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CBA of WWT management option for the Wadi Nar/Kidron

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List of abbreviations

CBA	Cost Benefit Analysis
CV	Contingent Valuation
WTP	Willingness to pay

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1 Introduction and background

This paper presents the results of a Cost Benefit Analysis (CBA) of alternative wastewater treatment options in the Kidron Valley/Wadi Nar river basin. The cross boundary character of the Kidron/ Nar river basin, starting from Israeli vicinities but mainly flowing through the Palestinian territories, might be one of the reasons, why it still contains untreated wastewater. The CBA was performed for six different wastewater treatment management options in the Kidron Valley/Wadi Nar basin. Each of the management options varies in the degree of cooperation, treatment plant location and management setting and thus leads to different costs and benefits.

There is a strong need to look at the basin as a whole and to ask the following question: "No matter who holds the property rights and no matter to whom the benefits or costs does accrue, are the benefits of cleaning up the river larger than the cost of doing so?" If the answer to this question is positive than there is another question: "Given, there is unused treated wastewater what is the best option to use the treated wastewater?" In the following, two reuse options are analysed: Agricultural use vs. letting the water flowing down the river.

In addition, in order o estimate environmental benefits, a Contingent Valuation (CV) survey has been carried out among a representative sample of Palestinian and Israeli people. CV is an economic tool used for estimating the value that a person places on environmental goods and services. It is particularly useful for estimating the value of non-market and non-use goods and services. CV is referred to as a “stated preference” method of valuation because it involves the survey of personal opinions of value regarding hypothesized, but unrealised, environmental changes. The CV analysis addresses the following issues:

- Analysis of preferences to have wastewater flowing or not flowing in the Wadi Nar/Kidron;
- Analysis of willingness to pay for removing waste water from the basin (respectively for letting treated wastewater flowing) by using the payment card method.
- Analysis of payment motivation (e.g. use value, bequest value, option value and existence value)
- Analysis of visit frequency under conditions of peace;
- Statistical information on interviewees.

It should be noted that in contrast to Multi-Criteria Decision Analysis (MCDA), there is only one goal in CBA and that is to maximize the net benefit in monetary terms. The costs and benefits are derived form the public's point of view and not via stakeholders analysis or any other group involved in the process.

The paper comprises the follwing: 2 describes the different waste water treatment alternatives and their costs. Chapter 3 describes the benefits of using treated wastewater both for agricultural as well as for environmental uses. Chapter 4 describes the results of the CBA while Chapter 5 concludes the paper.

2 The alternatives

As outlined in Klawitter et al 6 options to manage the waste water problem along the river were identified. They are noted as M1 through M6. Their characteristics and draft cost estimates are given in Table 1.

Table 1: Different options and their costs

	M1	**M2**	**M3**	**M4**	**M5**	**M6**
Inst. regime	PA	IS	Separate	Separate	PA	IS
Description	Joint WWTP in the Kidron Elbow	Joint WWTP at Nebi Musa	2 WWTP: (1)Kidron/ Nar (2) Nebi Musa	2 WWTP: (1) Jerusalem (2)Kidron/NAr	Unilateral (Kidron/Nar)	Unilateral Nebi Musa
Potential population served in 2005(000')	260	260	260	260	100	160
Amount of wastewater treated (MCM)	7.448	7.448	7.448	7.448	0.976	6.472
Capital	0.1	0.1	(1) 0.1	(1) 0.6	0.1	0.25

return ($/CM)			(2) 0.25	(2) 0.1		
O/M ($/CM)	0.1	0.25	0.1	0.1	0.1	0.1
Total cost ($/CM)	0.2	0.35	(1) 0.2 (2) 0.35	(1) 0.7 (2) 0.2	0.2	0.35

Source: Authors compilation

As can be seen from the table, the overall population currently at the basin is estimated by 260K which is split between Israelis (160K) and Palestinians (100K). Since water consumption is not identical between Israelis and Palestinians the wastewater production is more unevenly distributed. It is estimated by 7.5 MCM per year in total. This is split between Israelis (6.5 MCM) and Palestinians (1 MCM).

Wastewater treatment is divided between fixed and variable cost. Based on a given size for WWTP we have estimated the fixed cost per CM for a 20 years life time to range between 0.1 – 0.6 $/CM. The treatment cost is about constant at 0.1 $/CM.

3 Benefit estimation

The benefits from the treated wastewater can be thought of as water being used for two purposes: agriculture and nature. It should be noted that if the wastewater is removed from the river, still there is benefit from a dry river. However, if the river bed as a sink for flawing water is estimated in a higher value than the river being dry, the added benefit should be considered against the lost value in agriculture. To simplify things we can conclude that a wet river is preferred if the following equation holds:

$B_{WR} - TREC_{WR} > B_{DR} + B_{AG} - TREC_{DR} - TRAC_{AG}$

Where:

B_{WR} = Benefit from wet river

B_{DR} = Benefit from dry river

B_{AG} = Benefit from agricultural use

$TREC_{WR}$ = Treatment cost for wet river

$TREC_{DR}$ = Treatment cost for dry river

$TRAC_{AG}$ = Transfer cost to agricultural demand node.

Even though the costs are estimated and presented it is beneficial to break them into the various components. In case there is no difference in cost than only benefit matters.

3.1 Israeli and Palestinian agricultural water use

3.1.1 Israei water reuse options

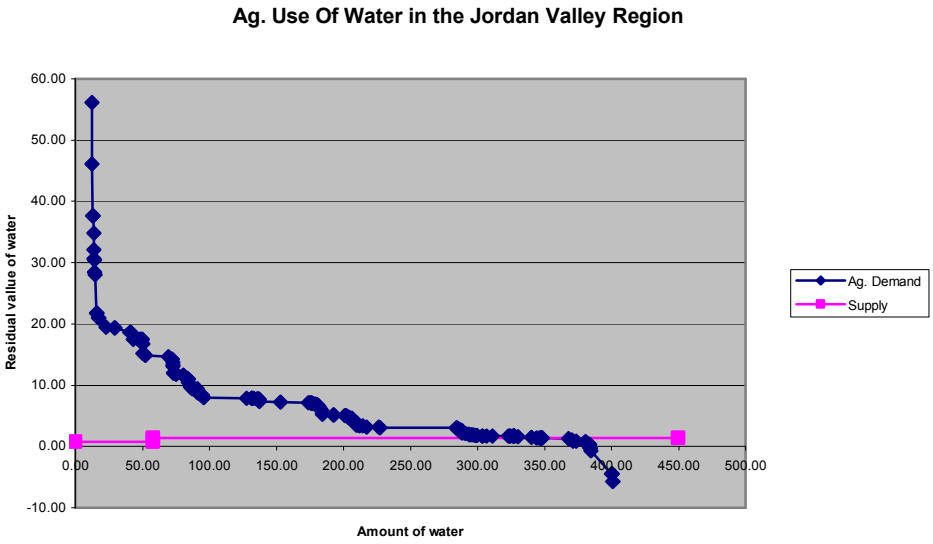
The only relevant regions in which treated wastewater can be used for agricultural purposes are the Jordan valley and the Dead Sea. There is a need for about 12 MCM per year. The plan is to split that amount between the Dead Sea region (5 MCM) and the Jordan valley itself (7 MCM). Thus, in case the wastewater will be treated at Nebi Musa, there is potential for agricultural demand.

Based on Demand analysis and residual value of water it can be concluded that the marginal value of water in both regions is 0.16$/CM. Figure 1 and Figure 2 give a graphical representation of the water demand in the two regions. The demand curves indicate that the residual value of the additional water is equal to 0.16$.

3.1.2 Palestinian water reude options

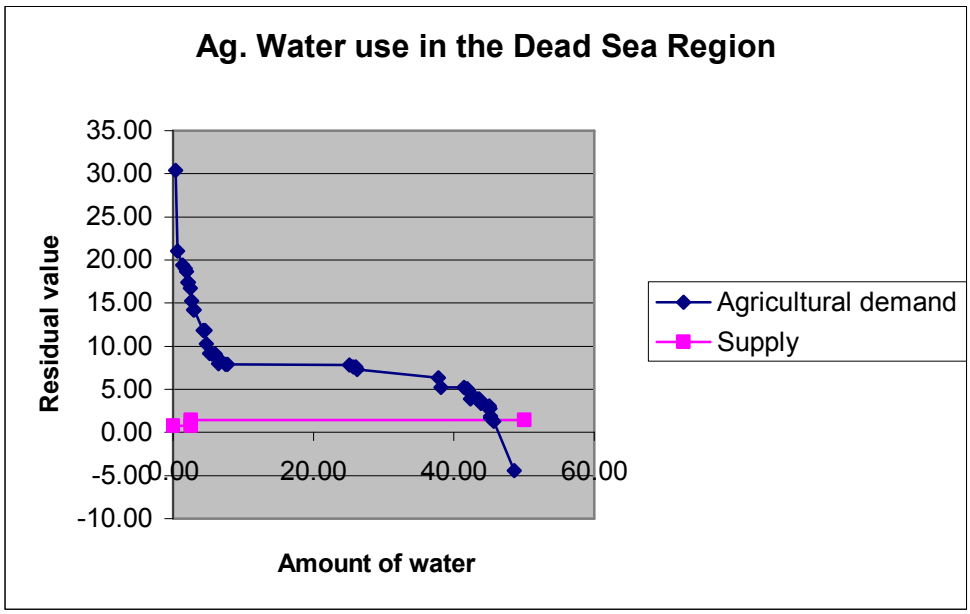
Based on HWE (2006), the residual value of water for the Palestinian in the Kidron Valley/Wadi Nar region is 0.20 US$/CM.

Figure 1: Agricultural use and value in the Jordan Valley



Source: Authors compilation

Figure 2: Agricultural use and value in the Dead Sea



Source: Authors compilation

It can be inferred that the wastewater treatment cost are higher than the agricultural benefits. However, wastewater treatment benefits not only farmers but they help clean up the river system. Thus, one can not conclude if the project is worthwhile unless one adds the environmental benefits.

3.2 Estimation of the river restoration

3.2.1 Contingent Valuation guidelines:

The Contingent Valuation Method (CVM) is used to estimate economic values for all kinds of ecosystem and environmental services. It can be used to estimate both use and non use values, and it is the most widely used method for estimating non-use values. It is also the most controversial discussed method of the non-market valuation methods.

CVM involves directly asking people, in a survey, how much they would be willing to pay for specific environmental services. In some cases, people are asked for the amount of compensation they would be willing to accept to give up specific environmental services. It is called "contingent" valuation, because people are asked to state their willingness to pay, contingent on a specific hypothetical scenario and description of the environmental service.

The contingent valuation method is referred to as a "stated preference" method, because it asks people to directly state their values, rather than inferring values from actual choices, as the "revealed preference" methods do. The fact that CV is based on what people say they would do, as opposed to what people are observed to do, and is the source of its greatest strengths and its greatest weaknesses.

Contingent valuation is one of the only ways to assign monetary values to non-use values of restored rivers projects—values that do not involve market purchases and may not involve direct participation. These values are sometimes referred to as "passive use" values. They include everything from the basic life support functions associated with the river, to the enjoyment of its scenery or the right to bequest those options to your grandchildren. It also includes the value people place on simply knowing that some ecosystems still exist.

It is clear that people are willing to pay for non-use, or passive use, environmental benefits. However, these benefits are likely to be implicitly treated as zero unless their dollar value is somehow estimated. So, how much are they worth? Since people do not reveal their willingness to pay for them through their purchases or by their behavior, the only option for estimating a value is by asking them questions.

However, the fact that the contingent valuation method is based on asking people questions, as opposed to observing their actual behavior, is the source of enormous controversy. The conceptual, empirical, and practical problems associated with developing dollar estimates of economic value on the basis of how people respond to hypothetical questions about hypothetical market situations are debated constantly in the economics literature. CV researchers are attempting to address these problems.

In order to estimate the environmental benefits we used the CVM by asking people about their willingness to pay to remove the wastewater from the river. The payment card method was used in which people have to circle the appropriate amount they feel most comfortable with. People were also asked to choose their most preferred option between a dry and wet river. The survey is divided into several sections.

The first section is devoted to introduce the respondent to the story and the problem. In this section the respondent was also asked to circle his preferred option for either dry or Wet River.

The second section deals with the willingness to pay. A payment card was inserted into the survey and the respondent was asked to circle his most preferred choice. This section also

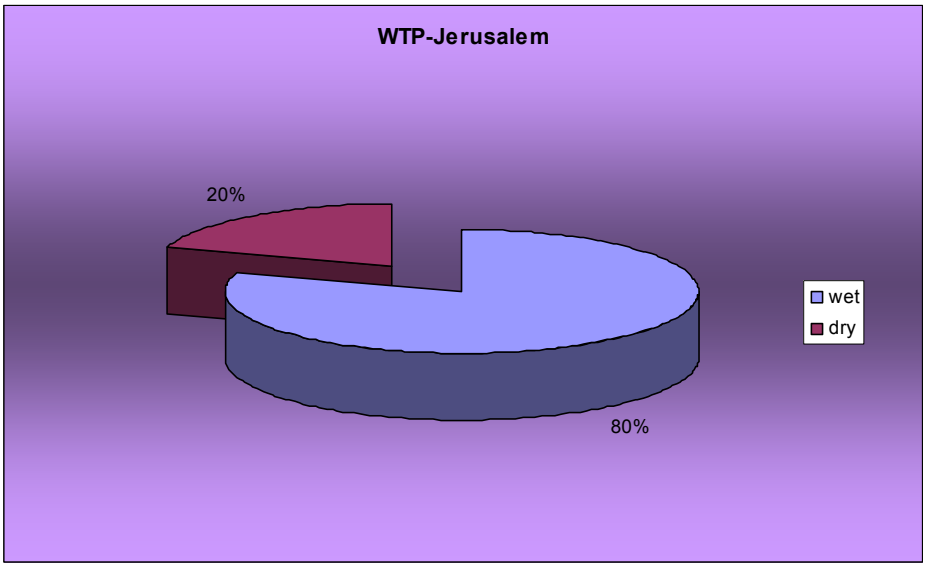
includes questions regarding the motives for payment. These motives include: Use value, bequest value, option value and existence value. It included also a question to describe the motives for a zero payment. This is especially important since zero payment can be declared either because the respondent doesn't place any value on the resource. However, the respondent also can declare a zero value as a protest bid. Those motives are not legitimate in CV analysis and they should be dropped out. Other wise the results would be biased downward.

3.2.2 Benefit estimation in Israel

The survey was conducted among 240 respondents. There were 206 usable questionnaires. Parts of them were located in major nature attractions in the Jerusalem area. The others were traced on the train between Jerusalem and Tel-Aviv. They should represent the general population or the population which doesn't treat Jerusalem as a tourist attraction but still may place a value on nature preservation.

Figure 3 and Figure 4 describe the distribution between those who prefer wet river and dry . About four fifth prefer wet "look". However, this is not the only important point since the WTP nedds to be taken ointo account.

Figure 3: Preferences for wet/dry in Jerusalem (Israeli inhabitants)



Source: Authors compilation

Figure 4: Preferences for wet/dry in the general population (Israel)

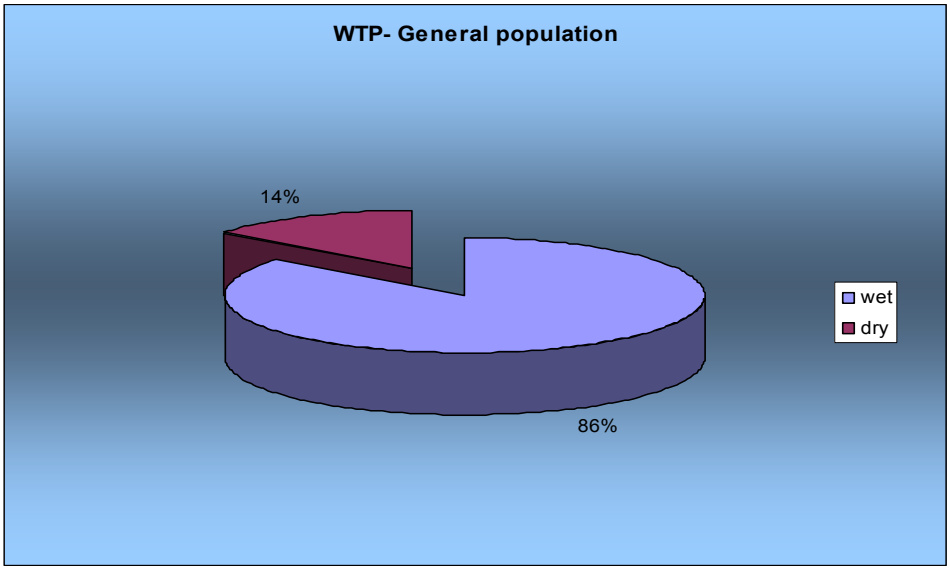


Table 2 and Table 3describe the descriptive statistics for those who prefer dry river bed and wet river bed respectively.

Table 2: Descriptive statistics of those who prefer dry river bed

Observations	**Total**	**Mode**	**S.D.**	**Median**	**Mean**	
40	16650485	50	36.28391	30.0	42.875	WTP (NIS)
		1	1.337573	1	1.425	Age
		3	1.009887	3	2.175	Education
		2	0.955416	2	1.6	Income
				0	1.1	No. of child.
8					0.2	Env. Memb.

Table 3: Descriptive statistics of those who prefer Wet River bed

Observations	**Total**	**Mode**	**S.D.**	**Median**	**Mean**	
166	85893204	50	87.9971	30.0	53.29518072	WTP (NIS)
		0	1.33585	1	1.198795181	Age
		3	0.95277	2	1.963855422	Education
		2	1.09972	2	1.608433735	Income
				0	1.042168675	No. Of child.
19					0.114	Env, Memb.

As can be seen, not only there is a majority (Israeli) of those who prefer wet "look", they also are willing to pay more on average; 53 NIS vs. 43 NIS for wet and dry river respectively. It is also important to look at the median since decisions which are taken in a democratic society are based on that criterion. The median is usually also more conservative. It is equal for both groups at a level of 30 NIS. The use value consists of 26% out of the total value. The overall share that preferred wet over dry was estimated at 82.5% and 17.5% respectively.

The number of households in Israel is about 1.6 Million while number of household in Jerusalem itself is about 36,000. These are the two extreme numbers for multiplying the mean WTP with. Before summarizing the findings it should be emphasized also that if a respondent didn't prefer a wet river to a dry one, that doesn't mean he doesn't have a value attached to it. The following assumptive positions were taken: There is no value attached to the second best alternative. It is valued at half of the stated WTP.

The following tables describe the different options for the benefit valuation based on the different assumptions.

Table 4: Benefit from a dry river (in 000'. US$) (Israel)

	Only Jerusalem – use value	Only Jerusalem – total value	Entire population – use value	Entire population – total value
No added 2nd choice benefit	16.56	63.675	740	2,830
50% added benefit of 2nd choice	64.701	240	2,880	11,060

Table 5: Benefit from a Wet river (000' $)

	Only Jerusalem – use value	Only Jerusalem – total value	Entire population – use value	Entire population – total value
No added 2nd choice benefit	96.30	370.37	4,280	16,461
50% added benefit of 2nd choice	104.58	402.23	4,648	17,877

As can be seen from the tables the values can differ significantly according to the assumptions about the beneficiaries and the legitimacy of the non-use value. A scenario which is safe enough to assume would be that there are benefits to the entire society but only those associated with the use value. However, 50% of the second best alternative should be added. Therefore, the value of the river as a dry one is 2.88 Million US$ annually while as a wet one it worth 4.65 Million US$ annually.

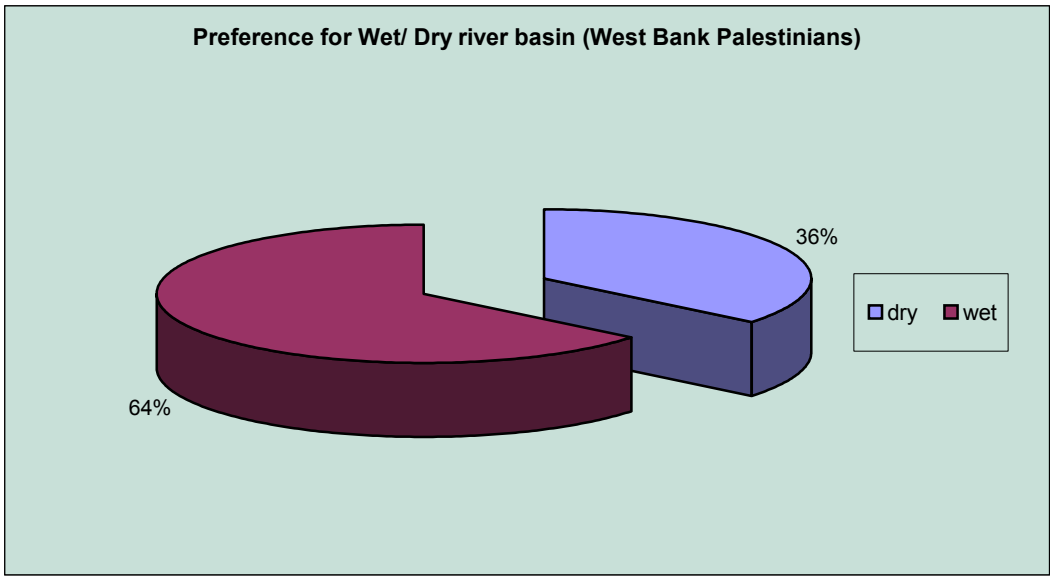
3.2.3 Benefit estimation in Palestine:

The CV survey follows the same methodology as described in detail in the Israeli analysis (carried out for the Israeli population) and addresses the following issues:

The sample of Palestinian people consists of 98 surveys that have been carried out in spring 2007, of which 88 questionnaires could be used for CBA analysis. The survey target group encompasses people living in communities located within or next to the Wadi Nar/ Kidron valley; namely Bethlehem, Beit Sahour, Beit Jala, Al Azzariya, Al Ubediya, Abu Dis, Beit Fajar, East Jerusalem, Refugee Camp Al Dheisheh , Refugee Camp Aida, Al Khader, Ramallah.

As a first step the Palestinian interviewees expressed their preferences for having a dry (depending only on natural precipitation) or a clean river (through draining treated waste water) flowing in the Wadi Nar/ Kidron. 3.3 shows the distribution of preferences: More than one third (36%) of the interviewees prefer not to release treated waste water into the basin, while the majority of almost two third (64%) prefer to have treated wastewater flowing in the river bed.

Figure 5: Preferences for wet/dry river basin (Palestine)



Source: Authors compilation

In a second step the specific willingness to pay (WTP) for a dry respectively a river basin with treated wastewater flowing was determined. The average WTP for West Bank Palestinians living in the surrounding of Wadi Nar/ Kidron for a dry or wet river basin with clean water) was 29.15 NIS.

A separate look on respondents preferring the wet to dry solution (See Figure 5) reveals, that the majority of Palestinian preferring the flowing river (64% of all respondents) are also willing to pay more on average (33.13 NIS), than the minority preferring the dry solution (36%) with 22.19 NIS. The overall (WTP) share of those who preferred the wet over the dry solution was 72.3% and 27.7% respectively. A look at the median shows, that the group preferring the wet solution has a higher value with 12.5 NIS than the group preferring the dry river basin with 10 NIS.

Table 6: Descriptive statistics of those who prefer dry riverbed in Palestine

	mean/average	**median**	**s.d.**	**mode**	**total**	**observations**
WTP (NIS)	22.1875	10	30.74184	0	710	32
Age	0.74193548	0	0.855092	0		
Education	2.53333333	3	0.860366	3		
Income	0.96774194	1	0.912282	0		
No of children	1.32258065	0				0
Environmental membership:						

Source: Authors compilation

Table 7: Descriptive statistics of those who prefer having treated waste water discharged into the basin in Palestine

	mean/average	**median**	**s.d.**	**mode**	**total**	**Observations**
WTP (NIS)	33.125	12.5	39.8356	5	1855	56
Age	0.854545	1	0.779795	1		
Education	2.482143	3	0.808839	3		
Income	1.018519	1	1.090105	0		
No of children	1.25	0				
Environmental membership:						2

Source: Authors compilation

The same calculation which was done in Israel, with respect to use/non-use values, was performed in the Palestinian side as well. The results indicate that the use value consists of 25.6% out of the total value.

For the calculation of the environmental benefit for the dry and the wet river basin solution, the number of about 402,071 households in the Palestinian West Bank has been applied.[1] This number needs to be multiplied with the corresponding mean WTP. As in the Israeli part analysis, two different scenarios were evaluated. Since the survey does not ask specifically for the willingness to pay for the not preferred (second best) option, which does not have to be necessarily zero. The first scenario is based on the assumption, that there is no value attached

[1] West Bank Population in 2005 was 2.372.216 (www.pcbs.org; 1.7.05) and the average household size for the West Bank was 5.9 in 2003 (PCBS 2004).

to the second best alternative, while the second scenario is based on the assumption, that the value attached to the second best alternative is half of the stated WTP.

Table 8 and Table 9 show the benefit based on the two assumptions.

Calculation of corresponding WTP for dry river benefit
dry: (mean WTP dry) 22.2 NIS* 0,36 (% dry)= 8 NIS
wet: (half mean WTP wet) 16.5 NIS* 0,64 (%wet)= 10.56 NIS
Sum: 18.56 NIS

Source: Authors compilation

Table 8: Environmental benefit from a dry river

	Use value (NIS/US$)	**total value (NIS/US$)**
No added benefit for second best alternative	823,440/ 206,270	3,216,570/ 805,750
50% added benefit for second best alternative	1,910,380/ 478,550	7,462,440/ 1,869,350

Source: Authors compilation

Calculation of corresponding WTP for wet river benefit
wet: (mean WTP) 33.2 NIS* 0,64 (% wet)= 21.25 NIS
dry: (half mean WTP) 11.1 NIS* 0,36 (% dry)= 4 NIS
Sum: 25.25 NIS

Source: Authors compilation

Table 9: Environmental benefit from a wet river (000')

	use value (NIS/ US$)	**total value (NIS/ US$)**
No added 2nd choice benefit	2,187,270/ 547,910	8,544,010/ 2,140,280
50% added benefit of 2nd choice	2,598,990/ 651,050	10,152,290/ 2,543,160

Source: Authors compilation

The benefits differ significantly depending on the assumptions about the beneficiaries and on the legitimacy of the non-use value. Not like in the Israeli analysis, the only significant factor is the inclusion of the non-use value. The issue of population is neglected here and it was

assumed that the sample represents the entire Palestinian population in the West Bank. Like in the previous section, we assume that only the benefit scenario corresponding to the use-value is safe enough to describe the benefits to the entire society. Beyond, we assume again that the second best policy worth 50% of the WTP. Therefore, the value (West Bank Palestinians) of a dry river basin is 478,550 US$ annually, while the value of a flowing river basin with treated sewage water is worth 651,050 US$.

3.2.4 Combined benefit estimation:

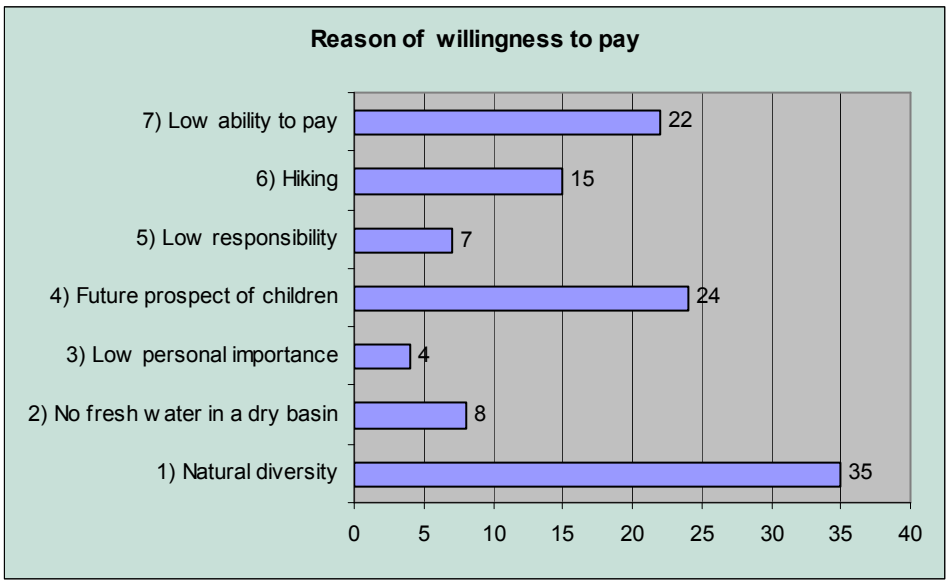
In order to find out the social value of the river, we need to take into account not only the sum of the private benefit (i.e., agriculture) but the public good's value (i.e. the non-market value of the river). The use value to the entire population accounts for:

4,648 + 651 = 5,299 (in 000' US$)

3.3 Reasons for willingness to pay

Figure 6 shows the reasons for the specific WTP as given by the Palestinian respondents while Figure 6 depicts the reasons of the Israeli people to pay.

Figure 6: Reasons for amount people are willing to pay



Source: Authors' compilation

4 Cost Benefit results:

4.1 The Israeli cost benefit results:

In order to analyze the priorities of the different alternatives, M1 to M6, equation 1 based on all the estimated costs and benefits associated with the given alternative was applied. It is assumed throughout the analysis that if only part of the water flaws in the river, there is only part of the benefit realized. Benefit to agriculture is, however, linearly associated with the amount of water diverted to agriculture use.

Table 10: Summery of CBA results (in Million US$)

Alternative	M1	M2	M3	M4	M5	M6
Cost	1.50	2.61	2.46	4.73	0.20	0.35
Benefit to agriculture	0.60	1.19	1.04	1.04	0.02	1.04
Non-market benefits (dry)	2.88	2.88	2.88	2.88	0.38	2.51
Non-market benefits (wet)	4.65	-	3.12	3.12	0.60	2.71
Net benefits (dry)	1.98	1.46	1.46	-0.81	0.16	1.12
Net benefit (wet)	3.75	-	1.7	-0.57	0.38	1.32

Source: Authors compilation

Not surprisingly, the most preferred alternative is to treat the water at the Kidron Valley/Wadi Nar Elbow but to let the water flaw back into the river. This alternative yields a net benefit of 3.75 Million dollars. A few reservations should be added at this point. There is an ongoing debate about the merits of a "wet river". If the analysis is restricted to the dry river options only, alternative M1 wins again. The reason is that there is a cost difference between using the water in the Kidron Valley/Wadi Nar vs. using it in the Jordan Valley/Dead Sea basin. Alternative M4 turns out to be also the most expensive one. It should be noted that the negative net benefits can be decomposed into Palestinian gain (depicted by M5) and the associated Israeli loss. That is the net benefit of a dry river is given by:

$-0.81 = 0.16 – 0.97$

Where 0.16 Million US $ is the PA gains and 0.97 Million US $ is the Israeli loss. The same goes for a wet look:

$-0.57 = 0.38 – 0.95.$

Where 0.38 Million US $ is the PA gains and 0.97 Million US. $ is the Israeli loss.

This can be thought as a reference point for non-cooperation. Thus, the worse case situation for the Israelis is 0.97 Million dollars loss/year.

4.2 The Palestinian cost benefit results:

Equivalent to the calculation for the Israeli survey, the analysis of the different alternatives (M1-M6) are calculated through equation 1 based on all the estimated costs and benefits associated with the given alternative. Table 11 describes the results.

Table 11: Summary of the Palestinian CBA results (in .000 US$)

Alternative	M1	M2	M3	M4	M5	M6
Cost	1500	2610	2460	4730	200	350
Benefit to agriculture	600	1190	1040	1040	20	1040
Non-market benefits (dry)	478.55	478.55	478.55	478.55	62.69	415.86
Non-market benefits (wet)	651.05	-	436.85	436.85	85.29	379.56
Net benefits (dry)	-421.45	-941.45	-941.45	-3211.45	-117.31	1105.86
Net benefit (wet)	-248.95	-	-956.15	-3253.15	-94.71	1069.56

Source: Authors compilation

The most preferable alternative is to treat only the Israeli waste water at Nebi Musa (M6) and not let the water flow. This alternative yields a net benefit of 1.1 Million USD (4.2). (The reason is that there is a cost difference between using the water at the Kidron Valley/Wadi Nar elbow vs. using them in the Jordan Valley/Dead Sea basin.) Alternative M4, with Israeli waste water treated within Jerusalem municipality turns out to be also the most expensive management option.

4.3 Combined CBA scenario

We now take the non-market value of the river as 5.299 Million US$.

Alternative	M1	M2	M3	M4	M5	M6
Cost	1.50	2.61	2.46	4.73	0.20	0.35
Benefit to agriculture	0.60	1.19	1.04	1.04	0.02	1.04
Non-market benefits (dry)	3.36	3.36	3.36	3.36	0.44	2.51
Non-market benefits (wet)	5.30	-	3.56	3.56	0.60	2.71
Net benefits (dry)	2.46	1.94	1.94	-0.81	0.26	3.62
Net benefit (wet)	3.80	-	1.10	-1.17	0.485	3.46

Source: Authors compilation

Results of the combined benefit valuation indicate that the net benefit is maximized under alternative M1 with a wet river bed. The net benefit in that case is estimated at 3.80 Million . US$.If we restrict ourselves to a dry river bed, than, alternative M7 yields a net benefit of 3.62 Million US$. While this is alternative 2 in priority in the Palestinian agenda, it is only number 7 in the Israelis.

5 Summery

Cost -Benefit Analysis was performed to choose the best option of wastewater treatment in the Kidron Valley/Wadi Nar basin. In the paper the costs of 6 alternatives are estimated as well as the benefits accrue to agriculture and nature. Engineering data for cost estimation and residual value of water for the agricultural benefit were used, as well as a CV survey in order to estimate the environmental benefits from cleaning up the river.

One immediate conclusion is that neither option would pass a CBA test if the benefits to rely on were only those which are market benefits (i.e. agricultural water use). Thus, there is a strong rationale for governmental intervention in order to push forward such projects that are identified with large environmental benefit portion.

The most preferred management option is to construct a mutual plant at the Kidron Valley/Wadi Nar elbow. This however requires cooperation and two more conditions:

1. Acknowledging that water will flaw in the river
2. Finding suitable water demand for the wastewater produced.

The Israelis can act totally unilateral but by doing so will lose about 1 Million US$ annually. Working out alternative M6 which is the option which is actually discussed by the Israeli stakeholder as most feasible the net benefit account for about 1.22 Million US$/year. This, however, includes non-market benefits as well which at the moment cannot be captured due to political reasons.

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Appendix A: Kidron River Restoration - Questionnaire

Note: The same questionaire has been used for the Palestinian analysis by WEDO. The qiestionaire was adapted to the different wording in use for Palestine.

No. of interview: _____
Name of interviewer: _____
Day of week and date: _____
Location: _____

Hello and welcome to _____

My name is _____ and I'm part of a research conducted by The Haifa University, Hebrew University and Tel-Hai College in Israel, with the funding of the BMBF/MOST. The goal of this research is to valuate the economic benefits of rivers restoration.

We would like to ask you please if you will be willing to spare a few moments and answer a few questions.The questionnaires are confidential and will not be used for any other purpose but this research.

For many years now, the Israeli rivers are used as dumping sites for solid wastes by municipalities, industries and the public. The sources of these rivers are being coughed for agricultural and municipal uses, and instead of fresh water they carry un-treated sewage water.

The Kidron River runs from the eastern slopes of Jerusalem, all the way to the Dear Sea, crossing some 20 km and descending from 820 meters above sea level to 410 meters below sea level. There are many archeological sites along the river, such as Horkania, a fortress built by Alexander Yanai who ruled the land in ancient times (103-76 BC), the Marsaba monastery, one of the first Greek Orthodocs monastery built in Israel (456 AC) which is still active, solitary places and ancient graves are scattered along it and more. The river runs through a deep gorge with high cliffs on both sides.

Nevertheless, un-treated sewage is still running along the river.

In order to overcome this problem, two alternatives are considered:

First alternative: Catch the sewage as soon as it starts flowing towards the river and divert them to a treatment plant, in a closed pipe. The treated water will be used for agriculture in the Jordan valley.

Second alternative: Catch the sewage after it has entered the Palestinian Authority (the PA) and divert them to a treatment plant which will be mutually built by Israel and the PA. The main benefit of this option will be that treated water will flow in the Kidron and not sewage.

The importance of reaching a point where clean water run in rivers and streams was manifested in the amendment to the water bill which was passed lately by the Israeli parliament and states that ecosystems are a legitimate consumer (or "client") in the national water allocation plan.

Yet, the Kidron is a "dry" river which doesn't normally have fresh water running through it. Fresh water may alter the desert ecosystem along the river, a fact that should be taken into consideration.

After having read the above and looked at the pictures in front of you, we would like to ask you please, how would you prefer to see the river? Please circle the preferred alternative, in your opinion:

(1) A flowing river

(2) A non-flowing ("dry") river

If you answered (1), please answer question no. (3)

If you answered (2), please answer question no. (4)

Please circle your choice in the following table:

(3) What will be your willingness to pay to a special fund that its sole purpose would be to fund the project of treating the Kidron sewage and let the treated water run through it?

(4) What will be your willingness to pay to a special fund that its sole purpose would be to fund the project of treating the Kidron sewage and using it for agriculture in the Jordan Valley?

Before you answer, we would like you to please consider a few important issues:

Within your budget restrictions, there may be other causes you may wish to contribute to. Please take that into account, along your other monthly expenses.

Please try to think as if you are actually going to take out the sum of money you stated from your pocket, even though the questionnaire is hypothetical. We need you to give as much a realistic answer to better valuate the decision.

Please imagine a peace situation where the political situation between Israel and the PA will allow a hike all along the Kidron River.

None (zero NIS)

5 10 15 20 25 30
35 40 45 50 55 60
65 70 75 80 85 90
95 100 105 110 115
120 125 130 135 140
145 150
More _____

Thank you for your answer.

We would like to ask you please to tell us the reason for choosing the amount you chose:

(1) A identify with the purpose of restoration and I think it's important to bring back life to all the rivers and streams in the country.

(2) I don't think fresh water should flow in "dry" rivers.

(3) River restoration is not that important to m for spending money on it.

(4) I'm prepared to pay towards river restoration to insure my children's possibility to enjoy them in the future.

(5) It is not my duty to personally fund river restoration.

(6) I would like to have the option to hike along the Kidron one day.

(7) I can't afford to spend any sum of money on river restoration.

(8) Other _____

Finally, we would like to ask you please to give us some personal information. We assure you that the information is anonymous and will not be used for any other purposes but those of this research.

(1) Suppose the river will be restored and the political situation will allow it, I would like to visit the place once every:

1 month 2 months 3 months 4 months 5 months 6 months 7 months 8 months 9 months 10 months 11 months a year 2 years 3 years 4 years 5 years 6 years 7 years 8 tears 9 years 10 years

(2) Gender: a. male _____ b. female _____

(3) Age: a. 18-25 b. 26-35 c. 36-45 d. 46-55 e. 56-65 f. above 65

(4) Place of birth: _____

(5) Marital status: a. single b. married c. other _____

(6) No. Of children: _____

(7) Place of residence: _____

(8) Green organization membership (please state the name of the organization):

(9) Level of education: a. Elementary b. High school c. Professional d. Academic

(10) The average house hold income in Israel is about 9700 NIS. Please circle your household level of income: a. A lot below average b. Below average c. Average d. Above average c. A lot above average

Thank you very much for your time and cooperation.