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Prioritization of Climate Change Adaptation Options

The Role of Cost-Benefit Analysis

Session 1: Introduction to the Nature of Cost-Benefit Analysis

Accra (or nearby), Ghana
October 25 to 28, 2016

Outline of presentation

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1) After Paris: Adaptation is still needed
2) The role of cost-benefit analysis
3) Economic, financial, and fiscal analysis
4) Economic versus cost-effectiveness analysis
5) Economic versus environmental impact analysis
6) Timing of the economic analysis
7) Cost-benefit analysis in practice
8) Selecting adaptation options
9) Climate-proofing investment projects

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After Paris: Adaptation is still needed

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- **Global average temperature has already reached 1°C above pre-industrial times in 2015. An additional warming of 0.4-0.5°C is expected as a result of historical emissions. The 1.5°C could be reached by the early 2030s.**
- **195 countries adopted the Paris Agreement on climate change.**
- **83% of the pledges are partially or totally conditional to the use of USD 100 billion per year in financial assistance for their implementation.**

Ghana's emission reduction goal is to unconditionally lower its GHG emissions by 15% relative to a business-as-usual (BAU) scenario emission of 73.95MtCO2e by 2030. An additional 30% emission reduction is attainable on condition that external support is made available to Ghana.

After Paris: Adaptation is still needed

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- **Global average temperature has already reached 1°C above pre-industrial times in 2015. An additional warming of 0.4-0.5°C is expected as a result of historical emissions. The 1.5°C could be reached by the early 2030s.**
- **195 countries adopted the Paris Agreement on climate change.**
- **83% of the pledges are partially or totally conditional to the use of USD 100 billion per year in financial assistance for their implementation.**
- **If all pledges are implemented, global GHG emissions will be 33% above the level of what they should be in 2030 to stay below 2C° above pre-industrial levels.**
- **The 2°C target could be reached by 2050, even if pledges are fully implemented.**

Source: Universal Ecological Fund. 2016. The Truth about Climate Change.

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The role of cost-benefit analysis

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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.

The role of cost-benefit analysis

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Cost-benefit 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 social costs and social benefits.

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

The cost-benefit analysis informs decision-makers, does not replace them.

The role of cost-benefit analysis

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Technically, the cost-benefit analysis…

1) **Is a process (technique) to compare all the gains and losses resulting from a project or from a policy into a common unit of measurement.**

2) **Summarizes all positive (benefits) and negative (costs) aspects of a project or policy into one number.**

3) **The economic analysis of a project (or policy) serves as an organizing framework for stakeholders to discuss the various aspects, both positive and negative, of projects or policies.**

4) **Aims to provide information about the economic efficiency of a project or policy.**

The role of cost-benefit analysis

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For any given project (or policy), we want to know:

Is this a good project (or policy)?

For any given group of projects (or policies), we want to know:

Which project (or policy) is better?

Given a set of options all achieving a given objective, we want to know:

Which of these options is better?

The role of cost-benefit analysis

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However:

- **Good or better for whom?**
  - **For a project proponent OR for Government OR for society?**
- **How do we measure 'good' or 'better'?**
  - **Proponent's profits OR Government budget OR society's welfare?**

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Economic, financial and fiscal analysis

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Cost-benefit analysis:

- Cost-benefit analysis has become a generic term. As its name suggests, it is an analysis which aims to compare the costs and benefits of a project or a policy.
- The question is: Whose costs and whose benefits?
- The answer to this question will determine the difference between a financial analysis, a fiscal analysis, or an economic analysis.
- Economists will generally equate cost-benefit analysis to economic analysis where costs and benefits to society are included in the analysis. However, project proponents also do cost-benefit analysis where costs and benefits to the project components are included in the analysis.

Economic, financial and fiscal analysis

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Financial analysis:

- A financial analysis is a cost-benefit analysis but where:
  - 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.
- A financial analysis examines the profitability of a project for the developer of the project or for the investor; it is based on a cash-flow analysis and looks at costs paid by the investor, and revenues received by the investor.

The question is:
Will the project increase investors' wealth?

Economic, financial and fiscal analysis

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Fiscal analysis:

- A fiscal analysis is a cost-benefit analysis but where:
  - The only stakeholder included in the analysis is the Government.
  - The only costs included in the analysis are the costs of the project to State budget.
  - The only benefits included in the analysis are the benefits of the project to State budget.
- A fiscal analysis examines the impacts of the project on government's fiscal (budgetary) position.

The question is:
What is the impact of the project on Government budget?

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Economic analysis:

- An economic analysis is a cost-benefit analysis but where:
  - The stakeholder is all society, not only the developer or investor.
  - The costs included in the analysis are all costs of the project for society resulting from all impacts.
  - The benefits included in the analysis are all benefits of the project for society.

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

Economic, financial and fiscal analysis

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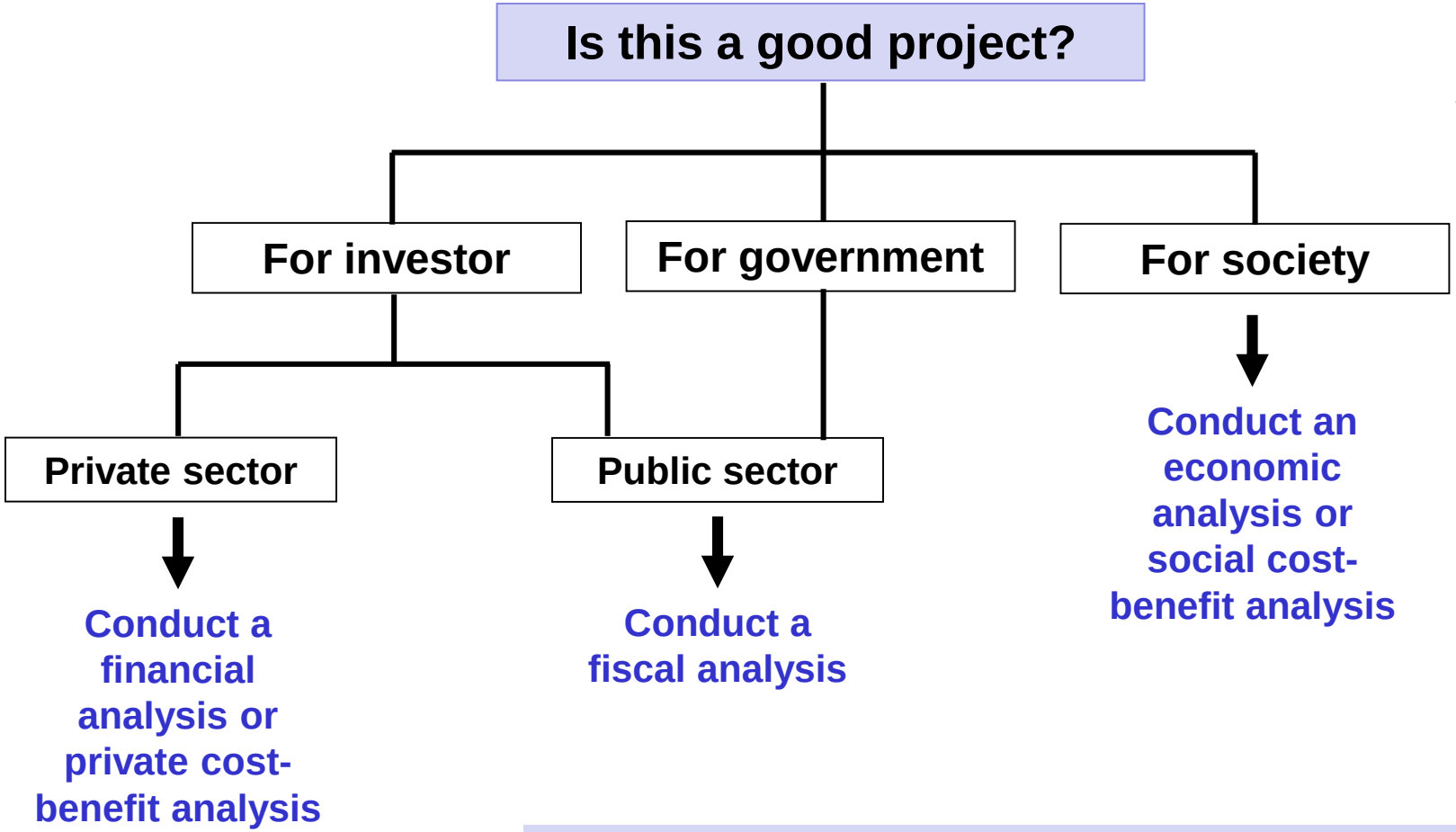

These 3 types of analyses are very different from one another and will provide different types of information to different types of decision-makers.

Economic, financial and fiscal analysis

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Common (unfortunate) practices:

- Often times financial, fiscal, and economic costs and benefits are put in a same table and then added and subtracted with one another and then compared.
- Often times financial costs to the project developer (such as labor costs and investment costs) are treated as economic benefits to the country.
- In a large number of cases, project developers (when requesting tax exemptions, fee concessions, or grants) submit a financial analysis of the project not an economic analysis. While these analyses assert to demonstrate how good the project is for the country, in fact they demonstrate how good the project is for the developer.

Economic, financial and fiscal analysis

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Hence:

- **Before conducting a "cost-benefit" analysis, a first key step is to ask: what type of cost-benefit analysis or whose point of view will this analysis take?**
- **Once an answer is given to the above question, then the analyst must ensure that only those costs and benefits consistent with that point of view are included in the analysis.**
- **As mentioned earlier, economists will generally equate cost-benefit analysis to economic analysis in which one aims to assess the impacts of the investment project or policy on society's welfare.**

Economic, financial and fiscal analysis

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For example:

GIZ. 2016. COST-BENEFIT ANALYSIS OF INDC ADAPTATION AND MITIGATION OPTIONS OF GHANA

"The Ministry of Environment, Science, Technology and Innovation put together a Technical Committee comprising representatives from Government Ministries and Agencies as well as other stakeholders to review the 20 mitigation and 11 adaptation programme actions. The Committee selected five Priority Actions (four mitigation actions and one adaptation action)."

Economic, financial and fiscal analysis

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	INDC Policy Actions	Programme of Action
Priority 1	Scale up renewable energy penetration by 10% by 2030	Scale up rooftop solar systems to 200,000 households
Priority 2	Fuel diversification	Fuel diversification in thermal power supply
Priority 3	Scale up renewable energy penetration by 10% by 2030	Scale-up solar mini-grid to 255 to serve an estimated 1,200 island and lakeside communities
Priority 4	Agriculture resilience building in climate vulnerable landscapes	Double 10,000 ha annual reforestation/afforestation of degraded lands
Priority 5	Agriculture resilience building in climate vulnerable landscape	Promote climate smart agriculture in the savannah landscapes of Ghana

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"The cost-benefit analysis was conducted on these five Priority Actions."

What type of cost-benefit analysis was conducted?

"The following Actions among the five Priority Actions show positive Net Present Values: i) Scale-up rooftop solar systems to 200,000 households; ii) Scale-up solar mini-grid to 255 serve 1,200 island and lakeside communities; and iii) Promote climate-smart agriculture in the savannah landscapes."

"(…) and the positive Net Present Values clearly reflect favourable financial returns on the investments that may be made to implement them."

So? What type of cost-benefit analysis was conducted?

"The key limitation of the cost-benefit analysis of the Actions under Ghana's INDC is the lack of disaggregated financial data on the Actions."

Seems to be a financial analysis. Let see later…..

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Economic versus cost-effectiveness analysis

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Cost-effectiveness analysis:

- **When undertaking a cost-effectiveness analysis, we do not ask the question:**

"Is this a good project?"

- **Instead, we ask the question:**

"What is the least cost way of achieving the same stream of benefits or the same objective or the same target?"

Economic versus cost-effectiveness analysis

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Example:

“We must achieve net zero GHG emissions by 2050.”

“Roads must be able to withstand a 1-in-50 flood event.”

Question is: What is the least cost way of achieving these targets?

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Economic analysis versus EIA

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Economic analysis versus EIA:

- A key difference between a financial and economic analysis is that the economic analysis includes an economic assessment of the environmental impacts of the project or policy.
- But in order to undertake this economic assessment of the environmental impacts, these impacts have to be identified and where possible quantified.
- The purpose of EIA is precisely to identify and quantify the environmental impacts of projects.
- So, EIA is the crucial first step in order to undertake the economic assessment of environmental impacts.

Economic analysis versus EIA

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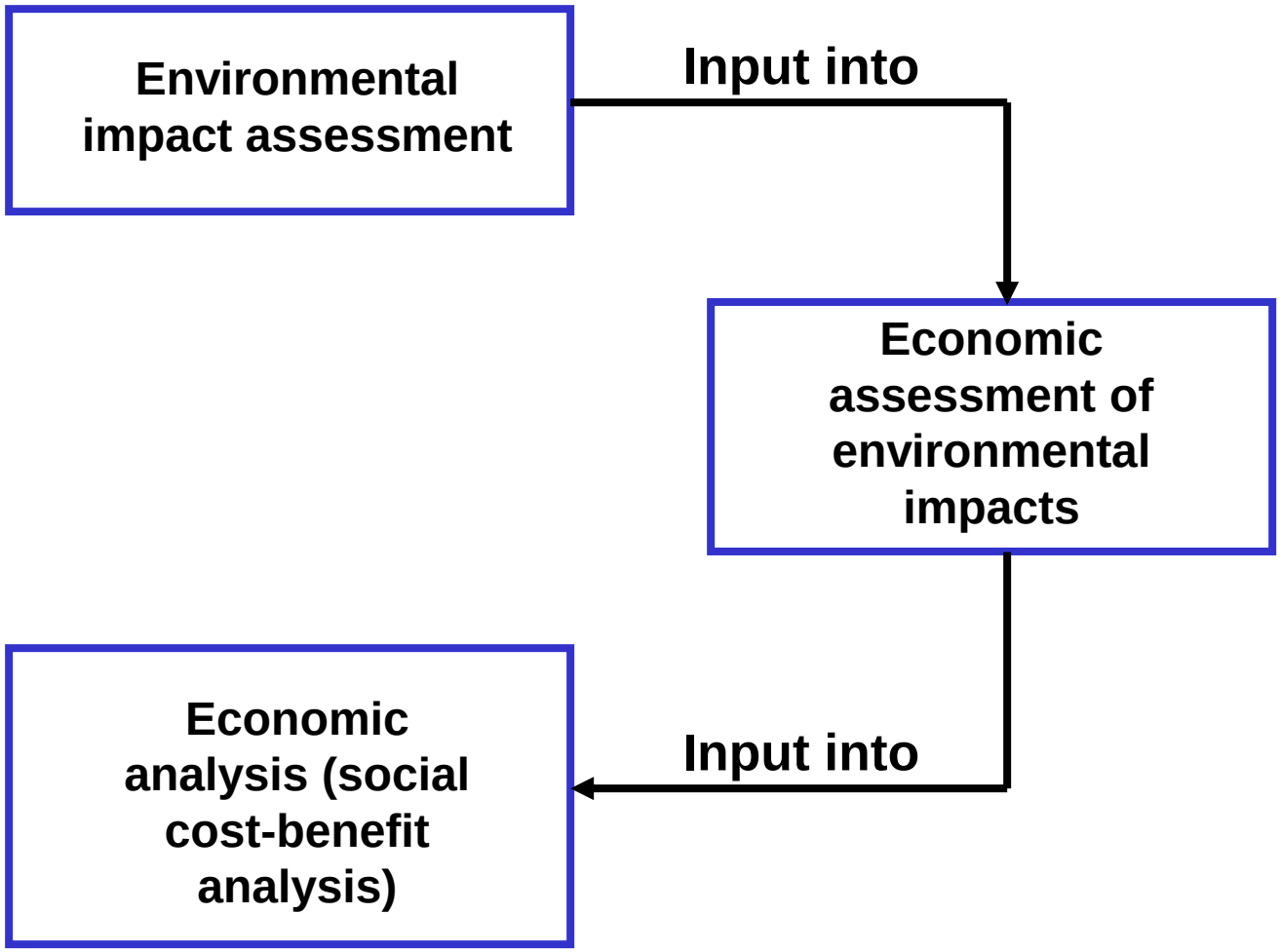

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Timing of the economic analysis

Timing of the economic analysis

Purpose of the analysis	Before project	During project	After project
Learning about the expected value of the project, and whether to go ahead or not.	Yes. This is most useful.	Generally not.	Too late. The project has been implemented.
Learning about the actual value of the project	No. Have to wait for project to be implemented.	To some extent.	Yes. This is most useful.
Learning about the expected value of other similar projects.	Generally not.	It may provide some information.	Yes. Issue will be: How ‘similar’?

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Cost-benefit analysis in practice

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Requirements to conduct CBA nature exist in numerous countries, including Australia, Canada, Philippines, and the United Kingdom among numerous others.

In Asian Development Bank and World Bank

All projects submitted to the Board of Management of these institutions must contain an economic analysis of the investment projects.

These countries and institutions have developed guidelines to conduct economic analyses. These are freely available on the web.

Economic and financial analysis

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For Green Climate Fund:

- **All projects must conduct economic analysis.**
- **If the project includes activities which may generate revenues (for example a water supply project), then a financial analysis must also be conducted.**

Economic and financial analysis

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4 pieces of economic analysis in GCF proposal:

- **Section E.6.1 Cost effectiveness and efficiency**

  A short paragraph which reports the estimated NPV.

- **Section F.1 Economic and financial analysis**

  A short but more detailed description of the economic analysis.

- **Appendix XII**

  Complete economic analysis.

- **Excel Spreadsheet**

Economic and financial analysis

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Warning

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

- **The physical or biological impacts;**
- **Economic efficiency;**
- **Distributional equity;**
- **Social and cultural and religious acceptability;**
- **Operational practicality;**
- **Administrative feasibility;**
- **Legality.**

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

Economic and financial analysis

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Warning

Economic efficiency is only one criterion used to decide whether a project should be funded or not. Other criteria are also used.

Hence, even if the economic analysis could show a negative NPV, it does not mean that a project should not be supported.

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Selecting adaptation options

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Provided that adaptation is still needed, then society faces a number of important questions, including:

- **What is the cost of climate change expected to be for different sectors (e.g. agriculture, water, health, coastal resources, etc.)?**

Selecting adaptation options

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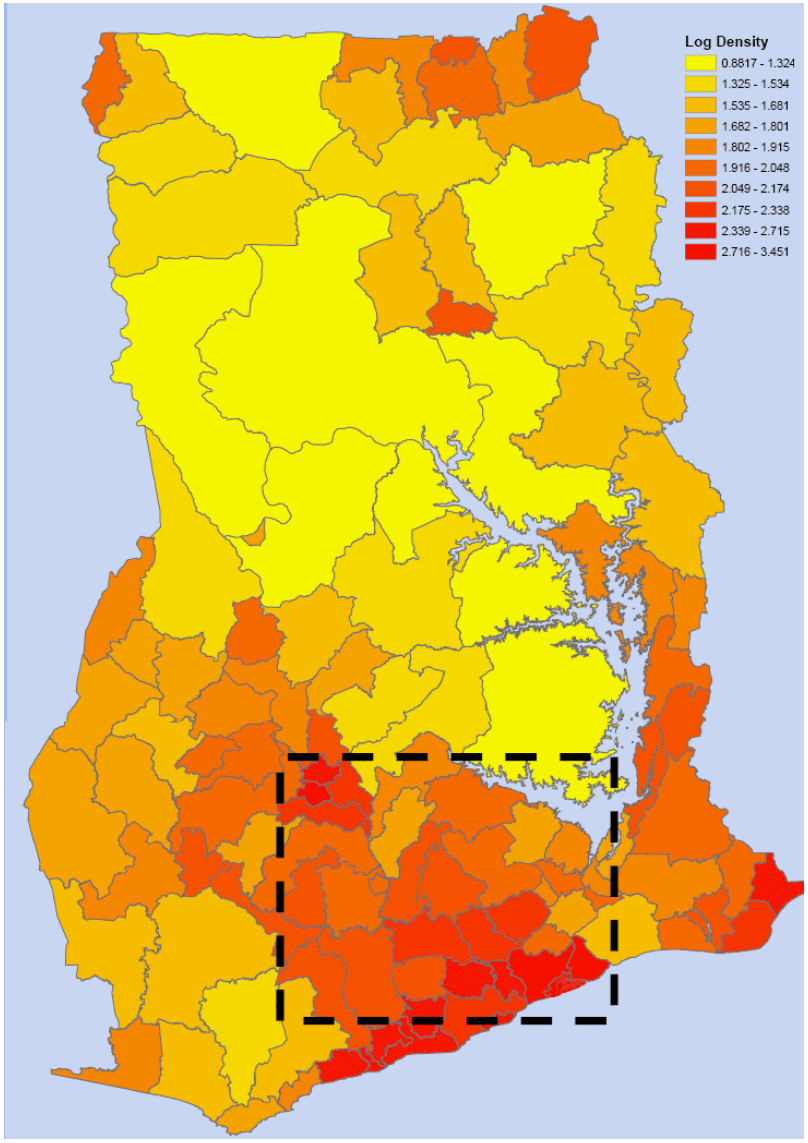
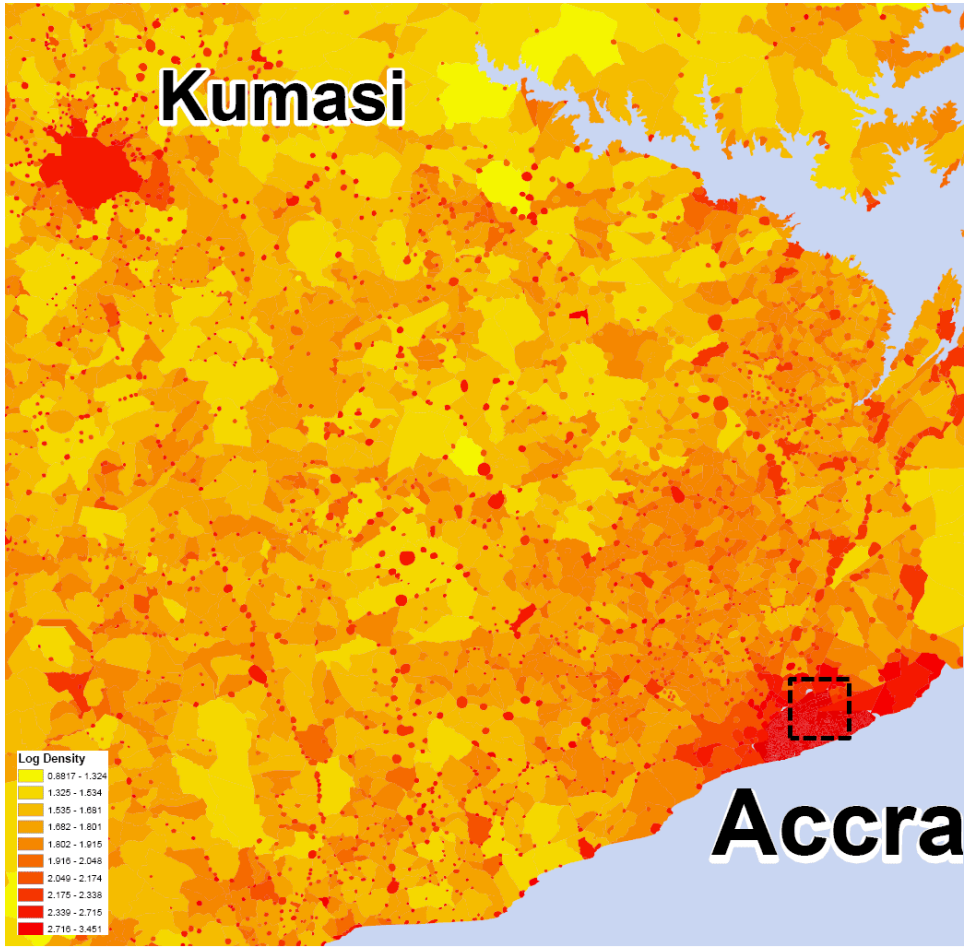
Ghana: Population distribution





Selecting adaptation options

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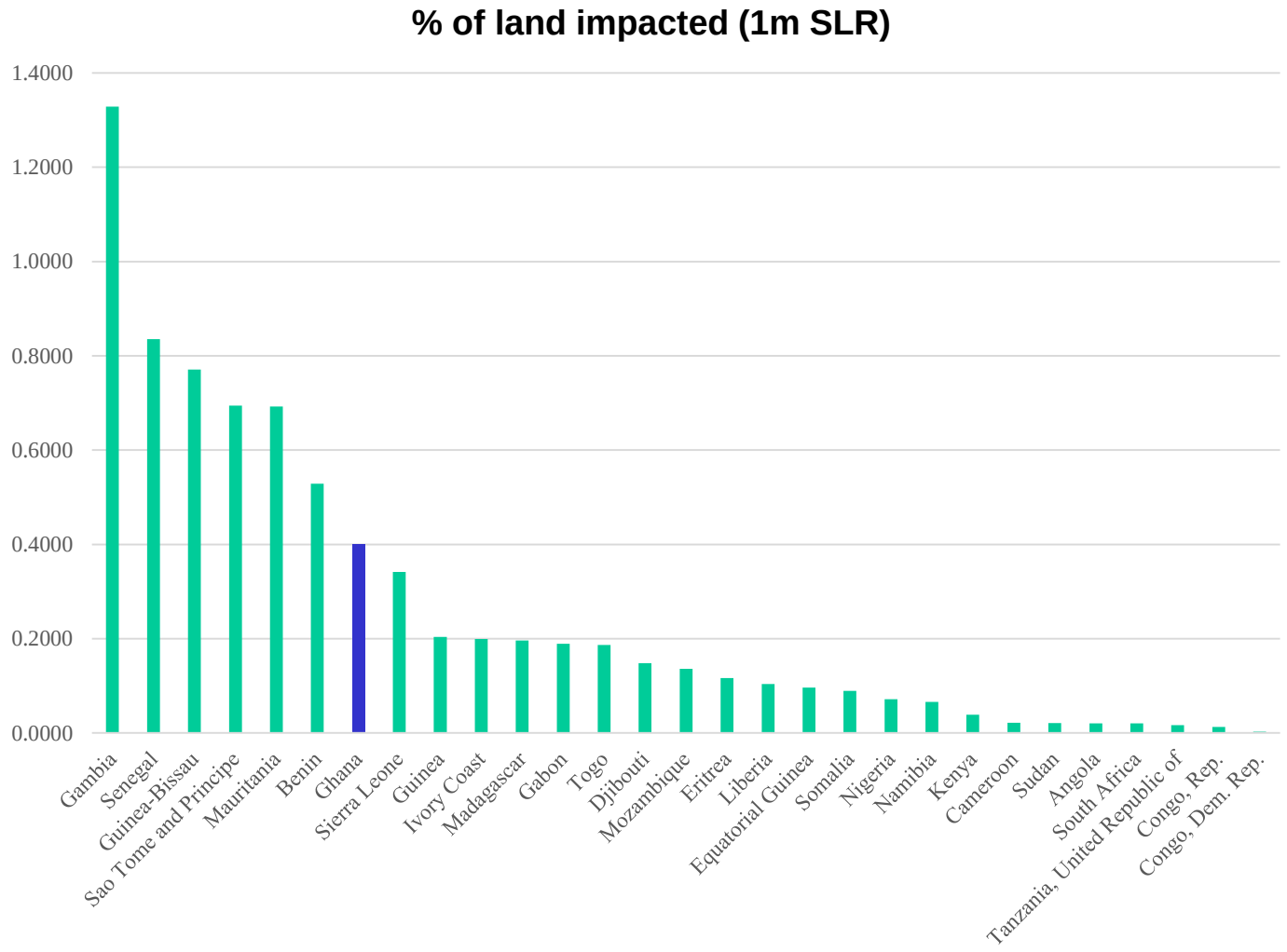

Selecting adaptation options

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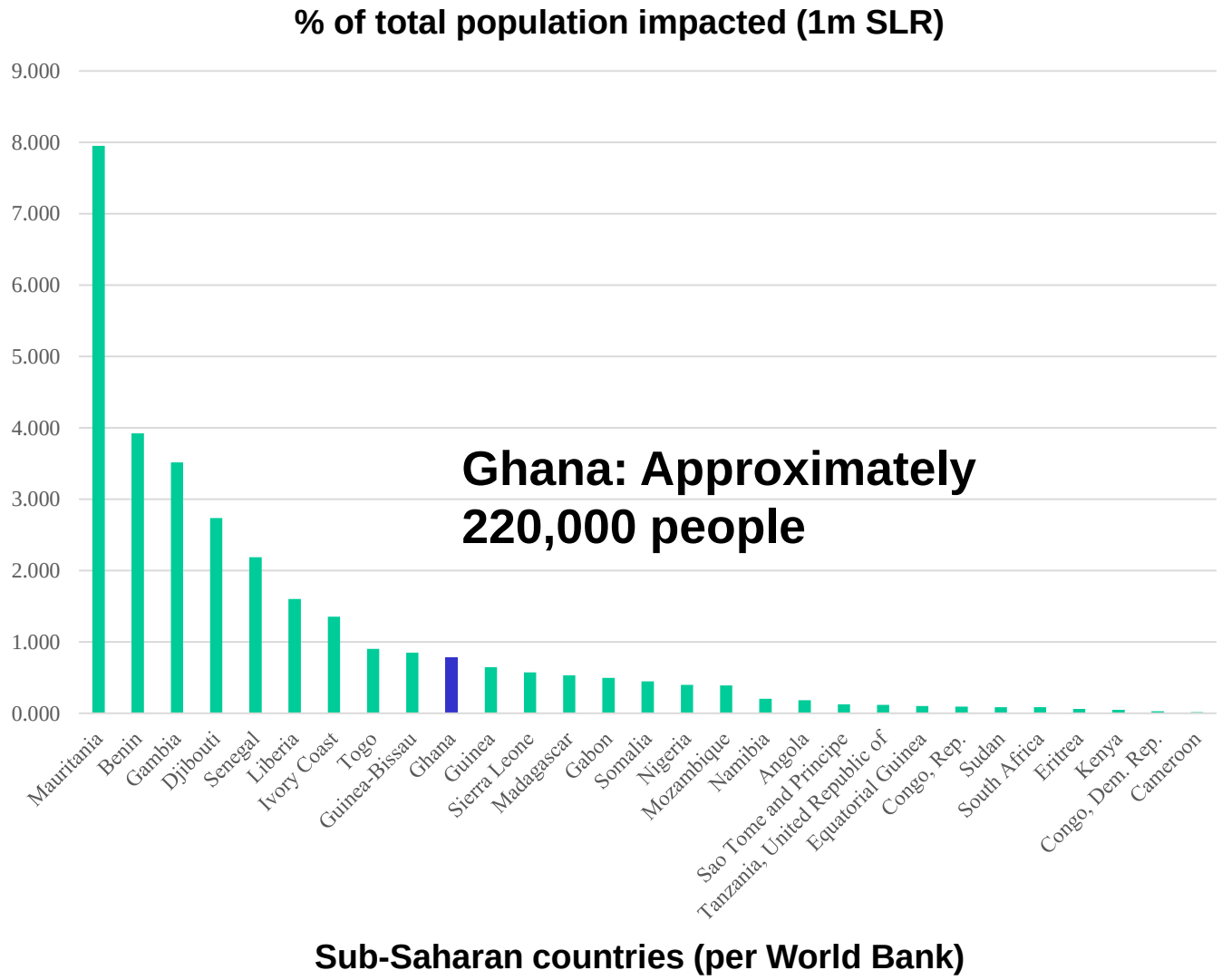

Selecting adaptation options

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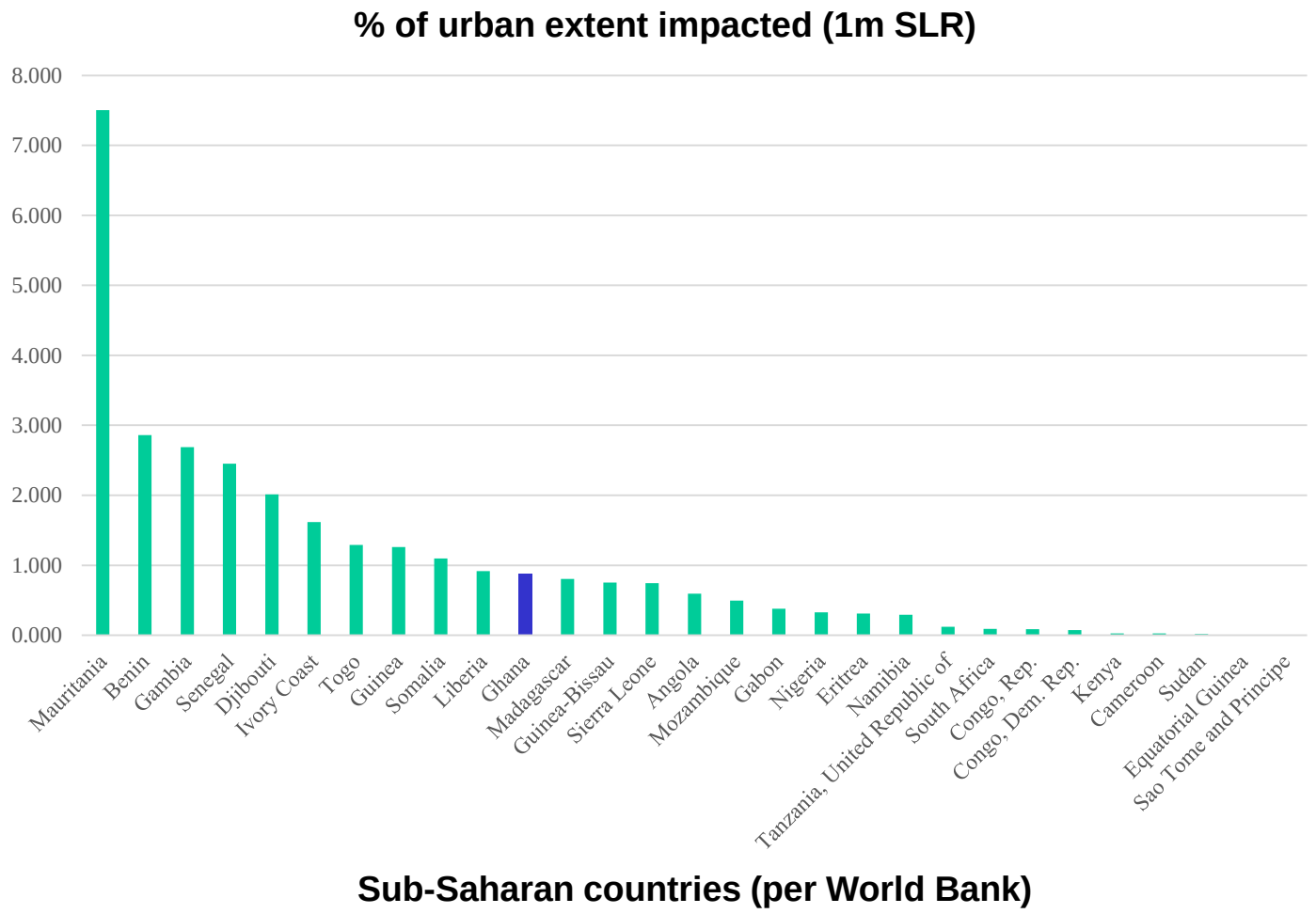

Selecting adaptation options

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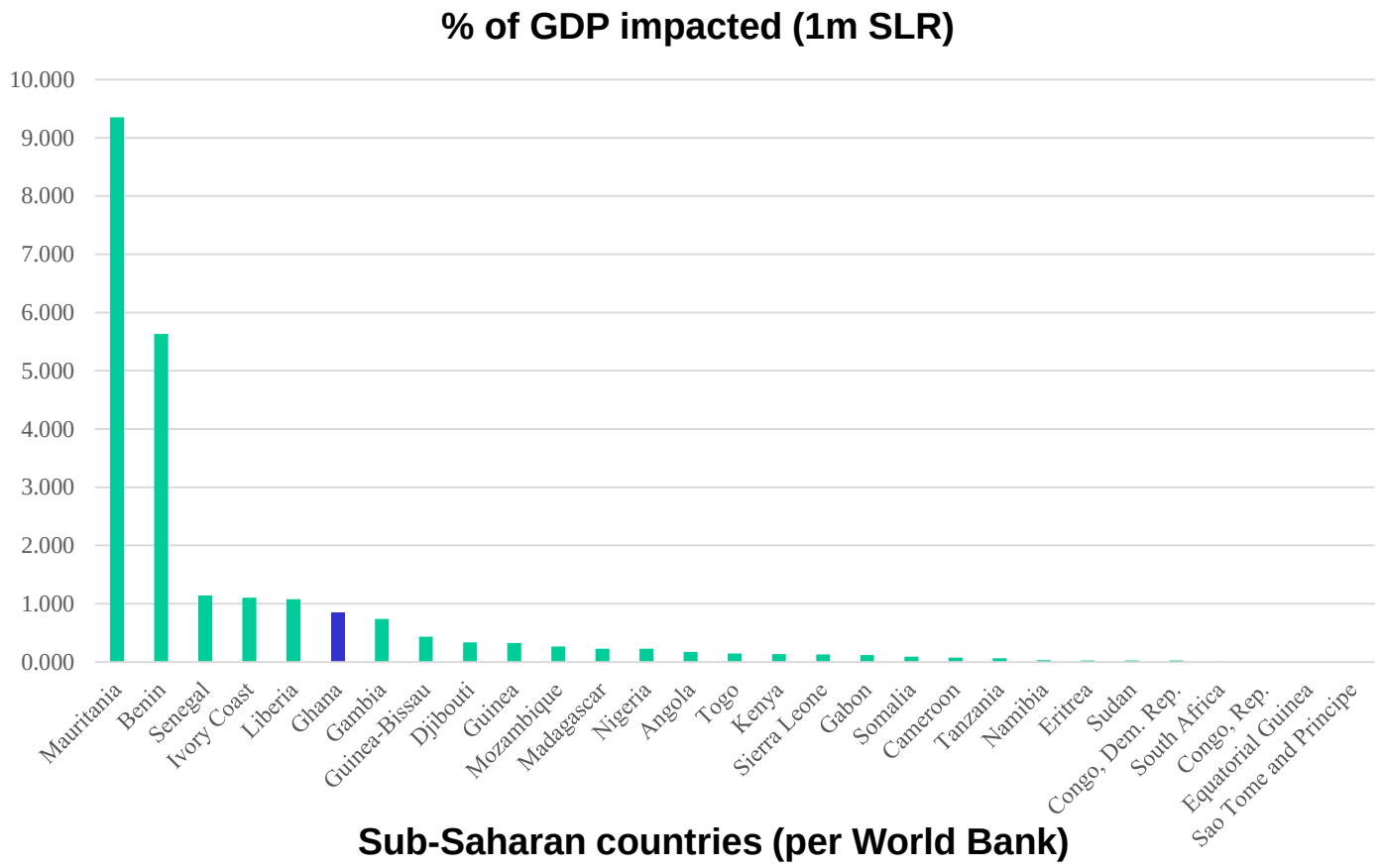

Selecting adaptation options

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Provided that adaptation is still needed, then society faces a number of important questions, including:

- **What is the cost of climate change expected to be for different sectors (e.g. agriculture, water, health, coastal resources, etc.)?**
- **How much to invest in adaptation?**
- **What are the costs and benefits of different adaptation measures? Which adaptation measure to select?**
- **What is the appropriate combination of soft measures (policies) and hard measures (infrastructure)? How to account for the co-benefits of ecosystem-based adaptation measures?**

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Climate-proofing investment projects

A menu of possible decisions:

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

Climate-proofing investment projects

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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.**

Climate-proofing investment projects

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.**

Climate-proofing investment projects

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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.

Role of cost-benefit analysis?

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GROUP DISCUSSION

How do you see the role of CBA in your work?

What are the barriers and constraints to the use of CBA?

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Prioritization of Climate Change Adaptation Options

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