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# Caribbean Scenarios 2050: GoLoCarSce Report

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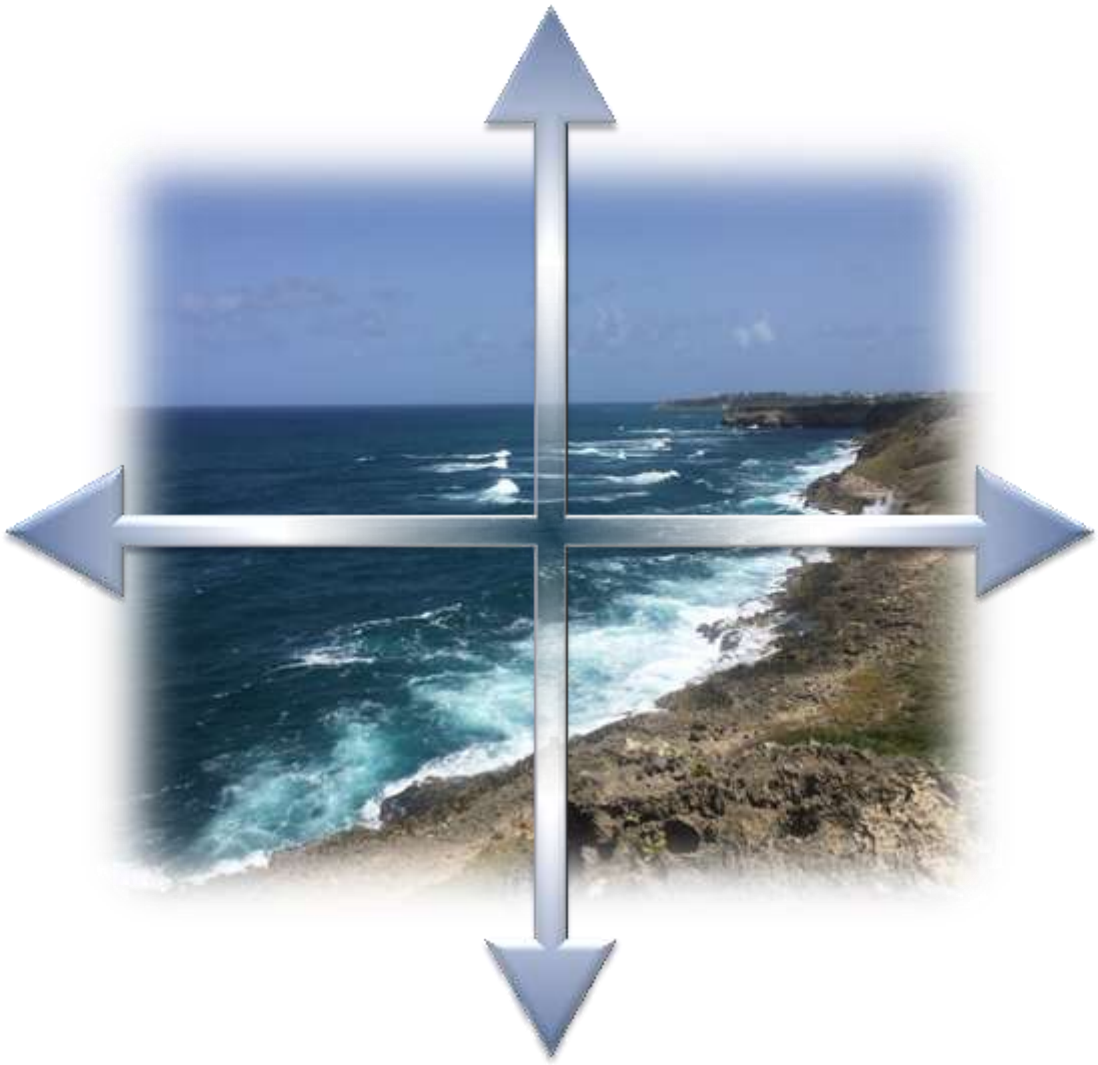

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## EXECUTIVE SUMMARY

As part of the GoLoCarSce project to understand the complexity of future climate changes on Caribbean Small Island Developing States (SIDS), socio-economic and political frameworks needed to be developed to contextualise the projected scientific changes. Under the climate scenarios climatic, environment and bio-physical changes will be exacerbated, adapted to or mitigated against based on the Caribbean's societal construct. Foresight scenarios have been developed to be used as tools for understanding the societal implications of the impacts of climate change on various natural resources and, as a result, future livelihoods.

An adapted methodological foresight approach was used to create regional socio-economic scenarios for the Caribbean for 2050. This foresight process included three main step-wise yet iterative phases; developing regional scenarios, "up-linking" to global scenarios and downscaling to national storylines. At each phase different methods were used to feed into the development and robustness of the final scenarios. Phase one, building the regional scenarios included desktop research, expert interviews, and scenario workshops. Phase two focused on incorporating global trends into the regional storylines using Bayesian Conditional Probability Theory and thirdly downscaling from the regional to national level through case studies and systems dynamic modelling that allowed for economic projections to be made. The participatory and iterative process resulted in four regional scenarios; *Cool Runnings, Island in the Sun, the Harder they Come, and Pirates of the Caribbean*. Each scenario represents a distinct pathway where combinations of policies can be developed now or in the future to address the impact of climate change across the Caribbean.

Scenario 1 "Cool Runnings" is a business driven future scenario where most social services are corporatised and regional integration is functional due to global pressures. Scenario 2 "Island in the Sun" is a possible future state where green technology, health and community governance dominate society. Scenario 3 "The Harder they Come" describes a Caribbean with a weakened position in the global market, increased protectionism on trade and uneven income distribution, and Scenario 4 is a "wild card" future scenario with two trajectories based on the strength of strong institutional governance. We split Scenario 4 into two distinct pathways. Pathway 1 outlines a Caribbean where the global economic depression fuels stagnant growth, increased inequality and resource shortages - "Pirates of the Caribbean". Pathway 2, "Redemption of Paradise," assumes strong institutional capacity particularly as a result of the economic collapse.

The scenarios created can act as a catalyst for developing policy at present, in order to shape the future. By rigorously developing the scenarios they can act as a context for the scientifically based impact projections for climate change. In creating more than one foresight scenario, decision makers can assess how effective a policy may be under various environmental and societal conditions.

# 1 INTRODUCTION

The Global Local Caribbean Climate Change Adaptation and Mitigation scenarios (GoLoCarSce) is a project designed to help Small Island Developing States (SIDS) in the Caribbean better understand and manage the effects of climate change. In carrying out scientifically based research on climate impact, it is expected to improve resilience and build adaptive capacity, as a means of promoting more sustainable forms of development and sustainable livelihoods. Specifically, GoLoCarSce, is designed to improve the scientific understanding of the effects of climate change on the ecological, social, political and economic systems of the small islands of the Caribbean through the development of a set of locally-relevant socio-economic scenarios for the Caribbean.

Foresight scenarios have been used in many regions and countries across the globe. At the global level socio-economic scenarios such as the Millennium Ecosystem Assessment Scenarios (Alcamo, et al., 2005) and Shared Socio-economic Pathways (O'Neill, et al., 2015) have been developed in an attempt to capture the global trends and how they may unfold in the future. These global scenarios have been used in the past as a framework to develop Caribbean scenarios in order to assess the impact of climate change on regional food systems (GECAFS, 2006). Also, Caribbean scenarios were constructed to analyse the possible consequences of the ecosystem and its services given varying approaches to economic and environmental management (Agard, et al., 2007). In building on these exercises the GoLoCarSce project has developed regional scenarios with input from local and regional experts using a multi-scalar technique. The storylines created describe a range of distinct socio-economic pathways which are compatible with various Representative Concentration Pathways (RCPs). The scenarios transcend one spatial scale and describe storylines that "up-link" to global trends (SSPs) and downscale to national models for robustness. The scenarios also include the capacity of the Caribbean to attain United Nations Sustainable Development Goals by 2030 under each scenario pathway. The aim is to provide possible future states for the Caribbean and offer a context for the case studies of this project i.e. water availability, forestry management, and health and disease management etc., and more importantly, inform robust proactive policies which can adapt to various eventualities. The rest of the report is as follows: Section 2 outlines the three-stage methodological foresight process used to develop the scenarios, Section 3 describes the Caribbean scenarios and Section 4 provides the storylines for each scenario. Section 5 concludes.

# 2 METHODOLOGY

A three-stage methodological process was employed to develop regional scenarios for the Caribbean that are 'up-linked' to global scenarios and 'downscaled' to country-level storylines:

1. Developing regional scenarios
2. 'Up-linking' regional to global
3. Downscaling regional to national

Each of the three processes consist of specific methodologies. The process follows a step-wise approach, but with feedback loops at each stage. We begin by developing regional-level scenarios and then move to 'up-link' these regional scenarios to global scenarios (such as the SSPs). Once we have identified suitable 'up-links' we take lessons from these global scenarios and incorporate them, where relevant, into the regional scenarios. We then turn to

'downscaling' the regional scenarios to illustrate their impact at the national level. In doing so, national influences were used to amend the regional storylines accordingly.

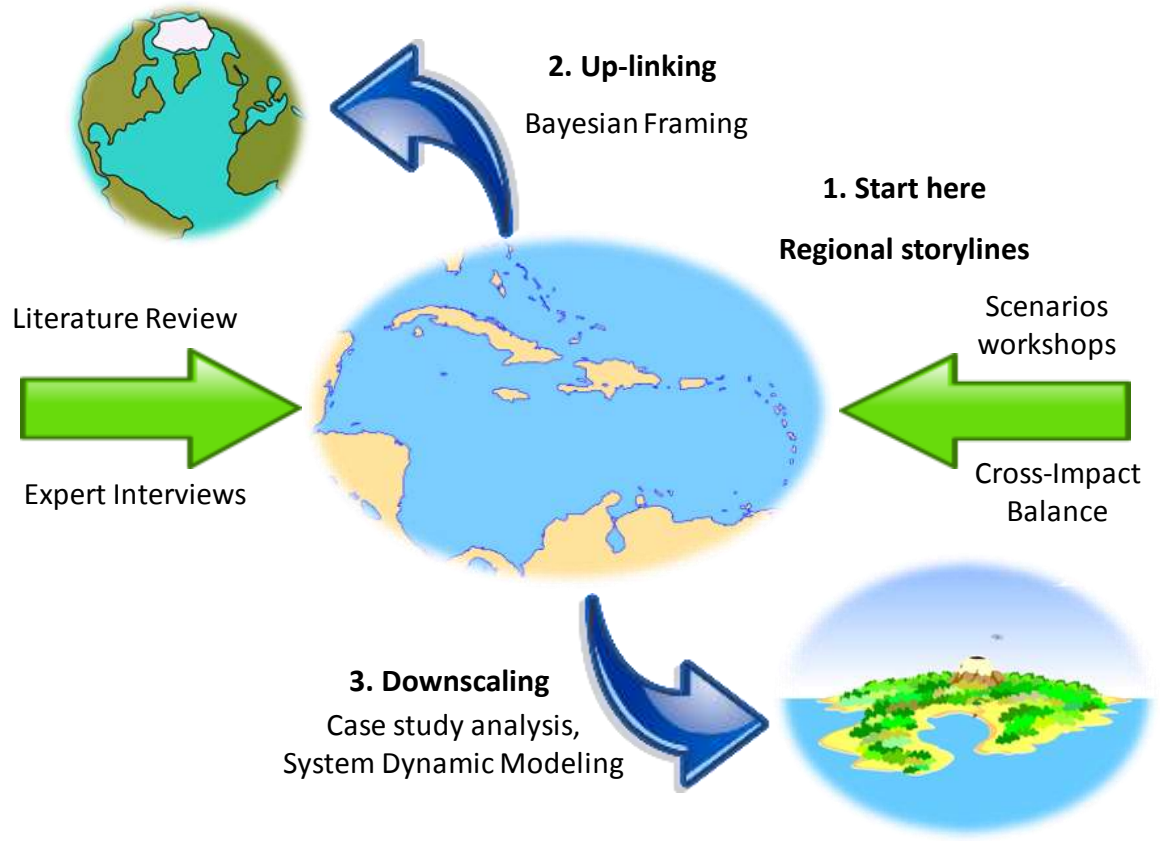


**Figure 1 Foresight methodology**

The Caribbean Scenarios 2050 were developed within the larger context of foresight methodology. Foresight is defined as the process by which iterative periods of open reflection, networking and consultation lead to the collaborative refinement of future visions (Cassingena Harper & Georghiou, 2003). Similarly, one can describe scenarios as being future visions. Moreover, Godet and Roubelat (1996) defined a scenario as a description of a future situation and the course of events which allows one to move forward from the original situation to the future. From these definitions a clear overlay of activity versus result can be made. While foresight methodology may use scenarios as a technique for a final objective for e.g. orienting policy and decisions, identify research and investment opportunities (Georghiou, Cassingena Harper, Keenan, Miles, & Popper, 2008), scenarios themselves can be a final output of the foresight process.

Figure 1 outlines the three foresight phases used by the researchers to develop the scenarios for the Caribbean. The process utilised is adopted from the foresight phases proposed in Georghiou, Cassingena Harper, Keenan, Miles, & Popper (2008) and the scenario approaches discussed by Mietzner & Reger (2005) and tailored to the requirements of the project. Phase one is an exploratory phase where activities such as environmental scanning, identifying key issues and drivers, assessment of time horizons and data gathering were conducted. The exploratory phase sought to frame the context, boundaries and objectives of the research. The second phase, scenario building, is the core of the foresight process. This phase comprised developing new knowledge from the information gathered in phase one. This stage is where scenario core drivers and trends are developed into consistent narratives through various

iterations. The final foresight phase aims to reinforce the plausibility of the scenarios. Combining qualitative (case studies) and quantitative (systems modelling) elements to the scenarios the researchers attempted to make the scenarios more consistent and robust.

The methodologies outlined in each phase of the foresight process in Figure 1 were used in the development of the Caribbean Foresight Scenarios 2050 because of the interdisciplinary nature and complex design of the scenarios. These methodologies are discussed in greater detail by Bishop, Hines, & Collins (2007), Georghiou et al. (2008) and Glenn & Gordon (2009). The practical application of each activity in the scenario building exercise is discussed next.

## 2.1 Phase 1- Building Regional Scenarios

### 2.1.1 Desktop research

Desktop research was conducted by carrying out a review of literature on futures scenarios, socioeconomic development and resource management. The review was conducted at the global, regional, national and sectoral levels. An environmental scan was also done on regional and national development strategies. The documents reviewed consisted of 87 articles from 17 online journals, 30 books, reports and conference papers, and 15 national and regional strategies. The literature was collected, collated and analysed using thematic analysis by grouping text by key words, such as foresight, climate change, integrated water resource management, and economic development.

### 2.1.2 Stakeholder interviews

Following the desktop review, stakeholder interviews were carried out over a period of five weeks between January and February 2015. Fifteen experts were invited to be interviewed via email and nine persons accepted. The nine experts represented the fields of water resources management, climate change, economics, youth, political studies, civil society and environmental development. Six of the interviews were conducted face-to-face in the island of Barbados, two were conducted via the internet and one via telephone due to participants being located in Kenya and Guyana, respectively. The instrument used to facilitate the interviews consisted of an open-ended questionnaire to receive as many in depth responses as possible. The aim of the stakeholder interviews was to gather information from experts in various fields to construct a regional scenario framework. The findings of the interviews included the identification of key drivers, critical uncertainties, sustainable development goals and possible wild cards for the Caribbean in the future. A final report was compiled and sent to the experts via email with participants responding and their comments included.

### 2.1.3 Scenario workshop 1

A two-day scenario workshop was held on March 4 and 5 2015, at The University of the West Indies (UWI) St. Augustine Campus, Trinidad. Thirty-five participants attended the workshop representing regional and international organisations[1], UWI departments[2] and various ministries in Trinidad, Tobago and Jamaica.

[1] CARICOM, CCCC, CARDI, Centre for World Economy Studies, Stockholm Environmental Institute
[2] Climate Studies Group UWI Mona Campus, CERMES UWI Cave Hill Campus, Life Sciences Department St. Augustine Department

On day one of the workshop, participants were engaged in a brainstorming activity focused on Caribbean development. The approach was similar to the first steps of a conventional intuitive logics activity (Huss & Honton, 1987; Amer, Daim, & Jetter, 2013), with some modifications. Drawing on earlier experiences by team members that asking for "drivers", as in a conventional approach, elicited factors that could not properly be classified as drivers or environmental factors, but which were nevertheless relevant, participants were invited to provide causal statements (which contained drivers), as well as policy levers and goals. The group was then divided into two break-out sessions and each group was given a set of causal statements which they had to plot on a graph representing uncertainty and impact. Following a conventional intuitive logics approach, the causal statements ranked high uncertainty and high impact were then identified as critical uncertainties (CUs).

After this exercise the scenario team developed a list of the CUs identified in the stakeholder interviews and the workshop and the participants finalised the list of CUs. On day two of the workshop, participants prepared the inputs to the Cross-impact Balance (CIB) analysis (Weimer-Jehle, 2006). Participants were placed into groups of 4-5 persons to list the exhaustive values of their assigned CUs; having an exhaustive set is required by the CIB technique. In plenary, the participants were then asked to determine the strength of impact of each CU value on all other CU values using the Scenario Wizard computer program, which implements the CIB technique.[3] The CIB analysis was chosen to advance the scenario development process because:

1) It provides an analysis of how multidisciplinary factors (environmental, economic, political, technological etc.) impact each other within a given system;
2) It is a systematic approach used to assess the interdependence of key variables in pairs;
3) In general CIB is used when the issue at hand is multidisciplinary in nature (Weimer-Jehle W. , 2014); and
4) The computer program condenses the complex algorithms of CIB into simple steps.

The main benefit of CIB analysis is it results in consistent scenarios within a network of interdependent variables. See Weimer-Jehle (2014) for a more detailed discussion on CIB analysis and its benefits.

We note that the CIB method was met with resistance from a few members of the group. This was partially because the methodology was new and complicated, and sufficient time was not allocated to outlining the motivation and purpose of the method to participants. Also, the resistance came from participants with experience in quantitative methodologies who were put off by the subjective nature of the technique, an aversion strengthened by the technique's apparent (and, to them, potentially misleading) air of rigour due to the semi-quantitative outputs. This is an issue of long standing dispute within foresight studies – the tension between the relative value of qualitative and quantitative inputs into scenario development – so it was not surprising that it arose in this context. Nevertheless, the team did not fully anticipate this resistance, and the experience highlights the importance of building consensus around, not only scenarios in themselves, but also the techniques and tools used in developing those scenarios. We achieved tentative acceptance once we assured the participants that at a later stage in the scenario process (but subsequent to the workshop) the scenario development team would be applying quantitative models to check, refine and illustrate the scenario narratives.

[3] Available from http://www.cross-impact.de/index.htm

The Scenario Wizard produced fifteen consistent scenarios. Following the workshop, the scenario team further analysed each scenario to remove duplication and settled on five consistent and independent draft regional scenarios. We then moved to refine and develop these draft scenarios by first up-linking them to global scenarios, and then down-scaling them into national storylines.

## 2.2 Phase 2"Up-linking" to Global Scenarios

### 2.2.1 Bayesian Conditional Probability

Within the Caribbean, the fact of being embedded in a larger economic and political milieu has always been apparent. For much of its history, extending into the early years of independence, the economic and political trajectories of the Caribbean islands closely tracked developments in the "metropole" (i.e. the European former colonial powers). However, after independence those links began to weaken, such that the Caribbean is influenced by developments in both North and South America, and even China, and by the EU rather than specific metropolitan counterparts. To include the close relationship the Caribbean has with the global economy, global scenarios (SSPs) are assessed based on their ability to co-exist within regional conditions.

To a large extent, Caribbean countries are constrained and informed by global developments, rather than the reverse, however, influences can sometimes work in the other direction. While the region does not at present impose constraints on the global economy – even with its substantial oil and natural gas reserves, Trinidad and Tobago does not significantly influence global energy prices – the region's contribution to global biodiversity, to the most recent round of climate negotiations demonstrates an influence out of proportion to its size. Yet the opportunity to exert influence depends on developments taking place on the global stage.

These observations suggest that cross-scale links can usefully be expressed as conditional tendencies: conditional because developments at one scale provide a context and impetus for developments at another; and tendencies because the links are not deterministic. If tendencies can be assigned probabilities, then we can think in terms of conditional probabilities, an approach that has been taken in past efforts to link qualitative and quantitative scenario elements (O'Neill B. C., 2004; van Vuuren, de Vries, Beusen, & Heuberger, 2008). If objectively measured probabilities are not available, then there are techniques to elicit subjective probabilities (O'Hagan, et al., 2006), and these techniques can also be used to generate parameter values from qualitative storylines (Alcamo J. , 2008; Kemp-Benedict, 2010). In the present study we are linking narratives at different scales, rather than forging links between qualitative and quantitative analyses. For inspiration in generating a suitable question, we turn to Bayes' rule, which we can write in this context as

$$P\left(\text{local narrative} \mid \text{global narrative}\right) = P\left(\text{global narrative} \mid \text{local narrative}\right) \times \frac{P(\text{local narrative})}{P(\text{global narrative})}. \quad (1)$$

Following convention, *P* indicates a probability, while a vertical line indicates a conditional statement, so in words the equation is read, "The probability that the local narrative holds true given the global narrative is equal to the probability that the global narrative holds true given the local narrative, multiplied by the ratio of the total probabilities that the local and global

narratives hold true." In Bayesian inference, the total probabilities are interpreted as prior probabilities, or "priors" that are held to be true before learning of the condition, while the conditional probability is the posterior probability that holds once the condition is imposed.

We can write the equation above in a more symmetric way, as

$$\frac{P(\text{local narrative} \mid \text{global narrative})}{P(\text{local narrative})} = \frac{P(\text{global narrative} \mid \text{local narrative})}{P(\text{global narrative})}. \quad (2)$$

This shows that in the case of quantified probabilities we can elicit responses starting with either the global or local narrative as the condition: the additional information that we are in a particular global narrative affects our assessment of the probability that the local narrative holds true as the other way around.

Because we are starting the scenario process from scenario narratives developed in the region, we chose to impose the local narrative as the condition and ask a question like: "Given that the region is in scenario *X*, how surprised would you be to discover that the world is experiencing global scenario *Y*?" Another reason for going from the regional to the global narrative is that it runs counter to the strongest causal link, and so creates a feeling of dissonance, encouraging the respondent to stop and think before replying. By using the language of surprise, rather than probability, those responding to the question do not need to make a quantitative judgement. This procedure is meant to elicit a rough assessment of the ratio on the right-hand side of the equation above – that is, the boost in plausibility of a global narrative given regional conditions.

In implementing and explaining this process we noted that some participants, even ones with a sophisticated understanding of probability, had difficulty with the counterintuitive approach of asking about the global narrative given the local narrative. There was a strong tendency to interpret the question in terms of causality, so they were led to think about how the region might influence the world.

To link the five qualitative regional scenario kernels to global scenarios and to determine quantitative indicators, the Bayesian Conditional Probability Approach was taken using the Shared Socioeconomic Pathways (SSPs) (O'Neill, et al., 2015). As the islands of Barbados, Grenada, Jamaica and Trinidad and Tobago were classified as Latin America and the Caribbean, middle income countries the scenario kernels and middle income country SSPs indicators were assessed based on their conditional probabilities.

We created tables for each of the scenarios including each of the key features of the five SSPs. We then asked respondents to rank how likely they were to occur. An example of this table is given in Figure 2. Respondents matched four of the five scenarios as matching closely, (Very Likely to Occur or Somewhat Likely to Occur) in a singular relationship, with global SSPs. One of the five scenarios was not identified as matching closely any of the five SSPs, and on investigation was found to be closely related to another scenario. These two scenarios were merged and a "wild card" scenario was developed.

***Given the local scenario A above:***

| How would you rank the occurrence of the following Global Scenarios? | Very Likely to Occur | Somewhat Likely to Occur | Indifferent | Not Likely to Occur | Not at all Likely to Occur |
|---|---|---|---|---|---|
| **SSP 1-Sustainabilty**<br><br>Pop Growth Relatively Low<br>Globalization Connected Markets<br>GDP Growth High<br>Inequality Reduced<br>Institutions Effective<br>Int'l Trade Moderate<br>Tech Transfer Rapid | X | | | | |
| **SSP 2- Middle of the Road**<br>Pop Growth Medium<br>Globalization Semi-Open<br>GDP Growth Medium<br>Inequality Uneven<br>Institutions Modest Effectiveness<br>Int'l Trade Moderate<br>Tech Transfer Slow | | | | X | |

**Figure 2 Example of table used in Bayesian up-linking**

## 2.3 Downscaling regional scenarios to national storylines

### 2.3.1 Case studies

In order to provide validation from historical experience to the results out of the e-Delphi and to provide greater depth to the national-level storylines, case studies were identified for each of the four scenarios and analysed. Where possible, case studies from historical experience from within the Caribbean region were chosen. Where no suitable case study was available within the Caribbean, the experience of countries from beyond the region was chosen. The identification of each case study was based on the knowledge of the authors and focusing on typical, most-similar examples following established approaches for case study selection (Mabry, 2008; Seawright & Gerring, 2008). Case studies from Guyana (for the period 1975 to 1989), Jamaica, Iceland and Mauritius (all present day) were chosen and key features, experiences and data were drawn out from literature for each.

### 2.3.2 Economic systems dynamic modelling

The heart of a scenario exercise is the set of qualitative narratives; but as noted above, quantitative analysis is frequently used to check, refine and illustrate the scenario narratives. For the Caribbean Scenarios 2050, one quantitative input is a national-level macroeconomic model that was applied to Barbados, Jamaica, and Trinidad and Tobago.[4] The model design was constrained by three major considerations: 1) the specific features of small, open developing economies; 2) the data available for calibration and hypothesis testing; and 3) correspondence between model inputs and scenario narrative elements, particularly the critical uncertainties.

The first consideration was addressed by drawing on the extensive economic literature originating from within the Caribbean. A common theme in this literature, starting with the Nobel prize-winning work of Sir Arthur Lewis (Lewis, 1954), is the "dual" economy. While the Lewis model contrasted a "modern" capitalist sector with a subsistence sector, more

[4] Detailed documentation will be provided in a separate working paper, which will be made available online. A draft of the working paper is available from the report authors upon request.

recent models feature an export-oriented sector and a domestic sector, both of them requiring capital investment (Seers, 1964; Bruce & Girvan, 1972; Girvan, 2009); this is the structure adopted for the GoLoCarSce model. In the model, there is some independent domestic demand for domestic goods, but this is constrained (Demas, 2009[1965]), and the main driver of the economy is the export sector. Selling into the export market generates income in the export sector, which is used to buy a mix of imports and domestic goods. The export sector thus underpins, through a multiplier effect, most economic activity. In this demand-driven model, output is constrained by the size of the capital stock; investment is stimulated by demand-led expansion in excess of current productive capacity, and dampened by rising debt relative to the size of the economy.

The second and third considerations sharply bounded the scope of the modelling exercise. Data limitations restricted the model to a representation of the "external" balance – that is, exports, imports, remittances, net foreign investment, and external debt – with no explicit representation of the internal structure of the economy. The dual structure was captured by constructing a two-sector mathematical model and aggregating it formally (that is, using pen and paper) to a one-sector structure. The aggregate one-sector model was then implemented in the Vensim system dynamics software.[5] Thus, while the calibration parameters refer to the separate sectors (such as the wage shares of income in the export and domestic sectors), the time-varying outputs, such as GDP and the capital stock, are at an aggregate level. The structure of the scenario narratives dictated some of the exogenous variables, although data limitations meant that not all scenario elements could be represented in the model. Climate impacts are represented through a storm damage function. Damage is a fraction of the capital stock, which is then rebuilt in the following period, and depends on the return period of the storm, in contrast to the approach taken by Moore, Wayne, & Lorde (2016), in which damage is a fraction of GDP. Both climate damage and exports are stochastic model elements; the model is run thousands of times with different trajectories for storm incidence and export demand, and the results are averaged to provide final outputs.

### 2.3.3 Scenario workshop 2

The second workshop was held on April 11$^{h}$ and 12$^{h}$ 2016. This workshop was attended by 25 professionals from around the Caribbean. The aim of the workshop was to refine the scenario storyline using a participatory approach. More specifically, it was to formally engage key stakeholders to the scenarios and garner feedback on the narratives through an analysis of the critical uncertainties and their relationships throughout each scenario. The goal was to identify any internal inconsistencies within the scenarios themselves as well as the compatibility of the Caribbean context within which they were being proposed. The participants were then invited to a general discussion about the drafted scenarios and their applicability to assist in addressing Caribbean challenge on day one. On day two participant contributions were explored under each scenario, for example, new trends and their implications to the narratives and alternative response to events within the scenario. This process led to the inclusion of key trends in each scenario and potential policy implications and more importantly, two pathways were constructed based on Scenario 4.

[5] http://www.vensim.com

# 3 CARIBBEAN SCENARIOS

The Caribbean Scenarios 2050 are future visions that focus on the possible socio-economic and political changes that may occur in the region, based on key drivers. Some societal variables are assumed to be externally driven such as technology, climate and environment and hence are not explicitly explored within the scenarios. Therefore, these factors are implicitly assumed to have complementary interactions within a given future state.

To overlay the projected climate global emissions scenarios to the regional scenarios, an assessment of the compatibility of societal changes with projected IPCC Representative Concentration Pathways (RCPs) was done. Table 1 shows the interaction between the regional scenarios and RCPs. Each regional scenario is assessed in relation to each RCP and the ability for each combination to co-exist without being mutually exclusive. For instance under the scenario "The Harder they Come" due to continued industrialisation and increased regionalism, it is unlikely those societal conditions could exist within a projected RCP 2.6 pathway. However, these conditions are plausible under RCP 4.5, 6.0 and 8.5.

**Table 1 Regional Scenarios and RCPs**

| RCP | Cool Runnings | Island in the Sun | The Harder they Come | Pirates of the Caribbean |
|---|---|---|---|---|
| 2.6 | x | x | | x |
| 4.5 | x | | x | x |
| 6.0 | x | | x | x |
| 8.5 | | | x | x |

We examine three key socio-economic variables in the Scenarios that follow for three key Caribbean countries: population, GDP-per-capita and the debt-to-GDP ratio. We present here historical data from 2011 for Barbados, Trinidad and Tobago and Jamaica for these three variables for comparison

**Table 2 Historical data for selected indicators**

| | Barbados | Trinidad | Jamaica |
|---|---|---|---|
| Population | 280,602 | 1,334,790 | 2,699,838 |
| GDP per capita (US$ 2005) | 14,534 | 14,024 | 4,119 |
| Debt-to-GDP ratio | 0.09 | -0.21 | 0.85 |

Source: (World Bank, 2015)

## 3.1 Scenarios

The following exploratory scenarios are presented as a snapshot of the year 2050 for the Caribbean region. The narratives are based on key drivers (see Appendix 1 for full description) which have been identified in the foresight methodology as having a profound impact on the future of the Caribbean. Each scenario below was developed to cover a wide possibility space to invoke a comprehensive suite of policy options in responding to future trends.

### 3.1.1 Scenario 1 “Cool Runnings”

> ***Sustainable Development Goals***
>
> In 2030 most of the Caribbean islands were close to achieving SDGs related to poverty, education, economic growth and gender equality. By 2050 the region, through Private Public Partnerships (PPPs), is focused on providing universal primary level education and basic health care services.

Globally, economic growth and development is uneven in line with historical patterns of winners and losers of a capitalist system. Income inequality also persists within and between countries placing pressure on the attainment of global sustainable development goals. Many countries have adopted new energy sources however some industries still rely on fossil fuel for energy. Population growth slows in developed countries while in developing countries reduced levels of investment in education contribute to rising fertility rates (O'Neill, et al., 2015). There is reduced demand for US-made products, shrinking their industrial capacity and their international influence. International trade is dominated by the BRIC (Brazil, Russia, India, and China) countries and other emerging economies such as Turkey, Indonesia and Thailand driven by low cost economic growth.

Increased free trade will force CARICOM member states to eliminate almost all barriers to trade, internationally and regionally. The Caribbean acts as one economic bloc using one currency controlled by the Caribbean Central Bank regulated under the Caribbean Single Market and Financial Treaty (CSMF) established in 2028. The CSMF was created by Caribbean countries to compete in the global market and to satisfy international protocols of trade. Countries specialise in high-end luxury tourism, specialty crops and products, and micro technology assembly projects funded by Chinese and African investors. Commercial activities are powered mainly by renewable energy, particularly solar energy facilitated by light weight glass technology. Solar powered technology for residential energy systems has matured and is affordable to most medium and high income households. This accessibility to new energy sources for domestic activities also reduces the region’s reliance on fossil fuels.

The Caribbean has strong private sector led integration with mergers and partnerships dominating business. The business driven cohesion, facilitates and promotes political strategic unity and greater functional cooperation. The creation of the CSMF facilitates greater inter-Caribbean migration with countries attracting migrants according to their increasing economic specialisation. Institutions such as The University of West Indies grow in international competitiveness as more skilled persons remain in the region. The increased migration across the regions leads to the development of a more homogenised Caribbean culture. The creation of the single market helps to reduce intra-Caribbean transport costs and helps facilitate trade across the region. This includes trade in natural resources such as freshwater from regions such as Guyana and Suriname to water-scarce islands. The two countries that dominate trade outside of the region are Trinidad and Jamaica. Trinidad dominates trade in the southern Caribbean and South America, while Jamaica controls most of the trade with the northern Caribbean and the Americas. Trinidad and Jamaica under the CSMF protocols determine economic activities that are complementary in nature however, at times there is some tension for power.

The region’s foreign direct investment is controlled by a regional organisation which manages all investments from abroad, placing investment in islands where they are either best suited, or on a needs based assessment. The specialised investment unit, along with

attractiveness of the business climate, facilitates the moderate levels of investment from emerging markets. The regional investment organisation and national policy makers negotiate and design these agreements to be mutually beneficial to both investors and the local economies with many investors benefitting from tax holidays and "locked-in" investment to the local economy to avoid overexploitation and capital flight. The region faces fierce competition from its neighbouring South American countries such as Panama for global investments. Economic prosperity is paramount and environmental issues are raised only when (i) crisis occurs and environmental policy is usually reactive to major events or (ii) when there is economic viability to exploit natural resources for profit.

The role of government is significantly reduced and fiscal balances are kept to manageable levels. The governments of the region focus primarily on the provision of security and defence, and social welfare i.e. low income housing, while public-private partnerships provide services such as education, health and water and sanitation. National governance systems are relatively horizontal with private actors and social "champions" taking a more active role in policy making in the interest of national development. The traditional parliamentary system still exists, however smaller third and fourth parties consisting of influential lobbyists and special interest groups are included in representative politics. The intervention by the private sector in the delivery of "social" goods and services results in an improvement in the efficiency and effectiveness in policy implementation.

There is a general focus by persons on material wealth and despite the high standard of living, new forms of white collar crime are committed particularly by upper middle class citizens. Highly sophisticated technology is being used to perpetrate crimes in financial institutions with law enforcement and regulators unable to anticipate and prevent these crimes from happening.

Gender equality is somewhat achieved throughout most of society with many women leading major conglomerates along with being heads of state for some Caribbean countries. In some instances there is an imbalance with more women participating in societal activities when compared to men. Vulnerable groups are mainly taken care of by state run programs and large companies through corporate social responsibility. New Information and Communication Technologies (ICTs) make access to social welfare and services easier. Although many efforts are made by PPPs to assist in social development, there are some groups in rural areas who because of geographical remoteness and lack of access and knowledge of technology do not receive social benefits.

At the community level private households comprise mainly nuclear families consisting of heterosexual and homosexual partnerships. Traditional monotheist religious groups still condemn the notion of modern marriage but the legalisation of those unions by the state facilitate the growing prevalence of such unions.

The built environment has spread throughout much of the islands with areas such as mountain ranges and swamps being unaffected by urbanisation. Many "green" spaces are created within urban areas for leisure activities e.g. cycling, sports and community workouts. In rural areas much of the housing is dated with little adherence to building codes and regulations. Persons living in rural communities work in mainly agricultural jobs harvesting fruit for specialty products.

Important ecological areas are preserved by special civil societies who lobby for more attention to be paid to issues such as conservation, littering and reforestation. Pollution is

mainly in inner cities and coastal areas are actively maintained because of their value to tourism and overall GDP. Forest cover is stable and beginning to slightly expand in some islands due to the land required for agriculture decreasing. Animal populations are stable due to increasing habitat availability. Local ecological communities are stable but begin to slowly change as climate change is resulting in increasing migration of invasive species, pests and diseases from South America. Monitoring and controlling of these invasions are applied with some sluggish success, but do not prevent these invasions. Production of fruits and vegetables is increasing due to the move towards high tech techniques that are intensive but require less space. Organic produce still struggles to become mainstream as the technology of producing organic produce in a high tech, intensive manner which requires little space is in its embryonic phase. Hence organic produce remain more expensive. Demand and the associated space required for livestock farming is decreasing as the demand for artificial laboratory produced meat becomes more popular and increases. See Table 3, Figure 3 and Figure 4.

**Table 3 Projected indicators for Cool Runnings for Barbados, Trinidad and Jamaica**

| | Barbados | Trinidad | Jamaica |
|---|---|---|---|
| Population | 247,030 | 1,130,700 | 2,946,000 |
| GDP per capita (US$ 2005) | 43,243 | 35,553 | 50,173 |
| Debt-to-GDP ratio | -0.20 | -2.54 | 0.69 |

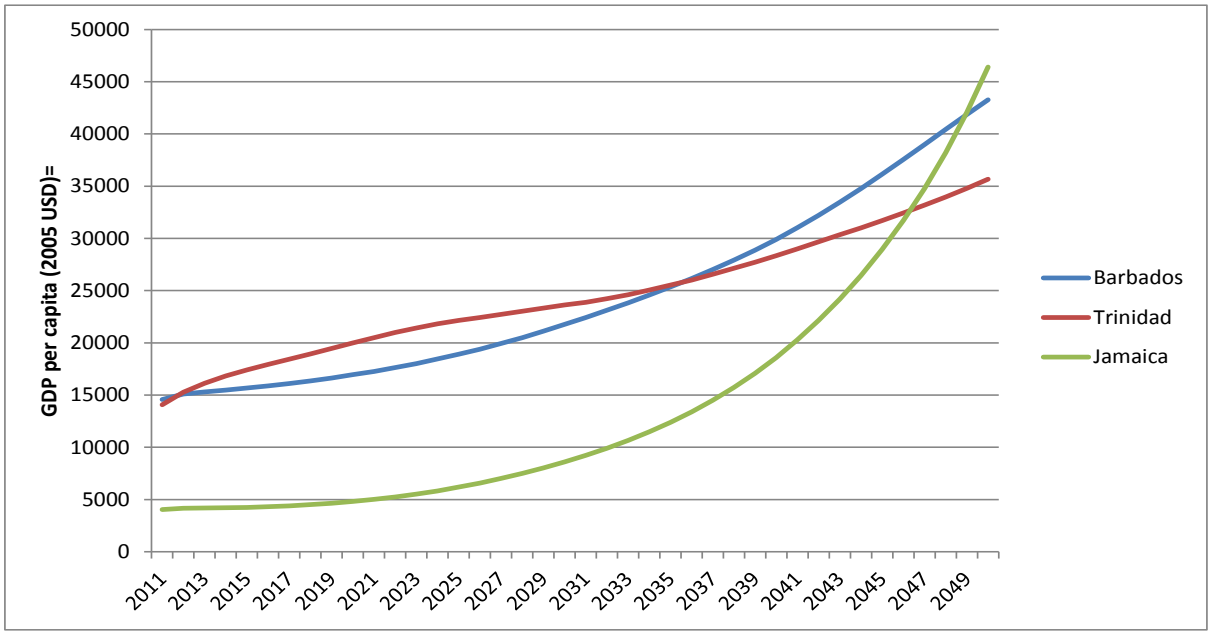


**Figure 3 GDP-per-capita (2005 USD) 2011-2050 – Cool Runnings**

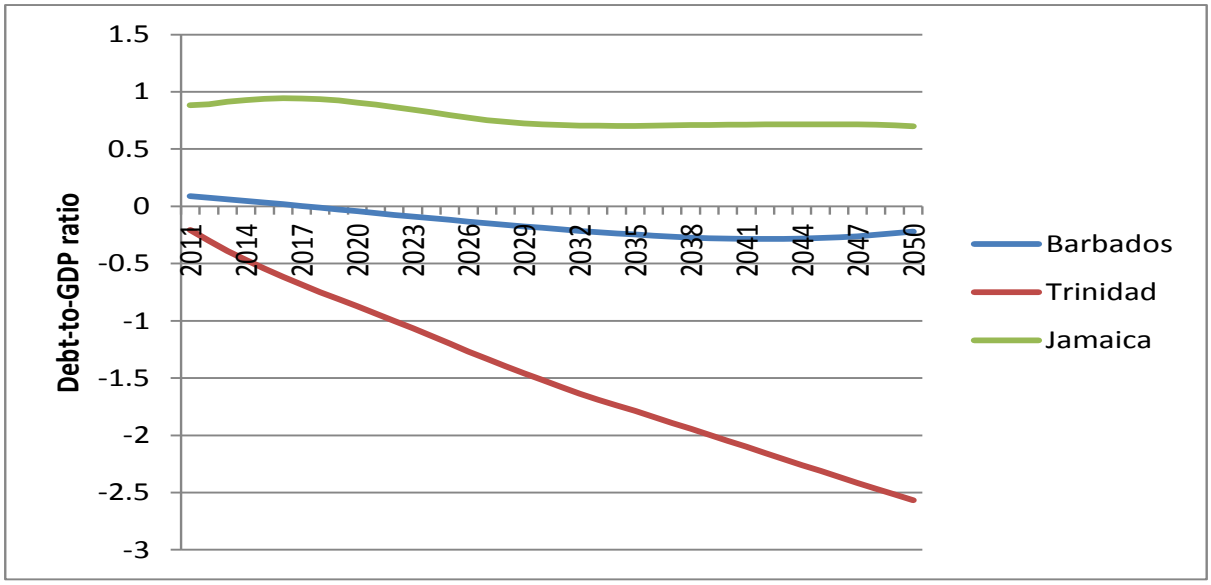


**Figure 4 Debt-to-GDP ratio 2011-2050 – Cool Runnings**

### 3.1.2 Scenario 2 "Island in the Sun"

The over industrialisation and mass levels of pollution from the major economies (USA and China) cause a drastic shift aimed at reclaiming the earth's natural state. This revolution sparks a rapid investment in renewable energy and the promotion of eco-friendly lifestyles. Economic growth is targeted within the constraints of environmental protection in order to achieve a more sustainable path. International organisations function effectively to achieve developmental goals. (O'Neill, et al., 2015). Globally it has been mandated that all countries conform to the use of renewables and this shift has caused large investments into the market for renewable energy with the aim of reduced energy and resource use. In 2050 the renewable energy industry has matured where its technology and products are affordable and easily accessible.

***Sustainable Development Goals***

The world fell short to achieve many of the SDGs by 2030. However, the shift in livelihood ideology facilitates the fast movement towards SDGs related to poverty, health and well-being, the environment and functional partnerships by 2050. New global indicators of development and prosperity are established in alignment with lifestyles.

The Caribbean is fully integrated and the economies are driven by renewable energy sources, with economic activity and job opportunities mainly coming from health and wellness tourism and the recycling and reuse sector. Regional cooperation is most effective in areas of energy, agriculture and health management. The economic union throughout the Caribbean increases intra-regional exports however, international exports remain relatively flat. Foreign investment is made mainly in research for new green technologies. Export demand is moderate with the majority of the export business originating out of large-scale, long-term contractual arrangements between private actors and foreign research institutions. Most of the growth in the economies comes from energy cost savings. In general, consumption is targeted at eco-friendly products with government placing high tariffs and taxes on products classified as "artificial", containing additives/ preservatives or that are environmentally unfriendly.

Traditional parliamentary systems exist within a regional agenda. National agendas are aligned with regional mandates as there is a general consensus that green technology, renewable energy and recycling are the best option for Caribbean sustainability. Governance moves towards a communal populist agenda rather than an elitist top-down approach. Consultation with specialists (environmentalists, nutritionists, farmers and scientists) at the national level is a prominent feature in the policy-making framework to promote sustainable lifestyles. Accountability for policy implementation is mainly at the community governance level with assistance from national agencies. This arrangement improves the success rate and ownership by everyday citizens of programs.

Societies are generally collectivist in nature and housing for most of the populations is in residential complexes that share recyclable and renewable utilities. Communities are encouraged to keep their communal areas and facilities clean and emphasis is placed on maximising space to produce vegetation e.g. roof top gardens. Women play a significant role in community governance and family-centred activities are engrained within societal norms. In some communities barter systems such as "time banking" are used to trade goods and services to reduce the dependence on fiat money. Public revenue is used to engage those disenfranchised and allow them opportunities to become active members of society again. Crime is minimal given there is shift away from the "need" of material wealth and possessions and more emphasis is placed on physical and psychological well-being.

Urban and rural areas in many cases work in sync where energy producing technologies (e.g. wind farms) are located in rural areas to supply energy for urban areas. Electric vehicles in urban areas serve as storage for these intermittent renewable sources, allowing for a fully-renewable electricity grid to be formed. Light rail transport systems powered by solar energy provide easy commute between city and rural areas.

The use of vertical farms grows rapidly with sensor technology increasing the yields of crops and livestock, while minimising the use of inputs into the sector. Fishing cooperatives across the region participate in smart fishing off the coast of many islands. A rise in vegetarian and vegan diets reduces the demand for livestock farming in the region.

Individuals are keen on preserving the environment. There are high levels of cooperation between the social partners (government, private sector, NGOs) in environmental protection. Programs centred on the relationship between bad practices (e.g. pollution, littering) and their effects on the environment and daily lifestyles are effective tools in sensitising and educating the public in preserving the environment. The increased knowledge and awareness of persons about the value of ecosystems is entrenched in everyday life and influences how persons interact with the natural environment. Based on research and necessary planning the appropriate adaptation and mitigation measures are implemented to safeguard the environment and its resources. There is constant reassessment of policy and response mechanism to cope with the growing challenge of resource allocation and societal factors. The taxation system moves away from taxing monetary commodities such as income towards taxing environmental waste such as pollution.

There is a noticeable increase in forest cover over most islands due to the decrease in land required for agriculture, industry etc. Local ecological communities are stable but are beginning to slowly change as climate change is resulting in an increase in the migration of invasive species, pests and diseases from South America. Monitoring and controlling of these invasions are applied with a large degree of success towards prevention. High tech production

of fruits and vegetables has almost completely replaced traditional farming methods, with waste products being recycled. This translates to much more land being made available for reforestation as well as significantly decreased water and land pollution levels. Organic produce is in high demand as high tech techniques have been developed to facilitate organic farming. See Table 4, Figure 5 and .

**Table 4 Projected indicators for Island in the Sun for Barbados, Trinidad and Jamaica**

| | **Barbados** | **Trinidad** | **Jamaica** |
|---|---|---|---|
| Population | 236,870 | 1,084,400 | 2,697,500 |
| GDP per capita (US$ 2005) | 38,719 | 32,646 | 23,931 |
| Debt-to-GDP ratio | -0.19 | -2.17 | 0.98 |

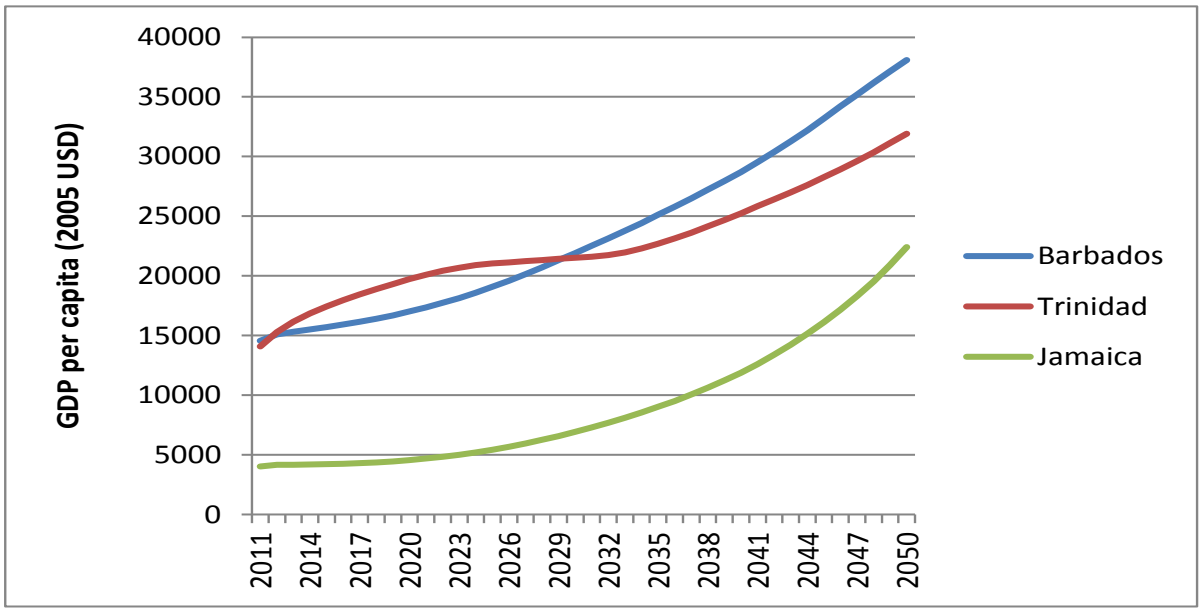


**Figure 5 GDP-per-capita (2005 USD) 2011-2050 – Island in the Sun**

### 3.1.3 Scenario 3 "The Harder They Come"

At the global level regional rivalry is increasing, compounded by weak coordination among global institutions. Protectionist policies are becoming more widely used at the regional and national level with a focus on security and food imports. Due to the slowdown in globalisation, economic growth slows and income inequality between countries grows. Global challenges such as climate change are no longer at the forefront of diplomatic discussions leading to environmental degradation (O'Neill, et al., 2015).

More explicitly, international trade between the Eastern and Western countries has reduced significantly, with

***Sustainable Development Goals***
By 2030 there is a mixed achievement of SDGs by various countries. Some countries with access to energy and natural resources attain goals associated with economic growth, innovation and infrastructure and strong institutions, however most countries fail to achieve goals related to health, education and climate. In 2050 there is little focus on global goals as international organizations are weakly coordinated.

countries becoming insular in an effort to protect borders. The European Union is disbanded with eastern countries such as Hungary Poland and Ukraine being annexed by Russia. Trade occurs mainly amongst countries with strong political alliance.

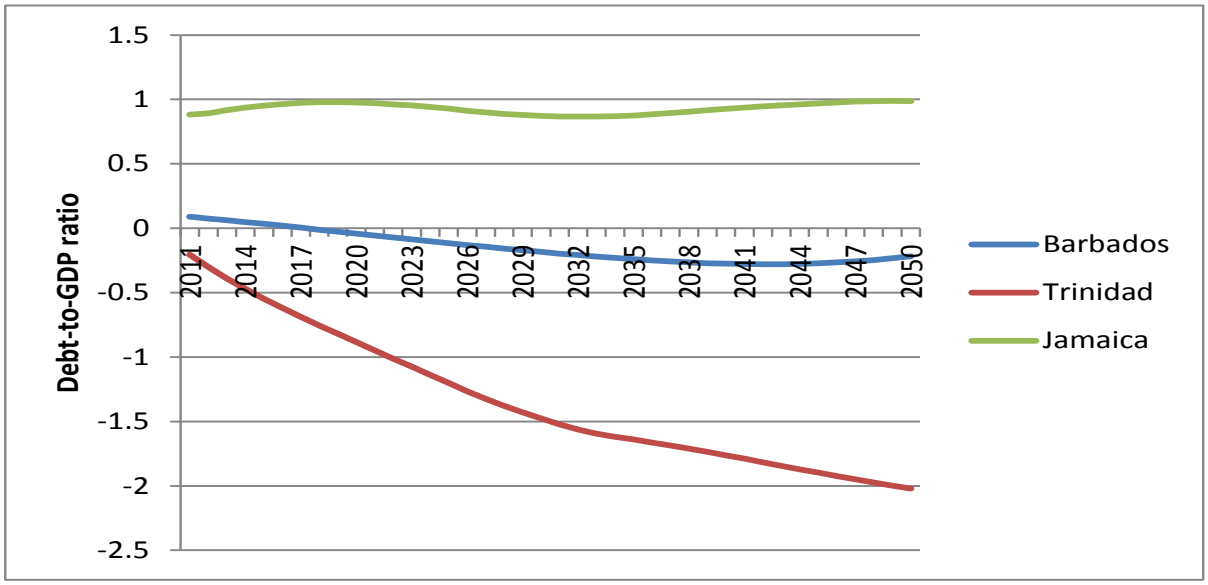


**Figure 6 Debt-to-GDP ratio 2011-2050 – Island in the Sun**

Regional integration is strained as each country faces its own economic and societal challenges making it difficult for political leaders to commit to regional agendas. The Caribbean economies struggle to maintain economic growth, and are characterised by obsolete tourism products, limited activity in financial services and agriculture. Many countries have low foreign reserve levels and are highly dependent on imports for basic goods such as food, toiletries and medicine. The demand for foreign goods and slow economic activity result in large external and internal debt. FDI is falling due to the high tensions between countries and most FDI projects originate from former colonial territories, e.g. the UK. The position of Caribbean small states is weak in the global economy and reliant on Britain and China for developmental aid. The decline in economic performance also affects the ability of government to provide basic social services for many persons.

Governance is centralised with only political officials and technocrats formally being involved in the policy making. National elections are highly divisive within countries and hinder the gains that could come from political stability and strong institutions. However, technology allows for special groups to organise mass rallies to place pressure on those in power in order for their interest to be included in policy. The central approach to policy implementation and lack of transparency result in many projects and programs being ineffective.

There is still a sizeable middle class within society but declining economic activity has widened the gap between the “haves” and the “have nots”. Many families live as extended families to use finances efficiently in order to maintain their standard of living. Many young adults migrate to the UK, South America and growing economies in West Africa seeking better employment opportunities.

The slowdown in economic growth, coupled with rising inequality, causes increased crime particularly home invasions in suburban areas. These crimes increase tensions in society. Government spending on security increases as does the size of the private-sector security sector.

Civil society has little influence on policy, with many organisations being undermined by political interference. Vulnerable groups such as the poor and the elderly are given very little support from governments or private organisations. Those who do receive benefits are usually closely politically affiliated with the ruling party at the time. Gender issues are pervasive particularly in the upper echelons of society with a large number of women in the workforce and in government but leadership and top positions are still generally held by men.

The physical infrastructure in urban and inner cities lags behind modern facilities of more developed nations. Urban housing is built around "micro" living where rooms are multipurpose in design and focused on cheap, easy to assemble units. In rural areas infrastructure is minimal and persons are actively engage in subsistence farming to cope with the increased cost and reduced amounts of imported foods.

The built infrastructure and natural spaces of the islands receive minimal maintenance with only tourist areas given special attention. Most of the local species are under threat of being endangered. Natural habitats and resources are only placed as priority when critical levels are reached.

Forestry is diminishing due to increasing deforestation. The main drivers of deforestation are increasing practice of shifting agriculture and an increasing demand for charcoal in poorer, smaller islands. Ecological communities begin to collapse and/or change drastically due to forest being cleared at an increasing rate as well as increasing invasion of invasive species, pests and diseases from South America - with limited monitoring and control. The resulting new ecological communities are composed of only a few dominant species - and so species diversity is decreasing at an increasing rate. Wildlife species have also begun to rapidly decrease in numbers as a result of decreasing habitat (due to clearing of forests) and the invasion of South American species. In addition to intensive row (non-organic) crop agriculture which pollutes both the soil and water, there is increasing shifting cultivation practiced within accessible forests terrain. There is also an increasing incidence of praedial larceny. See Table 5, Figure 7 and Figure 8.

**Table 5 Projected indicators for The Harder they Come for Barbados, Trinidad and Jamaica**

| | **Barbados** | **Trinidad** | **Jamaica** |
|---|---|---|---|
| Population | 250,690 | 1,225,900 | 3,738,200 |
| GDP per capita (US$ 2005) | 19,499 | 41,531 | 6,796 |
| Debt-to-GDP ratio | 1.09 | -3.71 | 2.46 |

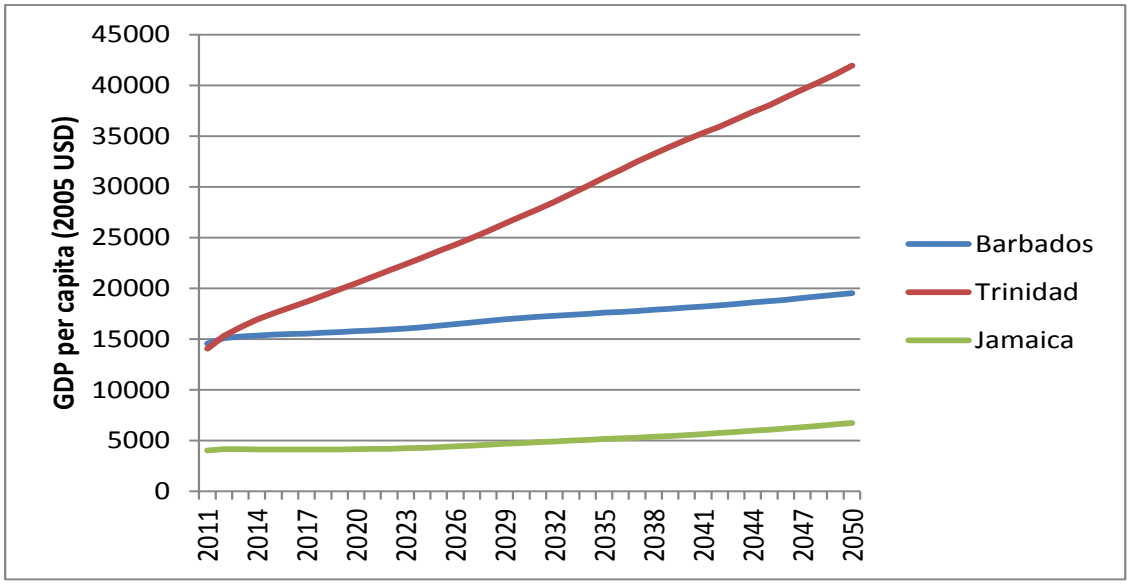


**Figure 7 GDP-per-capita (2005 USD) 2011-2050 – The Harder they Come**

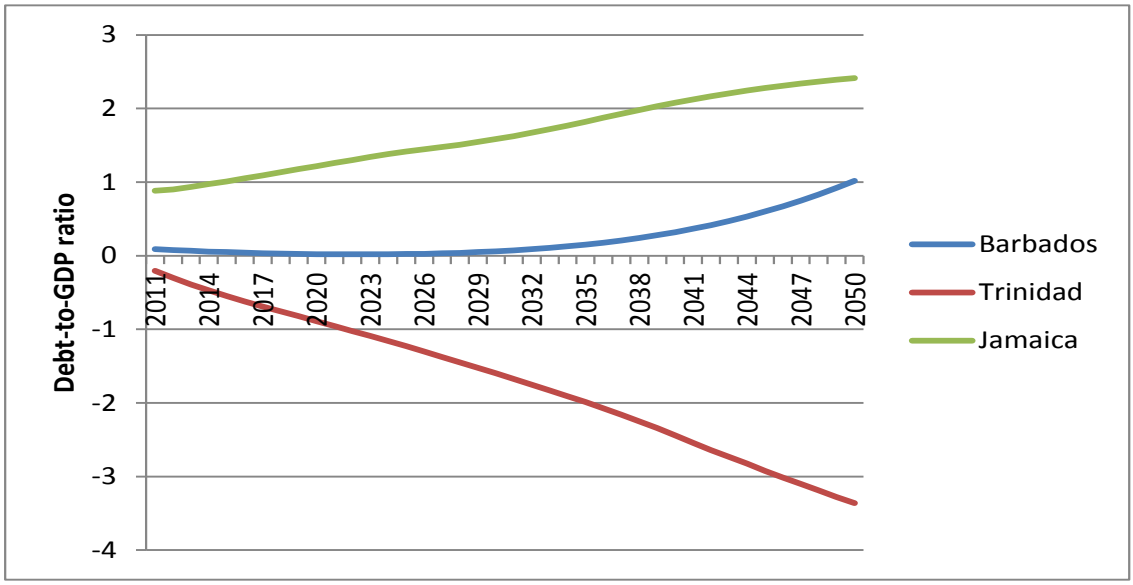


**Figure 8 Debt-to-GDP ratio 2011-2050 – The Harder they Come**

### 3.1.4 Scenario 4 "Pirates of the Caribbean" Pathway 1

The collapse of the US economy and devaluation of the US dollar has pushed most of the Western world into an economic depression. The economic downturn heightens tensions between the US and Arab extremist countries with many bio-chemical and cyber-attacks occurring. Chinese and Russian influence in global affairs grows strongly and the two countries forge close ties. Global Institutions have been disbanded due to the high distrust between countries and border security is critical to protecting limited resources. Before the collapse of the

***Sustainable Development Goals***
Some progress was being made to attain SDGs associated with poverty, education, water and climate. However by the early 2040s any progress that was made was quickly eroded. The absence of global cooperation results in the abandonment of global objectives.

US economy, countries were focused on reaching new renewable energy targets however, after the meltdown, investment into green technology was shifted towards military and defence budgets.

The worsening economic performance of the rest of the world negatively impacts the Caribbean economies. Reduced investment and limited job opportunities push many persons into poverty. Increased trafficking of drugs and arms create unstable societies where crime is the main concern for many. The reduction in trade due to the increased border security from developed nations limits the importation of key resources such as food, oil and medical supplies. Regional organisations struggle to execute their operations under limited financial support and the Caribbean Security Task Force is the only institution which is able to function relatively well.

Many Caribbean islands rely on the underground economy comprising of a large network of drug and arms distribution from South America. The Caribbean acts as one of the key transhipment points for drugs bound for West African countries. There is stagnant GDP growth throughout most of the islands, however, the underground market is growing and is almost three times the size of the formal economy. Business investment is relatively low with most companies acting as "store fronts" to launder money. Many businesses are tied to or directly linked to the drug trade and human trafficking is on the rise. Regulation is outdated and not capable of addressing the large volume of money laundering. Poverty and income inequality are at an all-time high and overall, development has slowed in many areas and wealth is concentrated amongst the elite and traffickers in society. Debt levels rise to dramatic levels forcing many Caribbean countries to impose drastic fiscal constraints and many are forced into defaults.

There is great pressure at the regional level to reduce corruption and the influence of the arms and narcotic trade on governing institutions. National governance is minimal with the judicial system being compromised by those involved in the drug and arms trade. Bribery is a common practice within the judicial courts and law enforcement. The average citizen has minimal engagement in the political process mainly from fear of the close relationship between some politicians and drug smugglers. The absence of policy to address many of society's challenges inadvertently promotes the negative effects of the drugs and arms trade on communities.

Corruption and bribery is extremely common among politicians and drug kingpins. Therefore politicians act in the interest of their funders rather in than the interest of the community. High levels of crime particularly kidnapping are occurring due to the strong gang culture. The high cost of the basic standard of living keeps many persons below the poverty line and loyal to local kingpins. The majority of the populations live in urban slums with high levels of drug abuse in adolescents and young adults. Rural-urban migration increases due to a lack of growth and incomes in urban areas. Population growth is high and growing due to the low levels of education and lack of access by many to obtain the necessary precautionary methods. Technological penetration happens at two different paces within society with penetration occurring rapidly among the elite and more slowly among the other classes in society. A strict curfew is enforced in many countries in an effort to minimise the sudden flare ups between rival gangs. Informal women's groups increase in number, in an effort to protect children and women from human and drug trafficking.

Limited investment in public infrastructure due to fiscal constraints impacts on the delivery of health services, education and transportation. Many of the region's economies spend a

significant amount of money on security and law enforcement. Provision of security services, personnel and technology is the main growth sector in the economy. Private schools and hospitals exist but are not accessible to the average citizens due to their high cost.

Environmental policy is crises-oriented rather than proactive and there is little urgency for environmental conservation. Poor water quality and regular instances of land and water pollution, particularly in inner cities and some coastal areas, exist from economic and household activities. Policy on security and law enforcement supersede all other issues.

Most forested areas have been cleared for various human uses such as agriculture, charcoal, timber and other livelihood needs. The small pieces of forest left on most islands consist of areas of inaccessible terrain. The remaining forest is highly fragmented and unable to support most species of wildlife that used to exist in the past. Most of the past ecological communities have been either destroyed or are on the verge of collapsing due to high fragmentation - with these fragments being separated and not even indirectly connected by impassable expanses by human activities. Hence species cannot migrate to other patches of forest and are isolated and disappearing. This situation is exacerbated by climate change which brings invasive species and pears from South America. Many wildlife species have gone extinct or are at the verge due to habitat loss. Shifting agriculture has become the main form of agriculture - leading to wide scale and uncontrolled destruction of forests and other natural habitat. See Table 6, Figure 9 and Figure 10.

**Table 6 Projected indicators for Pirates of the Caribbean for Barbados, Trinidad and Jamaica**

| | **Barbados** | **Trinidad** | **Jamaica** |
|---|---|---|---|
| Population | 229,370 | 1,058,770 | 2,715,800 |
| GDP per capita (US$ 2005) | 15,641 | 25,929 | 3,611 |
| Debt-to-GDP ratio | 1.82 | 0.48 | 4.72 |

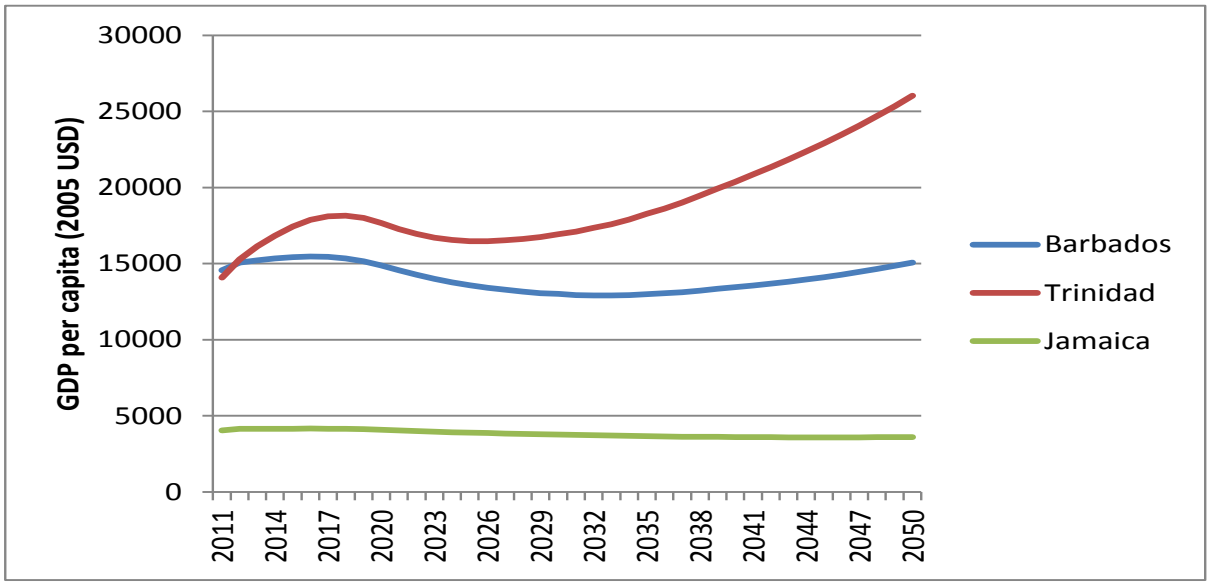


**Figure 9 GDP-per-capita (2005 USD) 2011-2050 – Pirates of the Caribbean**

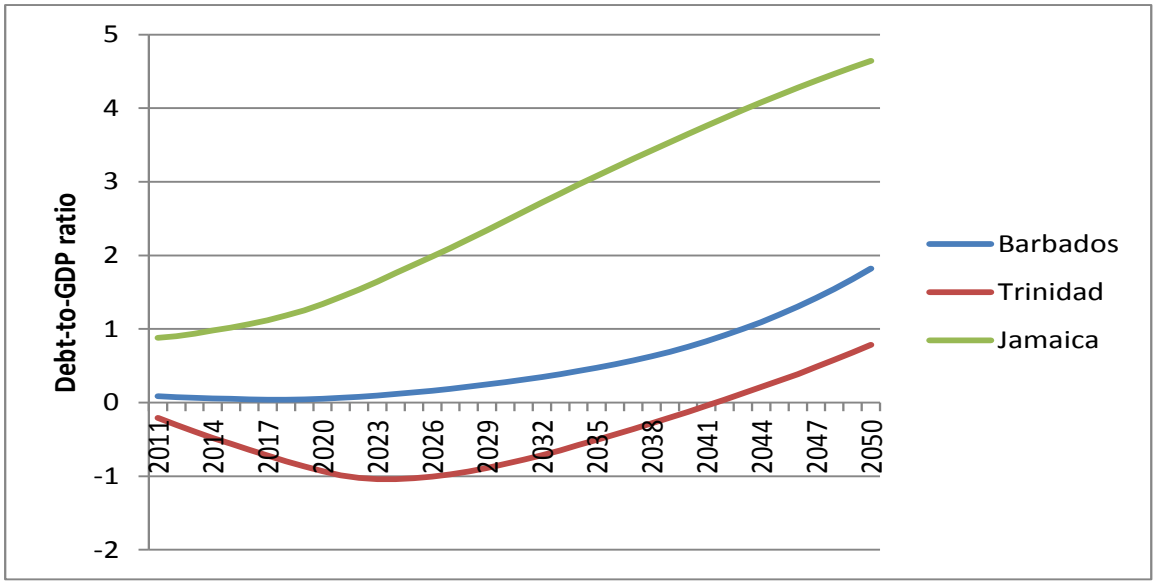


**Figure 10 Debt-to-GDP ratio 2011-2050 – Pirates of the Caribbean**

### 3.1.5 Scenario 4 "Redemption of Paradise" Pathway 2

In Scenario 4, the Caribbean faces a large external shock in the form of the economic collapse of the US, and institutions, both regional and international, fail to respond. Scenario 4 pathway 2 is a storyline in which these institutions respond more effectively to such a shock.

The US suffers economic collapse, global trade falls and much of the world enters a period of economic depression. However, some of the international institutional architecture remains in place, buttressed by additional support from emerging economies such as China and India. The centre of global power shifts eastwards and support given to developing economies flows according to the policy goals of these states.

In the Caribbean, the economic crisis creates the necessary expediency and political momentum for regional integration to become a reality, with rapid moves to economic and political integration. In the face of weak international conditions trade becomes increasingly locally-focused with Trinidad and Jamaica becoming strong regional powers. There is only a slow move away from fossil-fuels at the international level resulting in Trinidad experiencing strong revenues from its oil and gas reserves and related industries.

Public investment at both a regional and national level focuses heavily on security, although this reduces over time as the US economic collapse fades into the past. These efforts, through strong regional coordination, keep the worst excesses of criminal and drug-running enterprises at bay; although the heavy financial investment that is required in this area slows improvements in other social services such as health and education.

The collapse of western economies reduces the demand for skilled labour to migrate to these countries, reducing the migratory pull factors and also the availability of remittances from these areas. Migration increasingly becomes focused on intra-Caribbean thanks to stronger Caribbean integration, with some skilled labour moving to the emerging economies of China

and India. There is also a steady growth in intra-regional export activity facilitated by strong regional organisations.

Slow international economic growth limits foreign investment in the region and although there is domestic investment in renewable energy, fossil fuels are increasingly sourced within the region and remain a major part of the energy mix.

Tourism-based economies suffer significant short-term losses from the collapse of the western market and significant investments are required. Financing is sourced increasingly from within the region to both diversify their tourism product to a Caribbean and Asian market, and to diversify their economy based on Caribbean-wide value chains.

Governance is relatively transparent with a regional focus and acts of corruption occur infrequently but are policed and sanctioned severely. Caribbean societies start to move together due to stronger regional ties, with Trinidadian and Jamaican cultural influence predominating through the strong economic and political power that they hold. The vulnerable (poor and elderly) are given priority, however strained public finances limit the assistance that can be given and voluntary groups attempt to fill the void in services.

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# 5 APPENDICES

## 5.1 Appendix 1: Scenario key drivers

| *Driver (Critical Uncertainty)* | Cool Runnings | Island in the Sun | The Harder they Come | Pirates of the Caribbean |
|---|---|---|---|---|
| Governance | Strong governance | Strong governance, community oriented | Government is mostly stable but high level corruption scandals are prevalent amongst small groups of persons. | Weak government |
| Economic Growth | Increasing GDP growth | Moderate GDP growth | GDP growth is stagnant. | Stagnant/negative growth |
| Investment | Moderate levels of investment and high competition to attract investors | Multiple FDI projects around the region for "green activities" | FDI is low due to countries becoming more insular and increased barriers to trade. | Limited investment |
| Exports | Is increasing particularly for niche products and services | Increasing | Stagnant | Declining |
| Income Inequality | Income is normally distributed, with a large middle class, small but influential upper elite and declining lower class. | Predominantly even with pockets of very vulnerable groups | There is a still a large middle class however declining economic activity promotes the widening of the income gap between the "haves" and the "have nots". | Income is unevenly distributed. Vulnerable groups are protected by many social programs. |
| Consumption Patterns | Persons are preferential to foreign products and regard regional/local products as sub-par | Persons consume both international and regional products | Those who can afford high end consumer goods continue to the demand them but mostly there is preference for local and regional products. | There is a preference for local and regional products due to restricted imports. |
| Population Growth | Growth rates slow and fall in some countries | Growth rates fall sharply | Growth rates continue upon historic trends leading to strong growth in some regions | Growth rate slows as out-migration dominates |
| Crime | Moderate but not widespread | Minimal | Increasing slowly | High (organised crime) |
| Rate of Technology | Used actively by businesses and households | Used readily throughout society | Technology is being transferred to productive purposes at a slower rate. | High amongst elites in society and low in the other groups |
| Regional Integration | Strong | Strong (participatory approach) | Strained with a rise in nationalist policies | Weak overall, but strong in particular areas (security) |

## 5.2 Appendix 2: Scenario variable directions

| Variable | Cool Runnings | Island in the Sun | The Harder they Come | Pirates of the Caribbean |
|---|---|---|---|---|
| **GDP Growth** | ↑ | ↑ | ↓ | ↓ |
| **Income** | ↑ | ↑ | ↑↓ | ↓ |
| **Population** | ↑↓ | ↑↓ | ↓ | ↓↑ |
| **Oil Prices** | ↑↓ | ↓ | ↑ | ↑ |
| **Real Effective exchange rate** | ↑ | ↑ | ↓ | ↓ |
| **Gini coefficient** | ↑ | ↓ | ↑ | ↑ |
| **FDI** | ↑ | ↑ | ↓ | ↓ |
| **Export Level** | ↑ | ↑ | ↓ | ↓ |
| **Public Expenditure** | ↓ | ↑ | ↓ | ↓ |

## 5.3 Appendix 3: Expert interview survey template

# *Future Foresight Core Group Questionnaire*

**Objective**

The objectives of the face to face interviews are

1) To gather initial information for a regional socio-economic and political scenario for 2055.
2) Explore potential drivers in the political, social and economic sphere that could impact on the region in 2055
3) Identify how the above drivers are related to each other, their evolution from the present into the future and impact on society.
4) Suggest factors that may not have been considered as critical in the future.

**Section A- Regional Assessment**

The questions in this section are targeted to provide answers that identify a broad perspective on future trends for the region. More specifically, the questions seek to identify critical uncertainties and their respective values.

1) What key drivers/trends do you see having an influential impact on the region's society in the year 2055? ( Examples such as population growth and income distribution )
2) Describe how each driver evolves into the future. (Population growth remains steady in the near future, however, due to increased standard of living and higher levels of education population growth decreases in the long run)
3) From the drivers you identify categorise them as
    - **Low impact, low uncertainty**- driver with little importance in determining the future, and its future is somewhat predictable
    - **Low impact, high uncertainty**- driver with little importance in determine the future, and its future is highly unpredictable (**Weak signals**)
    - **High impact, low uncertainty**- driver with high importance in determining the future, and its future is somewhat predictable
    - **High impact, high uncertainty**- driver with high importance in determining the future, and its future is highly unpredictable (**Critical Uncertainty**)
4) If any of the driver(s) have been identified as high impact, high uncertainty, what values would you assign to them?(Example population growth – negative growth, exponential growth)
5) Are there any major targets you see the Caribbean reaching by 2055? (Example similar to the MDGs and SDGs currently in existence see Section D)
6) Describe the targets, if any can be identified, and what is the reasoning behind choosing such a target(s).

7) Name one highly improbable event (global/local, good/ bad) that could arise between 2055 and the present. (For example terrorist attacks on September 11th 2001)
8) How might such an event impact on the Caribbean if it occurred?
9) From a social perspective how do you see the Caribbean's society value system changing? Give reasons why you chose that type of value system. (Example individualistic vs collectivist)

**Section B- Sectoral Assessment**

The questions in this section seek to identify specific trends in your sector (economics, climate change, civil society, sociology, agriculture, and water management) that could affect the future.

10) What are some of the key and or emerging trends or challenges, in your field that could impact on the region in 2055? (Describe these trends and their impact. Example highly indebted countries leading to a collapse in the provision of social services)
11) Are there any specific factors that can be identified from the trend? (example high external debt to GDP ratios)
12) How might these trends evolve
13) What do you think are the underlying causes of these trends?

**Section C- Additional Information**

**Glossary**

| | |
|---|---|
| **Critical Uncertainty** | *A driver that is especially important in determining how the future evolves but whose future development is highly unpredictable* |
| **Driver** | *A key trend or dynamic that is most likely to determine the course of the future* |
| **Trend** | *A limited effect on the system* |
| **Weak Signal** | *A small habit that has the potential to become a mega trend. For example cell phones.* |
| **Wild Card** | *A sudden event that occurs and has the ability change the whole system* |
| **Regional Water Sector** | *All activities that relate to the research & investigation, technology consultation, planning, design, construction and management & maintenance in both public and private water sectors in damage mitigation, water supply, river environment improvement, diverse water supply sources, and groundwater protection projects around the Caribbean.* |

| | |
|---|---|
| **Water Security** | *The capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability (UN-Water,2013)* |

**Sustainable Development Goals**

| | |
|---|---|
| **Goal 1** | **End poverty in all its forms everywhere** |
| **Goal 2** | End hunger, achieve food security and improved nutrition and promote sustainable agriculture |
| **Goal 3** | Ensure healthy lives and promote well-being for all at all ages |
| **Goal 4** | Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all |
| **Goal 5** | Achieve gender equality and empower all women and girls |
| **Goal 6** | Ensure availability and sustainable management of water and sanitation for all |
| **Goal 7** | Ensure access to affordable, reliable, sustainable and modern energy for all |
| **Goal 8** | Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all |
| **Goal 9** | Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation |
| **Goal 10** | Reduce inequality within and among countries |
| **Goal 11** | Make cities and human settlements inclusive, safe, resilient and sustainable |
| **Goal 12** | Ensure sustainable consumption and production patterns |
| **Goal 13** | Take urgent action to combat climate change and its impacts* |
| **Goal 14** | Conserve and sustainably use the oceans, seas and marine resources for sustainable development |
| **Goal 15** | Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss |
| **Goal 16** | Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels |
| **Goal 17** | Strengthen the means of implementation and revitalize the global partnership for sustainable development |

**Impact, Uncertainty Graph**