IAIA Special Symposium
Sustainable Mega-Infrastructure and Impact Assessment

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ERM

The world's leading sustainability consultancy

Scope

- What the Challenge is when it comes to Climate Change in Mega-Projects?
- Drivers for action
- What are the tools available to address these issues?
- Drawing the big picture - the adoption of a life-cycle approach
- The cases

The Challenge

- There is no causal nexus between emissions of a project and Global climate change at a regional scale

- Most projects prepare a GHG inventory covering construction and operation and apply mitigation measures that are cost effective

Mega Projects

- Mega Projects are expected to last more than 50 years and be resilient to changes in environmental conditions

- In most of the world licensing applies historical weather behavior to predict future climate and asses potential impacts

Drivers/pressures for Climate Change Analysis

Emerging Market for less carbon intensive sources

- Cost effectiveness of renewables and natural gas will promote less carbon intensive sources in some markets
- Emerging technologies reshaping projects

Environmental Impact

- Resilience of assets (i.e. infrastructure) operating for longer periods of time
- Potential for emission reductions from less carbon intensive sources from a life cycle perspective

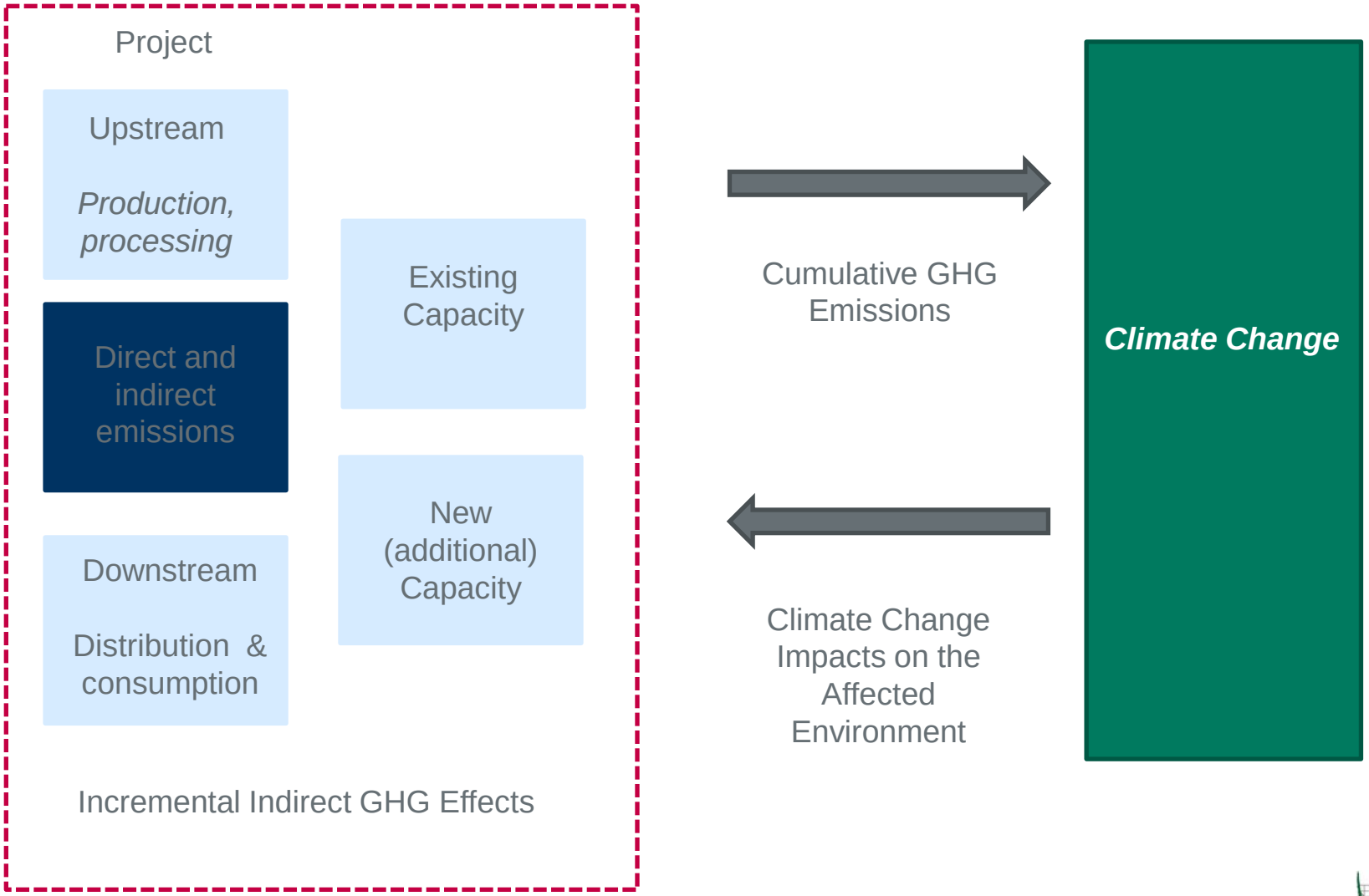
Regulations and Policies

- Emerging regulations on quantification of GHG and Climate change impacts in infrastructure projects
- Focus on reduction of costs and emissions (energy efficiency)
- National Adaptation Plans are being designed in many countires

Stakeholders

- Increased awareness on climate change impacts and the role to be played by all economic agents
- Need to be prepared for natural disasters. Resilience of the whole region where a Mega Project is implemented

ERM's Approach



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ERM's Approach

Task 1: Scenarios and Data Gathering

- Determine the project and alternative scenarios
- Gather information to evaluate project, upstream and downstream emission

Alternative Scenarios

Task 2: GHG Emission Assessment

- Evaluate project and alternative scenarios
- Consolidate direct impacts from construction and operations
- Evaluate indirect emissions from upstream and downstream use

Direct and Indirect GHG Emission Profile for project and alternatives

Task 3: Climate Impacts

- Identify appropriate regional downscaled model
- Identify appropriate parameters (i.e. temperature, precipitation etc.)
- Incorporate Climate change projections into environmental analysis

GHG and Climate Change Impact Analysis

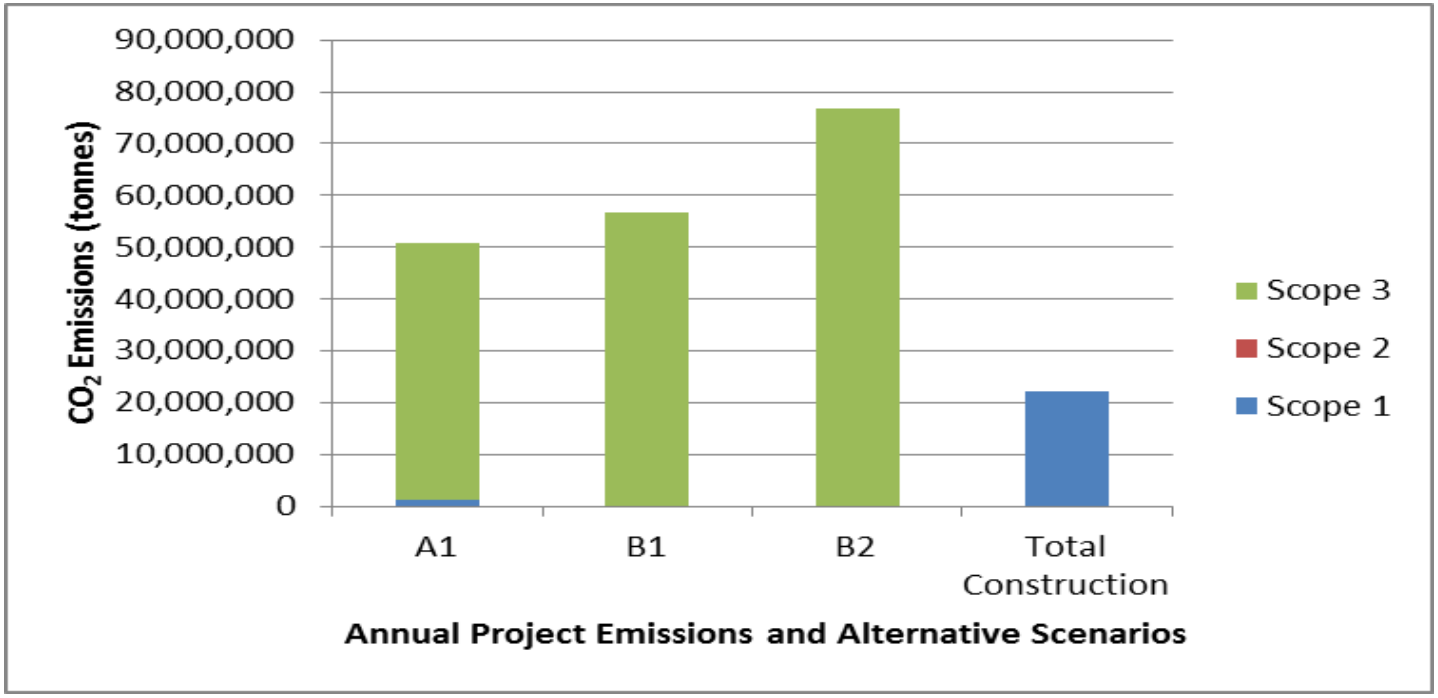
Task 4: Climate Change Management plan

- Timeline and scope
- Monitoring and deriving KPIs
- Mitigation and Adaptation Measures
- Preparedness for Disaster

Climate Change Management Plan

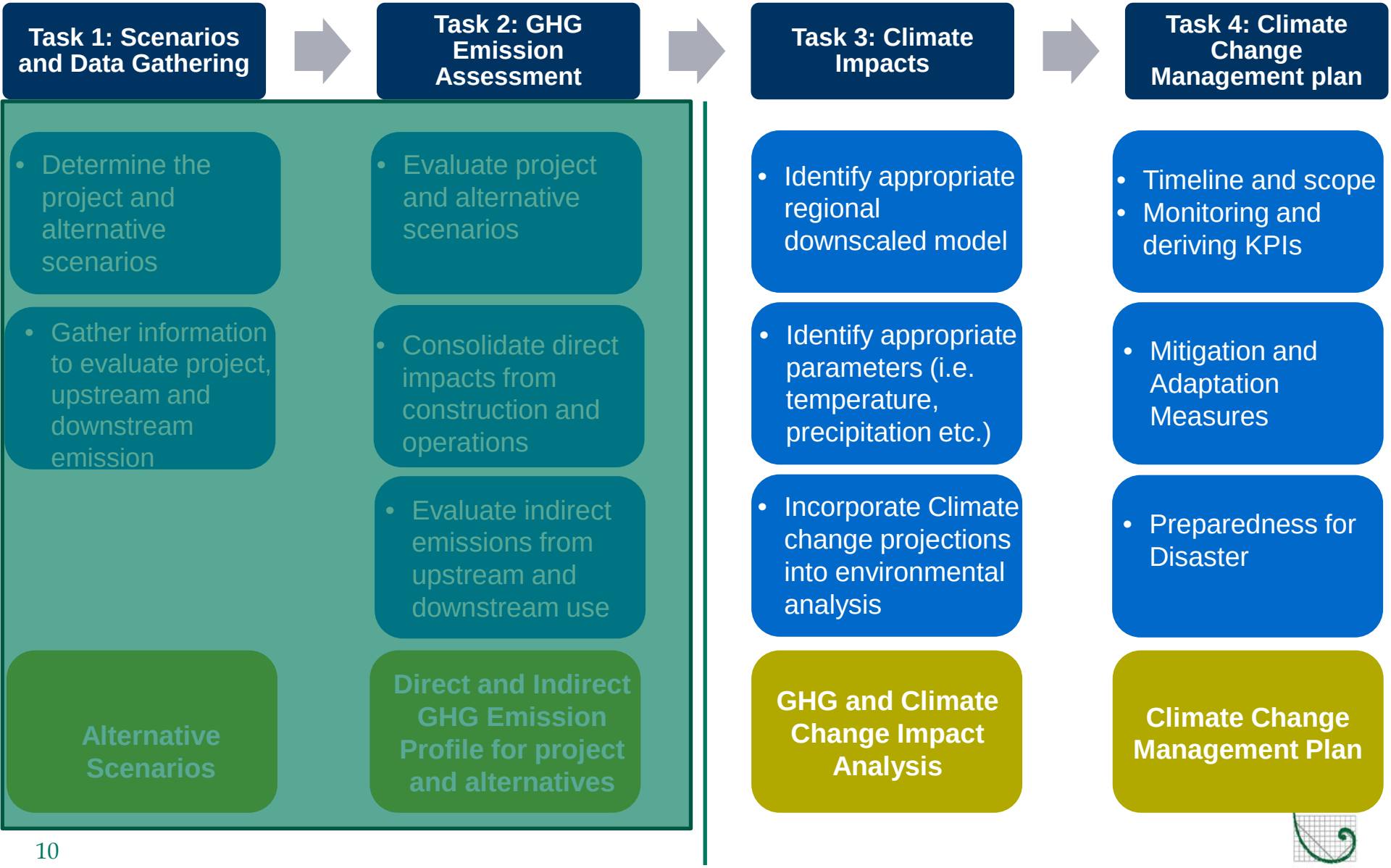
Case Studies: Nicaragua Canal

Indirect Emissions – project and alternatives: graph



Scenario A1 represents the annual total emissions from operation of the Project (Scopes 1, 2, and 3). Scenarios B1 (cape Horn) and B2 (train from Los Angeles Port) represent the alternative scenarios to the Project (not constructing the canal; emissions from ships and trains in alternative routes). On the right of the graph, the blue series represents the total cumulative Scope 1 emissions during construction only for reference.

ERM's Approach



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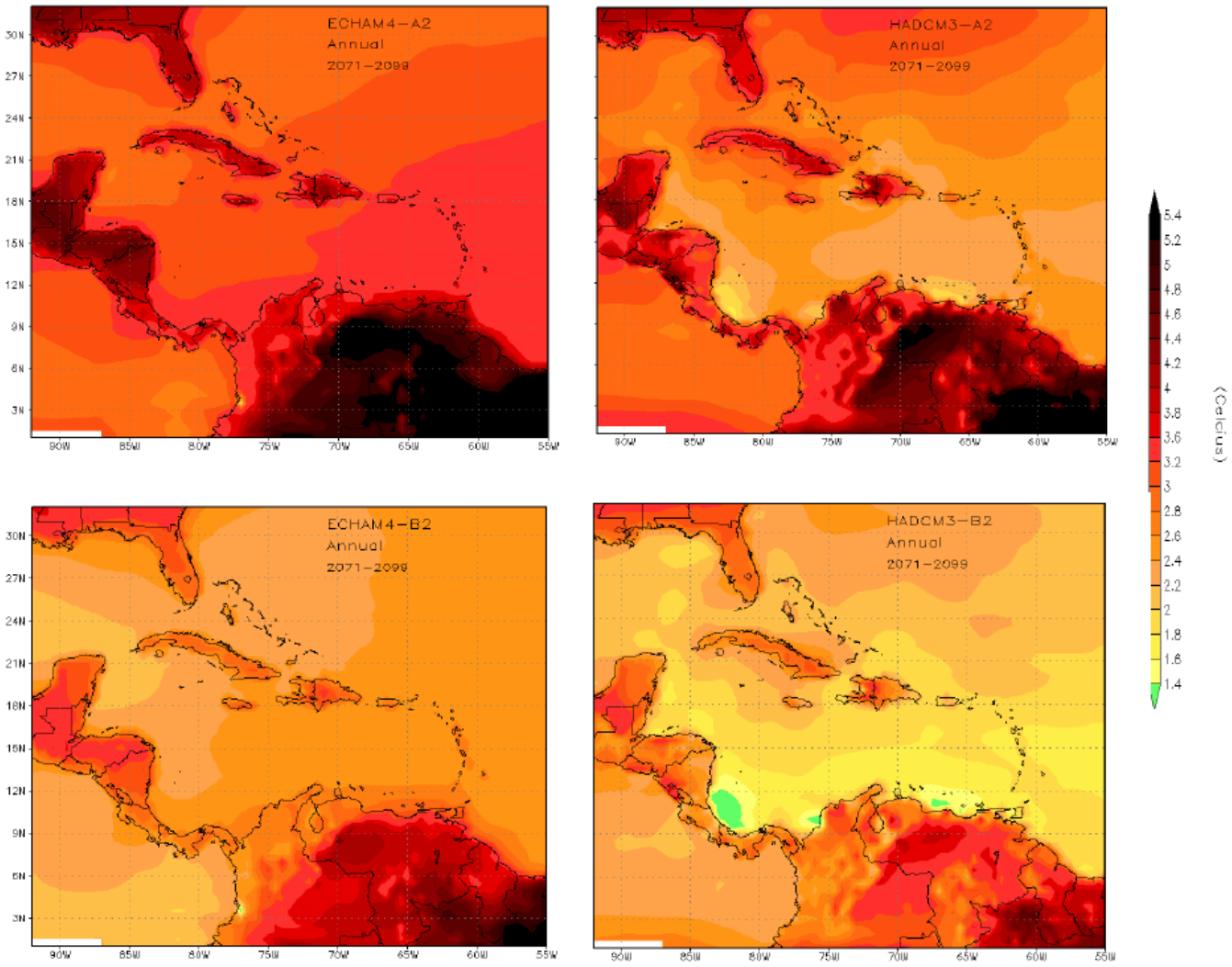
Public Climate Models downscaling resolution from ~250 to 25-50 km



Mean changes at the 1.5m altitude of the annual temperature change for 2071-2099 period as simulated by PRECISECHAM4 and PRECISHadCM3 for SRESA2 and SRESB2.

A Study of the Uncertainty in Future Caribbean Climate Using the PRECIS Regional Climate Model
By Abel Centella and Arnoldo Bezanilla Institute of Meteorology, Cuba & Kenrick R. Leslie Caribbean Community Climate Change Centre, Belize

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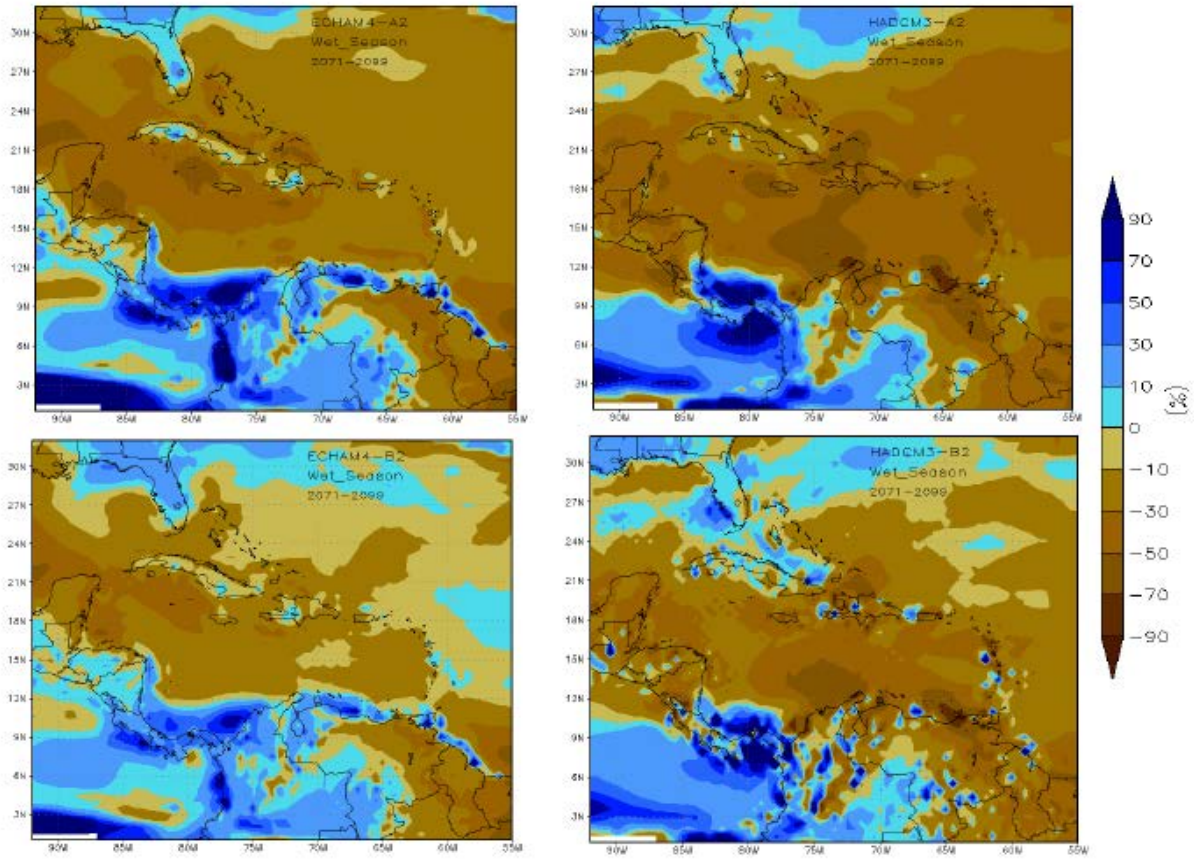

Wet Season annual mean changes in precipitation (%) for 20712099
as simulated by PRECISECHAM4 and PRECISHadCM3 for SRESA2 and SRESB2 emission scenarios.

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Cumulative Effects of Climate Change that could affect Infrastructure

Resource	Are there potential Material Impact from Cumulative Effect of Climate Change?	Management Plans
Geological Resources	Potentially The projected climate effects may require a change or revision on impacts to geological resources, specifically on potential of slips, landslides and flooding as a result of increasing precipitation. A more detailed study on climate change effects may be required on the impacts to geological resources.	Best Management Practices (BMPs) will be developed for flooding and landslides, however revisions may be required to incorporate variation from future climate change effects.
Soils	Potentially The projected climate effects may require a change or revision on the impacts to soils, particularly for soil erosion as a result of increased precipitation. A more detailed study on climate change effects may be required on the impacts to soils.	Changes in the management plan may be needed to adequately address the potential impacts due to climate change on soils.

Cumulative Effects of Climate Change that could affect the environment

Resource	Are there potential Material Impact from Cumulative Effect of Climate Change?	Management Plans
Wildlife	Potentially The projected climate effects may require a change or revision on impacts to some wildlife species such as endangered species and species with sensitive habitats. A more detailed study on climate change effects may be required on the impacts to endangered species and their habitats.	As a result, changes in the management plan may be needed to adequately address the potential impacts due to climate change on wildlife.
Vegetation	Potentially The projected climate effects may require a change or revision on impacts to some vegetation since the pipeline crosses through sensitive vegetative communities. Some of these vegetative communities are sensitive to temperature or are unique and can only be found in that geography. A more detailed study on climate change effects may be required on the impacts to endangered species and their habitats.	Conservation and mitigation plans are currently being developed in conjunction with agency consultation. These plans may potentially need revision to include cumulative effects of climate change.
Fisheries	Potentially The projected climate effects may require a change or revision on impacts to Fisheries, specifically on the impact on recreational fisheries. A more detailed study on climate change effects may be required on the impacts to recreational fisheries.	Changes in the management plan may be needed to adequately address the potential impacts due to climate change on recreational fisheries.

Additional Management Measures

- Depending on the results from the analysis of cumulative impacts from climate change on the infrastructure, incorporation of safeguards in the project that shall ensure resilience of the infrastructure under these new circumstances
- A revision in the monitoring plan to follow closely the actual changes in physical parameters that could affect the infrastructure and the environment
- The preparation of an adaptation plan for the environment involving local authorities. impacts to the environment will most likely affect not only the area of the project's infrastructure.
- To be prepared for disasters originated from climate extreme events or derived events. An action plan to face floods, lightning strikes, storms and other extreme weather events must be developed and the cost of the required infrastructure must be determined. Preparedness for disaster is a means to reduce risks, costs and interruption of operations.

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