



सत्यमेव जयते

# BIODIVERSITY / ECOSYSTEMS VALUATION METHODS

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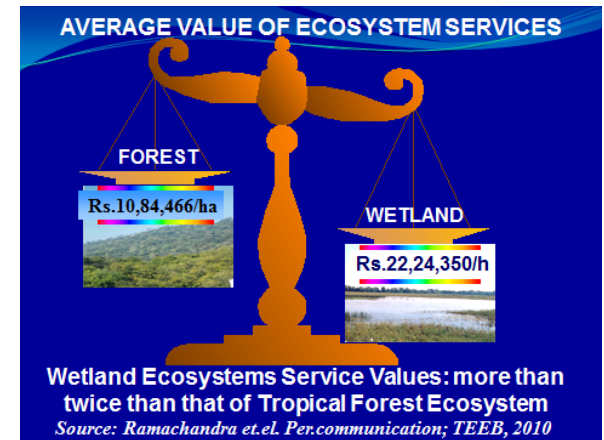
# Why Valuation of Environmental Goods and Services ?

- **Policy Appraisal** (best advice to policy makers)
- **Project Appraisal** (Cost-benefit analysis of projects)
- **Ecosystem Management** (compensation for ecosystem services)
- **Setting Environmental Taxes** (justify the tax rates)
- **Damage Claims**
- **Natural Resources Accounting** (Green accounting)



# Valuation Methods

- Ecosystem / Biodiversity Valuation will play an increasing role in policy making.
- Methodology development has progressed in the last 2 decades



- Different methods may be needed in different contexts
- Methods are classified in different categories by different studies
- TEEB Approach: (Methods classified into 6 heads)

# Different Valuation Methods

Group	Method
Direct Market Price	i. Market prices
Market Alternative	i. Replacement costs ii. Damage cost avoided iii. Production function
Surrogate markets	i. Hedonic Price Method ii. Travel Cost Method
Stated preference	i. Contingent valuation method ii. Choice modelling
Participatory	i. Participatory environmental valuation
Benefits transfer	i. Benefits transfer

**Source:** TEEB, 2010



# 1. Market Prices

- Certain ecosystem goods and services have market / value

**Goods:** Timber, NTFPs, fish etc.



**Services:** Amenities (natural beauty), mitigation of green house emission, water and nutrient cycling etc.



- Most appealing method
- Observed (actual/existing) market price is the criteria
- But, current price is not the real value.
- Value is often higher than the price (underestimation)
- What is the real value? How to estimate?



## 2. Market Alternatives

- When direct market prices are not available, indirect market price is the option.
- 3 Approaches
  1. Replacement Cost
  2. Damage Cost Avoided
  3. Production Function





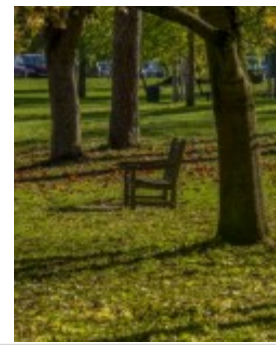
# Replacement cost

- Finding man-made solution as an alternative to biodiversity services.

*Eg. 1. Value of a fish habitat can be determined through cost of artificial fish breeding and stocking programme.*



*Eg. 2. Value of a forest ..... cost of afforestation programme*





- Replacement cost as a proxy for the value of ecosystem services
- Easy to apply (no complicated data analysis)
- But difficult to consider (human made = natural).
- Sometimes choices may be hypothetical



# Damage Cost Avoided

- How much spending was avoided because of the ecosystem services

Eg: Mangrove forests protect seawater intrusion and storm damages.



- If mangrove **didn't exist**:  
What would be the cost of reclaiming the groundwater quality or expenditure for drinking water supply?  
What would be the cost of storm damages?

Advantage: solid data, cost of damage is more appreciated to public than benefits.



# Production Function

- Nature's contribution in a production (inputs)

How much is the value added by the ecosystem services in the production process?

Eg: What is the contribution of water/soils in crop production

Eg: Land use changes at catchments alter the water availability in downstream

Eg: Blasting a coral reef alter the coastal protection services & fish yields.

- This alteration is measured in order to value the services.

Method: complicated (broader). Need multi-disciplinary understanding



# 3. Surrogate Markets

- In the absence of clear/defined market: Surrogate Market an option
- People's preferences and actions in related (surrogate) market are the criteria.
- Two methods:
  - 1. Hedonic Price Method:**
  - 2. Travel Cost Method.**



# Hedonic Price Method

- Commonly use in real estate market.
- Identifies how much a price differential is due to a specific environmental attributes.

Eg: The price of a house with the view of an ocean is likely to cost more than the same house with a view of a landfill.



- This price difference is the 'willingness to pay' for environmental attribute.
- Required significant data collection and complex analysis in segregating the environmental attributes.



# Travel Cost Method

- How much people are willing to spend to use a given ecosystem?
- Direct correlation between travel " expenses & sights value.
- Questionnaires method...  
(expenses related to travel + wage loss)
- Very promising method. But: estimating the true cost of travel is difficult (only the cost reported by the traveller).
- Leisure time is inherently valuable (forgone income is controversial).
- Limited scope (valuing recreational sites / use-value items only).





# 4. Stated Preference

- Evaluate people's preferences and choices to determine "willingness to pay" for ecosystem services.
- Two broad categories
  1. Contingent Valuation
  2. Choice Modeling



# Contingent Valuation

- Respondents make values on hypothetical environmental changes.
- Eg: What would be the willingness to pay (WTP) to maintain a forest area or What they will be willing to accept (WTA) as compensation for its loss
- WTP is the maximum amount an individual is willing to sacrifice to procure a good or avoid something undesirable.
- WTA is the amount that a person is willing to accept to abandon a good or to put up with something negative, such as pollution.
- The price of any goods transaction: point between a buyer's WTP and a seller's WTA.



### **Pre-conditions:**

- Detailed description of an environmental change
  - Representative group
- Challenge: Hypothetical and actual pay should differ
  - Ensure that the respondents give 'Realistic' willingness to pay (willingness to accept) estimates.



# Biases

- Need to consider (evaluating the data)

1. **Zero Bids:** If  $WTP = Rs\ 0$ , interprets different meanings

- Couldn't think the changes is valuable.

- Changes is valuable, but I am not responsible to pay. State should pay

- So valuable , but price less.

2. **Exaggeration:** Respondents may please the surveyor

People may agree the questions regardless of content (hypothetical pay)

3. **Bidding format:** Way to question posed can influence the results

Eg: Are you willing to pay Rs. 10?

Eg: How much you are willing to pay?



# Choice Modeling

- Instead of determining willingness to pay people chose between different situations.
- Give a 'menu' of options with differing level of ecosystem services and costs.
- Asking the respondent to chose the one which who prefer
- Challenge: Making sure that the respondent understand the stake

Asking a respondent to chose between a 'nature reserve' and 'grazing land' without knowing what is the ecological difference (No meaning).



# 5. Participatory Valuation

- Through a focus group exercise
- Stakeholders voice/concerns infer value.
- Significance of certain factors that are importance to them related to others
- For ascertain the value of NTFPs: villagers are expressing the value in the context of their own precipitation, needs and priorities based on a knowing product (rice).
- The quantity of rice signified how important a product to them (rank).
- Each product is valued based on the price of rice.



## 6. Benefit Transfer

- Not a methodology; but an approach
- Use primary valuation studies from other sites (transferring value)
- General steps:
  - **Identify**: similar studies
  - **Examine**: how transferable they are (identical)
  - **Screen**: theoretically and methodological robust
  - **Adjust**: existing value according to the site circumstances





- Eg: TEEB Estimation on the Total Economic Value of 63 million hectares of wetlands around the world = US\$3.4 billion/year.
- Benefit Transfer method was used for extrapolating from 89 wetland studies.
- Benefit function has been estimated using variables: wetland type, size, location, population density, and income per-capita.
- Estimated function values were transferred to 3800 wetlands around the world



# In Brief:

- The Non-excludability character of ecosystem goods and services often makes its market price close to zero.
- But actual value is quite large.
- For understanding the real value of ecosystem 'Valuation Methods' are available.
- Valuation is a challenging process.
- Selection of appropriate method, reliable data, and scientific application will provide reasonably good results.





# Thank You

