Analysis of survey based methods in ecosystem services valuation and introduces more appropriate methods to achieve reliable result in developing countries

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Abstract:

There is currently substantial interest in valuing various services provided by different ecosystems .Contingent valuation method (CVM) has been used as a most conventional method around the world, but using this method has some shortcoming and difficulties specially in developing countries. These are low level of information about natural resources, lack of public participation, economic and social problems and also low level of income in these countries.

In the most of developing countries the income distribution is uneven so it can not be fair that we calculate the public preferences based on individual preferences .In this situation, Survey based method will tend to undervalue the ecosystem services in question .The main purpose of ecosystem services valuation is to guide resource allocation, when we use willingness to pay (WTP), it is a poor guideline to fulfill this intention. In this paper we try to introduce more appropriate methods to achieve more reliable result for developing countries at least during the transition time.

Key words: ecosystem services valuation, developing countries, Contingent valuation method

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Introduction

In a world with limited environmental recourses, in which environment were pure public goods it would be necessary to have methods to determine the best allocation of resource among competing alternative uses. One of these methods is valuation technique that could help us to quantify the benefits of non marketed ecosystem goods and services so that they could be entered directly in a cost benefit analysis. Among various method that exist to calculate these values, contingent valuation method is the only one that is utilized to estimate economic values for all kinds of benefits such as used and non-used values.
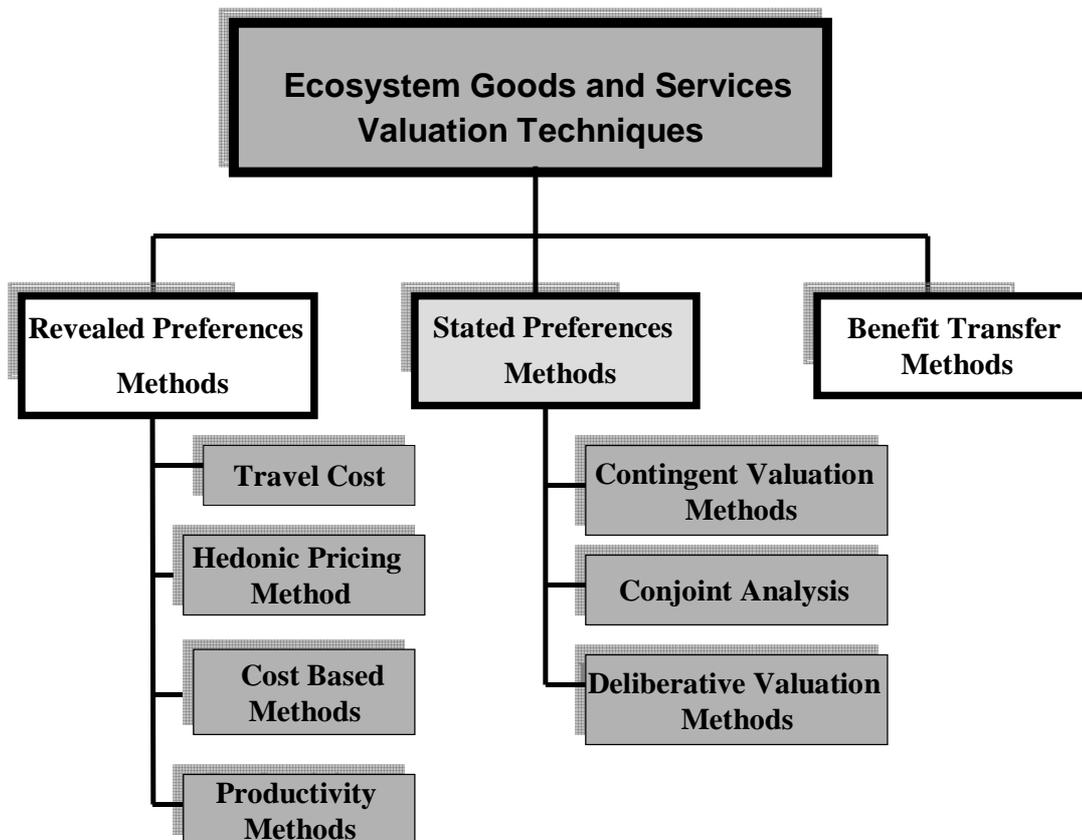
The CVM uses survey technique to ask people directly what their environmental preferences are. Since responses to a hypothetical situation are derived from potential consumer, CVM assumes that the consumer's expressed WTP in a hypothetical situation which is a measure of the consumer value in an actual situation. (Bann 1997 P: 91).It is called "*contingent valuation*" because the valuation is contingent on hypothetical scenario out on respondents (Perman et al 1999).
Hanemann (1992) traces the empirical roots of CVM back to 1958 and a US National Park services-funded study of outdoor recreation in the Delaware River Basin area. In 1970s it has been observed a gradual but sustained growth in application of CVM method and by the end of decade the CVM was given the official recognition .In 1980s was happen an explosion in number of CVM studies and its first application in developing countries and CVM entered the 1990s as the dominant technique for the valuation of non-market environmental costs and benefits (Bateman & Wills 1999).

Main ecosystem goods and services valuation techniques

There are various techniques for valuation ecosystem goods and services or assessing the change in environmental quality or quantity. Fig 1 shows these techniques briefly.

Fig 1 Main Ecosystem Goods and Services Valuation Techniques

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            │  Ecosystem Goods and Services    │
            │      Valuation Techniques        │
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 ┌──────────────┐   ┌──────────────┐   ┌──────────────┐
 │  Revealed    │   │   Stated     │   │   Benefit    │
 │ Preferences  │   │ Preferences  │   │  Transfer    │
 │   Methods    │   │   Methods    │   │   Methods    │
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   ┌─────────────┐    ┌──────────────────┐
   │ Travel Cost │    │   Contingent     │
   └─────────────┘    │ Valuation Methods│
   ┌─────────────┐    └──────────────────┘
   │   Hedonic   │    ┌──────────────────┐
   │   Pricing   │    │ Conjoint Analysis│
   │   Method    │    └──────────────────┘
   └─────────────┘    ┌──────────────────┐
   ┌─────────────┐    │  Deliberative    │
   │ Cost Based  │    │Valuation Methods │
   │   Methods   │    └──────────────────┘
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   │Productivity │
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There are two main categories for valuation methods, reveled preferences method and stated preferences method, in reveled preference method the valuation is to be based on observed economic behavior and individual preferences can be inferred base on what they do, but in stated preferences method the valuation is to be base on response to survey questions and what people say rather than what they do (Heal et al 2005 p: 101).It is important to use these valuation techniques properly. They provide powerful tools to assess the value of ecosystem services, but if they are mis-applied, their results will be of little use.(World Bank 2004)

In reveled preference method the valuation is to be base on observed economic behavior and individual preferences can be inferred base on what people do, for example in hedonic pricing method the basic assumption is that the market price of a good is related to its characteristic or the services that it provides. It is possible to value the specific characteristic of a good by looking at how the people are willing to pay the price, when the characteristic of good change, so the method is

based on peoples actual behavior. Also in travel cost method we assume that the value of site is reflected in how much people are willing to pay to travel to visit the site and again, the value originates from peoples actual behavior. In cost based methods we estimate the value base on either the costs of avoiding damages due to lost services, the cost of replacing ecosystem services or the cost of providing substitute services, this method is based on the assumption that if people incur costs to avoid damages caused by lost ecosystem services, or to replace the services of ecosystems, then those services must be worth at least what people paid to replace them. Finally productivity methods is used to estimate the economic value of ecosystem products or services that contribute to the production of commercially goods along with other inputs and at least has the value as equal as its contribute in producing a market goods for people.

In stated preferences method the valuation is to be based on response to survey questions and what people say rather than what they do. In comparison to revealed preferences methods, stated preferences methods exhibit the following advantages:

1-The only methods available for estimating nonuse value
2-Employed when environmental condition has not or can not be experienced so that revealed preferences data are not available
3-Used to estimate values for ecosystem services that do not affect people's behavior (Heal et al 2005 p: 128)

 CVM is a stated preference method, if people understand clearly the change in environmental quality being offered and answer truthfully, CVM is an ideal method but it is necessary that some pre conditions and background has existed to achieve reliable result from CVM. In practice CVM is the most useful methods for valuing changes in amenity, air and water quality, wildlife and biodiversity among a well-informed and concerned population (Winpenny 1991).

The benefit transfer methods is used to estimate economic values for ecosystem services by transferring available information from a site to another, the basic goal of benefit transfer is to estimate benefit for one context by adapting an estimate of benefit from another context. It is necessary to consider similarity in many aspects for two sites and using this method with caution, usually using the benefit transfer needs many experience and conditions.

Common problems with CVM

There are common problems with using stated preferences methods because, they are not base on peoples actual behavior (Diamond & Husman 1994, Hanemamm 1994, Portney 1994, Heal et al 2005 p 122). According to survey based and contingent nature of CVM there are potential bias sources in this method; bias is any element in the study that consistently skews results in one direction there by leading survey results away from actual WTP[2]. We explain some of these biases below.

Information bias

The quality of information given in a hypothetical market scenario almost certainly affects the responses received; type and amount of information provided to respondents may influence the WTP bid. Such variations pose problems as to what constitutes the correct level of information and how this can be determine(Jones et al 2000 p 96) some studies finding a threshold effect for information build up, below which no bias is detectable but above which a positive and weak effect is found (Pearce &Moran1994, Bann 1997 p 99).

Starting point bias

Sometimes when people asked their WTP for an scending or descending rang of values, their answers may be influenced by the starting level .The bias arises if respondents interpret the initial bid suggested by the questionnaire as being indicative of market information , or as reflecting a guide on their WTP .

Payment vehicle bias

The kind of payment can influenced peoples WTP for example cash price, entry charge, indirect tax, property tax supplement and so on. It means the bias between various forms of payment may reflect people's genuine preferences (Bann 1997 P.100).

[2] Willingness To Pay

Strategic bias

This kinds of bias arise when respondent doesn't state their true WTP or WTA[3] in order to change the results of the study in a way that they want , also several studies show that this bias can ameliorated if the survey was designed accurately (Schulze et al 1981,Thayer 1981,Joens et al 2000).

Part-Whole bias

If respondent confuse the subject of the equity with a wider questions, we have a part-whole bias. For avoiding this kind of bias it is necessary to well define the character that we want to ask the WTP for it.

How can we overcome these biases?

According to these kinds of biases that are existed with CVM, economists have tried to solve the problems with new versions of CVM. One of them is conjoint analysis (CA), the theory of the CA is similar to CVM but CA seeks to discover the contribution of different characters of a good towards its overall value (like hedonic method). In this case different combinations of characteristics of a "composite good" are comparing to achieve overall value (Joenes et al 2000) .An advantages of using CA comparing with CVM is its more possibility to use the results of CA for other similar site because it is based on sites characters not just a whole WTP for a site (Joenes et al 2000).

Another new direction to reduce biases in CVM is using deliberative monetary valuation (DVM), that it has been advocated by Spash (2001) Niemeyer and Spash define DVM as "the use of formal deliberation concerning an environmental impact to express value in monitory terms for policy purposes" (Niemeyer and Spash 2001,Spash 2005)

There is also a guidance upon the report of the National Oceanic and Atmospheric Administration panel (NOAA) to achieve a standard protocols for a good CVM study .This guidance tends to recommended such things as personal interviews, random sampling, full information on the resource change and checks for understanding the information given, dichotomous choice question format, careful design and pre-testing of questionnaires and reinforcing budget constraints (NOAA 1999, spash 2005) .

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[3]Willingness To Accept

Special problems with CVM in developing countries

The valuation methods for environmental functions may not be always the same in developing countries and developed countries and survey based methods such as CVM maybe superseded buy cost base methods in developing countries (Aylward & Barbier 1992). In addition to above biases about using CVM for valuation, there are some special deficiencies with CVM in developing countries. Many researches show that people in developing countries are not familiar with CVM. In these countries environmental needs are given less priority than basic material needs, thus using survey base methods will cause to undervalue the resources in valuation process(McCracken 2000 P:14). A basic need to receive actual results from CVM is peoples full access to information but in developing countries the flow of information about what is going on may be very selective (Winpenny 1991) and there are limited public participation in these countries, also it seems that understanding the importance of local environmental aspects is more tangible for ordinary people than their perception about biodiversity or the preservation of rare specious. Also uneven distribution of incomes makes it vital to distinguish the relative scales of value that different groups have (winpenny 1991). It is better to consider the WTP not as an absolute amount but as a portion of people's income, in fact the same WTP by a poor people hasn't the same value for a rich people

Conclusion and suggestions

It is remarkable that in some cases, CVM is the only method to derive value. According to its hypothetical nature, there are some preconditions and background such as full information on the resource change, understanding the information, careful design and pre-testing of questionnaires to achieve the reliable results. These factors require cultural and technical capacity-building. Due to lack of these preconditions in developing countries, it seems that it is better to use other method to derive the values .In such situation Revealed Preferences Methods are the second- best because in these methods, the result dose not depend on respondent opinion and some factors such as respondents lack of information or low level of income can not influence the results.

 It is possible to use CVM in developing countries in especial cases for assessing the local environmental situations where the people are familiar with them, but it is not suitable for complex environmental valuation like

existence and intrinsic value assessment. According to Bann (1997) many people in developing countries lack the appropriate background for CVM and in such cases CVM has proved to be more useful for issues of direct every- day relevance (such as water and sanitation) than for more remote issues such as biodiversity (Bann 1997 P: 102). If using the contingent valuation techniques is unavoidable it is necessary to consider uncertainty and reducing it by attention to preconditions. A number of recent valuation studies have used both revealed preferences and stated preferences data to estimate values (Adamowiicz et al1994, Cameron 1992, Heal et al 2005). It could help to achieve more reliable results because the inadequacy of each method can be covered by the other.

Finally there are some suggestions to achieve more reliable results in developing countries:

1-Using the revealed preference method have been preferred in developing countries due to its independent nature.

2-It is better to use CVM for assessing the local environmental situation rather than valuation of complex and unfamiliar aspects of environment

3-Pay attention to capacity building to prepare the preconditions and backgrounds that is needed to achieve an acceptable CVM

4-Using the revealed preferences and stated preferences methods together to reduce uncertainty

References

Adamowicz et al 1994 *Combining revealed and stated preferences methods for valuing environmental amenities*, Journal of Environmental Economic and Management 26:271-292

 Aylward.B &Barbier.E.B 1992 *Valuing environmental function in developing countries,* Biodiversity and Conservation 1, 34-50 .

 Bann .C.1997 *The Economic Valuation of Tropical Forest land use options A manual for Researchers*, EEPSEA Singapore.

 Bateman.J, Willis .K.G, Ed 1999 *Valuing Environmental Preferences Theory and Practice of the Contingent Valuation Method in the US , EU , and Developing Countries* Oxford University Press .

Cameron,T.A 1992 *combining travel cost and contingent valuation for the valuation of non market goods* Land Economics 68:302-317

 Diamond,P.A.,& Husman.J.A.,1994.*Continjent valuation :Is some number better than no number,*. Economic perspective 8(4):45-64 .

Jones E,G;Davies,B;Hussain,S;2000;*Ecological economics An introduction* ;Blackwell Science   London.

Hanemann, W.M., 1994. Valuing *the environment through contingent valuation,* Economic perspective 8(4):19-44.

Hanemann, W.M., 1992. Preface, in S. Navrud (Ed), *pricing the European Environment*, Scandinavian university press, Oslo.

Heal.G.M.,Barbier,E.B.,Boyle,K.J.,Covich,A.P.,Gloss,S.P.,Hershner,C.H.,Hoe hJ.P.,Pringle,C.M.,Polasky,S.,Segerso.K.,Schrader-Frechette,K.,2005 .*Valuing Ecosystem Services .Toward Better Environmental Decision-Making. The* National Academies Press, Washington,D.C.

Niemeyer.S.& Spash.C.L 2001 *Environmental valuation analysis, public deliberation and their pragmatic syntheses*: A critical appraisal .Government and policy 19(4):567-586.

NOAA 1993 *National resource damage assessment under the oil pollution act of 1990*, Federal registers 58(10):4601-4614.

Pearce, D.W & Moran. D., 1994 *The Economic Value of Biodiversity In association with biodiversity program of IUCN* Erthscan Publications Ltd.London .

Perman.R,.Ma.Y.,Mcgilvray.J.,Common.M., 2000 *Natural resources and environmental economics* Second Edition, Longman.

Portney,P.R 1994 *The contingent valuation debate: Why economist should care* ,The Journal of Economic Perspective 8(4):3-18.

Rietbergen .J, Cracken. Mc, Ed 2000 *Environmental valuation A Worldwide Compendium Of Case Studies* UNDP Earthscan Publication London.

Schulze, W.D.,Arge,R.C & Brookshire,D.S 1981 *Valuing environmental commodities: some recent experiments* .Land Economics 62,306-312.

Spash, C, L., 2001 *Deliberative monitory valuation, 5th Nordic environmental research conference, University of Aarhus, Denmark.*

Spash,C.L., 2005 *Economics of the environment and development* Pushpam Kumar (ed), Ane Book Publication, New Delhi .

Thayer, M, 1981 *Contingent valuation techniques for assessing environmental impacts: further evidence*. Journal of Environmental Economics and Management 8, 27-44.

Winpenny J.T, 1991 *Values for the Environment A Guide to Economic Appraisal,* Overseas Development Institute.

World Bank; 2004, *Assessing the economic value of ecosystem conservation* October Paper No 10