ADVANCING THE CIRCULAR ECONOMY

A PATHWAY TO MARINE PROTECTION AND SUSTAINABLE DEVELOPMENT

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Contents

1 Executive Summary

Jamaica generates approximately 1.45 million tonnes of municipal solid waste annually, with over 60% disposed at facilities operating below sanitary landfill standards. This linear take–make–dispose system produces environmental and economic costs: methane emissions from uncontrolled organic decomposition, groundwater contamination from leachate, marine pollution affecting fisheries and tourism, and the loss of economically valuable materials through disposal rather than recovery.

As a small island, Jamaica faces constraints that restrict safe disposal options, while strong hydrological connectivity between watersheds and coastal zones accelerates the transfer of land-based pollutants into marine ecosystems within 24–48 hours of rainfall events. Over 75% of Caribbean marine pollution originates from land-based sources, threatening blue economy assets such as fisheries, tourism, and coastal ecosystems which support national livelihoods.

The circular economy prompts the rethinking of how waste is often treated as a terminal output requiring disposal. This paper presents a four-component circular system transformation framework (section 2.2, figure 1) developed by Environmental Solutions Limited:

(1) Dominant material inputs requiring management

(2) Enabling infrastructure and policy systems

(3) Circular pathways prioritizing value retention

(4) Measurable environmental and economic outcomes.

This framework was developed under an initiative funded by the Caribbean Biodiversity Fund through its Advancing Circular Economy Facility. It directly addresses the challenges outlined above by linking land-based waste management reform to marine biodiversity protection and blue economy resilience. Application of the framework indicates that 50–65% of Jamaica's current landfill inputs could be diverted through a combination of material recovery, organic waste processing, and extended producer responsibility schemes. Such diversion would simultaneously reduce environmental harm, lower greenhouse gas emissions, create employment, and strengthen climate resilience.

The aim of the initiative is to advance the transition from Jamaica's linear waste management system to a circular economy model. Specifically, the initiative seeks to demonstrate how circular waste pathways can intercept pollutants upstream, retain economic value within the domestic economy, and contribute to environmental, climate, and socio-economic benefits.

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2 Introduction

The take–make–dispose paradigm, whereby materials are extracted from natural systems, transformed through energy-intensive manufacturing processes, distributed for single-use consumption, and subsequently relegated to terminal disposal in uncontrolled dumpsites, has generated externalities across multiple domains (Geissdoerfer et al., 2017). These externalities manifest as accelerating waste generation rates, progressive contamination of terrestrial and marine ecosystems, uncontrolled greenhouse gas emissions from organic decomposition and fossil fuel combustion, and the depletion of natural capital that impedes economic productivity.

In Jamaica, municipal solid waste generation reached approximately 1.45 million tonnes per year in 2021. More than 60 per cent (approximately 870,000 tonnes annually) was disposed at the Riverton disposal site in Kingston, much of it under conditions inconsistent with engineered sanitary landfill standards, including inadequate compaction, daily cover operations, leachate collection systems, and gas capture infrastructure (Söderholm & Kyriakidis, 2023; Planning Institute of Jamaica, 2020). Open dumping practices and poorly managed landfills contribute directly to methane[1] emissions, while uncontrolled leachate generation contaminates groundwater aquifers and surface water bodies with heavy metals, organic pollutants, and pathogenic microorganisms (Kjeldsen et al., 2002).

In the case of Jamaica these failures are magnified by Jamaica's geographic and structural characteristics as a Small Island Developing State (SIDS). Limited land availability (Jamaica's total land area is approximately 10,991 km^2, of which significant portions are mountainous, agriculturally productive, or designated for conservation) severely constrains options for safe waste disposal, long term containment, and buffer zone establishment around disposal facilities (World Bank, 2017). Strong hydrological connectivity between inland watersheds and coastal ecosystems, mediated by Jamaica's 24 major river systems and extensive storm water drainage networks, accelerates the transfer of land-based pollutants including plastic debris, nutrients from organic waste decomposition, sediments, and chemical contaminants into nearshore marine environments, often within 24 to 48 hours of rainfall events (Corbin, 2013).

Across the Caribbean region, environmental assessments conducted under the UNEP Caribbean Environment Programme (CEP) and the Land-Based Sources of Marine Pollution (LBS) Protocol, including pollution load inventories, coastal water quality monitoring, and wastewater infrastructure audits, indicate that over 75 per cent of marine pollution originates from land-based sources. These assessments further document that more than 80 per cent of municipal and industrial wastewater, amounting to approximately 400 million litres per day across the region, is discharged untreated into rivers, nearshore waters, and coastal ecosystems, due to limited sewerage coverage and underperforming treatment plants (UNEP CEP, 2018).

Jamaica's exposure to climate related hazards, including tropical cyclones of increasing intensity[2], accelerated coastal erosion, riverine and urban flooding, and prolonged drought cycles (World Bank, 2017), weaken adaptive capacity, increase disaster related fiscal burdens[3] and implicate long term economic resilience, particularly in waste intensive sectors such as tourism and urban

[1] Methane is a greenhouse gas with a global warming potential 28 to 36 times that of carbon dioxide over a 100-year period (IPCC, 2014).
[2] Hurricane Melissa, Category 5, made landfall in Jamaica in October 2025.
[3] Jamaica experiences average annual losses of 1.4 to 2.0 per cent of GDP from natural disasters (Planning Institute of Jamaica, 2021). Preliminary estimates of GDP loss from Melissa in 2025 is 30% (UNDP)

development. Infrastructure damage, business interruption, and environmental degradation create compounding economic losses (ECLAC, 2020).

2.1 Circular Economy as a Solution

The circular economy offers an alternative to Jamaica's linear waste and resource management model. It decouples economic activity from material extraction and uncontrolled disposal. Where linear systems treat waste as a terminal output requiring disposal, circular economy frameworks **reconceptualize waste** streams as secondary resource flows that can be reintegrated into productive use through prevention, material recovery, and value retention strategies (Geissdoerfer et al., 2017).

The circular economy operates on three core principles (Ellen MacArthur Foundation, 2015):

1. Designing out waste and pollution through upstream product design and material selection;
2. Keeping products and materials in use at their highest value through reuse, repair, refurbishment, remanufacturing, and recycling; and
3. Regenerating natural systems by returning biological nutrients safely to the biosphere.

Wilson et al. (2015) conducted a comparative Material flow analysis of waste management systems in low- and middle-income countries, including Caribbean SIDS, as part of the Global Waste Management Outlook Report 2015. Findings suggests that 50 to 65 per cent of current landfill inputs could be diverted through established circular economy interventions, including organic waste processing, material recovery facilities with multi stream sorting, and take back programs for priority waste streams (Godfrey et al., 2019). Godfrey et al. (2019) applied a material flow accounting and system boundary analysis to Caribbean solid waste streams, to quantify leakage pathways from land-based waste systems into coastal and marine environments. ***This showed that more than half of disposed waste flows could be intercepted upstream through source separation, material recovery facilities, and take-back or extended producer responsibility schemes, particularly for packaging and consumer products. This, would, in turn reduce landfill dependency while simultaneously lowering methane emissions (IPCC, 2019), and minimizing leachate generation (Bogner et al., 2008).***

Jamaica already exhibits informal and embryonic circular practices that illustrate both existing potential and structural constraints requiring policy intervention. Environmental Solutions Limited (ESL) has contributed to landfill rehabilitation and engineered waste management projects at major disposal sites such as Riverton, incorporating leachate management, landfill gas control, and preliminary material recovery systems that move beyond open dumping toward controlled disposal and value retention. These interventions, while primarily framed as environmental remediation and public health measures, also create the foundational conditions necessary for circular practices, which include waste segregation, recovery of recyclables, and the potential for waste-to-energy applications. ESL has been involved in national initiatives supporting the implementation and assessment of Jamaica's plastic ban and solid waste reforms, and the firm has assessed the technical feasibility of circular interventions and the institutional limitations that constrain scale-up, including insufficient downstream recycling markets, and limited integration between environmental regulation and industrial policy. ESL found that most restricted plastic items such as single-use plastic bags, straws, and expanded polystyrene food containers, are technically substitutable with biodegradable, reusable, or alternative materials already available on the local and regional market. However, the assessments showed that material substitution alone does not deliver circularity. In practice, alternatives often enter the same linear waste stream because Jamaica lacks consistent source separation, material recovery facilities, and quality control systems for recyclables. As a result, even "compliant" materials frequently end up in landfills rather than being reintegrated into productive cycles.

In relation to downstream recycling markets, ESL identified a critical structural drawback. Jamaica's recycling ecosystem remains thin, fragmented, and highly export dependent. While there is some domestic recovery of PET, HDPE, and scrap metals, volumes are insufficient to sustain stable local reprocessing industries. ESL's findings showed that recyclers face volatile commodity prices, high transportation and energy costs, and limited access to finance, which affects the commercial viability of scaling recycling operations. This weak downstream demand reduces incentives for upstream segregation and compliance.

2.2 Conceptual Framework

This paper adopts a Circular Systems Transformation Framework, structured around four interacting components:

2.2.1 Component 1: Material Inputs

The first component identifies the physical materials that enter Jamaica's circular economy system. These are the dominant waste streams that currently flow to landfills, informal dumps, coastal areas, and gullies with minimal value recovery.

While Jamaica has made significant regulatory progress on plastic waste, the reality is that plastics represent only one component of the national material footprint. Scrap metals hold higher economic value per ton but are often exported with minimal local processing. Organic waste dominates landfill volume and generates potent methane emissions. Disaster debris, as demonstrated by Hurricane Melissa and other recent storms, can overwhelm disposal

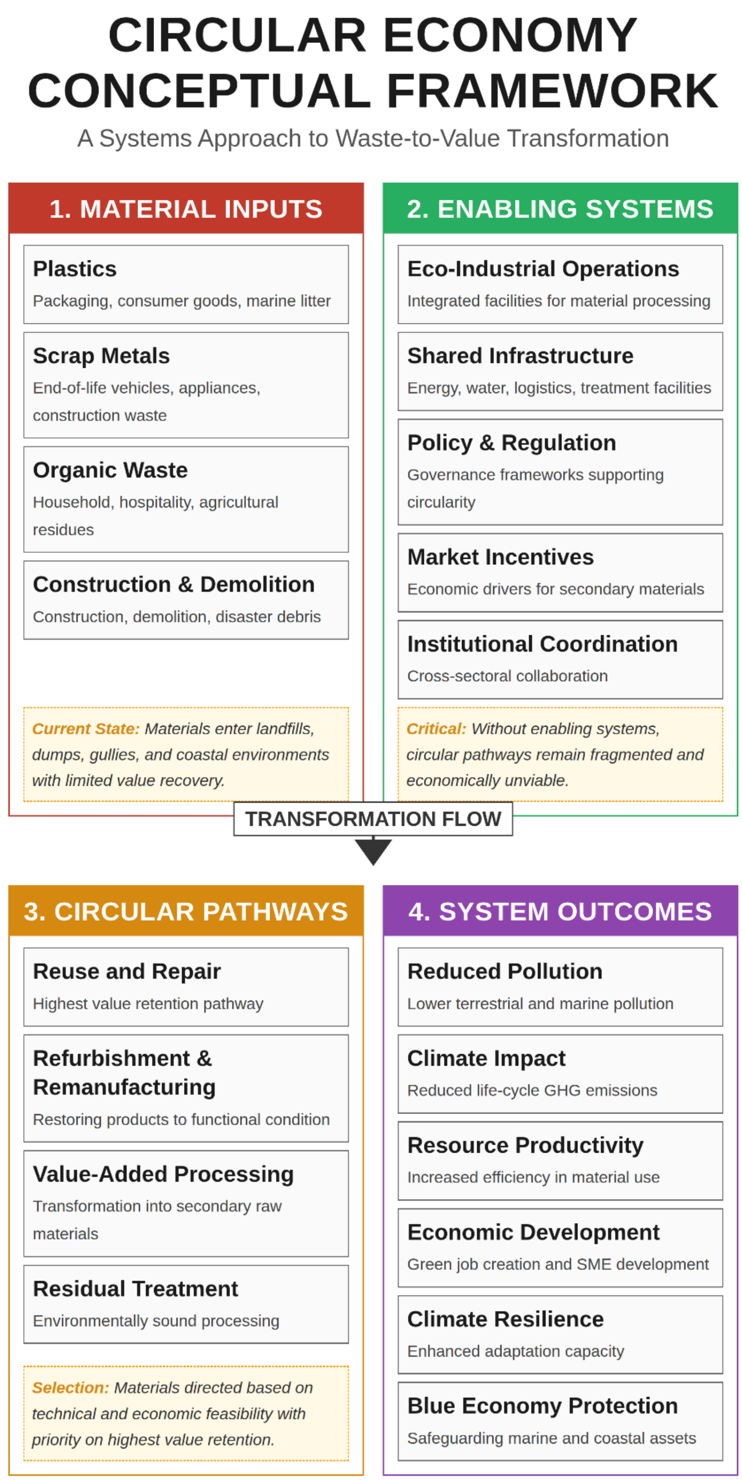

Figure 1 Conceptual Framework [Author: ESL]

capacity and contaminate coastal environments if not managed systematically.

2.2.2 Component 2: Enabling Systems

The second component addresses what makes circularity operationally viable. This component identifies five critical enablers:

1. **Eco-industrial plant operations** provide the physical facilities where materials are processed, but more importantly, they create conditions for industrial symbiosis. In an eco-industrial configuration, waste from one facility becomes feedstock for another.

2. **Shared infrastructure** such as energy systems, water treatment, logistics networks, and residual waste management, reduces the capital and operating costs that make small-scale recycling economically marginal.

3. **Policy and regulatory frameworks** facilitate the success of circular economy investments through clear legal frameworks and incentives.

4. **Market incentives for secondary materials** create economic pull for recovered resources. Without stable demand and viable pricing, even well-designed collection and processing systems fail.

5. **Institutional coordination across sectors** recognizes that circular economy transitions require coordination among waste management authorities, environmental regulators, trade and investment agencies, private sector, tourism stakeholders concerned with coastal aesthetics, and disaster management entities planning post-storm debris recovery.

This component is termed "critical infrastructure" because, without these enablers, circular pathways remain an aspiration. Jamaica's experience with pelletization illustrates this precisely: the technology worked, but the system failed due to volatile markets, high contamination, and insufficient integration with end-users.

2.2.3 Component 3: Circular Pathways

The third component defines how materials move through circular systems. Critically, it presents a value retention hierarchy. The framework prioritizes strategies that retain maximum value:

1. **Reuse and repair** (highest value retention) extend product lifespans without reprocessing. A repaired appliance retains nearly all of its original value, requires minimal energy input, and generates no reprocessing waste.

2. **Refurbishment and remanufacturing** restore components to functional condition, creating products that perform like new but use a fraction of the energy and materials required for virgin production.

3. **Value-added material processing** transforms recovered materials into functional products rather than generic commodities.

4. **Environmentally sound residual treatment** addresses materials that cannot currently be recovered economically or safely.

The hierarchy matters because policy and investment should prioritize higher-value pathways. Yet conventional waste management often inverts this logic, investing heavily in collection and disposal while neglecting repair infrastructure, refurbishment services, and value-added manufacturing.

2.2.4 Component 4: System Outcomes

The fourth component identifies what successful circular economy implementation delivers. In line with Jamaica's broader environmental, economic, and development objectives, the benefits are:

1. **Reduced terrestrial and marine pollution** flows directly from keeping materials in productive use rather than allowing them to leak into gullies, rivers, coastal waters, and ocean ecosystems.
2. **Lower life-cycle GHG emissions** result from multiple mechanisms: substituting energy-intensive virgin production with recycled material processing; diverting methane-generating organic waste from landfills to composting or anaerobic digestion; reducing transportation emissions through local processing (reduced need for imports); and shortening supply chains vulnerable to climate disruptions.
3. **Increased resource productivity** means extracting more economic value from each ton of material that enters the system.
4. **Green job creation and SME development** occur throughout circular economy value chains: collection and sorting operations, repair and refurbishment services, material processing facilities, quality control functions, logistics coordination, and sales of recovered materials and products.
5. **Enhanced climate and disaster resilience** operates at multiple levels. Locally processed materials create supply security when global supply chains face climate-related disruptions.
6. **Protection of Blue Economy assets** acknowledges that ocean-based sectors, fisheries, tourism, maritime transport, coastal real estate, depend on healthy marine ecosystems.

3 Baseline Challenges

3.1 Dominant Waste Streams

Inadequately managed plastics, including single-use polyethylene bags, polystyrene food containers, and polyethylene terephthalate beverage bottles, collectively constitute approximately 12 to 15 per cent of municipal solid waste by weight (National Environment and Planning Agency, 2019). Organic waste contributes significantly to biochemical oxygen demand and eutrophication in receiving waters. Electronic waste containing hazardous substances such as lead, mercury, cadmium, and brominated flame retardants poses additional contamination risks in coastal environments (Ivar do Sul & Costa, 2014). These waste streams enter coastal waters through major river systems, storm drain outfalls, and numerous informal coastal dumping sites identified through satellite imagery and coastal assessments.

3.2 Impacts of Waste Leakage

The waste flows contribute to: marine litter accumulation[4]; eutrophication events linked to dissolved oxygen depletion and fish kills in enclosed bays: physical degradation of coral reef structures through sedimentation and abrasion: and bioaccumulation of persistent organic pollutants and microplastics in marine food webs. The presence of these substances has been documented in commercially important species such as snapper, parrotfish, and lobster (Debrot et al., 2013; Browne et al., 2011).

Impacts of waste streams threaten tourism revenues by degrading beach quality, reducing reef-based recreational opportunities, and diminishing aesthetic value (Mumby, 2004). They also affect fisheries productivity through habitat degradation, nursery destruction, and stock depletion. The Caribbean's coral reef fish stocks have declined by an estimated 40 to 60 per cent since 1980 (Mumby et al., 2004). In addition, waste compromises natural coastal defence systems such as mangroves and seagrass beds, which attenuate wave energy by 50 to 99 per cent depending on density and extent; reduce coastal flooding and erosion, and function as critical blue carbon sinks sequestering approximately 0.5 to 1.5 tonnes of carbon per hectare per year (Fourqurean et al., 2012).

3.3 Waste Recovery

Informal waste pickers at the Riverton site, estimated at 200 to 300 individuals operating without occupational health protection, recover metals (primarily aluminium, copper, and steel), plastics, and reusable items, effectively performing material recovery functions that divert an estimated 5 to 8 per cent of disposed waste from final burial (Söderholm & Kyriakidis, 2023; Medina, 2007). These activities generate household incomes of approximately USD 800 to 1,200 per year but occur under hazardous conditions including exposure to leachate, infectious waste, heavy machinery, and landfill fires (Wilson et al., 2006).

4 Opportunities for Circularity

4.1 Waste Interception

Upstream waste interception is consistently identified as the most effective intervention point for reducing environmental leakage, particularly in small islands where stormwater systems act as primary conduits for plastics and debris into coastal waters (Corbin, 2013; UNEP, 2018). Jamaica's gully-capture pilots demonstrate that early interception can reduce downstream waste loads by more than half, while lowering cleanup costs and flood risks (Söderholm & Kyriakidis, 2023).

Scrap metals represent one of Jamaica's highest-value recoverable material streams, arising primarily from end-of-life vehicles, household appliances, and construction and demolition waste (Mohammadi et al., 2021). Under linear systems, these materials are typically exported with minimal preprocessing, forfeiting downstream fabrication value. Circular strategies instead prioritize dismantling, component recovery, grading, and domestic preprocessing, enabling integration with local fabrication and construction sectors (Söderholm & Kyriakidis, 2023). Recovered steel can substitute for imported rebar, while aluminium casings can be repurposed into roofing and fittings, reducing both import bills and embedded emissions. This illustrates the

[4] Beach surveys document 200 to 400 plastic items per 100 metre transect on Jamaican beaches, approximately 75 per cent of land-based origin (NEPA, 2019)

output-to-input principle: vehicle scrap becomes construction material; appliances become building components.

In tourism-intensive areas, segregated organic waste systems offer some of the highest diversion and climate-mitigation potential. Composting and anaerobic digestion can divert the majority of this fraction, reducing landfill pressure while producing soil amendments and renewable energy. The resulting compost supports local agriculture. Agricultural outputs supply hotels and restaurants; and food waste returns to treatment, effectively closing nutrient loops.

In urban residential areas, particularly the Kingston Metropolitan Area, unmanaged organic waste has been directly associated with landfill fires, public health emergencies, and flooding impacts. Investigations by the Office of the Public Defender (2015) that "there have been frequent fires at the Riverton waste disposal site, with over 400 reported fires between 1996 and 2015," linking these events to decomposing organic waste and methane buildup. One major fire alone "cost JA$25 million to extinguish and caused respiratory problems and cardiac illnesses among affected residents" (Söderholm and Kyriakidis, 2023).

Urban flooding is typically caused by mixed household waste blocking drainage infrastructure, with reporting noting that "uncollected garbage and blocked drains continue to worsen flooding in Kingston communities during heavy rainfall" (Söderholm and Kyriakidis, 2023). Source-segregated organic waste collection in urban areas would significantly reduce landfill methane generation, lower fire risk, and decrease the volume of waste entering gullies and drains.

4.2 Demonstrations (Eco-Industries)

The technical feasibility of these interventions has been established through pilot demonstrations and commercial-scale operations. Private sector entities including Recycling Partners of Jamaica (RPJ) have established island-wide collection and aggregation systems for PET and HDPE plastics; however, RPJ's operations also highlight a key structural constraint identified by ESL: the absence of domestic plastic reprocessing capacity means that much of the recovered material must be exported, limiting local value retention and employment creation RPJ also operates within constrained enabling environments with consumer behaviour patterns favouring disposal convenience over environmental stewardship, and competition from virgin material pricing that does not reflect full lifecycle environmental costs (Bjorndal et al., 2016; Rosa et al., 2019).

A second example is Wisynco Group, which has incorporated recycled PET content into its beverage packaging portfolio. This represents an upstream circular intervention, where manufacturers create demand for secondary materials within domestic value chains. While technically successful, ESL assessments noted that such initiatives remain voluntary and isolated, with no regulatory or fiscal mechanisms to systematically incentivise recycled content requirements across the wider manufacturing sector. These activities demonstrate the technical feasibility of diverting organic waste from landfills and reducing methane emissions, while producing usable outputs such as compost or energy inputs. ESL's findings show, however, that these models struggle to scale due to inconsistent feedstock quality, limited source separation, and the absence of long-term offtake agreements for recovered products.

A documented example of commercial-scale circular economy practice in Jamaica is provided by the Caribbean Broilers Group, through the development of its Hybrid Growth Centre ("The Nest") at Hill Run, St. Catherine. The facility is designed to internalize organic waste streams generated during poultry processing. Biological waste streams, including blood, feathers, fat, and offal, are diverted from landfill and processed on-site through a Protein Recovery and Rendering System, which converts these residues into usable secondary products such as animal feed ingredients and fats. The system is designed to recover and process up to approximately 23,000 tonnes of biological material annually that would otherwise be landfilled.

The facility also integrates wastewater treatment and reuse, with process water treated and reused for irrigation on-site, reducing freshwater demand and limiting effluent discharge to surrounding watersheds. Energy requirements are met through a dedicated LNG power facility which caters to an improved operational efficiency and controlled emissions management.

A more recent example is, Woodcats, through its design-led circular production approach concept, which represents a small-scale but high-impact circular business model that integrates material reuse, design innovation, and local value creation. The company transforms discarded wood, often sourced from construction waste, pallets, and storm-damaged timber, into premium furniture and architectural pieces.

5 Climate Mitigation and Adaptation Benefits

Beyond waste diversion metrics, circular economy adoption would enhance climate resilience. Reduced disaster related waste surges can be managed through decentralized composting of organic debris and stockpiling of construction materials for reuse in reconstruction, limiting strain on emergency disposal capacity (Brown et al., 2011). Prevention of pollutant transport during extreme rainfall events can be achieved through removal of hazardous materials from waste streams prior to cyclone season and establishment of covered storage for recovered materials that would otherwise be mobilized into waterways.

Lowering fiscal exposure associated with landfill fires[5], flooding of disposal sites, and infrastructure degradation can be accomplished through reduced waste volumes, improved site management, and diversification of waste processing across multiple facilities rather than concentration at a single vulnerable site.

For a climate-vulnerable island, circularity represents a low-regret, multi-benefit climate intervention that simultaneously reduces emissions, enhances adaptive capacity, and creates economic opportunities. This makes circular economy development eligible for climate financing and essential to Jamaica's Nationally Determined Contributions (NDCs) and long-term climate strategy.

GHG mitigation is also achieved through reductions in energy demand associated with material production (Mohammadi et al., 2021). Locally recovered materials allow for circular systems to reduce upstream emissions included in extraction, refining, and long-distance transport (Francomme, 2025). A second major mitigation pathway, as posited by ESL's framework (see section 1.2.4), is from methane avoidance.

6 Considerations for Policy and Investment

This paper is designed to invoke thought and encourage reflections on Jamaica's commitments to

[5] Occurs 21 times on average annually at Riverton, generating toxic emissions and requiring emergency response (Office of the Public Defender, 2015).

Vision 2030 which speaks to the sustainable management of natural resources, climate resilience, and the development of a green and blue economy as key drivers of national prosperity. Sustainable Development Goal 14 applies circular economy principles specifically to marine and coastal resource systems (Eikeset et al., 2018; Pinto et al., 2015). For Jamaica, whose exclusive economic zone is approximately 24 times its terrestrial land area, the Blue Economy represents an environmental management framework that provides for strategic economic development pathways to potentially transform the nation's productive base and export competitiveness (Vasconcelos et al., 2019).

Jamaica's marine environment caters to commercial and artisanal fisheries, which supports approximately 45,000 livelihoods directly and indirectly, and tourism, which generated approximately USD 4.3 billion in 2024 (JIS, 2025). Natural shoreline protection services are valued at USD 800 million to 1.2 billion per year in avoided damage (World Bank, 2017), and as such, blue economy opportunities for Jamaica include mariculture, marine biotechnology, and ecosystem restoration services. Portuguese researchers have developed edible coatings formulated from fish processing co-products, specifically utilizing gelatin extracted from tuna skin combined with bioactive compounds from seaweed species, to extend fresh fish shelf life and reduce reliance on conventional plastic packaging (Barroso et al., 2020). This reduces organic waste from seafood processing operations, creates value-added products from materials currently discarded, decreases plastic consumption in food packaging applications, and extends product shelf life thereby reducing food waste.

For the framework (figure 1) to be successful, the government should consider the provision of catalytic finance to fund research and development programmes, and create regulatory environments enabling innovation. Municipal and parish-level authorities should also manage waste collection infrastructure, issue development permits affecting land use patterns, and deliver consumer education programmes. Private sector entities have a keen role to play, as they are encouraged to develop and commercialize technological innovations, establish collection and processing operations, and respond to market signals favouring circular products.

7 Conclusion

This paper advances a reframing of Jamaica's waste challenge as an opportunity for economic transformation and environmental protection. It builds on the country's current experience and moves beyond the question "should we recycle?" to the more strategic inquiry: **"how do we design integrated systems that maintain material value, reduce environmental harm, create economic opportunity, and build resilience across all dominant waste streams, supported by enabling infrastructure, guided by a value retention hierarchy, and delivering multi-benefit outcomes that protect both terrestrial and marine environments?"**

ESL encourages an informed approach to circular approaches. Understanding which materials dominate the waste stream and what their characteristics are such as the contamination levels, economic value, and processing requirements, informs infrastructure design. For example, the presence of large volumes of organic waste in tourism areas justifies investment in anaerobic digestion facilities that can generate biogas and compost. Available infrastructure determines which processing pathways are viable. When eco-industrial clusters provide shared utilities and co-located facilities, value-added processing becomes economically feasible at scales that would not work for isolated operators.

The specific pathways chosen, prioritizing repair over disposal, value-added processing over commodity recycling, determine the quality and magnitude of outcomes achieved. Higher-value pathways generate more economic benefit, more employment, and greater GHG reductions per ton processed.

This is the critical feedback loop that can lead to positive outcomes such as pollution reduction, economic returns and job creation.

7.1 Recommended Actions

Advancing Jamaica's circular economy transition requires action-oriented engagement across institutions and sectors. Priority steps include establishing a national coordination platform led by government agencies responsible for environment, waste, water, and planning; undertaking targeted material flow assessments for dominant waste streams such as organics, plastics, construction debris, and wastewater residuals; and piloting eco-industrial nodes where shared infrastructure such as energy, water recycling, and wastewater treatment, can support value-added processing at scale.

Implementation should actively engage municipal authorities, large waste generators in tourism and agro-processing, utilities, financiers, and academic partners.

Table 1 Recommended Priority Actions and Key Stakeholders

Area	Recommended Action
National Circular Economy Governance and Coordination	Establish a standing inter-agency Circular Economy Coordination Platform responsible for sequencing policy, permitting, and investment priorities across waste, water, energy, land use, and marine protection
Priority Waste Stream Identification and Quantification	Conduct updated material flow and market assessments for organic waste, plastics, construction and demolition waste, scrap metals, and wastewater residuals, including volume estimates, contamination profiles, seasonal variability, and end-market demand
Eco-Industrial Node Planning	Identify and designate priority locations for eco-industrial nodes where multiple circular activities can co-locate, supported by shared utilities (energy, water recycling, wastewater treatment, material aggregation areas)
Organic Waste Diversion	Design and pilot anaerobic digestion, composting, and bioresource recovery systems in tourism zones and agro-industrial areas with high organic waste generation, including feedstock aggregation and offtake agreements
Water Recycling and Reuse Integration	Integrate wastewater treatment, water recycling, and reuse systems into circular economy infrastructure planning, including irrigation reuse, industrial process water reuse, and nutrient recovery where feasible
Circular Economy Financing	Prepare finance-ready project concepts for shared infrastructure, aggregation facilities, and processing systems, including feasibility studies, cost–benefit analyses, and blended finance structures
Skills Development, Training, and Applied Research	Develop applied training programmes and research partnerships focused on circular waste systems, marine pollution prevention, eco-industrial operations, and circular business models

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