

EE475: Natural Resource Economics

## Valuing the Environment: Methods

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## Outline

- Wrapping up the Benefit-cost analysis
- Valuing the Environment: Methods
  - Stated Preference Methods
  - Revealed Preference Methods

## Critiques on the Benefit-Cost Analysis

- Benefit-Cost analysis can be biased.
- It does not specify who receives benefits and costs.
- Estimation of intangible benefits is sometimes difficult or impossible.

## Other Decision-Making Metrics

- Measuring the distribution of benefit-cost
  - Economic Impact Analysis
  - Equity Analysis
- Tools in the case where benefit estimation is difficult or impossible
  - Cost-Effectiveness Analysis
  - Impact Analysis

## Valuing the Environment: Methods

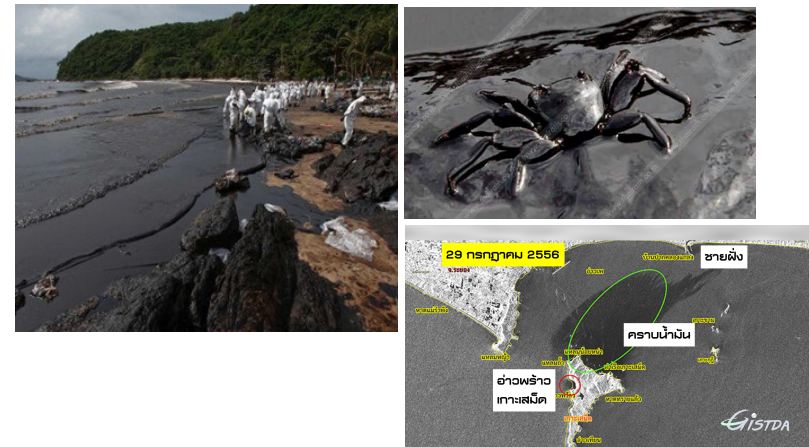
### Valuing the environment and natural resource, Why?

- Estimate damages caused by environmental events such as pollution, or oil spill
- Estimate benefits and costs for policy process
- Estimate non-market values and intangible value

### Example: Pollination



### Example: Oil Spill at Samet Island



## Types of Values in environmental and natural resource

- Use Value
  - Consumptive (active) vs non-consumptive (passive) use value
- Option Value
- Nonuse Value
  - Bequest value
  - Existence value

## Total Willingness to Pay

- Total willingness to Pay (TWP)
- = Use Value + Option Value + Nonuse Value

## Classifying Valuation Methods

**Table 4.1** Economic Methods for Measuring Environmental and Resource Values

| Methods  | Revealed Preference     | Stated Preference      |
|----------|-------------------------|------------------------|
| Direct   | Market Price            | Contingent Valuation   |
|          | Simulated Markets       |                        |
| Indirect | Travel Cost             | Attribute-Based Models |
|          | Hedonic Property Values |                        |
|          | Hedonic Wage Values     |                        |
|          | Avoidance Expenditures  |                        |
|          |                         | Contingent Ranking     |

Source: Modified by the author from Mitchell and Carson, 1989.

Source: Tietenberg & Lewis 2012, p.82

## Stated Preference Methods

- Contingent valuation
  - Survey based
  - Asking respondents directly to consider their willingness-to-pay question under a hypothetical circumstance.
  - Asking 'yes' or 'no' question

## Stated Preference Methods

- Five types of potential bias
  - Strategic bias
  - Information bias
  - Starting-point bias
  - Hypothetical bias
- Lack of similarity between willingness to pay (WTP) and willingness to accept (WTA)

## Stated Preference Methods

- Indirect hypothetical methods
  - Attribute-based methods
    - Such as conjoint models (or choice experiments)
    - Useful when the project options have multiple levels of different attributes.
- Survey based
  - Choose among alternate bundles of goods

TABLE 4.2 Attributes in the Maine Forest Harvesting Conjoint Analysis

| Attribute                                | Level                |
|------------------------------------------|----------------------|
| Live Trees After Harvesting              | No trees (clear-cut) |
|                                          | 153 trees/acre       |
|                                          | 459 trees/acre       |
| Dead Trees After Harvesting              | Remove all           |
|                                          | 5 trees/acre         |
|                                          | 10 trees/acre        |
| Percent of Forest Set Aside from Harvest | 20%                  |
|                                          | 50%                  |
|                                          | 80%                  |

Source: Boyle et al., 2001 and Holmes and Adamowicz, 2003.

### Conjoint Analysis

TABLE 4.3 A Sample Conjoint Analysis Survey Questionnaire

| Attribute                           | Alternatives |            |          |          |           |
|-------------------------------------|--------------|------------|----------|----------|-----------|
|                                     | A            | B          | C        | D        | No change |
| Live Trees Remaining                | No trees     | 459/acre   | No trees | 153/acre |           |
| Dead Trees Remaining                | Remove all   | Remove all | 5/acre   | 10/acre  |           |
| Percent Set Aside                   | 80%          | 20%        | 50%      | 20%      |           |
| Tax                                 | \$40         | \$200      | \$10     | \$80     |           |
| I would vote for (please check off) | —            | —          | —        | —        | —         |

Source: Thomas P. Holmes and Wiktor L. Adamowicz, "Attribute-Based Methods," A PRIMER ON NONMARKET VALUATION, Ian Bateman, ed. (New York: Kluwer Academic Publishers, 2003).

Source: Tietenberg & Lewis 2012, p.88

## Stated Preference Methods

- Indirect hypothetical methods
  - Contingent Ranking
    - Respondents are given a set of hypothetical situations that differ in terms of the environmental useful features available
    - The respondents are asked to rank-order them.
    - The ranking —> the implicit trade-offs between more of the features and less of the other characteristics

## Revealed Preference Methods

- Revealed preference methods
  - Observable - actual behavior
  - Indirect - infer value rather than estimate it directly
- Example:

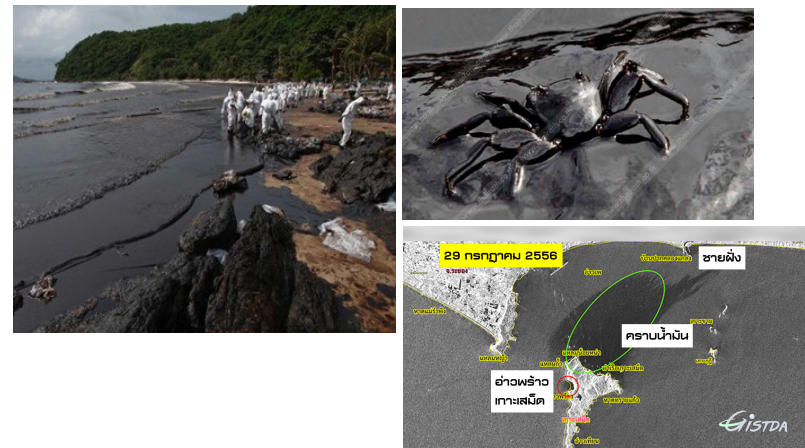
## Revealed Preference Methods

- Travel Cost methods
  - Using information on how much the visitors spent in getting to a recreational resource
  - Constructing a demand curve for willingness to pay for a “visitor day”
  - This approach has been used to value beach closures during oil spills, and the cost of development that has eliminated a recreation area.
- Limitation?

## Revealed Preference Methods

- Hedonic Property Value and Hedonic Wage Methods
  - Using a statistical technique, multiple regression analysis, to ‘tease out’ the environmental component of value in a related market.
  - Incorporating Geographic Information Systems (GIS) in Hedonic property valuation
- Averting Expenditures
  - Expenditure aiming to reduce damage caused by pollution by taking some sort of defensive action

## Back to the Oil Spill at Samet Island



How would you value Khao Yai National Park?



How would you value Dugong Dugon?



## Next Class

- Article: Sathirathai, S., & Barbier, E. B. (2001). Valuing mangrove conservation in southern Thailand. *Contemporary Economic Policy*. Vol.19, No.2, April, pp.109-122
- Try to capture
  - Research question(s)
  - Method(s)
  - Results
- What do you think about it?
- Now available on BE-Moodle