

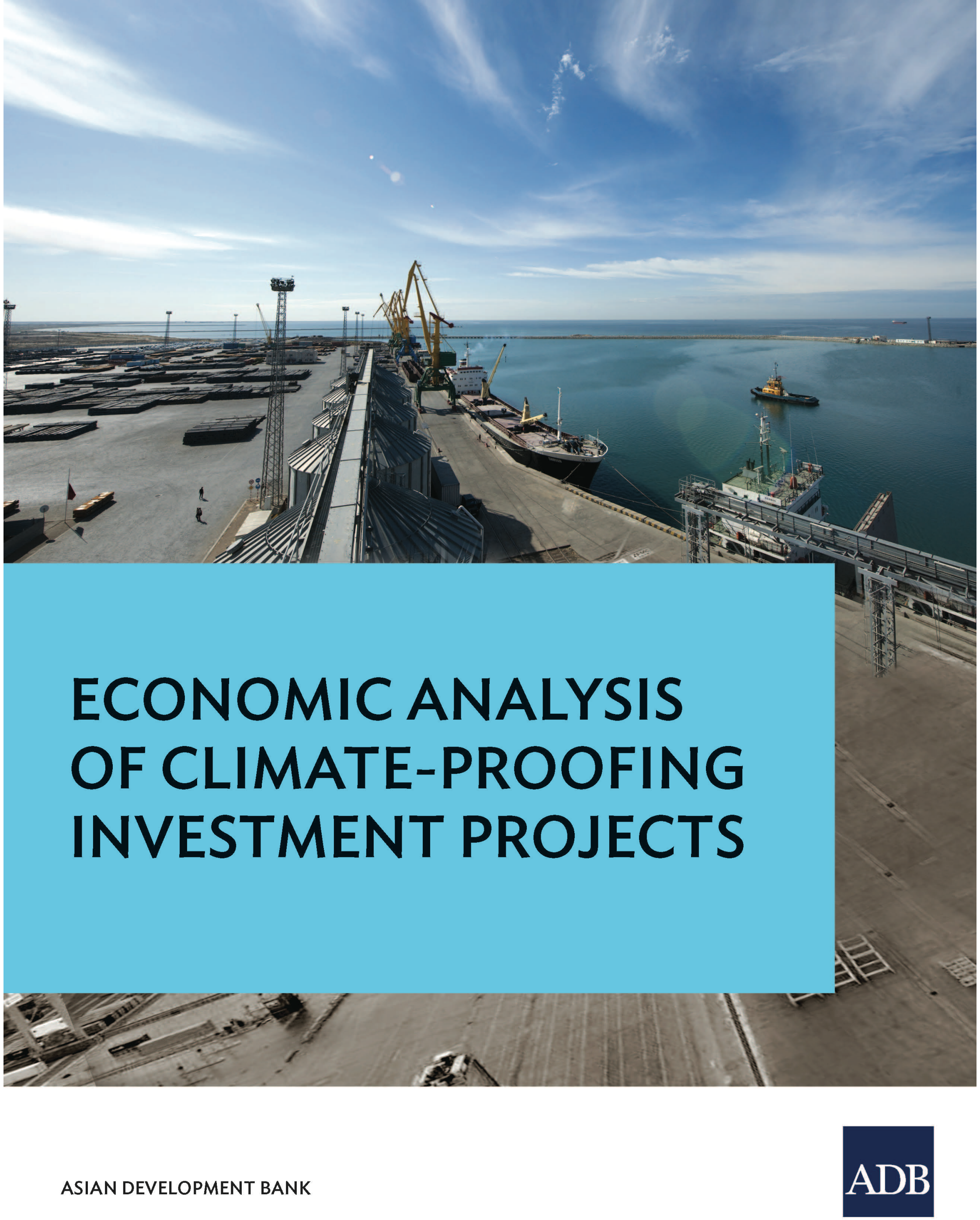

WORKSHOP ON CLIMATE CHANGE AND DISASTER RISK MANAGEMENT IN PLANNING AND INVESTMENT PROJECTS

Adaptation Assessment: Economic Analysis

By. Dr. Benoit Laplante, Consultant
Climate Change Adaptation Economist
New Delhi, India
June 27, 28 and 29 2016

Adaptation Solutions

ADB



Presentation is based on this recently published report.

Outline of Presentation

1. Questions of interest
2. Key message
3. Impacts of climate change on the project
4. Costs of climate change and benefits of climate-proofing
5. Traditional economic analysis
6. Accounting for uncertainty
7. Concluding remarks

Adaptation Solutions

ADB

Outline of Presentation

1. Questions of interest
2. Key message
3. Impacts of climate change on the project
4. Costs of climate change and benefits of climate-proofing
5. Traditional economic analysis
6. Accounting for uncertainty
7. Concluding remarks

Adaptation Solutions

ADB

Questions of interest

- **How will projected climate change impact the estimated costs and benefits of the investment project? If there were to be no technically feasible measure to mitigate these impacts, would the project still be economically viable?**
- **Is climate proofing the investment project desirable from an economic efficiency point of view? If yes, should climate proofing take place at the time of project implementation (built into project design), or should it be delayed to a later point in time? What is the "best timing" to climate proof the investment?**
- **If there are multiple technically feasible and economically desirable climate-proofing options, which of them should be recommended?**
- **Should benefits other than those strictly associated with climate proofing the investment project be included in the economic analysis?**

Questions of interest

It may be argued:

There is too much unknown or uncertainty about climate. These questions cannot be answered.

Reply:

Economic analysis of investment projects has always been conducted in a context of uncertainty. Uncertainty and incomplete information is not something new to the conduct of economic analysis.

Economic analysis does not provide a point estimate of NPV with certainty. It simply tells you about the possible impacts of the project on society's welfare: How likely is society's welfare to increase as a result of the project?

Adaptation Solutions

ADB

Outline of Presentation

1. Questions of interest
2. Key message
3. Impacts of climate change on the project
4. Costs of climate change and benefits of climate-proofing
5. Traditional economic analysis
6. Accounting for uncertainty
7. Concluding remarks

Key Message

There is no need for a new type of economic analysis to answer questions which may arise as a result of concerns about the impacts of climate change, and about how to respond to climate change.

However, we may need a better use of the economic analysis to guide project design and decision-making.

Outline of Presentation

1. Questions of interest
2. Key message
3. Impacts of climate change on the project
4. Costs of climate change and benefits of climate-proofing
5. Traditional economic analysis
6. Accounting for uncertainty
7. Concluding remarks

Adaptation Solutions

ADB

Impacts of climate change on the project

All investment projects funded by ADB must go through an economic analysis, and sometimes also a financial analysis.

It must be shown that the net present value (NPV) of the project is positive upon using a discount rate of 12% (or similarly that the internal rate of return of the project is greater than 12%).[1]

In economic terms, the impacts of climate change on the project will come to asking:

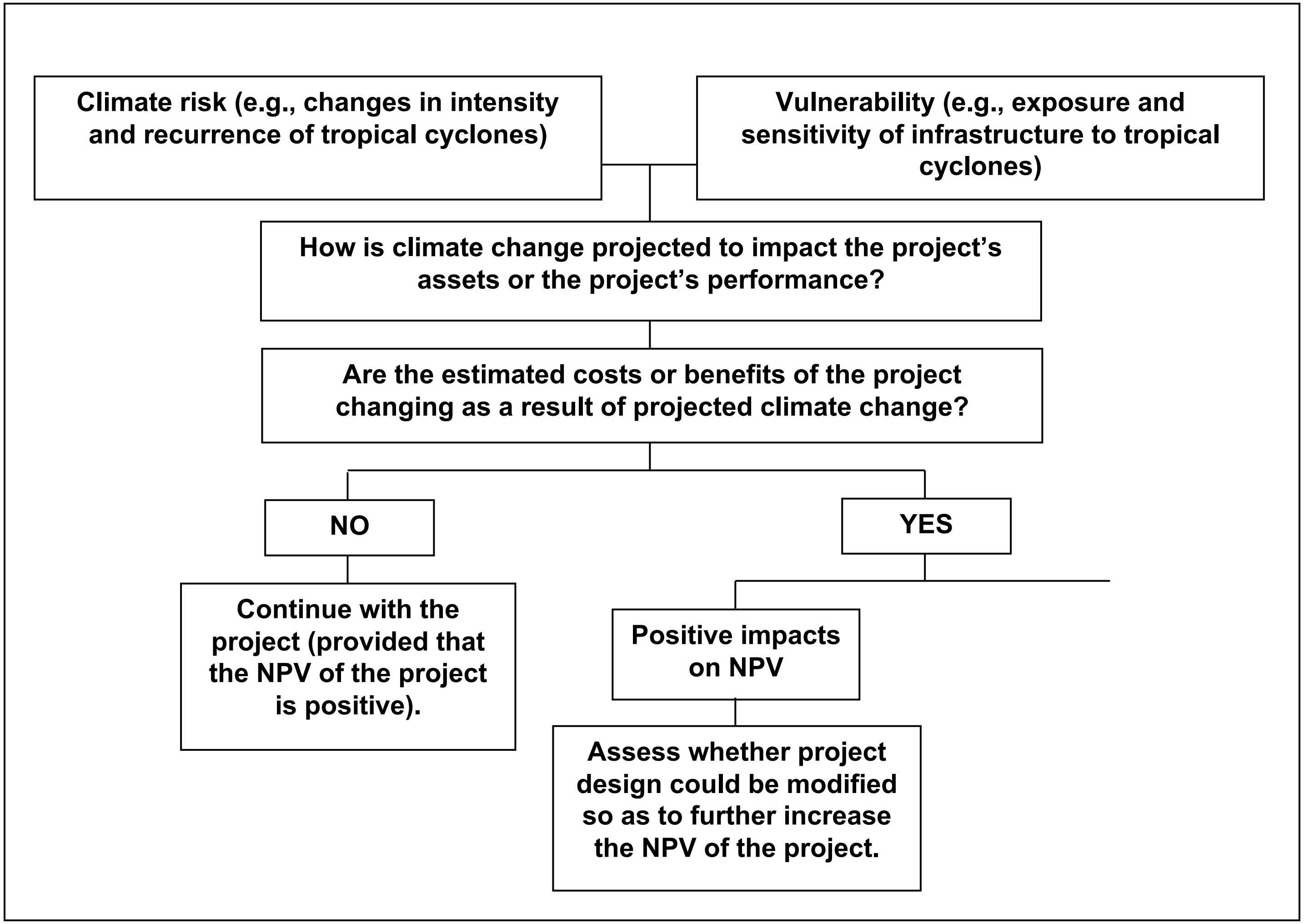
What happens to the NPV of the project?

[1] Note: ADB allows for the use of a lower discount rate if the project may deliver large unquantifiable benefits.

Adaptation Solutions

ADB

Impacts of climate change on the project



Adaptation Solutions

ADB

Impacts of climate change on the project

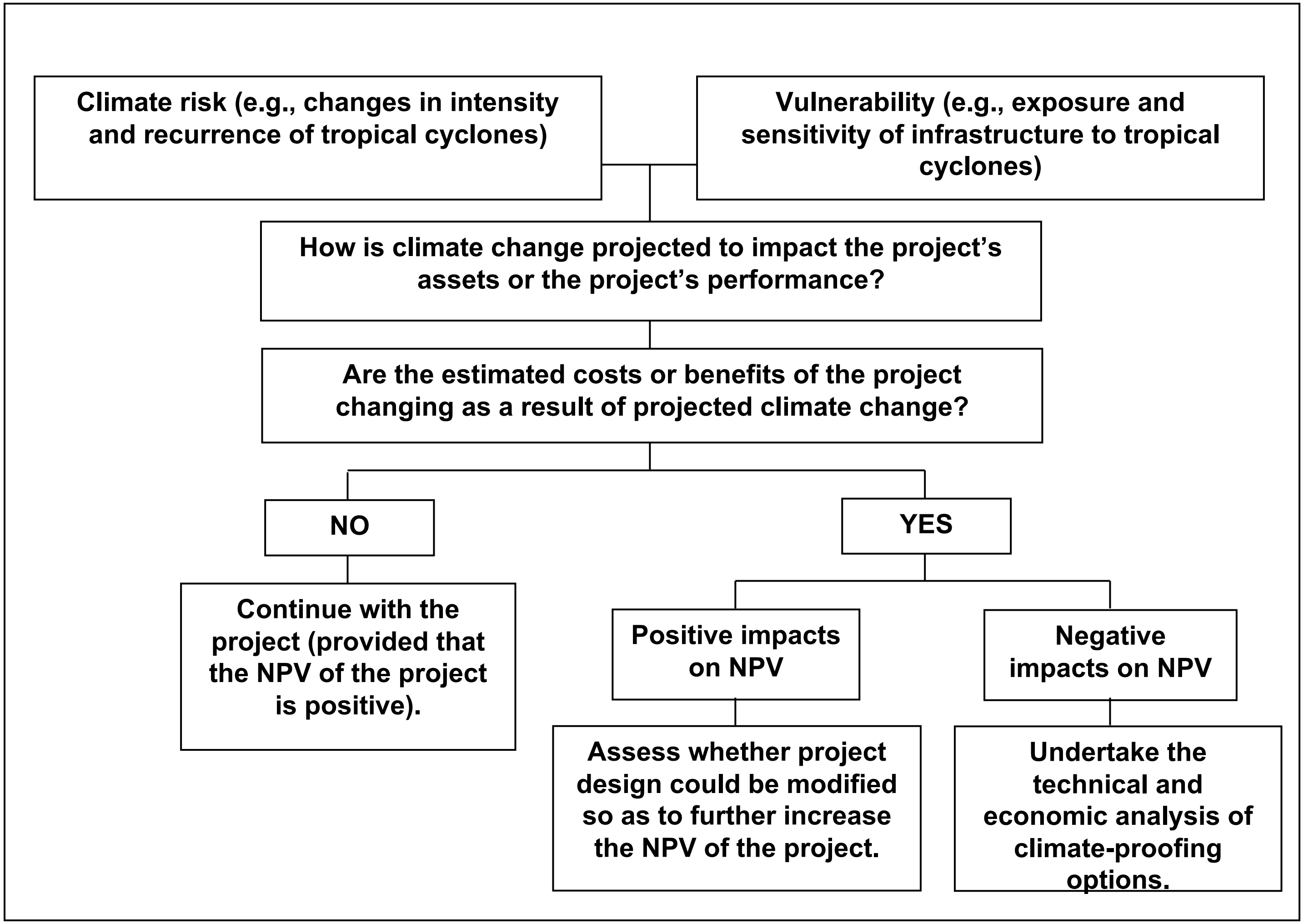
Example of positive impacts of climate change:

Nam Ngiep 1 Hydropower project in Lao PDR.

The CRVA estimated an increase in projected energy production as a result of greater water availability during the dry season, increasing the estimated NPV of the project.

Source: ICEM. 2015. Climate change risk and vulnerability assessment for the Nam Ngiep 1 hydropower project: Final Report. ICEM, Hanoi Viet Nam, 29th April, 2015

Impacts of climate change on the project



Adaptation Solutions

ADB

Outline of Presentation

1. Questions of interest
2. Key message
3. Impacts of climate change on the project
4. Costs of climate change and benefits of climate-proofing
5. Traditional economic analysis
6. Accounting for uncertainty
7. Concluding remarks

Adaptation Solutions

ADB

Costs of climate change and benefits of C-P

Cost of climate change

Reduction of the project NPV as a result of climate change.

Costs and benefits of the project **without** climate change

Costs and benefits of the project **with** climate change

Costs of climate change and benefits of C-P

Costs of the project may increase.

For example:

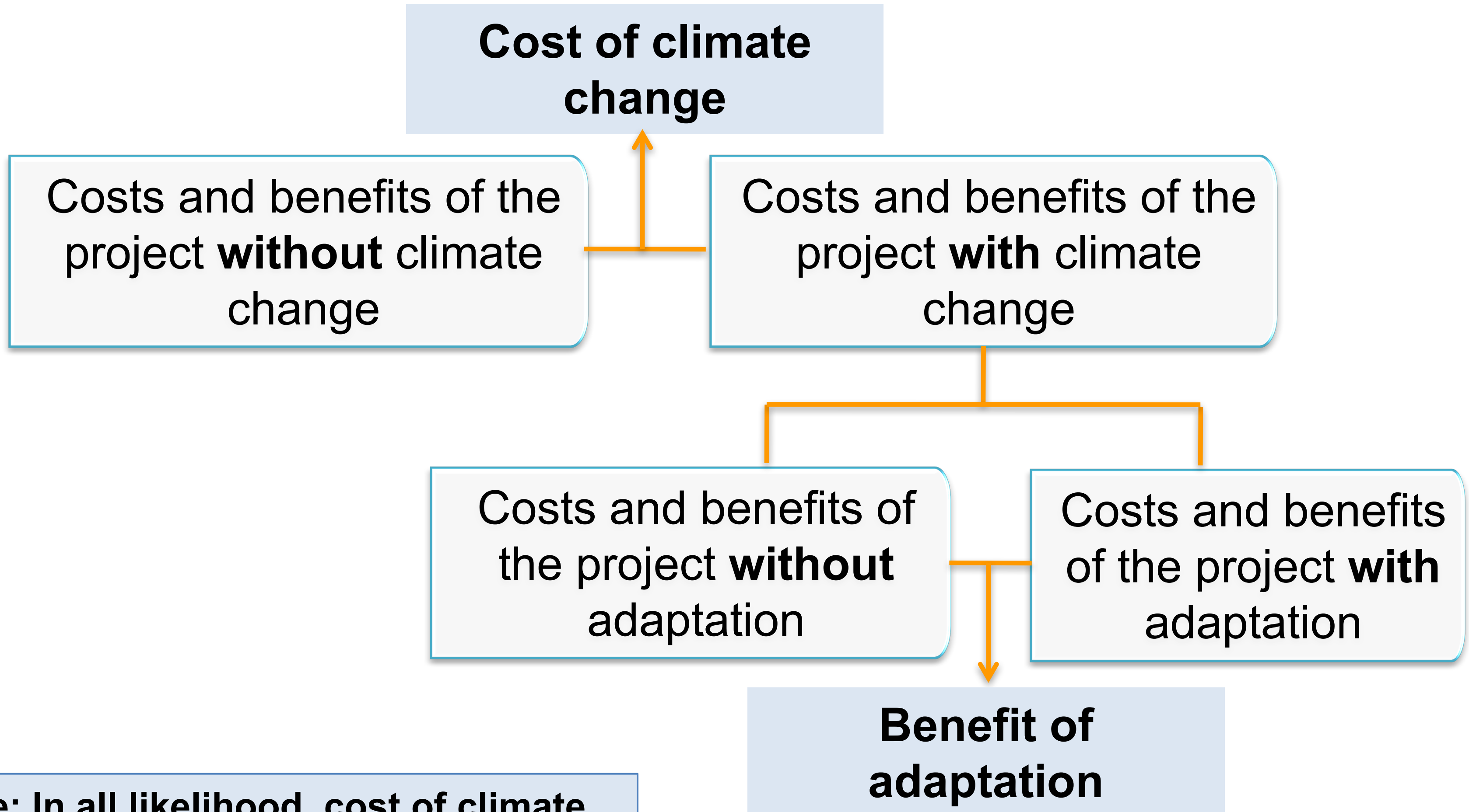
- **As a result of climate change (such as increasing temperatures), production cost of a water treatment project may increase to meet local regulatory standards.**

Benefits of the project may be reduced.

For example:

- **As a result of climate change (such as increased frequency or intensity of tropical storms) disruption of water supply services may result in reduced benefits of the project.**

Costs of climate change and benefits of C-P



Note: In all likelihood, cost of climate change > benefit of adaptation. Hence, the presence of residual damages.

Outline of Presentation

1. Questions of interest
2. Key message
3. Impacts of climate change on the project
4. Costs of climate change and benefits of climate-proofing
5. Traditional economic analysis
6. Accounting for uncertainty
7. Concluding remarks

Cost-benefit and cost-effectiveness analyses

ADAPTATION

Required adaptation

Efficient adaptation

When adaptation responds to complying with codes and standards

Cost-effectiveness analysis

Question: What is the most cost-effective way of complying with codes or standards?

Cost-benefit and cost-effectiveness analyses

ADAPTATION

Required adaptation

When adaptation responds to complying with codes and standards

Cost-effectiveness analysis

Efficient adaptation

When whether to adapt and how much to adapt is a choice

Cost-benefit analysis

Cost-benefit and cost-effectiveness analyses

Decision rule cost-effectiveness analysis:

- Choose the least-cost option to achieve desired objective (e.g. compliance with regulatory standards or achieving a targeted risk reduction).

Decision rule cost-benefit analysis:

- Invest in climate-proofing if
  NPV of project with CP > NPV of project without CP
- or similarly if
  NPV of CP is > 0
- If many CP options, choose option which delivers NPV.

Corollary: The fact that a project is expected to be adversely impacted by climate change does not necessarily imply that climate-proofing must be implemented.

Cost-benefit and cost-effectiveness analyses

Please note:

- **These "traditional" analyses can easily handle situations of risk (where the range of possible outcomes is known and over which probability distributions – discrete or continuous – can be attached).**

- **If a set of discrete probabilities is available, one calculates the expected NPV of the project (as opposed to the NPV of the project).**

- **If a set of continuous probability distributions is available, one runs Monte Carlo simulation to a NPV probability distribution.**

Adaptation Solutions

ADB

Outline of Presentation

1. Questions of interest
2. Key message
3. Impacts of climate change on the project
4. Costs of climate change and benefits of climate-proofing
5. Traditional economic analysis
6. Accounting for uncertainty
7. Concluding remarks

Accounting for uncertainty

Uncertainty:

- Probabilities cannot be attached to a known set of possible outcomes

OR

- Or the set of possible outcomes is not known or is not complete.

Accounting for uncertainty

Approaches:

- **Sensitivity analysis**
  - **Suppose cost increases x%**
  - **Suppose benefit decreases x%**

- **Scenario analysis**
  - **Compute NPV of the project under different scenarios.**
  - **Informed decision-makers to decide.**

Adaptation Solutions

ADB

Projected changes in precipitation

↓

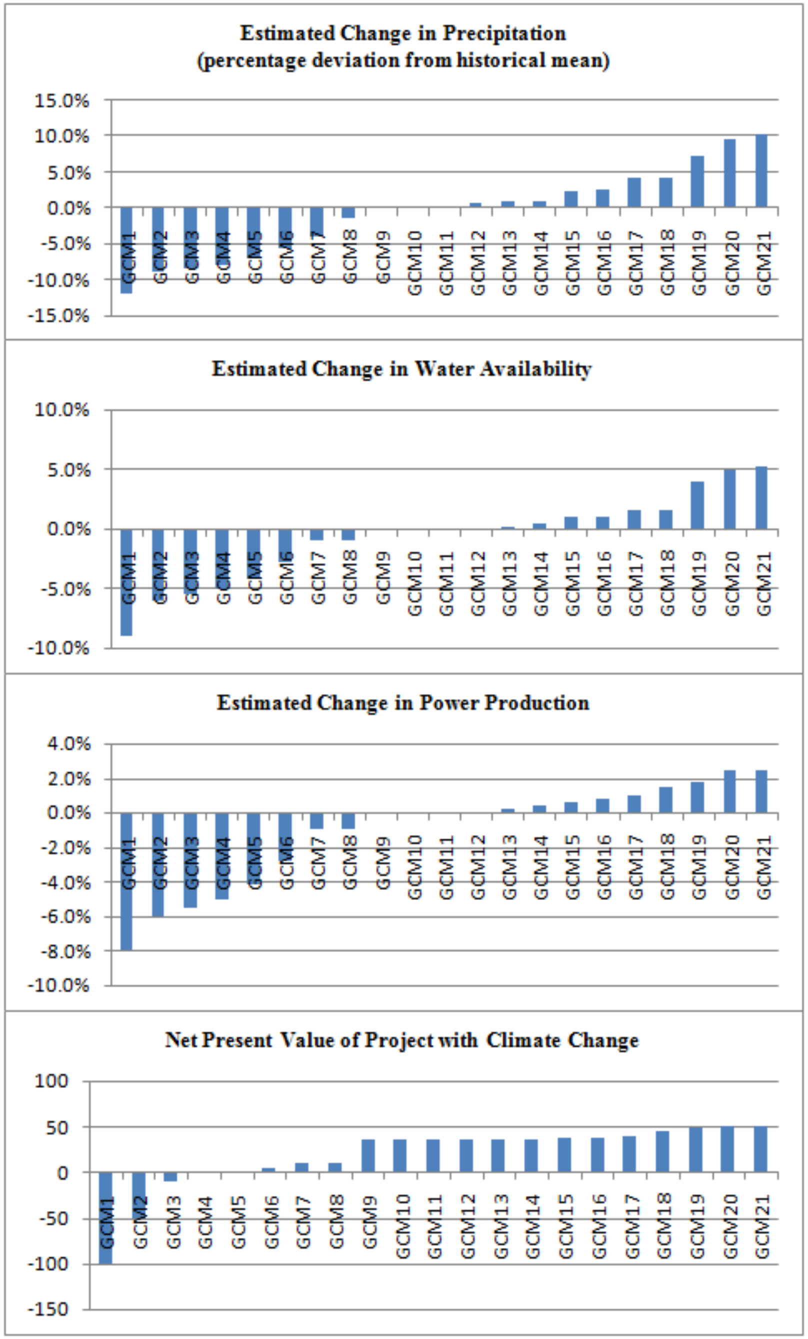
Projected changes in water availability

↓

Projected changes in energy production

↓

Projected changes in NPV



Accounting for uncertainty

Approaches:

- **Sensitivity analysis**
  - **Suppose cost increases x%**
  - **Suppose benefit decreases x%**
- **Scenario analysis**
  - **Compute NPV of the project under different scenarios.**
  - **Informed decision-makers to decide.**
- **Real option analysis**
  - **Keep the option to climate-proof in the future.**

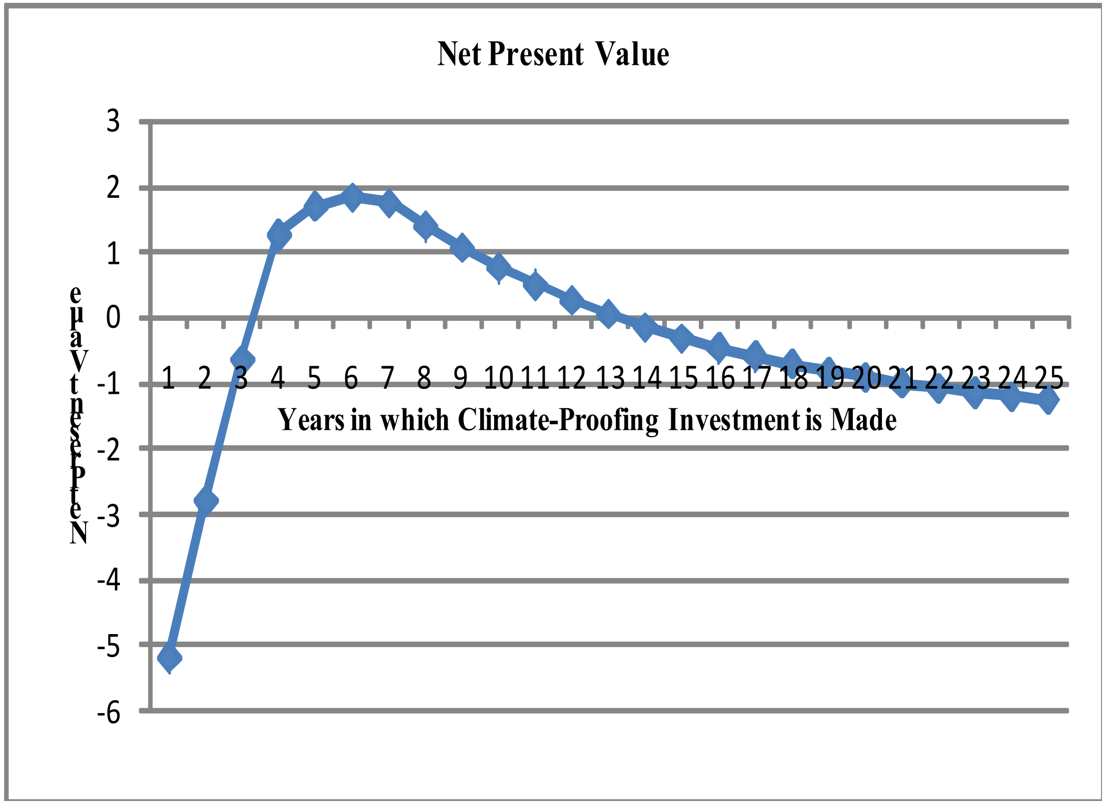
Adaptation Solutions

ADB

Accounting for uncertainty

Keep flexibility and the option to invest in climate proofing at a later point in time.

Use the economic analysis to determine when such investment may be optimal.



Accounting for uncertainty

Approaches:

- **Sensitivity analysis**
  - Suppose cost increases x%
  - Suppose benefit decreases x%
- **Scenario analysis**
  - Compute NPV of the project under different scenarios.
  - Informed decision-makers to decide.
- **Real option analysis**
  - Keep the option to climate-proof in the future.
- **Robust decision making**
  - Identify the extent to which different project designs can cope with climate change.

Adaptation Solutions

ADB

Accounting for uncertainty

Approaches:

- **Sensitivity analysis**
- **Scenario analysis**
- **Real option analysis**
- **Robust decision making**

These approaches do not replace economic analysis, but use the economic analysis as part of the process of informing decision-makers

Possible outcomes of the economic analysis

A menu of possible decisions:

Invest now	Be ready and invest later if needed	Do nothing and invest later if needed

Possible outcomes of the economic analysis

Invest now if:

- **costs of climate-proofing now are relatively small while the expected benefits are estimated to be very large (a low-regret approach), and/or**
- **costs of climate-proofing at a later point are expected to be prohibitive, or climate-proofing at a later point in time is technically not possible; and/or**
- **among climate-proofing options there exist options which deliver net positive economic benefits regardless of the nature and extent of climate change, including the current climate conditions (a no-regret approach); and/or**
- **the set of climate-proofing options includes options which not only reduce project climate risks, but also have other social, environmental or economic benefits (co-benefits). The presence of co-benefits, if any, must be included in the economic analysis of adaptation options.**

Possible outcomes of the economic analysis

Be ready and invest later if:

- **No climate-proofing investment is needed now, but the project can be designed to accommodate climate-proofing in the future if and when circumstances indicate this to be a better option than not climate-proofing.**
- **This type of decisions aim to ensure that a project is climate ready*.***

Possible outcomes of the economic analysis

Do nothing and invest later if:

- costs of climate-proofing now are estimated to be large relative to the expected benefits; and/or
- costs (in present value terms) of climate-proofing (e.g. retro-fitting) at a later point in time are expected to be no larger than climate-proofing now; and/or
- expected benefits of climate-proofing are estimated to be relatively small.

Note: The decision to “do nothing” does not come from ignoring climate change, but from rationally deciding out of a technical and economic assessment that the best thing to do for now is to do nothing.

Adaptation Solutions

ADB

Outline of Presentation

1. Questions of interest
2. Key message
3. Impacts of climate change on the project
4. Costs of climate change and benefits of climate-proofing
5. Traditional economic analysis
6. Accounting for uncertainty
7. Concluding remarks

Adaptation Solutions

ADB

Concluding remarks

There is no need to adapt cost-benefit analysis to climate change. There is a need for a better use of economic analysis.

The greatest difficulty in conducting an economic analysis of a climate-proofing investment is not with the economics.

The greatest difficulty is with the identification of projected changes in climate variables, and then of the physical impacts of these changes on infrastructure. Once these impacts are quantitatively identified, the economic analysis of climate-proofing investment is relatively straightforward.

As is ALWAYS the case, the economic analysis of an investment project is a multi-disciplinary exercise which requires the inputs of multiple experts and which is conducted in a context of uncertainty.

WORKSHOP ON CLIMATE CHANGE AND DISASTER RISK MANAGEMENT IN PLANNING AND INVESTMENT PROJECTS

Adaptation Assessment: Economic Analysis

By. Dr. Benoit Laplante, Consultant

Climate Change Adaptation Economist

New Delhi, India

June 27, 28 and 29 2016

Adaptation Solutions

ADB