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Review

Solid Waste Management in Small Tourism Islands: An Evolutionary Governance Approach

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Abstract: In many regions and nations, solid waste management is deemed as critical, complicated, and multifaceted. The essence of solid waste management in each society can be influenced by a variety of economic activities and physical geographies. Small islands with their geographic isolation and a tourism-driven economy pose a great challenge in ensuring sustainability in respect to solid waste management. Beyond the issues of solid waste management on small islands, the governance of solid waste management particularly requires distinctive attention. This aspect is often disregarded as it is a tricky issue for many governments, especially on the territories of small islands. Through the lens of Evolutionary Governance Theory, this paper examines the rigidity in the governance of solid waste management, particularly on small islands, in how related issues are addressed. A range of aspects of governance of solid waste management are analyzed and gaps are identified to propose a way forward in approaching governance problems on small islands through the conceptualization of evolutionary governance.

Keywords: small islands; solid waste management; governance; Evolutionary Governance Theory; circular economy

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1. Introduction

1.1. Small Islands

Small islands are abundantly spread around the world, however, there are different categories of small islands. From population to land area, national income and the share of the world trade, the smallness of small islands is defined as disparately as the criteria [1]. As proposed by the Commonwealth Secretariat and reflected in the report of the World Bank Joint Task Force on the Small States, a population threshold of 1.5 million is the commonly used standard. The Earth Summit (1992) in Rio de Janeiro elucidated that Small Island Developing States (SIDS) are a specific group that is susceptible to social, economic, and environmental complications. The recognition was specifically made in the context of Agenda 21 (Chapter 17G). The Brussels Rural Development meetings reported that SIDS comprise small islands and low-lying coastal countries that represent a diverse group in several aspects. At present, 52 countries and territories fall into the category of SIDS according to the United Nations [1].

Some small island territories may differ in their biomes. They may share few characteristics but are still considered islands. In addition, even though no one island embodies all characteristics, it is still recognized as an island. Geographically remote, with a limited region and population, small islands are economically and politically poor and unstable, culturally and environmentally distinct and fragile [2]. According to Chen et al. [3], SIDS

face environmental threats on a national scale of 1.5-fold more than the usual, making them extremely vulnerable [4].

1.2. Tourism in Small Islands

Tourism on small islands is particularly a matter of concern. This is because the word "small island" is solely the definition of a geographical area as an island with no extensive context [2]. The non-distinctive definition dismisses actual circumstances on small islands. In Mauritius, tourism has been a significant economic activity for about 30 years [5]. In the overall gross domestic product (GDP), the Mauritian economy gained 25.6% from the tourism sector. According to the World Travel and Tourism Council, the GDP will rise by 4% in 2027 [6]. Tourism in Galapagos Island, an archipelago in Ecuador, is considered essential [7]. Carlos Izurieta et al. [7] emphasized that tourism generates great benefits for the island, making it the main pillar of the Galapagos economy and a necessary sector to fulfilling the demands of service on the island. However, in the last decade, tourism behavior in Galapagos has faced irregularities due to the change in land-based tourism services. For instance, the food and beverage sector, which consisted of 43 businesses in the four populated islands in 2007, reported an increase of 209%, accounting for 133 businesses in 2015. During the same time, the number of travel agencies grew from 32 to 128, an increase of 300%. There was also an increase of 299% in business and 169% in installed capacity [7]. A tourism report on Galapagos Island between 2007 to 2015 also reported that boat-based tourism decreased (Compound Annual Growth Rate (CAGR) of −1.35%), while land-based tourism grew (+7.46%); thus, the growth in Galapagos tourism during the period was almost exclusively of the land-based mode [7,8]. This also adds to the evidence of how the socioeconomic pattern changes with tourism model, wherein the demand and supply show contrasting directions, hence inducing new development. Langkawi, Malaysia also portrayed that the increase in number of tourists influences the socio-economic impacts on the island [9]. With the transformation of the socioeconomic patterns on small islands, the governance of solid waste management requires special attention.

1.3. Solid Waste Scenario

In the last 20 years, mass tourism has displaced nearly 30% of the tribal population on small islands as hotels and other recreational facilities have been built to attract more tourists. Tourism has also been a source of environmental impacts when it consumes resources, contributing to public health problems [10]. Deshmukh [11] agrees that tourism development directly affects the environment of a tourist destination. Hotels tend to discharge their sewage and waste into the sea, making coastal areas polluted and unhygienic [11]. If such a trend of consumption continues, it will not take long for small islands to lose their beautiful appeal and economic tourism opportunities as well as their diverse cultural, ecological, and environmental wealth [12]. Increasing waste generation has been one of the big issues confronting small islands, and it is compounded by land shortages, lack of economic opportunities, and poor waste management skills. These problems diminish the future of solid waste management on small islands. Table 1 shows solid waste production on several small islands in the world [13]. The generation of solid waste has soared alongside tourism development. For example, around 350,000 visitors travel to Green Island, Taiwan per year, producing 3.91 kg of solid waste each on average [14].

The rapid increase of human population in untouched lands from the development of tourism influences the collection, treatment, and disposal of waste. This has also brought pressing sociological, ecological, and economic implications to this sensitive locality of small islands as there is no designated guideline to buffer the aftermath from the effects of the minimal infrastructure in solid waste management. The waste-related impacts on tourism in the small islands can be particularly problematic and are mostly recognized as a critical environmental matter [16].

Table 1. Solid waste production on several small islands in the world [15].

Area	Population	Land Area (km^2)	Distance (km)	Waste Generation Rate (kg/d)	Population Density (person/km^2)
Penghu	10,200	126.9	61	0.904	803.8
Matsu	13,000	28.8	213	1.507	451.7
Green	3804	15.0	33	1.233	253.6
Crete	623,065	8336	140	1.200	74.7
Menorca	81,150	702	225	1.480	115.6
Exuma	6928	187	155	1.813	37
Malta	475,000	316	100	1.616	1503.2
Balearic	760,000	5014	230	1.295	151.6
Canary	2,117,519	7493	100	1.860	282.6
Mauritius	1,240,000	1865	2000	0.968	664.9
Puerto Rico	3,410,000	8870	770	2.450	394.4
Nanri	57,150	44	10	1.030	1298.9

Small islands are unable to practice waste reduction as they depend on imported goods brought into the island, and waste brought into the islands is not under their control. Due to the limitation in land availability and financial resources, the amount of waste produced exceeds the island's capacity. The complication of the resale market of recyclables on the mainland aggravates the existing solid waste management scene [17,18]. Consequently, municipal governments on remote islands with few landfill options resort to open dumps and open-pit solid waste burning [16]. Realistically, the solid waste scenario in small islands is in distress.

Moreover, with the current COVID-19 pandemic involving travel bans and cross-boundary restrictions, small islands around the world are facing unprecedented dark times. The tourism industry is very much affected, which in turn cripples the socioeconomic state of small islands. Hotels, local businesses, and manufacturing industries are experiencing a change in demand and supply. Yeh [19] explained that social distancing measures due to COVID-19 have caused a decrease in demand, which directly reflects on tourism activities on the islands. The economic downturn resulting from this pandemic has caused the loss of jobs, which also contributed to the tourism falloff. During the COVID-19 outbreak in the United States, the amount of waste and recyclables produced by households have increased. The residential volume was projected to be about 20% higher than average, with some areas seeing increases of more than 30% [20]. The increase in the volume of clinical waste and the delay in waste recycling activities due to the pandemic have posed additional threat to the environment [21,22]. Additionally, the use of facial masks and healthcare personal protective equipment (PPE) have resulted in an increase in the production of surgical waste. This has caused the dynamics of plastic waste generation to change as a result of increased demand for single-use PPE by doctors and other health care professionals, as well as mandatory mask use by the general public to contain the spread of the virus. Public preference for single-use disposable containers and single-use plastic bags has changed due to the impression of hygienic superiority of single-use plastics over other substitutes. Furthermore, national lockdowns and home quarantine orders have prompted a greater emphasis on online delivery of food and other necessary groceries, potentially leading to a rise in plastic packaging waste generation [22]. Due to a shift in consumption patterns from tourism activities and national health protection, waste composition is experiencing a turnaround. This situation worsens the existing issues in solid waste management and hinders authorities from moving forward. The economic sectors on small islands are compelled to transform due to the demands of the new norm, and this calls for attention to the importance of consumption pattern transformation which underlines the need for resilient governance of solid waste management on small islands.

1.4. Structure of Governance (Arrangement)

Despite the solid waste issue evolving with time, the structure of governance for solid waste management has not been adapting to the ongoing development. As the economy grows, new actors and larger groups of the community are brought into the existing governance system. Governance is forced to evolve to acclimate to the new social and ecological conditions [23], wherein governance is described as the process of decision-making and where decisions are implemented [8]. Hettiarachchi et al. [24] addressed that governance indicates how society engages in and stakeholders carry out diverse activities to meet specific goals. According to Mohee et al. [25], deficiencies in governance are preventing solid waste management from making progress. Bhuiyan [26] also described that a weak governance has detrimental effects on one's politics, economy, and public administration. Research on Gili Trawangan by Willmott and Graci [16] highlighted that the success behind solid waste management on small islands is a strong foundation for management and governance. Previous literature [26] also justified the importance of effective governance in solid waste management, wherein this paper attempts to discuss the aspects of governance in solid waste management by analyzing the gaps and the hindering factors in the present governance of solid waste management in small islands.

2. Aspects of Governance (Rules, Roles and Organizations)

Solid waste management is a clear predictor of a governing structure's effectiveness. When solid waste management runs smoothly, a society's management processes, procurement policies, labor practices, accounting, cost recovery, management of corruption, poverty, and equity are all likely to run smoothly as well [27]. On the same note, in solid waste management, one of the first domain that needs to be tackled is governance. According to Hashim et al. [28], small islands fail to develop clear policies and strategies for promoting sustainable solid waste management. This is because they lack adequate resources to set up the necessary solid waste management systems, lack the infrastructure to support such systems, and rely heavily on international solid waste management knowledge. To bridge the ideology of governance, governance constitutes rules (institution), roles (actors), and organizations (embodying roles), whereby these separate bodies are the mechanisms in governance, require scrutinization.

2.1. Rules (Institutions)

This section describes the institutional constituent in governance. Governance is formed by the engagement between institutions of several levels of authority. The institutions hold respective portfolios in achieving the major goal of the government. According to Assche et al. [29], institutional economics defines institutions' game rules and coordinative resources. Decisions are made within the institutions underpinned by rules. These decisions generate guidelines to properly direct decision-making, interaction with one another, and subjection of actors, experts, topics, and ideas [29]. The institutions maintain rules for their establishment through policies, plans, and legislation. The discussion on institutions includes the institutional arrangement (and its hierarchy), policy implementation, and legislation enforcement in small islands.

2.1.1. Institutional Arrangement

Institutional arrangement is the structure of governance formed upon the interaction between authoritative stakeholders. The efficacy of the arrangement is driven by the roles and portfolios of every department and how the stakeholders perform. The horizontal and vertical institutional arrangements among the government, companies and civil society require a governance arrangement that can bring together the interests of various actors in the landscape of different territorial, administrative, and jurisdictional scales [30]. In Seram Island, Indonesia, a dynamic tradition of administrative structures has played a role in government, with formal community systems replacing tribal institutions. It created tension among clans who cannot come to agreement on who should be in the

formal leadership. Historically, the local government was often based on a system of rotating leadership in locally defined norms [31]. Temporary heads of villages on the island are appointed rather than elected, and somehow, they lack authority in some cases. Communities have described corruption as a problem on the island in which financial resources flowing from the federal government to the village level were inadequately provided by temporary village leaders [31]. The disengagement between the authority and the local communities due to institutional flaws has come to portray the significance of practicality in institutional arrangement.

According to Puppim de Oliveira [32] in a study of Penang Island, Malaysia, advances in solid waste management were possible in Penang because there were fewer political players connected to state and federal organizations, wherein local community groups got involved at the local level. The state and federal governments would not have been able to work together if such an arrangement had not been made. Policies to combat climate change, on the other hand, were challenging to implement because state and local governments had little influence over key policies [32]. Besides that, the potential of NGO participation in sustainability efforts have been greatly undermined in institutions. NGOs do not only represent a civil society's voice, but also fill the gaps where the government and business sectors' constituents are limited [33]. Sustainable Development Goals (SDGs) being a driver in solid waste management issues, is framed only in a national context deterring local level institutional mechanisms from participating [34]. Thus, this indicates that institutional arrangements involving participation and political alignment are significant factors in governance and require streamlining.

2.1.2. Policy and Legislation

One of the most important instruments for delivering change in any public administration and service is policy. Policy formulation is increasingly discussed at local, national, and international levels, reflecting societal dynamics, and this has resulted in a clash and disagreement among stakeholders in transmitting their ideas and views. As a result, present-day formulation of a comprehensive policy is influenced by many viewpoints, including theoretical, realistic, and political perspectives [35]. In essence, policy is a mechanism that many governments used to achieve their target of improved management and growth. In a study by Meylan et al. [36], the researchers agreed with Azahar Abas and Seow [35] that there is a challenge to developing consistent policies and plans for solid waste management in Seychelles. Hong Kong, a metropolitan island, also struggles from policy challenges in its municipal solid waste management [24,37].

In a small island context, the policies are not adaptive enough to catch up with the solid waste issues due to increasing mass tourism each year in comparison to mainland tourism hotspots. Solid waste management in Latin America and the Caribbean (LAC) illustrates the perfect example of a policy adaptation issue. LAC countries have rapidly expanding cities with rising waste generation rates, whereby, in a study [24] of climate change in the Caribbean States, when funding is sufficient, inadequate policy alignment between states and government agencies has a negative impact on absorptive capability [38]. Maladaptation occurs when localized climate change adaptation measures have the potential to increase the vulnerability of another region or sector to climate change due to a lack of sufficient data for policy and decision-making, as described by the Intergovernmental Panel on Climate Change (IPCC). This scenario applies relatively to the condition of solid waste management wherein the management strategies have not changed to keep pace with these realities and deal with solid waste production [24].

Since environmental health is such an important policy priority, nations across the globe have national regulations in effect enforcing sanitation and solid waste management measures. Solid waste management legislation places a legal duty on an entity, usually the waste generator, to ensure the waste is gathered, separated from its source, and delivered to the designated facility. Municipalities or districts, or relative local governments, are

responsible for municipal solid waste. It is the responsibility of economic and industrial players to ensure that all sources of waste are properly disposed of [39].

2.1.3. Implementation and Adaptation

According to the World Bank [40], policy implementation of solid waste management has been a major concern of the government. Inefficient policy enforcement has been expressed in the problem of inadequate solid waste management. Malaysia, a developing country with numerous emerging tourism islands, has the institutional structure in place under the Ministry of Housing and Local Government. The National Solid Waste Management Department was established as a regulatory body, and the Solid Waste and Public Cleansing Management Corporation was established as solid waste management operating arm [35]. Malaysia's exemplar tourism destination, Langkawi Island, is one of the islands that faced policy implementation issues. Despite providing comprehensive and consistent guidelines, surveys have shown that the roles and functions of the agencies concerned are the primary causes of structural deficiencies in solid waste management. A SWOT analysis performed on solid waste management in Malaysia indicated that one of the potential weaknesses was stakeholder perception of a lack of political will for the implementation of solid waste management-related policies and legislation [41]. Periathamby and Shahul Hamid [42] also pointed out that the delay in policies being formalized by formal adoption, declaration, or enactment, especially the enactment and compliance of the Solid Waste Management Act 2007 makes up of the issues in implementation.

In Seychelles, Ministry of Environment is responsible for environmental standards, policies, and legislations, whereby the Environment Protection Act and regulations provide an institutional and legislative framework for environmental management. This legislation is based on European Standards in general [36]. Waste management authority, Lagos Waste Management Authority (LWMA), and waste concessionaire STAR Seychelles Limited have had an agreement in which LWMA must pay STAR per tonne of waste tipped at the landfill. STAR is charged a monthly flat fee of (Seychellois Rupee) SCR 6 million (approximately EUR 360,000 or USD 450,000). In this case, STAR had no reason to remove waste from landfills, even though STAR intended to divert recyclables from landfills 20 years earlier when the contract was signed. The diversion of recyclables however, has not been implemented for an undisclosed reason [43]. This particular case portrays the rigidity policy implementation in small islands.

2.2. Roles (Actors)

Governance of solid waste management on small islands is usually operated by a hierarchy of stakeholders, depending on its governance structure. Governance according to Assche et al. [44] includes individuals and organizations that can participate in governance as actors. Actors use formal, informal, and dead institutions to conduct decision-making. Primary, secondary, and tertiary stakeholders in solid waste management can be classified into three categories. Actors in charge of policy formulation, regulation, and implementation are referred to as primary stakeholders. Secondary stakeholders are those in the private sector who engage in policy implementation. Tertiary stakeholder is someone who follows the law or regulation. Government agencies are typically the main stakeholders of most governments. Concession companies are considered secondary stakeholders, while local communities are considered tertiary stakeholders. Actors in an institution navigate through power and knowledge.

2.2.1. Power

In the case of Gili Trawangan Island, traditional laws (*adat*) and regulations (*awig–awig*) governed the political structure in previous decades, with a headman (*kepala desa*) overseeing the island's development. This included the incremental growth of tourism, which was fueled by local tourism entrepreneurs [45]. This is similar to the solid waste management on the island today where key stakeholders consist of community-based

organizations as the main commanders of the management system. Conversely, the extent of power in governance depends on the capacity and willingness of government. To put it another way, certain governments have the power and jurisdiction to fulfill their obligations to their citizens, but they lack the motivation to do so. This can be described as a "shadow state," or personal control under the umbrella of a recognized government, for the political and financial gain of those in authority for example, on Zanzibar Island and other African countries [46].

2.2.2. Knowledge

As shown in Figure 1, knowledge is directly correlative to perception, which contributes to awareness and participation. According to Azizan et al. [47] in research on recycling, the practice of solid waste management is difficult because of the lack of involvement of the local communities due to the lack of knowledge. Perception from knowledge is subsequently built upon understanding is based on individual beliefs, intentions, and levels of importance in determining the attitude toward recycling. In this respect, the management of knowledge faces challenges in most governance. Abila and Kantola [48] noted that cultural belief, communication channels, personal morale, packaging, and product producer involvement are the challenges faced by solid waste management in Nigeria. These factors affect the level of awareness among stakeholders. Awareness comes from education and constant reminders. Hence, to put together solutions, the awareness of the actual scenario and problem in solid waste management should be in place.

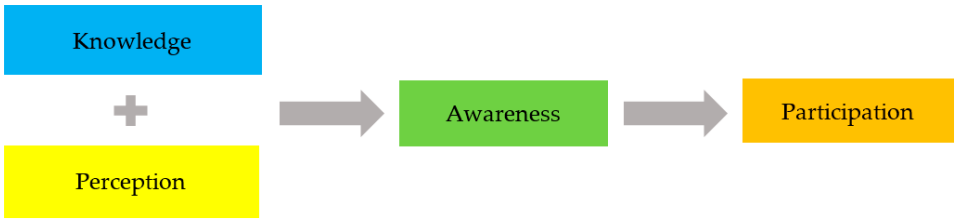

Figure 1. Participation stemming from knowledge, adapted from Azizan et al. [47].

2.2.3. Stakeholder Participation and Interaction

The participation of multiple stakeholders is necessary, particularly when dealing with environmental problems that are often linked to economic, social, and governance factors [49]. In solid waste management, stakeholder participation can be complicated because each phase of the solid waste management process, from waste generation to final disposal, necessitates the identification of different stakeholders. The problem of governance for the protection of Hawaii's heritage has become complicated due to the unstructured involvement of the federal government, state government, local governments, and a variety of other stakeholders [50]. The accelerating processes of urbanization, globalization, and industrialization have now shifted half of the world's population to urban areas, and by mid-century, almost all regions of the globe will be largely urban. As a result, the number of stakeholders has grown each year, becoming more complex and difficult to manage. This change has posed significant challenges for both the state and federal governments in terms of ensuring that solid waste management strategies are successfully tailored to the needs of all stakeholders [51,52].

To illustrate the significance of stakeholder participation in the governance of solid waste management, Willmott L. and Graci [16] emphasize the success of awareness education by local community-based organizations. In 1996, in response to growing concerns about widespread burning and dumping, garbage, and uncollected material, solid waste management services were formed on Gili Trawangan. A multi-stakeholder partnership was established to manage Gili Trawangan's brand-new waste system. The island's waste management authority was *Forum Masyarakat Peduli Lingkungan* (FMPL), a community-based organization. It was run and controlled by a group of local Indonesians from Gili Trawangan who had been appointed by the local government to this role. Gili Eco Trust

(GET), an environmental non-governmental organization on the island, was another stakeholder that took the lead alongside FMPL. FMPL was in charge of waste management services, including collection and disposal activities, as well as planning and management, while GET was primarily in charge of waste management planning and management, diversion facilitation, public awareness and education, and assisting FMPL as required, including financial assistance. FMPL, on the other hand, did not perform well in its function. According to Hindarman et al. [53], residents on Gili Trawangan commented that FMPL, the local government, and the regional government performed reasonably poorly in solid waste management. Residents, on the other hand, clarified that GET's solid waste management output was good because the answers to the questions were satisfactory. The involvement of stakeholders was effective in raising waste awareness among the citizens of Gili Trawangan, as well as improving education on waste impacts and desired solid waste practices [16].

A case study conducted in Macao Island also illustrated that the implementation of policies on e-waste recycling is dependent on consumer behavior and willingness to pay (WTP) [54]. Policy implementation is built upon social participation rather than the presumed roles of the authorities, whereby it highlights the importance of consumer needs inclusion, especially decision-making in governance. Admittedly, the shortfall of stakeholder engagement and interaction can be represented by Oahu, Hawaii. Hawaii state and Hawaii county governments are the two main landowners on the Big Island, with state-level plans setting extensive priorities for all islands, such as closing dumps, raising recycling and landfill disposal rates, and reducing greenhouse gas emissions, while county plans to discuss specific project sites and proposals, funding, and state and federal enforcement [50]. This suggests that both state and county have contrasting goals. However, according to social systems theory, the lack of interaction in the governance of solid waste management in Hawaii could be a factor in existing issues. In small islands, local communities are largely essential stakeholders. According to Muhamad Khair et al. [55], community participation is associated with motivation, whereby to sustain community participation is to fully understand the values and motivations of the community groups to ensure that they do not lose interest. The sense of ownership for a social construct is fairly important in determining engagement in which individuals tend have a propensity to volunteer to improve and contribute to the environmental wellbeing of the society in which they live. Hence, integrating stakeholder participation and interaction gives importance to the governance of solid waste management [56].

2.3. Organization (Embodying Roles)

Organizations are social structures with defined borders that self-replicate by decisions [29], involving the actors with designated roles in driving and narrating the entire management process. Organizations involve the interaction between the institutions in terms of the unified roles, visions, and missions. The execution is conducted through interdependency in designing the plan with respect to economic, social, and environmental significance. To begin with, the direction of the organization in terms of solid waste management begins with planning and is followed by the management and coordination.

2.3.1. Planning and Development

For the preparation and delivery of solid waste systems to be inclusive and representative of stakeholder needs and interests, all stakeholders must be interested in improving the feasibility and performance of the solid waste management system [16]. In light of small islands, stakeholders play a bigger role as key players of the governance whereby small islands require a more distinct planning and development approach to focus on the right problems. In a Galapagos Island study by Fuldauer et al. [57], on the volcanic archipelago, a fragmented approach to planning became a problem, with the author describing the islands' planning as tactical in the sense that national decision-makers mostly concentrated on existing issues and governmental state. Despite the challenges faced by small islands,

solid waste was rarely considered and looked upon in national, strategic, and long-term planning whereby data insufficiency became a contributor to poor governance planning. According to the data from the Ministry of Public Labour, Transport and Communications of Mauritius, the total amount of solid waste produced in the Port-au-Prince urban community was estimated to be 1500 tonnes per day. Since the data were not based on direct calculations but were averages determined based on projections for the Caribbean and Latin America before the year 2000, the unreliability of this calculation revealed that the positions of stakeholders were compromised. As compared to the increased migration traffic from the country to Port-au-Prince, the numbers were significantly understated [56]. Hence, the absence of sufficient data influences the reliability of strategies constructed by stakeholders.

Additional measures to reduce the amount of solid waste produced at the source may result in possible energy savings in solid waste management. Source reduction, the largest portion in the waste hierarchy, is a qualitatively different approach to dealing with the solid waste issue than recycling or energy recovery (Figure 2). Instead of coping with waste after it has been discarded, it reduces waste generation in the first place. Except for food and yard wastes, almost all manufactured products entering the waste stream can be reduced to some extent, while composting may be considered a mitigation method since it keeps certain materials out of the municipal solid waste stream [58]. In a study conducted on the Green Islands, Chen et al. [3] stated that preventing waste creation in product design or packaging is not a choice for local governments. Awareness initiatives or the use of economic instruments (waste tax or unit-based pricing) to reduce waste generation are considered ineffective and politically unfeasible because the majority of waste are created by tourists [14]. The present waste management policies and practices aim to shift away from linear approaches and toward sustainability, with a focus on resource recovery. Such efforts are typically focused on with the consideration of environmental and economic values, legislation, and economic impacts. However, the social and technical aspects are left unattended [59].

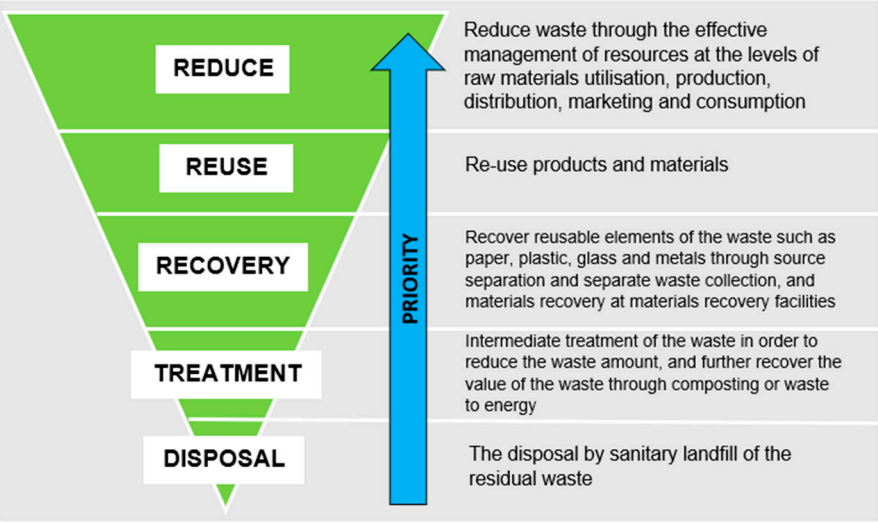

Figure 2. Solid waste hierarchy practiced on small islands, adopted from Shamshiry et al. [60].

Solid waste disposal is also a big concern due to the geography of several small islands, where roads are narrow and gravel-based. Given the lack of other sustainable waste disposal systems, solid waste is often disposed of in landfills after collection. Even though solid waste compositions are evolving, many small islands have landfills which are poorly located [25]. For instance, in Langkawi Island, Kampung Belanga Pecah landfill operates as a mere open dump that lacks a proper lining system and leachate treatment facility whereby it has been in operation since 1985, with an estimated daily solid waste input of 80 tonnes. The landfill is not built to be sanitary, and leachate run-off occurs

frequently, particularly during the monsoon season [61]. The use of open dumps or landfills has become common practice in many countries. Waste is dumped directly into an open area in dumps. Contaminants are contained in landfills, which require sanitation through the use of liners, covers, and compression techniques. These locations can be foul-smelling and home to disease-carrying mosquitoes and rodents. The most difficult aspect for island settings is that dumps and landfills need a lot of space, which can be scarce [62].

In Maui County, landfilling became the center of solid waste management, and maintaining landfill capability became a top priority for officials. Good waste management on the island in the 1980s focused on merely collecting items, littering, and illegal dumping. However, by late 1980s, solid waste quantities had risen to the point that landfill disposal fees had started to escalate, prompting a growing number of visitors and operators of private residential facilities to begin separating green waste and recyclable metals from the remainder of their waste to save costs on waste collection fees. Thus, in Maui, the private sector took the initial step toward a deflective approach of governance for economic importance [63]. Dong et al. [14] seconded the opinion of the case study in Hawaii [64] by commenting that in the long run, although incineration will not fix the issue of solid waste management, it will only buy time for new technologies to be developed.

Incineration may not be the ideal substitute for solid waste disposal, but it has proven to be the best choice for waste management in Singapore, a small island of 721.5 km^2. All non-recoverable incinerable wastes are incinerated because incineration will reduce waste quantities to a remainder of at least 10%, preserving the limited capacity of Singapore's sanitary landfill. This method was first used in the late 1970s, even though it was six to seven times more expensive than landfill [63]. Amaral et al. [65], in an annual report by World Tourism Organization, agreed with Bai and Sutanto [13] by advocating that for densely populated and developed islands like Singapore, Hong Kong, and Japan, incineration with energy recovery is a viable choice. These studies demonstrated the planning and development of self-sufficient waste management strategies on islands. Incineration with electricity generation is difficult to achieve on small islands with low waste generation and large seasonal variability. However, shipping the combustible component of the waste outside of the island allows the combustible waste to be recovered as electricity. Transforming combustible waste into refuse-derived fuel (RDF) is believed to increase the feasibility for long-distance domestic and foreign waste movement [17]. Kinmen Island, Taiwan, has looked into shipping waste in the form of refuse-derived fuel (RDF) [66]. These studies show that technology alternatives may not fit and be effective for every small island territories.

With the remoteness and inconvenient transportation on certain small islands, solid waste treatment in Mauritius is fairly difficult and expensive. Efficient source reduction and proper treatment selection are the key solutions to the current problems. On this small island, the government aims to incorporate 4% of electricity from waste-to-energy (Wte) technologies into the national grid by 2025 as an alternative in solid waste management, according to the Long-Term Energy Strategic Plan (LTES) 2016–2030 report in Mauritius Island. This would strengthen the country's energy security. As a result, waste is no longer seen as an unwanted by-product of development, but as a valuable source of energy. Nonetheless, it has been noted that Mauritius' energy strategy has not determined the type of Wte technology to be used for this initiative hence obstructing progress [67]. The takeaway from this scenario of governance is that the current planning and decision-making in Mauritius is rigid and treated indifferently. Fuldauer et al. [57] in a study conducted on Curacao Island suggested that the only approach that will prevent landfill depletion and treat the highest amount of waste in the future is a technology-led strategy that uses energy-generating technologies. The strategy is less adaptable to multiple potential development conditions due to the high per-unit running costs. There should be more deliberation included in planning of solid waste management of small islands.

2.3.2. Operation and Management of the Solid Waste Management System

When the rising rate of solid waste production on small islands is a big problem, the waste composition should not be neglected. This is because small islands can differ from their economic stratum due to their assorted developments. Because of potential associations in small island residents' consumption habits, the composition of solid waste in the various geographic SIDS regions differs marginally among the three geographic regions [68]. Furthermore, due to different use and output trends, the current waste composition varies from that of the past. Changes in consumer behavior, especially in low-income countries, have created a shift in waste composition. One of the most significant changes in the generation of plastic waste is that plastic waste has become a major concern on small islands in the 21st century [69], and this paradigm may change over time.

The main phase in solid waste management is the collection. An inefficient collection will have an impact on the normal operation of the transport and treatment processes. The Wanshan Islands were the first in China to have solid waste transported outside of the islands. The major problem was the steep cost of transportation, where the cost to transport solid waste to the mainland from the Wanshan Islands ranged from RMB 1500 to RMB 2000 per tonne [14]. This was not a sustainable alternative. After voluntary disposal at collection points (public dustbins) or spontaneous dumps in Port-au-Prince (Haiti's capital), the Metropolitan Service of Solid Waste Collection (MSSWC) was entirely responsible for waste collection. MSSWC collected 15% of the total volume of waste produced daily in 2006. Observations revealed that the complications in solid waste management were beyond expectations. The sanitation services were limited to only targeted districts. A waste collection service was used by more than 77% of upper-middle-class households. A total of 93% of poor households in deprived districts, on the other hand, did not have access to services, and there were no public rubbish bins [56]. This reveals the inconsistencies and discrepancies in the island's solid waste management service delivery.

2.3.3. Coordination between Organizations

The disparity between planning and management lies in its coordination and communication between organizations and related agencies, at the local level. As organizations require a unified vision and mission during planning, most governance of solid waste management, however, does not portray this ideal quality. In Pune City, India, it is said that there is a lack in effective e-waste governance and management due to a lack of proper communication and coordination among key stakeholders, in both formal and informal sectors [70]. According to Anwar Zainu et al. [70], many studies on waste composition have been conducted in Malaysia in the past, but all these studies show that organizations suffered from lack of coordination. This inadequacy could derail a good municipal waste management policy in the country. In researches by Anwar Zainu et al. [70] and Soltani et al. [71], the authors highlighted the importance of coordination between organizations through the need for the implementation of a decision support system (DSS) and a model-based decision support framework, respectively, in order to provide cohesiveness in decision-making in governance.

Poor coordination between the recycling sector and the local authorities in the state of Johor in Malaysia is shown through a low recycling rate due to privatization of the sector. The privatization was not in overseen by the federal government, causing the lack of support toward recycling activities in the state [32,72,73]. In the municipal waste sector where the stream is mixed, the responsibilities lie between the Department of Environment, the Ministry of Housing and Local Government, and the local authorities themselves, which is somewhat confusing and unorganized. Since there is no unified framework or authority for agencies to organize and provide programs based on their own goals and mandates, the lack of cooperation makes it impossible to address problems outside of their immediate jurisdiction. Gili Trawangan was studied as a local, often informal, highly complex, and rapidly developing governance structure. Being a small island near Lombok, Indonesia, that was once home to a few fishermen, the island's dive tourism potential was

recognized by Western tourists, who transformed it into a major diving hub in Southeast Asia with global significance within two to three decades. The appropriate coordination of stakeholders in solid waste management is best presented by Gili Trawangan as a governance evolution that occurred due the island's rapid economic expansion, which then required coordination between institutions to encourage the emergence of a new governance [74]. This further signifies the important role of coordination in an organization.

Caniato et al. [75] suggested that "solid waste management experts" must have a broad and thorough understanding of the situation and context, taking into account a variety of factors, including the diverse interaction of stakeholders. In reality, multidisciplinary expertise, which includes environmental and social sciences, politics, and ethics, is needed to better approach multifaceted environmental decisions. Holistic approaches are favorable specifically in the governance of solid waste management. To define the best approach for waste handling with government-friendly strategies, consumer responsibility, and advanced materials and methods from researchers, strong collaboration is needed among society, government, businesses, and researchers [21]. Respective agencies and organizations require inter-organizational coordination and effective communication to contribute to the alignment of visions and missions of a common goal. Inter-organizational coordination helps in facilitating effective implementation and enforcement.

3. Challenges and Gaps

The governance of solid waste management on small islands takes place in the transformation and interaction between the rules, roles, and organizations. The rules in this context include the institutional arrangement, policy, and legislation, as well as implementation and adaptation. The roles, on the other hand, incorporate power, knowledge, and stakeholder participation. Consecutively, the organization involves planning, financing, operation management and its coordination. The common linkage and flaw between all three aspects are the linearity, rigidity, and devolution in governance. In the world of small islands, challenges vary depending on the social, economic, and environmental capacity. Therefore, the established criteria for case studies selection are (i) principal economic activities, (ii) geographical environment, and (iii) forms of government and political systems. The six selected small islands are distinct from one another in the mentioned criteria, giving a diverse panorama of the challenges and gaps in the governance of solid waste management on small islands as shown in Table 2.

The challenges and gaps highlighted include: (i) institutional responsibility; (ii) motivation in participation; (iii) rigidity in policies; (iv) consumption pattern; (v) government adaptability; and (vi) political climate [29]. The issue of the governance of solid waste management on small islands is the circularity in action. The linear waste hierarchy and solid waste management adopted on small islands have become normalized whereby this linearity has become a "blueprint" for most management systems in general. This norm, however, brings about surplus—solid waste generation in the context of solid waste management. According to Williams-Gaul [76], materials are discarded and wastes are generated at any point of the linear production model. When raw materials are sourced and materials are processed through the various stages of manufacturing, large amounts of waste are produced. Additional wastes are generated by the linear economy's logistics, production, and packaging processes, and finally, wastes are produced at the point of sale, all of which contribute to an increase in waste volume as economies expand. Manufacturing cost reductions by efficiency gains are now largely gradual in the linear economy. As a result, many manufacturers try to boost profits by selling more goods and driving customer demand by constantly marketing new products with more features that set them apart from the competition. As a result of the rebound effect driving prices lower, consumers engage in more goods consumption.

Table 2. Mapping of the challenges and gaps of the governance of solid waste management on selected small islands.

Small Island	Rules	Roles	Organizations	Gaps	Proposed Strategies
Gili Trawangan, Indonesia Economic niche: tourism [15,23]	• Waste is defined as the residue of an activity. The law is silent about municipal solid waste (Law No. 23/1997 on Environmental Management). In 2003, an academic draft on Waste Management Law defined waste as an invaluable organic and/or inorganic solid or semi-solid residue from a business and/or other activities.	• A community-based organization, Gili Ecotrust was the only influential authority in terms of finance, social and politics to deal with solid waste management issues. • Informal social networks were the drivers of solid waste management on the island, including scavengers, community organizations and NGOs. • Gili Ecotrust also participated in other sectors, such as marine activities. Participation in waste collections among local businesses was affected due to this. Gili Eco Trust's diversion in roles made local businesses lose trust in them.	• Lack of formal regional and national government involvement in solid waste management. • An issue over the voluntary fee imposed on waste collection where it was seen as a form of corruption as it was not officially recognized. • The lack of formal transparency for collective financing created a sense of skepticism among potential participating businesses. • The conflict brought upon chaos forcing political leaders to address realities. • Multi-level conflicts caused chaos and induced institutional change. • The amount of community fee depended on the living condition of the residential area and decided among community members.	• The solid waste management on this island was led by roles and organizations. • Solid waste management was acknowledged as the responsibility of the municipality, which omitted the role of local communities and national government. • The aim and vision of solid waste management might be altered due to institutional change as there was no guideline or instrument to lead the governance of solid waste management. • The tasks and portfolios of responsible authorities were not designated well. • Focus on circularity in solid waste management was absent. • No synchronization in community fee dampened social participation.	• Implementation of incentive-driven solid waste management activities (i.e., polluter pays principle) [77]. • Formalization of solid waste management authorities and integration of both formal and informal authorities [78]. • Coordination of specific policies and legislations. • Incorporation of circular economy concept into the planning process of solid waste management. • Streamlining roles of NGOs in the governance of solid waste management [34].

Table 2. *Cont.*

Small Island	Rules	Roles	Organizations	Gaps	Proposed Strategies
Macao Economic niche: tourism, gambling, manufacturing [79]	• Implementation of e-waste recycling was dependent on the consumers' behavior and willingness to pay. • No special policies for e-waste. The existing policies were only allotted to municipal solid waste. • High consumption on the island but there was a lack of special policies for e-waste.	• Participation of consumers was still insufficient. • Consumers were not involved in the governance of municipal solid waste, which is the responsibility of the local government. • The majority of consumers had heard of waste segregation and recycling but the willingness was not high.	• Increasing expenditure in solid waste management as solid waste increases. • No financial incentives for waste generators to play a bigger role in waste reduction. • No garbage fee imposed on consumers. • Only about 6.35% of solid waste had regularly been recycled and 93.65% had never been recycled. • Linear solid waste management system.	• The inclusion of consumer in the governance of solid waste management was absent. • Lack particularity of policies for the small island. • Participation was involuntary—consumers were reliant on recycling programs to perform recycling. • Poor resource management as there was no focus on circularity.	• Community-based monitoring tool to empower community [55]. • Assigning local community groups, a dominant actor in the governance [77]. • Inclusion of small island specification in the development of policies. • Waste hierarchy re-evaluation to put more focus on source reduction and zero waste.
Mauritius, East Africa Economy niche: tourism, financial, sugar export and textile industry [43,80]	• Lack of laws and regulations to control the illegal exportation of waste material. • No legislation related to e-waste.	• The roles of stakeholders were undermined in the waste data collection on the island. The waste data was estimated rather than collected. • Insufficient information on solid waste management on the island reduced the participation of the public in recycling.	• Insufficient data affected the reliability of strategies developed by stakeholders. • Stakeholders lost motivation to initiate alternatives in solid waste management. • Decision-making was impractical. • Cleanliness programs were dependent on financial allocation. • Lack of incentives from the government in solid waste management.	• Data insufficiency reduced the motivation of stakeholders to perform their roles and portfolios. • Illegal waste activities showed that enforcements were not effective and laws were not firm. • Strategies were short-termed (only solved contemporary issues).	• Reformulation of long-term policy, legal and fiscal frameworks for resource management [76]. • Implementation of database development. • Reinforce legal instruments (e.g., penalties and levies) [81].

Table 2. *Cont.*

Small Island	Rules	Roles	Organizations	Gaps	Proposed Strategies
Green Islands, Taiwan Economic niche: tourism [3,82,83]	• No policy clause called for waste generation (no taxation or fee imposed on waste generated). • Taiwan's policies in 2004 to develop a "zero-waste society" did not apply to Green Island for its touristy nature. • Policies based on economic incentives.	• Waste Recycling Fund (WRF), a national recycling program involved the community residents, recycling industries and local authorities. • NGOs and communities involved in the Waste Recycling Fund (WRF) changed citizen's consumption behavior and promoted publicity with tips on waste elimination.	• The solid waste management alternatives were limited to recycling and biofuel manufacturing (due to small island constraints). • Visitors were charged a lower fee for waste generation than locals. • Only the lower-level waste management solutions (recycling, incineration, and disposal) were appropriate and publicly acceptable. • Incineration acted as a short-term relief to the high solid waste generation.	• Unable to decrease waste generation as the largest waste generators were from tourists. • Policy measures could not move up the waste hierarchy. • The high-cost consumption in incineration did not support the government's vision of zero waste. The waste hierarchy was not utilized accordingly (i.e., disregarding source reduction).	• Inclusion of carrying capacity and contribution in policy-making and legislations on waste generation [84]. • Re-evaluating and restructure waste hierarchy used (prioritizing source reduction) [85]. • Incorporation of source reduction as the main principle in solid waste management.
Langkawi, Malaysia Economic niche: tourism [4,60,86]	• Food waste policies imposed by hoteliers whereby food was discarded after 4 h and it could not be packed home due to hygienic reasons. • Policy implementation was problematic due to the lack of a centralized authority to oversee the solid waste management system's programs and activities.	• Lack of political will affected stakeholder perception. • Low awareness of food consumption among consumers (due to price of food). • Food waste was produced at all stages due to ineffective communication, both with external parties and within the hotel (such as spoilage food waste, preparation food waste, leftover food waste and customer plate waste).	• No waste audit and waste separation among hoteliers. • Lack of facilities for disposal and food waste technology. • Clean and untouched food was thrown out. • The consumption pattern was unpredictable.	• Food waste policies in hoteliers did not align with food waste disposal policies. • Resource management did not make good use of food waste. • No designation in the coordination of projects and activities in solid waste management. • Awareness was driven by monetary motivation. • Interaction between the stakeholders was ineffective.	• Streamlining authorities to a centralized institution [25,87]. • Coordination and clarification of roles between state and local authorities through mapping [35]. • Realignment of visions and missions of different institutions [57].

Table 2. *Cont.*

Small Island	Rules	Roles	Organizations	Gaps	Proposed Strategies
Hong Kong Economic niche: financial services, tourism, trading & logistics [37,88,89]	• The waste disposal quantity fluctuated depending on the economic situation and the number of construction projects underway. • The implementation of must-have policies for municipal solid waste management and governance has been delayed, with the Waste Disposal (Charging for Municipal Solid Waste) (Amendment) Bill 2018 being postponed for ten years. As a result, Hong Kong could not reduce the amount of waste deposited in landfills regularly.	• Governance arrangement was of the colonial structure. • Inadequate institutional ability to introduce a mandatory municipal solid waste charging scheme and an extended producer responsibility (EPR) system. • Equal lack of forces to utilize food waste due to little incentive. • The incentive was a driver in the participation and willingness of consumers in recycling.	• Large waste load occurred due to the slow transition of sustainability planning. • Significant misalignment between cost and benefit distribution regarding municipal solid waste management and governance in Hong Kong. • Converting food waste into fish feed and compost was only sold in limited quantities as part of the Food Wise Campaign. Exporting such low-value goods to other countries was not economically feasible. In this regard, recyclers were less likely to collect food waste at their own expense.	• Development of the island altered the needs for governance transition. • The existing governance structure (colonial government) was rigid and not adaptive. • Participation in waste programs was economic-driven rather than environmental. • Due to institutional arrangement, every department might differ in opinions and demands causing fragmentation of responsibility and competition. • Cost–benefit misalignment indicated poor planning.	• Establishment of solid waste management projections to allow better planning (i.e., financing, environmental impact, socio-economy) [57]. • Cultivation of environmental-based reasonings in solid waste management education from stakeholder level. • Governance path analysis to realign roles of stakeholders [23].

Waste collection accounts for 75% of the municipal budget in Malaysia. According to Shamshiry et al. [62], Langkawi Island had an issue with garbage collection and transportation to landfills. From 2012 to 2016, the Solid Waste Management and Public Cleansing Corporation (SWCorp Malaysia) reported that the department's operational costs rose by an average of 39.4% per year, with 87% of the budget allocated to solid waste management. Malaysia's government spent MYR 1.86 billion on solid waste management in 2016, with MYR 74 million going toward the operation and maintenance of disposal facilities. The cost of solid waste disposal has risen to the point that it is now beyond the government's financial capacity [90]. In Macao, solid waste facilities had traditionally been funded by general government revenues from taxes and levies. The costs of waste collection and disposal, on the other hand, were very high. The government spent around USD 17 million per year on solid waste management (collection/transport: USD 12.7 million; solid waste incineration: USD 3.9 million; landfilling: USD 0.625 million) [79]. In Mauritius, the Ministry of Public Labour, Transport, and Communications had allocated a discretionary allocation for the partial provision of the operation, ensuring that the solid waste management system is funded. However, this allocation was not necessarily guaranteed, as a simple revenue issue can result in a cutback or complete elimination of the budget. In this sense, the authority's ability to fund the service remains a persistent obstacle. With foreign support, the system's fragile equilibrium was preserved. The author emphasized that when solid waste management is carried out under financial constraints, these cleanliness programs in the interest of the urban environment achieve only sporadic long-term results. Only when the available funds are depleted does the complexity of the issue become apparent [67].

As a while, a government's financial status is reflected in its planning. As discussed in the previous section, linearity in planning is a reflection of the concept of linear economy in the governance of solid waste management. The linearity of the solid waste management system illustrated in Figure 3 explains that by-products of the utilized resources end up as waste at the end of the solid waste management system. The life of materials in a linear economy is typically short, with 80–90% of products generated being wasted in at least a year. The Organisation for Economic Co-operation and Development (OECD) reports that one-fifth of global material extraction is wasted every year, with the International Solid Waste Association (ISWA) estimating that 70% is disposed of in landfills [51]. The large rise in solid waste production, climate change and pollution, natural resource depletion, public health and sanitation issues, and the high expenditure indicate that linear economy practice is not sustainable [91].

Figure 3. The linear economy in the solid waste management system, adopted from Williams-Gaul [77].

In a study conducted by Zaman [91], the types of resources derived from waste management systems determine the economic benefits of solid waste management systems. The state of a local waste market is critical to the overall financial benefit. It is clear that waste can provide major economic benefits to high-income countries (HICs) through resource recovery activities. The average person in a high-income country (HIC) contributes about USD 60.74 per year to waste material recovery, while the average person in a low-income country (LIC), lower-middle-income country (LMIC), and upper-middle-income country (UMIC) receive USD 0.49, USD 2.27, and USD 3.65, respectively. The results of this valuation are essential for assessing the existing waste management system's success and guiding future waste management. Even though solid waste management systems are costly and have minute economic gains, this study found that waste management systems can be advantageous to the environment and economy with established resource recovery and systemic waste management [50,52].

Therefore, circular economy (CE) concept (Figure 4) comes into the picture. CE is refined from the realization that a linear economy contributes to unsustainability and a new approach that values raw materials differently is needed. The CE's overall goal is to maximize resource value and keep them in use for as long as possible. The entire concept of CE centers on resource management, which is the essence of this approach. As defined by the United Nations Environment Programme (UNEP), "resources are the naturally occurring assets that provide use benefits through the provision of raw materials and energy used in economic activity (or that may provide such benefits one day) and that is subject primarily to quantitative depletion through human use" [76]. Materials and items in a CE are intended to reduce waste and are reused, recycled, or recovered. The energy inside the unused raw material is extracted to replace virgin fuels and contaminants that can be safely discarded in landfills [76].

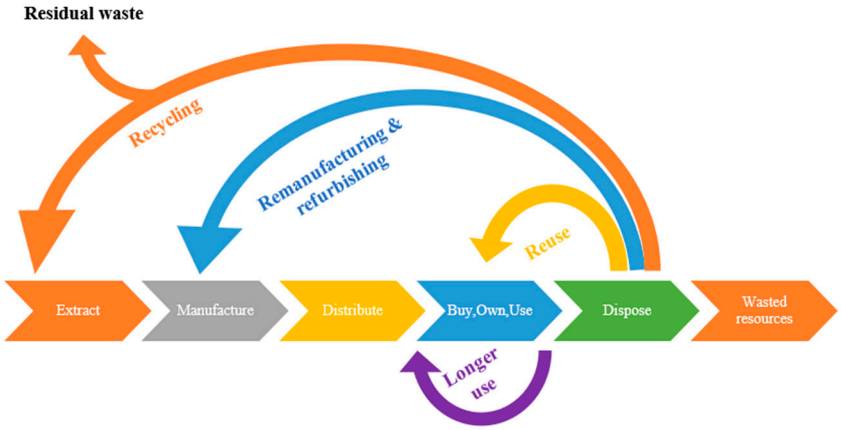

Figure 4. The circular economy concept in solid waste management, adapted from Brocklehurst [59,92].

Isernia et al. [93] pointed that CE approaches are important in which optimized waste management processes could represent a relevant way to achieve economic, environmental, and social benefits. CE is sometimes seen as a means of achieving more efficient waste management [94]. Nonetheless, the CE concept per se is insufficient in confronting this specific locality due to the specific conditions on small islands. The entire concept of CE centers on resource management, wherein it is one of the underlying key aspects in governance to address the gaps and rigidity of rules, roles, and organizations in the governance of solid waste management in adapting to the current needs of small islands. The challenges highlighted in this section focus on how the current governance is not small island-specific, it has low replicability in different scenarios, and it is static with the continuum. All existing issues point to the non-evolutionary governance of solid waste management on small islands.

4. Evolutionary Governance in Solid Waste Management

Rules (institution), roles (actors), and organizations (embodying roles) have been identified as the working mechanisms in governance, whereby it encompasses the state's position in society, the management of socioeconomic activities in the public, private, and community sectors, and the participation of civil society in the overall management of society [89]. The current governance of solid waste management on small islands requires a more evolutionary and adaptive governance model. Schlüter et al. [74] in a study of evolutionary governance of coastal development affirmed the significance and urgent need for governance evolution and adaptation specifically on small islands. Evolutionary governance of solid waste management particularly on small islands can address island-specific factors related to the governance of the small islands. The constraints and limitations due to isolated locations of small islands can be addressed through disclosure between the co-evolution of governance aspects.

As mentioned earlier, institutions, actors, knowledge, objects, subjects, organizations, and others are all elements of governance, and the relations among them are constantly changing. The elements co-evolve, as do their relationships, with any change in one element causing a change in the other, although their relationships can change as well. Both elements and their relationships are formed by a variety of processes, some of which are linked to mutual understandings, others to actor strategies and the existing set of rules and roles [95].

4.1. Evolutionary Governance Theory

According to Beunen et al. [96] in Evolutionary Governance Theory (EGT), no model of governance is ideal in terms of legitimacy, efficiency, and stability. Configuration of power/knowledge that changes when encountered by others, as well as actor/institution configuration that are similarly self-transformative, have all been debated as sources of instability. Changes in society result in the appearance of new narratives or the reinterpretation of existing ones, as well as the emergence of new actors associated with old or new narratives, or actors that will enact governance shifts and will be transformed. Actor/institution configuration are simultaneously sources of stability.

Path dependencies and systems theory play a role in EGT, with these principles embedded in the idea that institutions and discursive realities for governance arise from what came before, with the sections of an enclosed system acting as the building blocks for what comes next. Gili EcoTrust, for example, is the only community-based conservation organization in Gili Trawangan with the appropriate social and political connections, finances, and influence to address environmental issues. It was the most institutionally competent organization at coping with the situation when solid waste management became a primary concern. The evolution of governance is influenced by the characteristics of the environment in which it happens [23]. EGT creates a framework for observing the governance of solid waste management by incorporating elements of institutional economics, social systems theory, and path dependency. EGT also connects all of the elements, offering an overarching framework for comprehending the dynamic realities of government that can be applied to solid waste management systems [29].

In the structure of governance, arrangements play a large role in governance effectiveness. However, understanding the functioning of governance arrangements requires reconstruction of paths whereby there are three categorizations: (i) governance models, (ii) governance dimensions, and (iii) spatial scales. Governance dimensions is a more relevant category in understanding the functioning of governance arrangements in the context of solid waste management on small islands. There are four dimensions in governance, namely, (i) types of institutions, (ii) forms of democracy, (iii) forms of steering, and (iv) knowledge mobilized. In these dimensions, the polarization of positions does take place. For example, the spectrum of positions will fall between formal and informal institutions, representative and participatory democracy, central steering and network steering, and expert knowledge and local knowledge. The differing standpoints will be capped off through the decision-making of the authority. According to Assche et al. [44], dimensions and chosen positions co-evolve, implying that events in other dimensions have a direct impact on the choices in one dimension. Some positions on other dimensions become difficult or less appealing as a result of the dominant position on one dimension. This mechanism results in a reliance on governance, which is a blend of path dependence and interdependence. Choices of one governance dimension, as well as the positions taken, are likely to cause changes in the two configurations and their relationships. The functioning of higher-level configurations will be revealed by displaying the connection of the dimensions and their reactions to change in other dimensions.

4.2. Conceptual Approach

The application of EGT in the context of solid waste management on small islands will continually be improved and reconditioned according to the change in governance

progression. The interaction between the aspects of rules, roles, and organizations gives rise to evolution in governance. As the elements of each aspect of governance interact and form a dependency on one another, a subject–object interaction occurs and co-evolves with oneself [74]. This process is coherent with the participatory theory that bridges subject–object distinction. Participatory theory cooperates with EGT in the co-evolution between subject and object in all three aspects of governance. This co-evolution contributes to the governance path formation in evolutionary governance.

The governance of solid waste management is a multi-level mechanism that includes many pathways that occur in a larger society. The concept of a path refers to the explicit transformation of governance in a society [29]. Paths can be formed from any interactions among the institutions, both horizontally and vertically. Actors can take part in multiple routes, and some sites can be shared by multiple paths. In terms of path dependencies, interdependencies, and target dependencies, each governance path will be distinctive [95]. The actor/institution configuration is generated within this component in the conceptualization.

Stakeholder theory holds a crucial position in the interactions among the stakeholders in the governance itself, including the federal government, state government, local authorities, businesses, concessionaires, and local communities. This theory is seen as a genre in management theories to recognize the value of the variety of uses one can make of this set of ideas [96]. The interactions among stakeholders in terms of participation and involvement are the contributors to the power/knowledge configuration in EGT [58]. The roles and dependencies are scrutinized using this theory. The discussed supportive theories will act as building bricks of the synthesis of an evolutionary governance conceptualization. The connection and engagement of both actor/institution and power/knowledge configurations are apt to be spelled out through the meta-configuration.

There are three steps in grounding the meta-configuration [95]. Firstly, by analyzing the actors/subjects involved and how their positions are described, governance paths and its contexts are mapped. Secondly, investigating discursive mechanics that can be observed in the path by context mapping. Thirdly, categorization of a governance arrangement by path mapping and path analysis. Discursive analysis and analysis of cohesive choice dimensions will complete the path analysis by combining induction and deduction methods. This grounding process allows the study of autopoietic evolutions in governance arrangements. Toward the identification of gaps in the current governance of solid waste management on small islands, the suggested steps are as follows:

1. Pin down the governance categorization and study how each dimension affects another. The influence of one dimension over the other controls the central steering of governance.
2. Identify the configuration between actor/institution and power/knowledge and how it co-evolves (meta-configuration) in the governance dimension of solid waste management on small islands. The interactions between the configurations in interdependency, goal dependency, and path dependency should be clarified to understand the governance path.
3. Subsequently, observe governance arrangement through the object and subject construction from the meta-configuration. The discourses can be identified by the reconstruction of governance path and mapping the bigger contexts.

To facilitate circularity in solid waste management, this evolution in governance enables functional governance, which knits closely with the CE concept. According to Ghisellini et al. [94], putting a CE as a goal allows stakeholders to efficiently utilize the resources through the application of reduce, reuse, and recycle (3R). CE practices will maximize resource utilization and minimize waste generation. Hence, the evolving mechanism in this way forward will contribute to the circularity in solid waste management on small islands. For better comprehension, the application of EGT in the conceptual approach is presented in Figure 5 whereby the framework clarifies the relation and integration of every aspect of rules, roles, and organizations on whatever paths will be taken. The iden-

tification of governance path and arrangement will allow the assessment of governance from an institutional level [9]. New actors that are significant to the present solid waste management can also be added to the governance of solid waste management. Roles of stakeholders can be reformed according to the needs of the governance to form new paths by streamlining strategies and planning. There will also be more consideration of small islands' particularity as the approach will directly address first-hand issues; where the issues are only within the small island, it will narrow down to the requirements and solutions for the small islands.

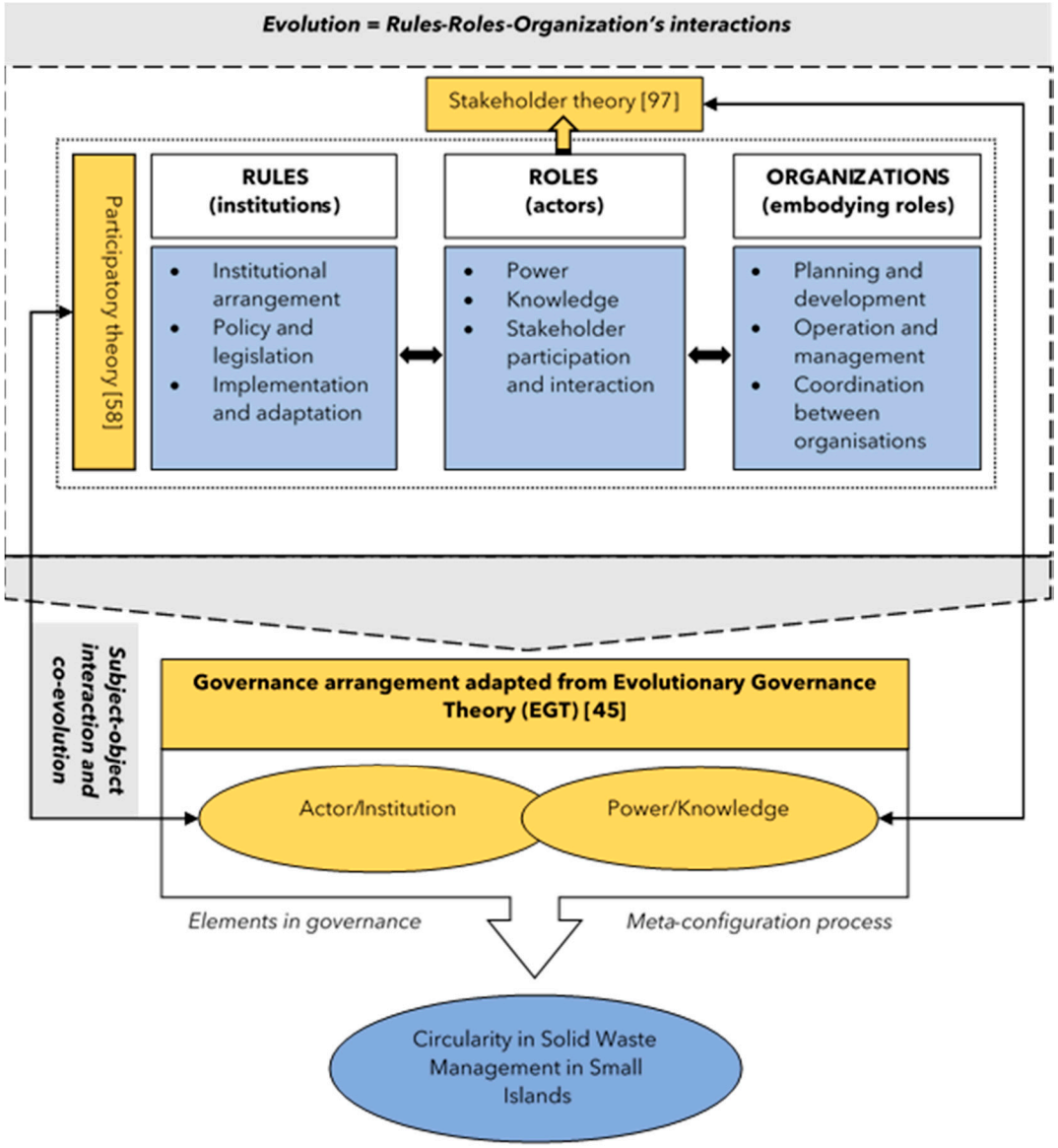

Figure 5. Conceptual framework of EGT application for the governance of solid waste management on small islands, adapted from [44,57,96].

Drawing from application of the conceptual approach, some implications can be stated. Firstly, policy makers and stakeholders involved are able to examine the gaps within the governance of solid waste management on small islands. Policy makers will be able to adjust policies and plans according to the needs of the current state of solid waste governance. At the same time, the interaction among stakeholders can be re-evaluated to reinforce governance paths among the institutions. The gaps discussed in Table 2 allow stakeholders to look into areas and institutions that are the real "culprits" in the hindrances to small

islands' solid waste management. In addition, with the power/knowledge configuration in the construct of policy-making, an understanding between the distinct actors and their roles can be formed to contribute to the effectiveness of each and every proposed strategy. This approach allows stakeholders to view governance from both vertical and horizontal direction simultaneously. Furthermore, this research can provide insights and guidelines for stakeholders in consideration of the evolution of the solid waste management, especially on small islands. Also, it will serve as a practical direction for all relevant stakeholders to assess their current governance of solid waste management and begin to work toward circularity through evolutionary governance.

5. Conclusions

As tourism is the essential driving economic sector on small islands, solid waste management will continue to be the main problem for the environment on small islands. Solid waste management on small islands is a daunting problem, but development partners have done little to channel acknowledgment of small island-specific issues into genuine small island-specific reforms, even though small islands have lobbied for and pursued this attention. In response to the current governance of solid waste management, an evolutionary governance approach can be the solution to governance issues. Although there have been numerous approaches to the governance of solid waste management, such as multi-stakeholder participation and community-based strategies, they have yet to be proven effective and molded specifically to answer the main concerns on small islands. Therefore, evolutionary governance should be considered to tackle institutional, operational, and even stakeholder engagement problems altogether. We suggest that stakeholder and participatory theories are incorporated with the Evolutionary Governance Theory for an all-inclusive approach to achieve circularity in solid waste management. This incorporation and integration of the mentioned theories through the proposed conceptual approach will allow stakeholders to access necessary areas and governance paths to work toward an evolutionary governance. With the application of Evolutionary Governance Theory to the governance of solid waste management, the approach can be integrated more cohesively, therefore giving a solution to real-time solid waste problems on small islands.

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