

General approaches to determining the cost of implementing Nationally Determined Contributions

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General approaches to NDC costing

- Cost Benefit Analysis
- Feasibility - Viability
- Business cases



Cost Benefit Analysis

CBA is 'a systematic approach to estimating the (economic) strengths and weaknesses of alternatives'.

Commonly used to determine the prospective merits of policy proposals.

Nearly all western countries require CBA and have developed protocols for CBA

Benefits and costs in CBA are expressed in **monetary terms** and are adjusted for the **time value of money**.

CBA is simple at face value:

- If there are no constraints on inputs, adopt all projects that have positive net benefits (i.e. NPV).
- If there are budget constraints, choose the combination of projects that maximizes net benefits (i.e. NPV).

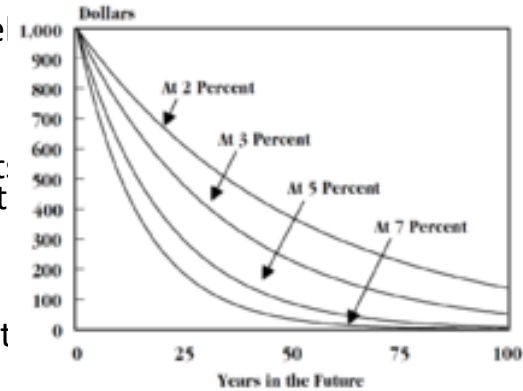
It is complicated in practice.



Cost Benefit Analysis

Let's do the simple first:

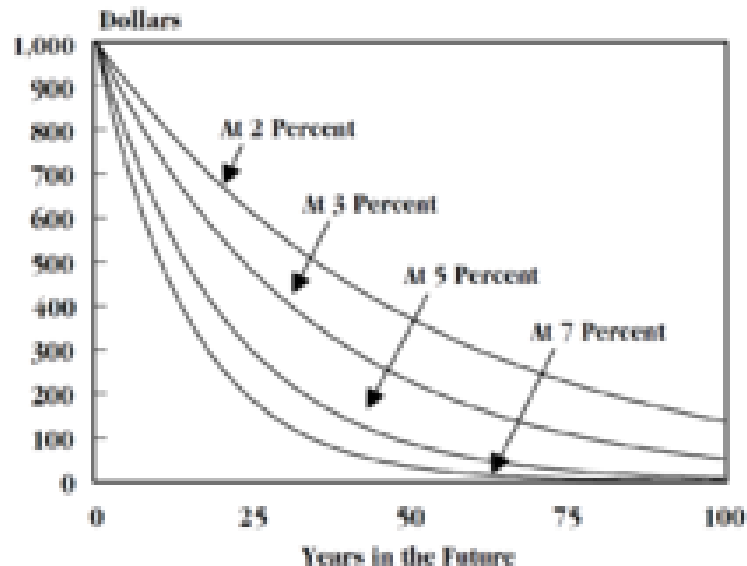
- **Step One: Brainstorm Costs and Benefits**
- All costs associated with the project, imaginable and unimaginable; make a list of these. Then, consider the lifetime of the project. When are costs and benefits like to occur?
- **Step Two: Assign a Monetary Value to the Costs**
- Costs of physical resources, human effort involved in all phases of a project. "Costs are often relatively easy to estimate (compared with revenues)". Include also cost incurred over the lifetime of the project. Costs after the project lifetime?
- **Step Three: Assign a Monetary Value to the Benefits**
- More complicated because everything is in the future (cost/investment is up front Benefits in the value of services rendered, direct and indirect costs saved, time saved (common for transport), (health) value of pollution eliminated. Benefits after the project lifetime?
- **Step Four: Compare Costs and Benefits**



Cost Benefit Analysis

And then add the complication with just three simple questions:

1. is there no future beyond the project, e.g. an open pit coal mine?
2. the cost to whom?
3. which benefits?

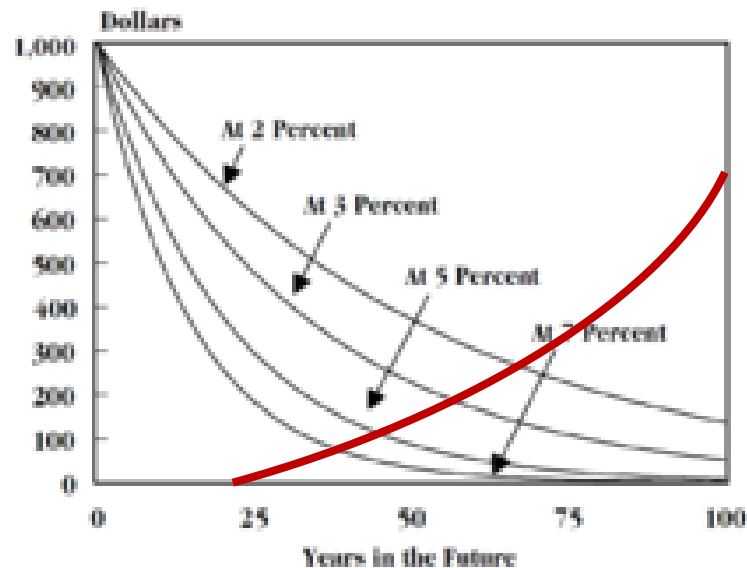


Cost Benefit Analysis

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Environmental externalities are practically defined out of CBA



Cost Benefit Analysis

The entire climate change disaster is due to the failure to correctly determine the cost and benefit of activity.

Traditionally, when economic and environmental interests clash, the economic interest always prevails.

The tragedy of the commons

Cost Benefit Analysis



Market failure

Cost Benefit Analysis



Market failures or externalities should be included, but are very difficult to assess - and difficult to defend. These are at a minimum the cost to

- a. nature (no people)
- b. health (all people)
- c. other stakeholders (the downstream issue) (specific people)

The solution to the climate change disaster cannot be more of the same.

All we have invested in that causes climate change has been decided on the basis of CBA

Hence, if we want to use the CBA approach, it must incorporate the real cost to the environment.

It should as a minimum include a price of carbon - probably 25-50 USD/ton.

Even if it is not charged, doesn't mean it is not a cost!

Cost Benefit Analysis

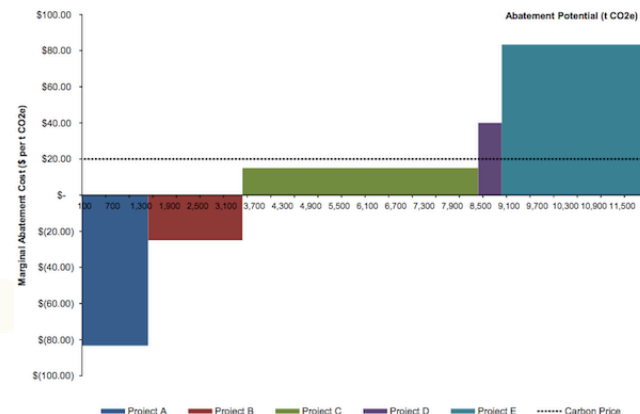
Core issue:

The setting of boundaries, activity-wise and time-wise

The Marginal Abatement Cost concept

The Marginal Abatement Benefit concept

You may not have heard about the latter one - which speaks volumes of the way we treat CBA even in the age of climate disaster



Feasibility - Viability



Normally also includes 'bankability', but we assume we don't go to the bank (yet)

Most NDC substance is about Infrastructure Projects

- Energy supply

- Transportation (roads, rails, ports, airports, etc.)

- Water and sanitation

- Telecommunication

- Environmental services

Feasibility - Viability



What makes a project feasible?

- Does it address the defined need?
- Is it technically doable and does it involve appropriate technology?
- Does it integrate with existing systems?
- Does it deliver the expected output?
- Does it serve the people for whom it's intended?
- Does it comply with existing laws & regulations?
- Does it have adverse effects on environment?
- Does it conflict with other means and purposes?
 - Priorities and scarcity of funds

Feasibility - Viability

In principle, feasibility does not have to consider costs

Viability, on the other hand, is about pricing:

- Price of the investment
 - Affiliated permit, reconstruction or rehabilitation costs
 - Capital/finance costs
 - Operational costs
 - Externality costs
-
- The cost of risks
 - Revenues - including costs chargeable to stakeholders
 - Can it be made viable?



Feasibility - Viability

Making investments viable may be a political choice

- For instance, deciding on the price of energy that includes externalities
- Or deciding to subsidize agricultural output to make it affordable to low income households
- Or reducing the tax on electric vehicles to make them competitive against ICE cars
- Unless everything is entirely deregulated, every viability calculation is influenced by past government choices, directly or indirectly
- Viability determination, therefore, will oftentimes depend on revision of old (political) choices
- Hence, viability determination is fundamentally subjective
- Oftentimes, it is subject to interests of revenue preservation



Feasibility - Viability

The identity of the investor

Private or public?

The public sector is viability driven

The private sector - business cases - are bankability driven

So now we go to the bank. And the bank is driven by risk concerns



Feasibility - Viability

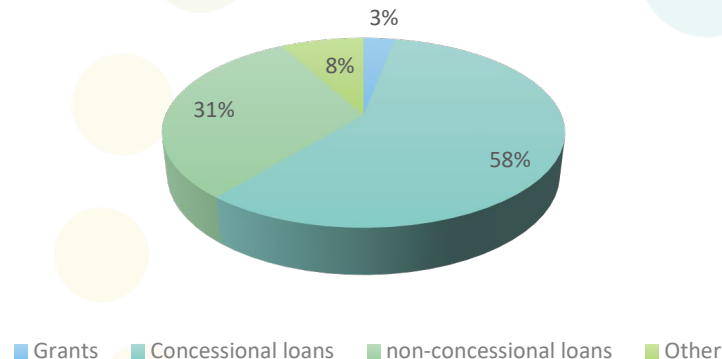
Before we leave the public sector...

- feasible
- viable
- bankable



- feasible
- grantable

Distribution on types of climate finance from major donors



Feasibility - Viability

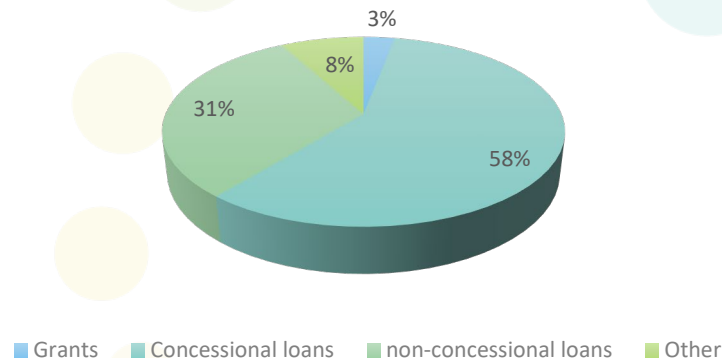
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- ~~• feasible~~
- ~~• grantable~~

Distribution on types of climate finance from major donors



Business cases

Feasibility - Viability - Bankability

For most infrastructure services, the regulator decides which business cases are feasible, viable and bankable, and which are not.

Example: Environmental Fiscal Reform

Specifically designed to make environmentally damaging investments unviable - although it comes with a lot of dilemmas attached.



Business cases

Feasibility - Viability - Bankability

Business cases are meant to create a profit, so do they come at a cost?

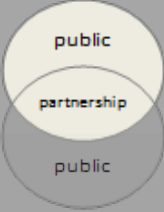
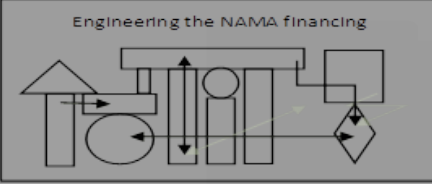
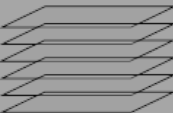
Is the BAU investment that does **not** pay for its externalities the right benchmark?

How to treat the costs to make profitable business cases?



Business cases



 PUBLIC SECTOR SOURCING INSTRUMENTS	 PUBLIC SECTOR OPERATIONAL INSTRUMENTS	 PRIVATE SECTOR FINANCING INSTRUMENTS
Environmental Fiscal Reform	Grants	Equity
Loans	Purchase contracts for goods	First-loss (mezzanine, junior debt)
Soft loans	Purchase contracts for services	Loans
Bonds	Additional payments (e.g. feed-in tariffs)	Bonds
Dedicated credit lines	Public procurement guidelines	Risk cover, guarantees
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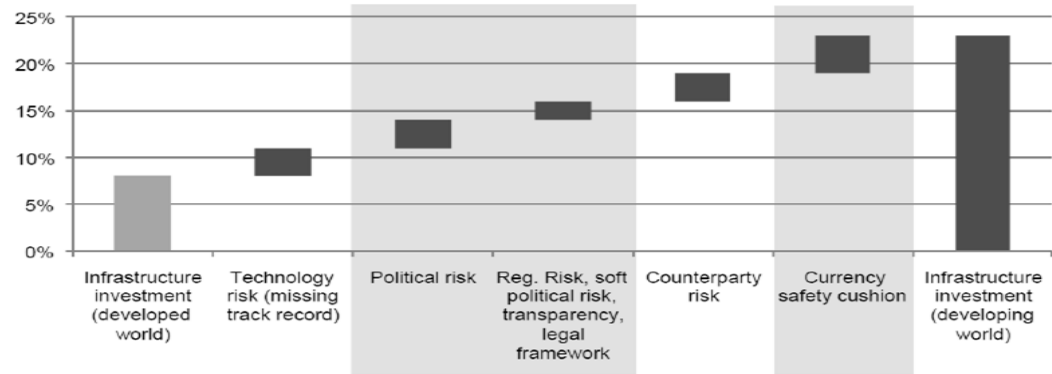
Public sector instruments for creating profitability in business cases (possibly EFR)

Business cases

The private sector is bankability driven

The banks are driven by risk concerns

Risk cover comes at a cost



Source: DB Climate Change Advisors

Business cases

Project/investment risks may relate to questions like

- Does the project address the defined need?
- Is it technically doable and does it involve appropriate technology?
- Does it integrate with existing systems?
- Does it deliver the expected output?
- Does it serve the people for whom it's intended?
- Does it comply with existing laws & regulations?
- Will the laws and regulations change?
- Does it have adverse effects on environment?
- Who charges the customers – and who pays if they don't?
- etc.



Identification of incremental cost (climate component) of investments



Does the climate component have a cost?

Just like no activity has a given cost, neither can it have a given incremental cost

300 MWe Gas fired power plant	500 million
500 MWe wind power	<u>800 million</u>
incremental cost	300 million

20 year LCOE* of gas power	35
20 year LCOE of wind power	38
40 million MWh x 3, incremental cost	120 million

20 year LCOE* of gas power	35
carbon cost of gas power	10
20 year LCOE of wind power	38
40 million MWh x 7, incremental profit	280 million

What is the cost of programmes?

The budget is not the cost

The investment is not the cost

EUs gigantic Covid-recovery programme of 1.9 trillion EUR is not the cost.

Most will come back due to **dynamic effects** - some activities are more 'dynamic' than others, particularly the labour intensive ones

When does an activity end? What is actually the baseline?



Setting the baseline

Just because the cost is not in the budget now, does not mean that it will not be in the budget later.

Building up environmental debt



What is the cost of programmes?

When determining the (incremental) cost on climate investment, establish the baseline (BAU) cost, gross or net

Only adaptation actions are cost-only; practically all mitigation actions are investments

If the private sector invests, it makes a profit. Consider only those public sector costs that cannot be recovered from the activity

Donors and investors alike are unhappy to compete against subsidies (e.g. in the form of not tidying up after open pit mining)



What does GCF say?

"Baseline scenarios, which are essential for defining incremental costs are hypothetical; defining them constitutes a major issue in the determination of incremental costs and is inevitably a matter for negotiation among the parties concerned."

"The use of net versus gross incremental costs may lead to different funding levels. If net costs are used, any local economic benefits from the project would be subtracted and therefore the amount of incremental costs would be reduced."

"The fact that the alternative project has important economic or local benefits does not guarantee that the additional funds required will be available domestically or from external - public or private - sources."



GCF guidance

"Incremental costs is a key tool to assess climate rationale."

"Qualitative approaches connected to **a strong theory of change** should be used for all funding proposals, at a minimum."

"Quantitative approaches should be applied to activities when sufficient data is available."

"Funding for full cost of adaptation can be justified through incremental reasoning and funding for full project costs may be justified under certain circumstances."



Identification of appropriate financial instruments

August 25, 2021

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Principles

1. Before you start choosing financing instruments, start by avoiding the finance you do not need
 - There is no given cost of an activity
 - You may shop expensively, cheaply or smartly
 - Minimizing the cost is in everybody's interest. NDC host countries will probably pay most of the costs of any activity, especially for mitigation

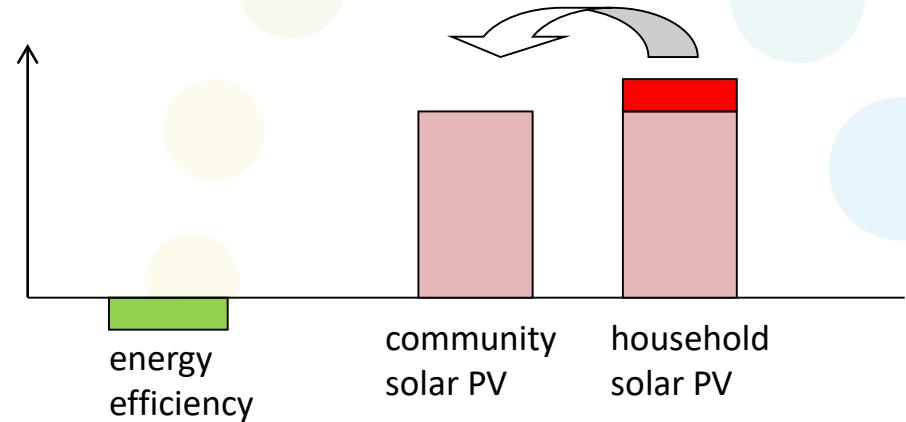
Hence

2. structure the activity,
3. reduce cost elements as much as possible,
4. alleviate risks,
5. monetize positive externalities,
6. distribute the costs on relevant stakeholders, and
7. select financial instruments carefully, they are part of the cost as well



Principles

8. Cost *inefficiency* is not a disqualification in itself
9. Engineering the financing of an activity is not (necessarily) influenced by high costs of abatement
 - wind power and solar energy thrive;
 - energy efficiency does not



A shift from high to lower cost of abatement indicated by the arrow reduces costs, but remains far above the (negative) cost of energy efficiency initiatives

Principles

structure the activity,

- scale, components, ownership (public/private)

reduce cost elements as much as possible,

- need to have/nice to have
- short term savings vs. long term costs and vice versa

alleviate risks,

- identify and address no cost risk reduction options (e.g. regulatory)

monetize positive externalities,

- include cost reductions in other sectors and make budget revisions

distribute the costs on relevant stakeholders,

- e.g. introduce levies on externalities


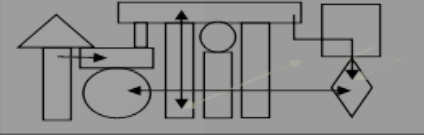
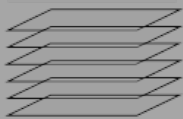
select financial instruments carefully

- some instruments are costlier than others



Public sector **sourcing** of finance



 <p>PUBLIC SECTOR SOURCING INSTRUMENTS</p>	<p>Engineering the NAMA financing</p>  <p>PUBLIC SECTOR OPERATIONAL INSTRUMENTS</p>	<p>business opportunities</p>  <p>PRIVATE SECTOR FINANCING INSTRUMENTS</p>
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Public sector deployment of finance



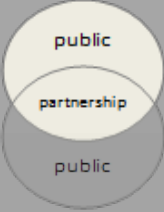
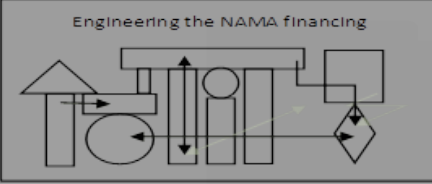

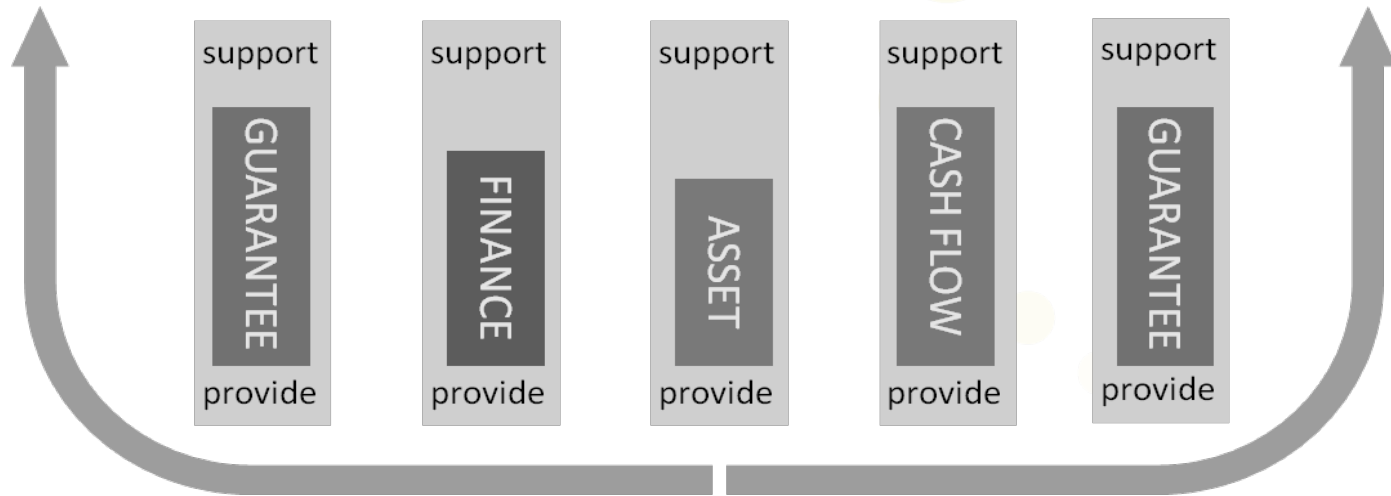
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Table 3: Financing instruments

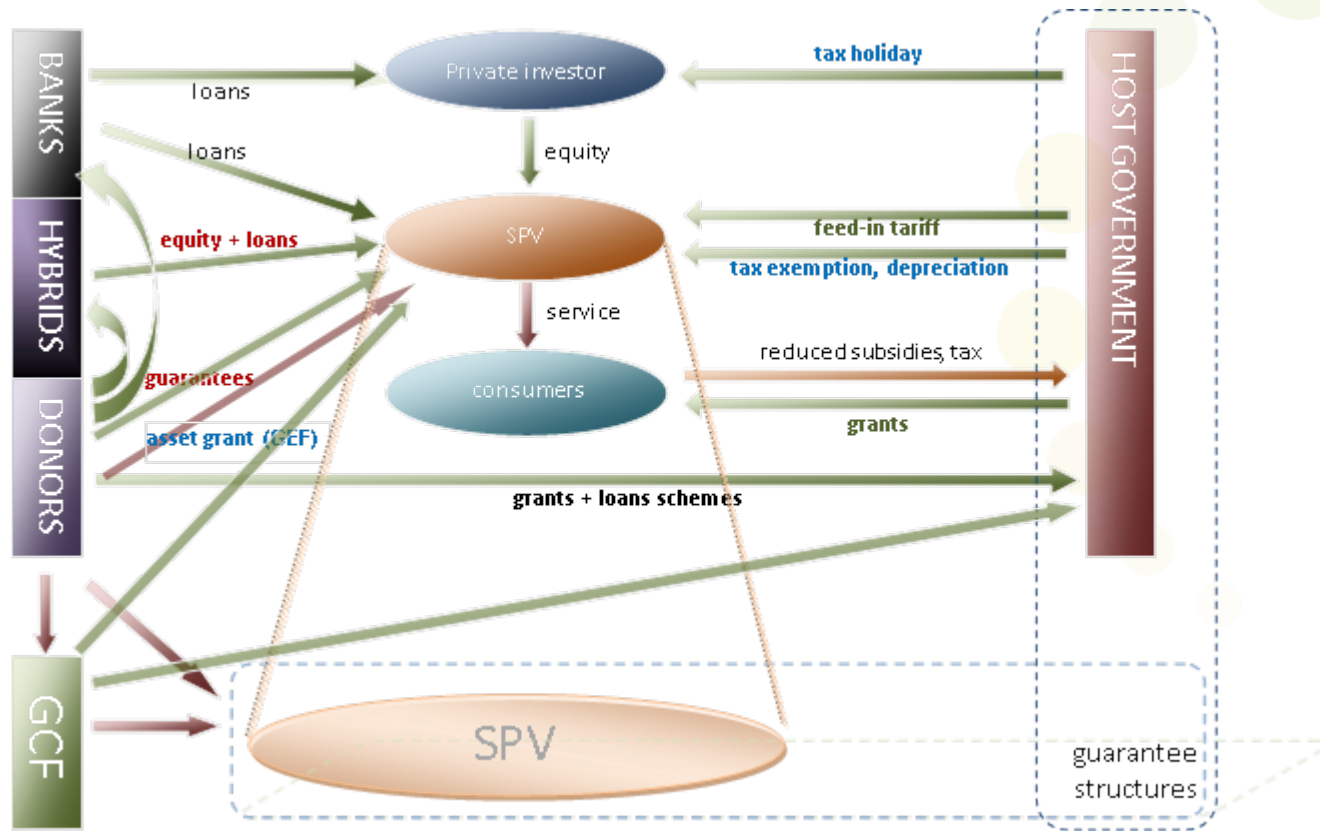
Instrument	Characteristics	Typical providers
Equity	Investments made directly in projects or operating assets by investors who assume a portion of ownership relative to their provision of capital.	Private companies, individuals, venture funds, publicly funded venture funds (hybrids), pension funds
First-loss	A tranche of finance that, in the event of a default, takes the first loss, before other tranches. Also called “mezzanine financing” or sometimes “junior debt”. May be regarded as a hybrid of debt and equity.	Private companies, venture funds, publicly funded venture funds (hybrids)
Loans	Traditional debt financing on standard terms (market rate and tenor), commonly provided by banks, including development banks.	Banks, development banks, publicly funded venture funds (hybrids), pension funds
Soft loans	Loans on favourable terms (below market price) with low interest rates, long maturities and possible grace periods. A subset of soft loans are mixed credits which, according to OECD rules, must contain at least a 35% grant element.	Bilateral donors (through commercial banks), multilateral development banks
Bonds	A debt investment in which an investor loans money to an entity (corporate or governmental) that borrows the funds for a defined period of time at a fixed interest rate. The bond (i.e., the debt) may be traded at an exchange and bought by anyone.	Financial arrangers such as banks and credit institutions, large corporations, governments

Dedicated credit lines	Lines of credit (debt finance) for investing in projects that meet specified criteria, e.g. related to climate change. Credit lines are typically established by development banks or less commonly by public entities (government agencies) and channelled through a private sector bank or financial institution for the financing of (most often) private sector initiatives.	Multilateral and bilateral development banks
Risk cover instruments, guarantees	Several instruments provided by either the public or the private sector, most often in the form of insurance against certain events. Governments will typically provide political (policy) guarantees and government agencies may insure such guarantees; private sector entities may provide technical (technology) risk cover. Guarantees (except government guarantees) are paid for much like an insurance policy.	Export Credit Agencies, insurance companies, banks, governments, technology suppliers
Project Finance	Financing structured around a project's own operating cash flows and assets, without requiring additional financial guarantees by the project sponsors. Loans in a project finance structure are also called "non-recourse" lending. Project finance depends essentially on the structuring of the risk through risk-cover instruments.	All of the above
Grant	Provision of funds without expectation of repayment, using government budget allocations, and/or international financial institution/donor funds. An example would be funds provided to pay up-front costs of measures/projects.	Bilateral donors, philanthropic funds
Blending mechanisms	Blending facilities use grant funds to create a blend of debt and guarantee instruments from a number of financial institutions in order to provide a package of finance with attractive terms to meet project finance needs.	Both the Green Climate Fund (GCF) and the NAMA Facility have signalled their intent to provide a wide variety of financial instruments

Interventions come at different levels of cost efficiency



To minimize cost, follow the general direction of the arrows



So what is the takeaway?

- There are textbook principles, but there is no textbook approach
- You will choose your approach based on your purpose and your role in project development.
- Emphasize costs, or emphasize benefits. Maximize incremental costs or minimize them
- You may wish to emphasize your domestic climate finance, or you may wish to underscore the shortage of investment capital. You may wish to do both.
- If the purpose is to access financing, be prepared for negotiating the basis for the financing before negotiating the actual financing



So what is the takeaway?

- CBA is entirely dependent on the setting of boundaries - project-wise and in time.
- Incremental cost calculations are entirely dependent on the baseline and on the choice of financial instruments
- The important issue is to be transparent about what you do, how you calculate, what you include and exclude

If you are to finance 50% of the investment yourself, what would be your approach to costing?



Case Studies

The image shows a large-scale industrial facility, possibly a nuclear or thermal power plant. Three prominent, grey, hyperboloid cooling towers are the central focus, rising vertically against a bright blue sky filled with soft, white clouds. To the left and right of the towers are several tall, intricate steel lattice transmission towers for high-voltage power lines. The base of the towers and the surrounding area are landscaped with green grass, small shrubs, and young trees. A white building with blue accents is partially visible behind the towers. The overall scene conveys a sense of large-scale engineering and infrastructure.

Case studies

Three break-out groups:

1. Cost Benefit Analysis
2. Incremental costs in adaptation
3. Financing instruments



Case studies

If you need projects to focus on, maybe use these two for CBA and financing instruments

Panama to build \$1bn Generadora Gatún natural gas-fired power plant

By NS Energy Staff Writer 02 Jun 2021

POWER FOSSIL FUEL / COAL AND GAS GAS

The 670MW power plant is expected to begin operations in either late 2023 or early 2024



Enel Green Power begins construction on 26MW solar project in Panama

By NS Energy Staff Writer 12 Nov 2020

POWER SOLAR PLANT

The solar plant is part Enel's new investments of \$50m that will be made between 2020 and 2021 in the country



Cost Benefit Analysis - break out group

Cost to whom?

- a. nature
- b. health
- c. other stakeholders (the downstream issue)

How to assess the value of a public good?

- a. A public good is paid by the regulated, through Government regulation (limitation) of activity. Absence of regulation equals the building up a debt burden (the cost of future tidying up). The benefit may be measured in the absence of debt
- b. The absence of direct causality means that the Government assumes the cost (of a health care system) or the sick pay
- c. Other (weaker) stakeholders pay the cost of upstream activity



Cost Benefit Analysis - break out group

Benefits to

- a. nature
- b. health
- c. other stakeholders (the downstream issue)

The benefits - positive externalities - must be determined by the regulator, regardless if

- a. Some benefits are difficult to monetize (tiger)
- b. It is difficult to establish causality (all people)
- c. Stakeholders for whom both cost and causality can be established are weak (downstream people with no influence)



Case Study

CBA inspiration

Cheapest Energy Generation Technology By Country

2014

Coal	Gas	Wind	Solar
Belgium	Algeria	Denmark	
Bulgaria	Argentina	Germany	
Chile	Australia	Uruguay	
China	Brazil		
France	Canada		
Greece	Egypt		
India	Israel		
Indonesia	Mexico		
Italy	Peru		
Japan	Philippines		
Malaysia	Russia		
Morocco	Saudi Arabia		
Poland	U.S.		
South Africa	UAE		
South Korea			
Spain			
Thailand			
Turkey			
U.K.			
Vietnam			

2019


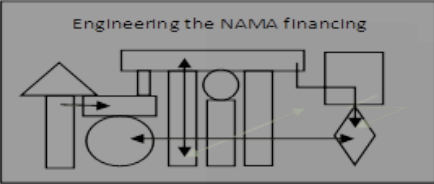

Coal	Gas	Wind	Solar
Indonesia	Algeria	Argentina	Australia
Japan	Belgium	Brazil	Chile
Malaysia	Bulgaria	Canada	Egypt
Philippines	Greece	China	France
Poland	Russia	Denmark	India
South Korea		Germany	Israel
Thailand		Mexico	Italy
Turkey		Morocco	Saudi Arabia
Vietnam		Peru	South Africa
		U.K.	Spain
		U.S.	UAE
		Uruguay	

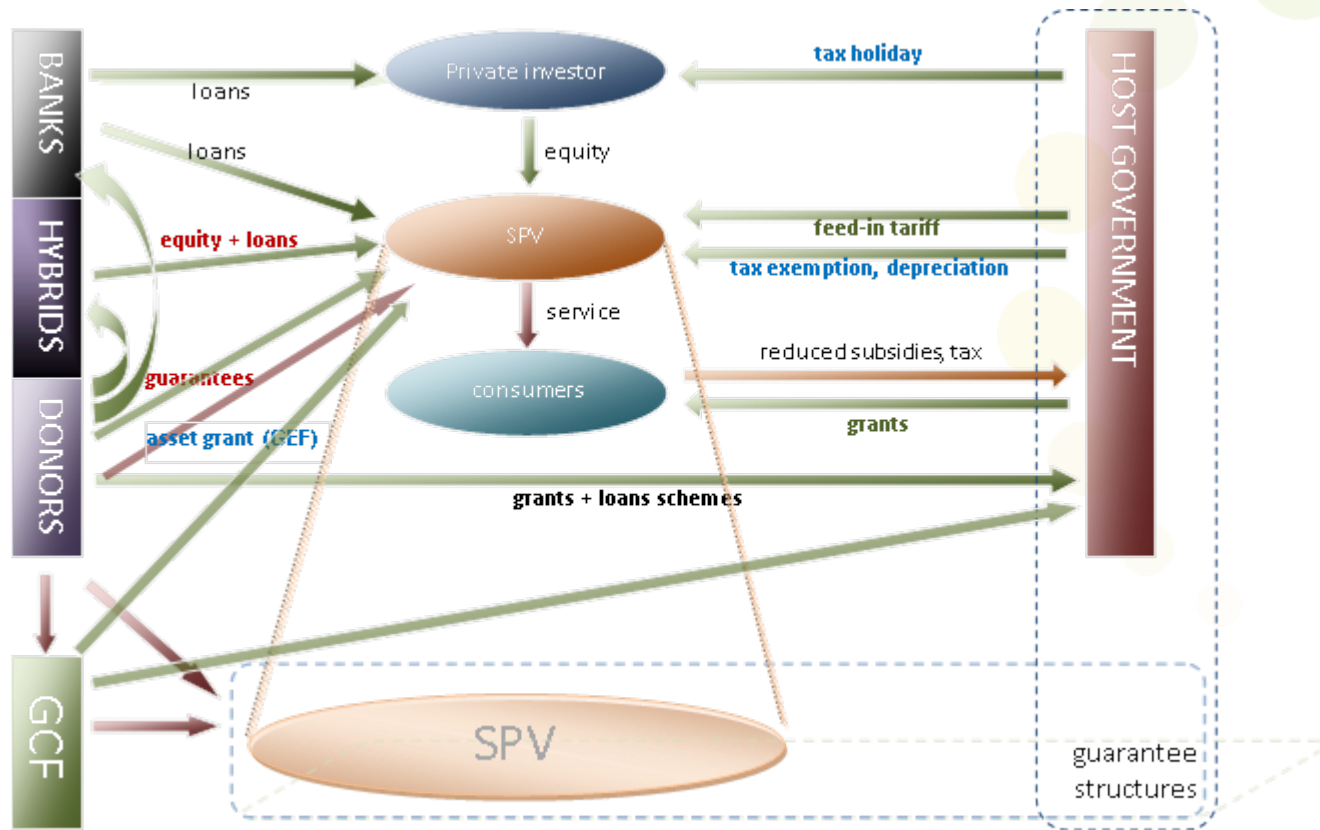
Note: Reflecting the cheapest benchmark project for each technology and market.
Source: BloombergNEF New Energy Outlook



Case Study - financing instruments



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Incremental cost

- with an adaptation focus

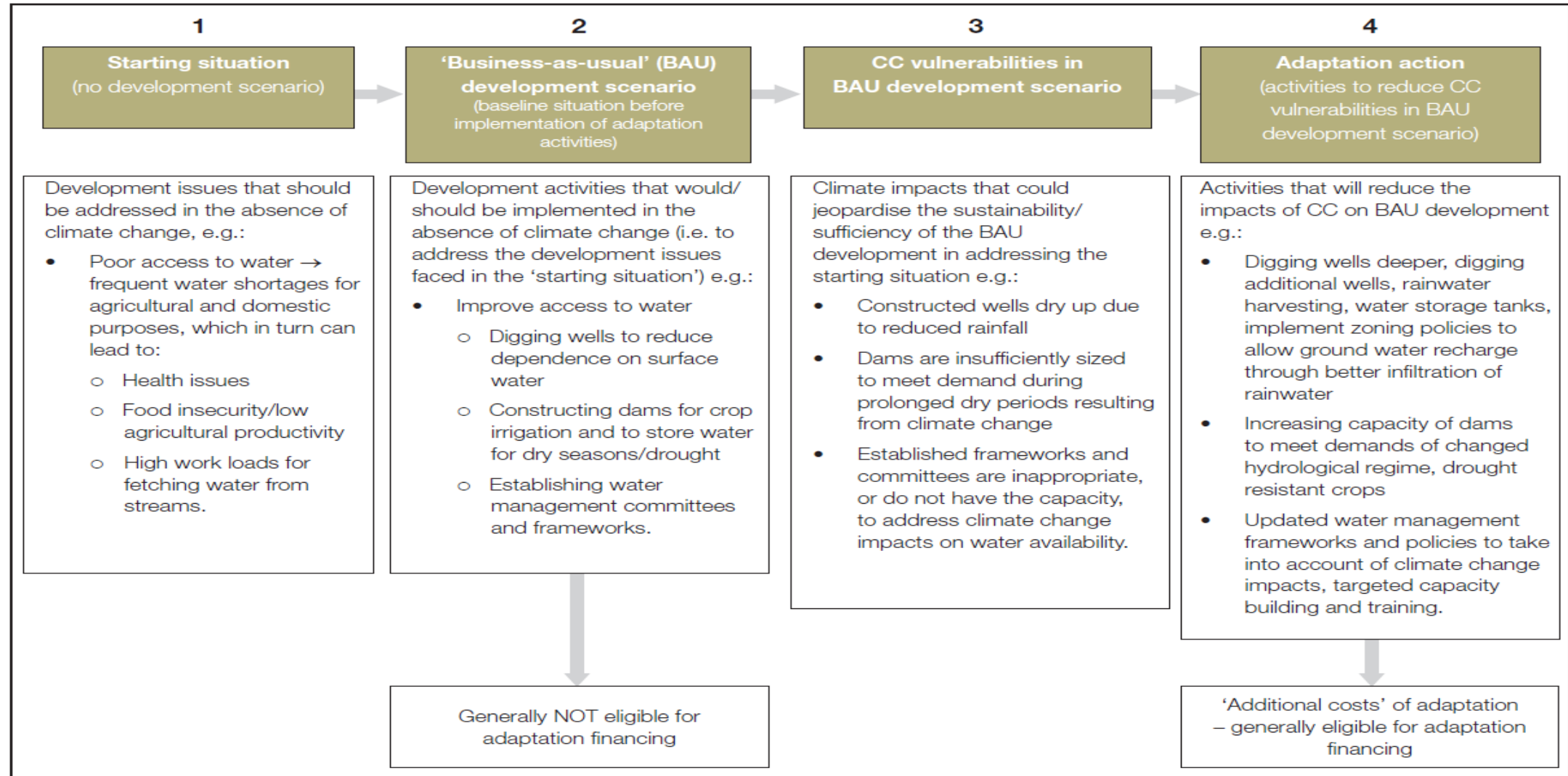
Incremental costs can also be understood as **additional expences to produce outputs that results in climate adaptation and mitigation.**

Example:

- Large scale infrastructure investment e.g. water system, road, harbour
- BAU cost of investment in the absence of climate change and without climate outcomes e.g. without climate proofing of the infrastructure, without integration of climate adaptation
- BAU + incremental cost covering the climate proofing, the climate adaptation, and the climate resilience element of the infrastructure

Incremental cost - Adaptation

Figure 3.1: Schematic presentation of the adaptation rationale and additional cost argument for a generic example in the water sector. Steps 2, 3 and 4 correspond to the three sub-questions of the adaptation rationale identified in the main text. Theoretically the cost of 4 can be considered 'the additional cost of adaptation' (or simply 'the cost of adaptation')



Climate funds are willing to pay incremental cost with climate outcomes:

- Several GCF projects financing incremental cost of infrastructure e.g. Project no 8 in Fiji on water & sewage system renovation and resilience <https://www.greenclimate.fund/project/fp008>, project 52 in Nauru on harbour construction partly to address climate change effects.
<https://www.greenclimate.fund/project/fp052>

In such cases, the benefits of the climate outcomes are factored into the "price tag":

- **Net costs:** The economic benefit from the mitigation and adaptation outcomes is subtracted, incremental costs are therefore reduced

To identify incremental cost of a project:

- Solid data on the climate effect in relation to the project e.g. what part of the water & sewage system problem in Fiji is caused by climate change. Can involve a vulnerability assessment or similar
- Robust identification of necessary resilience efforts from a technical point of view, and establishment of the costs (absolute and relative of the overall cost of the project). This can include estimating the benefits and identifying the net costs

Group Work - adaptation incremental cost

- How can Panama use its vulnerability/resilience/adaptation approach to uncover/deliver data on the climate part of problems investments seek to address?
- How can Panama institutionalise a process to identify adaptation/resilience efforts and their costs as part of large scale investments/projects in a wide range of sectors?
- How will Panama cover the incremental adaptation costs?