


Adaptation Assessment:
Economic Analysis of Adaptation Measures

Presentation by Dr. Benoit Laplante
Environmental Economist

Workshop on Climate Risk Management in Planning and Investment Projects
Manila, 9-10 February 2105

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Outline of Presentation

1. Background: The role of economic analysis
2. Costs of climate change vs. benefits of adaptation
3. Cost-benefit analysis and cost-effectiveness analysis
4. Possible outcomes of the economic analysis
5. Cost-benefit analysis in a context of risk and uncertainty
6. Concluding remarks

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Background: The role of economic analysis

In presence of limited resources, decision makers are left with the difficult problem of evaluating and choosing investment projects and assessing policies in a context of significant complexity and uncertainty.

For this purpose, decision makers have a need for a framework which structures information in a way which makes feasible and transparent this process of evaluation and selection.

Background: The role of economic analysis

Economic analysis provides a means of assessing and comparing the impacts of projects and policies, even when benefits and costs occur over long time horizons.

It provides a systematic means to identify, quantify, and wherever possible monetize all impacts of a project or policy (including their environmental impacts), and present these impacts as economic (or social) costs and social benefits.

The role of economic analysis is to provide information to the decision-maker about the costs and benefits of the project or the policy.

Background: The role of economic analysis

Warning

Numerous other criteria should (must?) also be used to assess projects or policies, such as:

- **Distributional or equity issues;**
- **Social and cultural and religious acceptability;**
- **Operational practicality;**
- **Administrative feasibility;**
- **Legality;**
- **Etc.**

The economic analysis informs decision-makers and policy-makers only about the economic efficiency of projects or policies.

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Background: The role of economic analysis

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[1] is positive upon using a discount rate of 12% (or similarly that the internal rate of return of the project is greater than 12%).[2]

[1] Note: The net present value of an investment project is defined as the present value of the project's benefits minus the present value of the project's costs.

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

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Background: The role of economic analysis

Financial analysis

- The only stakeholder included in the analysis is the developer (or investor).
- The only costs included in the analysis are the costs of the project to the developer or investor.
- The only benefits included in the analysis are the benefits to the developer or investor.

- The question is: Will this project increase investors' wealth?

Economic analysis

- The stakeholder is all society, not only the developer or investor.
- The costs included in the analysis are all costs of the project to society, including costs of environmental impacts if any.
- The benefits included in the analysis are all benefits of the project to society.

- The question is: Will this project increase society's well-being?

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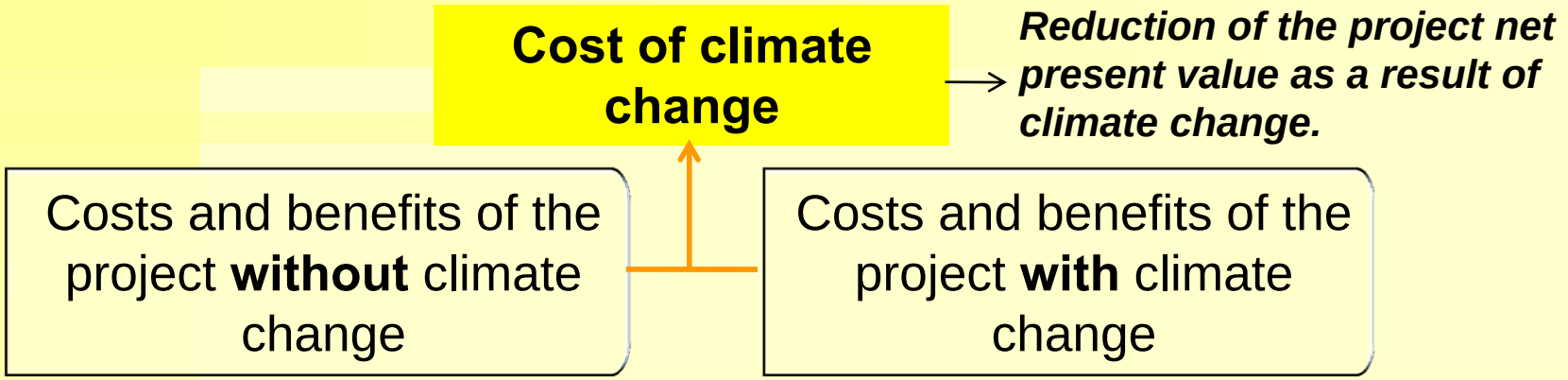
Costs of climate change vs. benefits of adaptation



Background: The role of economic analysis

Costs of the project may increase.

For example:

- **As a result of climate change (such as increased intensity of precipitation), the annual repair and maintenance cost associated with a road project may be expected to increase.**

Benefits of the project may be reduced.

For example:

- **As a result of climate change (such as increases in peak temperature), the efficiency of a thermal power plant may be reduced and adversely impact the quantity of energy produced.**

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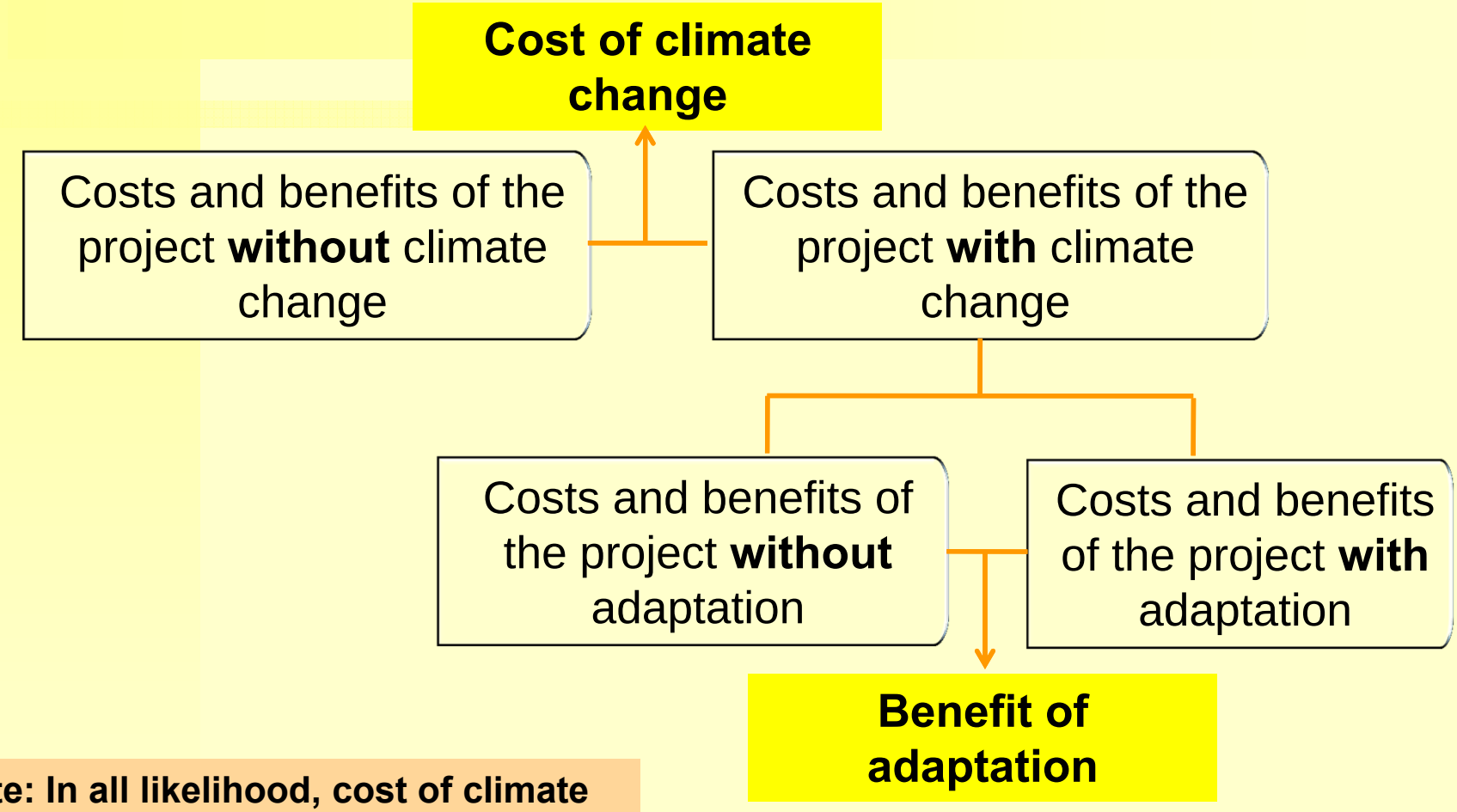
Costs of climate change vs. benefits of adaptation



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

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Cost-benefit vs cost-effectiveness analysis

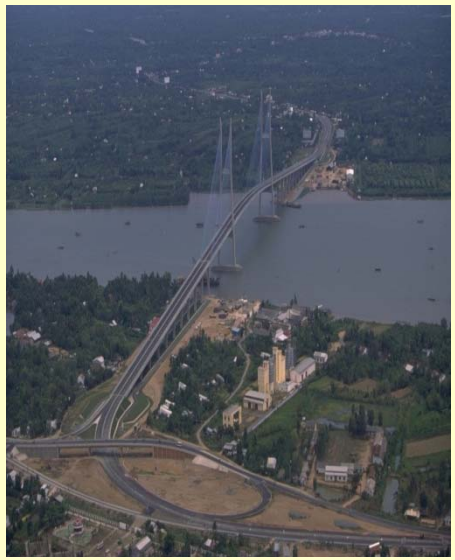
ADAPTATION

Required adaptation

Efficient adaptation

When adaptation responds to complying with codes and standards

Cost-effectiveness analysis



MRC: Minimum navigational clearance of 37.5 m for the P_{05} (5%) annual flood.

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

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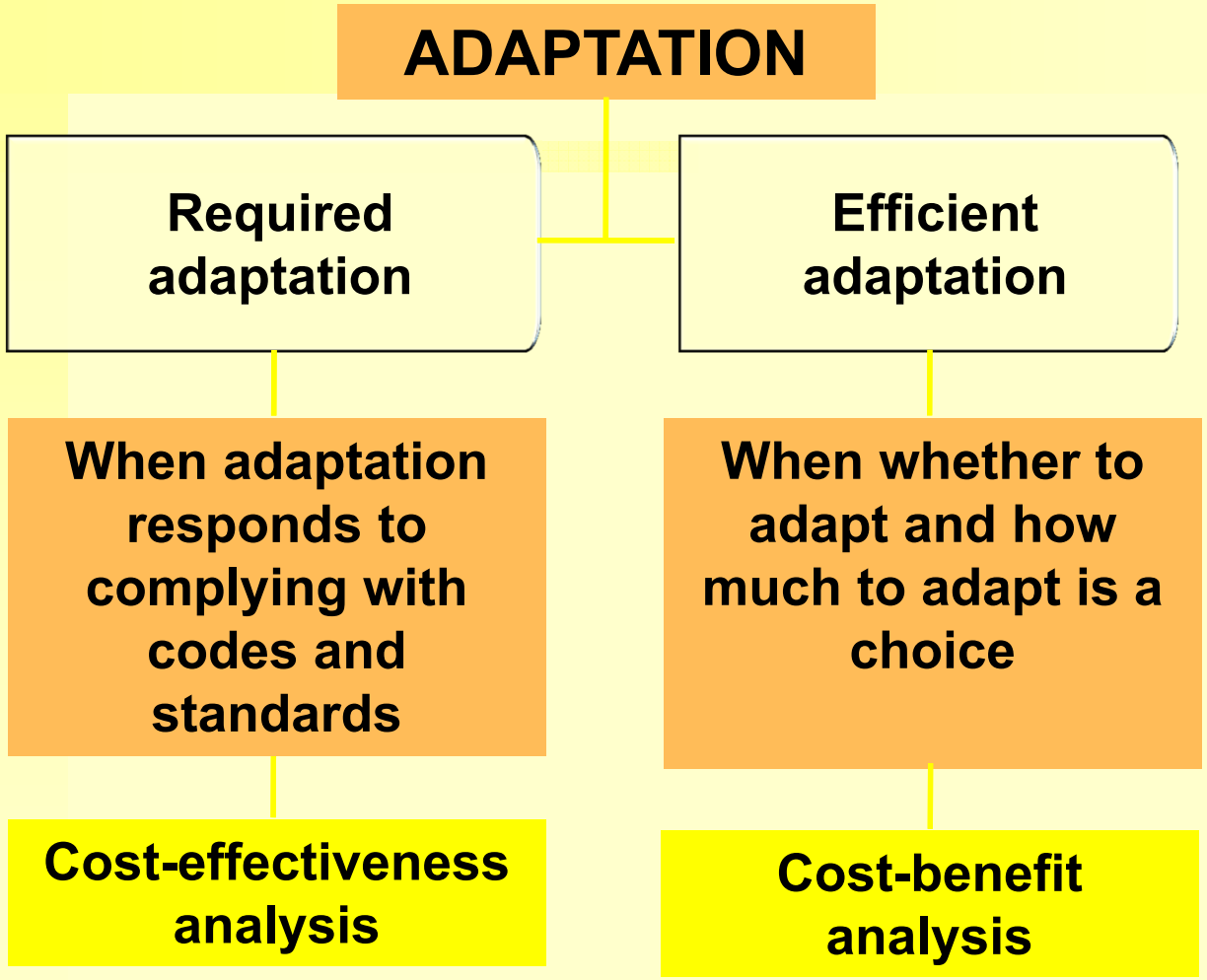
Cost-benefit vs cost-effectiveness analysis



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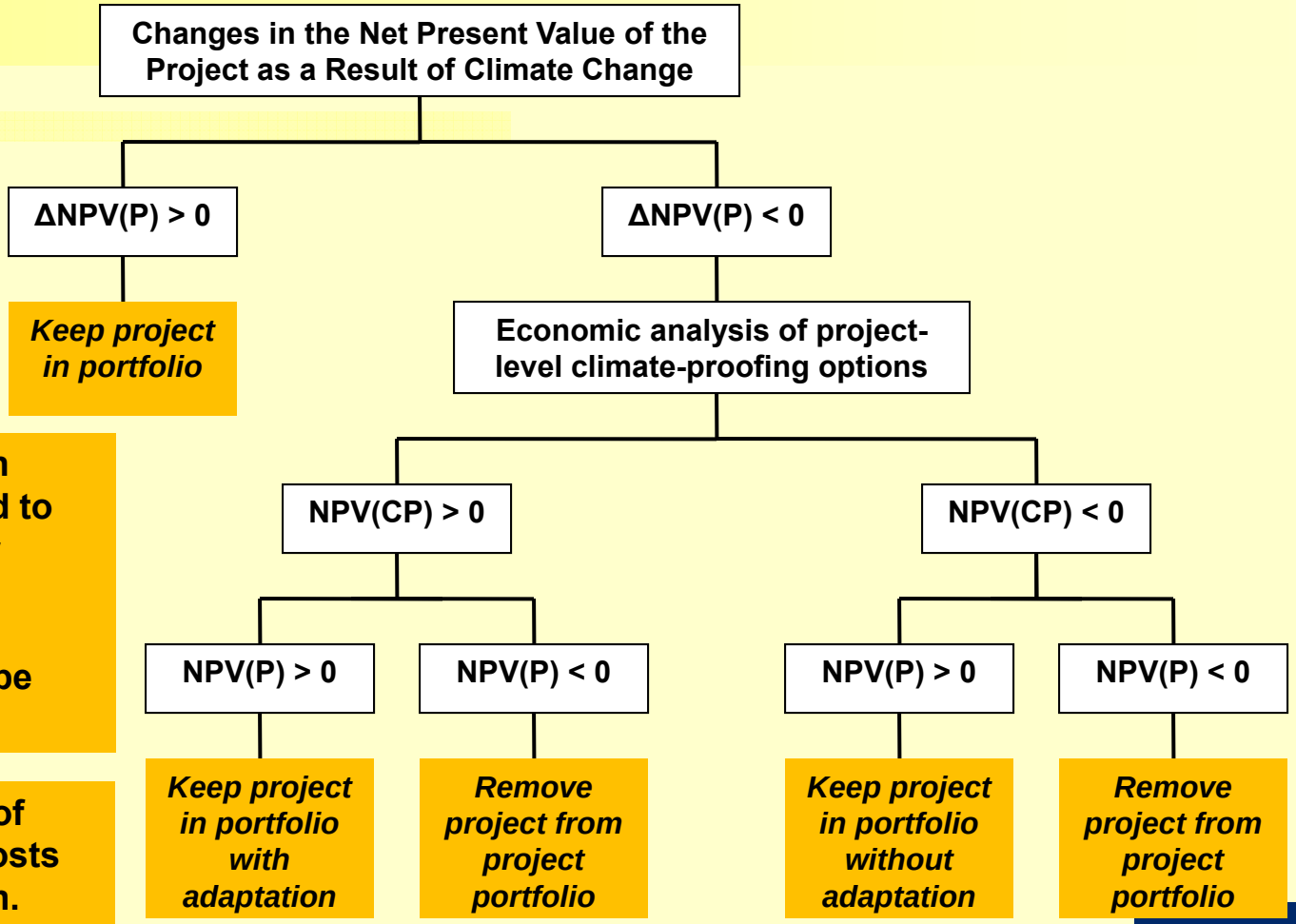
Possible outcomes of the economic analysis



Corollary: The fact that an infrastructure is projected to be adversely impacted by climate change does not necessarily imply that adaptation options must be implemented.

From an economic point of view, it depends on the costs and benefits of adaptation.

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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.

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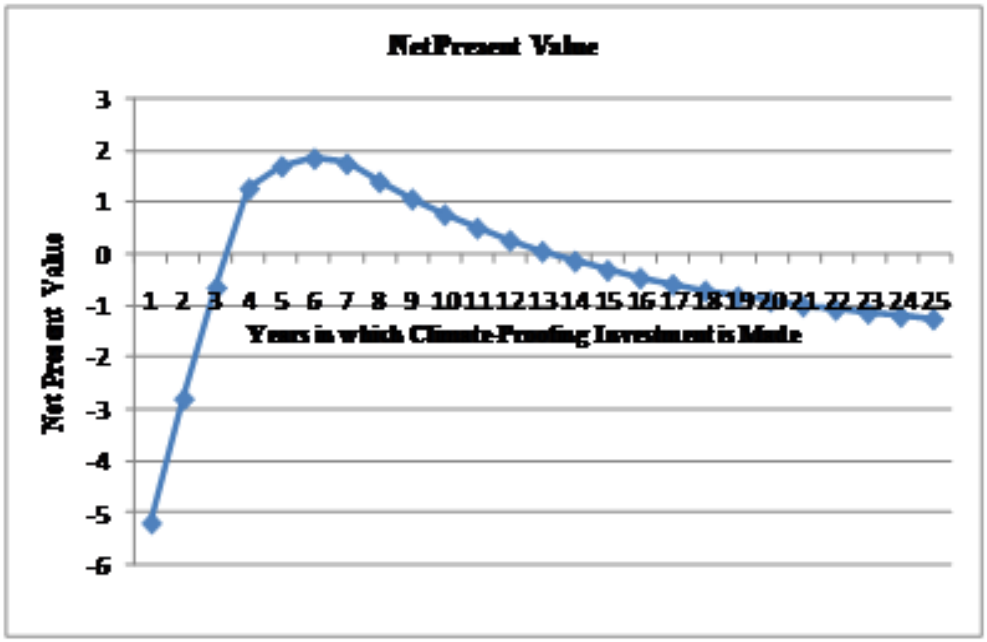
Possible outcomes of the economic analysis

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.**



Economic analysis can be used not only to say "yes or no" to adaptation but also to analyse the best timing for adaptation investments.

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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.

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Possible outcomes of the economic analysis

A menu of possible decisions:

Invest now

If navigation clearance could become an issue, raising the bridge deck may not be an option in the future. It has to be done at the time of construction.

Be ready and invest later if needed

In order to raise a sea dyke at a later point in the future to deal with higher sea level or storm surges, its base may have to be constructed to be able to accommodate an increase in height (and weight) when needed.

Do nothing and invest later if needed

The project design is sufficiently flexible to accommodate numerous types of changes and it is better to wait to have more information about the extent of climate change.

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Risk and uncertainty

Accounting for risk:

- Sensitivity analysis
- Probabilistic analysis
  - Discrete probabilistic analysis
  - Continuous probabilistic analysis (Monte Carlo simulation)

Dealing with uncertainty:

- Real options analysis
- Robust-decision making analysis

Assessing the costs of climate change and the net benefits of adaptation under various climate change scenarios and assessing the "robustness" of the adaptation decision to a range of scenarios.

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Concluding remarks

There is no need to adapt cost-benefit analysis to climate change. The general framework for conducting economic analysis of investment projects and of adaptation options in a context of climate change is appropriate.

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.

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