Regional Training Workshop on
"The Economic Valuation of The Goods and Services of Coastal Habitats"

March 24-28, 2008
Samut Songkram, Thailand

Economic Valuation
Based on Surrogate Market

Wallapak Polasub

March 26, 2008

What is a Surrogate Market?

- In the absence of a market, information can be drawn from related marketed goods to determine the use value of the non-marketed goods.

- Consumptive decision of marketed goods may revealed consumer's preferences for environmental non-marketed goods. Hence a surrogate market is created.

Valuation Methods based on Surrogate Market

- They are also referred to as *revealed preference methods*.

- They can assess value of a resource as well as a change in environmental quality.

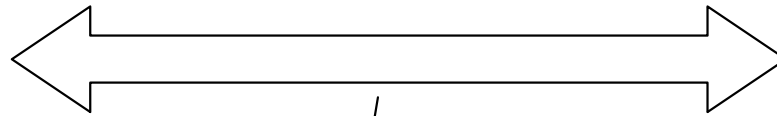- Two main approaches are: *Travel Cost Method (TCM)* and *Hedonic Price Method (HPM)*.

Travel Cost Method

Key Concepts

- TCM assesses recreational use value of resources and the environment.

- Participation in recreation activity and site visits uncover a consumer's preference over the resource.

Key Concepts (cont.)

Travel cost

Costs on Site

Use value of the site

Key Concepts (Cont.)

- **There are two broad approaches:** *a single site model* **and a** *multiple site* **model**

- **In a single site model,** *total monetary value spent on each visit* **and** *the number of visits* **can be used to construct a travel cost demand function for the recreational site.**

- **Theoretically, the demand function can be derived from a utility maximization problem of an individual who consume recreational activity**

$$Max_{n} \ u\left(x, n, q\right)$$

subject to $\quad M + \left(w \cdot T\right) = x + \left(p_n \cdot n\right)$

where

u( ) – utility function

x – consumption of all other goods

n – number of visits $\qquad$ q – site quality

M – non labor income $\qquad$ w – wage rate

T – total discretionary time $\qquad$ pn – total cost of a visit

Solving the above problem yields the demand function:
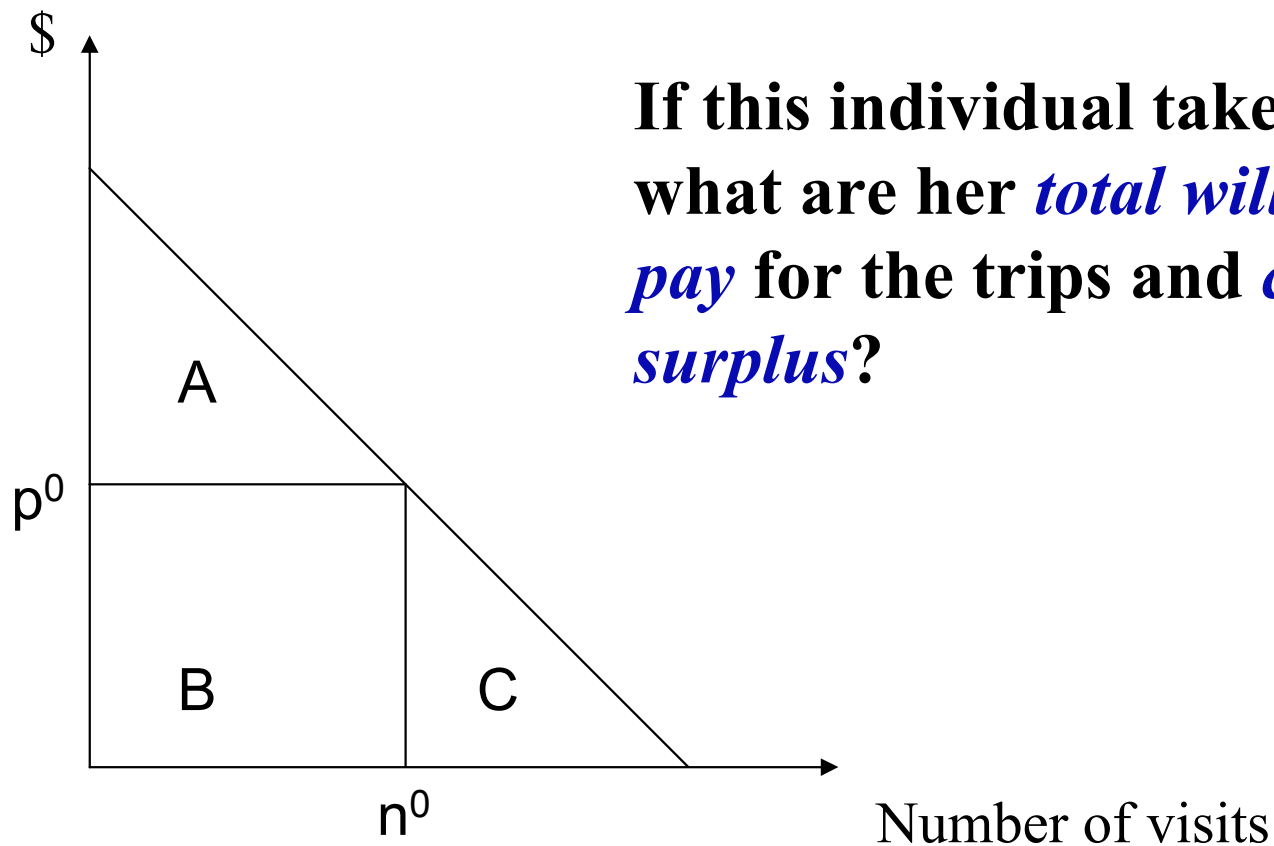
$$n^* \left(p_n, M, q\right)$$

Key Concepts (Cont.)

- **Practically, we may estimate demand function directly as a function of trip costs and other variables that may affect the number of visits to the site.**

- **When linear model is employed.**

$$n = \beta_0 p_n + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_m x_m$$

Key Concepts (Cont.)

If this individual takes n^0 trip, what are her *total willingness to pay* for the trips and *consumer surplus*?

$ (vertical axis)

p^0

A

B   C

n^0

Number of visits

Access Value in a Linear Single Site Model
(Parsons, 2003)

Methodological Steps (Parsons, 2003)

- Define the site to be value
- Define the recreational use and season
- Develop a sampling strategy
- Specify the Model
- Decide on the treatment of multiple purpose trips
- Design and implement the survey
- Measure trip cost
- Estimate the model
- Calculate access value

Data Requirement

- **Primary/ survey data (current situation, periodical database)**

- **The needed typical data are: number of trips, trip expenses, travel distance, trip duration, substitute site(s), socioeconomic data, site characteristics, etc.**

Data Requirement (cont.)

Obs.	# of trips this season	Total trip costs ($)	Annual Income ($000)	# of children
1	3	40	5	0
2	8	89	12	3
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
N	1	100	34	0

Limitation

- Only use value

- Complicated statistics

- Measurement of trip costs

- Multiple destination trips

Some Applications of the Travel Cost Method

- Land use alternatives

- Change in environmental amenities and natural resource damage assessment

- Introduction of user fees or regulation of number of visitors

- New site development

14

Hedonic Price Method

Key Concepts

- utilizes the property sale or rental values to determine the implicit price of the environmental amenities and disamenities.

- When an individual chooses a property, she takes into account the various characteristic of the property including the embedded environmental attributes.

Key Concepts (Cont.)
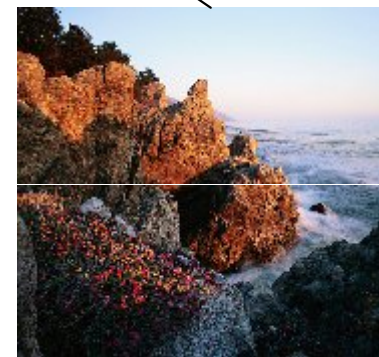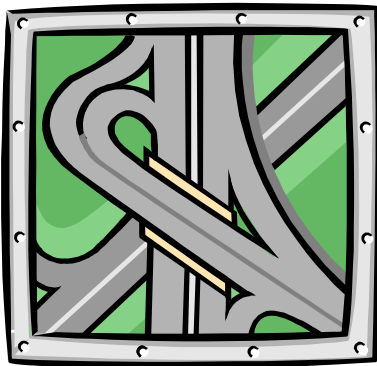
Key Concepts (Cont.)

- **In equilibrium, the hedonic price function of property is given by:**

$$p_h = h(S, N, Q)$$
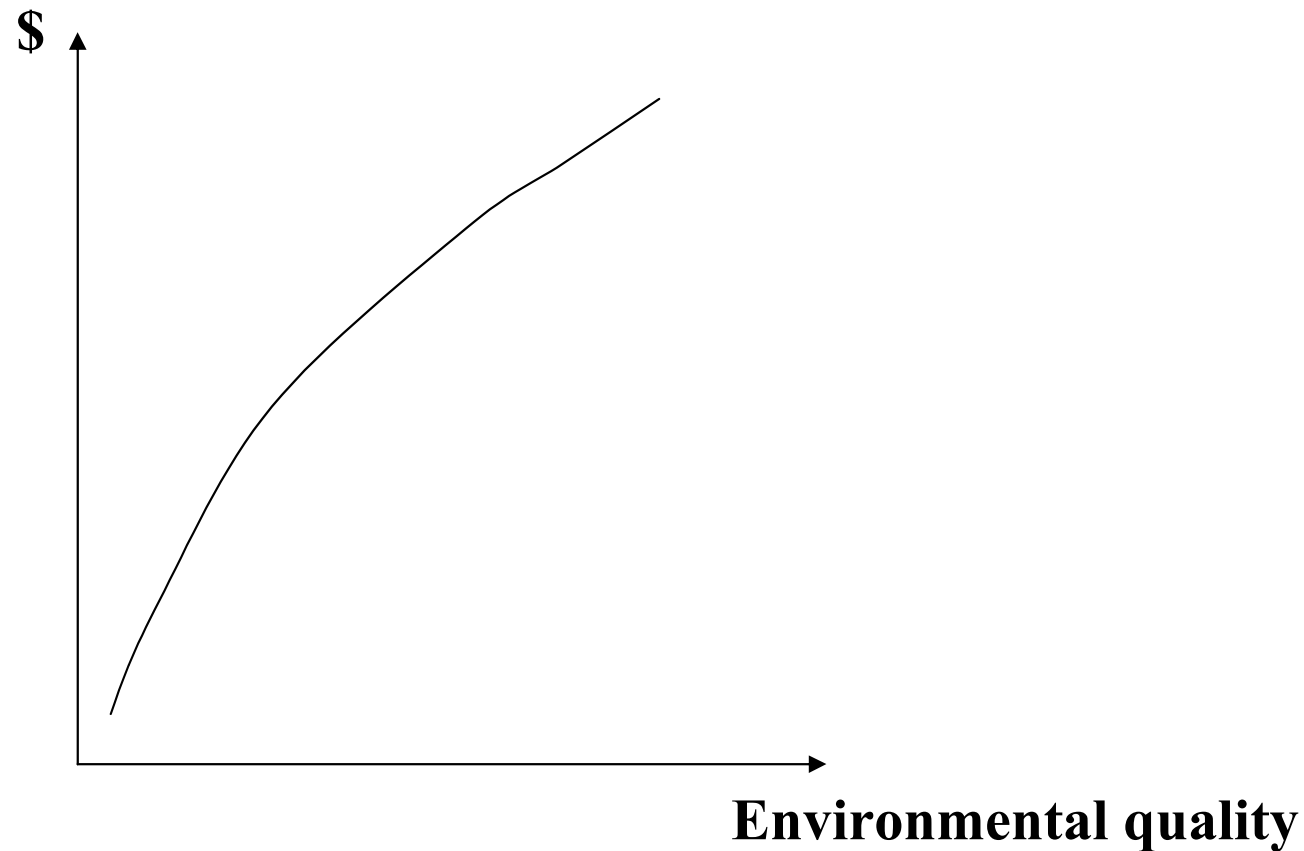
where   S – a vector of structural characteristics

         N – a vector of neighborhood characteristics

         Q – a vector of environmental amenities

$\dfrac{\partial p_h}{\partial q_i}$ **is the *marginal implicit price* of amenity q_i**

Key Concepts (Cont.)

Change in property value with increasing
environmental quality (Garrod and Willis, 1999)

Methodological Steps (Taylor, 2003)

- **Define the value to be estimated**

- **Collect data on Property Value**

- **Choose functional form**

- **Address spatial dependence and correlation**

- **Compute Welfare Measure**

Data Requirement

- **Primary and Secondary data**

- **Specific information of the property**

- **Local information on neighborhood and amenities**

Limitation

- **Information/ awareness of consumers**

- **Suitable only for *ex post* policy evaluation**

- **Only use value**

- **Data complication**

- **Statistical difficulty**

Some Applications of the Hedonic Price Method

- Role of proximity of resources

- Effects of natural disaster threats

- Introduction of property tax

Travel Cost or Hedonic Price ?

- **Environmental resource to be valued**

- **Affected party**

- **Can we employ both methods or do we have to pick just one?**

References and Further Readings

Boyle, Kevin J. 2003. "Introduction to Revealed Preference Methods". In *A Primer on Nonmarket Valuation*. Edited by P.A. Champ, K. J. Boyle and T. C. Brown. Kluwer Academic Publisher. Dordrecht. The Netherlands.

Freeman, A. Myrick. 2003. "The Measurement of Environmental and Resource Values: Theory and Methods". Resources for the Future. Washington, D.C. USA.

Garrod, Guy and Kenneth G. Willis. 1999. Economic Valuation of the Environment: Methods and Case Studies. Edward Elgar Publishing, Lmt. Glos. UK

Habb, Timothy C. and Kenneth E. McConnell. 2002. "Valuing Environmental and Natural Resources: The Econometrics of Non-market Valuation". Edward Elgar Publishing, Inc. Massachusetts. USA.

Hoban, Christopher and Koji Tsunokawa. 1997. "Roads and the Environment: a Handbook".World Bank technical paper no. 376. World Bank, Washington, D.C. USA.

Lipton, Douglas W., Katherine Wellman, Isobel C. Sheifer and Rodney F. Weiher. 1995. "Economic Valuation of Natural Resources--A Handbook for Coastal Resource Policymakers". NOAA Coastal Ocean Program Decision Analysis Series No. 5. NOAA Coastal Ocean Office, Silver Spring, MD. USA.

References and Further Readings (Cont.)

Parsons, George R. 2003. "The Travel Cost Model". In *A Primer on Nonmarket Valuation*. Edited by P.A. Champ, K. J. Boyle and T. C. Brown. Kluwer Academic Publisher. Dordrecht. The Netherlands.

Robinson, Jackie. 2001. "A Review of Techniques to Value Environmental Resources in Coastal Zones", working paper, Cooperative Research Centre for Coastal Zone, Estuary and Waterway Management (Coastal CRC), University of Queensland. Australia.http://www.coastal.crc.org.au/wetlands/publications.html

Taylor, Laura O. 2003. "The Hedonic Model". In *A Primer on Nonmarket Valuation*. Edited by P.A. Champ, K. J. Boyle and T. C. Brown. Kluwer Academic Publisher. Dordrecht. The Netherlands.

Pompe, Jeffrey J. and James R. Rinehart. 1995. "Beach Quality and the Enhancement of Recreational Property Values". *Journal of Leisure Research*, vol. 27(2): 143-154.

Thank You!