Non Market Issues in Energy Resource Exploitation

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Sustainable Development

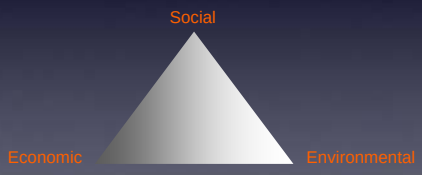
"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs"

Brundtland Commission
"Our common future" 1987

Three Dimensions of SD

The challenge: Balancing economic development with social and environmental objectives

Agenda 21



Link to Energy?

Energy plays a key role in all three dimensions:

- A principal motor of macroeconomic growth
- A source of environmental stress
- A prerequisite for meeting basic human needs

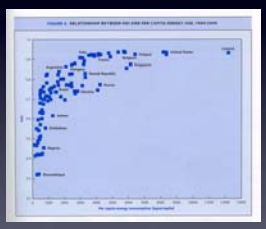
=> A vital component of SD

Sources: Najam and Cleveland (2003), Richmond and Kaufmann (2003), Reddy (2002), Davidsdottir (2006, 2007)

Energy use and Human Welfare

As energy use increases, human welfare (HDI) increases

- Literacy
- Schooling
- Infant mortality
- Income per capita



Source: WEA Update

Sustainable Energy Development

The development of sustainable energy systems has 'emerged as one of the priority issues in the move towards global sustainability' (Malkina-Pykh et al. 2002)

Towards SD

Challenge is to ensure that we use our energy resources such that we enhance economic and social welfare, without affecting the ability of future generations to do the same - and at the same minimize environmental impact.

What has this to do with the economics of energy resource exploitation?

Energy resource exploitation involves tradeoffs between uses of environment - has economic impact affecting welfare

Evaluate Tradeoffs

Must achieve the best allocation of our resources - evaluating which option is most valuable economically to the nation, community or the individual in the long run – maximizing social welfare.

Projects must be socially beneficial – benefits exceed the costs

But how is this possible if environmental impact (and thus the tradeoff) is excluded from the economic framework, which we use to make decisions?

Environmental impact assessment

Financial valuation of profitability

Economic valuation

- Should include the economic cost of environmental impact as these costs may be significant – even if they do not carry a market price

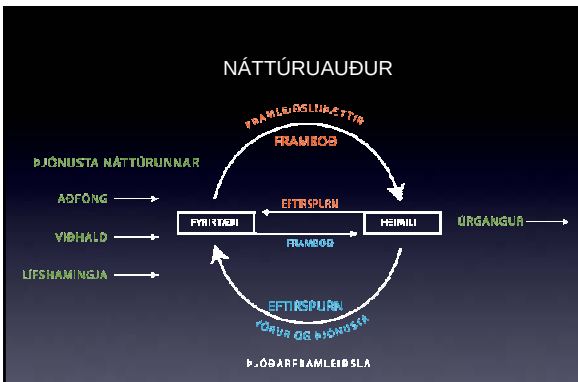
As a result, excluding indirect costs as currently is done may lead to decisions being made that reduce social welfare.

Occurs in cases when the cost of environmental impact actually exceeds the financial gains.

Moving us away from SD

Overview

1. The Economy and the Environment – conceptualizing "the environment"
2. Natural Capital and Ecosystem Services
3. Non-Market Valuation, the Toolbox
4. Why not to Value Ecosystem Services?
5. Conclusion



Natural Capital

The environment or natural capital can be considered a stock, which similar to man-made capital yields through its multiple functions a flow of goods and services into the future.

Natural capital thus has specific functions that then provide a flow of goods and services, which most often are called collectively ecosystem services.

Ecosystem Services

Ecosystem services are defined as those functions of natural capital that support (directly or indirectly) human welfare and therefore are defined by the benefits people obtain from the biosphere and its ecosystems.

Anthropocentric concept

Ecosystem services classification

i. Provisioning – Food, water, fuel, ornaments

ii. Supporting – soil formation, water supply

iii. Regulating – e.g. carbon sequestration

iv. Cultural – Aesthetic, recreational, educational

Each system can provide multiple services – but use of one service may affect the provision of others – e.g. recreational services – represents a loss that we must value (ED)

Non-market Evaluation Toolbox

The task

To assess the value of ecosystem services that are not traded in markets

Only when we have this value can we begin to understand what it means to loose those services – and can properly evaluate the welfare effects

Routinely used in the United States to evaluate development projects and policy

Use values "active use"

- Direct (consumptive, non consumptive)
- Indirect

Non-use values "passive use"

- Existence value
- Option value, bequest value

Total Economic Value = UV + NUV

Valuation tools

Use values – revealed preferences

- Market prices
- Travel cost
- Hedonic pricing
- Cost-based measures

Non-use values – stated preferences

- Contingent evaluation

Estimating Use Value

Market prices

Economic value of services bought and sold in markets

Available for a limited number of ecosystem services

E.g. Value of the hydropower sold, value of harvest

Estimating Use Value

Travel cost

Mostly used for recreational services

Survey travelers to assess how much time and money - including lost wages – people are willing to pay/use to travel to a particular site and back.

Reveals willingness to pay for visiting the site – proxies the economic benefits

Travel cost

Used to assess:

- Proposed changes in access costs for a recreational site
- Elimination of an existing recreational site
- Changes in environmental quality of a recreational site

Travel Cost

A few different methods

1. Based on a zonal travel cost approach
   - Simple travel data from visitors
   - Linking # of trips from specific zones to cost
2. Based on individual travel cost
   - Detailed Survey of individuals
   - # of visits linked to travel cost
3. A random utility model (RUM)

Travel Cost

Issues

- Multi-purpose trips
- Opportunity cost of time
- Substitute sites
- Sample bias (Interviews, living nearby)
- Must be enough difference in travel cost
- Limited in Scope
- Statistical issues

Estimating Use Value

Hedonic pricing

Value of the service is reflected in how much people are willing to pay extra for associated products such as real estate.

Example: proximity to a lake or a river increases the value of a summer home - reflects the value of the lake.

The value of Esjan (case study)

Hedonic Pricing

Issues

Advantages

- Value based on actual choices
- Property records and data reliable

Disadvantages

- Scope limited
- Price fluctuations…. Has Esjan decreased in price?

Estimating Use Value

Avoided Cost

- Value assessed via the cost of avoiding damages due to lost services
  - Cost to society if a natural service were not in place or is overwhelmed
    - Example: pest control - cost of pesticides
    - Example: Carbon sequestration – carbon credits

Estimating Use Value

Defense expenditures

Expenditures that are taken due to unwanted side-effects to our actions. Supplement productive capabilities of nature that may have been degraded.

Example: water filters (clean water),

Estimating Use Value

Replacement expenditures

Based on replacement or restoration values

Reveals how much we are willing to pay for restored services

Example: the cost of restoring a wetland

Cost based measures

Not strict measures of economic value

Assume that if people incur cost to avoid damages or to replace a service then those services must be worth at least what people paid to avoid damages or to replace them.

Only applies in limited cases

Cost based measures

Cost based methods (advantages)

- Easy to assess
- Less data and resource intensive
- Surrogate measure of value

Cost based methods (disadvantages)

- Is cost accurate measure of value?
- Do not consider social preferences
- Do not really show willingness to pay

Estimating non-use values

Contingent evaluation – stated preferences

Use surveys to assess:

- Peoples willingness to pay for preserving an ecosystem
- Or compensated for loosing an ecosystem

Reveals willingness to pay - put into the context of known values such as price of electricity

Example

A remote site on public land provides important habitat for several species of wildlife. The management agency in charge of the area must decide whether to allowing creating a reservoir at the site.

Thus, they must weigh the value of the hydropower development against the wildlife habitat benefits that may be lost if the site is developed.

Because the area is remote, few people actually visit it, or view the animals that rely on it for habitat. But, the area has existence value – use CV methods to assess willingness to pay for the site

CV - Issues

Issues

Information problem, People lie

Biases e.g.

- Warmglow effect
- Strategic bias
- Answer depends on who is asking

Embedding

Summary

Begin by classifying ecosystem services

Overlay with appropriate evaluation methods

Total value = UV + NUV

Loss in total value due to exploitation of energy resources must be included in economic valuation

Why non market evaluation?

Is no value better than an incorrect one?

Value already being put on ecosystem services – close to zero

At least by trying to put a value on ecosystem services that are affected by development we are approaching a more accurate picture of the costs and benefits involved – enabling better informed decisions.

Conclusion

The development of estimation methods of the value of ecosystem services in addition to the more general recognition of the value of ecosystem services to the economy demands a rethinking of the way development projects are evaluated.

Economic evaluation methods must be extended to take into account the full social cost of proposed projects – if not…

May lead to decisions being made that reduce social welfare by allowing projects to go ahead where damages may actually exceed the financial gains