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**Climate Change Impacts and its  
Potential Integration in the  
Environmental Impact Assessment (EIA)  
Process & Property**

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# Climate Change Impacts and its Potential Integration in the Environmental Impact Assessment (EIA) Process & Property Management: The Case of the Negril Tourism Industry in Jamaica

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## ABSTRACT

Tourism-related developments in Negril, Jamaica, hotels in particular, are most vulnerable to climate change because of their location. This research examined the extent to which climate change impacts were integrated in select EIAs undertaken in Negril between 1992 and 2013, and industry managers' knowledge, perception, and awareness to climate change. Negril is Jamaica's foremost tourist destination with a significant proportion of hotel developments along eleven kilometers of coastline that is highly susceptible to climate change. The research design is qualitative involving a review of EIA reports approved by the lead agency, the National Environment and Planning Agency (NEPA) using a modified climate change assessment tool and questionnaires completed by hotel industry managers in Negril. Thereafter, the findings were analyzed using the SPSS statistical software. The findings revealed that climate change integration in the EIA reports reviewed generally improved with time. EIAs generally lacked an integration of climate change impacts in project modelling to include future perspectives. Industry managers were generally aware of climate change impacts related to their developments, and government assistance and regulations regarding tourism and climate change. However, it was clear that additional training is necessary. This thesis is the first in evaluating the level of integration of climate change in EIA studies in Jamaica and it is hoped that the findings will inform EIA implementation. It is recommended that a climate change assessment tool be included in the reviewing of EIAs, and climate change considerations are specifically incorporated in the terms of reference issued. Tourism is an important contributor to Jamaica's economy and therefore this study recommends a full evaluation of all tourism-related EIAs due to the significant fixed assets located along Jamaica's vulnerable coastline.

**Keywords:** Climate Change, Vulnerability, Environmental Impact Assessment, Tourism sector, Jamaica.

## INTRODUCTION 1.0

The true costs of the impact of climate change in the America's are unknown, moreso for vulnerable Small Island Developing States (SIDS) such as Jamaica. Jamaica is highly dependent on natural resources. Its geographical location and biophysical landscape make it vulnerable to climate change impacts especially along coastal sectors and livelihood activities [1]. This vulnerability belies the very resource that forms the basis of its primary economic driver, tourism.

According to the [2], mean surface temperatures in the Caribbean have increased by approximately 1.0 degree Celsius over pre-industrial times and warming is occurring at approximately 0.2 degrees Celsius per decade. Sea levels are estimated to be rising at approximately 3 mm/year and this rate of sea level rise is steadily increasing [3]. The 2018 report estimates global mean sea level rise in the range of 0.26 to 0.77m by 2100 at 1.5°C of global warming [2]. This Caribbean mean is expected to be higher. The Caribbean Sea and the Atlantic Ocean are becoming more acidic [4]. Approximately 70 - 90% coral reefs loss is anticipated at a 1.5°C of warming while approximately 99% of coral reefs will likely be lost at 2.0°C of warming [2].

Since the year 2000, looking at just the impact of hurricanes which are forecast to become more intense if not more frequent, the costs have been estimated to exceed USD 33 billion with the Caribbean accounting for approximately one-third of this cost [2]. Jamaica's largest service sector tourism is highly susceptible to the impacts of climate change. According to the United Nations Economic Commission for Latin America and the Caribbean (ECLAC), over the 30 years leading up to 2004, Jamaica suffered damages from hurricanes amounting to US\$ 5.7 billion. The amount of damage to infrastructure was estimated at 79 percent while direct losses and damages to production and social sectors such as tourism were estimated at 48 percent [5]. Between 2001 and 2010, there were 10 major climate-related disaster events, resulting in cost to the country estimated at approximately JMD 111.81 billion. This impact has notably resulted in a measurable decline in the health of coral reefs; loss of sea-grass beds; severe beach erosion and loss of forested areas. This is compounded by significant social dislocation, economic losses and other damages. For instance, in 2004, Hurricane Ivan resulted in damage totalling J\$35 billion (USD 575M) or 8% of GDP, while Hurricane Dean in 2007 left J\$23 billion in damage. The magnitude of these damages and losses is expected to increase significantly moving from an average of 2% of GDP in the last decade to close to 14% by 2025 [6].

Jamaica's dependence on tourism as a primary economic driver in its national development will likely continue to increase in the immediate future, particularly since Jamaica appears to have a strong comparative advantage as a leading destination in the Caribbean.



The challenge for Jamaica is developing this industry in a sustainable manner, considering the economic realities of climate and also considering the many environmental and social problems attendant with its growth. With respect to product quality, tourism destinations are now being environmentally evaluated and certified by entities within and outside the industry, particularly in consumer markets such as the European Union [7].

In 2011, a regional workshop on climate change resilience was organized by Panos Caribbean (PC), a regional non-governmental organization, in collaboration with the National Environmental Education Committee of Jamaica (NEEC) and the Planning Institute of Jamaica (PIOJ) also highlighted significant climate change issues of importance to Jamaica and the leading tourism resort town of Negril in particular. The report highlighted the harsh effects of climate change over time on beaches in the Negril area, the sensitivity of the wider Negril environmental area and its vulnerability to coastal erosion, the extent of damage to infrastructure from intense storms, the long restoration time that hinders the recovery process, and strict enforcement policies and building codes that could aid in resilience building as part of the adaptation strategies. In light of all these issues, the Environmental Impact Assessment (EIA) process has been identified as a prospective mitigation tool to combat these effects from the project level, through the possible inclusion of a modified EIA-Climate Change assessment checklist that would address some of these issues during the planning and approval stage.

Jamaica is a signatory to the United Nations Framework Convention on Climate Change (UNFCCC) having acceded to the Convention in 1995 and to the Kyoto Protocol in 1999 [8]. Article 4(f) of the Convention and articles 2.3, 3.14 and 12.3-12.5 of the Kyoto Protocol have identified EIAs “as a tool to mitigate human influences on climate and adapt to future changes” [9]. Although research has been conducted to show the possibility and usefulness of such integration, climate change considerations have not yet been fully integrated into the EIA process in Jamaica. While several evaluation tools have been developed to examine the effectiveness of EIAs, an official evaluation tool to examine how well climate change impacts and issues have been integrated into the EIA process is absent [10].

Jamaica’s service sector which is dominated by tourism is highly vulnerable to climate change impacts [11]. Economic and environmental goals applied to this sector are not necessarily incompatible, and much research has focused on the principles and benefits of long-term resource based development. Despite this, the tourism sector continues to be under the microscope in implementing sustainable development projects and as such is considered one sector that continues to over good practices and principles in terms of tourism planning.

While the EIA tool and the way it is administered vary from country to country, not many have formally included climate change scenarios when evaluating the impact that the project could have on the environment vice versa [12]. In an attempt to bridge the gap between climate change and EIA, this paper proposes a new evaluation tool for assessing climate change impacts on the tourism industry which could be included in the traditional EIA review process in Jamaica.

The EIA as a regulatory tool and the manner in which it is administered vary from country to country. Despite the length of time since its development, not many have formally included climate change scenarios when evaluating the impact that development projects could have on the environment. In an attempt to bridge the gap between climate change and EIA, this paper proposes a new evaluation tool for assessing climate change impacts using tourism related projects as a case study to showcase how it may be integrated in the traditional EIA review process in Jamaica. The EIA tool will be used to analyse the level of integration of climate change considerations into EIAs developed for five major hotels in Negril, Jamaica. The areas addressed include various impacts of climate change, both adaptation and mitigation, including sea level rise, flooding, more frequent and heavy rainfall, increased wind speeds and stronger gusts, higher storm surge, coastal erosion, biodiversity and infrastructure, energy, drought and heatwaves. Each EIA reviewed was assessed to give a holistic understanding of the level of integration of these hazard considered during the relevant studies. Based on the level of integration or lack thereof, recommendations are made for future consideration in light of the perceived increased impact that climate change will have on major economic sectors such as the tourism sector in SIDS such as Jamaica.

## METHODOLOGY 2.0

The literature on EIA practices in development planning in SIDS is limited and the relationship between climate change and EIA even more so. This research explores the extent to which climate change has been integrated into the exploration and further elaboration in EIA public documents through the established institutional EIA process in Jamaica. The method used builds on previous work examining the quality of EIAs in Jamaica with a focus on the primary economic driver - the tourism sector through a case study of approved developments in the tourism-centred Negril area of Jamaica’s north-coast. This could be due to the fact that there are so many uncertainties and complexities when dealing with climate change and its integration into national development processes.

### 2.1 STUDY AREA

Negril is situated on the western end of Jamaica (Figure 1) and contains the island’s finest beaches, stretching for more than 6km (3.7mi) along a sandbar at Negril. It is sometimes known among tourists as the “7-Mile Beach” although it is only slightly more than 4mi (6.4km) in length, from the Negril River on the south to Rutland Point on the north. On the inland side of Negril’s main road, to the east of the shore, lies a swamp called the Great Morass, through which runs the Negril River within the Great Morass is the Royal Palm Reserve with protected wetlands and forest. The existing land use in Negril is mixed and includes tourism, commercial, residential and recreational uses; with tourism facilities being the dominant land use. Several small fishing beaches as well as an aerodrome are found throughout the area. There are two primary beaches located at Bloody Bay and Long Bay which fronts most tourism-related development and are used



primarily for recreational purposes by tourists and residents [13].

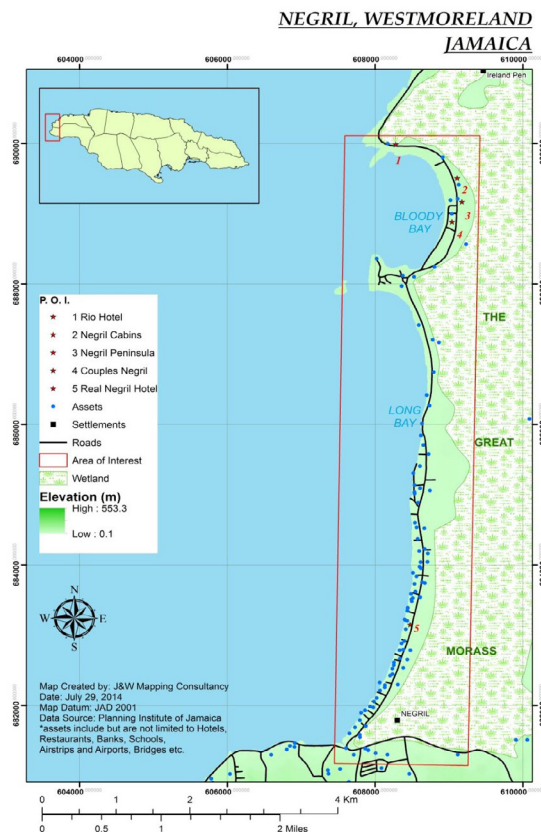


Figure 1: Map of Negril, Jamaica

## 2.2 DESIGN OF THE EIA REVIEW TOOL/ CHECKLIST

A review of relevant literature was conducted to arrive at various principles which must be considered when implementing climate change scenarios into EIAs. This review of literature involved various guides which assisted in the design of the final checklist. The modified checklist is largely based on the “Climate Proofing Checklist” developed by the City of London Corporation and the universally accepted Lee and Colley Review Package [14]. It is also informed by the work done by the Greater London Authority in creating the document “Adapting to Climate Change: A Checklist for Development” developed in November 2005 [15] and Vong Sok’s EIA-Climate Change evaluation tool developed in 2009 [16]. The checklist also included a scoring matrix based on the rating criteria developed by the European Commission developed in 2001 [17].

During the evaluation of these documents, it was generally found that air quality and water quality impacts were paramount to any assessment of climate change within the context of the EIA. The modified checklist (Table 1 and Table 13) developed consisting of questions divided into ten (10) categories namely; General, Sea Level Rise, Flooding, More Frequent & Heavy Rainfall, Increased Wind Speeds & Stronger Gusts, Storm Surges, Biodiversity & Infrastructure, Energy, Drought & Heat Waves.

Table 1: Generalised EIA-CC Review Checklist (Detailed version in Appendix – Table 13)

Category	Relevant	Adequately addressed?	What other information is needed?
1. General (12 Questions)			
2. Sea Level Rise (5 Questions)			
3. Flooding (9 Questions)			
4. More Frequent and Heavy Rainfall (5 Questions)			
5. Increased Wind Speeds & Stronger Gusts (3 Questions)			
6. Higher Storm Surge (3 Questions)			
7. Coastal Erosion (7 Questions)			
8. Biodiversity & Infrastructure (6 Questions)			
9. Energy (6 Questions)			
10. Drought & Heat Waves (12 Questions)			

## 2.3 SELECTION OF EIAs FOR REVIEW

Five environmental impact assessments conducted within the Negril area over the period 1992-2012 were chosen. The limited sample size was based on the research timeline and available documents housed in the library of the state agency, the National Environment and Planning Agency (NEPA) for review which was in-Agency review of hardcopy case files. These reports outlined the potential impacts of particular hotel development projects on the coastal environment of Negril, Jamaica’s prime tourist destination. None of the EIAs had international bank funding; all were private developments with funding primarily through private investments. The EIAs were chosen on the basis of requiring a full environmental assessment, unity of project type (hotel development) and similarity of project location (Negril, a coastal environment with unhindered access for locals and tourists alike). EIAs falling within the same year were grouped and a single EIA chosen at random.

The review of the EIAs followed the following protocol: a detailed description, and a modified questionnaire checklist. In the detailed description of the particular review areas, an extended characterization of the deficiencies was provided. The modified questionnaire/checklist solicited answers from several sub-sections outlined above





set on the basis of the gathered information. The following EIAs met the requirements for review: Real Negril Hotel (1992), Couples Negril Hotel (1999), The RIU Hotel, Bloody Bay, (2001), The Negril Cabins Bloody Bay Expansion (2003), and the Negril Peninsula Resort (2007). EIAs were chosen as close to five (5) year intervals as possible. There were no EIAs conducted for hotel developments during the period 2008-2014. Each project met the threshold requirement for an EIA and has a medium to long time horizon, thus it could or will be affected by climate change, or was included because climate change had been identified as an issue.

## 2.4 EIA REVIEW PROCESS

The EIAs selected were reviewed in stages to assess the level of adequacy and therefore quality. Initially, a broad scan was done and a perusal of the table of contents to get a general idea of how the report was organized. Secondly, a scan was done of the contents of the main EIA document to determine whether key terms such as “climate”, “greenhouse gas”, “global warming”, “methane”, “fossil fuel”, “wastewater”, “intense storms”, “greenhouse effect”, “heatwave”, “renewable energy” and other popular climate change terminology were mentioned. This was done by reviewing each section of the EIA thoroughly. A note was taken of the terms if they were mentioned; any pictures, diagrams and illustrations were also noted in relation to the questions on the checklists. Basic information such as project type, location and size were analysed and each EIA was scrutinized for any specific examination of climate change issues. Following the preliminary review, the EIAs were reviewed on a question by question basis. Each criterion was marked and assessed quantitatively and a letter grade assigned to denote its level of adequacy (Table 2). Comments were made, where necessary, and if further information was needed, that was also noted.

Table 2: EIS Rating Criteria [17]

Rating	Explanation
A	Full provision of information with no gaps or weaknesses
B	Good provision of information with only very minor weaknesses which are not of importance to the decision
C	Adequate provision of information with any gaps or weaknesses in information not being vital to the decision process
D	Weak provision of information with gaps and weaknesses which will hinder the decision process but require only minor work to complete
E	Very Poor provision of information with major gaps or weaknesses which would prevent the decision process proceeding and require major work to complete

## RESULTS 3.0

The EIAs conducted during the period 1992-2002 performed poorly during, with a slight improvement for those post 2002. Of the five proposals three received scores of “E”. The highest score was a “C”

for the most recent development, the Negril Peninsula Resort. This overall score was determined on the basis of the scores achieved in the various sub-section analysis (Table 3). An “E” score refers to a document that is considered to be very poor in regards to the provision of information, with major gaps or weaknesses identified which should’ve prevented the decision process proceeding, and a document that requires major work to complete” according to the rating criteria developed by the European Commission [17]. Of the three EIAs with a score of “E” only one received a grade better than a “C” in any review sub-section, this being the Rio Hotel Development EIA done in 2001. However for the two most recent EIAs analysed, scores of As, Bs and Cs were attained in some sub-categories which were seen as a major improvement; the only development to receive an “A” (full provision of information with no gaps or weaknesses across all sub-categories) was the Negril Cabins Expansion EIA for the subcategory on sea level rise. Also, performance in the sub-categories with respect to integration of climate change in EIAs improved over time. The Negril Cabins EIA received an overall grade of D indicating weak provision of information that would be barriers to the decision making process if climate change was taken into consideration at the time the EIA was conducted. The Negril Peninsula Resort received an overall grade of “C” indicating that the documents may be considered as having adequate provision of information with any gaps or weaknesses in information not being vital to the decision process. Despite this slightly acceptable performance, the Negril Cabins Bloody Bay Expansion EIA outperformed the more recent EIA. This EIA had seven of ten categories being graded as a C or better.



Table 3: Performance of EIAs using the Modified Climate Change Checklist

EIA(s)/ Year	Sub Section Review Criteria										Overall Score
	General	Sea Level Rise	Flooding	More Frequent and Heavy Rainfall	Increased Wind Speeds/ Stronger Gusts	Higher Storm Surge	Coastal Erosion	Biodiversity	Energy	Drought and Heat Waves	
Real Negril Hotel (1992)	E	E	E	E	E	E	E	E	E	E	E
Couples Negril Hotel (1996)	E	E	E	B	E	E	D	E	E	E	E
Riu Hotel Development (2001)	D	D	E	E	E	D	D	E	E	E	E
Negril Cabins Bloody Bay Expansion (2003)	C	D	C	D	A	D	D	D	B	D	D
Negril Peninsula Resort (2007)	D	D	C	C	E	C	B	D	C	D	C

### 3.1 REVIEW SUB-SECTION ONE: GENERAL

The EIAs did not perform particularly well in terms of mentioning climate change issues and related hazards in areas such as the description of the project and baseline conditions, alternatives, possible impacts, project monitoring, cumulative effects, climate change impacts on the project over time, mitigation and the presentation of coastal hazard maps. From a total of eleven review questions in this category, the two developments in the 1990s scored a combined 17 “E” and 5 “D” for an overall sub-section grade of “E”. Of the three developments in the 2000s, there were a combined 2 “A”, 11 “B”, 1 “C”, 7 “D”, and 15 “E”. Despite the better performance, the overall sub-section grade was between a “C” and a “D”.

### 3.2 REVIEW SUB-SECTION TWO: SEA LEVEL RISE

This subsection sought to evaluate the performance of EIAs with questions aimed at understanding the risks to the proposed site from climate-related impacts including such as saltwater intrusion, sea level rise and whether drainage was designed to accommodate chances of flooding and if building designs utilized flood resistant materials on the lower floors which were exposed to. The Real Negril Hotel Development EIA received Es for all five questions in this category and subsequently got an E for the overall categorical grade (Table 4). The Couples Negril Resort EIA got one B (indicating adequacy of information with minor deficiencies) and four Es to receive an overall





score of E for the category. For the Rio Hotel Development, there was one B, one C and three Es so it received a D for the overall grade. The later EIAs also performed poorly with the Negril Cabins Bloody Bay Expansion Project receiving one A (sufficient information with little or no deficiencies), one C, one D and two Es to receive an overall categorical score of D. Also, for the Negril Peninsula Resort there was one A, one D and three E(s) so this EIA received a D for the overall grade in the subcategory.

**Table 4:** Performance of EIAs in Review Section: Sea Level Rise

Year	Title of EIA	Overall Sub-Section Score
1992	Real Negril Hotel Development	E
1996	Couples Negril Resort	E
2001	Riu Hotel Development	D
2003	Negril Cabins Bloody Bay Expansion Project	D
2007	Negril Peninsula Resort	D

### 3.3 REVIEW SUB-SECTION THREE: FLOODING

In terms of flooding, review questions sought to explore how EIAs dealt with anticipated shifts in 100 year flood line, site drainage design regarding more frequent floods, building design in light of increased flooding, emergency plans, the capacity of the project to alter existing flood plains/watersheds and the stability of embankments. The Real Negril Hotel Development EIA performed poorly in this category receiving an E for six out of the nine review questions with three not being applicable to this project; thus the grade given was an E for the subcategory (Table 5). The Couples Negril Hotel EIA received one C and five Es with three questions not being applicable and was assigned an E for the subsection. The Riu Hotel Development EIA received one C, one D and six Es with one question not being applicable and was assigned an E grade. In contrast, the Negril Cabins Bloody Bay expansion Project EIA showed better performance as it received two As, one B, one C and three Es to receive an overall score of C for the subsection. In addition, the Negril Peninsula Resort also fared well, receiving one A, two Bs, one C and three Es with two questions not being applicable and thus ended up with a C for the overall subsection. Despite the improvements in the latter two EIAs there was no consistent improve observed with time. Of the nine questions in this sub-section, only the question in relation to anticipating shifts in the 100-year flood line in building design and floor elevation showed any reasonable performance, wherein the three most recent EIAs evaluated all received a grade of C compared with Es for the two earlier EIAs.

**Table 5:** Performance of EIAs in Review Section: Flooding

Year	Title of EIA	Overall Sub-Section Score
1992	Real Negril Hotel Development	E
1996	Couples Negril Resort	E
2001	Riu Hotel Development	E
2003	Negril Cabins Bloody Bay Expansion Project	C
2007	Negril Peninsula Resort	C

### 3.4 REVIEW SUB-SECTION FOUR: MORE FREQUENT AND HEAVY RAINFALL

This section covered questions that dealt with the design of site drainage to accommodate more frequent and intense storms and the design of storm water management systems to store and dispose of storm water. Of the five review questions in this subcategory, the Real Negril Hotel EIA and the Rio Hotel EIAs got one D and four Es and thus received a score of E for the sub-section (Table 6). The Couples Negril Resort EIA was the best performing EIA in this category with one A, three Bs and one E and thus received an overall score of B for the category. It should be noted that the Negril Cabins EIA was not graded for one review question. The Negril Cabins Bloody Bay EIA received one A, one C, one D and one E and received a sub-section grade of D while the Negril Peninsula Resort EIA got one B, two Cs and two Ds and received a sub-section grade of C.

**Table 6:** Performance of EIAs in Review Section: More Frequent and Heavy Rainfall

Year	Title of EIA	Overall Sub-Section Score
1992	Real Negril Hotel Development	E
1996	Couples Negril Resort	B
2001	Riu Hotel Development	E
2003	Negril Cabins Bloody Bay Expansion Project	D
2007	Negril Peninsula Resort	C

### 3.5 REVIEW SUB-SECTION FIVE: INCREASED WIND SPEEDS AND STRONGER GUSTS

This section sought to explore if any of the selected EIAs had plans proposed to deal with potential extreme wind gusts and if any plan was executed in terms of a cooling and ventilation system so as to tackle potential power outages from anticipated high winds. There were three review questions in this category of which four EIAs (Real Negril Hotel, Couples Negril Hotel, Riu Hotel Development, Negril Peninsula Resort) received Es for all the review questions and



thus got E for the sub section score (Table 7). Noteworthy, was the performance of the Negril Cabins Bloody Bay EIA which received an A for the relevant review questions and thus received a sub-section categorical score of A. It should be noted that the two most recent EIAs reviewed were not graded for one review question in regards to other adaptive design elements proposed to be used as enough information was not available to score.

**Table 7:** Performance of EIAs in Review Section: Increased Wind Speeds and Stronger Gusts

Year	Title of EIA	Overall Sub-Section Score
1992	Real Negril Hotel Development	E
1996	Couples Negril Resort	E
2001	Riu Hotel Development	E
2003	Negril Cabins Bloody Bay Expansion Project	A
2007	Negril Peninsula Resort	E

### 3.6 REVIEW SUB-SECTION SIX: HIGHER STORM SURGES

The questions included in this section explored the possibility of storm surges affecting the project, if there was any plan in place to pump out excess seawater in addition to plans for storage and contaminated waste-water. The Real Negril Hotel EIA and the Couples Negril Hotel EIAs both performed poorly as they received Es for all three review questions posed (Table 8). The Riu Hotel Development and Negril Cabins Bloody Bay EIAs both received one B, one D and one E and thus both received an overall subsection score of D. The Negril Peninsula Resort EIA received one A, one C and one E for this subcategory and received an overall grade of C.

**Table 8:** Performance of EIAs in Review Section: Higher Storm Surges

Year	Title of EIA	Overall Sub-Section Score
1992	Real Negril Hotel Development	E
1996	Couples Negril Resort	E
2001	Riu Hotel Development	D
2003	Negril Cabins Bloody Bay Expansion Project	D
2007	Negril Peninsula Resort	C

### 3.7 REVIEW SUB-SECTION SEVEN: COASTAL EROSION

This subsection of the review checklist contained seven questions which explored the possibility of saline intrusion, evidence (via maps/other media) regarding coastal erosion, plans to design and implement structures to mitigate against coastal erosion, set back

limits and finally the distance of proposed projects to known areas of notable high water marks due to storm surges and flood lines. The Real Negril Hotel EIA received one D and six Es thus receiving an overall subsection score of E (Table 9). The Couples Negril hotel received two Bs and five Es and received an overall score of D. Likewise, The Rio hotel development received one B, one D and five Es to receive an overall score of E. A better performance was seen in the Negril Cabins EIA as it received two Bs, two Ds and three Es to receive an overall score of D. The only EIA to receive As in this category was the Negril Peninsula Resort which received three As, two Bs and two Es and gained an overall score of B for the subsection. Within this sub-section most EIAs performed well, receiving Bs or better in regards to the information presented on the closeness of the proposed developmental site to historical high water marks caused by storm surges.

**Table 9:** Performance of EIAs in Review Section: Coastal Erosion

Year	Title of EIA	Overall Sub-Section Score
1992	Real Negril Hotel Development	E
1996	Couples Negril Resort	D
2001	Riu Hotel Development	D
2003	Negril Cabins Bloody Bay Expansion Project	D
2007	Negril Peninsula Resort	B

### 3.8 REVIEW SUB-SECTION EIGHT: BIODIVERSITY

This section includes a series of questions which were aimed at finding out any expected impacts associated with climate change on the biodiversity within the project environment, cumulative effects, if climate change issues were considered in project monitoring and whether the project proposed entailed any land use of forestry changes that would lead to increased emissions. The Real Negril Hotel Development received an E grade as it lacked information for all of six review questions included in the checklist (Table 10). The Couples Negril Hotel EIA and the Rio Hotel Development EIAs both received one B, one D, and four Es to receive an overall grade of E for the subcategory. The best performing EIA in this category was the Negril Cabins EIA due to the fact that out of six review questions it scored one A, one B, one C, and three Es to receive an overall grade of D for the category. The Negril Peninsula Resort EIA performed poorly like the initial three EIAs as it scored a D grade for the whole subsection attaining one A, one B and four Es respectively.

Aside from the Real Negril Hotel Development EIA, the other EIAs performed creditably in most instances by providing information on potential climate change impacts on biodiversity will be tracked scrutinized within the proposed monitoring programme. Also information on any changes in land use that may decrease or increase emissions e.g. afforestation/deforestation was presented and in most





cases scoring a grade of B or higher.

**Table 10:** Performance of EIAs in Review Section: Biodiversity

Year	Title of EIA	Overall Sub-Section Score
1992	Real Negril Hotel Development	E
1996	Couples Negril Resort	E
2001	Riu Hotel Development	E
2003	Negril Cabins Bloody Bay Expansion Project	D
2007	Negril Peninsula Resort	D

### 3.9 REVIEW SUB-SECTION NINE: ENERGY

This subsection contained six questions which examined the usage of renewable energy sources, the consideration of technologies or materials to reduce emissions and the inclusion of energy efficiency into the design of the project. The Real Negril Hotel received Es for all the review questions and thus received an overall score of E. The Couples Negril Hotel EIA scored one C and four Es with one question not being applicable and received an overall grade of E (Table 11). The Riu Hotel Development EIA had two not applicable questions and received four Es and finished off with an overall grade of E. The Negril Peninsula Resort EIA received two Bs, one C and one E with two not applicable questions and received an overall grade of C. The best performing EIA in this category was the Negril Cabins Bloody Bay EIA which received three Bs and one E with two questions not being applicable. An overall grade of B was assigned for this subcategory.

Generally, the EIAs reviewed provided little information to adequately provide grades for all review questions in this sub-section. At least two questions resulted in grades for only two EIAs, in areas related to information on personal travel for staff and freight transportation.

**Table 11:** Performance of EIAs in Review Section: Energy

Year	Title of EIA	Overall Sub-Section Score
1992	Real Negril Hotel Development	E
1996	Couples Negril Resort	E
2001	Riu Hotel Development	E
2003	Negril Cabins Bloody Bay Expansion Project	B
2007	Negril Peninsula Resort	C

### 3.10 REVIEW SUB-SECTION TEN: DROUGHT AND HEAT WAVES

This section generally had a poor representation in all the EIAs of issues that dealt with water demand, increased temperatures, vulnerability

to wild fires, building design to withstand higher temperatures and water recycling systems. Out of twelve review questions included in this subcategory, the Real Negril Hotel EIA scored an E for nine (three not being applicable) thus got an E for the overall subsection grade (Table 12 and appendix D). The Couples Negril Resort received one B, one D and seven Es (three questions not being applicable) and thus received an overall grade of E. The Riu Hotel Development EIA received one B, one C, one D and six Es in this category (three questions not being applicable) and ended with an overall score of E. The Negril Cabins Bloody Bay EIA and the Negril Peninsula Resort EIA both received one B, one C, three Ds and four Es resulting in a grade of D overall for this category.

There was no information in any of the EIAs reviewed to understand whether emission of volatile organic compounds (VOCs) will occur and if these emissions would negatively impact the tropospheric ozone layer during warm or sunny days. Similarly, little or no information was available to determine how vulnerable the projects were to increasing water temperatures or low river flows. Here, it would be useful to note that there were no rivers in immediate proximity of any of the proposed projects. Little/no information was provided on impact to aquifers. It should be highlighted that all proposed projects were proposed for lands with a coastal/seaward boundary.

**Table 12:** Performance of EIAs in Review Section: Drought and Heat Waves

Year	Title of EIA	Overall Sub-Section Score
1992	Real Negril Hotel Development	E
1996	Couples Negril Resort	D
2001	Riu Hotel Development	D
2003	Negril Cabins Bloody Bay Expansion Project	D
2007	Negril Peninsula Resort	D

## DISCUSSION 4.0

The most noticeable feature that could be utilized to evaluate increased awareness of climate change in EIAs would be the mentioning of the impact and related hazards in the individual reports in a single section or throughout the major sections of the EIAs. The EIAs reviewed prior to 2003 showed little integration of climate change concerns however, the ones conducted in 2003 and 2007 discussed potential climate change impacts and threats in depth, and in some instances provided maps, diagrams and even computer modelled results of future scenarios that could result from climate change induced hazards.

Holistically, the EIAs reviewed showed an improved performance in addressing climate change issues with time and overall EIA quality



improved, despite the EIAs receiving only adequate or almost adequate ratings for the more current development projects.

This finding may be due to several factors, such as the local regulator, NEPA, increasingly promoting awareness of climate change and its integration in the EIA process as well as in hazard mitigation within the industry [18]. In 2008, NEPA hosted a seminar in commemoration of World Tourism Day looking at the issue of climate change and the strategic business outlook for the tourism sector in Jamaica. This seminar was seen as a major step in promoting climate change awareness in the tourism sector not just for developers but also practitioners involved in the environmental permitting process including EIAs [18]. This further signifies the intention to strengthen its integration in an important economic sector. This approach has been further strengthened by their work in initiating responses to climate change in Jamaica by focusing on their roles and functions and the integration of climate change and disaster risk reduction into the EIA process, in keeping with growing trends regionally and internationally. Education and awareness of climate change were identified as key components to the process where NEPA was seen as the agency to enlighten the government and public on the status of the natural resources and the environment and in turn enable policymakers to better inform economic, social and educational policies for Jamaica [18]. At the time of this research, there were only two developing countries in the Caribbean region with climate change integrated into their EIA processes at any level, namely, Trinidad & Tobago and Grenada [19]. Up to 2014, there was no checklist for consideration of climate change adaptation or mitigation in the EIA process in Jamaica. This is changing with the incorporation of climate change in the screening process and within the Development Orders approved for Jamaica. The latter being a development planning tool to sub-national development in accordance with the SDGs.

It was enlightening to note that the Negril Peninsula Resort EIA, conducted in 2007, already included climate change and hazard mitigation issues within the EIA. It points to the suggestion that EIA practitioners are becoming more cognizant of the potential climate change impacts on the existing environment from and on development projects and integrating those concerns into EIA documents. These initiatives by NEPA are believed to have had an impact on the EIAs conducted in 2003 and 2007 where hazard vulnerability, mitigation and adaptation issues were observed as recurring themes throughout the documents. This was in contrast to the EIAs conducted in 1992, 1996 and 2001 which largely recorded Es suggesting a scarcity of information with major deficiencies or omissions which would hinder the decision making process.

The issue of rising sea levels and coastal erosion was poorly dealt with in all the EIAs reviewed. From as early as 1982, Hendry compiled a study which looked at the “structure, evolution and sedimentology of the reef, beach and morass complex at Negril” [20]. Hendry [21] plotted the rise of sea level at the coastal wetlands of Negril and Black

river, showing that sea level rose rapidly from as early as 6000 years ago. In addition, the Mines and Geology Unit in Jamaica has within its archives, aerial photographs and satellite images taken from as early as 1940, which, when compared with other aerial photos taken in the area over time, show shoreline retreat [22]. This study utilized sea level records from 1954 and aerial photos taken between 1971 and 2003 to show shoreline retreat occurrences in Negril. Although published research papers and aerial photos were available, they may not have been widely circulated or available for EIAs done prior to 2001, thereby providing a possible explanation for the lack of such information in EIA documents reviewed. This points to the need to share information widely and publicly to inform decision making at all levels.

Due to advancement in technology, more user friendly interfaces and the processing capabilities of computers, EIA practitioners should be able to better predict future events and propose actions to prepare for such events. In addition, the new building code of Jamaica is expected to include provisions for incorporating climate change considerations when modifying building designs to adapt to effects of climate change [6].

Drainage and flooding was either not mentioned or vaguely mentioned in EIAs conducted pre 2001, however, much attention was given to these in the EIAs post 2003. The increased attention given to flooding and drainage in the latter EIAs suggests EIA practitioners were becoming more mindful of the importance of flooding as another aspect of the environment which could impact significantly upon a project, and which may be exacerbated by climate change-due to observed changes in the magnitude and intensity of rainfall and storm events.

The links to impacts from tropical storm systems resulting in flood was in tandem with the findings by Bueno [23] in a study focused on Cuba stated that in light of climate change, tourism, one of the region's most climate dependent economic sectors, will become even more vulnerable to damages from extreme weather events and surging storm waves causing extensive impact on vital tourism infrastructure. Thus, studies on flood hazards which result from more intense storms associated with climate change are valuable to EIAs because they could help to prevent the detrimental side effects of a disaster due to ill-advised planning. Additionally, the gap between climate change science and the decision makers could be bridged with greater use of flood risk forecasting. A visual presentation of graphics, diagrams and scenarios would aid relevant authorities in having a clearer picture of the hazard, the perceived magnitude and the areas that could potentially be affected within development projects [24].

Stronger winds will be associated with more intense hurricanes and storms aggravated by climate change [25]. In light of this, increased wind speeds and stronger gusts associated with more intense storms and hurricanes were inadequately discussed in all the EIA(s) reviewed.





Only one EIA, the Negril Peninsula Resort EIA, made note of the fact that high velocity winds generated by hurricanes could exceed 160 miles per/hour and cause significant damage to “high” buildings located along the coastline with no wind barriers, a typical feature of hotel developments. Even though most buildings along the coastline were outlined to be between one and three storeys, the fact that the EIA practitioners recognized the risk of these buildings to the full impact of hurricane winds will hopefully bring greater attention to this issue resulting in the designing of mitigation measures to protect against any future impacts.

It must be noted however that there are uncertainties with regards to wind speed projections in the Negril area. According to data from the Climate Studies Group at the University of the West Indies (Mona), mean marine wind speeds around Jamaica have shown significantly increasing trends over the period 1960-2006; whilst observations from the nearest land-based observation station closest to Negril indicates decreasing (but not statistically significant) trends between 1973-2008 [26]. Mean wind speeds generally increase slightly in Global Climate Model Projections (GCMs) for Jamaica, whereas a general decrease is observed in Regional Climate Models (RCMs) for the Negril area [26]. Just as the case was with sea level rise and coastal erosion, uncertainties in wind speed projections could have formed the basis for the exclusion of information linking climate change with increased wind speeds and gusts in EIA(s).

Uncertainties aside, Jamaica has already drafted a new building code which should be passed into legislation soon. This new building code will replace the decades old one and will seek to account for climate variability and change. Also, new and revised provisions will adapt building designs to flooding and stronger winds [27]. In addition, goal 2 of the Regional Framework for Achieving Development Resilient to Climate Change speaks to the adoption of building codes that would be modelled based on the perceived effects of storms of greater intensity and the magnitude of rising sea levels. It is expected that these codes would be incorporated into the planning and implementation of coastal infrastructure and would be useful in the retrofitting of existing infrastructure [28]. Interestingly, the region is now discussing accessing climate finance from the Green Climate Fund to address this very issue following the devastating impacts of hurricanes in Dominica, Antigua and Barbuda, Haiti and the Bahamas in the 4 years leading up to 2020.

The issue of storm surges, which was also poorly evaluated post 2001, was given greater attention in EIAs post 2001. Increased knowledge and advancements in computer technology pertaining to climate change have allowed for better modelling and forecasting [3]. This assertion was substantiated in the post-2001 EIAs in which the use of technology (HURWave and sBEACH computer models) to determine potential impact was outlined. Coastal inundation, storm surges and other coastal hazards will be exacerbated by rising sea levels associated with climate change [3]. It was also expressed with high confidence

that increased risks due to climate change will further expose coasts to storm surges and coastal erosion [3]. Not only did the post-2001 EIAs map past scenarios, but the computed data for storm surges allowed for mapping of futuristic scenarios using computer models. With more models becoming available, practitioners appeared to be more attentive to these issues and the need to study and model future scenarios in these later EIAs to better plan and prepare for higher storm surges associated with more intense storms worsened by climate change.

It was interesting to note that although the EIAs reviewed did not examine the potential impacts that climate change will have on biodiversity, it was no different to practices in developed countries in the European Union and therefore not a flaw unique to Jamaica's EIA process. In 2013, the European Union stressed that for future projects, the effects that changes in climate will have on biodiversity must be discussed within EIA(s) potentially over long timescales and there must also be discussions on the project's resilience and coping capacity [29].

EIAs conducted pre- 2001 made no mention of any energy conservation methods; neither did they mention any climate change related mitigation effort to reduce emissions associated with freight transport or personnel travel. However, it is expected that future reports will include these issues as the reduction of GHGs are central when adapting and mitigating climate change impacts. A study conducted by CARIBSAVE [30] made recommendations for Negril to quickly act to lower GHG emissions and take steps towards low carbon or carbon neutrality. In addition, the recommendations encouraged entities to work with an ongoing Travel Foundation Project to rationalize energy use in tourism accommodation providers. The two more recent EIAs evaluated the use of resource conservation and energy conservation methods and proposed mitigation measures related to the improvement in energy management, energy monitoring technology, translucent shades, phosphorescent lighting and heat recovery systems. The use of renewable energy and innovations regarding energy conservation was also a plus.

The issue of drought impact and drought management was not well addressed throughout all reviews. Water is a critical resource for this sector. The integration of issues related to drought and potential water shortages needs greater attention when examining impacts relating to climate change and development. Despite this, there was a common understanding across all the EIAs that the Negril area is extremely vulnerable to water shortages due to the pressure on the scarce resource. Even though there was no information on previous droughts that had impacted the area, increased tourism activity in Negril over time would have meant that the influx of more tourist developments would increase the demand on what can be categorized as an in-demand and sometimes scarce resource required for development of all types. In light of this, and the fact that climate change projections indicate water supplies will become scarce, it is



felt the EIAs reviewed should've addressed the issues of drought and potential water shortages with greater depths. This should become a staple of future EIAs in the sector in light of the condition of watersheds and the projected demands for water resources coupled with the islands drought history in all future tourism-related EIA(s).

## CONCLUSION 5.0

The results indicated that the integration of climate change into EIAs increased over time based on the EIA reviews conducted. Only the EIAs conducted in 2003 and 2007 exhibited any considerable improvement in tackling climate change issues in EIAs as per the modified climate change assessment tool used.

While the decisions taken at that time may have been considered adequate, in light of the current understanding of climate change, it is prudent that efforts are made to integrate climate change considerations in the EIA process. The state regulator, NEPA, has recognized this challenge and has started the process. The experiences of the earlier emails can only help to improve the quality of climate change considerations incorporated in EIA documents by EIA practitioners.

It is clear that the early ToRs did not include any provision for ensuring the integration of climate change concerns in EIAs, albeit based on a limited study sample. There were no formal regulations/guidelines for climate change integration into the EIA process, despite the need to present adaptation and mitigation measures specific to climate change in the EIA documents. Neither was there any regulation at the time these EIAs were conducted that would encourage proponents to examine how the project would have exacerbated climate change impacts. As a result, the EIA reports reviewed only considered historical climate change information of the project destination. These shortcomings could be due to the fact that in the 90s, the EIA process was still relatively new to Jamaica. Coupled with the uncertainties that existed at that time regarding climate change, modeling of current and future scenarios for Negril was likely not available and/or advanced as it is now.

With climate change awareness increasing globally and the impacts of climate change induced hazards occurring, there must be a clear scope for the overall integration of climate change adaptation in tourism projects. If this is done, there will be increased resilience in one of our most economically and socially vibrant sectors in Jamaica. As more climate change information, modelling and prediction become further defined, and the modalities for integration into the EIA process further refined, stakeholders at all levels will be more supportive and receptive of the utilization of EIA to promote climate change adaptation at the project level.

## RECOMMENDATIONS 6.0

The following are recommendations that Jamaica and other SIDS should consider in climate proofing their development planning processes.

1. Consider revising the definition of EIA to include climate change considerations and modify TORs, as appropriate.
2. Develop specific criteria for integrating climate change considerations in the screening and scoping stages of the EIA process
3. Develop clear criteria governing EIA experts
4. Consider strengthening process to share research findings in climate change among EIA practitioners and decision makers
5. Strengthen ongoing public awareness campaigns on climate change and the EIA process with greater emphasis on training

## REFERENCES





Climate Change Impacts and its Potential Integration in the Environmental Impact Assessment (EIA) Process & Property Management: The Case of the Negril Tourism Industry in Jamaica

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## APPENDIX

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