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Environmental Values Estimation in the Transportation Projects

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Abstract
There are concerns about environmental protection on one hand and on the other hand, a desire to have sustainable development. The environmental values estimation studies help us find a balance between environmental concerns and the development. Thus, economic valuation help human for obtaining "sustainable development". Estimation of environmental values provides quantities tool for making a sound policy. Our objective is to introduce a sound appreciate and economic technique for estimation environmental asserts in the projects. Some of the major environmental impacts of road projects contain damage to the natural resources and the fragile environment. The environmental impact assessment (EIA) accomplishing is essential for transportation projects. Another concept relates to environment in the transportation projects is the "externality". An externality is an un-priced benefits or costs straight gave or imposed upon one agent by the actions of another agent. Externalities cause market failures in the sense will exist a difference between the private and the social (private plus external) costs and benefits. The sum of all of different values join together with a resource is total economic values or (TEV). The economists define "economic value" as the maximum willingness to pay (WTP) for an environmental source or natural resource. The CVM is the only approach accessible for estimating nonuse values. The contingent valuation method (CVM) is the most common method for valuing non market amenities. Moreover, the CVM questioning form based on hypothetical features is the most usually used to estimate the non-use value of the environment including bequest, existence and option value through directly surveying respondents on WTP for possible environmental characteristics in a hypothetical market.

Introduction

In this modern age, there is a public concern regarding safe and efficient transportation ever increasing by the day. However, there exists a paradox about transportation project. There are concerns about environmental protection on one hand and on the other hand, a desire to have sustainable development. One of the challenges, facing the human race is finding the equilibrium between the development and environmental protection or environmental supporting. It is the sustainable development. The environmental values estimation studies help us find a balance between environmental concerns and the development. Thus, economic valuation help human for obtaining "sustainable development".

However, most of the time, external costs are not included in such studies. Consequently, a full economic evaluation approach is essential to determine the monetary value of environmental properties. Moreover, it is used to calculate the net social benefit of a transportation project.

The overall purpose of cost benefit analysis is to provide information for political and administrative decision makers and/or the broader public about the economic desirability of different project or policy alternatives (Johansson, 1991). Estimation of environmental values provides quantities tool for making a sound policy. We intend to introduce a sound appreciate and economic technique for estimation environmental asserts in the projects.

Costs and Benefits in the Transportation

Transportation projects regularly make public goods. It is either impossible or unwanted to charge the consumer. These projects have some costs and benefits. The most complicated duty in estimating transportation projects is estimating the benefits. Actually, the benefits of transport projects cannot for all time be calculated by the market value of the services made and scientists should choice to indirect measures to evaluate the transportation. Although, the conceptual framework is quite uncomplicated, the estimating difficulties may be daunting.

The most ordinary direct benefits of transport projects have both of direct and indirect benefits. The direct benefits including: savings in vehicle operating costs, increased reliability of service, reduction in the frequency and severity of accidents, increased comfort, convenience, and reliability of service. Also, the indirect benefits including: stimulation of economic development and environmental improvements.

It should be added, not every transport project creates all of mentioned benefits and on the other hand, not all of the above benefits are equally difficult to estimate. Further, some of benefits like" savings in vehicle operating costs" are the easiest to calculate in monetary terms. Time saving is an important benefit of transport projects. In many studies, the value of time saved is considered in demand for the quicker service and the price that consumers are willing to pay for it, like in the case of airplane services but in the others, as for most roads, the value that consumers attach to time saved must be derived indirectly. Many of scientists believe the "value of time saved" depends on the travel objective or objectives.

We propose one of techniques for evaluating saved time value relates to labor time price considering in

our study. When a working person starts a travel during working hours, the time employed is time not used at his/her work. Thus, working time saved, is working time. It can be used to make furthermore its value is the value of the additional good or service produced, net of costs.

The costs of transport projects are clear-cut. But the value or values of environmental improvements and increased comfort and convenience are the most difficulty. It is because natural resources and the environment have not any market. For example, all of vehicle operating costs like fuel, lubricating oil, spare parts, hours for labor maintenance, tires, depreciation and crew have market price. The mentioned costs depend in turn on freeway geometry conditions like grades, curves, super elevation, and surface conditions like unevenness or roughness. Of course we can add driver behavior and traffic control to other one, too. The vehicle operating costs are higher on grades and curves road. Also, they are higher on rough surfaces and slower roads. It is necessary mentioned; changes in any of above parameters will result in a change in vehicle operating costs.

The transport projects could have an effect on movement safety on the infrastructure. Also, they have effect by changing the quantity of movement undertaken. Even it is by changing the situations in which the movement happens. Sometimes the transportation impacts may be positive. For example, if the project like our case study reduces accident costs numbers but it may be negative if the project increases traffic accidents, especially when the speed of automobiles will increased. Actually, a new freeway makes the transportation safe to travel at high speeds. It possibly will increase the accident rate if the improvement is not gone along with additional safety factors. Some of safety factors are like better marking of lanes, or better and more abundant safety barriers. When projects increase or decrease the traffic accident numbers, the effects must be taken into account when measuring benefits.

The freeway construction will decrease traffic accident costs. Typically transport accidents involve the following types of economic impact: physical damage to automobiles and road furniture; costs of hospitalization and treatment; loss of output by (and hence obtaining for) injured persons; physical injury to drivers, passengers or third parties (like walkers), including fatalities; pain and suffering.

The usual method to estimation is to differentiate between property harm, personal injury, and fatalities and between all of them; the damage to property is the easiest to estimate. It is often revealed in traffic reports and insurance claims. The costs of personal injury which contains three types of costs: costs of medical treatment, costs of lost output, and pain and suffering for both the victim and relatives. On the other hand, is more difficult to measure because they have not any market. The benefit measuring from reduced fatalities are the most complicated to quantify in monetary terms, because it needs considering a value to life. There is an almost universal reluctance to evaluate the value of life in monetary terms.

In the transportation economic section we need to estimate transportation demand. The most uncomplicated technique for approximation demand stemming from normal traffic is go to background or to extrapolate from past trends and suppose growth will stay stable in either absolute/relative terms. There is a superior method to relate other parameters like, traffic growth to GDP growth, population growth, fuel costs, or other significant variables, as the demand for transport naturally grows with population, income and the passage of time. So there is a predicting demand on the basis of expected GDP growth, population growth and changes in fuel prices projections of the explanatory variables are required. Also, demand based projections need elasticity of incomes and prices. The scientists should consider the elasticity of each country but if the country specific data is not available, default values may be substituted. There is a different in transport type, for cargo transportation the income elasticity is typically about or a little less than unity, whereas for passenger transportation it is typically a little more than unity. We consider two scenarios with project and without project, and base traffic levels, to be supposed in the “without the project” scenario must reflect this kind of expected secular growth.

The evaluation demand for the new service or services is the most important step in estimating the benefits of the transport projects. The transport projects are usually long lasting. Thus the decision to assume such investments necessarily rest on long term predicts. Then, the transport projects include considerable some of doubts. Also they usually include great investments. Sometimes scientists get demand wrong, so society may be loaded with costly. Estimating demand as exactly as possible should be carry out. After that, it must be complemented with a methodical analysis of hesitation estimation the robustness of the consequences.

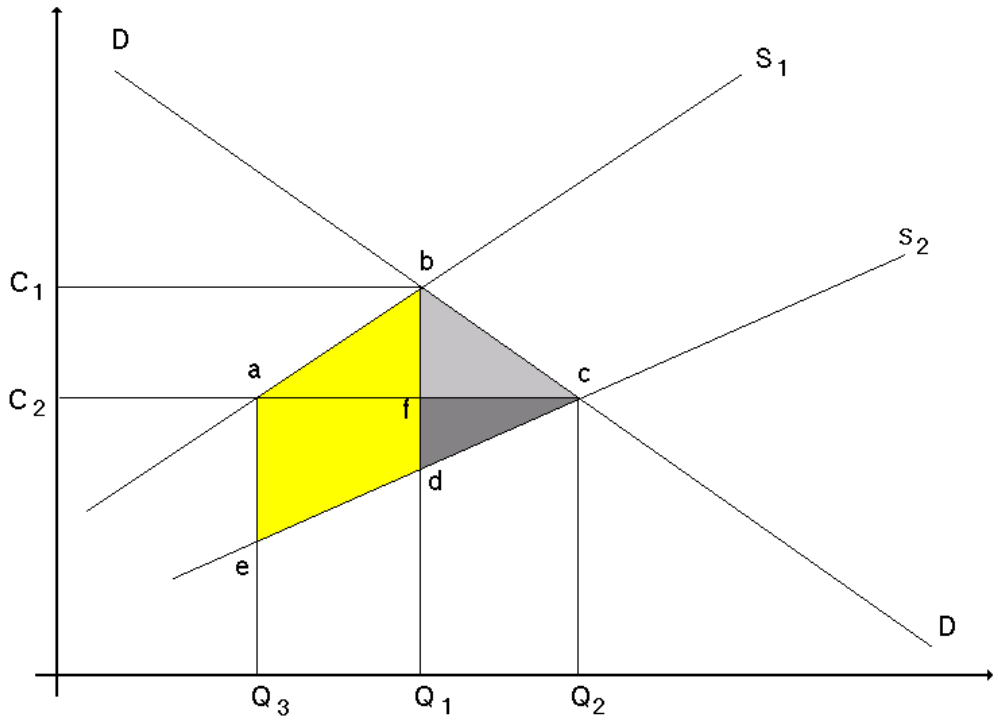

Figure-1 Supply-Demand Curve for Transportation

Figure-1 shows the net benefits creating from a project that adds to existing supply. We can suppose there are a demand "D" and two supply "S_1" and "S_2", in the situation without the project "Q_1"services are provided at cost of "C_1". When a new service contributor comes into the market displacing the supply curve from S_1 to S_2 and so there is a lower cost for the service, "C_2" and a higher quantity demanded, "Q_2". Although the new contributor supplies the quantity (Q_2 - Q_3) because it partially displaces old providers, the project increases total quantity supplied only by (Q_2 - Q_1). The amount displaced is given by the difference, Q_1 - Q_3. The net benefits are provided by the enlarge in consumer's surplus (triangle bfc) in addition the increase in producer's surplus (triangle dfc) in addition the net savings in costs of offering the displaced demand (area eabfd). The displaced demand was being offered by the main contributors at a cost offered by the area under the supply curve "S_1". The new amount is now being offered by the fresh situation, more able provider. Also it is at a cost given by the area under the supply curve "S_2". In the end we can find the difference between the two areas which is equal to the cost savings. Furthermore the consumers which use/not use free way, save the difference between what they were giving without the project for the quantity "Q_1" (C_1xQ_1) and what they give with the project (C_2xQ_1) and it is given by the area (C_1C_2fb). However the saving enjoyed by consumers who are user free way is offset by a loss to the old providers and so we can perform same this examination for cost and benefit analysis for transportation project.

Environment in the Transportation Projects

There is a rising awareness about transportation development and specially road development because it has major environmental impacts. Some of the major environmental impacts of road projects contain damage to the natural resources and the fragile environment. For example, loss or decrease of productive agricultural lands, immigration of huge people numbers, permanent disruption of local economic activities, soil erosion, accelerated urbanization, forest clean cutting and introduction of new disease. Therefore the environmental impact assessment (EIA) accomplishing is essential for transportation projects. The follow up phase of environmental impact assessment procedure is considered as a main inadequacy in many jurisdictions (Arts, 1998; Arts et al., 2001). The natural resources and the environment of the area where the freeway position is to be constructed were already extremely degraded. It is more serious especially about to the fauna and flora of the ecosystems, stream water quality, and land use characteristics. The characterization of the baseline situation was done mostly through collection of data from official departments, and municipalities of the area. The forecasting and evaluation of potential important impacts was based on the baseline characterization for hypothetical future development without the project and mathematical models were used to predict for change in quality of water,

air, soil, fauna, flora and al of ecosystem parts.

Descriptive tools suggested impacts on fauna and flora, sketches of landscape impacts, and projections of trends in growth, population, traffic, and economic aspects enabled analysts to assess territorial planning and urban development induced impacts. The preparation of the Environmental Impact Assessment (EIA) report should start at an earlier phase of the planning and allow consideration of alternatives. Greater public participation in the EIA process should be promoted (Canelas, 1989).

The EIA will need the applying of a specific economic valuation methodology. Sometimes it needs clarification of specific impacts. They are quantified in monetary expressions. The environmental economic valuation process in EIA often emphasizes on the construction phase of the projects. While there are probable to be environmental impacts for the period of the construction, operational and finally decommissioning phases of a transportation project, the economic valuation should apply to the full life period of the transportation project. The main objective of the EIA report is to enumerate and assess the significance of main impacts. It is also intends to mitigation measures.

Another concept relates to environment in the transportation projects is the "externality". An externality is an un-priced benefits or costs straight gave or imposed upon one agent by the actions of another agent. Externalities cause market failures in the sense that there will exist a difference between the private and the social (private plus external) costs and benefits of an action and the free market's allocation of resources will, as a result, be non-optimal from society's point of view (Varian, 1992).

There is an externality for a free way construction actually environmental degradation is an externality. Levinson and Gillen in 1998 developed a full cost model for freeway which identifies the key cost components and then estimate costs component by component: user costs, infrastructure costs, time and congestion costs, noise costs, accident costs, and pollution costs. In other word, their model covered externality for freeway. In the estimation external costs process, we are using the estimated amount of economic damages produced by the externality, rather than the cost of preventing that damage in the first place. Jacob et al., (2006) believe to estimate the total cost of transport, it is necessary to look at indirect or external costs simultaneously. External costs are not born by the public and private transport users they were paid by others, generally the society as a whole, but also the environment. These mainly comprise: external accident, air pollution, climate change, external parking, congestion costs and others (Becker, 2002; Litman, 2002). Of all transport related external costs evaluated in the literature, external accident, air pollution and climate change are the three largest (Maddison, 1996) comprising (77%) of the overall costs (Becker, 2002).

Finally, in a cost benefit analysis we have to add external costs beside other costs like operating costs or investment costs. Even we can degradation costs of transportation project like the freeway projects as an externality and add it to other costs.

Environment is known as a public good. The public goods belong to many people but private goods usually paid by one person or one household. The public good may be defined as "a good that must be offered in the same quantity to all the affected consumers" (Varian, 1990). In many literatures about public goods, there are two main points: first; each person can use them without lessening their convenience for others (according economists opinion it is non competition) and other one: It is very complicated, to prevent people from using them. In other words, public goods are non excludable. The problem with public goods is that everyone has a relatively small incentive to offer them, for that reason individuals will tend to free ride on others presenting it and benefit from public goods freely. As a consequence, public goods are under provided or, reversing the argument.

There will be an over provision of public bad (such as water pollution or soil erosion). The difficulty is whether such action is justified, in the other word, whether the benefits balance the necessary costs of publicly providing the goods.

The welfare economics offered the theoretical foundations for judging the environment and natural resources as goods for which society and individuals' willingness to pay (WTP) could be estimated. Beside the development background of the environmental applications of economic theory, the use of valuation became more significant during the years.

In environmental and resources economics literatures some economists have recommended a substitute welfare decisive factor known as Potential Pareto Improvement Criterion or the Potential Compensation Test (Hicks 1939; Kaldor 1939). This standard has been debatably because, without the actual payment of makeup, it is possible to make a very small group of people much better off while making the huge majority worse off. In the applied economists, the potential compensation test is extremely accepted and widely employed.

A main part of many economic valuation studies attempts has been allocated to discovering a sound tool for the direct questioning of consumers. It is in turn to decrease misrepresentation of their preferences for public goods. It can be reached in the course of the facts of the Hicks-compensated demand curves. It is just obtained from consistent econometric estimate tools of entire sets of demand functions for every goods estimated one by one for each individual.

It is important to mentioned, the welfare analysis of Contingent Valuation Method (CVM) in this manner, is suitable to public goods since the private goods market functions in a totally different style. According to Marshal Theory, the results in private goods market take place at the equilibrium price which demand and supply are the same. However competitive equilibrium mentioned above, assembles the welfare economic tests. In this market, whoever pays for the mean quantity of a commodity is the average consumer of a private good.

Environmental economists are noticed in the concept of value from a severely anthropocentric opinion. What is being studied is "the willingness of individuals" to use rare natural resources on the environment that could very well be applied for choice objectives. For instance, if individuals believe as very important environmental good, their tendency to pay out money for tree conservation will be high. But what is being valued is not the 'essential' worth of trees, which is totally independent of the existence of human, but rather, the importance that man joins to such trees. So far, another form of positive "economic value" comes up even when the good in the questions of questionnaires is consumed, exhausted or even unseen. In fact, the individuals may have a tendency to charge for a part of environment, they will never see, just to make certain somebody in the future will.

Values in Transportation

Another concepts related to this paper is "value". The economists define "economic value" as the maximum willingness to pay (WTP) for an environmental source or natural resource. The area below the demand curve for the resource is recognized as WTP. The natural resources goods are some significance for individuals. So, a demand for the good must exist even if have not any clear market transaction takes place, for instance, no markets for a beautiful aspect of a wetland can be subsisted in the real world, but if anyone looks into individuals' behavior she/he may notices that they actually give up other resources to moderate the impacts of wetland degradation for her/him. In another example we can consider individuals pay for money on supporting environment to keep away from contact to water pollution which is source of their drinking water or on illness treatments to improve its effects. This information is what lets economic scientists to estimate "economic values".

There is more than one valuation technique in the economic. It can be applied to situate a monetary value for the similar resource. For instance, the illness cost approach imprisons the health benefits of clean water, although a travel cost method can be applied to estimate the recreation value of water quality, too. While every one of (health benefits or travel cost) techniques measures different aspects of water quality the estimates may be will different. A result of the reality that the environment can be a source of welfare for different causes and different individuals is developing diversity of valuation techniques. The forests can present ecosystems services for neighborhood communities. For example they offer timber for loggers and carbon sinks for global carbon dioxide emissions, tender water filtration for hydroelectric plants, give genetic resources for multinational pharmaceutical factories, at the same time.

The sum of all of different values join together with a resource is total economic values or (TEV). It is a phrase recommended first time about 30 years ago. Fortunately, there is an agreement on the environmental values classes. Each of values have different meaning, the first important distinction is between use values and non-use values.

The "use values" are those that have base in the society's benefits from using. Also, they are potentially using, a given environmental resource. And the use values which contain: direct, indirect, and option values. The direct use value is extractive, consumptive and structural use value, gains from commodities which may be extracted, consumed, or directly benefited. We can offer an example: direct uses of water contain: waste disposal, drinking and industrial procedure. For example, water use value for a producer is strongly communicated to the degree to which water is required element of the production of a certain good. In addition, other direct uses for water like sport fishing or recreation. But quite the opposite, indirect use values are those in which water is indirectly applied to make a commodity.

The indirect use values arise from the natural utility of ecosystems. Even, sometimes they referred to as un-priced benefits to water users (Awad and Hollander, 2010).

The "non-use" values contain existence values and bequest values. In some studies option values consider as a non-use value, too (Awad, and Hollander, 2010). Direct use values derive from the consumptive or non consumptive use of the resource. For example logging the forest to obtain fuel wood or fishing for subsistence is two examples of the individual directly enjoys the resource either by consuming it.

There is a difference between direct use values and indirect use values but the difference between direct use values and indirect use values is not always observable. If they require arises the option values obtain from the potential future use of a commodity. The subject is very usual in economics where options are sold for the right to sell a stock market good at a precise time and at a precise price in the next years. The value of options obtains from the fact that present time information is not ideal. If holding the asset is valuable, the time will

advise us. And remaining that option will make it possible to take advantage of any new information. The idea uses to the environment as well. For example, the conservation of a natural area is an option, giving us the possibility of transforming the area in the future as a protected river or protected area. And it is according to the update data collected on the relative value of the protected river or protected area.

In other word, passive use values or non use values are the demonstration of people's willingness to pay or (WTP) for a good (in this case, a natural resource) in spite of their capability to make any applying of it for now, or in the future, such values may occur for the reason that of unselfishness towards future generations which our children (bequest value). Sometimes it is because of the simple awareness of something exists, it is named: existence value. Even if individuals in no way have any plan to apply it. In Figure 2 the relationship between different types of values and methods is illustrated.

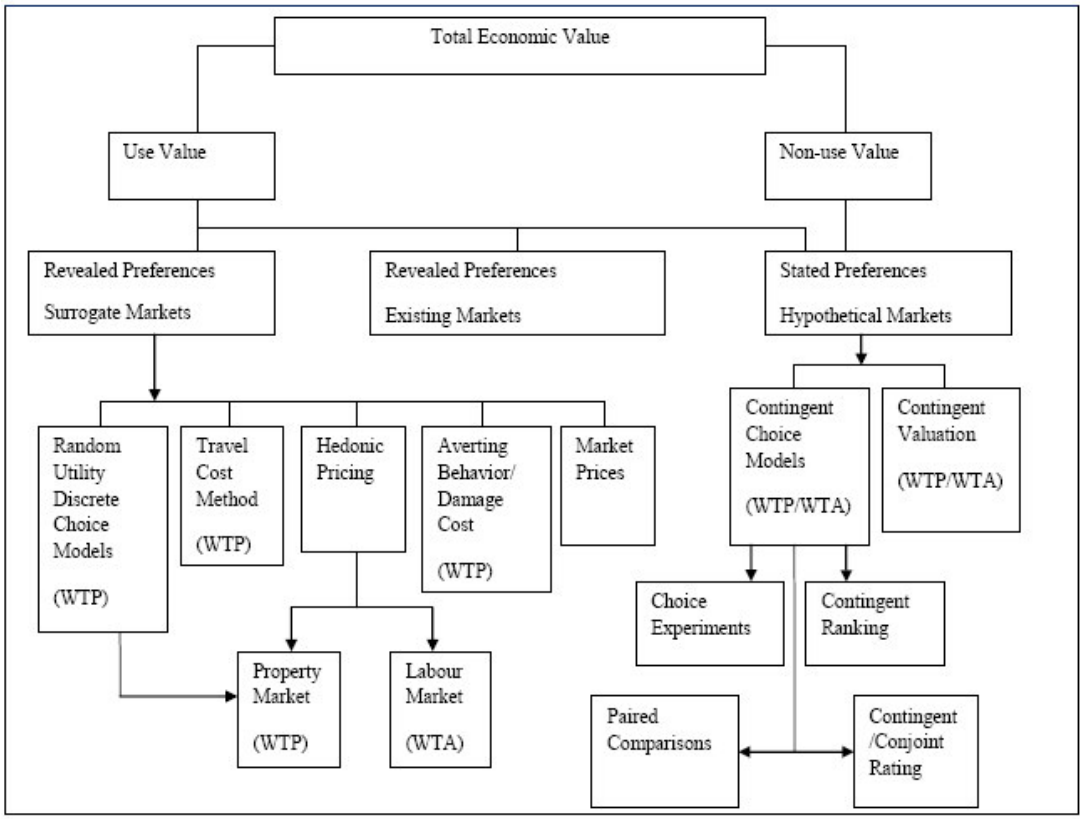

Figure 2 Relationships between TEV, WTP and Estimation Methods
(Source: Adapted from Pearce, et al., 2006)

According to Awad, and Hollander, (2010) the CVM is the only approach accessible for estimating nonuse values. Also, Arrow et al., (1993) pointed to that CVM is the most common method for valuing non market amenities. Moreover, the CVM questioning form based on hypothetical features is the most usually used to estimate the non-use value of the environment including bequest, existence, and option value through directly surveying respondents on WTP for possible environmental characteristics in a hypothetical market (Mitchell and Carson, 1989; and Haab and McConnell, 2003). Griffin et al. (1995) stated that CVM are utilized to assess public goods or environmental amenities, in case of a water system. It is possible to exanimate the results of a contingent valuation survey by comparing the answers given when the water system was hypothetical to the actual behavior once the water system becomes available. Furthermore, Washington (1998) indicated that now we have come full circle that is assumed by many environmental and resource economists, and policy analysts working in developing countries that CVM surveys are straightforward and easy to apply. Even, Lipton et al. (1998) stated that the CVM can be considered the best method to estimate the economic value of anything.

The most important reasons assumed to CVM selection are: CVM is the just method can estimate the nonuse values of a resource it includes existence values and bequest values. It can be utilized to assess the value of any non market good without need for data. Also, it is the best method to estimate nonuse values and the most important point, CVM is not usually complicated to understand. It also can be judged by the estimating of a mean or median value. Even the mean WTP obtained from CVM has used as a calculation for cost and benefit analysis or (CBA). The CVM draw outs information on the value of the amenity directly by using a questionnaire or interview to increase a hypothetical market in which the consumers uncover the values they place on a resource. The WTP question format utilized in the CVM questionnaire offers the opportunity to use a

variety of econometric and statistical techniques and the most important; it can presents helpful and reliable information of WTP.

Conclusion

Good economic analysis inquires whether the project can be expected to create more net benefits to the economy than any other known option for the use of the resources in question. The project design, therefore, should be compared with different other designs involving differences in such important features as the scale of the project, the choice of beneficiaries, the types of outputs and services, the production technology, location, starting date, and sequencing of components. The project should also be compared with the alternative of not doing it at all.