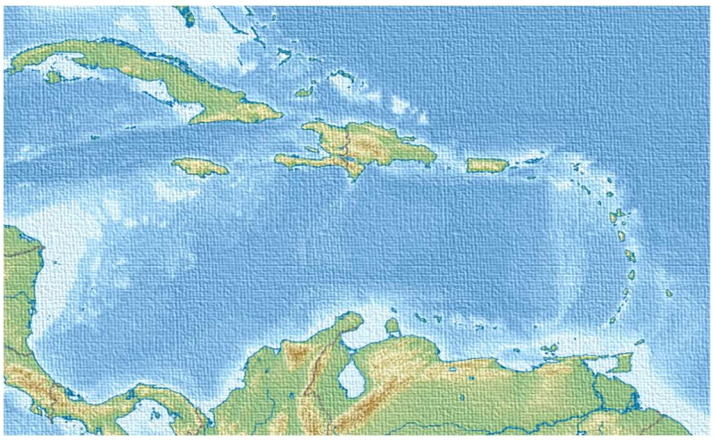

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Conceptualizing a circular economy in the Caribbean: perspectives and possibilities

Introduction

Key recommendations:

- **Promote renewable energy development**
- **Promote efficient waste minimization**
- **Promote efficient water pricing and regulation**
- **Implement performance bonds for public/cultural events**
- **Develop efficient land-based transportation**
- **Apply Pigouvian (green) taxes**
- **Establish green and blue investment bonds**
- **Set optimal carrying capacity limits for the natural resource base**
- **Promote elements of a shared economy**

Although the notion of a circular economy (CE) has been conceived and debated for more than half a century (Henrysson and Nuur, 2021), it has gained considerable popularity in the lexicon of economists, ecologists and other development thinkers over the past two decades. The increasing evidence of the existential threat of human-induced climate change and the related imperatives of decarbonizing the global economy, have led to greater focus on strategies for a more sustainable use of the natural and environmental resource base. This approach is deemed to be crucial to the attainment of a carbon-neutral, resource efficient and competitive economy (European Commission, 2015). Increasing interest in CE is also linked to a recognition of the potential economic benefits of this approach to development, with Deselnicu et al (2017) estimating an overall savings potential to European industry of 630 billion Euros per year from reduced material inputs and better use of resources. As the global economy has shown increasing affinity to the merits of this approach to development, the idea of a circular economy has also gained considerable traction among policymakers and private enterprise.

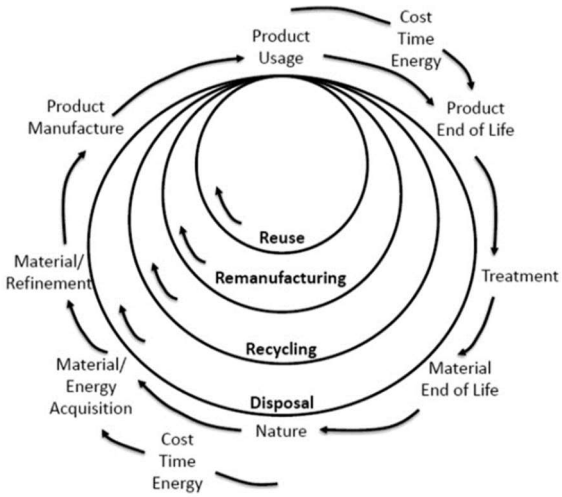
But what essentially are the defining elements of a circular economy? As noted by Kirchher, Reike and Hekkert (2017), circular economy has come to represent an array of paradigms, ranging from "an operationalization for businesses to implement the much-discussed concept of sustainable development", to the adoption of "green economy and green growth concepts". Possibly one of the more widely accepted notions of CE is offered by Korhonen, Honkasalo and and Seppälä (2018). These researchers framed a comparative construct of CE as an economy which, in its generation of values, operates as a cyclical materials and energy flow model, unlike the current and traditional linear model which produces goods and services based on an "extract-produce-use-dump material and energy flow model". The latter they deem to be unsustainable based on the resultant contemporary environmental impacts such as pollution, biodiversity loss, and related climate change effects which now confront humanity.

Notwithstanding this definition of CE, some research has shown *recycling* to be the most broadly adopted and pivotal element contemplated by circular economy protagonists, with this idea being central to as much as 85 per cent of peer reviewed research on the topic since 2012 (Kirchhner et al, 2017). Moreover, with the focus on materials and energy as the basis for the reshaping of traditional economies, no research has been found which anticipates the reorientation of service-based economies into cyclical ones. Given the high dependency of Caribbean economies on trade in services, this policy brief makes a cursory analysis of the application of the circular economy approach to the economies of Caribbean small island developing States (SIDS).

1. Theoretical perspectives on circular economy in the Caribbean

From the purview of ecology, a circular economy is principally concerned with the movement of materials and energy through an economy. This perspective recognizes an economy to be circular, where it seeks at every stage to reuse, remanufacture, and/or recycle materials in the production and consumption process, with a minimum of disposal of wastes into nature. In this model too, energy use is maximized, with minimum impacts on the natural environment from its utilization. This CE model is well summarized by Korhonen et al (2018), as shown in figure 1.

Figure 1: Concept of a circular economy



Source: Korhonen et al (2018).

In the model, the inner circles of reuse and remanufacturing are deemed to be higher priority since they are less demanding of material resources and energy and generate more economic value per unit. In a functioning CE, the time that the value of the materials and energy spends in each cycle is maximized, and the resource value is only shifted to an outer circle with declining material and energy values.

A significant departure from the now conventional thinking about CE, is the reduced centrality of *recycling* in driving the operations of the circular economy. This relates to the issue of entropy or thermodynamic limits which is one of several CE limitations[1] as identified by Korhonen et al. They argue that a focus on recycling for driving the CE, would result in the reinsertion of more primary materials into the economic system. The preparation of such recyclables would require greater energy use, thereby generating further environmental impacts.

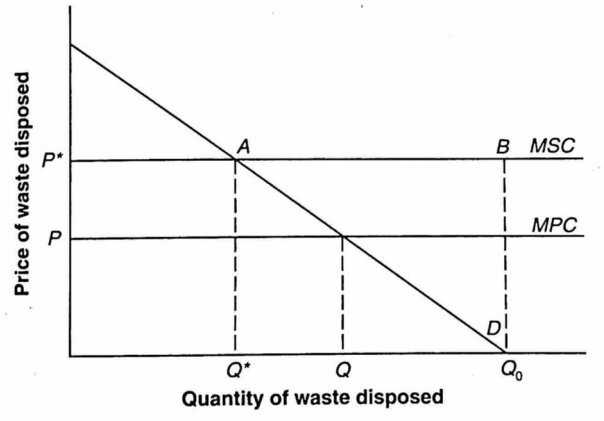
[1] Korhonen et al identify six limits to the CE concept: i) thermodynamic; ii) system boundary; iii) physical scale of the economy; iv) path-dependency and lock-in; v) governance and management; vi) social and cultural definitions. See Korhonen for a more elaborate treatise of these concepts.

Thus, the more highly valued cycles of reuse and remanufacturing (or refurbishment) are considered to be more efficient in the production of economic value, relative to environmental impacts. The outermost cycle of disposal functions only to accommodate any additional wastes which the circular economy is simply unable to internalize. This is expected to be minimized in an effectively functioning CE.

Departing from the broader ecological perspective, economics also provides a useful framework for a theoretical analysis of the CE. In the classical linear economy, production and consumption are undertaken through the efficient use of production factors, typically categorized as land, labour and capital, in the production *and* consumption of goods and services. In this classical model only the cost of production factors is minimized, while other unintended costs are assumed to be zero. Such unintended costs, or *negative* externalities[2] usually include pollutants, damage to the natural environment, loss of biodiversity, or even unanticipated impacts to *other* economic agents. Given the assumption of zero costs to these negative externalities, materials and energy tend to be utilized at a much higher level than would be necessary to minimize long-run average costs, leading the common environmental impacts as identified above.

In transitioning to a CE, prudent economics would require an assessment of the implications of negative externality costs on profit-maximization of the firm. Further, costs of consumption per unit would also need to be taken into account, since consumption also generates negative externality costs. The key economic premise here relates to how 'internalized' negative externalities may change the cost structure of firms and households, and how such changes can ultimately affect a firm's production, investment, savings, and household consumption. In the circular economy, it is expected that the optimization of such variables should lead to greater efficiency in the utilization of materials and energy, while at the same time minimizing environmental impacts. A cost analysis of this approach is provided by Macauley and Walls in Portney and Stavins (2000), who examine the quantity disposed relative to private and social costs in the case of wastes (figure 2).

Figure 2: Cost analysis in a waste disposal market



Source: Macauley and Walls in Portney and Stavins, 2000.

As shown in figure 2, the quantity of wastes disposed is inversely related to the unit price of waste disposal, as reflected in the line AD. For an efficient firm, the price of waste disposal P, is chosen such that it is equal to the Marginal Private Costs (MPC) of providing waste disposal services. At that price P, the firm will dispose Q quantity of wastes, in order to maximize profits. But MPC reflects only the costs internal to the firm and does not include externality costs. If the firm is however required to take into account its negative externalities[3], its price of waste disposal would increase to P*, which is now equal to the Marginal Social Cost (MSC) of waste disposal. At P*, a reduced quantity (Q*) of wastes would be disposed.

In a circular economy, these cost dynamics would create the necessary incentives for greater reuse, remanufacturing, and even recycling, and reduced materials disposal and energy use, as contemplated by Korhonen et al above. Ultimately, an evolving CE is expected to foster the development of key sectors

[2] Note that there can be positive externalities, which are unintended *benefits* as well. In a macro-trade-off analysis, the net externality cost may be used as a basis for economic and social choice.

[3] This might be, for example, either through waste treatment before disposal, or storage, or incineration.

and economic activities related to renewable energy, reduction of materials and energy use, greenhouse gas mitigation and waste minimization. Indeed, Korhonen et al suggest that in the context of sustainable development, a CE functions to achieve the following three objectives:

(i) Environmental: reduction of production-consumption material and energy use and waste emissions.
(ii) Economic: reduction of raw materials and energy costs, wastes and other emission costs, risks, and the fostering of innovative new product designs and business opportunities.
(iii) Social: evolution of a sharing economy with greater joint social decision making and cooperative use of capital.

This latter objective is more fully elaborated below.

2. Circular economy in the Caribbean: some possibilities?

The centrality of materials and energy in the CE discourse to date suggests that it is best oriented towards extractive and manufacturing economies, for which the options for reuse, remanufacturing and recycling may be more obvious. But how is this likely to be operationalized in the small, open, serviced-based economies of the Caribbean? Several peculiarities of this subregion provide ample options for CE development.

Apart from a few exceptions, for which minerals and agriculture are the principal economic sectors,[4] Caribbean countries are highly dependent on tourism services to drive their economies. These services are provided in the form of accommodation, food and entertainment, and depend substantially on the subregion's natural assets these being the sun, sea, and pristine environments. For the wider subregion for example, tourism's direct contribution to GDP averaged 11.8 per cent in 2019[5], with a range from 1.1 per cent for Suriname, to 30.4 per cent for Aruba (ECLAC, 2020). However, for the most tourism dependent economies, tourism directly contributed in excess of 10 per cent to national GDP, as was the case for Antigua and Barbuda, the Bahamas, Barbados, the British Virgin Islands, Dominica, Jamaica, Saint Lucia, and Saint Kitts and Nevis.

Another important characteristic of the Caribbean subregion is its high dependence on imported fossil energy. Only Trinidad and Tobago, Suriname and recently Guyana, possess significant domestic energy resources, with the remaining countries being net energy importers. Over the recent decade however, several Caribbean countries have begun to make significant investments in renewable energy (mainly solar, wind and geothermal) as a strategy to both reduce their energy insecurity, as well as to meet their climate mitigation obligations under the Paris Accord.

Photo credit: Flash Dantz (2021), https://flash-dantz.com, Unsplash Photos for Everyone, https://unsplash.com/photos/lAELCxtP-l8.

Yet another attribute of Caribbean economies is their high vulnerability to natural hazards, as evidenced by the frequent occurrence of disasters such as tropical cyclones, flooding, earthquakes and volcanic eruptions. As noted by Bello (2017), since the 1970s economic losses from disasters have grown steadily to now average 8 per cent of GDP for the Caribbean over the past decade.

[4] Guyana, Trinidad and Tobago, Suriname, Belize, are major energy and/or agricultural producers.

[5] Note that this contribution declined significantly with the onset of the Covid-19 pandemic in 2020. This was on account of a fall in tourism arrivals of 65 per cent, and related tourism expenditure of between 60–80 per cent according to the Caribbean Tourism Organization (https://www.onecaribbean.org/caribbean-tourism-performance-report-2020/).

This compares to a hemispheric average (Latin America and the Caribbean) of just 1 per cent for the same period.

Island ecosystems such as the Caribbean are also unique given their generally high level of biodiversity per unit of area, high percentage of endemic species, high values of ecosystem services per capita, and the generally pristine nature and high vicarious values of their natural environments (Conference on Biological Diversity, 2021). Consequently, the opportunity costs of degrading the natural environment through unaccounted negative economic externalities are likely to be high over time and make a strong case for strategies to preserve the subregion's natural capital.

Finally, it is apparent that the traditional linear economic model has not served the Caribbean well, as reflected in the current and enduring challenges of low growth, significant fiscal and current account deficits, high debt, and limited economic diversification of subregional economies. For example, ECLAC (2018) estimates the average annual growth for the subregion to be 0.8 per cent, compared to an average of 4.7 per cent for other small states, since the 2010 global recession.

All of the above factors make a good case for the consideration of a circular approach to the future development of Caribbean economies. This rationale is bolstered by the possibility that high dependence on energy imports, along with the scale limitations of small markets, has stymied the efficient development of other subsectors such as for example, manufacturing. Hence options for reorienting traditional economies through reuse and reduction of materials and energy remain limited. Moreover, given that the successful provision of tourism services is so intimately linked to the preservation of the natural environment, a CE strategy which seeks to minimize material and energy use is prudent.

A cursory examination suggests that there are many avenues for Caribbean economies' transition, in a manner that positions them closer to a circular model. For service-based economies, these approaches are perhaps more traditional, but can nonetheless operate to reduce negative externalities and to change incentive structures through costs. In many aspects, the subregion is already leaning towards circular economy strategies, albeit that such strategies might not yet be formalized. Some of these areas are elaborated below.

2.1 Possibilities

a. Renewable energy development

According to the International Renewable Energy Agency (IRENA, 2016), Caribbean SIDS are blessed with abundant renewable energy (RE) resources which include wind, solar, ocean and biomass potential. Such potential is further complemented by the presence of several volcanoes which also afford the possibility of geothermal energy. The Caribbean is nevertheless very energy insecure, with many countries depending on imported fossil energy to meet up to 81 per cent of their national energy needs (Guerra, 2016). While in global terms, the subregion as a whole is a miniscule greenhouse gas emitter, this high dependence on fossil energy suggests a relatively high climate externality which would need to be addressed, in order to reorient these economies towards a circular path.

Fortunately, many Caribbean countries have already made significant strides towards the adoption of RE technologies[6], with utility scale solar installations, wind projects, and even efforts to harness geothermal energy. As noted by IRENA (2021), CARICOM States[7] have set a regional target of 47 per cent renewable energy in the total electricity generation by 2027. For the subregion as a whole, current projections are for an additional 4 gigawatts of renewable energy production, in order to meet

[6] Antigua and Barbuda, Aruba, Barbados, Curacao, Guadeloupe, Guyana, Jamaica, Saint Lucia, Saint Kitts and Nevis, and Saint Vincent and the Grenadines are some of the countries that already have or are actively pursuing RE installations.

[7] The Caribbean Community (CARICOM) is the oldest surviving integration movement in the developing world. It is a grouping of twenty Caribbean countries: fifteen member States and five associate members.

nationally determined contribution targets under the Paris Accord. Nevertheless, these developments represent good first moves towards the shaping of a circular economy in the Caribbean.

b. Waste minimization (recycling, composting, efficient waste disposal pricing)

Although recycling presents challenges of scale in small islands States, it is still an important strategy in moving Caribbean economies in the direction of circular economies. This is so if it is seen as part of a broader strategy for waste minimization, which would also include efficient waste disposal pricing and composting. With respect to the former, many Caribbean countries are yet to implement optimal pricing strategies for waste disposal, with the result that municipal waste management is often underfunded and inefficient. Waste disposal pricing however is a delicate balancing issue, as it can easily produce perverse incentives which lead to increased illegal dumping (Macauley and Walls, 2000).

In the case of composting, there is far greater potential, especially since organics constitute the largest share of municipal wastes in the Caribbean, as evidenced by the high "wet content" of between 45–50 per cent for municipal wastes (IDB, 2016). Scale efficiencies in composting could be possible if Caribbean States made greater efforts in the promotion of community composting as part of a shared economy as elaborated below.

Significant waste minimization could also be achieved through the robust implementation of deposit refund schemes which create meaningful incentives for return of bottled containers and related packaging. This is especially important in nurturing a circular economy, given the subregion's high per capita generation of plastic wastes (IDB, 2020).

c. Efficient water pricing and regulation

Yet another possible strategy for circular economy is the adoption of efficient water pricing which reflects the real cost of use, and negative externality costs of *wasteful use* of water resources. As an absolute essential commodity for the sustenance of life, water is regarded as a merit good, for which consumers enjoy a high consumer surplus. This is because its essential nature directs water policy towards pricing which makes it affordable to all. Within the Caribbean, however, the reality of inefficient and unreliable municipal water supply, along with minimal investment in wastewater recycling suggests the need for a more realistic water pricing strategy. Efficient pricing would allow for improved long run capital investment, which would enhance the reliability of supply.

At the same time better regulation will provide for more optimal intersectoral use of water among, for example, municipal, agriculture, tourism, and industrial sectors. Better regulation would also forge the necessary fiscal regime to support the provision of water as a public good, while at the same time creating incentives for public and private investment in related services such as water conservation, rainwater harvesting, and wastewater treatment. These water aspects remain underdeveloped in the subregion and are critical for the reorientation of Caribbean economies towards a circular one.

d. Performance bonds for cultural events

As a highly tourism dependent region, the Caribbean has constantly sought to enhance its attractiveness to source markets. One such effort has been the promotion of its sociocultural and historical attributes through the hosting of national events such as carnivals, sports, music festivals, beach festivals, culinary arts events, and even meetings and conferences. Many of these events are typically organized by private promoters as mass gatherings which utilize public spaces, and ultimately result in negative environmental impacts. Among such effects are high generation of solid wastes and wastewater, physical trampling of soil, vegetation and built heritage, and disturbance of natural habitats through noise and other nuisances.

One strategy for internalizing the costs of these externalities for such events would be the posting of performance bonds[8] by promoters, which would obligate them to undertake the necessary safeguards for minimizing impacts on the physical environment. Such bonds would also ensure that remediation costs, where these arise, do not fall to the public purse, but are borne by the "consumers" of these events. To date there is little evidence that this tool is routinely and widely employed in the Caribbean. A circular economy would require that this, and similar policy tools become standard practice in the subregion.

e. Efficient land-based transportation

After power production, land-based transportation accounts for the second largest share of fossil-energy consumption in the Caribbean. The subregion, as part of Latin America and the Caribbean also has one of the highest vehicle motorization rates in the world, with 201 vehicles per 1000 inhabitants in 2015 (IDB, 2019). This is the third highest rate after North America and Europe. For Caribbean States, the level of motorization ranged from 67 per 1000 for Jamaica to 292 per 1000 for Trinidad and Tobago, and 387 for Barbados (IDB, 2019). These figures have increased by 4.7 per cent over the past decade, on account of rising incomes, urbanization, and the availability of relatively cheap reconditioned vehicles from Asia. They however also reflect the challenge which the subregion faces in providing efficient and reliable public transportation, for even small national populations.

transportation in the Caribbean. This would include strategies for greening and expanding public transportation, reducing vehicle concentrations, and fostering the use alternative and more sustainable modes of personal transportation. Ultimately, these strategies will also involve rural and urban planning considerations, as well as lifestyle changes which reduce the use of fossil energy vehicles for personal mobility.

f. Application of Pigouvian taxes

Pigouvian or green taxes are *direct* taxes applied to meet the negative externality costs of market transactions. They are regarded as one of the most efficient taxes, since they cover a broad spectrum of payees, with relatively low transaction costs. Within the Caribbean, very few countries have implemented direct green taxes, as a means of recovering negative externalities on the natural environment[9]. Some countries have however implemented various consumption or sector specific taxes such as on water, electricity or even tourism services.

A circular economy, however, would require investment in a number of public goods and services in order to obviate environmental impacts from production and consumption. Given the nature of property rights associated with public goods and services, their provision does not benefit from private investment. Examples of such goods and services include watershed reforestation, coastal cleanup, treatment of toxic wastes, water conservation, and wildlife protection. Hence, Caribbean governments