Global Climate Change Alliance
Support Facility

Module 6
Costing, assessing & selecting adaptation & mitigation options & measures

Training workshops on
mainstreaming climate change

MWH

BUILDING A BETTER WORLD

Key topics covered by this module

- Tools for costing and assessing adaptation and mitigation options
- Tools for prioritising and selecting adaptation and mitigation measures

Assessing adaptation options

- Generic approach proposed by OECD (2009):
  1) Identify current and future vulnerabilities and climate risks
     - Use climate risk screening to support this step
  2) Identify possible adaptation measures
  3) Evaluate and select adaptation options
     - Based on effectiveness, cost and feasibility
     - **Cost-benefit analysis (CBA)** or **cost-effectiveness analysis (CEA)** are good tools for supporting the identification of 'no-regrets', 'low-regrets' and 'robust' options
  4) Monitor and evaluate success of adaptation strategy

Strategic choice of mitigation options

- The choice of GHG abatement technologies should result from a strategic prioritisation process:
  - Initially at least, focusing limited resources and capacities on a limited range of technological options is likely to be more effective and efficient than a dispersion of efforts
  - Abatement technologies must be matched with:
    - the country's development strategy
    - its natural resource endowment, existing infrastructure, institutional, technical and other characteristics
  - Already proven and established technologies and those already economically viable are 'safer bets'

Tools for costing and assessing adaptation and mitigation options

Cost-benefit analysis (1)

- Cost-benefit analysis (CBA):
  - Quantifies all the costs and benefits (*) of an intervention (with benefits including both 'positive' benefits and avoided losses) over the entire lifetime of the intervention
  - A 'discount rate' is applied to all costs and benefits to represent 'preference for the present' or simply the opportunity cost of capital -> calculation of 'present value'
    - The higher the discount rate, the smaller the present value
    - The further away in the future, the smaller the present value
    - Significant controversies over the 'right' discount rate for assessing long-term options

(*) Actually the 'incremental' costs and benefits, i.e. the difference in costs/benefits between a 'with intervention' and a 'no intervention' scenario

Cost-benefit analysis (2)

- Outputs of cost-benefit analysis:
  - Benefit-cost ratio (BCR) = ratio of benefits to costs calculated at their present value (the smaller, the better – 'no regrets' if BCR > 1)
  - Net present value (NPV) = benefits minus costs calculated at their present value (the larger, the better)
  - Internal rate of return (IRR):
    - technically, the discount rate at which the NPV = 0
    - concretely, a measure of the 'benefit-generating power' of the option or intervention
    - the higher, the better – should exceed the opportunity cost of capital

Cost-benefit analysis (3)

Adaptation

Costs: extra costs incurred compared with 'business-as-usual' scenario

Benefits: avoided damage and losses, extra developmental benefits compared with 'business-as-usual' scenario

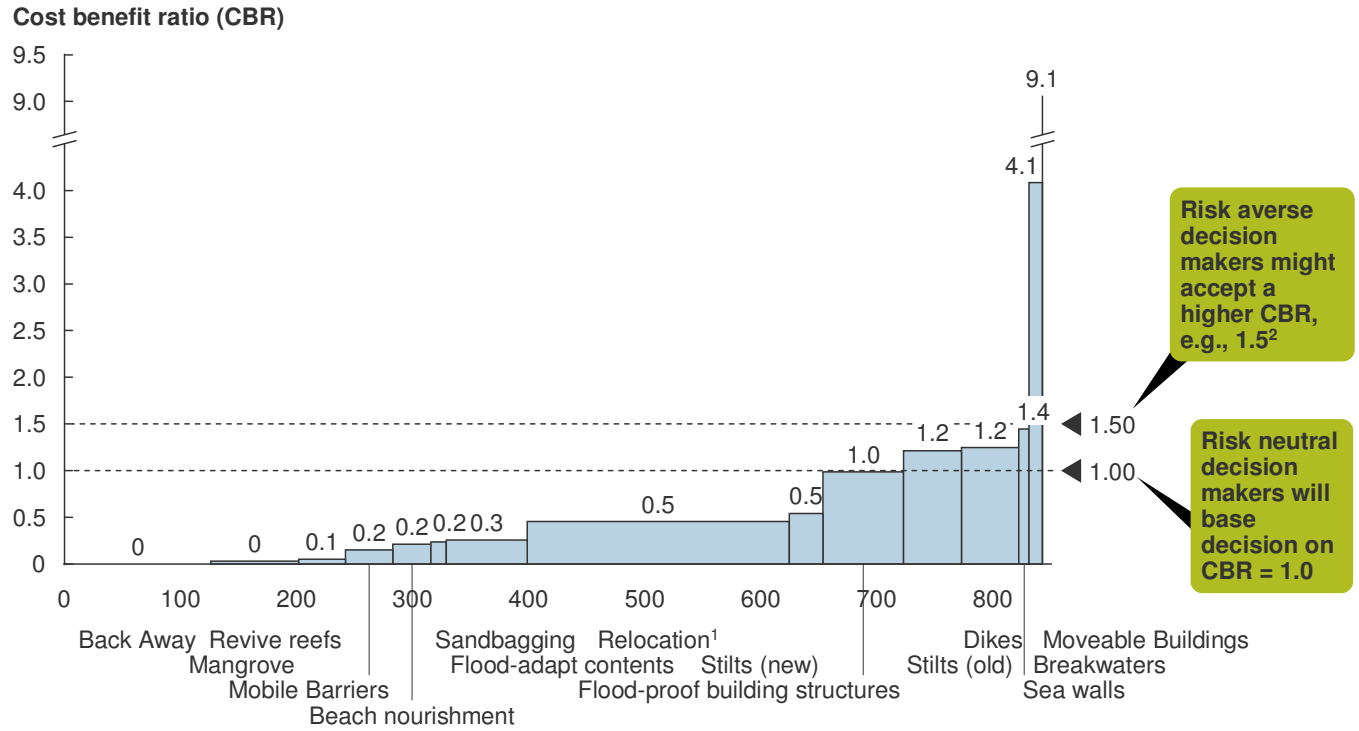
Mitigation

Costs: extra costs incurred compared with 'business-as-usual' scenario, reduced economic growth opportunities

Benefits: cost savings, sales of carbon credits, positive environmental and related health/livelihoods outcomes (+ difficult to value: strategic and competitive advantages)

Illustration of CBA (1)

Exhibit 4 – The overall cost-benefit assessment shows a variety of options to reduce coastal flooding risk/annual expected loss



1 Relocation only includes residential and commercial buildings outside of Apia
2 For example, a cost benefit ratio of ~1.5 is implicitly accepted by customers purchasing an insurance contract with a loss ratio between 60 and 70%

SOURCE: Team analysis

Source: Economics of Climate Adaptation (2009) *Test case on Samoa – Focus on risks caused by sea level rise*, Fig. 04, p. 123

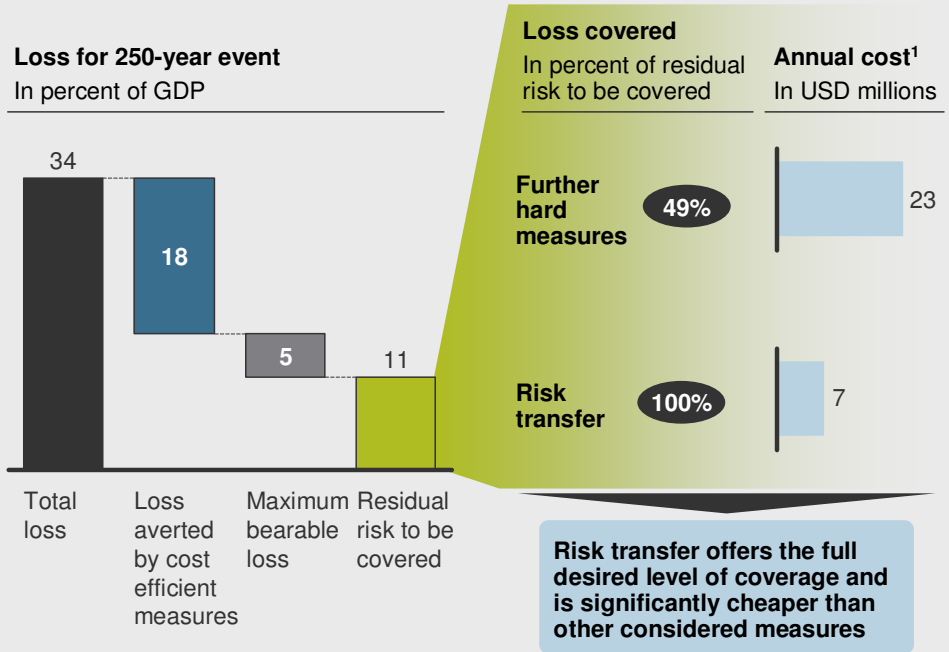
Illustration of CBA (2)

Exhibit 5 – Risk transfer is the most efficient way of providing additional coverage for low-frequency events

Approach to risk averse decision making

- In a **risk averse setting**, decision makers select adaptation measures by taking into account two main components:
  - Objective/risk-neutral net value
  - Subjective assessment of costs and benefits
- The results of subjective assessment of costs and benefits should include two main elements:
  - A **reference event** to be considered while selecting protection (e.g., a 250-year event)
  - The **maximum bearable loss** for the reference event – this can be expressed as a percentage of GDP (e.g., 5%)

Example of evaluation of alternative options to cover residual risk of coastal flooding in Samoa



SOURCE: Team analysis

Source: Economics of Climate Adaptation (2009) *Test case on Samoa – Focus on risks caused by sea level rise*, Fig. 05, p. 123

Cost-effectiveness analysis (1)

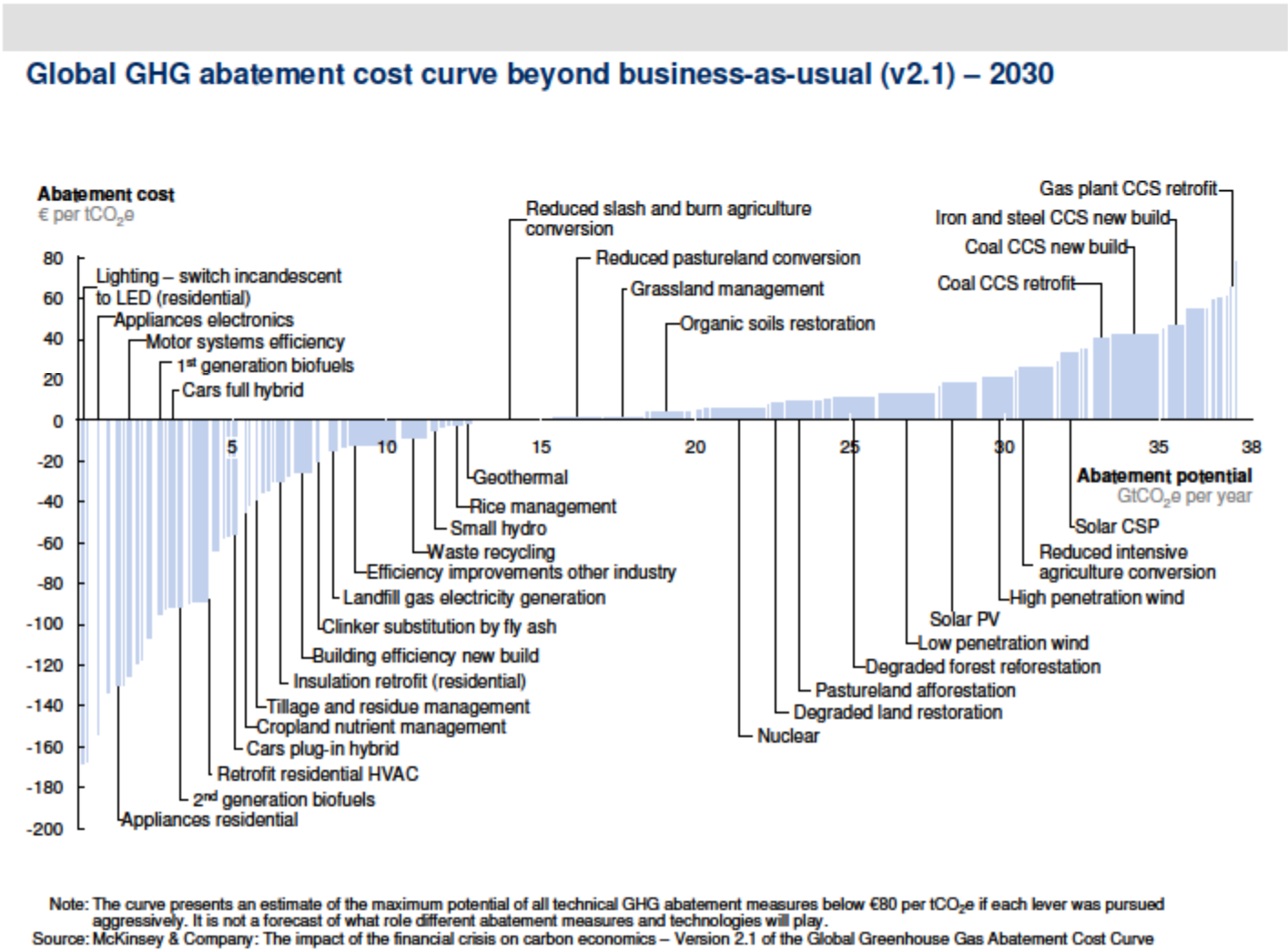
- Cost-effectiveness analysis (CEA):
  - Costs are valued in monetary terms, and benefits (*) quantified in 'physical' units, over the entire lifetime of the intervention; again, a discount rate is applied to both
  - This allows calculating unit costs, as the ratio of total discounted costs to total discounted benefits obtained
  - The obtained unit costs support :
    - the comparison of several options
    - comparison with 'benchmark costs' for similar interventions, where available

(*) As in cost-benefit analysis, 'incremental' rather than absolute costs and benefits should be taken into account

Cost-effectiveness analysis (2)

- Compared with CBA, CEA:
  - is suitable where it is difficult to assign a monetary value to benefits
  - but requires identifying a single, all-encompassing measure of benefits – which may be both difficult and reductive)

Illustration of CEA: the McKinsey GHG abatement cost curve



Note: The curve presents an estimate of the maximum potential of all technical GHG abatement measures below €80 per tCO_2e if each lever was pursued aggressively. It is not a forecast of what role different abatement measures and technologies will play.
Source: McKinsey & Company: The impact of the financial crisis on carbon economics – Version 2.1 of the Global Greenhouse Gas Abatement Cost Curve

Source: McKinsey (2009), Exhibit 8, p. 17

Financial and economic analysis

- Both CBA and CEA support:
  - *financial analysis*: considers the 'monetary' costs and benefits (or equivalent) accruing to parties directly concerned by a project or programme, at their 'face value'
  - *economic analysis*: broadens the analysis to more accurately reflect costs and benefits to society
- Private sector stakeholders will make decisions on the basis of *financial* ratios/indicators
- Public sector stakeholders should in principle make decisions on the basis of *economic* ratios/indicators

Complementary tools

- For the assessment of robustness and the integration of uncertainty, CBA/CEA can be combined with:
  - the use of multiple scenarios (e.g. 'no change' scenario and various climate change and development scenarios)
  - sensitivity analysis (i.e. testing of the effect of changes in scenario assumptions on the BCR, NPV, IRR or unit costs)
  - risk analysis (-> risk-benefit analysis includes the probability of occurrence of various cost and benefit outcomes in calculations... assuming probabilities are known)

Tools for prioritising and selecting adaptation and mitigation measures

Supporting decision making

- CBA/CEA support the financial and economic assessment of adaptation options
  - They help identify measures that offer the best 'value for money' – a key aspect in situations of budgetary constraints
- Other types of assessment and other criteria (e.g. technical, social, environmental) are nevertheless likely to be required to fully inform decision makers
- Multi-criteria analysis (MCA) helps integrate various criteria

Multi-criteria analysis (1)

- An approach to decision support that uses more than one criterion to assess performance and rank various options or interventions
- The term actually covers a wide range of methods
- Typically:
  - various options or interventions are assessed against a pre-determined set of criteria
  - qualitative ratings or quantitative scores are given
  - rules are then applied to rank options/interventions
    - Numerical scores can be added up to calculate a total score (with the possibility of applying different weights to different criteria)

Multi-criteria analysis (2)

- MCA is a useful complement to CBA/CEA
- Allows combining financial/economic criteria with technical, environmental and social ones
- It can be used on its own, or in combination with CBA/CEA:
  - MCA before CBA/CEA: allows reducing the number of options to which CBA/CEA is applied
  - MCA after CBA/CEA: CBA/CEA helps eliminate financially or economically unviable options, after which MCA allows making the final selection on the basis of additional criteria

MCA: illustration

- Kiribati – Criteria used for final prioritisation of adaptation measures to be mainstreamed in the National Development Strategy:
  - results of the national consultations
  - capacity to address vulnerability (expert judgment)
  - likely cost-benefit
  - urgency
  - likely degree of environmental impact
  - cultural acceptability
  - degree of community participation
  - synergies with poverty reduction
  - synergies with international conventions

Source: UNDP-UNEP (2010), based on World Bank (2006)