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Preservation or Exploitation? What to Do with Caribbean Ecosystem

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Abstract. Many Caribbean islands grapple with the problems of how to pursue economic development while preserving their fragile natural environment. For many of these countries, the main income generating sectors such as agriculture, fisheries, tourism, and mining induce negative stressors on the natural environment. This paper presents a discussion on the contrasting approaches used by Jamaica and Belize in incorporating natural resource management in the development process. It documents the success and challenges of each country in pursing sustainable development by highlighting how the development process affects the environment and how each country mitigates these effects. The paper also makes a case for promoting the use of economic valuation methods as an essential tool in informing policy decisions in the Caribbean, particularly on matters affecting the natural environment.

Keywords: Jamaica, Belize, sustainability, development, economic valuation.

Introduction

The Caribbean islands by the nature of their sizes are environmentally and economically vulnerable. Many of these Small Island Developing States (SIDS) grapple with economic problems such as low growth rates, rising debt and macroeconomic instability. In addition to these, their natural environments are constantly under threat from factors such as climate change and human activities. These countries' quest for economic growth also affects the natural environment as the economic activities that are relied on to boost economic growth depend on ecosystem services. For most countries, agriculture, fisheries, tourism, and mining are the main income-generating sectors which also happen to be energy and/or water intensive and may induce negative stressors on the natural environment. In many cases, the countries battle to decide whether to preserve or exploit the ecosystem for economic gains.

This paper presents a discussion on the contrasting approaches used by Jamaica and Belize in incorporating natural resource management in the development process. It documents the success and challenges of each country in pursing sustainable development by highlighting how the development process affects the environment and how each country mitigates these effects. The paper also makes a case for promoting the use of economic valuation methods as an essential tool in informing policy decisions in the Caribbean, particularly on matters affecting the natural environment.

Following this introduction, a discussion on the role of ecosystem services within the Caribbean region is presented. The next section looks at how the environment is treated in the national development process of Jamaica and Belize. The final section shows how economic valuation has been applied in the Caribbean including a discussion of the usefulness of this tool, especially in cases where there is a trade-off involved between natural resources exploitation and reservation.

The Caribbean Ecosystem

The Caribbean ecosystems provide "vital freshwater resources, help mitigate the impacts of hurricanes, regulate local climate and rainfall, prevent soil erosions, produce hydroelectricity and yield locally consumed non-timber forest products" (Critical Ecosystem Partnership Fund, 2009, p vi). Additionally, the ecosystems are home to diverse plants and animals, over which 7000 are endemic to the region. Included in this is 2.9% of the world's vascular plants species and 2.9% of the vertebrate species, placing the region in the top 8 of the world's 25 biodiversity "hotspots" (Day, 2009). The natural forest cover in the region provides timber, fuel wood and other non timber products such as medicinal plants and items used in the craft industry. It is essential to carbon sequestration and buffer coastal development against floods and storms. Considering that populations, ports and roads are along the coasts, without this function natural disasters and storm surges would have deleterious effects on coastal infrastructures. Mangrove forests are not only vital to this function but also serve as nursery for fish, a source of absorbing nutrients, a trap for sediments deposited by rivers and restrict the flow of salt water into fresh water sources (CEPF, 2009).

The Caribbean ecosystems support economic activities in the tourism, energy, agriculture and mining sectors. Unfortunately, these activities also exert some pressure on the ecosystem that if left unregulated, could do substantial damage to the ecosystem. Tourism is a major income earner in the Caribbean. World Travel and Tourism Council (2013) reports that in 2012, travel and tourism in the region contributed about 14% to total GDP, accounted for 12.3% of the total employments and represented 11% of total investments. For some countries, tourism is the major foreign exchange earner. In Anguilla, Antigua and Barbuda and the British Virgin Islands, tourism's contribution to GDP was 57.1%, 62.9% and 76.9% respectively in 2013 (WTTC, 2014). The region itself is said to be four times more dependent on tourism than anywhere else in the world.

The Caribbean tourism products emphasize the natural assets of the region. Main products supplied are cruise tourism and sea-sand-sun tourism. Other less developed products are eco-tourism, cultural tourism and health tourism (Zappino, 2005). Whilst, tourism is a major income earner, it has its ills. Tourism activities place high demands on energy and water and it also produces large quantities of solid and liquid waste, some of which pollute coastal waters. Tourism uses all aspects of the environment – land and sea. Activities such as snorkeling and scuba diving destroy coral reefs and sea grass ecosystems. Tourism infrastructures (hotels, ports, roads) that are located along the coast negatively affect coastal habitats resulting in soil erosion and sedimentation, overexploitation and a reduction in the quality and quantity of natural resources (CEPF, 2009; Grandoit, 2005). In the region, environmental concerns are often sidelined to pursue the economic gains that the tourism sector provides. Unfortunately, current trends in the tourism sector lean towards degradation of the natural environment rather than preservation (Grandiot, 2005).

Mining is a major economic activity in some Caribbean countries. Jamaica mines bauxite; Cuba mines cobalt and nickel; Dominica Republic mines bauxite, cement, ferronnickel, gypsum, limestone, marble, nickel, salt, sand and gravel and the Bahamas also does salt mining. These activities pollute the environment with radioactive substances that are emitted in the process and by discharging by-products into water resources. Mining also results in substantial environmental degradation due to the removal of forest covers, for example, the Northern Range and Northern Basin of Trinidad. Quarrying activities resulted in the removal of both top soil and forest cover leading to watershed degradation and soil erosion with silt going in the water courses. Land degradation is also a result of illegal sand and gravel mining from rivers and beaches (IADB, 2003). Another effect of mining is the gas emissions and dust nuisance that affects the health of persons who work and live around mines, especially in bauxite mining (ACP-EU, 2011).

There is recent interest in the Caribbean region as a source of oil exploration – particularly offshore drilling. However, some countries such as Belize are weary of

oil exploration due to environmental concerns. Off shore oil drilling can have substantial impact on the environment due to the toxic substances such as mercury, lead and arsenic that are released in the oil drilling process. There is potential threat to marine life that comes from oil spills and seismic waves that are sent into the ground to locate potential oil reserves. Though useful, these seismic noise can cause mass whale beaching as these noises disorientates them. These disruptions along with pollution can have spin off effects on the tourism sector of small developing countries. With disruptions to the marine lives and habitat, the quality of the sand-sea tourism product will be affected (Nixon, 2008). In some country, the issues of energy production rest on the dependence on charcoal and fuelwood for household energy in rural communities resulting in over collection and also loss of forest and shrub areas (CEPF, 2009).

Trinidad and Tobago is the major oil exporter in the Caribbean. Chandool (2001) noted that Trinidad has had its problems with air and water pollution, damages to the ecosystem resulting from oil spills, blow outs and improper disposal of waste in oil and gas production. Oil spills have polluted waterways in the southern one third of the island resulting in damages to mangrove and beach areas. Even though oil pollution is not a severe problem, oil field brine has contaminated small waterways causing damages to the natural environment. Oil and gas production also results in deforestation to establish liquefied natural gas and berthing plants. Particularly in the Southern peninsula, the result has been beach erosion and silting (IADB, 2003).

In the Caribbean, agriculture is still a lucrative industry even though for most Caribbean countries total and per capita agricultural production is decreasing (CEPF, 2009). The Windward Islands depends on a few agricultural products as their major source of foreign exchange and employs a substantial portion of the labor force. Some agricultural practices pressure the environment. Land clearing reduces natural habitat for wild life. For some islands, it is the hunting of wildlife and the introduction of invasive species (either accidentally or to get rid of local species) that serve as stressors to the ecosystem. The practice of slash and burn results in forest fires, deforestation and soil erosions. IADB (2003) reports that in

the Northern Range of Trinidad and Tobago, repeated forest fires resulted in the growth of grassland and shrub. The consequence of this is water runoff and soil loss thirty eight times greater than if the natural forest was intact. Agriculture and also industrial companies introduce pollutants into the coastal environment causing nutrient enrichment. In Barbados and Jamaica when untreated or inadequately treated sewage seeps into coastal environment, it results in algae overgrowing fringing reefs (van Beukering et al, 2007). In some cases, "increasing stress is being placed on potable water supplies and coastal ecosystems due to the variety of pesticides, heavy metals, oil (from spills), nutrients from sewage and grey water runoff that adjacent communities and industries typically input into the marine system (van Beukering et al, 2007, p 11)."

The clearing of forest region for housing, agriculture, industry, tourism and infrastructural development such as roads is one of the environmentally damaging impacts of economic development on small islands. The effects of human activities on the environment can be seen in The Northern Range of Trinidad and Tobago that houses over 50,000 hectares of the most populated areas of the country. Human activities along the general terrain has resulted in land degradation, poor water quality and flooding (IADB, 2009). Urbanization also results in clearing and grading of lands that result in soil erosion and the pollution of waters by sedimentation. In some cases, these are not planned developments but rather squatter settlements that are established through the clearing of the forest areas. These further exacerbate the problems of soil erosion and increase the levels of runoff and sediment loads (IADB, 2009). Areas that had great vegetation before lands were cleared tend to have more accelerated erosion after clearance. For example Haiti, which is surrounded by fringing reefs and also is a high island with high rainfall is at risk for accelerated rates of soil erosion following the clearance of forested regions (van Beukering et al, 2007).

In some cases, the life style of the poor affects the environment but they are also the most affected by environmental degradation. The poor tends to pollute waterways and participate in illegal logging to clear forest areas for housing and

farming and they tend to overhunt. On the other hand, the poor tend to directly depend on the environment for food, fuel, housing, health care and for their general livelihood. Of course, this makes them most vulnerable to environmental degradation. They are most susceptible to landslides and flooding and their economic base is often most vulnerable to disruptions in the ecosystem, for example those who depend on fishing (CEPF, 2009).

Conflict between Preservation and Exploitation

Jamaica

The Jamaican government has engineered a roadmap to guide the island to a developed country status by 2030 with The Vision 2030- National Development Plan. The Vision 2030 outlines the challenges the country faces in attaining sustainable development and ways in which these will be overcome. Sustainable development and human survival in Jamaica rest on healthy natural environment. However, there are certain realities that now beset this process of development. The natural environment is believed to be undervalued resulting in the lack of sustainable use of natural resources resulting in depletion and degradation. There are particular challenges that are faced that seem to hasten this process. The island is prone to natural and man-made disasters including hurricanes, earthquakes, drought, floods and landslides. Between 1991 and 2005, there were six natural disasters resulting in damages estimated at J$53.03 billion (Government of Jamaica, 2009). This situation is compounded by the proclivity towards squatter settlements usually along river and gully banks which increases the vulnerabilities to natural disasters. The local legislation is weak kneed in dealing with matters affecting the environment. Environmental issues are not properly integrated into sectoral policies and sustainable development commitments are not supported by the citizenry and political directorate. More so, an integrated approach to environmental management is not fully supported by the relevant agencies and there are inadequate financial resources to support these endeavors (Government of Jamaica, 2009).

The Vision 2030 document highlights that recent evaluations indicate that the Jamaican environment is at risk. Recognized trends include "deteriorating air and water quality; poor management of solid, liquid and hazardous wastes; loss of biodiversity; watershed degradation and net loss of forests cover; and increasing incidence of fires (Government of Jamaica, 2009 p. 7)". Other issues include habitat loss, invasive alien species, over-exploitation, poor spatial planning and land use, inadequate awareness of the value of natural resources and climate change (NEPA, 2010). The government has responded with policy initiatives including action plans, laws and regulations to mitigate some of these effects. However, these are beset with challenges including "inadequate policy, legislative and institutional capacity in critical areas of the system". Legislations are also outdated and lack clout in terms of enforcement. In some cases, the enforcing bodies even lack the capacity to effectively carry out their function (GoJ, 2003).

There are few scenarios that indicate Jamaica's challenges in natural resources management. The government appears to make decisions affecting key natural resources without conducting evidence-based analysis of the likely impacts of policy decisions. One of the most memorable events is the ongoing discussions about mining in the cockpit country. This area expands across five of the fourteen parishes and houses a number of endemic species to Jamaica and the Cockpit Country itself. The wet limestone forest is the largest intact forested region in Jamaica. The area provides ecosystem services such as climate, gas and water regulation; habitat to a number of animals and plants; and supports ecotourism activities. It is believed to provide roughly 40% of Jamaica's water resources. In the 1960s Alcoa was granted Special Mining Leases (with permission to progress to mining) to conduct checks for bauxite in the heart of the Cockpit Country. In 1974 these leases were rescinded in an action to protect the cockpit country. In 2006, Alcoa applied for a renewal of this exploration permit to examine the potential of mining for bauxite in the Cockpit Country. A flurry of discussions emanated from environmentalists and citizens on the need to preserve the area. On November 27th of 2006, the Executive Director of the Bauxite Institute responded in statement

reassuring that there are no immediate plans to mine within the core area of the Cockpit Country and that bauxite exploration will leave as little damage as a bird watcher would. By December 14th of the said year it was announced that the government had approved and signed the renewal of Alcoa's licence. However, on December 20th, in a Cockpit Country stakeholders meeting, the government revealed that no prospecting licence and mining leases would be granted until the boundaries of the region is established and a comprehensive review carried out on the mining policies of Jamaica. The result of the boundary was finally released in 2013, after being commissioned 6 years prior. But up to August 2014, there is still no clear cut consensus as to what the boundaries of the Cockpit Country are or whether or not bauxite companies will be allowed to explore or mine within the area (Jamaican Caves Organization, 2014; Jamaica Observer, 2014).

Another case can be found with the road construction work within the Palisadoes area. The Palisadoes-Port Royal Protected Area was declared as such in 1998 under the Natural Resources Conservation Authority Act. In 2005, the area was designated a Wetland of Importance (Ramsar Site) as a Waterfowl Habitat (NEPA, 2013). The Palisadoes peninsular that links Kingston to Port Royal is home to over 300 species of plants and animals. In 2010, work began to expand 4 km of the Palisadoes roadway into a 4 lane highway to make it less vulnerable to flooding and create a good impression for tourist arriving at the Norman Manley International Airport at an estimated cost of USD $65.7 million. Majority of the funding came from the China Exim Bank and the project was undertaken by the China Harbour Engineering Company (CHEC) (Neufville, 2010; JET, 2011; Aiken and Webber, 2010).

The development within the area proceeded despite outcry from the public and environmentalists about the possible negative impacts on the ecosystem and the absence of a current EIA on the area. The EIA used was conducted in 2007 for a project by Cuban engineers to replenish sand dunes along the Palisadoes strip that was aborted. For the construction of the roadway, National Environment Planning Agency (NEPA) granted beach licenses for the construction of sea walls and coastal

reclamation work. They also granted an environmental permit for wetland modification and permission to store petroleum. The original plan for 4 lane roadway was downgraded to 2 lanes with 2 shoulders (JET, 2011). The Jamaica Environment Trust filed a petition to the courts to rule on National Resources Conservation Authority (NRCA) and NEPA's public consultation process and the granting of permits and licenses issued by NEPA. The courts ruled that NEPA had breached the legal standard for consultation and the legal procedure that requires that all information be made public before approval is granted. Regarding the beach permits granted by NEPA, the courts ruled that these were sufficient for the work done (JET, 2011). In 2013, after the completion of the highway, NEPA presented a draft of a five year Zoning Plan for the Palisadoes – Port Royal Protected Area. The purpose of the Plan is to protect key habitats and to ensure that natural resources are used within the ambits of the laws and regulations (NEPA, 2013).

There have been instances where the operations of governmental agencies have affected the natural environment even though the necessary legislations exist to prevent such. Up to 2010, for about 25 years, the National Water Commission (NWC), a government-owned monopoly on the supply of water has been dumping untreated sewage in the Harbour View community and also the Kingston Harbour. This results from a broken sewage treatment plant. In 2010, the JET took the NWC, NEPA, NRCA and the Kingston and St Andrew Health Department to task in the court of law on their negligence and complete disregard of their statutory duties. The court ruled that these agencies failed in their environmental stewardship and that NWC must clean up and repair whatever damage they caused for over two decades. NEPA and NRCA were both chastised for failing in the statutory duties (Jamaica Observer, 2010).

Jamaica's growth rate has been anemic over the past years. Growth seems to be an elusive quest in the presence of macroeconomic instability and social problems such as crime and violence. For 2012, growth rate was -0.3%. Like any other country, Jamaica's top priority is economic growth and development. The country finds itself in a precarious situation. The major foreign exchange earners including

tourism, agriculture and fishing and mining rely heavily on the ecosystem. However, these activities compromise the quality of the ecosystem.

On a more recent development, the China Harbour Engineering Company in 2013 submitted a proposal to the Government of Jamaica for a transshipment port and an industrial and commercial economic zone valued at US$1.5 billion. The proposed investments are to take place on the Goat Islands and areas around the Old Harbour Bay. This region falls within the Portland Bight Protected Area which was created under the Natural Resources Conservation Authority (NRCA) Act in 1999. This logistics hub is poised to take advantage of the widening of the Panama Canal scheduled for an April 2015 completion. The hub will make Jamaica the fourth node in global logistics (joining Singapore, Dubai and Rotterdam), serving as a gate way to Europe and Africa. Along with being the transshipment and air cargo logistics hub of the Western Hemisphere, Jamaica is expected to serve as the Caribbean's strategic handling point for bulk commodities and also a centre for aviation-related maintenance repair and overhaul along with ship repair and dry docking.

Should the country forgo potentially beneficial economic activities to preserve the environment? Better yet, can the country afford to forgo multi-billion dollar investments due to the potentially environment effects? These debates about mining for bauxite in the Cockpit Country and the development of a logistics hub in the protected Portland Bight area are reflections of the contention between natural resources preservation and exploitation. With regards to the development in the Portland Bight area, Transport Minister Omar Davies pointed out that "we must bear in mind the country's current economic and social challenges and the urgency with which we need to secure investment for the sustainable future of all Jamaicans". He further reiterated that "we [the Jamaican government] would be irresponsible were we to simply refuse the possible benefits of an investment which would simultaneously create significant employment and expand the economy (Davies, 2003, p 5)". He believes that with such an investment that could lead to the

creation of over 10,000 jobs, the death or dislocation of lizards should not stir controversy.

The logistics hub is touted to be the biggest project to be undertaken by the government. Before the country can capitalize on such activities, there are certain local infrastructures that need to be in place. Many of nation's ports will see development activities. This includes expansion of the Port of Kingston, construction of a dry dock in Jackson Bay Clarendon; installation of bunkering facilities at Cow Bay St. Thomas; construction and repair of the Vernamfield facility in Clarendon and the development of an economic zone at Caymanas. Shirley (2014) highlighted that essential to the successful achievement of a logistics hub is "modernizing the legislative and regulatory framework; expanding and integrating the modes of transportation; further developing the range of IT services; attracting logistics suppliers and operators; and developing capacity to deliver a range of support services including legal, financial, insurance, education and repair of cargo transport equipment; and creating economic zones".

The central focus of the development agenda will be the economic zones. These zones should attract regional and international investments of all sorts targeted at supplying the entire Americas. Jamaica offers a central location for producers in Asia and the Pacific to do final value adding before distributing goods in a time manner. According to Deans (2014), the Logistics Hub Initiative can benefit the Jamaican real economy by providing opportunities for micro, small and medium enterprises. The Hub will demand all sorts of labour, ranging from unskilled labour to very skilled labour. Jamaicans will be able to capitalize on these opportunities.

The Goat Islands development has been met with much opposition. The use of the islands has been opposed on the grounds of the likely impact on the ecosystem. The logistics hub will result in the destruction of coral reefs, sea grass beds and mangrove forests. There will be loss of endemic and endangered species and loss of fishery. There is the possible effect of beach erosion and increased vulnerability to flooding, natural disasters and climate change (Jamaica Environmental Trust, 2013). The islands along with the entire Portland Bight Protected area have

environmental and historical significance to Jamaica. Great and Little Goat Islands contains dry limestone forest vegetation including cashew, log wood and the endemic Broom Thatch Palm; mangrove wetlands; coastal vegetations; brackish water bodies; sea grass bed and reef slope (Port Authority of Jamaica, 2013). The area has Jamaica's largest nursery area of fish, lobster and conch. The carbon sequestration value of the Portland Bight mangrove forest is estimated at US$45 million per year and the total protection value of the marine and coastal ecosystem is valued around US$400,000 per year (Cesar, 2001 and NEPA, 2012 quoted in Jamaica Environment Trust (2013). In terms of plant endemism, Jamaica is ranked 5th in the world. Table 1 provides information on the number of indigenous and endemic species to Jamaica. The Portland Bight Protected area is home to a number of rare, threatened and endangered species of plants and animals. The Jamaica Iguana and the Jamaica Coney were all thought to be extinct but the Jamaican Iguana was rediscovered in Hellshire Hills and there are signs that the Jamaican Coney is also present. There are no signs of any of these on the Goat Islands. However, the Jamaican Government had proposed the Goat Islands for a sanctuary for the Jamaican Iguana considering that they are threatened by non-native predators (Jamaica Environment Trust, 2013). Other endemic vertebrate species include the Portland Ridge tree frog, thunder snakes, blue-tailed galliwasp and a skink population located in the Hellshire Hills. There are also West Indian Manatees, Jamaican Boa, American crocodile, Dwarf snake and Jamaican fig-eating bat. In total, sixteen endemic vertebrates where found and six of these are considered to be threatened and endangered. Among endemic plant species to the region includes the Bastard Lignum Vitae, Velvet-leaved Maiden Plum and Wild Orange. Within the Portland Bight Area, fourteen plant species are found to be endemic to Jamaica and three are considered to be threatened and endangered.

Table 1: Jamaica's Indigenous and Endemic Species

Category	Indigenous	Endemic	Percent of Total
Plants	3304	923	27.9%
Invertebrates	1000	625	62.5%
Fish (Freshwater)	6	4	66.6%
Amphibians	22	22	100%
Reptiles	43	33	76.7%
Birds (shore and sea)	39	1	2.6%
Birds (land)	67	30	44.8%
Bats	21	2	9.5%
Mammals	2	2	100%
Total	4,504	1,642	36.5%

Source: Douglas (2013)

In Jamaica even though laws and regulations exist, in some instances they lack clout or are not supported by the relevant agencies. In some instances, areas that are declared protected by law are targeted for exploitation for economic gains. Successful environmental management necessitates strict regulations that are adhered to by the government and citizens alike. Most importantly, environmental management must be fully incorporate in every sectors' development strategy and must be actively pursued. Resource management should not be treated as an unnecessary nuisance to the development agenda but must be recognized as vital to the achievement of Vision 2030 and any other national development plans. In all the cases highlighted, past and present, the theme is the same. The government has proceeded or signalled its readiness to develop environmentally sensitive areas and in some cases declared protected areas without a clear plan as to how the natural resources will be protected. Appropriate EIAs are blatantly absent at the beginning of these projects. We believe that all major investments that affect key resources must be fully informed by EIAs or economic valuation reports. This will provide some form of cost-benefit analysis. In both the Cockpit Country and the logistics hub proposals, no rigorous economic valuation study has been conducted by the government to inform the decision making process.

Belize

Belize has been making efforts to create a balance between people and the environment. To date, the country has a track record of attempting to conserve its natural environment even while pursing economic growth and development. In 1969, the Belize Audubon Society (BAS) was formulated with a special interest in protecting the countries resources while educating the public about the value and sustainable use of the natural environment. The BAS "call[s] for development that is socially responsible, economically feasible with the least negative impacts to the environment (BAS, 2008)". However, recently the natural resources are being threatened by economic growth and development. Environmental issues for Belize include deforestation, improper solid-waste management, oil production and exploration, coastal development, poverty and weak institutional and legal framework (Young, 2008).

The Belizean coast provides many useful ecosystem services. Such services include tourism, a home of biodiversity, coastal protection and carbon sequestration. Belize hosts the longest barrier reef in the Western Hemisphere, the Barrier Reef Reserve System which is a World Heritage site. Roughly 40% of the Belizean population lives along the coast (Arkema, n.d.). The barrier reefs, mangrove forests and wetlands all provide protection to these people in the form of buffer against storm surges. Coastal systems also support livelihoods such as fisheries and aquaculture. Over 25,000 fishermen benefit from the lobster and conch fishing industry. Approximately 38% of the country's GDP is linked directly to the coastal zone (Clarke et al., 2013).

The coastal ecosystem may be at risk due to development efforts. Young (2013) relates that between 75-80% of Belize coastal land has been purchased by foreigners for the purpose of constructing resorts or residential housings. To facilitate this kind of development, it will be necessary to clear mangroves and littoral forests. Even though a great portion of the original mangrove remains, there have been reductions due to urbanization and tourism development. This situation is also compounded by the prevalence of the aquaculture industry along the coast. It is

found that "where coastal development expands, risk to marine habitats generally increase, lobster catch and revenue decline, and areas of the coastline vulnerable to storm surges expand (Young, 2013)". Other stressors to the environment include utility supply, waste disposal, dredging and mineral extraction, population growth and pollution. These are all compounded by the threats of climate change (Clarke et al., 2013).

The Belizean forest cover is being threatened by economic activities. It is estimated that by 2020, the forest cover will decrease by 58% if current development trends continue and will be gone within the next forty years. The deforestation rate is increasing. For 2010-2012, the deforestation rate was 11,671 hectares/year in comparison to 9,872 hectares/year for 1980-2010. Most of this occurred outside of the Belizean protected areas. For the 2010-2012 period, approximately 33,129 hectare was damaged by fire or hurricane. Economic activities threatening the forest cover include large scale agriculture and aquaculture. Other activities including illegal logging slash and burn and increasing coastal development pose additional threat to the forestry. In some cases, individuals clear tracks of land under a façade of development to prevent the government from recovering leased lands. Illegal migrants from Guatemala pose a serious threat to forests in Belize. They hunt, farm and harvest non timber products illegally and have contributed to the deforestation rates. Thirteen thousand acres of forest was removed illegally in 2007 (Young, 2008; Cherrington).

The Belizean government has recognized that there is a tradeoff between the environment and economic growth. Development will disturb the natural environment but it is necessary to increase local income. In response to the rising demand for coastal land, the Belizean government passed a Coastal Zone Management Act of 1998 to look at development, overfishing and population growth. This Act mandates a National Integrated Coastal Zone Management (ICZM) Plan to "ensure sustainable coastal resources use by balancing conservation ideals with the economic and social needs of the country". The ICZM requires an integrated approach from stakeholders to "maintain, restore and improve the quality of coastal

ecosystems and the communities they support" (Clark et al. 2013). Marine and coastal services were zoned based on conservation, development and informed management needs. The decision support tool, InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs) was then used to model ecosystem services and finalize zoning schemes. The results of InVEST indicated the conflicting nature between environmental preservation and development. The risk of environmental degradation increases with development. A balance can be maintained with conservation efforts but this will be at the expense of somewhat minimizing human use of the coastal zone (Clarke et al., 2013).

Oil exploration both offshore and onshore began in Belize in the 1930s. By 2000, over 50 exploration wells were dug, 34 onshore and 16 offshore but oil was not found in commercially viable quantity (Government of Belize, 2013). The wells were dry with the exception of the Eagle #1 where about 3 barrels of light crude oil was discovered. There was a renewed interest in Belize after the 2000 oil discovery at about 130 feet at Calla Creek, Cayo District. An exploration license was granted to the Belize Natural Energy Ltd and they made their first commercial discovery in 2005. This was developed into the Spanish Lookout Oilfield that now produces on average 2100 barrels of oil per day. In the 2008, another discovery was made in the Never Delay area. This oil field currently produces roughly 16 barrel of oil per day. To date, there are 9 companies involved in oil exploration in Belize and a total of 134 wells have been dug. This involves seismic surveys and drilling explorations. Such activities are monitored by the Petroleum Act and Regulations and are governed by the terms of the exploring companies' licenses. Exploration and production activities are supervised by the Geology and Petroleum Department.

The oil industry provides revenue for the Belizean government. The Government of Belize (2013) outlines that oil producing companies pay a royalty to the government and that they are charged a 40% income tax. There is a Petroleum Surcharge from windfall profits oil prices and revenues are generated from the government's 10% working interest in an oilfield. Companies pay a transportation tax per barrel of oil trucked on public highways and they are also required to pay

annual license, administrative and rental fees to the government. The government and interest groups alike have recognized the need for a sustainable oil industry. BAS opined that for the oil industry to contribute to sustainable development in Belize, the government needs to adhere to environmental policies. This is so because oil production and exploration can have irreversible damage on the country's environment.

The Belizean government has demonstrated a proactive approach towards natural resource management. While pursing development, the country makes an effort to create a balance between its people and the environment. Major economic activities such tourism, coastal development and oil mining pose significant threat to the ecosystem. However, policies, laws and regulations are enforced to minimize the potential dangerous impact on the environment.

Economic Valuation of the Caribbean Ecosystem

In informing the decisions of how to pursue economic development while preserving the Caribbean ecosystem, economic valuation can be a useful tool. Such a method can be used to determine the tradeoffs that can be made in the environment to promote sustainable development and also identify areas where effective conservation maybe necessary (van Beukering et al., 2007 and Kushner at al., 2012). There is substantial economic valuation literature on the Caribbean ecosystem. On the Caribbean coastal and ocean resources alone, there are over 200 economic valuation studies. These studies have generally increased awareness about the ecosystems but have been limited in their influence on public policy or investment in the region (Kushner et al. (2012). There are cases where governments have successfully used economic valuation to promote environmental stewardship. Such cases include the establishment of the first marine national park in St Maarten and the banning of bottom trawling in Belize. These initiatives were founded on valuation studies indicating that the St. Maarten coastal ecosystem contributes over $58m per year and that tourism based on coral reefs and

mangroves in Belize is valued between $150 m and $196 m per year (Waite and Kushner, 2012). In Jamaica, the NEPA undertakes ecosystem evaluation as a part of its environmental impact assessments process and also as a part of a Caribbean Large Marine Ecosystem (CLME) project. Other examples include the "Nelson's Dockyard National Park (Antigua), Bonaire and Saba Marine Park, Brimstone Hill Fortress National Park (St. Kitts), and Pigeon Island National Park (St. Lucia)" (van Beukering et al. (2007, p. 5). Due to valuation studies, protected areas now have revenue generating strategies that make them self financing. In some cases, economic valuation studies are used to inform penalties for ecosystem damages.

Economic valuations have been limited in its scope to significantly inform policy decisions in the Caribbean. For example, in Jamaica there are 17 identified valuation studies but yet none have had any significant influence on policy formulation. As a matter of fact, according to Kushner et al. (2012) only 13 valuation studies have had any influence on policy for the region. The success of ecosystem valuation seems to be the exception and not the rule. While the volume of such studies increases the quality of the ecosystem still declines (Waite and Kushner, 2012). Regardless of this, there is a place for economic evaluations in informing the choice between preservation and exploitation. Economic valuation should precede the implementation of economic activities that affect the natural environment. It is necessary to have some means of quantifying the benefits of ecosystem services in a manner which policy makers and the public can relate to. Economic valuation is a useful method in identifying the true value of ecosystem services. Without such, ecosystem services will continue to be undervalued and will be sidelined for economic activities where the monetary benefits can be readily seen. It is an appropriate tool to provide a basis on which conservation and investments decisions can be made by providing monetary values of ecosystem services to compare with projected benefits and costs of economic activities. This becomes more compelling considering the fiscal situation of many Caribbean nations that may make short-term potentials for economic growth, resulting from natural resources

exploitation, more appealing than the long-term benefit accruable to natural resources preservation (Abdulkadri, 2014).

However, these studies must be carried out in a transparent manner and publicly promoted so that it is acceptable to both the public and policy makers. Successful studies must have "a clear policy question; local demand for valuation; strong local partnerships and stake holder engagement; good governance with high transparency; opportunities for revenue-raising; effective communications and access to decision makers and/or media; and a clear presentation of methods, assumptions, and limitations" (Kushner et al., 2012). Caution must also be taken to ensure that the appropriate methodology is used.

Conclusion

The Caribbean ecosystem provides many useful services to the region. It supports numerous economic activities including tourism, agriculture and fishing. These activities in turn place tremendous strain on the region's natural resources which in some cases have shown evidence of depletion. This becomes worrying because the region hosts a number of endemic and endangered species and if proper stewardship of the natural environment of the region is not enforced the quality of economic activities could decline. This implies that economic development cannot be divorced from the environment. This paper highlighted two different approaches by Jamaica and Belize to economic development. Belize has realized that development impacts the environment and has fully integrated the preservation of the environment into its economic planning by incorporating and enforcing environmental regulations to minimize expected impact. Contrastingly, in Jamaica environmental policies are outdated or lack enforcement powers. Environmental issues are not properly integrated into sectoral policies and sustainable development commitments are not supported by the citizenry and political directorate. This paper has further highlighted the importance of economic valuation of ecosystem services in the decision making process. While Belize has

utilized economic valuation studies to inform economic development in situations where the environment may be threatened, there is very little evidence to support the use of such studies in Jamaica. Therefore, we suggest that more needs to be done to promote the use of economic valuation amongst Caribbean countries in matters relating to the natural resource.

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