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ADB Working Paper Series

**ADDRESSING MARINE LITTER
THROUGH SUSTAINABLE TOURISM:
THE CASE OF THE SIARGAO ISLANDS
IN THE SOUTHERN PHILIPPINES**

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Abstract

Marine litter seriously affects island-based or archipelagic economies. The Philippines is an example of a country at the center of this predicament due to its strategic geographic location as a regional trade route. Urbanization, rapid economic development, and the population increase are some of the key factors contributing to increased consumption and waste generation. Tourism is one of the main economic drivers, with several pristine islands serving as leisure destinations for local and international visitors. In fact, 8 million tourists visited the country in 2019, which contributed 12% to the country's GDP and provided 5.4 million jobs. However, tourism is under threat from locally generated waste materials and those reaching the shores from international waters. One of the most popular tourism destinations is the Siargao Islands, which earned the top spot in the Best Holiday Destination in 2020 of Conde Nast, a prestigious international travel magazine. The island is well known for its annual international surfing and game fishing competitions. It is pursuing sustainable tourism because of the increasing number of tourists along with the alarming increase in waste generation. The island faces the Pacific Ocean and receives marine debris that yearly monsoon winds bring. This paper aims to explore marine litter mitigation and prevention in tourism destinations like Siargao through circular economy interventions. Innovative legislation and policies, capacity building, deposit refund systems, technological innovations, and community-based approaches to minimize, capture, and process marine litter are some of the key areas that it will tackle in the hope of contributing to the global practices on sustainable tourism in island economies.

Keywords: Sustainable tourism, circular economy, marine litter, participatory governance, international cooperation

JEL Classification: Z3

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1. INTRODUCTION

The Philippines has emerged among the most-favored tourist destinations in the world. Being an archipelagic country in Southeast Asia, its 7,641 islands offer a range of breathtaking tourism attractions. To the west of the country is the Western Exclusive Economic Zone and to the East is the Philippine Sea, and it has a total land area of 298,170 square kilometers. It has an extensive and rich coastline of 36,289 kilometers that serves as a major tourism asset. As of 2019, the country's total population was 108,116,615 (World Bank 2020), of which the coastal population constitutes about 62%.

The ocean economy in the Philippines employs around 2.15 million people, which is 5.5% of the total employment. It accounts for 7% of the country's GDP, valued at US\$11.9 billion. The tourism sector contributes around US\$3 billion in value added (PEMSEA 2017). The tourist arrivals in the country have grown strongly and steadily in the last 10 years. They escalated to a growth rate of 6.07%, with 8,260,913 arrivals, in 2019, generating 5.7 million jobs in the same year. This figure represents an increase of 6.5% in the employment rate compared with 2018 (Department of Tourism 2019).

The Philippines has enjoyed the benefits of the ocean economy primarily through tourism. However, the issue of marine litter has emerged as one of its major challenges. Marine litter from inland sources and marine debris coming from international waters have become a gargantuan problem. A study that Ocean Conservancy conducted revealed that the People's Republic of China, Indonesia, the Philippines, Viet Nam, and Thailand are the top five countries that contribute more than half of the plastic waste in the ocean (Ocean Conservancy 2017). The Philippines alone generates about 2.7 million tons of plastics annually (Lor 2019). Marine litter degrades the pristine coastal and marine assets and threatens tourism resources. If left unchecked, the tourism industry is likely to lose its vibrancy, and this will affect a huge population that is highly dependent on tourism for employment. Currently, many local governments units are betting on tourism as a major economic lifeline. The Philippine Government has exerted direct efforts to address the deterioration of nature-based tourism destinations through ecotourism.

The greater challenge, however, lies in the advent of the global health pandemic. Recent data that the Philippine Department of Tourism (2021) released revealed that tourist arrivals in the country had plummeted to a low of 82.05%. Only 1,482,535 tourists visited in 2020 as opposed to 8,260,913 in 2019. Foreign tourists' expenditure plunged to a low of 83.12% from Php482.16 billion in 2019 to Php482.16 billion in 2020. The pandemic has caused enormous economic distress in tourism, triggering leaders in the industry to rethink the industry. Marine litter is one of the major areas that needs immediate interventions. As domestic tourism leads the recovery of the industry (Department of Tourism, Dr. Andrew L. Tan Center for Tourism, and Guide to the Philippines 2020), the government has issued health guidelines to ensure global health compliance in destinations. These require tourists and host communities to use PPE, face masks, and the like, which will further increase the waste generation. A synergistic approach of cooperation at the local, national, and international levels will help considerably in achieving this end.

This paper aims to discuss the existing and emerging measures to address marine litter in the Siargao Islands along with strategic and sustainable waste management solutions to maintain its ecological integrity and its position as a tourism destination. To arrest the linear thinking of consumption and disposal, it proposes juxtaposing circular economy-oriented measures with interventions like tourism branding, diversification, and enhanced partnerships.

2. RESEARCH METHODOLOGY

2.1 Tourism in the Caraga Region and Siargao Islands

Caraga is one of the administrative regions of the Philippines. It is composed of five provinces, namely Agusan del Norte, Agusan del Sur, Dinagat Islands, Surigao del Norte, and Surigao del Sur. Located at the northeastern tip of Mindanao, Caraga Region is a tourist's paradise. Its topography, consisting of mountainous areas, flat rolling lands, and long stretches of coastlines, are among its major tourism strengths. These natural endowments provide huge advantages to tourism and other industries, such as forestry, agriculture, and even mining. Caraga Region's declaration as a separate administrative region on 23 February 1995 helped to gain momentum for the tourism industry, enabling it to flourish as one of the major economic drivers of the region.

Since surfing was introduced in the Siargao Islands in the 1980s, tourism development has experienced unprecedented growth. Surfing events attracted substantial attention from enthusiasts and eventually earned the island international recognition as the surfing capital of Asia. The wealth of the island's marine resources made it even more popular through the International Game Fishing Tournament. Apart from the yearly water sports adventure events, the Siargao Islands' diverse natural attractions, such as long stretches of white sand beaches, waterfalls, islands, lagoons, and caves, enticed more tourists to visit.

Tourism flourished almost effortlessly because of the island's natural affluence. Its tourist arrival growth rate has swelled by 18.27% in the last 5 years. In 2018, there were 181,782 tourists, 42% more than the 257,900 who visited in 2019. While tourism has undoubtedly brought progress, the surge of tourists has become a growing concern in maintaining the integrity of the island as a protected area. Long before they became a popular tourism destination, the Siargao Islands were a protected area by virtue of Presidential Proclamation No. 902 in 1996, known as the Siargao Islands Protected Landscape and Seascape (SIPLAS). There are trade-offs with tourism development such that the tourism-carrying capacity has emerged as a major issue. An increase in tourist arrivals equates to increased waste generation. In 2020, tourists generated an estimated 125 tons of waste. The expectation is that this figure will rise in the advent of the global health pandemic. Domestic tourism is the Philippine Department of Tourism's direction toward recovery with the enforcement of global standards of safety measures. The wearing of face masks, face shields, and PPE is mandatory and is likely to double the volume of waste on the islands.

COVID-19's disruption of travel and tourism in Siargao decreased tourist arrivals by 3.57% in the first quarter of 2020, with 53,820 visitors compared with 55,814 in 2019. While the pandemic caused heavy economic losses on the one hand, on the other hand, it provided a break for many ecotourism sites. However, threat springs anew as destinations are slowly opening for domestic tourism. The threat of plastic pollution is foreseeable as health protocols require the wearing of face masks and the use of personal protective equipment (PPE).

2.2 Literature Review

This research combined secondary data collection and a desk review of concepts, approaches, and methods of sustainable tourism and the circular economy. It analyzed sustainable tourism strategies and activities in island-based tourist destinations in Caraga Region, Siargao, in particular. It reviewed the policy and regulatory framework to identify the prevailing policies and regulations that affect tourism and waste management. The paper presents a discussion of marine litter issues and interventions in Siargao using data from local government units. The study analyzed the development patterns in the region and the existing and emerging sources of waste to gain an understanding of the waste pollution problem in the pilot area, including the approaches and technologies that are in operation in coastal marine litter management. The study selected Siargao as the featured area because it is one of the premiere tourist destination sites in the Philippines, with a steady growth rate of 20% in tourist arrivals in recent years. It also faces the Pacific, from which it receives trash/debris from the Great Pacific Garbage Patch during the northeast monsoon seasons.

In the 1950s to the 1970s, the tourism sector expanded almost on its own, without the support of proper planning and development policies. The absence of specific tourism planning controls, the inadequacy of legislation, and inadequate and ineffective tourism organizations were responsible for the failure of tourism planning (Dowling and Fennel 2003). According to Costa (2001), tourism was under the umbrella of town planning, which was dependent on urban growth. It lacked the planning instruments capable of coordinating and regulating the development of resorts, which resulted in failure to control tourism's development. After the 1980s, tourism planning theory and practice started to emerge with the support of evidence and research through a unique body of knowledge (Buhalis and Costa 2006).

Getz's (1986) integrative systems model emerged as an approach that introduced cohesive planning activity incorporating economic, social, and environmental components, spatial concerns, and temporal or evolutionary stage implications (Dowling and Fennel 2003). It is based on research and evaluation, in which planning and theory must interrelate and goal setting must complement the development plan. The model highlights the optimization of the potential contribution to human welfare and environmental quality. Getz stressed that a more comprehensive approach would be to incorporate salient issues, stakeholders, and unbiased information on regional impacts.

Related to Getz's integrative systems model is Gunn's (1988) interactive systems model, which contributed to the foundation of the sustainable development concept. He emphasized the need to integrate continuous tourism planning with all other planning for social and economic development. The model seeks to strike a balance between tourism and the protection of the cultural and natural resources on which tourism depends. It underscores the symbiotic relationship between a thriving tourism industry and a protected environment through the use of tourists' satisfaction as the basis for tourism planning. It factors in tourism planning, tourism systems, and the supply/demand relationship. The goal is to integrate tourism into the social and economic life of a community. Hence, the focus of planning is mainly on generating income and employment and ensuring resource conservation and traveler satisfaction.

Inskip (1991) established approaches and guidelines for integrated and sustainable development. He was among those who opposed the market-driven approach of the tourism development model. He reasoned that the tourist market may demand attractions, facilities, and services that could result in environmental destruction and

damage to the socio-cultural integrity of the tourism area. In contrast, the supply-led approach implies that it is best to integrate those types of attractions, facilities, and services into tourism, resulting in the minimum impacts on the local development patterns and society. Marketing aims to attract only those tourists who find this product to be of interest (Andriotis 2015). Hall, Finsterwalder, and Ram (2015) advanced the idea that the achievement of tourism development occurs when tourists and the local community are satisfied. He said that, in the long run, the most sustainable tourist destination is not one that relies on tourism alone but one that lives, works, and interacts with diverse communities, allowing their distinctive identities to evolve over time. Its primary focus is on meeting the community's needs (Hall 2015).

3. TOURISM IN THE CONTEXT OF THE PHILIPPINES

3.1 Definition and Classification

The United Nations World Tourism Organization (2011) defined tourism as comprising the activities of persons traveling to and staying in places outside their usual environment for not more than 1 consecutive year for leisure, business, and other purposes. The Philippines, like all other countries, aims to increase its number of tourist arrivals as a major economic indicator of tourism growth. According to the UNWTO's definition, a visitor is any person who travels to a country other than that in which the person has his/her usual residence but outside his/her usual environment for a period not exceeding 12 months and whose main purpose of visiting is other than the exercise of an activity to receive remuneration from within the country visited. The person is a tourist if he/she stays for at least one night in collective or private accommodation in the country. However, a visitor who does not spend the night in collective or private accommodation in the country is a same-day visitor.

The Philippines offers rich and diverse tourism resources. The National Tourism Development Plan outlined a portfolio of 10 tourism products, namely nature-based tourism, cultural tourism, agri-tourism, sun and beach tourism, health, wellness,

and retirement tourism, cruise and nautical tourism, education tourism, meetings, incentives, conferences and exhibits (MICE) tourism, leisure and entertainment tourism, and diving and marine sports tourism. The 10 major tourism products emerged from the results of a market-product analysis recommending the prioritization of enriching the tourist experience and boosting the product diversification.

3.2 Approaches and Strategies

The Philippines Department of Tourism has adopted the tourism cluster approach for destination development among the guiding principles of the National Tourism Development Plan (NTDP). The strategy involves linking tourism development areas (TDAs) into logical groupings of transport networks, natural and cultural tourism sites, and urban service centers that provide facilities and amenities, all with at least a primary gateway providing services. There are 49 TDAs in the country, and the province of Surigao del Norte is part of the Southern Philippines Tourism Cluster.

The convergence approach is also an essential guiding principle of the NTDP's implementation. It involves the creation of partnerships with public and private stakeholders, ensuring participatory governance and strengthening stakeholders' capacity. The analysis of tourism's current situation addressing the major challenges of the industry drew the strategic directions.

4. POLICY AND REGULATORY FRAMEWORK

As is apparent from the above discussion, all the policies are in place, and there are clearly defined areas for collaboration between and among government agencies, but an increase in their implementation and enforcement is necessary. Local government units, which are the frontline for addressing environmental issues such as marine litter, should have the available capacity and resources and at the same time the proper guidance from the national government to generate resources and navigate local solutions.

Table 1: Philippine Laws and Policies

Laws/Plans	Salient Provisions	Enforcement Entities	Implementation Challenges
Global Partnership on Marine Litter (GPML) ^a	The United Nations Environment Programme (UNEP) hosts the Global Partnership on Marine Litter (GPML), which it launched during the UN Conference on Sustainable Development (Rio+20) in June 2012. It focuses on three main areas, marine litter, nutrient arrangement, and wastewater, through voluntary multi-stakeholder partnerships of governments, academia, the private sector, and civil society. It provides a platform for cooperation and the sharing of ideas and expertise among stakeholders.	UNEP, multiple stakeholders	<ul style="list-style-type: none"> • Gaining the involvement of stakeholders (national and local) • Identifying a common circular economy framework to address marine litter in areas such as packaging, labeling, and infrastructures
Tourism Act of 2009 (Republic Act 9593) ^b	The law provides a policy direction aiming to harness tourism as an engine of socio-economic growth and cultural affirmation to generate investment, foreign exchange, and employment and promote national pride among Filipinos. It expanded the roles and powers of the Department of Tourism as the primary planning, programming, coordinating, implementing, and regulatory agency in the development and promotion of the tourism industry.	DOT, national government agencies (NGAs), local government units (LGUs)	<ul style="list-style-type: none"> • Tourism officers do not hold regular positions at the local level • Limited budgetary allocation to implement programs
National Tourism Development Plan (NTDP)	Outlines the vision and strategic directions of the Philippine tourism sector using a strategic and innovative approach to promote inclusive growth in strategic programs ranging from transport infrastructure, marketing, human resources and service standards, and gender and women's empowerment to risk and crisis management. It promotes a cluster approach to the development of identified tourism areas and a convergence approach to enhance efficiency and inclusivity. The NTDP underpins sustainable tourism as its general framework for developing the country's rich tourism resources.	DOT, NGAs, LGUs	<ul style="list-style-type: none"> • Some LGUs have limited or no capacity to implement programs on the ground • Tourism officers do not have a permanent position, which results in challenges related to overseeing the project implementation and continuity of programs • Some DOT staff at the regional level do not have the absorptive capacity to implement downloaded programs due to limited personnel and numerous expectations

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Table 1 *continued*

Laws/Plans	Salient Provisions	Enforcement Entities	Implementation Challenges
National Ecotourism Strategy and Action Plan 2013–2022	The Tourism Act of 2009 or the Republic Act 9593 Section 36 mandated the formulation of the National Tourism Development Plan. It outlines the vision and strategic directions of the Philippine tourism sector using a strategic and innovative approach to promote inclusive growth. It focuses on strategic programs ranging from transport infrastructure, marketing, human resources and service standards, and gender and women's empowerment to risk and crisis management. It promotes a cluster approach to the development of identified tourism areas and a convergence approach to enhance efficiency and inclusivity. The NTDP underpins sustainable tourism as its general framework for developing the country's rich tourism resources.	DOT, NGAs, LGUs	<ul style="list-style-type: none"> • The same explanation as above.
Ecological Solid Waste Management Act of 2021 (Republic Act 9003) ^d	The Ecological Solid Waste Management Act of 2000 is landmark environmental legislation in the Philippines that adopts systematic, comprehensive, and ecological waste management programs. It emphasizes source reduction composting, recycling, and reuse and promotes the establishment of material recovery facilities (MRFs) in communities. The National Solid Waste Management Commission (NSWMC) is the agency with the task of implementing the Republic Act 9003. It is also responsible for establishing the National Ecology Center, which serves as the platform on which to conduct research and develop databases and training and networking services.	Department of the Environment and Natural Resources (DENR), National Solid Waste Management Commission (NSWMC), city, provincial, and local government units	<ul style="list-style-type: none"> • Limited technical knowledge of some LGUs to execute the provisions of the law • Limited funding amidst competing priorities at the local level • Limited government–private sector complementation
Climate Change Act of 2009 (Republic Act 9729)	The Act was the country's response to the worldwide phenomenon of climate change. It provides a comprehensive framework for integrating the concept of climate change with risk reduction in various phases of policy formulation, development plans, poverty reduction, strategies, and other development tools and techniques.	Climate Change Commission, NGAs, LGUs	<ul style="list-style-type: none"> • Building local capacities to plan, implement, monitor, and evaluate climate change initiatives/projects

^a UNEP (2020). ^b Department of Tourism (2020). ^c Department of Tourism Central Office (2011). ^d National Solid Waste Management Commission (2021). ^e Climate Change Commission (2021).

Seamless coordination among these bodies is imperative to establish coherent programs to address identified issues. The Mandanas Rule, which the government intends to implement in 2022, aims to bridge the gaps along this line. It seeks to improve the capacity of the local government units to implement plans by devolving some functions of the national government. These include concerns about the environment and tourism. Integral to the Mandanas Rule is the increase in the tax revenue shares of the local government units. Executive Order 138 provides for the full devolution of certain functions of the executive branch to the local governments and the creation of a committee on devolution. The Mandanas Ruling is the Philippine Supreme

Court decision that clarified the method for calculating LGUs' share in the national taxes (Department of the Interior and Local Government 2021).

4.1 Institutional Arrangements

The National Integrated Protected Area System (NIPAS) or the Republic Act 7586 classifies the Siargao Islands as a wildlife sanctuary. Their management is under the tutelage of the Protected Area Management Board (PAMB) by virtue of Presidential Proclamation No. 902, Series of 1996, as the Siargao Island Protected Landscape and Seascape (SIPLAS). The PAMB serves as the deciding body for all major development interventions on the islands, with the aim of protecting its rich natural resources. It consists of the Regional Executive Director of the Department of Environment and Natural Resources (DENR) Caraga, the Provincial Development Officer, the Local Chief Executives (LCEs) of the nine municipalities of the Siargao Islands, and three representatives from non-government organizations or local community organizations. The DOT's role is to provide the provincial and municipal local government units with technical support in the development and promotion of the Siargao Islands as a visitor destination. These include, among others, the formulation of a tourism development plan aiming to improve tourism products and linking them to other tourism hubs to expand the market niche (DENR 2015).

4.2 Implementation Gaps

Some implementation issues and gaps in the management of the Siargao Islands relate to political, technical, social, and economic factors. Political differences harm the continuity of initiatives and tend to become compartmentalized rather than being comprehensive because local leaders do not belong to the same political party. Regarding the aspect of waste management, the absence of an island-wide authority prevents LGUs from crafting island-wide resource recovery programs designed to reduce, recover, and recycle waste materials. The tendency is for each LGU to develop its own programs. There is also insufficient technical know-how on managing marine litter, which causes the abandonment of marine debris on coastal shores or its disposal at solid waste facilities without recovery efforts. Added to this is the lack of organized island-wide mechanisms to manage marine litter. At the community level, there is limited effort to heighten the awareness of proper waste disposal, which contributes to marine littering. The inability of LGUs to mobilize resources is due to their limited funds because of competing priorities like health, education, and sanitation.

The *Siargao Islands Situational Report* (Tourism Enterprise Zone Authority 2018) identified specific challenges in the island's solid waste management (SWM). There is poor implementation of segregation at the source, particularly on the household level, as the mixed-waste collection practice of most municipalities evidences. An inefficient waste collection system due to the lack of resource allocation compounds the burden. Most of the municipalities have only one waste collection vehicle, which is vulnerable to breakdown. In most cases, when this happens, waste accumulates at the source. Residents look for alternatives for waste disposal, such as open pits in their backyards. The majority of the municipalities continue to operate illegal dumpsites. There is also a lack of waste diversion structures, such as material recovery facilities (MRFs) and composting facilities. The islands do not have adequate final disposal facilities, such as an engineered sanitary landfill or waste-to-energy (WTE) facility.

5. MARINE LITTER AND TOURISM IN THE SIARGAO ISLANDS

5.1 Sources of Waste

The Siargao Islands generate waste from households, tourists, offices, shops, schools, and markets. Data from selected LGUs show that the average annual waste generation per municipality ranges from 300 to 2,000 tons, with average per capita waste generation of 0.30–0.65 kilograms/day. In terms of composition, Siargao's waste consists primarily of biodegradable (47%), recyclable (36%), residual (11%), and special waste (8%). These figures are based on the initial average of data from the LGUs, namely Pilar, Sta. Monica, Socorro, and San Benito.

The increase in generation is attributable to the surge of tourist arrivals, as the following table shows:

Table 2: Tourist Arrivals in Siargao Islands, 2016–2020

Year	Foreign	Local	Total
2016	27,843	109,211	139,070
2017	34,166	95,564	131,747
2018	57,939	123,843	183,800
2019	74,858	183,042	259,919
2020	13,941	39,879	53,820
2021	22,456	97,810	120,266
2022	22,917	104,530	127,447
2023	23,386	111,713	135,099
2024	23,865	119,389	143,255
2025	29,930	143,329	173,259

Source: DOT Caraga.

DOT Caraga has estimated that each tourist generates about 0.3 kilograms of waste per day and stays in Siargao for a minimum of 7 days.

**Table 3: Tourist Arrivals vis-à-vis SW Generation in the Siargao Islands
(2016–2020)**

Year	Tourist Arrivals (Caraga Region)*	Tourist Arrivals (Siargao Islands)*	Waste Generation/Year (Kilograms)**	Waste Generation/Tourist/Year (Tons)
2016	1,464,124	139,070	292,047	322
2017	1,756,949	131,747	276,669	305
2018	2,108,339	183,800	385,980	425
2019	2,530,006	259,919	545,830	602
2020	194,498	53,820	113,022	125

* Domestic and foreign tourists combined.

** Based on 0.3 kilograms per capita waste generation multiplied by 7 days' minimum stay.

Source: DOT Caraga.

5.2 Development Patterns

Siargao has been undergoing infrastructural development for the past several years in response to the rising tourism market demand. The islands have become a popular tourist destination. Facing the Pacific Ocean, their tropical climate and exposure to strong winds, which generate large waves, make it a prime destination for local and international tourists who enjoy surfing and sports fishing. As such, resorts, hotels, and restaurants abound on the islands. A domestic airport provides a link from key cities, such as Metro Manila, Cebu, and Clark. Boats and ferries provide daily trips from and to Surigao City.

A number of tourist facilities exist in Siargao. The following table shows the number of tourism facilities on the islands:

Table 4: Number of Tourism-Related Facilities on the Siargao Islands (2020)

Facilities	Number
Other tourism-related establishments	63
Accommodation establishments	502

Source: DOT Caraga.

The number of commercial establishments, likewise, is increasing to serve the needs of local residents and tourists. These are usually located in the central area of each LGU.

The SIPLAS is divided into two zones: the strict protection zone (SPZ) and the multiple use zone (MUZ). The former covers both terrestrial and marine areas and constitutes only 3% while the latter occupies 97% of the protected area. The SPZ is closed to human activities except for scientific studies. In short, its designation is purely for protection and conservation, while the MUZ is for settlements, sustainable land use, extractive activities, and other revenue-generating activities (DENR 2015).

Some issues of the development patterns in Siargao include resorts along coastal areas violating the 20-meter easement rule, which prohibits establishments from erecting structures close to the shore. Another issue is non-compliance with the government's required Environmental Compliance Certificate (ECC) to ensure that projects do not have negative impacts on the environment. Most of the tourism-related enterprises (TRES) and accommodation establishments (AEs) do not have sewerage treatment plants (STPs) to treat sewage before discharging it to the environment. The Republic Act 9593 requires their accreditation with the DOT, but, because of their non-compliance with the ECC requirements, very few establishments have registered with the DOT.

5.3 Plastic Pollution Epidemic

The Philippines produces 2.7 million metric tons of plastic annually, and estimations indicate that it has the third-highest rate of mismanaged plastic waste in the world (Cervantes 2020). Siargao, which consists of islands, faces the problem of high proliferation of single-use packaging materials for goods and products entering the islands. Tourists bring in bottled water and food items in single-use plastic bags. Currently, no LGU has legislation banning its use, so the problem lingers. NGOs' clean-up drives have resulted in the collection of a large number of plastic items, and they have ended up in open dumping sites because there is no sanitary landfill yet in Siargao. The DOT's rapid assessment of solid waste facilities in 2017 revealed

that plastics and paper are inundating disposal sites and that the disposal site in General Luna becomes submerged during the rainy season.

5.4 COVID-19's Impacts

COVID-19 has had a tremendous impact on tourism in Siargao and in Caraga Region in general. The government-imposed lockdown in March 2020 shut down Siargao from tourists. Siargao airport was likewise closed, preventing commerce on the islands. Some businesses had to close because of the situation, leading to a loss of revenue and jobs for local residents. Those who had previously worked in the tourism industry returned to fishing and farming to survive. As of the writing of this study, Siargao remains closed to foreign tourists, according to the DOT Caraga. The plan is to reopen the islands in January 2021. Conversely, the pandemic has given the islands a needed break from tourism activities and allowed the environment to heal and grow.

As an intervention, the Philippine Congress passed the proposed PhP165 billion Bayanihan to Recover as One Act in August 2020. One of its purposes is to provide soft loans for badly hit sectors, such as micro, small, and medium enterprises, transport, tourism, and agriculture (Yap 2020). The assistance will provide the necessary relief for TREs and EAs in Siargao.

6. DEVELOPMENT INTERVENTIONS

6.1 The Circular Economy

The current global resource consumption model of take, make, and dispose has depleted natural resources enormously and led to environmental pollution. One of the main effects is the proliferation of single-use plastics and their indiscriminate disposal on streets and in waterways. In the Philippines, this causes the clogging of drains during flood events. The limited or lacking solid waste infrastructure to capture and recover this kind of material perpetuates the problem. One of the solutions is the concept of the circular economy, which aims to minimize or eliminate waste pollution, keep products and materials in use, and regenerate natural systems (Ellen MacArthur Foundation 2020). The idea of the circular economy is simple: to produce products that are reusable to avoid extraction in producing new products.

6.2 Practices to Reduce and Manage Waste in the Siargao Islands

The SIPLAS Management Plan articulates standards and guidelines. Regarding waste management, solid and liquid waste management programs require the approval of the Protected Area Management Board (PAMB) and enforcement in all facilities and communities. Training is also part of the program to ensure sustainability. In compliance with the Republic Act 9003, some LGUs practice segregated waste collection. Waste collection on the islands is the responsibility of LGUs. Generally, it is not performed regularly due to the limited number of collection vehicles, which, in some cases, departments share with each other, like the case of Del Carmen, where the Engineering Department also uses the collection vehicle. In most cases, only the main barangays receive a service, leaving peripheral communities to manage waste on their own. For example, in Del Carmen, the collection rate is only about 28%, covering only two urban barangays. Some LGUs, like Pilar, have a separate collection schedule for

non-biodegradable and biodegradable materials. The collection of health care waste is separate from that of municipal waste. The form of treatment is the use of septic vaults.

The recovery of recyclable and biodegradable wastes is mandatory under the Republic Act 9003 through the establishment of a material recovery facility (MRF) in each LGU or cluster of LGUs. Most of the municipalities in Siargao have existing MRFs, like Del Carmen, Sta Monica, General Luna, and San Benito. In Dapa, the location of the main port, enterprising individuals have storage facilities for recyclable materials. However, the recovery of recyclable materials could still be low in Siargao due to its informality and the large deposits in disposal sites. The Municipal Environment and Resources Office (MENRO) reported that, in San Benito, recycling has only reached the 10% level.

The LGUs have enacted ordinances to reduce and manage waste. Pilar, Socorro, Del Carmen, Sta. Monica, San Isidro, and General Luna are among those that have piloted an ordinance banning the single use of plastic. Other local laws include mandatory backyard composting and proper waste segregation in Santa Monica. San Isidro and Del Carmen have adopted a Solid Waste Management and Environmental Code. Socorro has legislated its Tourism Code, which defines the carrying capacity of its major tourism sites. Del Carmen practices annual closure of its major tourism sites for weeks to allow the areas' rehabilitation and natural rejuvenation. The LGUs also regularly conduct clean-up drives in coastal areas to remove litter from the shores of Siargao.

6.2.1 Siargao Tourism Operators Association (STOA)

The STOA serves as the united voice of tourism business operators in Siargao and aims to influence local policy making positively. Its mission is to synergize and strengthen business operators for the conservation and sustainable development of the islands as a tourist destination and a national asset. Its primary goal is to overcome the challenge of indiscriminate disposal of waste. Its main activities include awareness campaigns on integrated solid waste management, research and preparation of solid waste assessment reports, and active work with LGUs to improve local waste management (STOA 2017). Its clean-up drives include collecting trash along main roads and seashores. It also has drop-off points for recyclable items.

6.2.2 Siargao Environmental Awareness Movement (SEA Movement)

SEA Movement is a volunteer organization that advocates for the preservation of the natural resources and beauty of Siargao. It is a platform to connect people with talents and skills to solve the island's environmental problems (SEA Movement 2020). Its mission is to initiate and execute environmental awareness and protection projects in tandem with local stakeholders to institutionalize sustainable tourism on the islands. Its main projects include training women to become skilled in converting waste materials into fashionable items, workshops, video production on solid waste management, SEA Patrol clean ups, and a plastic bottle campaign. The last project aims to convince business owners to provide water stations and reusable water bottles to reduce the dependence on single-use plastic bottles and eventually remove them from the waste stream. The clean-up drive takes place regularly and mobilizes communities and volunteers to remove marine litter from the seashores.

6.2.3 DOT and DENR Caraga Initiatives

In 2015, the DOT Caraga in partnership with the DENR initiated a region-wide solid waste planning program aimed at integrating waste management at tourism sites, activities, and local festivals. The program had two results: the SWM communication plan and the assessment of solid waste management in Siargao. The first output aimed to strengthen the education component by identifying key messages on solid waste. The second output was an assessment of the solid waste situation on the Siargao Islands and some key recommendations to reduce the use of plastics (DOT Caraga 2015). One key proposal was to implement a plastic beverage recycling program through a redemption program that will buy used plastic beverage containers from residents and tourists and sell them to processors in bulk. The program is a partnership between a private entity, the provincial government of Surigao del Norte, and the municipalities comprising Siargao. The private entity that will manage the program will receive a share of the income from selling recyclables through a profit-sharing arrangement. The DOT and DENR Caraga will provide technical assistance.

6.2.4 International Donors

The DOT has partnered with the World Bank in a program called Transforming Communities Towards Resilient, Inclusive and Sustainable Tourism (TouRIST). It aims to improve access to priority infrastructures and to strengthen local economic development and disaster and crisis preparedness in select tourism destinations in the Philippines. The Siargao Islands are a recipient of an Integrated Solid Waste Management Project with components on Priority Infrastructure Investments, Information Education Campaign (IEC), Knowledge Management, Capacity Building, and Enhancement, and Project Implementation and Management Support. The project costs Php 282,780,000.

The Priority Infrastructure Investments component includes the acquisition of four waste collection vehicles, 375 waste bins, sanitary landfill (SLF), a material recovery facility (MRF), and composting equipment. The project also covers the construction of a Category 2 SLF and a composting facility.

The technical components of the project include the Information Education Campaign (IEC) and Knowledge Management, Capacity Building, and Enhancement. The former involves conducting public awareness-raising campaigns and augmenting the present LGUs' capability to disseminate information via digital media platforms to serve as a repository of SWM knowledge. The latter focuses on the improvement of the technical monitoring and evaluation capacity of LGU staff on environmental, physical, engineering, and technical standards and criteria, including training on SWM accounting, tariff setting, landfill operation, and collection.

The Project Implementation and Management Support component completes the SWM TouRIST initiative. It provides technical support in terms of data analysis, the identification and preparation of project proposals and detailed engineering design standards, financing schemes, and business plans for legal and institutional administrative structures and arrangements. The expectation is that the rolling out of the TouRIST program will take place in the early part of 2021.

6.2.5 Technologies in Coastal Marine Litter Management

The collection of marine litter in Siargao remains highly manual, with groups and volunteers using jute sacks and debris-grabbing sticks. During the monsoon season, marine debris ends up on shorelines and LGUs mobilize employees to participate as well. They also provide the containment trucks and food for the volunteers.

6.3 Solving Marine Plastic Issues to Achieve the Sustainable Development Goals

Interventions to address marine litter relate to some key Sustainable Development Goals (SDGs). SDG 12 stresses sustainable production and consumption, redefining and broadening the scope of extended producer responsibility (EPR) and ensuring the participation of key players, such as the chemical industry, plastic recycling companies, distributors, dealers, local governments, and consumers. Marine pollution cuts across boundaries and has regional and global impacts, so international cooperation and global partnerships, which SDG 17 embodies, are crucial. The Global Partnership on Marine Litter, which the UNEP hosts, aims to make an impact in terms of achieving SDG 14, having two specific targets: Goal 14.1 on preventing and reducing marine pollution from land-based activities, including marine debris and nutrient pollution, and Goal 14.7, which aims to increase the economic benefits for least-developed countries from the sustainable use of marine resources through the sustainable management of fisheries, aquaculture, and tourism (UNEP 2020). Another relevant goal is SDG 12 on responsible consumption and production. Target 12.5 aims to reduce waste generation through prevention, reduction, recycling, and reuse. It is possible to prevent marine litter by creating products with packaging materials that are reusable, biodegradable, and easy to recycle.

7. CONCLUSIONS

The transition to a circular economy in the Philippines is a long process because of the socio-cultural, political, and economic barriers. The Republic Act 9003 institutionalized the reduce, reuse, and recycle (3Rs) at the regional, provincial, city, and barangay levels and placed the responsibility for waste management on local government units. Through their solid waste management plans, they must articulate and implement soft and hard SWM infrastructures. For example, some LGUs have enacted ordinances on banning single-use plastics in commercial establishments. However, some have faced difficulties passing similar legislation due to the above-mentioned barriers. At the national government level, the NSWMC passed Resolution No. 1363, Series of 2020, directing the DENR to prepare and implement the banning and use of unnecessary single-use plastics in national government agencies, local government units, offices, and all other government-controlled offices. The lower house of the Philippine Congress has introduced a bill to prohibit the manufacture, importation, sale, and use of all single-use products. However, there has been a counter proposal at the Philippine Senate to regulate instead of banning single-use plastics, requiring companies and manufacturers to recycle single-use plastics (Terrazola 2020).

One of the prerequisites for sustainable tourism in the Philippines is a legislative and policy backbone to address marine litter not just at the national level but in the Asian region. Siargao is vulnerable to external and internal marine litter, and addressing it involves instigating resource recovery systems that are sustainable, cost effective, and participatory. Local residents remain dependent on the sea for their

livelihood (fishing and tourism), so a blue economy on the islands must include a sound waste management system to ensure the health of marine life and assets.

8. RECOMMENDATIONS

8.1 Siargao Central Waste Authority

Siargao's growing island-based tourism economy and the increasing requirements for coherent waste management call for the creation of a single solid waste authority. The goal is to strengthen waste management as a public service and enforce legislation consistently. An authority with a semi-corporate character would provide flexibility and efficiency in managing recycling programs and waste management facilities.

The nine municipalities of the Siargao Islands cannot separate themselves from each other in managing their common resources as an island-based tourism economy operating within a nationally declared protected area. The existing institutional mechanisms with which the LGUs operate separately only further the fragmentation of efforts toward a common goal, which at times become counter-productive. The authority can even expand its agenda from waste management to health-related concerns and other important island affairs.

8.2 Siargao Beverage Recycling Program

Recyclable materials, such as PET bottles and bags, constitute about 35% of the waste stream of Siargao. Unmanaged, they end up in streets, drains, and water channels and pollute the environment heavily. They are part of marine litter, which kills aquatic life and ecosystems. A deposit–refund system would fit the geographical character of Siargao and would capture plastic beverage containers centrally, through a profit-sharing scheme, and sell them to processors. A private entity-led program would run as a business and be sustainable. A necessary ingredient of any deposit-refund system is the establishment of extended producer responsibility (EPR), which would elevate manufacturers' participation in the recycling arena.

8.3 Sustainable Residual Waste Recovery

Most LGUs in Siargao engage in open dumping because of the unavailability of sanitary landfills. However, the Republic Act 9003 allows a cluster approach to landfilling whereby LGUs can co-manage a landfill and share the costs of maintaining a disposal facility. Siargao does not need a landfill for each LGU but rather a centralized one with transfer stations to facilitate the shipment of waste to the central disposal facility. When the proposed centralized landfill starts to operate, the recovery of refuse-derived fuel (RFD) can be undertaken along with landfill mining to prolong its life. It is also possible to establish a recovery center at the facility to recover more valuable waste materials, like metals, textile, and appliances, prior to their final disposal.

8.4 Zero-Carbon Resorts

The TREs in Siargao Islands use a significant amount of electricity, water, and sewers. The push toward sustainable tourism requires a significant reduction in resource consumption and CO₂ emissions and decreased dependence on fossil fuel. To realize this, the DOT and DENR Caraga advocate the use of renewable energy to power resorts. The Most Environmentally Responsible Tourism-related Establishment (MERT)

launched in 2018, encouraging the reduction of carbon footprints in TREs. The criteria include best practices in TREs' waste management, the use of renewable energy, support for community enterprises, corporate social responsibility, and compliance with government regulatory requirements. As the initial result, some establishments have started to use solar panels as the island enjoys year-round light and heat from the sun. Rainwater collection is another existing practice. Activities such as these can expand further to other tourism facilities and utilities, such as transportation units and restrooms, to produce more impactful results. In the near future, waterless toilets could save precious water. Tour boats could also use solar energy and electricity to reduce their reliance on petrol, which is expensive on the islands.

8.5 Tourism Branding

The DOT has branded the Siargao Islands as the ultimate surfing and game fishing destination in the world. More than a haven for surfers and anglers, this island paradise offers many learning experiences from its natural endowments, its people, and the unseen but strongly felt island vibe that make up the total of the Siargao Islands' charm. Tourism branding needs to raise its pitch explicitly to carry key messages of responsible tourism to increase tourists' consciousness of their behavior toward the environment and people. It is worth highlighting the island's notable practices in marine litter management through an innovative resource recovery program, multi-stakeholders' partnership, and other efforts for environmental protection in tourism promotional campaigns. The introduction of mangrove- and tree-planting activities among tourists and community interactions in people's everyday life can strengthen the image of the destination as a vibrant tourism destination that upholds its integrity as a declared protected area.

Other island destinations can learn great practical lessons that they may replicate in tourism island management. The Siargao Islands have the potential to become an island destination benchmark for other LGUs, especially with big ticket project interventions from international donors.

8.6 Appropriate Technology to Manage Marine Litter

Land- and water-based technologies are emerging to tackle marine litter. Japan, for example, has developed plastic bottles made of 100% plant oil, which are biodegradable. It is also developing sorting technologies to improve the efficiency of plastic recycling using a combination of optical, gravity, and near-infrared technology. For example, Shibaura Institute of Technology, Tohoku University, and Shizuoka University in Japan are co-developing a new sorting machine using a terahertz device that greatly enhances plastic separation. The near-infrared sorter is the most popular technology in the recycling industry. However, it has difficulty sorting out colored plastic packaging and is expensive. In general, sorting machines remain costly for developing economies, and a partnership framework, of which the transfer of technology is a component, is necessary. Hence, the three mentioned universities are exploring avenues to introduce the technology into developing countries like the Philippines. The terahertz-based technology has the potential to produce high-quality recycled plastic materials while creating employment.

Japan's waste-to-energy technology captures single-use plastics effectively, thereby minimizing the leakage of plastic into the oceans. Over the years, sorting out plastic materials has become increasingly challenging in Japan due to the emergence of a multitude of plastics with complex properties. In the case of the Philippines, it is

important for technological interventions to be appropriate, cost effective, and locally accepted to ensure that they are sustainable. Regarding the sorting of plastics, a coastal community like Siargao can use a hybrid type of technology combining manual collection and handy sorting machines. The key is to be able to separate plastics based on their resin property, like polyethylene terephthalate (PET), polyethylene (PE), polystyrene (PS), and polypropylene (PP), because doing so would increase the value of plastic materials. The result is recycling efficiency and the creation of jobs for local communities. Beyond technology is the need to develop multidimensional solutions ranging from institutional reforms, capacity building, and innovation to knowledge sharing, which the G20's Osaka Blue Ocean Vision best encapsulates.

8.7 Sustainable Financing

The use of economic instruments could enable LGUs to have a constant source of revenue to manage local solid waste infrastructures. A user fee is one tool whereby households, tourists, and businesses pay for the management of waste. Residents and tourists may pay a fixed yearly amount, while businesses' fee depends on their size and nature. The government could impose tariffs on beverage containers arriving on the islands.

8.8 Regional and International Cooperation to Deter Ocean Waste Pollution

Addressing marine litter entails a strong push from the national government in cooperation with regional and global communities. Limiting or eliminating the use of single-use plastics in one country will not solve the problem. There should be a coordinated effort among countries because a blue economy will prosper in shared waters.

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