Lecture 10

Scope of Analysis
Communicating Results
Methods for Measuring Benefits

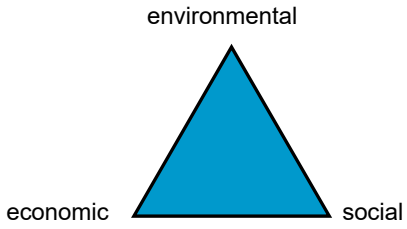
Scope of Analysis

Triple Bottom Line vs Business Case Analysis

- Not all criteria for success are financial
- Need for decisions and recommendations to consider triple bottom line / sustainability goals
- Comparison with business case analysis

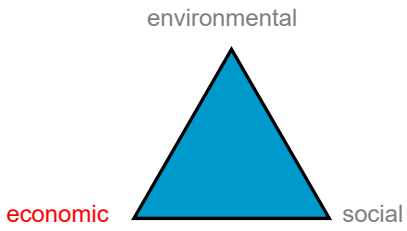
Triple Bottom Line vs Business Case Analysis

- Sustainability concepts:
  - Local and global; long term impacts
  - Interconnectedness of systems
  - Collaborative
  - Includes financial impacts

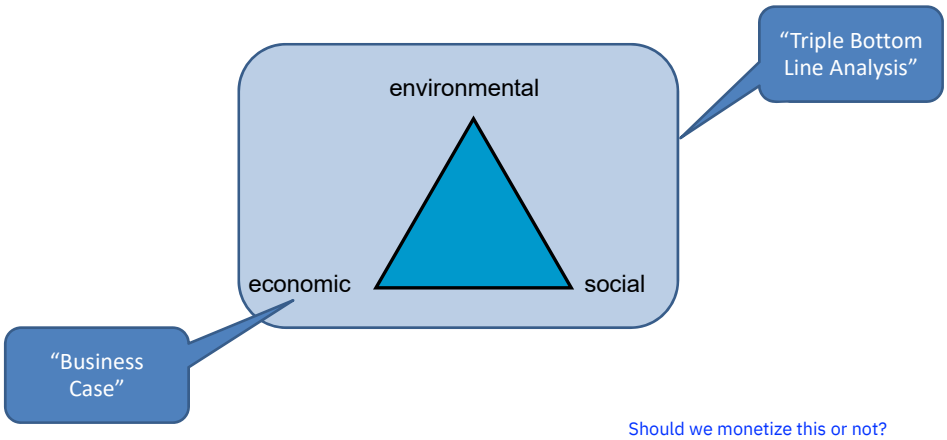


Triple Bottom Line vs Business Case Analysis

- Business Case analysis:
  - Local and global; long term impacts
  - Interconnectedness of systems
  - Collaborative
  - Includes financial impacts



Summary: Scope of Analysis



Should we monetize this or not?

Triple Bottom Line Analysis

Incorporate all significant criteria that could be affected:

- Environmental
- Technical
- Operational
- Social
- Financial

Triple Bottom Line Analysis

- Environmental
- Technical
- Operational
- Social
- Financial

- Measures will not be directly comparable, so subjective comparisons must occur
- Appropriate financial limits?
- Comparing different impacts: how best to spend dollars
- Basis for regulations

Communicating Results

Information / Communication Example (TBL)

Alternatives	1 Biogas used to Generate Heat and Elec	2 Biogas Sold to Fortis	3 Biogas used in Boilers & for Biosolids Drying	4 Biogas used in Boilers & Sold to Fortis
Energy Purchase	77 / 800	81 / 300,000	79 / 0	80 / 0
Energy Sold	0	2	1.5	1
Biogas Utilization	83	93	50	93
Corporate GHG Emissions	4,000	18,000	3,000	5,000
Net Greenhouse Gas Emissions (Regional)	4,000	-4,000	-21,000	-7,000
Impact on Utility Operations	low	high	high	medium
Potential Social Impacts	low	medium	high	low
Capital Cost	28	31	44	28
Net O&M Costs	4	7	6	5
NPV (40 years)	(200)	(270)	(280)	(230)

Methods for Measuring Benefits

Measuring benefits overview

Categories of benefits

Methods of measuring market benefits

Methods of measuring non-market benefits

How can benefit-cost analysis best be used?

Concerns / what's missing?

Measuring Benefits:

Different ways the environment can benefit people

A. Market values

B. Non-market benefits

1. Indirect use values
2. Non-use values (passive use)

Measuring benefits

A. Market values: measuring market benefits

- simpler than other situations, since direct relationship/data exist
- such benefits can sometimes be transferred, but must control for other factors

Measuring benefits

B. Measuring non-market benefits

1. Indirect use

   Situations where proxies exist for estimating value placed on goods that don't have a direct market, by measuring what people do in some other related way
   Can be benefit-based or use costs as proxies

2. Non-use values

   - Option value - you want to go?
   - Bequest value - your kids want to go?
   - Existence value - it makes me happy.

   In the context of visiting polar bears

Indirect: Complementarity method / Surrogate market

This method can only measure indirect use value.

The value of an improvement in environmental quality can be inferred from people's expenditures on complementary goods, or goods that tend to be consumed along with the environmental amenity.

There are several specialized kinds of complementarity methods: we'll consider a few next.

Indirect: Surrogate Market - Travel cost method

- measures benefits that people get from a particular site
- can only measure indirect use values

The value of a public park or recreational site can be inferred from information about the travel costs people incur to visit the site. People spend money to go to and visit areas because they value them.

Example proxies:

-
-
-

See Vancouver example

Indirect: Surrogate market - Hedonic price (property value) method

- measures benefits that people get from particular environmental goods
- can only measure indirect use values

The costs associated with avoiding pollution or otherwise undesirable locations are often reflected in the property values of people living nearby, so comparisons of property values between different locations can provide a proxy value for the benefit.

Examples:

- Value of improved visibility
- Value of a location farther from a hazardous waste site or landfill
- Value of a scenic view
- Value of a “statistical life saved”

See Bellingham WA example

Indirect: Averting behavior / averting expenditures method

This method can only measure indirect use value.

The value of an improvement in environmental quality can be inferred from people's expenditures on other things that help them avoid or cope with environmental problems.

Examples:

- Purchasing of bottled water or water filtering devices measure the value of avoiding water pollution or waste odor/taste concerns
- Visits to the doctor or use of air conditioning measure the value of avoiding respiratory illnesses
- Buying a safer car to reduce the risk of injury

Can also be used to estimate the value of a statistical life.

Indirect: Wage / Foregone earnings method

- Shares characteristics with hedonic price method or averting behaviour method, depending on application
- Can only measure indirect use values
- Differences in wages between a risky occupation and a less risky one can measure the benefits of lower risks.
- Differences in wages can also indicate the extra value of living in a more desirable city or region (due to cultural or environmental assets)

Examples:

- Workers are paid well to clean up radioactive contamination sites, even when the work isn't technical or complex
- Workers may settle for lower pay levels to live in Vancouver or SF than in places with fewer amenities

Can be used to estimate the value of a statistical life.

See williams uni study

Indirect: Conjoint analysis

Conjoint analysis is an advanced analysis method that attempts to understand how people make complex choices. It can only capture indirect use value.

Imagine you're buying a house. As one of the most complex purchase decisions you can make, you must consider numerous preferences. Everything from the location and price to interest rate and quality of local schools can play a factor in your home buying decision. Subconsciously, one person might be more price-sensitive while another is more feature-focused.

Conjoint analysis attempts to extract consumer preferences during the purchasing process, and statistically analyzes it to tease out which factors are important and which are not.

Indirect or non-use: Value of a statistical life

Many regulations exist to reduce low probability risks.

Suppose it would be possible to reduce the chances of dying in an automobile crash from 3 in 10,000 to 2 in 10,000 by adding a stoplight at a dangerous intersection. changing how cars are designed.

Suppose also that the average individual is willing to pay $50 for this.

If all 10,000 people were like that average person, they would collectively pay $0.5 million to avoid one death. That's called the "value of a statistical life".

Intent: It's really a way to estimate the average value of risk reduction

User groups: Insurance agencies use this method to establish fees

Cost-based methods of estimating use benefits

Relocation cost

- Estimates the monetary value of environmental damages based on the potential costs of relocating a physical facility that would be damaged by a change in environmental quality.
- Relies on data on potential expenditures.

Cost-based methods of estimating use benefits

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Replacement cost

- Measures the potential expenditures that would be required to replace or restore a productive asset that would be damaged by some project or development.
- These costs are then compared to the costs of preventing the damage from occurring to determine which is more efficient.
- If an environmental resource that has been impaired is likely to be replaced in the future by another asset that provides equivalent services, then the cost of replacement may be used as a proxy for the environmental damage, assuming that the benefits from the original resources are at least as valuable as the replacement expenses.

Cost-based methods of estimating use benefits

Dose-response method

- Requires information on the effect that a change in a particular chemical or pollutant has on the level of an economic corporate or personal activity.
- Example 1:
  - Ground levels of air pollution, such as ozone, affect the growth of various plant species differently
  - in some cases, this results in a reduction in the output of a crop, and the loss of output can be valued at market prices
- Example 2:
  -
  - Air pollution causes illnesses or deaths

    Proxy markets exist

Non-use: Contingent valuation method (CVM)

- measures benefits that people get by what they are hypothetically willing to pay to keep a good
- can be used to estimate indirect use or non-use values

A survey or choice experiment is used to elicit information about people's valuations of an amenity or a change in public policy.

This is the only method that can measure **non-use** values (which could include **existence** values or **option** values).

Contingent valuation method (CVM)

Examples:

1. Value of avoiding respiratory illnesses
2.
3.
4.
5.

Contingent valuation method (CVM)

Two related versions of CVM can be used:

Willingness to pay (WTP): how much would people be willing to pay for an increase in environmental quality?

Willingness to accept (WTA): how much would people have to be paid in compensation in order to induce them to accept a reduction in environmental quality?

In practice, WTP and WTA might be different, with WTA ≥ WTP. Why might this be?

Choice experiments establish preference using 'would you rather' techniques (harder to get at value that way though)

Contingent valuation method (CVM)

Potential biases:

- strategic bias
- information bias (data)
- starting point bias
- hypothetical bias
  - impacts identification
  - impacts description
  - good and topic familiarity

Other difficulties

- Source of change sometimes matters
- WTP vs WTA