Key Concepts: Measuring costs and benefits

Cost-Benefit Analysis training workshop - Samoa

February 6-9, 2012

Objectives

Understand:

1. types of costs and benefits included in CBA
2. marginal v non-marginal changes and implications for measurement of costs and benefits
3. when to measure

Types of Costs and Benefits

Costs

Explicit Costs

- Costs of buying materials, labor, and machines to build project (accounting costs)

- Purchased items needed for project

- Sea-wall Example:
  - Labor costs
  - Material costs (buying rocks/aggregate)
  - Purchased capital (machines)
  - Rented machines for construction

Costs

Implicit Costs

- Opportunity costs
  - Rental value of machines already owned
  - Own time for management

- **Non-Market Costs**
- Lost goods and services not sold by market
  - Lost ecosystem services provided by mangrove (fish and crab nursery)
  - Lost visual amenity of mangrove

Measuring Costs

Measuring Costs

- If we assume our project does not change market prices, we can use market prices to value inputs

- Examples of data we would need:
  - Wage rate to value labor
  - Price of rocks/aggregate to value rocks
  - Rental rate to value capital equipment (machines)

Calculating Rental Value

- Rental values can be observed in a market
- If one owns equipment, one can deduce rental value (R) from purchase price (P) and lifetime (T) at interest rate (r)
- $P = \Sigma R\exp(-rt)$ from 1 to T
  - $P = R\exp(-r) + R\exp(-2r) + \ldots + R\exp(-rT)$
- $R = rP/[1-\exp(-rT)]$

Benefits

- We would like to measure **market** and **non-market** benefits
  - Total Economic Benefits = Market Benefits + Non-market Benefits

- **Market Benefits**
- Benefits that directly accrue to society (consumers and producers) of a good/service purchased in markets

- Sea-wall Example:
  - Avoided damages to houses and other infrastructure from cyclone and/or storm surge (that can be attributed to protection provided by wall)
  - Avoided losses in business revenue or income from lower clean-up and reconstruction (attributable to protection provided by sea wall)

Marginal Market Change

- A change is marginal if it does not change price

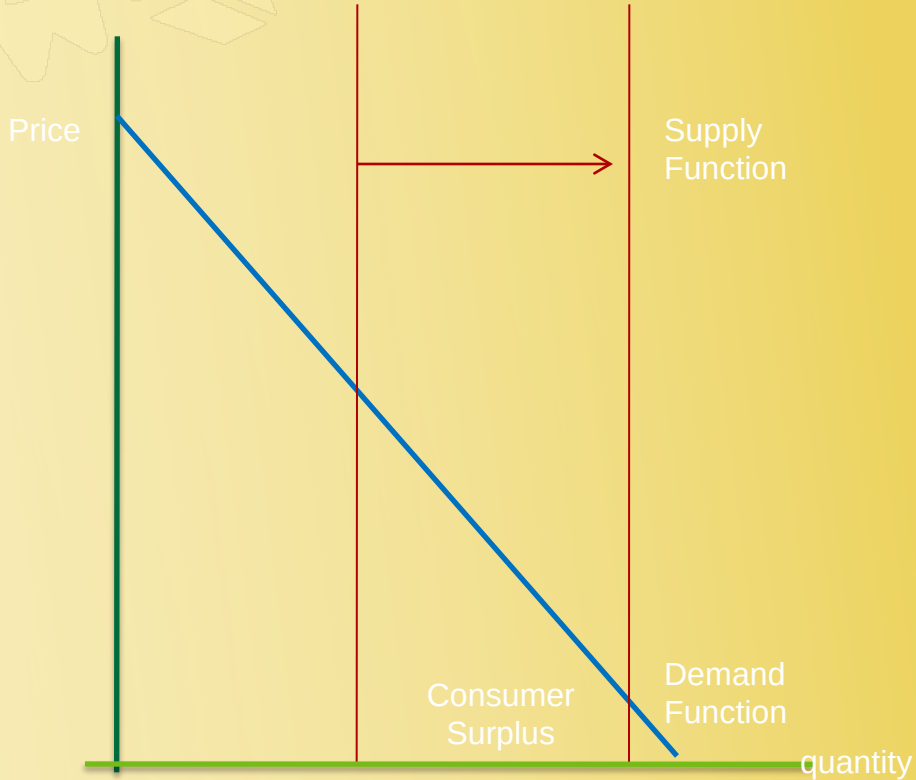
- Use price to value quantity
  - For example, $100,000/house to value a house

- The value of a change is price times the change in quantity

Non-Marginal Market Change

- A change is non-marginal if it is big enough to change market prices
- Need a demand function for market good
- Value is change in consumer surplus (area underneath the demand function)

Measuring Benefits



Non-Market Benefits

- Non-market Benefits (and costs) come from goods/services that aren't purchased within a market

- Sea wall example:
  - lives saved
  - (ecosystem services provided by mangroves)

Measuring Benefits

Measuring Nonmarket Benefits

- Since these goods/services are not traded in a market, we need to use other techniques to infer the values.
- Can use values measured elsewhere
- Can do studies for PACC in broader economic research plan, but probably not as part of demonstration project CBAs.
- Examples:
    - Hedonic Property and Wage Techniques
    - Travel Cost Models
    - Averting Behavior Models
    - Stated Preference Techniques

When to measure

- The cost of doing the analysis should be small relative to the cost of the project itself

- Some costs and benefits aren't worth capturing because they are either too small or too abstract (e.g. only a small area of mangrove is removed)

- Some important aspects of the analysis may be expensive to measure
  - PACC countries may want to value collectively
  - Borrow values from elsewhere
  - For example, cost of constructing sea-wall, ecosystem services values of mangroves

Thinking laterally

- There is often more than one way to skin a cat.
  - Because of data and resource limitations, analysts are often required to think of alternate ways to make measurements

- E.g. estimating avoided damages to schools
  - Ideally we would like to know the % damage caused to this particular infrastructure for each level of flood caused by storm surge
    - the 'stage damage curve'
    - performed by engineers, ideally specific for that infrastructure
  - But we do know (i) what damage a 2m flood caused to the school in 1998; and (ii) stage damage curve for another type of infrastructure - residential houses.
  - Use this information to approximate a stage-damage curve for the school.

- In this way, we are still able to provide a reasonable estimation of the costs which is helpful for decision-making

When to measure

- Where it is not feasible to quantify some costs or benefits in monetary terms or this cannot be done with any precision, applying the CBA framework is still important and useful

  - ensures that all relevant costs and benefits are identified and properly considered as part of project appraisal/evaluation

  - clarifies particular areas of uncertainty and/or disagreement in project appraisal/evaluation.

Key messages

- Costs to be included in analysis can be categorised as:
  - Explicit
  - Implicit
    - Non-market is a type of implicit cost

- Market and non-market benefits should be included.

- Valuation of costs and benefits can be difficult and expensive - detail and accuracy of CB assessment should be commensurate with size and importance of project.
  - No hard and fast rules
  - Pilot projects warrant a good level of detail as they will inform up-scaling (i.e. are part of a large project)