



Cost Benefit Analysis of Upgrading the WWTPs in the Izmit Bay

➤ Cost – Benefit Analysis

- 1) Financial CBA – whether it is financially feasible for municipalities to upgrade their WTP to advanced treatment?
- 2) Economic CBA – whether the benefits of upgrading is more than costs from a macro economic point of view

Financial CBA

Cost of treating one cubic meter of wastewater compared to the fee that the people would be willing to pay as wastewater charge

Investment Cost : 28 Euro / capita

Unit Investment Cost : 0.019 Euro / m³

Operation Cost : 0.024 Euro / capita / day

Unit Operation Cost : 0.12 euro / m³

Total Unit Cost : 0.139 Euro / m³

Financial CBA

WTP for improved water quality was measured with the help of a questionnaire :

What is your opinion about the water quality in the Izmit Bay?

- 1>Very polluted, it is impossible for many species to survive, not suitable for swimming (59%)
- 2>The sea cleans itself automatically, so it shouldn't be very polluted. One can swim from time to time
- 3>I think it is OK
- 4>I don't have any idea
- 5>Other.....

Financial CBA

Do you swim in the Izmit Bay?

1> Yes, frequently (0%)

2> Sometimes (2%)

3> I have swam a couple of times

4> I like swimming but I don't swim in the Bay now that I think that the water is polluted (65%)

5> I don't know how to swim, I don't swim

6> Other.....

Financial CBA

Which of the following answers reflect your idea about swimming or not after the abatement of the Izmit Bay?

- 1> I don't swim at all,
- 2> I don't think that I will swim,
- 3> Maybe I can swim,
- 4> I swim,
- 5> I certainly swim,

1 – 2 : 32 %

The background of the slide features a blue gradient with several concentric white circles representing water ripples. These ripples are located in the bottom right and bottom center areas of the slide.

Financial CBA

TL	NO	
0	0	0,00
15	25	375,00
35	10	350,00
75	20	1500,00
150	6	900,00
250	1	250,00
300	0	0,00
0	50	0,00
	112	3375,00
		30,13

Financial CBA

55% is ready to pay

On the average, people are willing to pay
15,8 Euro /cap / annum. That converts to
0.256 Euro / m³.

B/C Ratio : $0.256/0.139 = 1.84$

Economic CBA

Water quality (SDD) in the Izmit Bay has an impact on Real Estate Value.

The Hedonic Pricing Method has been used to measure the impact of SDD on property value since environmental services affect market prices.

HEDONIC PRICING

Step 1 : Data Collection

- Collect data on residential property sales prices in the region (174 data).

The required data include:

- *sales prices
- *property characteristics that affect selling prices, such as apartment age, size, number of rooms, and number of bathrooms at certain districts
- *SDD in the area close to the district

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Gebze	1993	35000	35	1	4	0	Elektirik	Soba	Var	Yok	Yok	Yok	Yok	Dolu
Gebze	bilgi yok	54000	90	2	3	3	Kömür	Soba	Yok	yok	Yok	Yok	Yok	Dolu
Gebze	1997	63000	120	3	4	3	Kömür	Soba	var	yok	Yok	Yok	Yok	Dolu
Gebze	bilgi yok	80000	134	3	2	2	Kömür	Soba	Yok	yok	Yok	Yok	Yok	Dolu
Gebze	2008	80000	90	3	3	0	Dogalgaz	Kombi	Yok	yok	Yok	Yok	Yok	Boş
Gebze	bilgi yok	84000	134	4	3	3	Kömür	Soba	var	yok	Yok	Yok	Yok	Dolu
Gebze	2001	85000	130	5	5	3	Dogalgaz	Kombi	Var	Yok	Yok	Yok	Yok	Dolu
Gebze	2001	85000	130	4	5	3	Dogalgaz	Kombi	var	var	var	evet	Var	Dolu
Gebze	2000	90000	145	4	5	4	Dogalgaz	Kombi	var	yok	var	evet	Var	Dolu
Gebze	2008	90000	110	4	3	2	Dogalgaz	Kombi	var	yok	Yok	Yok	Var	Dolu
Gebze	2008	95000	130	5	5	3	Dogalgaz	Kombi	var	var	var	evet	Var	Dolu
Gebze	2005	100000	130	3	3	2	Dogalgaz	Kombi	Var	Yok	Var	Yok	Yok	Boş
Gebze	2008	100000	130	4	3	2	Dogalgaz	Kombi	var	yok	var	evet	Var	Boş
Gebze	bilgi yok	100000	140	3	4	4	Dogalgaz	Kombi	var	yok	Yok	Yok	Var	Dolu
Gebze	1989	110000	145	4	5	5	Dogalgaz	Kombi	var	yok	Yok	Yok	Var	Boş
Gebze	2008	113000	100	4	3	0	Dogalgaz	Kombi	var	var	var	evet	Var	Boş
Gebze	1998	120000	140	4	5	4	Dogalgaz	Kombi	Var	Yok	Yok	Yok	Yok	Dolu
Gebze	1998	120000	140	4	5	4	Dogalgaz	Kombi	var	yok	Yok	Yok	Var	Dolu

Step 2:

The data are analyzed using regression analysis, which relates the price of the property to its characteristics and the environmental characteristic of interest.

The following formula defines Price as a function of 2 variables.

$$P = -22,097 + 418 S + 2,515 (SDD)$$

P = sales price of an apartment in Euros

S = size of an apartment in square meters

SDD = measure of clarity of water in meters

R squared = 0.52

F value = 92.02

Total Economic Benefit

Benefit from rising real estate values :

$(SDD_{\text{target}} - SDD_{\text{present}}) \times 1,197 \times \text{apartments at the coast}$
(pop. 18.326)

1 meter improvement will mean a benefit of ~22 million Euro

Benefit from increase in people's satisfaction :

733.051 people \times 18.7 Euro/cap/year

~13 million Euro

Total Economic Cost

Daily amount of water treated (146.000 m³) \times 0.139 (Euro/m³)
 \times number of days to reach the target SDD