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Evaluation of Environmental Damages on Establishment of Great Dams in Iran: Case Study: Alborz Dam, Mazandaran

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Abstract There is an increasing challenge posed by the environmentalists on the investment for the infrastructural affairs and the establishment of the cement structures in water industry which do not consider and evaluate their side effects on the environment. These groups wonder whether establishing such massive dams is able to produce sufficient economical benefits for compensating these diverse environmental damages or not. In order to answer this question, it has been attempted in this paper to prepare a framework of benefit- social costs analysis[i] and to qualify the monetary value of the environmental damages and to calculate the amount of the environmental damages of Alborz Dam using the experimental approach for choice – election[ii] and its modeling according to the multinomial legit model (MNL)[iii] pattern along with the project's cost-benefit ratio with/ without regarding the environmental costs for clarifying the effectiveness of these indexes and their sensibility toward the environmental considerations. The findings showed that cost-benefit ratio of this dam with/ without adding the environmental costs of implementing this project are 1.77 and 1.24, respectively.

Keywords Environmental Effects, Choice-Based Experiment, Multinomial Logit, Social Cost-Benefit Analysis, and Alborz Dam

1. Introduction

Till now, numerous economical researches have been done on establishing dams and water power factories in the country which rely mainly on direct costs and profits such as profits earned from irrigation for urban and agricultural utilities, electricity production as well as profits gained from controlling the seasonal floods and investment costs. Of course, all these works have been done with no attention to the environmental considerations. At the same time, in most cases, the processes of building huge dams have remained several reverse effects on the natural and social ecosystems among which one can refer to the jungle destructions, the rareness of various animal and plant species and even the flood over great historical places and cultural inheritance.

Whenever the market prices lose their quality values and the private sectors decide to just increase their own earnings, several hard- to - compensate damages occur which result in difficulties for other people and the whole society. Among these factors are the side effects namely, those expenses which are incurred not only for individuals, but also for the whole society. The most important side effects, just to mention some, are depletions of the natural resources and the environmental pollution.

As a common rule, the governments frequently underestimate these resources instead of regarding their real situation. Also, they enforce the private agencies to include external costs as well. The result of calculating these expenses and applying the analyses of cost- profit in the public investment decisions will be helpful for preventing the environmental damages as well as the great changes in decreasing the subsidiary costs and improving the plans.

A study was done by Hanley and colleagues in 2005 to estimate the economic value of the three components of ecological recovery in both the UK and key Weir rivers took place in Central Scotland and used the polynomial Logit model with random parameters. The results indicated different values of each of these three characteristics of the respondents which were in the minds of participants in such a way that for each river, the river ecology had the highest value and its beauty was of the lowest importance.

2. Methods of Evaluating the Environmental Impacts

The economic literature on the demand function is a good tool to identify individuals 'preferences for a product. These

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functions represent how people with different levels of income demand the product according to its various prices. in cases of its supply , certain commodities market structure are formed by the intersection of supply and demand functions, and therefore, the equilibrium values of price and quantity are determined. But this clear and transparent structure of the market exists only for private goods and in most cases such as public goods, environmental goods and services this structure is not transparent, and generally market fails in its mission.

The absence of a clear structure is determined by the intrinsic properties of the goods such as ambiguity about the property rights and the exploitation right, locating them in public goods, common ownership of these resources, possessing some market and non market, applicable and not applicable profits, and their multi-purpose feature. Due to these factors, they are often called as the limitations for establishing the market or simply the market failure in dedicating these resources in an efficient manner. Special features of the above-mentioned commodities for the ecological goods have led economists toward their economic valuation methods to present their advantages and disadvantages. Generally, the environmental valuation methods of the goods and services are based on two approaches in the demand curve (direct method) and the non-demanding approach (indirect method).

The demand curve approach has focused on ways which lead to the environmental consequences of mining commodity demand curve and directly measure the monetary value of environmental services while looking for alternative markets which are typically complementary goods markets or other effective inputs in the production function of the household for asking people to express their preferences. Travel cost method (TCM), the Hedonic function of the price, contingent valuation method (CVM) and Choice experiment approach (CEA) are the most direct methods. Indirect methods which are mainly discussed and examined on the general framework of production functions and cost-based methods.

Include the procedures of Dose - Response , cost opportunity and replacement cost. As far as these approaches do not clarify the economic values of the environmental goods from their demand function, the values obtained from this approach will not reflect the true value of that goods.

Direct valuation approaches themselves are divided into two groups: revealed preference-based method and the stated preference[12]- based method. In the revealed preference[13] method, people's preferences are chosen based on the produced goods available in the real market of the goods exchange. The Hedonic function of the price and Travel cost method (TCM) are mostly chosen based on these kinds of references to clarify the demand function. Of course, these approaches have their own limitations for real valuation of the environmental goods, since (1) most of these environmental goods are not purchased in the real market, hence, there is no information for predicting their demand and value.(2)even in the case of the availability of such information, the demand rate of these goods cannot represent the their revealed preferences. Its most brilliant example is the existence values which are impossible to evaluate with the revealed preferences. Valuation approaches which are based on the revealed preferences, the economic value of environmental goods with planning an imaginary market are performed via direct questionnaire about people's preferences for evaluating the goods and their features. Therefore, this approach does not have any of the above-mentioned limitations of the revealed preferences approach and it is used as a non- market approach in various studies, especially in fields of analyzing the profit of the environmental costs and evaluating the environmental effects and it includes valuation of applicable and non-applicable values of these goods.

Contingent valuation method and selection- based experience are of two of the most important techniques which are based on the stated preferences that, despite some problems and criticisms, are used in various economic surveys (Davis 1963, Albryny et al 1997, Dickey and trucks, 2001, Bitmap and Turner 1993, Walk and Russell 1994, etc). Contingent valuation is mostly used when the only option is an alternative to the status quo. If multiple features are considered along with several alternatives, using this approach will face some limitations. Of course, in these situations CE approach is recommended. Here, test method is chosen based on the features and there is the possibility of evaluating the characteristics and changes of position.

On the other hand, the choice-based experience approach is theoretically based on a random utility[15] model that is consistent with economic theories. Prevention of strategic behavior , the ability to work both in utility and the willingness to pay (WTA) and tendency to get (WTP) in this way, are of the other advantages of this method comparing with contingent valuation method.

Considering the characteristics of the CE method with a view to the construction of large dams is generally associated with multiple environmental risks. Therefore, the preferences of the people and estimation of the marginal propensity to pay (MWTP) are preferred to the CV method to reduce the environmental impacts of. Alborz Dam.

3. Test Selection Scenario

In this method, the responsive faces multiple- choice sets in which there are two or more options in each category. By selecting one of the option sets, he/ she in fact expresses his/ her preferences for different levels of attributes. In other words, the structure of consumer preferences is set in this way, with an emphasis on the relative importance of attributes.

The basic premise is that every person has a reasonable power in such a way that his most utilities choice is aligned with maximization of its utility regarding its spending limits. So, the characteristics of this method require an

environmental assessment and definition of the various levels of these qualities. For example, the environmental damage features of the dam which can be threatening are: 1 - Jungle (forest) 2 - Plant species (flora) 3 - Animal species (fauna) and 4 – Antiquities that are defined with different levels of protection.. Then the "price" can be used as a vehicle payment. In any item in every choice-set, respondent can select either the environmental features or his/ her optimal willingness to pay. In this case, the estimation of the final willingness helps us to make the willingness valuations for changes in the levels of the characteristics found in environmental goods.

In this study, the three threatened environmental characteristics and the "price" are originally defined to assess the different levels of the Alborz Dam environmental damage in the below table. Next, the selected set of these features and surfaces are formed so that the respondents can respond to their preferences for each of the levels of protection against the price they are willing to pay. Then, the price range and features were selected based on a number of open-ended pilot questionnaires distributed randomly between 30 households within that case- study area.

The questionnaire began with a brief description of the Alborz Dam and its environmental impact to provide suitable information for the respondents and then the question was, "How much money are you willing to pay monthly for reducing the environmental impact of Alborz Dam?" The obtained results of analyzing the data of these questionnaires showed that the price range of the households who are willing to pay monthly for reducing the environmental impact of the Alborz Dam fluctuates between 0 to 10,000 Rials. Therefore, for each price set four levels were considered that are 2000, 5000, 7000, & 10000 Rials, respectively.

The levels of each of these three features were determined in such a way that its first level of protected feature was its condition in presence of the dam and three others were based on the assumption that each feature has been improved. So, the fourth level of the feature represented its best feature compared to the first level of each attribute. Table (1) demonstrates their attributes and corresponding levels in the chosen case study of Alborz Dam.

Experience-based approach requires the choice of designing the options that reveal the factors that influence the choices. In this method, typically answerable, the respondent is faced with a selection set in which each set of two or more options is compared.

In this study, every choice set includes three main options: option A indicates the current status of the dam, and in all categories, it is a fixed and common option and the other two options (B and C) indicate the improvements scenarios. Accordingly, since four attributes and four levels are considered for each attribute, the combinations of the two options and the number of 4*4 modes may be selected. In this study, a sub- group is chosen with these combinations n which include 35 choice sets using the "orthogonal main effect design" technique and SPSS software. Finally, these set were randomly divided into seven 5- blocks, and a special questionnaire was prepared for each of them in such a way that they were different in designs. Therefore, each respondent had 5choice- sets and he/ she was requested to choose one set out of three: option A (the one that included the first levels of each characteristic and indicated the status of the dam), or the other two options ,either B or C (the ones that can be defined with different levels of four features.)

Table (1). Environmental attributes and levels of experience-based test case selection Alborz Dam

Attributes	Description	Levels	Levels
Forest	Hectare of protected forest	Level1*	**8000**
		Level 2	**10000**
		Level 3	**13000**
		Level 4	**16000**
Fauna	NO of protected fauna species	Level1*	**150**
		Level 2	**170**
		Level 3	**200**
		Level 4	**245**
Flora	NO of protected flora species	Level1*	**15**
		Level 2	**20**
		Level 3	**25**
		Level 4	**32**
Price	Additional increase in monthly water rate per household (Rials)	Level 1	**2000**
		Level 2	**5000**
		Level 3	**7000**
		Level 4	**10000**

Source: findings of research

4. Econometric Modeling

4.1. Random Utility Model

CE technique structures are consistent with a random utility model. In this framework, the respondents choose a choice among the available choice- set choose an option that optimizes his/ her utility. In this framework, it is possible to write the indirect utility function of the i*th* respondent of the j*th* choice- selection in the selection set, C*i*, as follows (Mac Fadden 1984):

$$U_{ij} = V_{ij}(Z_{ij}, S_i) + e_{ij} \qquad (1)$$

in which V*ij* is the visible defined component and e*ij* is the invisible random component. V*ij* is the linear function of the features available in your choice -set (Z_{ij}) and the characteristics of the respondent (S_i). The i*th* respondent will choose j*th* option when foe all $j \neq k$ in the selected set, C_i, $U_{ij} > U_{ik}$. Therefore, the probability of choosing

j*th* choice for the respondent i*th* will be as follows:

$$pr_i(j \perp C_i) = pr(V_{ij} + e_{ij} > V_{ik} + e_{ik}) = pr(V_{ij} - V_{ik} > e_{ik} - e_{ij}) \quad (2)$$

In other words, the random utility represents that the i*th* respondent will the j*th* choice, if the indirect utility is larger than any other choice in this category.

In this case, the possibility of choosing the j*th* option based on the logit model would be as follows:

$$pr_i(j \perp C_i) = \exp(\mu V_{ij}) / \sum_{k \in C_i} \exp(\mu V_{ik}) \quad (3)$$

in which μ is the scale parameter and is inversely related to the variance of the error. The basic premise of this model is that the error terms are distributed independently and uniformly with Weibull distribution. This sort of the error term distributions ensures that the j*th* option choice is the most likely option defined as Logistic Distribution. Logarithms of the likelihood function for estimating the equation (2) using the max elasticity approach is estimated as follows:

$$LnL = \sum_{i=1}^{N} \sum_{j=1}^{3} \left\{ Y_{ij} . \ln \left[pr_i(j \perp C_i) \right] \right\} \quad (4)$$

If the i*th* respondent chooses the j*th* choice, the option Y_{ij} will have the value of one and otherwise it will be zero. A strong assumption in the logit model is to provide the explicit requirement of independence of irrelevant alternatives. In other words, the probability of selection associated with these options is retained either with selecting or removing an option. This condition is tested in the conditional logit model by Houseman - Mac Fadn test and has two stages. First, the useless pattern can be estimated in a full model with all the options. In the second phase, the optimized model is estimated by restrictions on the options and Houseman statistic Test is as follows (Houseman and Mac Fadden 1984).

$$\mathrm{H} = \left[\beta_{\mathrm{u}} - \beta_{\mathrm{r}} \right]' (\Omega_{\mathrm{r}} - \Omega_{\mathrm{u}})^{-1} \left[\beta_{\mathrm{u}} - \beta_{\mathrm{r}} \right] \quad (5)$$

The model parameters β_{u} and β_{r} are the vectors of useless and useful parameters and r and u are the variance - covariance models of useful and useless patterns. This statistic has a X 2 distribution with K degrees of freedom and the null hypothesis of the test is the independence of irrelevant alternatives (Houseman and Mac Fadn 1984).

4.2. Explicating the Econometric Model

In order to calculate the marginal willingness to pay (MWTP) of the households toward reducing the environmental damage caused by the Alborz Dam, two multivariate logit models are estimated. In one model, the indirect revealed utility function is the only linear function of a vector of four- stage environmental attributes and price characteristic s. In other words, in this model, the impact of the respondent's characteristic (choice) on the selected choice is considered, and therefore we have:

$$Z = (Z_1, Z_2, Z_3, Z_4) = (forest, fauna, flora, price) \quad (6)$$

$$V_{ij} = \beta_1 . Z_{1,ij} + \beta_2 . Z_{2,ij} + \beta_3 . Z_{3,ij} + \beta_4 . Z_{4,ij}$$

β_1 and β_4 are the environmental features and price for each of the parameters that affect the people's utility . By taking the total differential of equation (6) the willingness to pay for each attribute is estimated and shows that final value (price) of one unit increase in attribute. In other words, the final shift of environmental features suggest that every environmental feature that represents an implicit price index is obtained by division by the coefficient of each feature of the price.

$$MWTP_{forst} = dZ_4 / dZ_1 = -\beta_1 / \beta_4 \quad (7)$$

$$MWTP_{fauna} = dZ_4 / dZ_2 = -\beta_2 / \beta_4 \quad (8)$$

$$MWTP_{flora} = dZ_4 / dZ_3 = -\beta_3 / \beta_4 \quad (9)$$

In equation (6), the price differential index (β_4) is the same as the marginal utility of income and each of the equations, 7 to 9, reflects the rate of substitution between changes in income and changes in any of the environmental features:

In the second model, MNL, the subject interrelationship of selected features of the model along with the selected features are subject with selected features. In addition to determining the effects of selected characteristics on the likelihood of self-selection, the effect of economic variables - the social choice and finally the desire to pay for improved environmental characteristics is determined. In this case, the simple model, MNL, (Equation 6) will be as below equation:

$$V_{ij} = \beta_1 . Z_{1,ij} + \beta_2 . Z_{2,ij} + \beta_3 . Z_{3,ij} + \beta_4 . Z_{4,ij} + \sum_{k=1}^{6} \gamma_i Z_{1,ij} . S_i^k + \sum_{k=1}^{6} \delta_i Z_{2,ij} . S_i^k + \sum_{k=1}^{6} \varpi_i Z_{3,ij} . S_i^k + \sum_{k=1}^{6} \eta_i Z_{4,ij} . S_i^k \quad (10)$$

which is Economic- social characteristics of the respondents. The marginal willingness to pay for environmental characteristics of each of the following relationships are obtained as below(Equation 10):

$$MWTP_{forst} = dZ_4 / dZ_1 = -(\beta_1 + \gamma_1 . S^1 + ... + \gamma_6 . S^6) / (\beta_5 + \eta_1 . S^1 + ... + \eta_6 . S^6) \quad (11)$$

$$MWTP_{fauna} = dZ_4 / dZ_2 = -(\beta_2 + \delta_1 . S^1 + ... + \delta_6 . S^6) / (\beta_5 + \eta_1 . S^1 + ... + \eta_6 . S^6)$$

$$MWTP_{flora} = {dZ_4}/{dZ_3} = -(\beta_3 + \varpi_1.S^1 + ... + \varpi_6.S^6) / (\beta_5 + \eta_1.S^1 + ... + \eta_6.S^6)$$

Marginal willingness to pay (MWTP) provides the basis for calculating households' willingness to pay (WTP) per household Compensation for environmental damages to each of the features and delivers the highest level of that feature.

Accordingly, the damage to any of the Alborz Dam which threatened the ecological characteristics of the study population perspective is used to improve the situation and decrease the negative effects of the dam on the environment. So the total damage to all three characteristics, forest and animal species, plant species from a total of dam would damage public perceptions of environmental issues.

5. Experimental Results

The results of this paper can be divided into three sections. In the first section, the descriptive results of 100 questionnaires on general tendencies and attitudes of the respondents toward the water resources of the county and establishment of giant dams are represented. In the next part, based on the calculation of the environmental damages of Alborz dam and by using the results of the conditional logit patterns as well as estimating the economic evaluation of Alborz dam project, the final tendency of the sample householders has been estimated. The last section is related to the economic evaluation indexes of this project in two cases: with and without calculating the environmental costs. The obtained results of analyzing the questionnaires showed that about 73.3 % of the respondents considered the current status of the water recourses of the country in a critical condition and the believed that the water supplies are rare in the country, whereas 10.2 and 15 % believed that the current status of water supplies in the country is plenty and normal, respectively. Moreover, majority of them (88 %) estimated that this country will face draught in near future. nearly 44.5% believed that building dams will be the best way to solve this problem. 28 % reducing the water consumption, 9.7 % servicing and repairing the distributional webs, 8.3 % rising the price of water, and the remaining 9.5 % believed that developing new water supplies is the best way to confront this issue. the findings showed that most people do not have enough knowledge about the multi- level environmental effects of these giant dams on the natural ecosystem and the environment.

To estimate the marginal propensity of households to pay for any of the environmental features of the Alborz Dam and the threat of environmental damage to the dam, two multivariate MNL logit models have been estimated using the SHAZAM program software. Their estimated results have been proposed in Tables (2) and (3). Results in Table (2) provide the simple model without interactions with the characteristic features of the economic environment - Social features of the respondents and the results listed in Table (3) corresponds to "interactions". model.

Table (2). Simple Conditional Logit Model Estimation Results Without Interaction

T-static	Cofficient	
6/2**	**0/031**	Forest
2/3*	**1/42**	Founa
3/1*	**6/08**	Flora
-1/8*	**-0/06**	Price
	500	No. of observation***
	176/9	Wald-static
	-3243/5	log-likelihood

Source: findings of research

Table (3). Estimation Results of the Conditional Logit Model with Interactions

t-static	Coefficient	
3/4**	**0/027**	Forest
1/3	**1/79**	Founa
2/4*	**7/32**	Flora
-2/7**	**-0/071**	price
1/13	**0/01**	Forest×visit
0/14	**0/005**	Forest×sex
-0/42	**-0/05**	Forest×age
1/92*	**0/003**	Forest×edue
1/5	**0/00128**	Forest×income
0/61	**0/26**	Founa×visit
1/2	**0/031**	Founa×sex
-3/3**	**-2/8**	Founa×age
1/2	**3/02**	Founa×edue
0/4	**0/051**	Founa×income
3/2**	**1/02**	Flora×visit
-0/68	**-0/04**	Flora×sex
1/04	**2/27**	Flora ×age
-0/26	**-0/79**	Flora ×edue
2/11*	**0/235**	Flora ×income
1/88*	**0/0048**	price×visit
-0/48	**-0/05**	price×sex
-0/06	**-0/02**	price×age
1/6*	**0/032**	price×edue
2/44*	**0/0021**	price×income
	500	No. of observation
	284/3	Wald-static
	-2908/6	log-likelihood

Source: findings of research

The results (Table 1) are successive to the coefficients of all the features in a simple pattern, meaning that it is significant and has the expected sign of the coefficients of the three features, so all three environmental features are positive and indicate that the level of each of these features has a positive relationship with choosing options B and C as well as the present situation (option A) in the choice sets. Also, they have a negative significant relationship with the cost feature index, i.e. if the level of cost be higher in the option, less probability it will have to be chosen.

Marginal willingness to pay per household for each of the environmental features based on the results of two multiple logit models are contained in tables (2) and (3) Also using the relations (7), (8), (9) and (11), it has been determined that the figures can be reported in Table 4.

Based on this table, for each of the features of the forest, animal and plant species on the basis of a simple model, MWTP is of the 0.516, 23.6 and 101.3 Rials . This means that each unit increase in the protection of these features corresponds with the final value of the above figures.

For example, the final value of a unit increase in the level of protection of plant varieties is 101.3 Rials. The results of these estimates for the marginal propensity of households to pay based on logit model with interactions are very close to the results of the logit model. So, it seems that the import economic variables - in the form of social interaction, it's not a significant MWTP change in the results of each feature.

Table (5) represents the willingness to pay (WTP) per month per household to reduce environmental impacts of Alborz Dam, and to optimize each character from the lowest level to the highest level. It can be achieved through multiplying MWTP of each feature by the difference between the lowest and the highest level of that feature. it is observed that willingness to pay per household to move from the lowest level to the highest levels of forest based on a simple model and without its interactional impacts is 4,128 Riyals per month, for all animal species , it is 2242 Rials and for the threatened plant species, it is 1730 Rials .

Table(4). Estimated Household Surveys of Compensation for Environmental Damage Alborz Dam

MWTP (Pattern with correlation interaction)	MWTP (Pattern without correlation interaction)	Fatures
0/58	**0/516**	Forest
24/2	**23/6**	Founa
112/32	**101/3**	Flora

Source: findings of research

Table(5). Estimated Total Value of Compensation per Household Ranges and Environmental Studies The Alborz Dam

WTP (Pattern with correlation interaction)	WTP Pattern without correlation interaction	
4640	**4128**	Forest
2299	**2242**	Founa
1909/4	**1730**	Flora
106181	**97200**	Total propensity for annual payment per family(Rials)
550167/7	**503669/4**	Total environmental damage of the dam(Rials)

Source: findings of research

6. Findings

Accordingly, willingness to pay per household to offset any environmental damage multiple Alborz Dam is as a monthly average of 6/8100 Rials per month and 97,200 Rials per year. Also, the mean willingness to pay per household based on the pattern of interactions is respectively 8848.4 and 106181 Rials. So, the total environmental damage Alborz Dam that is the result of multiplying the number of households in the study of household by willingness to pay per year is estimated based on the two models with and without interaction effects as 550167.7 and 503669.4 Rials, respectively.

In this section, in order to compare the internal rate of invested capital return of Alborz dam in two cases, with and without counting the cost of environmental, and analyzing the way the economic indexes react to these costs, the environmental damage estimates are as a part of the cost plan done based on logit model. In other words, the total cost of the Alborz Dam is the total cost of the building and environmental costs. Therefore, justification of the plan has been done from the economic and financial perspectives. In analyzing the economic benefits of the project, just the costs of the case study were evaluated against the costs of construction and operation and maintenance costs. Whereas in the economic - the environmental analysis, the benefits of the project have been assessed against all three types of costs plus the costs of environmental dam. The second column of Table (6) shows the results of the cost-benefit analysis (CBA) without counting the Environmental costs of the Alborz Dam Project - and it is done based on the prices of the base year (2003). The third and fourth columns of the table represent the results of the environmental CBA and environmental costs based on prices in 2007 from the perspective of the whole study population. Thus, in order to add up these two cost figures, it is necessary to evaluate both of them based on the annual costs. Therefore, the price index of Seville (Civil cost index) is used in this research during the years 2003-2007 to upgrade the present value of the profits and Alborz Dam building costs (these figures and benefits are shown in column 2, Table 6) and turn them into the prices in 2007.

The results in this table show that cost: benefit ratio of this project excluding interest expense of environmental design is 1.77 which shows the relatively high justification of building a dam in this situation. Whereas, the rates of this index in the first situation and during the period when the damage cost of the dam are being studied in the country are 1.24 and 0.72, respectively.

Comparing these figures shows that applying the costs of the environmental damage in the total cost of the dam has reduced its flexibility justification to a considerable degree. the results can be more interesting if they are generalized to the whole country . Let’s note that if these results were supposed to be applied to the whole country, the ratio of benefits to costs Alborz Dam would be 0.72, which was not economically justified.

Table(6). Analyses of benefit-cost (CBA), Alborz Dam (Rials)

CBA with environmental costs(viewpoint of total households of country, base year 1387)	**CBA** with environmental costs(viewpoint of statistics society,base year1387	**CBA** without environmental costs(base year1381)	
1170/41	**1170/41**	**566/43**	(construction costs)
1697/6	**503/66**	**0**	(environmental costs)
2868/01	**1674/07**	**566/43**	(Total costs)
2081/49	**2081/49**	**1007/35**	(Profits of project)
0/72	**1/24**	**1/77**	(B/C) Benefit –cost ratio

Source: findings of research

7. Conclusions and Discussion

Despite having the remarkable economic benefits, building large dams is accompanied with negative effects on the ecosystem-including natural and socio deforestation, the destruction of plant and animal species, and in some cases, several monuments and Cultural heritage have gone underwater or are threatened. Therefore, today, investments in infrastructure and construction of concrete structures in the water industry, regardless of the economic evaluation of the environmental impact have been increasingly challenged by the environmental groups. The question is whether the construction of large dams can cause a variety of economic benefits sufficient to offset the environmental damage or not.

REFERENCES

[1] Ben-Akiva M, Lerman S. Discrete choice analysis: theory and application to travel demand. Cambridge, MA: MIT press,. 1985.

[2] Diener AA, Muller RA, Robb AL. willingness- to- pay for improved air quality in Hamilton-wethworth: a choice experiment. Hamilton, Ontario: department of economics, McMaster university; 1998

[3] Hanley N, Spash CL. Cost-benefit analysis and the environment. Aldeshot: Edward Elgar; 1993

[4] Hanely N, Wrigh RE, Adamowiez W. Using choice experiments to value the environment. Enviromental Resources Economics 1998;11:413-28.

[5] Hartman, L. M., and G. Taylor., (1989), Irrigated Land Values in Eastern Colorado: An Analysis of Farm Sale Prices for Pumped Irrigated Land Overlying the Ogallala Aquifer, Colorado State University, Agricultural Experiment Station, Technical Bulletin LTB89-1.

[6] Kennedy, G.A., & et al., (2002), Estimating tract value relationships in the north Louisiana timberland market, Southwestern Econ, Rev. 28:123–134

[7] Lancaster, K. J., (1966), A new approach to consumer theory. Journal of Political Economy, 74: 132–157.

[8] Malpezzi, S., (2002), Hedonic pricing models: A selective and applied review, Housing Economics and Public Policy, 67– 89.

[9] Palmquist, R. B. (1989), Land as a Differentiated Factor of Production: A Hedonic Model and Its Implications for Welfare Measurement, Land Economics, 65: 23–28.

[10] Petrie, T., and J. Taylor., (2007), Hedonic Approach Applied to Farmland in the Southeastern United States, Land Economics, 83: 302–318.

[11] Rosen, S., (1974), Hedonic prices and implicit markets: product differentiation in pure competition, Journal of Political Economy, 82

[12] Scarpa, R., & et al., (2000), Assessing the non-timber value of forests: A revealed-preference, hedonic model, J. of Forest Econ, 6 :83–107.

[13] Shults, S. D., & K. A, King., (2001), the use of census date for hedonic price estimates of open space amenities and land use, Journal of real estate finance and econometrics, 22: 239-252

i Social cost-benefit analysis

ii Choice experiment

iii Multinominal logit model(MNL)