Evaluating Climate Change Adaptation for the Maldives' Tourism Industry

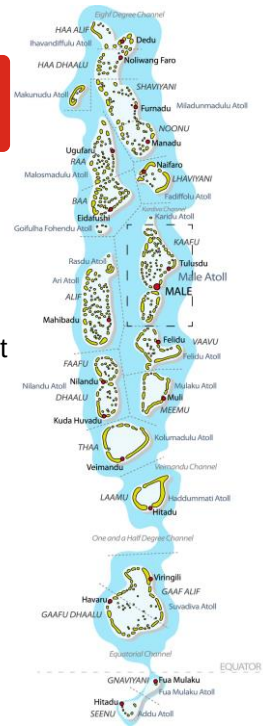
Adaptation Future
May 12, 2016

Project Objective

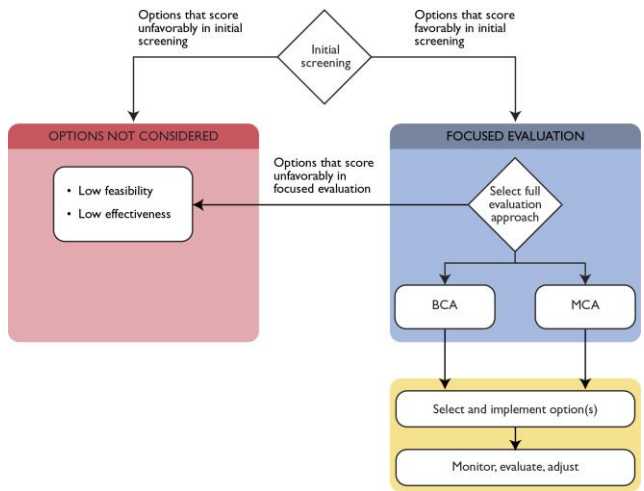
- Client: United Nations Development Program – Maldives and the Maldives Tourism Adaptation Project
- Objective: Economically evaluate climate change adaptation for the tourism industry in the Maldives

Background

- Geography
  - About 1,190 small coral islands
- Economy
  - Tourism is about 30% of direct GDP; about 70% of direct and indirect GDP
- Climate change
  - Sea level rise
  - Increase in air and sea-surface temperature
  - Extreme events



Methods



Multi-criteria analysis (MCA)

MCA Evaluation Criteria

- **Effectiveness** – *extent to which the adaptation options reduce vulnerability*
- **Feasibility** – *ability to implement the adaptation options based on technical and financial capacity, political support, and cultural alignment*
- **Additional benefits** – *indirect benefits of the adaptation options, such as ecological or social benefits*
- **Flexibility** – *ability to adjust the adaptation options to respond to evolving conditions and information*
- **Robustness** – *ability of the adaptation options to perform under a wide range of possible climate futures*
- **Relative cost** – *relative cost of the adaptation options, financial, capital and O&M costs*
- **Indirect costs** – *non-financial costs of the adaptation options, such as ecological or social costs*
- **Implementation timing** – *if the adaptation options should be developed and implemented now or in the future*

Scoring Adaptation Options

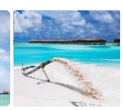
Perspec-tive	Effective	Feasible	Co-benefits	Flexible	Robust	Relative cost	Indirect cost	Overall score
Coastal vegetation buffer								
Public	High	Moderate	High	Moderate	Moderate	Moderate	High	22.8
Private	High	Moderate	High	Moderate	Moderate	Moderate	Moderate	24.6
Coral reef protection								
Public	High	High	High	Low	High	Low	Low	28.0
Private	High	Moderate	High	Moderate	Moderate	Moderate	Moderate	24.3
Beach nourishment								
Public	Moderate	Moderate	High	High	Moderate	Moderate	High	22.5
Private	High	High	High	High	High	Moderate	High	25.0

MCA Findings

Public sector	Score	Private sector	Score
Coral reef protection	28.00	Beach nourishment	25.00
Coastal vegetation buffer	22.83	Coastal vegetation buffer	24.60
Beach nourishment	22.50	Coral reef protection	24.25
Land use set back zones	19.00	Artificial coral reefs	22.17
Elevated buildings	17.50	Land use set back zones	22.00
Artificial coral reefs	16.83	Land reclamation	21.50
Land reclamation	16.75	Seawalls	18.00
Seawalls	16.50	Elevated buildings	14.50








MCA Findings

Stakeholder preference for soft, coastal protection adaptation options

Public sector	Score	Private sector	Score
Coral reef protection	28.00	Beach nourishment	25.00
Coastal vegetation buffer	22.83	Coastal vegetation buffer	24.60
Beach nourishment	22.50	Coral reef protection	24.25
Land use set back zones	19.00	Artificial coral reefs	22.17
Elevated buildings	17.50	Land use set back zones	22.00
Artificial coral reefs	16.83	Land reclamation	21.50
Land reclamation	16.75	Seawalls	18.00
Seawalls	16.50	Elevated buildings	14.50



MCA Findings

Stakeholder aversion to hard coastal protection adaptation options

Public sector	Score	Private sector	Score
Coral reef protection	28.00	Beach nourishment	25.00
Coastal vegetation buffer	22.83	Coastal vegetation buffer	24.60
Beach nourishment	22.50	Coral reef protection	24.25
Land use set back zones	19.00	Artificial coral reefs	22.17
Elevated buildings	17.50	Land use set back zones	22.00
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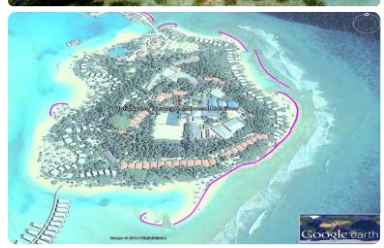
Benefit-cost analysis (BCA)

BCA: Holiday Inn Resort Kandooma

- Kandooma Island
  - 13-hectare (32-acre) island on the southeastern edge of the South Malé Atoll
  - Exposed to the Indian Ocean, making it vulnerable to storm surges and other extreme events
  - Seawalls are a common coastal protection measure



BCA: Holiday Inn Resort Kandooma

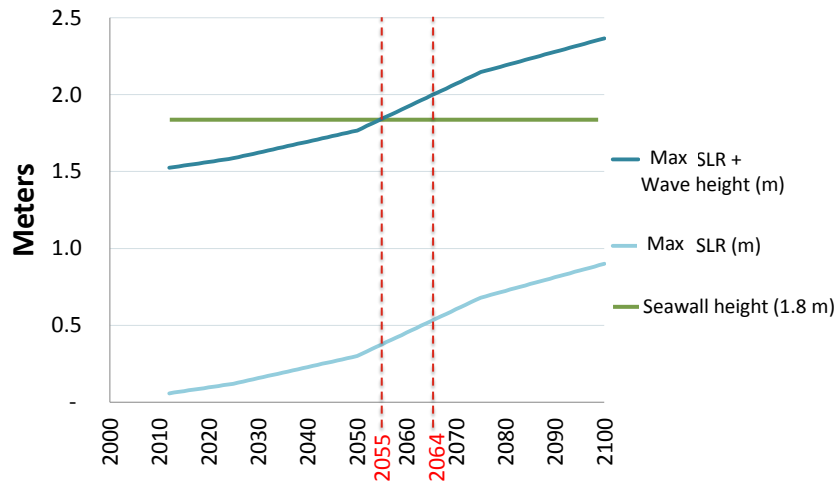
Monetary costs and benefits

Financial costs	• Capital cost of raising the height of the coral gabion seawall in front of damaged garden villas by 0.6 meters • Operation & maintenance costs for the raised portion of the seawall
Monetary benefits ***(avoided losses)***	• Damage to a garden villa and common areas • Labor costs to renovate and restore damaged villas and their common areas • Loss in resort revenue during the villa renovation (one-week)

BCA Results: Net Present Value

	Low-tourism season	High-tourism season
Total discounted costs	$257,677	$257,677
Total discounted benefits	$207,053	$389,669
Net present value (NPV)	($50,624)	$131,992
Benefit cost ratio (BCR)	0.80	1.51

BCA Results: Time Option



Recommendations

- Promote soft adaptation options
  - Raise awareness to link healthy ecosystems and climate change resilience
  - Enforce existing conservation laws and regulations
  - Value natural resources in planning and decision-making
- Mainstream adaptation in planning and decision-making
  - Incorporate adaptation in strategic national planning and development
  - Incorporate adaptation in local planning and development
  - Enhance government coordination
- Promote dual-benefit solutions
  - Improved waste management
  - Improved water supply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