POWER SECTOR RESILIENCE

SYSTEM PLANNING APPROACH

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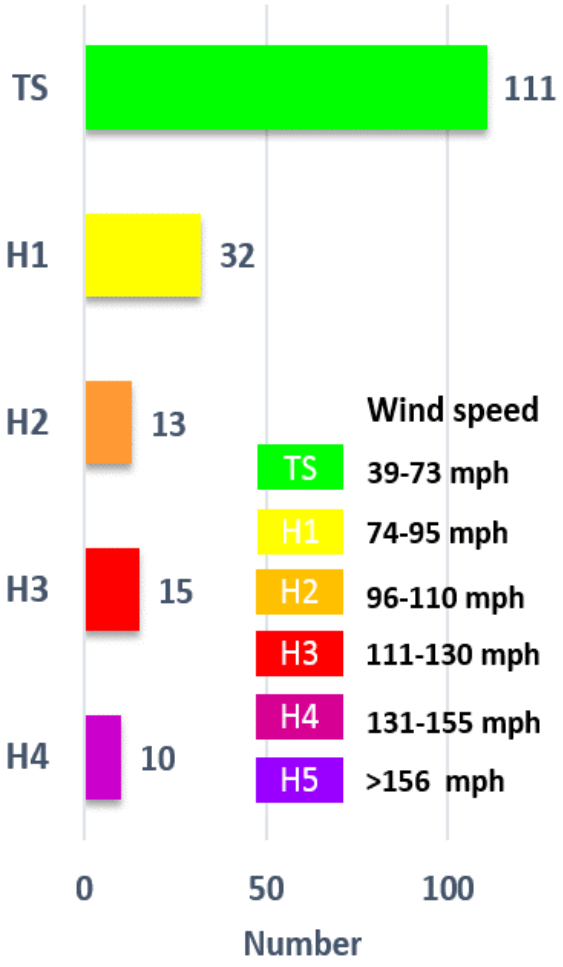
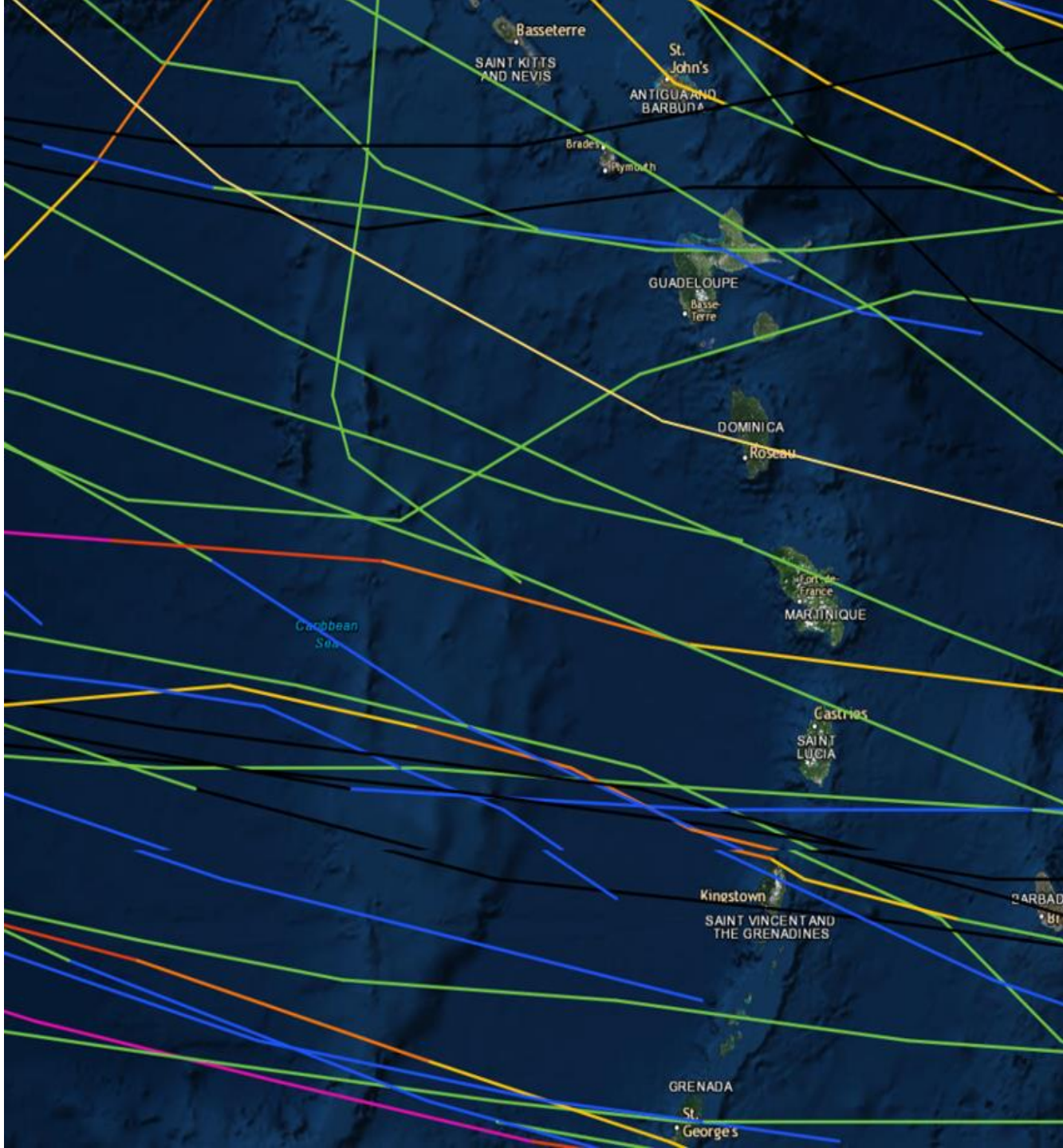
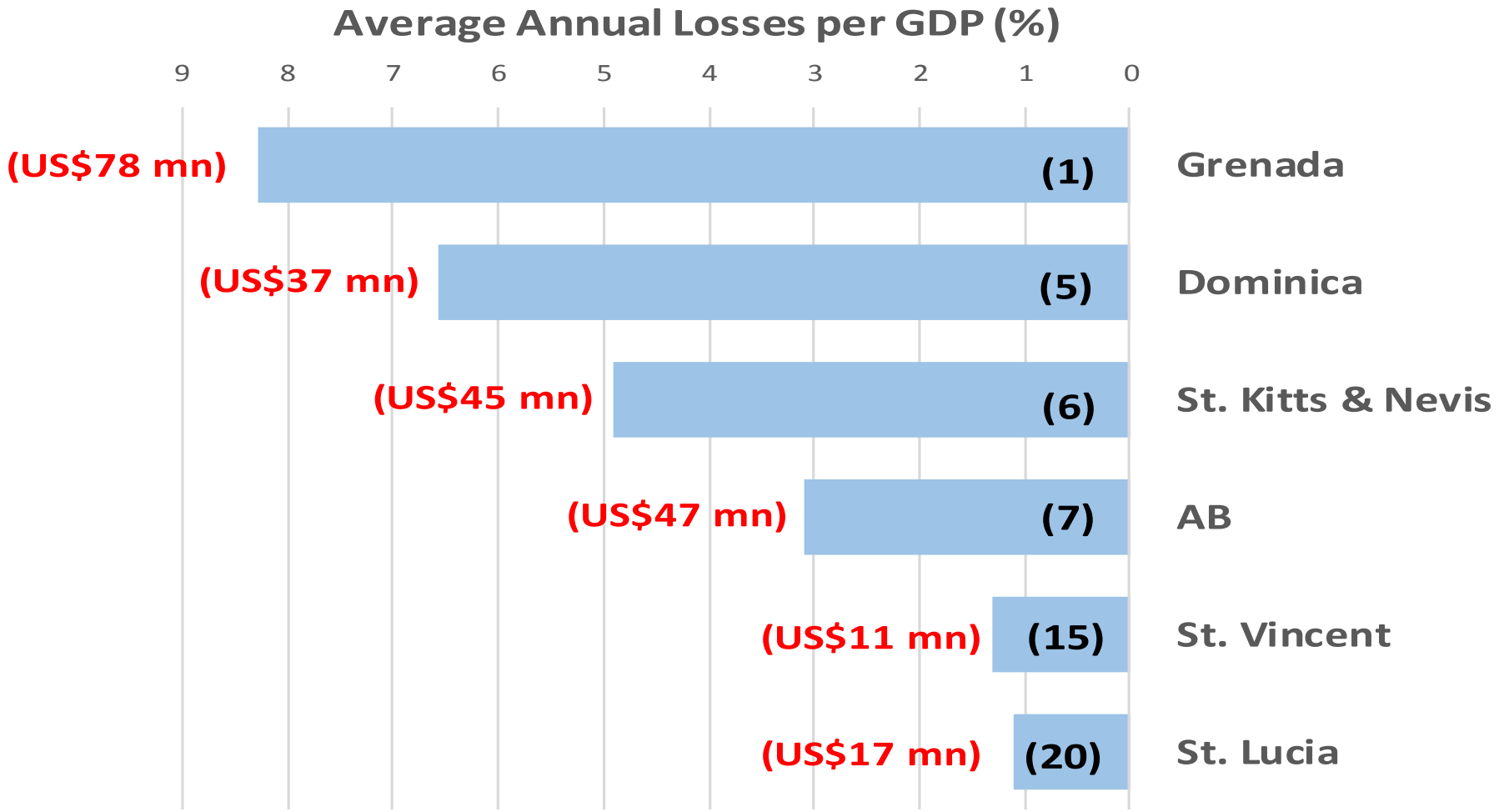
Hurricanes& Storms 2000-2015





Economic Losses from Extreme Weather Ranks OECS in the Top 20 Globally

Source: *Climate Risk Index (1995-2014)*



- *(#) indicate Global Ranking of 183 countries and territories evaluated*
- *Losses (in PPP) are average figure (1995-2014)*

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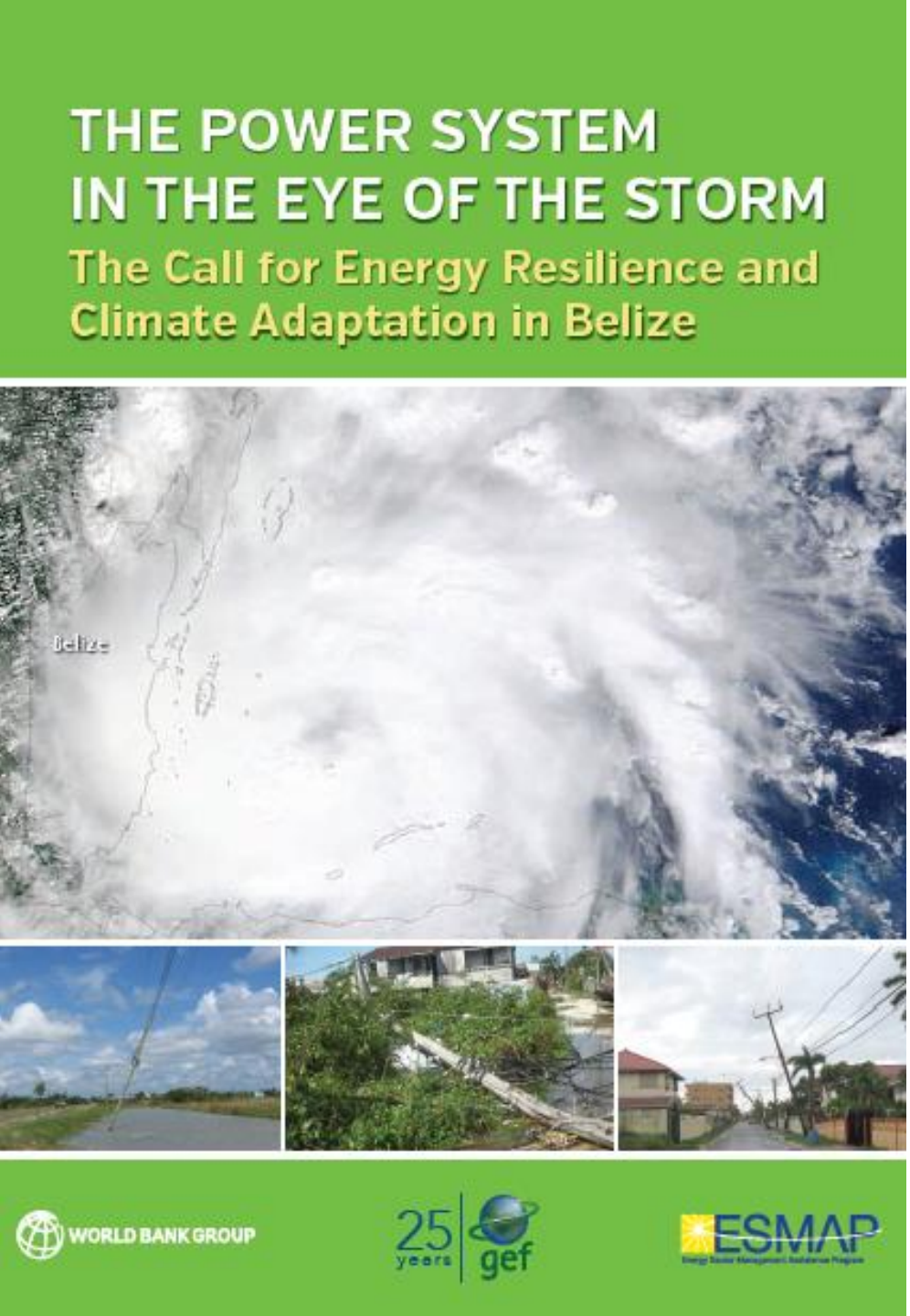
Energy & Extractives

OECS Power Systems are Vulnerable

- **BARBUDA:** Hurricane Irma (2017) destroyed the entire electrical grid and severely damaged the island's generation assets. Estimate damage amounts to nearly $130 million
- **DOMINICA:** Hurricane Maria (2017) damaged about 98 percent of the power transmission and distribution (T&D) network in Dominica
- **GRENADA:** Hurricane Ivan (2004) caused damages to 80% of electricity distribution system, left 75% resident w/o power, damages of $26m and losses of $8m.
- **ANTIGUA:** Hurricane Earl (2010) led to significant outages mostly due to fallen trees on power lines.
- **SAINT LUCIA:** Tropical Storm (2013) produced excessive rain & flooding leading to T&D damages leaving 15% customers without power.

WB Engagement on Energy resilience



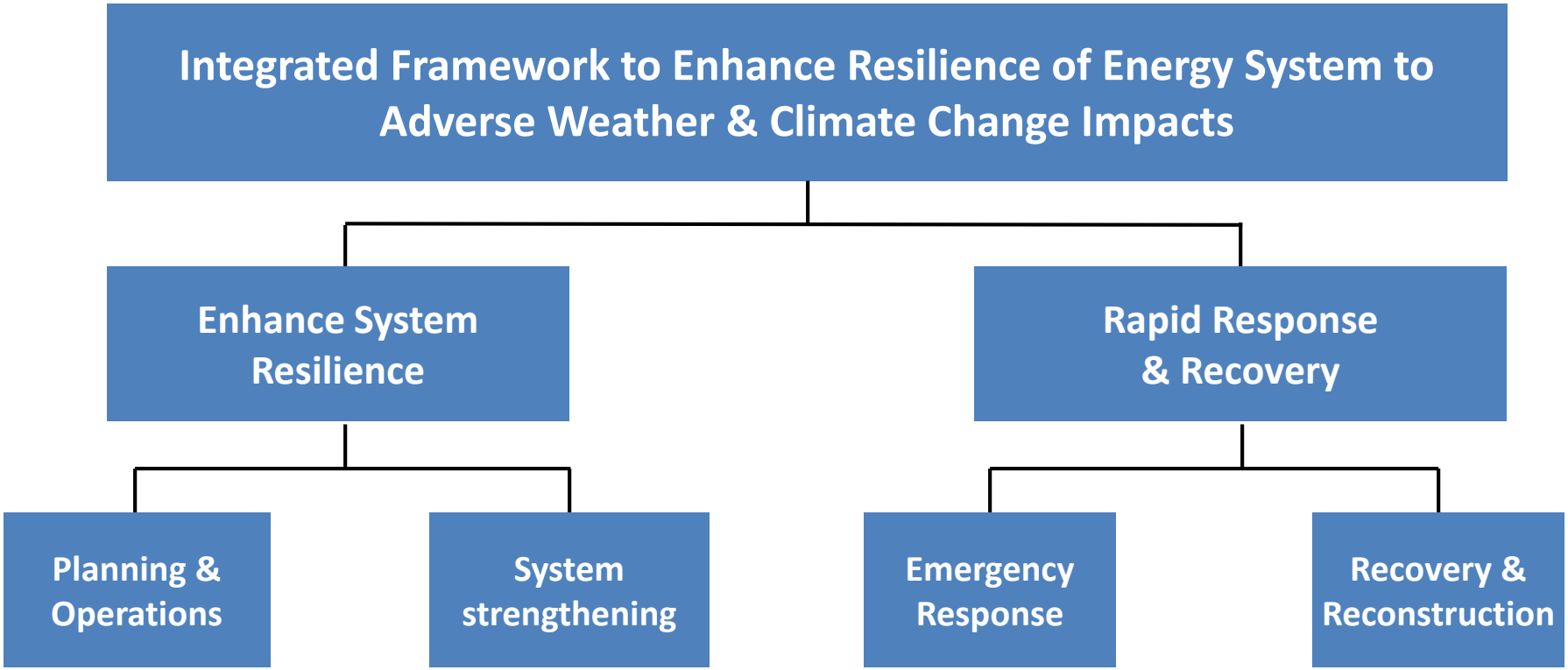
BELIZE

- Mapped the impact of storms
- Evaluated the vulnerabilities of the power system
- Helped develop solutions for enhancing energy resilience
- Led to Energy Resilience for Climate Adaptation Project (ERCAP)

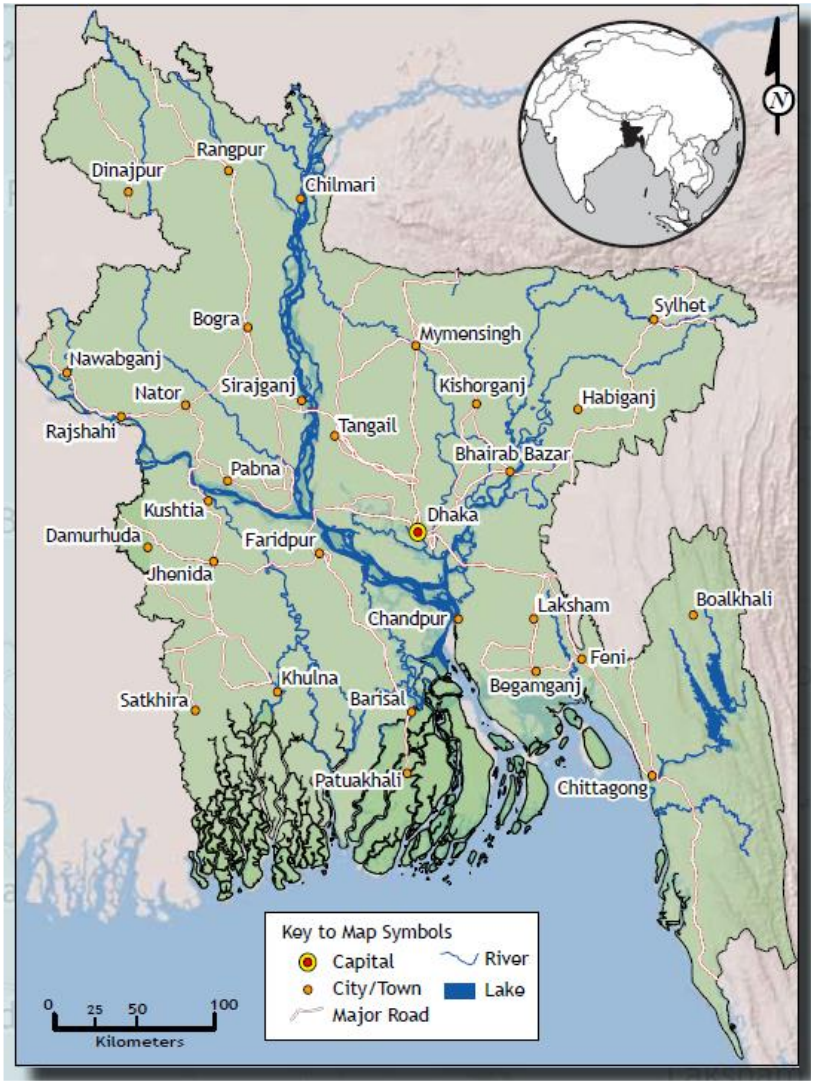
WB Caribbean Energy Resilience Program

- **Objective:** Provide timely support to OECS utilities and policy-makers to build power networks which are resilient to climate-related risks as well as design rapid response and recovery mechanisms to tackle future extreme weather events.
- **Current Country Engagement:** Saint Lucia, Saint Vincent and Grenadines, Antigua and Barbuda, Saint Kitts and Nevis
- **Timeline:** Two year technical assistance program. Subsequent investments expected.
- **Output**: Comprehensive and customized recommendations for enhancing energy resilience and climate adaptation leading to country-specific resilient infrastructure investments

WB Caribbean Energy Resilience Program



BANGLADESH



Power System Planning & Climate Adaptation

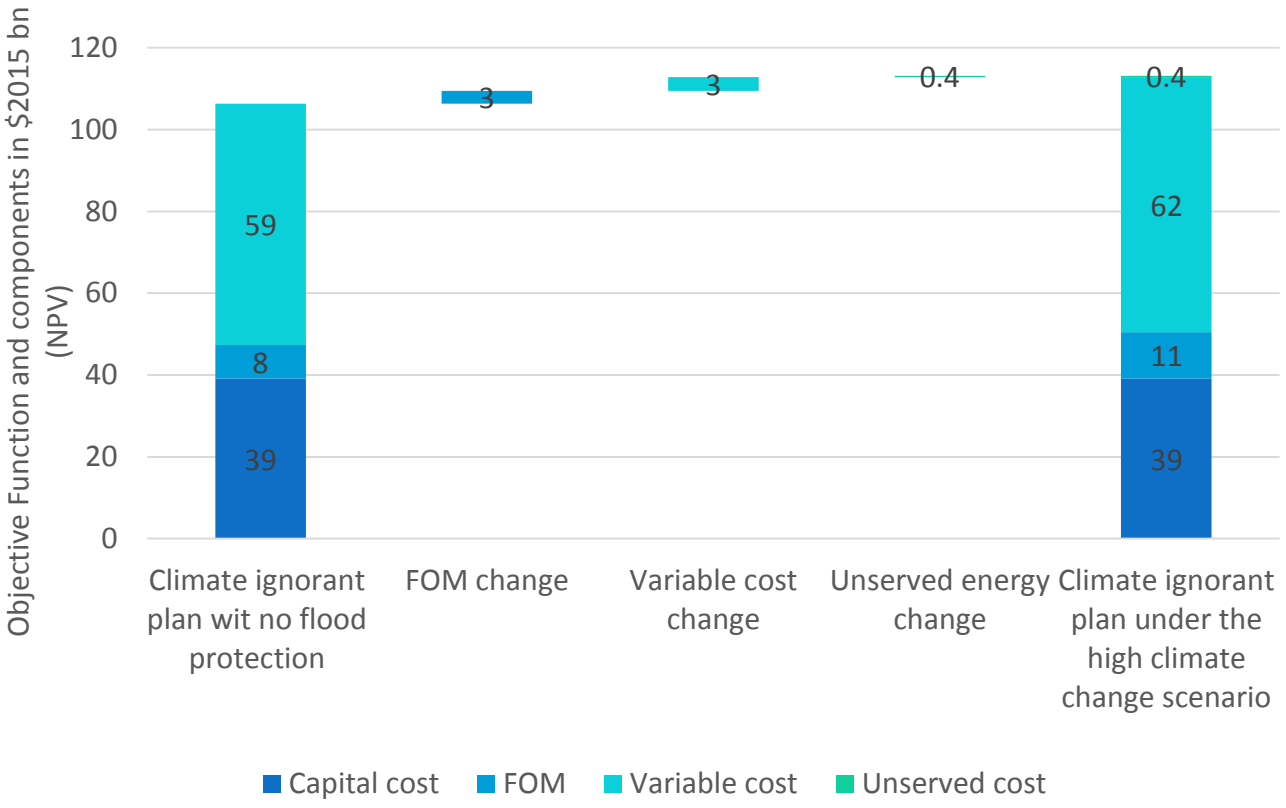
- Long-term assessment of electricity demand, supply options to determine infrastructure investment needs, generation mix, broad siting of infrastructure (generation & transmission)
  - Output - investment decisions in specific generation, transmission projects.
- CC impacts demand, generation efficiency, cooling water availability, site viability etc.
- **System planning is a priority:**
  - long term climate change impacts & longevity of investments under power system plan
  - strengthen planning process & avoid future lock-in
  - critical in countries with infrastructure gap & significant pipeline of new investments

Climate-resilient system planning: Bangladesh

6% increase in NPV if climate is ignored but High climate change projections realized:

- 46% of the increase due to flood damage
- 54% due to re-dispatch to accommodate flooding outages, derates, and cooling demand

Note: analysis did not consider possible adjustment in generation siting/mix investment



Climate-informed plan leads to prioritization of investments in less flood prone areas early in the horizon and then shift from coal capacity to interconnection and natural gas later in the horizon (2016-41). (World Bank, 2017)

Climate-resilient power system