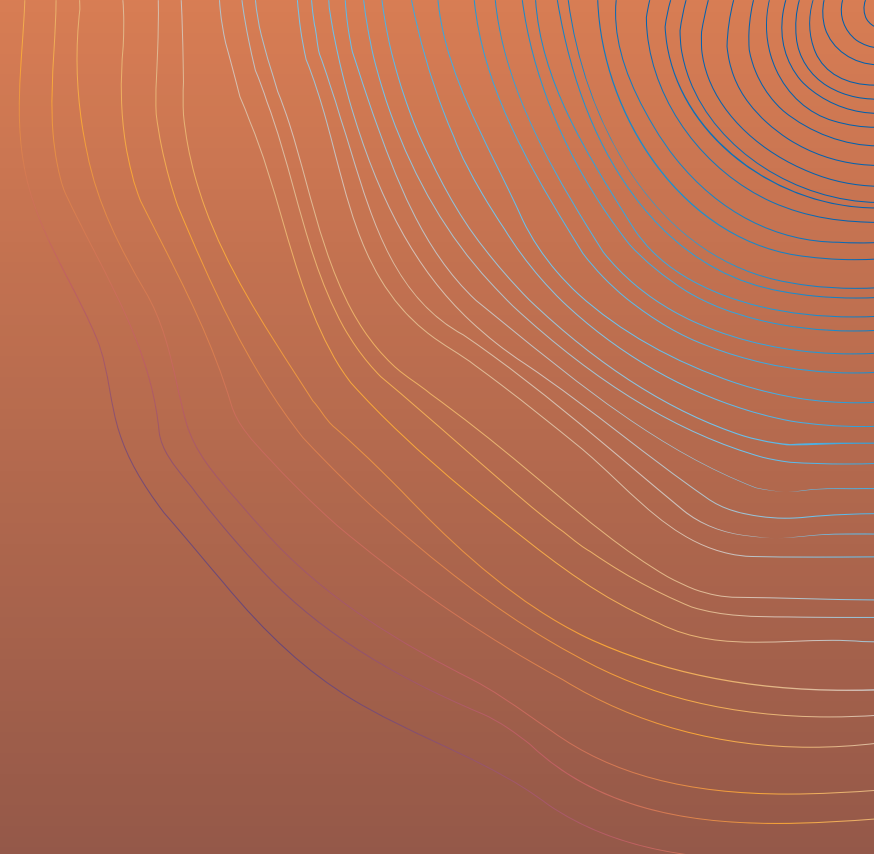
MALDIVES

World Bank Group

COUNTRY CLIMATE AND DEVELOPMENT REPORT

Executive Summary

June 2024



© 2024 The World Bank Group
1818 H Street NW, Washington, DC 20433
Telephone: 202-473-1000; Internet: www.worldbank.org

This work is a product of the staff of the International Bank for Reconstruction and Development (IBRD), the International Development Association (IDA), the International Finance Corporation (IFC), and the Multilateral Investment Guarantee Agency (MIGA), collectively known as The World Bank, with external contributors.

The World Bank does not guarantee the accuracy, reliability, or completeness of the content included in this work, or the conclusions or judgments described herein, and accepts no responsibility or liability for any omissions or errors (including, without limitation, typographical errors, and technical errors) in the content whatsoever or for reliance thereon. The boundaries, colors, denominations, links/footnotes, and other information shown in this work do not imply any judgment on the part of any of the organizations of The World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries. The citation of works authored by others does not mean The World Bank endorses the views expressed by those authors or the content of their works. The findings, interpretations, and conclusions expressed in this volume do not necessarily reflect the views of IBRD/IDA, IFC and MIGA, their respective Boards of Executive Directors, and the governments they represent.

The contents of this work are intended for general informational purposes only and are not intended to constitute legal, securities, or investment advice, an opinion regarding the appropriateness of any investment, or a solicitation of any type. Some of the organizations of The World Bank or their affiliates may have an investment in, provide other advice or services to, or otherwise have a financial interest in, certain of the companies and parties named herein.

Nothing herein shall constitute or be construed or considered to be a limitation upon or waiver of the privileges and immunities of any of IBRD/IDA, IFC and MIGA, all of which are specifically reserved.

Rights and Permissions

The material in this work is subject to copyright. Because The World Bank Group encourages dissemination of its knowledge, this work may be reproduced, in whole or in part, for noncommercial purposes as long as full attribution to this work is given and all further permissions that may be required for such use (as noted herein) are acquired. The World Bank Group does not warrant that the content contained in this work will not infringe on the rights of third parties, and accepts no responsibility or liability in this regard. All queries on rights and licenses should be addressed to World Bank Publications, The World Bank Group, 1818 H Street NW, Washington, DC 20433, USA; e-mail: pubrights@worldbank.org.

Executive Summary

Maldives' development success is facing headwinds

Maldives has achieved remarkable economic success in the last couple of decades. In 2023, the country achieved the highest gross domestic product (GDP) per capita in South Asia and human capital (health and education) indicators that are on par with high-income economies. Since the early 2000s, Maldives has doubled its real income per capita, transitioned from low- to middle-income status, and substantially reduced poverty. Human capital has also seen marked progress. Life expectancy more than doubled from 1960 to 2020, child and maternal mortality decreased drastically, and educational attainment significantly increased. The government has made infrastructure investment a priority, with construction of over 200 artificial harbors since 2002, six major seaports/terminals, 17 airports, and numerous seawalls and jetties (to name but a few examples).

Tourism and fisheries, both reliant on the country's natural capital, have been instrumental in Maldives' economic transition. Tourism and fisheries account for about half of the value-add to GDP and jobs, with their success intimately linked to the country's natural capital. While 8 out of 10 visitors report being attracted by the beaches, 6 out of 10 are drawn to the marine life. Beaches and marine life are maintained by the extensive coral ecosystem, which is critical for the islands' climate resilience.

High public spending, particularly driven by infrastructure investments, has led to a rising debt stock and concerns about the ability to service the debt. Public debt increased to an estimated 123 percent of GDP in 2023, compared to 77 percent in 2019. The twin deficits in fiscal and current accounts have increased the risk of debt distress and there are almost no fiscal or external buffers in place. High fiscal deficits and growing external liquidity pressures contribute to concerns over short-term liquidity and solvency. According to the debt sustainability analysis carried out by the World Bank and the International Monetary Fund in March 2024, increasingly higher repayment requirements would negatively affect several debt indicators, rendering debt unsustainable. As a result, Maldives is at a high risk of external and overall debt distress. Failure to implement planned fiscal reforms, while obtaining new external debt at expensive terms, could lead to a macro-financial shock. This would have significant negative impacts on the country's growth and debt profile and undermine the ability to finance urgent reconstruction and climate adaptation investments.

Climate change will have unprecedented impacts on the economy

Maldives is renowned for its unique island geography and rich biodiversity. With only 298 km² land surface, the country comprises 1,192 coral islands dispersed across 26 atolls over roughly 90,000 km². This makes it one of the most geographically dispersed countries on the planet. The country is distinguished by its extraordinary marine ecosystems, including extensive coral reefs that support natural island growth and a wide array of marine life that forms the foundation for economy and climate resilience. The land area has an average elevation of just 1.5 m, with 80 percent elevated less than 1 m. This fact renders Maldivians and their assets particularly vulnerable to sea level rise (SLR) and flooding, among other climate impacts.

SLR and related flooding is a major concern. Between 1992 and 2015, annual SLR averaged just under 4 mm. However, projections carried out by this Country Climate and Development Report (CCDR) suggest the rate could increase to between 6 and 12 mm per year, under severe warming scenarios, potentially leading to a rise of anywhere from 0.5 to 0.9 m by 2100. Without adaptation, coastal flooding could damage up to 3.3 percent of total assets by 2050 during typical 10-year floods. For rare, more intense events, damage to natural assets could reach up to 3.8 percent (for century-level floods) and 4.4 percent (for millennium-level floods).

Maldivian islands have adapted to SLR naturally in the past, but climate change impacts make their future natural adaptation potential highly uncertain. The physical foundation of atoll islands largely comes from the sand produced by marine ecosystems. This has historically enabled them to adapt to SLR. Despite SLR

of 3–4 mm per year in recent decades, only 3 percent of the islands experienced net land loss from 2004 to 2016, while 59 percent saw increases in land area and 38 percent remained stable, owing to natural accretion and strategic land reclamation. However, the degradation of coral reefs compromises the islands' ability to sustain this vital sand production. More than economic loss, this represents a substantial reduction in the ecosystem services that coral reefs provide. The flood protection service of coral reefs alone is valued at US\$442 million or 8 percent of GDP per year.

This CCDR estimates that SLR impacts would cause an almost 11 percentage point reduction of GDP by 2050 under a high-emission scenario—this impact, however, can be reduced to less than 6 percentage points with sustained reconstruction and adaptation investments. The macroeconomic modeling conducted for this CCDR assesses the impact of SLR on economic growth and the debt trajectory. It is based on scenarios with different considerations of reconstruction, adaptation investments, and fiscal consolidation. This reflects the critical role of fiscal reforms in improving the debt profile and boosting the government's ability to finance reconstruction and adaptation.

Almost all coral cover could be lost if global temperatures exceed 2°C. Ocean warming—resulting in coral bleaching events—is a major climate concern. Past ocean heating events in Maldives led to significant coral mortality. The severe 1998 coral bleaching event, for instance, resulted in a reduction of coral coverage from more than 70 percent to less than 10 percent. Fortunately, corals recovered to nearly pre-shock levels, until the next bleaching event occurred in 2016. Coral bleaching is cyclical, and corals can recover if they have the necessary time. However, climate change shortens the duration between ocean heatwaves and intensifies them. Modeling conducted for this CCDR estimates that almost all coral cover could be lost if global temperatures exceed 2°C. Even under a low-emission scenario, heatwave intensity will increase two to five times. Despite significant impacts, under the low-emission scenario, reefs would retain substantial coral cover. In addition to lowering global emissions, reducing impacts from local stressors such as coastal development and pollution will be key to preserving the country's vital coral reefs.

Severe climate-induced impacts are expected to begin in the second part of this century. The projections prepared for this CCDR on the climate change impacts on coral reefs, fish stocks, land, and infrastructure, all indicate that up until mid-century the negative impacts are expected to be incremental only. However, by around 2050, negative impacts are expected to escalate quickly, especially under the medium- to high-emission scenarios. Ocean heating, for instance, could cause an almost entire collapse of coral reefs and fish stocks. It is critical to use the decades leading up to these projected impacts to plan and build adaptive capacity for high-impact scenarios and, with the support of the international community, prevent them to the extent possible.

Impact of climate change on key sectors of the Maldivian economy

The tourism sector urgently requires accelerated climate adaptation efforts across its resort islands and guesthouses. A survey conducted for this CCDR across 55 resorts indicates that over 90 percent are grappling with moderate to severe beach erosion, while around 60 percent report considerable infrastructure damage due to climate-related events. However, many of the problems reported are not solely attributable to climate change. Islands naturally change (eroding in one area, while gaining land elsewhere) as a reaction to seasonal oceanographic patterns. Tourism infrastructure is often not designed with this changing environment in mind, requiring interventions to prevent naturally occurring erosion. Yet, as climate change alters natural oceanographic processes, often exacerbating their impacts, stepping up the climate resilience of the tourism sector is key. The sector also faces climate transition risks, including those related to the high carbon intensity of air travel.

Climate change is also anticipated to have a severe impact on the fisheries sector with analysis conducted for this CCDR projecting a dramatic decrease of almost 100 percent in fish catch potential by the end of the twenty-first century under a high-emission scenario. If no adaptation action is taken, such impacts could translate to almost 99 percent revenue reduction from fisheries. About 91 percent of key species are at very high risk from increased ocean temperatures and acidification. The Maldives' northern exclusive economic

zone (EEZ) is particularly at risk of high rates of local species' extinction due to accelerated warming, whereas the southern EEZ is expected to witness increased species' invasion rates alongside more intense marine heatwaves. In contrast, low-emission scenarios show inconsequential impacts on fish catch and revenue, reemphasizing the need for the international community to reduce emissions globally.

Importance of island-driven adaptation approach

There are five broad categories of adaptation options for making atoll islands more climate resilient: (a) protection infrastructure (using hard/gray measures to reduce SLR and flooding); (b) accommodation measures (building resiliently, such as on stilts or floating); (c) nature-based solutions (NbS), using natural practices such as restoring coral reefs or planting mangroves for flood protection); (d) island raising and land reclamation; and (e) relocation and migration. Underpinning these adaptation options are climate, disaster, and environmental monitoring and modeling as well as early warning systems (EWSs), serving as crucial tools to facilitate effective implementation.

These climate adaptation options must be tailored to the needs of each island. This CCDD develops an island typology and four archetypical Dynamic Adaptive Policy Pathways (DAPPs) that aim to guide island-level SLR adaptation strategies. The four pathways identified are (a) protection, (b) transition to protection, (c) transition to accommodation with nature-based measures, and (d) pure accommodation with nature-based measures. These generic pathways offer a starting point for developing more detailed adaptation strategies for individual islands and recommend solutions for various situations and points in time.

Choosing the right island adaptation measures

Currently, the most prevalent coastal adaptation measures are land reclamation and hard/gray coastal protection infrastructure. More than three-quarters of the 188 inhabited islands have seen some form of island or sandbank widening (and in selected cases also raising) or a seawall, breakwater, or groyne erected on its shores. Between 2000 and 2016, a total area of 10 km² was reclaimed (about 3 percent of the total land area). In the past, reclamation has primarily been done to create additional space for housing and economic development and not for climate adaptation, with most of the reclaimed areas not raised higher than the original surface area. However, climate adaptation is likely to become a more prominent objective for choosing land reclamation going forward.

While gray-engineered measures currently dominate adaptation efforts on both inhabited islands and resort islands, several resort islands have experimented with NbS. From 2004 to 2016, 47 inhabited islands implemented coastal protection interventions and 45 of them chose gray interventions. Very few inhabited islands have implemented NbS such as mangrove planting or coral restoration. Resort islands also report a predominant use of gray solutions although to a smaller degree. About 40 percent of resort islands reported application of beach nourishment, more than 15 percent mangrove plantation, and about 5 percent coral restoration.

Island raising and reclamation can address risks from SLR but can also exacerbate vulnerabilities. Hulhumalé, for instance, was designed and developed with future SLR in mind and features extensive island augmentation. The land was raised to approximately 1.8 m above mean sea level to reduce flood risks. However, land reclamation often affects lagoons and coral reefs, which are instrumental in natural island formation and growth, by disrupting natural sediment transport processes. The removal and redistribution of sand and sediment can also damage coral structures that protect against coastal erosion and flooding.

Gray infrastructure can have tangible coastal protection benefits in some cases but also detriments in other cases. Depending on the island type, coastal protection with gray infrastructure may be the right-fit approach to coastal protection. That said, there are also maladaptive examples—**islands locked into hard protection pathways lead to destruction of protective coral reefs, which has negative impacts on the tourism and fisheries sectors that rely on healthy coral ecosystems.** On inhabited islands, gray coastal protection measures are often a solution to the consequences of past island development choices, including

infrastructure placement and type, rather than to climate change impacts. These coastal modifications have had impacts in the form of coastal erosion down current. Consequently, efforts are being made to mitigate these erosion effects through coastal protection measures. This highlights the complexity of coastal protection in the face of economic imperatives such as tourism as well as the urgent need for a nuanced approach that combines engineered and nature-based measures. Such a balanced strategy aims to protect island communities while preserving ecological integrity and adaptive capabilities.

Maldives' commitment to climate change adaptation

The government has established a comprehensive policy framework to address climate change, but implementation is hampered by inadequate inter-agency coordination, translation of policies into action, and tracking of commitments. The lack of a detailed National Adaptation Plan (NAP) as well as weaknesses in project planning, preparation, and selection exacerbate effective public investments in climate adaptation. The 2020 Nationally Determined Contribution (NDC) targets a 26 percent reduction in emissions by 2030, with aspirations for net zero emissions, contingent on international support. However, policy implementation is hampered by coordination challenges among institutions with partly overlapping mandates and disjointed activities. Local island councils also struggle to manage climate impacts and disaster response, and central agencies face challenges in monitoring and forecasting.

Transitioning to a green economy

Maldives can reap significant development benefits from a green transition in key sectors, particularly energy. The country is heavily dependent on imported diesel fuel for electricity production which accounts for over 90 percent of its energy needs. The fuel import bill was US\$507 million (8 percent of GDP) in 2022, with US\$61 million paid in subsidies. The potential fiscal and foreign exchange savings from switching to cheaper solar energy could help facilitate investments in climate resilience and other development objectives over the medium to long term. In addition, creating its own energy would reduce vulnerability to global energy shocks and create quality jobs for the local population. There are also significant development benefits from transitioning transport, housing, and waste management to a greener pathway. However, large investments in the green transition need to be planned carefully and implemented sequentially considering the current macro-fiscal limitations.

Enhancing social protection and skills development is crucial for building the resilience of people and communities and fostering sustainable growth. Poor and vulnerable households in Maldives report higher incidences of floods and droughts. Remote atolls face increased risks of coastal flooding and extreme sea levels and have more difficulty accessing post-disaster support. There is a foundation for a responsive social protection delivery system, but it requires improved digital infrastructure, data, financing, and institutional strengthening. Existing social and social protection programs need to be more adaptive, scalable, and targeted to reach the poorest households. Skill development and unemployment insurance could help mitigate risks from green transition policies, which must be designed carefully, as they could also further add strain to public finance. A robust social protection system, digitization, and smart policy design can shield the poor from the impacts of decarbonization reforms, such as energy subsidy removal.

How to finance climate action in Maldives

The financing requirements for Maldives' climate change adaptation to SLR and flooding alone range between US\$2 billion and US\$4 billion. This estimate is based on selecting bespoke coastal protection solutions to cater to the physical characteristics of each island (which contrasts with previous estimates based on the costliest measures). It does not include other adaptation costs such as those related to ocean warming, which will significantly threaten tourism and fisheries. Similarly, it also does not include the financing gap for mitigation, which has been estimated at US\$1 billion.

Restoring fiscal space, building external buffers, and ensuring macroeconomic stability will be a prerequisite to mobilizing the required financing for climate action. Major policy reforms are urgently needed, including significant expenditure adjustments via reforms in subsidies, the health sector, public investment, asset and

debt management, and state-owned enterprises (SOEs) and private sector support. In addition, structural reforms are needed to diversify the economy over a longer term. Revenue-side measures such as the Green Tax and airport development fees could be increased to finance urgently needed climate action.

The financing gap cannot be met by domestic public finance alone. A variety of external financing sources should be explored. Grants and concessional financing totaling around US\$500 million have contributed to financing climate projects in the past. For adaptation investments that are not commercially viable, grants will continue to be crucial but will not be sufficient to fill the significant financing gap. New sources of concessional funds may be tapped, which could be facilitated by establishing dedicated conservation and climate adaptation trust funds. Related to that, the government could consider other debt-neutral instruments such as debt-for-nature swaps or donor outcome-based bond structures. The country can also tap into carbon markets, including for blue carbon projects, and develop climate-related risk management financial products such as insurance and instruments for disaster risk financing.

Mobilizing private sector finance will be critical but might require de-risking instruments to attract investors. Maldives needs an updated public investment management (PIM) framework and could expand public-private partnerships (PPPs) to mobilize green finance. Once the existing fiscal and external vulnerabilities are addressed and the appropriate regulatory frameworks are in place, more projects can be bid out to the private sector. The small project size and lack of capacity might require the use of de-risking instruments to attract more private capital and foreign direct investment (FDI) to meet climate adaptation and mitigation financing needs. A fiscal commitments and contingent liabilities (FCCL) framework for PPP projects can help manage the associated fiscal risks and enhance coordination between institutions.

Structure of the main report and recommendations

Figure ES.1: Conceptual framework for climate change and development in Maldives



The main report analyzes the climate resilience and green transitions as well as the enablers to address critical climate hazards and reap development benefits in more detail. Figure ES.1 presents the report’s conceptual framework. After an introduction to the Maldives’ development trajectory, the CCDR discusses the main climate hazards—SLR and ocean warming—based on several pieces of original modeling work conducted for this report (Chapter 1). At the core of the report is the discussion of the key resilience

transitions for climate-resilient ecosystems (Chapter 3), islands and infrastructure (Chapter 4), and livelihoods (Chapter 5), focusing on tourism (5.1) and fisheries (5.2) as the main sectors of the economy as well as social protection and people (5.3). The need for a green transition is discussed in Chapter 6 and focuses on energy (6.1), mobility (6.2), and waste (6.3). The CCDR identifies four key enablers for the resilience and green transitions: macro and fiscal stability as well as finance (Chapter 7), policies and institutions (Chapter 2), and adaptation planning (Section 4.2).

Based on the findings from this analysis, this CCDR presents a set of Key Recommendations that are structured along six High-Level Objectives. The High-Level Objectives are aligned with the report’s conceptual framework. The Key Recommendations build on a longer list of technical recommendations identified throughout the report at the end of the individual chapters and sections. Table ES1 provides a snapshot of the Key Recommendations with those considered *urgent* (as defined in the main report) marked with a ★ symbol. The Key Recommendations are further elaborated (including in terms of the time frame for implementation, synergies and trade-offs with other development objectives, implementation barriers, and progress indicators) in Chapter 8 of the main report.

Table ES1: High-level objectives and snapshot of key recommendations

High-Level Objective 1: Improve macroeconomic stability and fiscal space to finance climate action	
	(1.1) Reduce expenditure related to subsidies, infrastructure, expensive health care options, and SOEs to return public spending to sustainable levels; address fiscal vulnerabilities; create space for climate-related spending over the medium term; and increase private sector participation.
	(1.2) Implement revenue mobilization measures including tax reforms such as raising the Green Tax and dedicating proceeds to environmental- and climate-resilient interventions.
	(1.3) Pass a new Public Debt Management Bill and a revised Fiscal Responsibility Act to address debt vulnerabilities.
	(1.4) Limit the sovereign-bank nexus to allocate more resources to the private sector for climate adaptation investments and enhance banking regulation and supervision to ensure financial stability.
High-Level Objective 2: Mobilize climate finance	
	(2.1) Operationalize the Climate Finance Hub and develop a climate investment plan with bankable projects.
	(2.2) Set up a conservation and climate adaptation trust fund with appropriate governance structures to help attract additional concessional finance for climate adaptation and environmental protection.
	(2.3) Develop a national carbon market strategy and infrastructure and promote the development of robust carbon crediting systems to tap into finance from voluntary and compliance markets.
	(2.4) Introduce climate budget tagging to improve climate-related spending and decision-making and facilitate the engagement with green investors.
High-Level Objective 3: Enhance the climate resilience of islands and infrastructure	
	(3.1) Develop an NAP and related island/regional development plans that explicitly integrate SLR, flooding, and ocean heating scenarios to guide future spatial and development planning.
	(3.2) Develop guidelines for island raising and land reclamation to optimize their use and, when used, increase the resilience and sustainability of newly developed land and limit negative environmental impacts.
	(3.3) Systematically study the feasibility and unintended side effects of hard/gray protection infrastructure and preserve natural island processes to avoid maladaptation and lock-in effects.
	(3.4) Update building codes and practices to increase the resilience and sustainability of infrastructure.
	(3.5) Further assess the feasibility and effectiveness of NbS to support their scale-up.

High-Level Objective 4: Enhance the climate resilience of ecosystems	
	(4.1) Develop a coral management and funding plan with a time horizon until 2050 to scale up coral reef restoration, including exploring emerging restoration technologies.
	(4.2) Improve waste management and coastal infrastructure development to reduce local stressors on coral reefs.
	(4.3) Systematically develop and implement marine protected areas (MPAs) to conserve high-biodiversity marine and coastal ecosystems.
	(4.4) Establish a coral reef management decision support system to guide the targeting of conservation and restoration interventions.
High-Level Objective 5: Enhance the climate resilience of livelihoods (fishers and tourism)	
	(5.1) Research pelagic and reef fish migration and impacts under different climate scenarios to inform fisheries planning.
	(5.2) Assess alternative livelihood opportunities for fishers such as diversification of deep-sea fisheries and mariculture development to improve the resilience of fishing communities.
	(5.3) Strengthen the regulatory framework to ensure that new resorts and guesthouses are being developed using climate-resilient and green infrastructure, existing resorts and guesthouses receive advice on and support for upgrades/retrofits, and minor repair and climate resilience upgrade works can proceed without lengthy approval processes.
High-Level Objective 6: Unlock the development benefits from green transitions in the energy, mobility, and waste sectors	
	(6.1) Phase out fossil fuel subsidies and reduce public expenditure while mitigating the impacts on poor and vulnerable households.
	(6.2) Promote risk-sharing frameworks and increased private sector participation and PPPs to increase renewable energy adoption and improve waste management.
	(6.3) Introduce a renewable energy mandate for resorts to increase the share of renewable energy.
	(6.4) Develop a strategy and action plan to promote green mobility, including non-motorized transport, e-scooters, e-buses, e-ferries, and charging infrastructure.