Valuing a Clean River
A case study of Musi River, Hyderabad, India

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Abstract

The current study uses contingent valuation technique to estimate the value of clean water in river Musi in Hyderabad, India. The main source of pollution of the river is untreated domestic and industrial wastewater from the urban area of Hyderabad. Therefore, people's Willingness To Pay [WTP] for the treatment of their wastewater to different quality levels (Level C, B & A) is estimated using a payment card method. Four variables were considered to influence the willingness to pay - number of years the household lived in Hyderabad; individual perceived importance of controlling water pollution; household income levels and proximity to the river. The results of the logistic regression confirmed that the variables - perceived importance of the respondent of controlling water pollution and household incomes have a significant influence on people's WTP. Only 30% of the respondents were willing to pay for wastewater to be treated to level C. It was concluded from the survey results that 100% cost recovery of sewerage services and wastewater treatment would not be possible in Hyderabad in the current situation. However, a phased increase in the water tariffs accompanied with simultaneous improvements in service delivery mechanisms and awareness among consumers may be successful in the long-run.

Key words: *Contingent Valuation, Wastewater Treatment, Musi, Hyderabad, Willingness to Pay*

1. Background

This paper is part of a doctoral study conducted in Hyderabad, India. Wastewater irrigation is a common practice in developing countries of Asia and Africa and also in the water scarce regions of the developed world like Australia and USA. The percentage of total sewered wastewater that actually undergoes treatment to secondary level is 35% in Asia. Almost no sewage is treated in Africa and more than 65% is treated in developed countries (WHO and UNICEF 2000). Untreated wastewater from domestic, hospital and industrial areas pollute rivers and other natural water bodies. More than 80% (only 4,000 Million Liters per Day [MLD] out of 17,600 MLD wastewater generated in India is treated) of wastewater generated is discharged into natural water bodies without any treatment due to lack of infrastructure and resources for treatment (Winrock International India 2007). Approximately 30,000 MLD of pollutants enter India's rivers, of which 10,000 million liters are from industrial units alone (CPCB 1995).

Hyderabad is the fifth largest city of India with a population of 3.5 million (7 million including the suburban areas) and an annual average rainfall of 750mm. The metropolitan area of Hyderabad generates about 840 mld of wastewater of which less than 10% of wastewater is treated to secondary level. The untreated wastewater is disposed into the Musi river which flows through the centre of the city and used extensively for irrigation downstream of Hyderabad. This has resulted in severe groundwater pollution in these areas and the productivity of the lands irrigated with wastewater has decreased by more than 50 percent (Buechler & Devi. 2005). Also in the urban area along the polluted river, the rental and property value is lower than the general market price because of the unsightly lookout, severe mosquito problems and foul smell in the area. The river which could otherwise had been a natural asset for the city with environmental, recreational and aesthetic value has been turned into a drain to carry the city's wastewater.

However, under a new project called "Save Musi Campaign"(SMC), four new treatment plants will be set up soon and it is mandated that all the wastewater that enters the Musi River will be treated to secondary level. The sewerage network and sewage treatment components will be funded partially by a grant from National River Conservation Directorate [NRCD] for the sum of 70% of the cost and the remaining 30% will be funded by the State Government of Andhra Pradesh. Time and again it has been seen that state governments receive grants to cover the capital costs of treatment plants, but still do not have enough money for operation and maintenance of these treatment plants and hence the very goal of their establishment fails.

In order to understand the main reasons for the lack of treatment of wastewater, an institutional analysis of wastewater situation in Hyderabad was conducted followed by the contingent valuation survey. From the institutional analysis it is clear that the water boards responsible for the treatment of wastewater often do not not have the resources to ensure 100% treatment of wastewater due to a number of reasons. With the new wastewater treatment plants being set up, about 70% (590 mld) of the wastewater can be treated to boatable quality before it is released into the river. However, for the sustenance of the treatment plants, the operation and maintenance costs of the treatment plants have to be met on a regular basis. In most developed countries the full cost of the treatment of the wastewater is collected from the polluters i.e. the urban households and the industries. In so called developing countries like India, full cost recovery of water supply services has not been possible for various reasons. Most of the previous research

work has been concentrated on the water supply issues and very little research or literature available on issues of cost recovery of wastewater services. However with the increasing education, awareness levels on environmental issues, demand for higher quality of life in urban areas and rising per capita income levels and affluence in urban areas, it was necessary to test the waters and see if urban people were ready and willing to pay to have a clean river. Therefore a contingent valuation survey has been conducted to estimate the actual Willingness To Pay [WTP] of the urban water consumers of Hyderabad to keep their river clean. The current paper presents the results and discussion of the contingent valuation survey conducted in Hyderabad in January 2008.

2. Contingent Valuation Technique

The Contingent Valuation (CV) technique simulates in a questionnaire a hypothetical market in which behaviour can be modeled (Sinden and Thampapillai 1995). The CV method uses a series of questions to elicit people's preferences for public goods by finding out what they would be willing to pay for specified improvements in them (Mitchell and Carson. 1989). The response should be an estimate of the total benefit that the person expects from the particular item or good or service.

The Objectives of the Contingent Valuation Study were:

- To know if people of Hyderabad value clean water in their rivers.
- To know if people of Hyderabad are willing to pay for clean water in the rivers.
- To know how much the people are willing to pay for different levels (Level C, B & A) of water quality in the river.
- To know if variables: income levels; proximity to the river; no. of years lived in Hyderabad; and perceived importance of controlling water pollution - influence the amount people are willing to pay to treat their wastewater.

The sample was stratified based on income and proximity to the river. A total of 275 respondents were surveyed with a questionnaire (see Annex 1 for the questionnaire and payment card). The questionnaire was designed to capture the information and data required to satisfy the objectives of this study. It was made available to the respondent in both English and *Telugu* (the local language of the area). The literature from the book "Using Surveys to Value Public Goods: The Contingent Valuation Method" by Mitchell and Carson (1989) has been very useful in the design of the questionnaire for this study. The questionnaire has three sections namely – A, B and C. Section A records the respondent's profile. Section B acts as a warm up section for the respondents to bring their attention to the issue of water pollution and to assess their opinions on sources of water pollution and motivation to prevent water pollution. Then in section C, there are questions which asks them whether people are willing to pay to treat wastewater and if yes, then how much in real Indian Rupees is it worth to them to achieve three different water quality levels in Musi River in Hyderabad city. Before the start of the section C, a card explains the current status of Musi River and what different water qualities actually mean [See Card 1 in Annex 1].

Payment card method was used to elicit respondents WTP values. The payment card [See Card 2 in Annex 1] shows the current sewerage cess (35% of the water supply charges) paid by people to the HMWSSB and then they are provided with a series of options with 5% increase in sewerage

cess per month. Respondent is free to pick a figure according to his choice and the value he places on the different quality levels. Some respondents wanted information on how much it actually costs (INR / KL) to treat wastewater to each quality level. Such respondents were not willing to state their WTP without this information and therefore the information was provided accordingly.

3. Data Analysis, Results and Discussion

The data for this survey was collected through application of a questionnaire which consisted of three sections A, B and C. The analysis, results and discussion is presented here for each of the sections.

3.1 Section A: Respondent Profile

The different characteristics of the respondent profile that were analyzed are education, age and sex. Only 4% of the respondents were uneducated. The high level of literacy rate may be attributed to the fact that it was an urban survey. 72% of the respondents were in the age group of 19 – 35 years and about 20 % in the age group of 36-50 years which basically may be attributed to the fact that the working group of the households was interviewed for this study. Of the total no. of respondents 81% (223) were male and 19% (52) were female. The respondents were chosen randomly and no preference was given to any particular gender group. The high percentage of male respondents might be attributed to the fact that the interviews were conducted in work places. In India, the percentage of women employed in formal organizations is still low.

3.2 Section B: Pollution of water bodies and its importance to urbanites

Sixty three percent (174) of the respondents were in favor of protecting the environment while still holding the current costs. In India, a very small percentage (0.01%) of the total budget outlay for the state is actually allocated towards environmental issues. It might be concluded that people are unaware of the actual money government spends on environment. However from this result and from many other studies in general it can be concluded that people are cost conscious and highly sensitive to prices in India. When people were asked how important was controlling pollution in rivers and lakes to them, 32 % (87) said that it was “Very Important” and 64% (177) said that it was “Important”. It can be concluded that more than 90% of the respondents realized the importance of controlling pollution in rivers. When respondents were asked to rank (1 and 2) the top two sources of water pollution according to them, 46% (127) of the respondents ranked industrial pollutants as No1 and 54% ranked sewage from commercial complexes (hospitals, hotels, garages, laundry, beauty saloons, butcher shops) as No 2. Question 13 presents various reasons why some people might value water quality in their rivers. The respondents were asked to rank two of the reasons for reducing water pollution in Musi River in Hyderabad city, which were most important to them personally. Of the total respondents, 47% ranked reason two (I/my household would like to have clean water in the river to avoid the problems of bad odour, mosquito problems & pollution of our ground water) as one and 33 % ranked reason two (I/my household pollute the Musi River by discharging our domestic wastewater into the river and hence feel responsible to clean it as well) as rank 2 (see Table 1). About 28% respondents realized the importance of clean water for agriculture and ranked reason 5 among their top two motivations. It is interesting to note that very few people valued the recreational value of the

river. This might be due to the fact that, Musi River has been polluted for more 20 years now and people cannot even think of boating or swimming or any other recreational value of this river. However, once the river is cleaned and the flow in the river increases, probably its recreational value will increase.

Table 1. Reasons/motivation why respondents value clean water in the river and their ranking

Reasons / Motivation	Rank 1	Rank 2
1. I (my household) pollute the Musi River by discharging our domestic wastewater into the river and hence feel responsible to clean it as well.	85 (31)	91 (33)
2. I (my household) would like to have clean water in the river to avoid the problems of bad odour, mosquito problems & pollution of our ground water.	128 (47)	30 (11)
3. I (my household) would like to have clean water in Musi river so that we could go swimming, boating & fishing	2	7
4. I (my household) would like to have clean water in Musi river so that we could go picnicking, bird watching / stay in a vacation cottage near the river.	0	8
5. I (my household) would like to have clean water in Musi River so that we could use it for irrigation and get better yields.	29 (10)	50 (18)
6. I (my household) get satisfaction from knowing that the water in the river is clean.	27 (9)	82 (30)

Note: Figures in brackets represent the percentage of total sample size of 275.

3.3 Section C. Water quality valuation for Musi River: Logistic Regression and ANOVA

The data was analyzed using logistic regression to see if the following independent variables had a significant influence on the consumers (consumer is defined as an urban respondent of Hyderabad with a piped supply of water from HMWSSB and connected to a sewerage system) willingness to pay a higher sewage cess in their water bills.

$$WTP = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4$$

WTP: Willingness To Pay
X_1 no. of years the respondent household has lived in Hyderabad
X_2 respondent's perceived importance of controlling water pollution
X_3 income level of the respondent household
X_4 proximity of the respondent household to the river

Hypothesis:

X_1H_0 : The number of years a household has lived in a city does not have a significant influence on their WTP
X_1H_1 : The number of years a household has lived in a city has a significant influence on WTP

X_2H_0 : Respondent's perceived importance of controlling water pollution does not have a significant influence on WTP
X_2H_1 : Respondent's perceived importance of controlling water pollution has a significant influence on WTP

X_3H_0 : Household income level does not have a significant influence on WTP
X_3H_1 : Household income level has a significant influence on WTP

X_4H_0 : Proximity to the river does not have a significant influence on WTP
X_4H_1 : Proximity to the river has a significant influence on WTP

Table 2. Results of the Logistic Regression of the variables

Effect	**DF**	**Wald Chi-Square**	**Pr Chi Square**
No.of years lived in Hyderabad (X_1)	40	36.7860	0.6157
Importance given to controlling water pollution (X_2)	3	12.1067	0.0070
Household income levels (X_3)	12	53.3792	<0.0001
Proximity to the river (X_4)	1	0.9917	0.3193

Note: The data has been analyzed using SAS Version 9.

Table 2 clearly indicates that the probability chi square of the variables – perceived importance of controlling water pollution (X_2) and household income levels (X_3) is less than 0.05 indicating a significant influence on the Willingness To Pay, whereas the variables -No. of years lived in Hyderabad (X_1) and Proximity to the river (X_4) whose probability chi square is much greater than 0.05 have no or insignificant influence on the dependent variable WTP of the respondents. The insignificant influence of the variable X_4 can be explained by the fact that the market has already internalized the negative externalities of the polluted river through reduced rents and property value of those located close to river and therefore no further concession would be made on this account. The results of the logistic regression were further confirmed through the Analysis of Variance. Table 3 shows the results of ANOVA.

Table 3. Results of Analysis of Variance

Source	**d.f**	**s.s**	**m.s**	**v.r.**	**F pr.**
Proximity to the river (X_4)	1	5955734	5955734	11.45	< 0.001

Household income levels (X_3)	12	18652009	1554334	2.99	< 0.001
Residual	260	135253195	520205		
Total	273	159860938	585571		
Source	**d.f**	**s.s**	**m.s**	**v.r.**	**F pr.**
Importance given to controlling water pollution (X_2)	3	8359058.	2786353.	4.97	0.002
Residual	270	151501879.	561118		
Total	273	159860938			

3.4 Protest zeroes and rationale

In contingent valuation surveys the category of protest zeroes or zero bidders refers to respondents who are not willing to pay anything for the programme under analysis. Of the total number of respondents, 10% refused to pay any sewerage cess at all, 26% refused to pay for treatment level beyond Level B and 40% refused to pay beyond treatment level A.

A brief summary of the various reasons for respondents' refusal to pay for treatment of wastewater are presented below:

1. The poor level of water supply has an important and negative influence on people's WTP for wastewater treatment. People always associated HMWSSB mainly with water supply and considering the fact that currently they receive only 2 hrs every other day of water supply, many refused to pay for wastewater treatment.
2. Lack of trust: Most respondents said that they do not trust the government to spend their money efficiently towards wastewater treatment.
3. Some respondents were of the opinion that it was Government's responsibility to keep our rivers clean and therefore they should divert money from other development works towards wastewater treatment.
4. Some respondents were of the opinion that Government is already collecting enough taxes and not providing any services. They complained about bad roads, bad water supply and sewerage services. They were of the opinion that there was no point in paying additional water cess, as it would not anyway improve the condition of the river.
5. Corruption: Respondents said that the officials in government system were corrupt and there was no point in paying more money for a service as it is going to be misused.
6. High level of dissatisfaction with HMWSSB for the current services
7. Conditional: Respondents were willing to pay on the condition that, first government invest in wastewater treatment plants, start treating wastewater and only after they see visible improvement in the quality of water in the river and at the same time improve the condition of the sewerage network, they would be willing to pay for the treatment of wastewater.
8. Some respondents were happy to pay for treatment only upto boatable quality (level C). They refused to pay for higher levels because of various reasons:
   a. Satisfied with level C quality
   b. Cannot afford to pay more due to financial constraints
   c. Conditional: First let the HMWSSB treat all the wastewater to Level C and then we will pay for the next level.

9. Some respondents were happy to pay for treatment only upto fishable quality (level B). They refused to pay for higher levels because of same reasons as mentioned above.

3.5 Consumer Surplus and Demand curves

The WTP response should be an estimate of the total benefit or value that one expects from the particular item and subtraction of the appropriate costs should provide an estimate of the consumer's surplus. In the current study, respondents are paying currently INR 378 per annum per household (connection) as a sewer cess which pays for the maintenance of the sewer lines. On an average a household consumes about 10 kl of water per month of which 80% (8 kl) is discharged as wastewater. Table 4 shows the actual cost of treatment per month per household to be paid to treat the wastewater from (current water quality in Musi river) level D to C, B and A.

Table 4. Cost of treatment and amount that each household need to pay

Water quality	INR/kl	INR/8kl @ 80% outflow[1]	INR / month / hh	INR/year/hh
Boatable Quality	1.40	11.2	42.7*	512.40
Fishable Quality	6.40	51.2	82.7*	992.40
Swimmable Quality	9.00	72	103.5*	1242.00

***** A fixed cost of INR 31.50 for maintenance of sewer lines is added to the cost of treatment to arrive at this figure.

[1]On an average, each household consumes 10 kl per month and therefore discharges 8 kl per month (@80% outflow) of wastewater into the sewer lines

The consumer surplus for different levels of treatment has been calculated. Table 5 shows the consumer surplus for respondents for different levels of wastewater treatment. As the cost of treatment increases, number of respondents willing to pay decreases and hence the consumer surplus decreases. The consumer surplus is highest for wastewater quality level C.

Table 5. Consumer Surplus (At 80% of water supplied discharged as wastewater)

Quality level	Cost of treatment from Level D (INR/annum/hh)	No. of respondents WTP above the actual cost of treatment	Consumer Surplus	Consumer surplus per person
C	512.40	81 (29)	59778	738
B	992.40	28 (10)	34295	1225
A	1242.00	11 (4)	14652	1221
Total Consumer Surplus			108725	

Note: Figures in brackets represent the percentage of total sample size of 275.

Only 29% of the respondents were willing to pay above the actual cost of treatment for level C. From table 4, one can see that even though the consumer surplus per person is highest for wastewater quality level B, it is more viable to treat to the level C which has the highest total consumer surplus. Figures 1, 2 and 3 presents the demand curves for wastewater quality levels C, B and A respectively and their consumer surplus.

Figure1 Consumer surplus and demand curve for wastewater quality level C

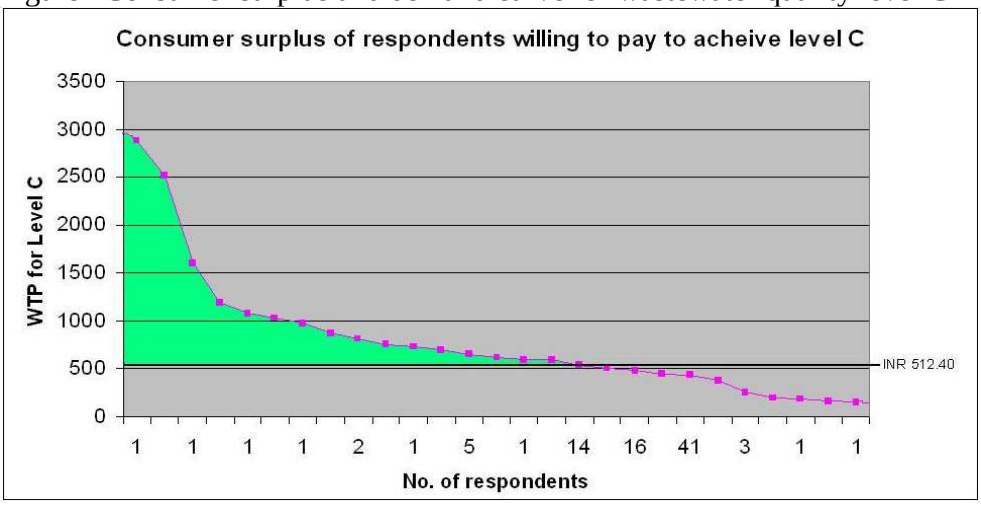


Figure 2 Consumer surplus and demand curve for wastewater quality level B

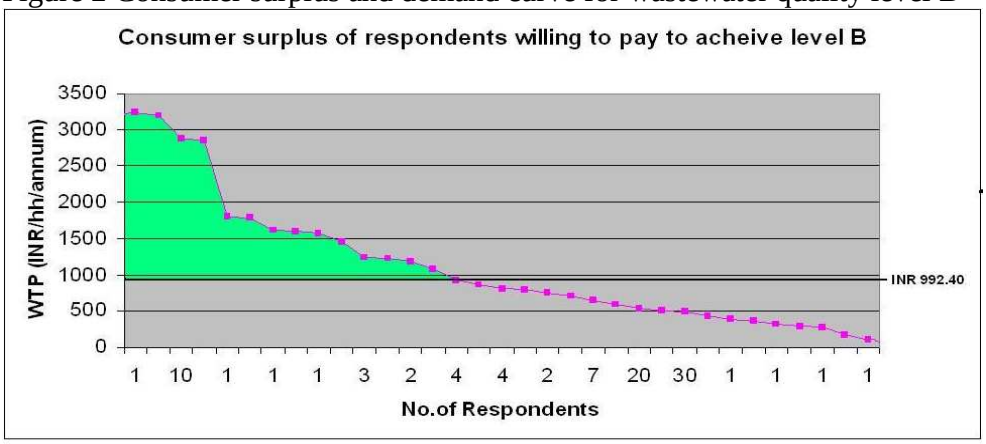
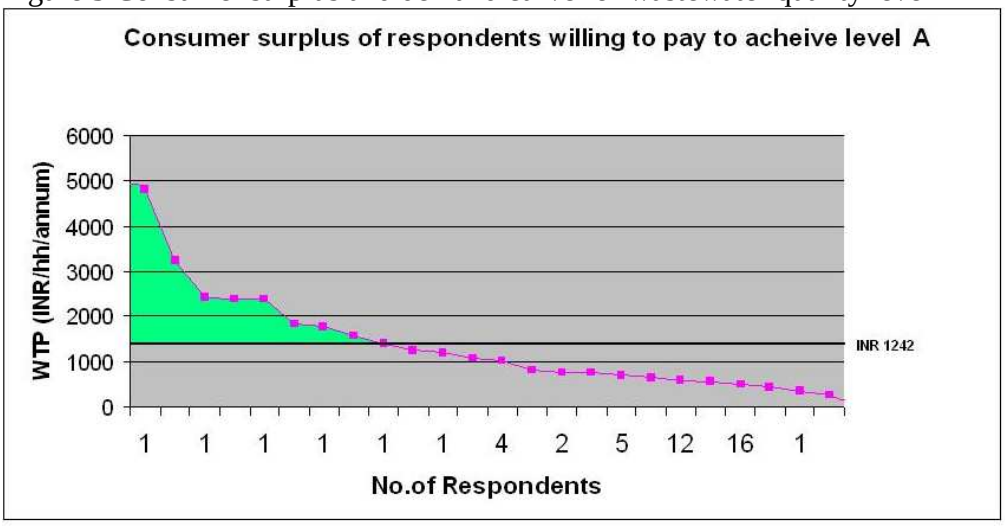


Figure 3 Consumer surplus and demand curve for wastewater quality level A



4. Conclusions

From the analysis and results the following conclusions may be drawn

1. Only 30% of the respondents were willing to pay for wastewater to be treated to boatable quality. It's very evident from the survey results that 100% cost recovery of sewerage services and wastewater treatment is not possible in Hyderabad at the moment. However a phased increase in the water tariffs accompanied with simultaneous improvements in service delivery mechanisms may be successful in the future. The current cost recovery efforts are restricted to water supply and HMWSSB has not yet been successful in full cost recovery.
2. Forty six percent of the respondents perceived industrial pollutants as the major source of water pollution followed by commercial complexes (26%) and residential areas (25%). This perception has implications for the WTP for treatment. The sewage charges should be accordingly structured to cover costs of wastewater treatment.
3. Increased awareness among the city dwellers of the importance to prevent pollution of the surface water and ground water sources is expected to help in increasing the cost recovery for water utility and treatment services.
4. The sewerage cess should be levied considering the income levels of the people as are the water supply charges.

5. Recommendations

A number of measures need to be taken simultaneously to protect the rivers in developing countries like India. To ensure treatment of wastewater one needs to ensure that there is 100% cost recovery of treatment either from the polluter or from a range of other sources. There is an urgent need to treat wastewater as an economic good and not as something to be disposed of at a considerable cost to the society and the environment. Sustained improvements in the water and wastewater service delivery are an important and essential pre-requisite to build the trust of people in water supplying authorities like Hyderabad Metro Water supply and Sewerage Board before increasing the water tariffs. A key conclusion of this survey is that in the current conditions, it is not possible to recover 100% cost of wastewater treatment from the polluters. Therefore from this survey and results of the institutional analysis conducted as part of this doctoral research, it is recommended that wastewater should be treated to a quality where it can be suitably and safely recycled and the costs must be recovered from the users of recycled water.

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Annex 1. Questionnaire for the contingent valuation survey

Survey Instrument to Assess Peoples' Opinion on Water Quality in Rivers and Their Willingness to Prevent Pollution in Musi River in Hyderabad City

This survey is to assess what is the worth of clean water in our rivers in general and Musi River (in particular) for the residents of Hyderabad city. It is part of a doctoral research conducted by Mekala Gayathri Devi who is currently doing her internship with the International Water Management Institute.

Most of the questions in this survey are related to your opinions and attitudes. There are no right or wrong answers. This interview is confidential and your name will never be associated with your answers.

Respondent's Name & Address

Mr / Ms _____

_____

_____

Date of Interview:

SECTION A: RESPONDENT PROFILE [Please circle your answer]

1. Age < 18 19 – 35 36 – 50 51 – 65 > 65	**2. Sex** Male Female
3. Education level 1. None 2. Primary level (1 – 5 years) 3. Secondary level (6^{th} – 10^{th} standard) 4. Senior Secondary (11 – 12^{th} std) 5. Degree (Bachelors) 6. Masters 7. Tertiary (PhD)	**4. Caste affiliation** 1. Scheduled Caste 2. Scheduled Tribe 3. Backward Caste 4. Other Caste
5. No. of years you lived in Hyderabad = _____Years	

SECTION B: POLLUTION OF WATER BODIES AND ITS IMPORTANCE TO URBANITES [Please circle your answer]

6. Here is a **list of issues, which are of concern to the urban taxpayers**. For each, please tell me whether you feel the amount of money we as a nation are spending is too much, too little or just about the right amount on the following issues:

	Too much	Right amount	Too little	Don't know	Refused
a. Reducing air pollution	1	2	3	4	5
b. Fighting crime	1	2	3	4	5
c. Reducing water pollution	1 Go to Q 7	2 Go to Q 9	3 Go to Q 8	4 Go to Q 9	5 Go to Q 9

7. You said we are spending too much on reducing water pollution. Do you think we should be spending

1. Great deal less
2. A little less
3. Don't know
4. Refused

7. You said we are spending too little on reducing water pollution. Do you think we should be spending

    1. Great deal more
    2. A little more
    3. Don't know
    4. Refused

8. Which statement do you agree with most in the below 3 statements (1,2,3)?

    1. Protecting environment is **very important regardless of cost.**
    2. Protecting environment is **important** while **holding the current costs**.
    3. We have made **enough progress** on cleaning environment. We should **cut down** the costs.
    4. Don't know
    5. Refused

9. Some national goals are more important to people than others. How important to you is controlling pollution in our rivers and lakes?

    1. Very Important → [Go to Q 11 else skip to Q12]
    2. Important
    3. Somewhat Important
    4. Not Important
    5. Don't know

10. You said controlling pollution in our rivers and lakes is "very important" to you. Would you say it is one of your

    1. Very Top Priority
    2. Top Priority
    3. Important
    4. Somewhat Lesser Importance
    5. Don't know

11. Following is a list of different sources of water pollution in our rivers. Rank the two sources [1, 2], which you feel probably, cause most water pollution in the nation?

Cause	Rank (1 & 2)
1. Domestic sewage from households / residential areas	
2. Sewage water from hospitals, hotels, garages, laundry, beauty saloons, butcher shops and other commercial complexes	
3. Industrial effluents	
4. Run off from roads and highways	
5. Seepage from garbage dumps	
6. Runoff from agriculture	

12. There are various reasons why some people might value water quality in their rivers. Please rank two of these reasons for reducing water pollution in Musi River in Hyderabad city, which are most important to you personally?

Reasons for reducing river pollution	Rank (1 & 2)
1. I (my household) pollute the Musi River by discharging our domestic wastewater into the river and hence feel responsible to clean it as well.	
2. I (my household) would like to have clean water in the river to avoid the problems of bad odour, mosquito problems & pollution of our ground water	
3. I (my household) would like to have clean water in Musi river so that we could go swimming, boating & fishing	
4. I (my household) would like to have clean water in Musi river so that we could go picknicking, bird watching / stay in a vacation cottage near the river.	
5. I (my household) would like to have clean water in Musi River so that we could use it for irrigation and get better yields.	
6. I (my household) get satisfaction from knowing that the water in the river is clean.	

SECTION C: WATER QUALITY VALUATION FOR MUSI RIVER

In this section I'm going to ask you how much in real Indian Rupees is it worth to you to reach three different water quality levels in Musi River in Hyderabad city. See the Water quality card for information.

13. Would it be worth anything to you / household to achieve water quality level C where water in Musi river in Hyderabad city is clean enough for boating?

    1. Yes [Go to Q 15]
    2. No [Go to Q 16]
    3. Don't know
    4. Refused

14. What would be the most you are willing to pay as sewage cess per year to clean the water in Musi River in Hyderabad city and bring it to boatable quality (Level C)?

    Rs _____ Enter amount here

    000 Zero or Nothing
    999 Don't know
    998 Refused

15. If your answer is no, kindly give your reason _____
    _____

16. Would it be worth anything more to you / your household to achieve Level B where water in Musi river in Hyderabad city is clean enough for most types of fish to live in?

    1. Yes [Go to Q 18]
    2. No [Skip to Q 19]
    3. Don't know
    4. Refused

17. What would be the most you are willing to pay each year to achieve Level B?

    Rs _____ Enter amount here

    000 Zero or Nothing
    998 Don't know
    999 Refused

18. If your answer is no, kindly give your reason _____
_____

19. Lastly, would it be worth anything more to you (or your household) to achieve Level A, where the water in Musi river in Hyderabad city is clean enough to swim in it?

    1. Yes [Ask Q 21]
    2. No [Skip to Q 22]
    3. Don't know
    4. Refused

20. What would be the most you would be willing to pay each year to achieve Level A?

    Rs _____ Enter amount here

    000 Zero or Nothing
    998 Don't know
    999 Refused

21. If your answer is no, kindly give your reason._____
_____

22. Which category best describes your total household income earned in 2007 before taxes?

A	1	< 110,000
B	2	110,001 To 150, 000
C	3	150,001 To 200,000
D	4	200,001 To 300,000
E	5	300,001 To 400,000
F	6	400,001 To 500,000
G	7	500,001 To 600,000
H	8	600,001 To 700,000
I	9	700,001 To 800,000
J	10	800,001 To 900,000
K	11	900,001 To 10,00,000
L	12	10,00,001 and over
	13	Don't know
	14	Refused

23. How much of the household income do you earn?

    1. 100 %
    2. 75 - 100 %
    3. 50 – 75 %
    4. 25 - 50 %
    5. 0 - 25 %
    6. Don't know
    7. Refused

24. ANY OTHER COMMENTS_____
_____

THANK YOU FOR YOUR TIME AND COOPERATION

Card 1 - WATER QUALITY LEVELS

Water quality level	**Water quality parameters as defined by Central Pollution Control Board www.cpcb.nic.in**	**Translations of the quality for layman to understand**
LEVEL "D"	No water quality parameters.	- Water is so polluted that it has oil, chemicals, raw sewage and other trash; - It has no plant or animal life; - Smells bad and contact with it is harmful to human health **Musi River water is of D level quality.** Note: A number of small rivers in India passing through he cities are of this quality.
LEVEL "C"	pH between 6.0 to 8.5 Electrical Conductivity at 25°C Max.2250 micro mhos/cm Sodium absorption Ratio Max. 26 Boron Max. 2mg/l	- Water is of **boatable** quality. - Water is of a quality such that if you happen to fall into it for a short time while boating or sailing its not harmful to you.
LEVEL "B"	pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more Free Ammonia (as N) 1.2 mg/l or less	- Water is of **fishable** quality. - Though some fish can live in boatable quality of water, it is only at this level that most types of fishes can survive
LEVEL "A"	Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 Dissolved Oxygen 5mg/l or more Biochemical Oxygen Demand 5 days 20°C 3mg/l or less	- Water is of **swimmable** quality.

CURRENT SCENARIO OF MUSI RIVER IN HYDERABAD CITY:

- Musi River water is of D level quality. Please see the pictures.
- Currently 95% of sewage water entering Musi from Hyderabad is untreated.
- The quality of the water in the river can be improved by cleaning / treating all the sewage (domestic and industrial) water entering the river in a Sewage Treatment Plant.
- Sewage treatment is possible if you (as a citizen and polluter of water) are willing to pay a higher sewerage cess in your water bill to treat the sewage to appropriate levels.
- Currently you pay 35% of your water charges (About Rs 30 per month) as sewerage cess. However, this is not enough to cover the treatment costs of sewage to desired levels.

Water Quality Ladder

Best possible water quality

9

8

7

6

5

4

3

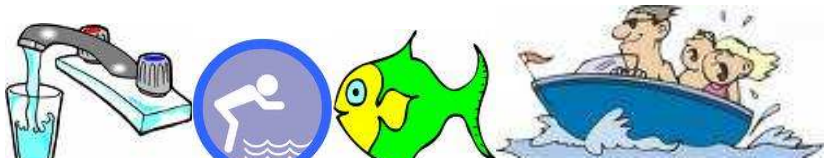
2

1

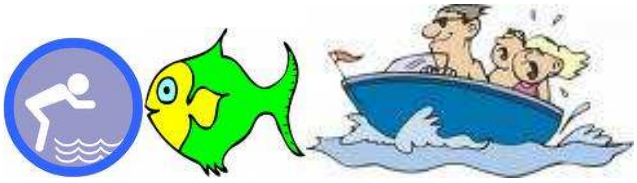
Worst possible water quality

A

DRINKABLE



SWIMMABLE



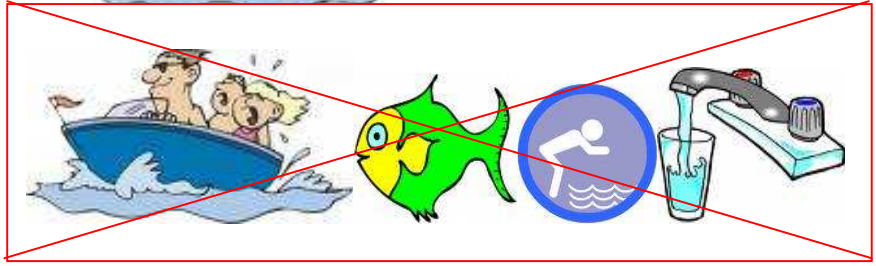
B

FISHABLE

C

BOATABLE

D



Card 2 - Payment Card

Sewer cess @	Monthly water bill (INR)	Monthly sewer cess(INR)	Annual sewer cess (INR)
0.35	90	31.50	378 (currently paying)
0.40	90	36.00	432
0.45	90	40.50	486
0.50	90	45.00	540
0.55	90	49.50	594
0.60	90	54.00	648
0.65	90	58.50	702
0.70	90	63.00	756
0.75	90	67.50	810
0.80	90	72.00	864
0.85	90	76.50	918
0.90	90	81.00	972
0.95	90	85.50	1026
1.00	90	90.00	1080
1.05	90	94.50	1134
1.10	90	99.00	1188
1.15	90	103.50	1242
1.20	90	108.00	1296
1.25	90	112.50	1350
1.30	90	117.00	1404
1.35	90	121.50	1458
1.40	90	126.00	1512
1.45	90	130.50	1566
1.50	90	135.00	1620
1.55	90	139.50	1674
1.60	90	144.00	1728
1.65	90	148.50	1782
1.70	90	153.00	1836
1.75	90	157.50	1890
1.80	90	162.00	1944
1.85	90	166.50	1998
1.90	90	171.00	2052
1.95	90	175.50	2106
2.00	90	180.00	2160
2.05	90	184.50	2214
2.10	90	189.00	2268
2.15	90	193.50	2322
2.20	90	198.00	2376
2.25	90	202.50	2430
2.30	90	207.00	2484
2.35	90	211.50	2538
2.40	90	216.00	2592
2.45	90	220.50	2646
2.50	90	225.00	2700
2.55	91	232.05	2784.6

Note: AUD 1 = INR 35 (Exchange Rate as on Jan 2008]