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AN ASSESSMENT OF THE ECONOMIC IMPACT OF CLIMATE CHANGE ON THE COASTAL AND MARINE SECTOR IN SAINT KITTS AND NEVIS

NOTES AND EXPLANATIONS OF SYMBOLS:

The following symbols have been used in the present study:

A full stop (.) is used to indicate decimals

n.a. is used to indicate that data are not available

The use of a hyphen (-) between years, for example, 2010-2019, signifies an annual average for the calendar years involved, including the beginning and ending years, unless otherwise specified.

The word "dollar" refers to United States dollars, unless otherwise specified.

The term "billion" refers to a thousand million.

The boundaries and names shown and the designations used on maps do not imply official endorsement or acceptance by the United Nations.

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EXECUTIVE SUMMARY

Owing to their high vulnerability and low adaptive capacity, Caribbean islands have legitimate concerns about their future, based on observational records, experience with current patterns and consequences of climate variability, and climate model projections. Although emitting less than 1% of global greenhouse gases, islands from the region have already perceived a need to reallocate scarce resources away from economic development and poverty alleviation, and towards the implementation of strategies to adapt to the growing threats posed by global warming (Nurse and Moore, 2005).

The objectives of this Report are to conduct economic analyses of the projected impacts of climate change to 2050, within the context of the IPCC A2 and B2 scenarios, on the coastal and marine resources of St. Kitts and Nevis (SKN). The Report presents a valuation of coastal and marine services; quantitative and qualitative estimates of climate change impacts on the coastal zone; and recommendations for possible adaptation strategies and costs and benefits of adaptation.

A multi-pronged approach is employed to valuing the marine and coastal sector. Direct use and indirect use values are estimated. The amount of economic activity an ecosystem service generates in the local economy underpins estimation of direct use values. Tourism and fisheries are valued using the framework developed by the World Resources Institute. Biodiversity, an indirect use value, is determined in terms of the ecological functions it provides, such as climate regulation, shoreline protection, water supply erosion control and sediment retention, and biological control, among others.

Estimates of future losses to the coastal zone from climate change are determined by considering: (1) the effect of sea level rise and coral reef decline on coastal lands; and (2) the effect of a rise in sea surface temperature (SST) on coastal waters. Discount rates of 1%, 2% and 4% are employed to analyse all loss estimates in present value terms.

The overall value for the coastal and marine sector are USD $342.4 million (mn). As a ratio to SKN's 2008 GDP, the sector's size is 60%. Biodiversity comprises almost 78% of the value of the sector.

By 2050, the effects of climate change on coastal lands are projected to be $1,026.4 mn and $832 mn under the A2 and B2 scenarios respectively. In present value terms, if A2 occurs, losses range from $197.7-$657.8 mn and if B2 occurs, losses range from $160.2-$547.8 mn. With respect to coastal waters, estimated costs of a rise in SST by 2050 indicate losses between $646.8 mn and $1,034.9 mn Assuming a discount rate of 4%, losses are $124.6 mn for the B2 scenario and $199.3 mn for the A2 scenario. If a discount rate of 1% is assumed, estimated losses are much greater, ranging; $425.9 mn under B2 and 684.4 under A2. When taken together, overall losses to the coastal and marine sector by 2050 are $1.479 billion under B2 and $2.061 billion under A2. In present values, losses range from $284.8-$973.7 mn under B2 and $397.0-$1,357.2 mn under A2, depending on the discount rate employed.

Factoring in projected climate change impacts, the net present value of the coastal and marine sector suggests that the costs of climate change exceed the sector's current value for nearly all scenarios, assuming discount rates of 1%, 2% ad 4%; the only exception is for the B2 scenario using a discount rate of 4%.

The study also developed a baseline or "business as usual" (BAU) pathway—the "no climate change" trajectory—for the value of the coastal and marine sector up to 2050. Under BAU the sector is predicted to have a value of $1.115 billion by 2050. When comparing the trajectory of the sector's value "with climate change", that is, under the A2 and B2 climate change scenarios, with little exception, the sector's value is negative.

Since SKN emits minimal greenhouse gases, but will be greatly affected by climate change, the Report focuses on adaptation as opposed to mitigation strategies. The options shortlisted are: (1) Enhance monitoring of all coastal waters to collect a variety of data, including water temperature and salinity for early warning; (2) introducing artificial reefs or fish-aggregating devices; (3) introducing alternative tourist attractions; (4) providing retraining for displaced tourism workers; and (5) increasing recommended design wind speeds for new tourism-related structures.

Of the 5 options considered 4 had benefit-cost ratios of at least 1 over a 20-year horizon: option 1; option 2; option 3; and option 5. While option 4 has a ratio below 1, once non-tangible benefits are included in the analysis it is quite likely that this ratio might easily rise above 1. Indeed, while retraining workers might not be cost-effective, in terms of the national well-being, the option might still be considered ultimately viable.

I. INTRODUCTION

The Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report (AR3) noted that small island states, such as those in the Caribbean, share many similarities (e.g., physical size, proneness to natural disasters and climate extremes, extreme openness of their economies, low adaptive capacity) that enhance their vulnerability and reduce their resilience to climate variability and change.

Observational data showed a global mean temperature increase of around 0.6°C during the 20th century. Notably, the rate of increase in air temperature in the Caribbean during the 20th century exceeded the global average. Mean sea level rose by about 2 mm/year, although sea-level trends are complicated by local tectonics and El Niño-Southern Oscillation (ENSO) events, an interaction between pronounced temperature anomalies and sea-level pressure gradients in the equatorial Pacific Ocean, with an average periodicity of 2 to 7 years. The AR3 also found much of the rainfall variability appeared to be closely related to ENSO events, combined with seasonal and decadal changes in the convergence zones.

Owing to their high vulnerability and low adaptive capacity, Caribbean islands have legitimate concerns about their future, based on observational records, experience with current patterns and consequences of climate variability, and climate model projections. Although emitting less than 1% of global greenhouse gases, islands from the region have already perceived a need to reallocate scarce resources away from economic development and poverty alleviation, and towards the implementation of strategies to adapt to the growing threats posed by global warming (Nurse and Moore, 2005).

The TAR reported that sea level is projected to rise at an average rate of about 5.0 mm/year over the 21st century, and concluded that sea-level change of this magnitude would pose great challenges and high risk, especially to low-lying islands that might not be able to adapt (Nurse and others, 2001). Given the sea level and temperature projections for the next 50 to 100 years, coupled with other anthropogenic stresses, the coastal assets of the Caribbean (e.g., coral reefs, mangroves, sea grasses and reef fish), would be at great risk. As the natural resilience of coastal areas may be reduced, the costs of adaptation could be expected to increase. Moreover, anticipated land loss, soil salinisation and low water availability would most likely threaten the sustainability of island agriculture and food security.

In addition, the AR3 noted that most settlements and infrastructure of island states are located in coastal areas, which are highly vulnerable not only to sea-level rise but also to high