

Part 3 Project Evaluation

3.1 Introduction

Economic evaluation was conducted by comparing economic benefit and economic cost of a project which were quantified from the viewpoint of regional or national economy. In the same way, financial evaluation was made on income generating projects by comparing project cost and revenue. The way of making a cash flow and calculating evaluation indicators are quite same for both evaluations.

Table 3.1.1 shows a standard form of cash flow table. The first three columns are to be estimated separately and the last net cash flow is calculated by a difference of benefit or income (3) and cost ((1) and (2)) by a formula of $(4) = (3) - (1) - (2)$.

To estimate the internal rate of return (IRR) using the net cash flow, an iterative calculation is usually needed. However, any table calculation software such as Excel and Lotus facilitate a function to calculate IRR. In case of Excel, for example, the IRR function is expressed as $IRR(A : B, a)$, where “A” is the address of the top cell of the net cash flow column, “B” is address of the bottom cell and “a” is the initial value of iteration usually taking a value of 0.0.

Table 3.1.1 Cash Flow of Project to Evaluate

Year	Project Cost (1)	O&M Cost (2)	Benefit or Income (3)	Net Cash Flow (4)
2008				Cell No. A
2009				
2010				
2011				
2012				
2013				
:				
:				
:				
:				
2039				
2040				Cell No. B
Total				

3.2 Vehicle Operating Cost

Economic benefit of a transportation project is defined in this Study as savings in vehicle operating cost and travel time cost. Accordingly, unit vehicle operating cost is needed to estimate the benefit. Study team has estimated the unit cost in Istanbul by type of vehicle and by travel speed, based on collected data in this Study as well as accumulated information in the past Studies. They are shown in the following tables.

(1) Vehicle Characteristics

Table A-1 Summary of Representative Vehicles

Vehicle Type	Motorcycle	Taxi	Compact Car	Luxury Car	Service Bus	Bus	Small Truck	Truck
Vehicle Name/Code	Honda CBP 150	Fiat Albea 1.3	Renault Clio 1.5 DCI	BMW 520D	Ford Transit	Mercedes Citaro	Nissan Skystar	Mercedes Axor 295
Fuel Type	Gasoline	Diesel	Gasoline/Diesel/LPG	Diesel	Diesel	Diesel/LPG	Diesel	Diesel
Engine Size (cm3)	150	1,300	1,500	4,000	2,200	6,370	2,500	12,000
Engine Power (hp)	11	70	80	163	130	279	133	401
Vehicle Price (YTL)								
(1) Market Price	3,640	22,500	31,000	132,500	38,600	250,000	42,000	126,700
(2) Economic Price	2,830	15,014	20,686	74,859	30,011	209,767	32,957	99,419
No. of Tires	2	2	4	4	4	4	4	6
(1) Tire Set at Market Price	236	566	566	1,200	1,200	4,085	1,200	9,532
(2) Tire Set at Economic Price	200	480	480	1,017	1,017	3,462	1,017	8,078
Annual Running Distance (km)	17,000	83,000	21,000	21,000	68,000	68,000	41,000	79,000
Average Travel Speed (km/hr)	25	30	35	35	25	25	35	40
Estimated Annual Driving Hours	680	2,767	600	600	2,720	2,720	1,171	1,975

Note 1: The data of annual running distance for a passenger car (6,500km) comes from HIS 2006-2007

Note 2: The data of annual running distance for a bus coach (68,000km) comes from IETT statistics

Note 3: Vehicle economic price is not inclusive of transferable costs such as Special Purpose Tax on Vehicle (1% to 5% depending on vehicle type and engine size) and VAT (18%).

Add To Table A-1

	Special Vehicle Tax (%)	VAT (%)	Market Price (YTL)	Economic Price (YTL)
Compact Car	27	18	31,000	20,686
Luxury Car	50	18	132,500	74,859
Taxi	27	18	22,500	15,014
Minibus	9	18	38,600	30,011
Bus	1	18	250,000	209,767
Small Truck	8	18	42,000	32,957
Truck	8	18	126,700	99,419
Motorcycle	9	18	3,640	2,830

Note : Composition of Compact Car and Luxury Car is 92% : 8%

Table A-2 Engine Type Compositions among Cars and Buses

Year	2007	2023	
Passenger Car (%)	Gasoline	62	62
	Diesel	30	30
	Autogas	8	8
Ave. Vehicle Market Price (YTL)	39,120	39,120	
Ave. Vehicle Economic Price	25,020	25,020	
Bus (%)	Diesel	97	55
	Autogas	3	45
Ave. Vehicle Market Price	250,000	334,060	
Ave. Vehicle Economic Price	209,767	274,939	

Note 1: Change in bus fleet composition due to increasing Autogas use (100 units per year) and constant scrapping of aging diesel fleet (50 units per year)

Note 2: Autogas bus price: YTL 436,800 at market price and YTL 354,594 at economic price

(2) Fuel Cost

Table A-3 Road Transport Fuel Cost(in 2007, YTL)

Category	Market Price	Economic Price
Gasoline (per litter)	3.05	1.17
Diesel (per litter)	2.50	0.71
Autogas (per kg)	1.74	0.76

Table A-4 Combined Fuel Unit Cost by Vehicle Type

	Passenger Car	Bus	
		2007	2023
Gasoline	62	0	0
Diesel	30	97	55
Autogas	8	3	45
Market Price (YTL/Lt. and kg)	2.78	2.48	2.16
Economic Price (YTL/Lt. and kg)	1.00	0.71	0.73

A-5 Fuel Consumption and Cost by Vehicle Type, 2007

	Speed (Km/hour)	Motorcycle	Taxi	Passenger Car	Minibus	Bus	Small Truck	Truck
Fuel Consumption (litters/1,000km)	5	102.9	154.5	159.9	230.4	858.5	271.0	828.0
	10	65.9	100.9	104.4	150.5	550.9	177.0	531.4
	20	45.1	73.0	75.5	108.8	398.8	128.0	384.7
	30	33.5	63.3	65.5	94.4	361.7	111.0	348.8
	40	30.2	58.1	60.2	86.7	338.0	102.0	326.0
	50	27.0	57.0	59.0	85.0	361.7	100.0	348.8
	60	31.1	58.7	60.8	87.6	415.7	103.0	401.0
	70	36.2	62.1	64.3	92.7	486.7	109.0	469.4
	80	41.6	67.3	69.6	100.3	561.1	118.0	541.2
	90	45.9	74.7	77.3	111.4	618.5	131.0	596.6
	100	50.8	82.1	85.0	122.4	682.8	144.0	658.5
	110		90.6	93.8	135.2		159.0	
120		100.3	103.8	149.6		176.0		
Fuel Cost - Market Price (YTL/1,000 km)	5	313.8	386.2	444.5	575.9	2,126.7	677.5	2,070.1
	10	200.9	252.2	290.3	376.1	1,364.8	442.5	1,328.5
	20	137.5	182.4	210.0	272.0	988.0	320.0	961.7
	30	102.1	158.2	182.1	235.9	895.9	277.5	872.1
	40	92.2	145.4	167.3	216.8	837.3	255.0	815.0
	50	82.4	142.5	164.0	212.5	895.9	250.0	872.1
	60	94.7	146.8	169.0	218.9	1,029.9	257.5	1,002.5
	70	110.3	155.3	178.8	231.6	1,205.7	272.5	1,173.6
	80	126.8	168.2	193.6	250.8	1,389.9	295.0	1,352.9
	90	140.0	186.7	214.9	278.4	1,532.2	327.5	1,491.5
	100	154.8	205.2	236.2	306.0	1,691.3	360.0	1,646.3
	110		226.6	260.8	337.9		397.5	
120		250.8	288.7	374.0		440.0		
Fuel Cost - Economic Price (YTL/1,000 km)	5	120.8	109.4	160.1	163.1	609.1	191.9	586.3
	10	77.4	71.4	104.6	106.5	390.9	125.3	376.2
	20	53.0	51.7	75.6	77.0	283.0	90.6	272.4
	30	39.3	44.8	65.6	66.8	256.6	78.6	247.0
	40	35.5	41.2	60.2	61.4	239.8	72.2	230.8
	50	31.7	40.4	59.1	60.2	256.6	70.8	247.0
	60	36.5	41.6	60.8	62.0	295.0	72.9	283.9
	70	42.5	44.0	64.4	65.6	345.3	77.2	332.4
	80	48.8	47.6	69.7	71.0	398.1	83.5	383.1
	90	53.9	52.9	77.4	78.8	438.8	92.7	422.4
	100	59.6	58.1	85.1	86.7	484.4	102.0	466.2
	110		64.2	93.9	95.7		112.6	
120		71.0	104.0	105.9		124.6		

Add To Table A-5 Fuel Consumption Indicator

Speed (Km/hour)	Motorcycle	Middle Vehicle	Large Vehicle
5	381	271	254
10	244	177	163
20	167	128	118
30	124	111	107
40	112	102	100
50	100	100	107
60	115	103	123
70	134	109	144
80	154	118	166
90	170	131	183
100	188	144	202
110		159	
120		176	

(3) Oil Cost

Table A-6 Motor Oil Consumption and Cost

	Speed (Km/hour)	Motorcycle	Taxi	Passenger Car	Minibus	Bus	Small Truck	Truck
Motor Oil Consumption (lt./1,000km)	5	0.2	0.3	0.5	0.8	1.6	0.8	1.6
	10	0.2	0.3	0.5	0.8	1.6	0.8	1.6
	20	0.2	0.3	0.5	0.8	1.6	0.8	1.6
	30	0.2	0.3	0.5	0.8	1.6	0.8	1.6
	40	0.2	0.3	0.5	0.8	1.6	0.8	1.6
	50	0.2	0.3	0.5	0.8	1.6	0.8	1.6
	60	0.2	0.3	0.5	0.8	1.6	0.8	1.6
	70	0.2	0.3	0.5	0.8	1.6	0.8	1.6
	80	0.2	0.3	0.5	0.8	1.6	0.8	1.6
	90	0.2	0.3	0.5	0.8	1.6	0.8	1.6
	100	0.2	0.3	0.5	0.8	1.6	0.8	1.6
	110		0.3	0.5	0.8		0.8	
120		0.3	0.5	0.8		0.8		
Motor Oil Cost: Market Price (lt./1000km)	5	2.2	3.3	5.0	8.7	17.4	8.7	17.4
	10	2.2	3.3	5.0	8.7	17.4	8.7	17.4
	20	2.2	3.3	5.0	8.7	17.4	8.7	17.4
	30	2.2	3.3	5.0	8.7	17.4	8.7	17.4
	40	2.2	3.3	5.0	8.7	17.4	8.7	17.4
	50	2.2	3.3	5.0	8.7	17.4	8.7	17.4
	60	2.2	3.3	5.0	8.7	17.4	8.7	17.4
	70	2.2	3.3	5.0	8.7	17.4	8.7	17.4
	80	2.2	3.3	5.0	8.7	17.4	8.7	17.4
	90	2.2	3.3	5.0	8.7	17.4	8.7	17.4
	100	2.2	3.3	5.0	8.7	17.4	8.7	17.4
	110		3.3	5.0	8.7		8.7	
120		3.3	5.0	8.7		8.7		
Motor Oil Cost: Economic Price (lt./1000km)	5	1.6	2.4	3.7	6.4	12.7	6.4	12.7
	10	1.6	2.4	3.7	6.4	12.7	6.4	12.7
	20	1.6	2.4	3.7	6.4	12.7	6.4	12.7
	30	1.6	2.4	3.7	6.4	12.7	6.4	12.7
	40	1.6	2.4	3.7	6.4	12.7	6.4	12.7
	50	1.6	2.4	3.7	6.4	12.7	6.4	12.7
	60	1.6	2.4	3.7	6.4	12.7	6.4	12.7
	70	1.6	2.4	3.7	6.4	12.7	6.4	12.7
	80	1.6	2.4	3.7	6.4	12.7	6.4	12.7
	90	1.6	2.4	3.7	6.4	12.7	6.4	12.7
	100	1.6	2.4	3.7	6.4	12.7	6.4	12.7
	110		2.4	3.7	6.4		6.4	
120		2.4	3.7	6.4		6.4		

Note 1: Motor Oil Market Price (YTL/Lt.) in 2007 10.88

Motor Oil Economic Price (YTL/Lt.) in 2007 7.96

Note 2: Motor oil is replaced with new one either every 10,000 km or every year in case of less than 10,000km yearly.

Note 3: Motor oil tank capacity - motorcycle (1 lt.), car & taxi (3 lt.), minibus & small truck (8 lt.), bus & truck (16 lt.)

(4) Tire Cost

Table A-7 Tire Wearing Rate and Cost

	Speed (Km/hour)	Motorcycle	Taxi	Passenger Car	Minibus	Bus	Small Truck	Truck
No. of Tires per Set		2	4	4	4	4	4	6
Tire Price - Market (YTL/Set)		236	566	617	1,200	4,085	1,200	9,532
Tire Set - Economical (YTL/Set)		200	480	523	1,017	3,462	1,017	8,078
Ave. Durable Distance (km)		40,000	50,000	50,000	50,000	60,000	50,000	60,000
Ave. Wearing Rate (%/1000km)		2.5	2.0	2.0	2.0	1.7	2.0	1.7
Wearing Indicator by Driving Speed	5	53	53	53	53	53	53	53
	10	56	56	56	56	56	56	56
	20	60	60	60	60	60	60	60
	30	67	67	67	67	67	67	67
	40	78	78	78	78	78	78	78
	50	92	92	92	92	92	92	92
	60	107	107	107	107	107	107	107
	70	125	125	125	125	125	125	125
	80	151	151	151	151	151	151	151
	90	180	180	180	180	180	180	180
	100	212	212	212	212	212	212	212
	110		247	247	247		247	
120		285	285	285		285		
Tire Cost at Market Price (YTL/1000km)	5	3.1	6.0	6.5	12.7	36.1	12.7	84.2
	10	3.3	6.3	6.9	13.4	38.1	13.4	89.0
	20	3.5	6.8	7.4	14.4	40.9	14.4	95.3
	30	4.0	7.6	8.3	16.1	45.6	16.1	106.4
	40	4.6	8.8	9.6	18.7	53.1	18.7	123.9
	50	5.4	10.4	11.3	22.1	62.6	22.1	146.2
	60	6.3	12.1	13.2	25.7	72.8	25.7	170.0
	70	7.4	14.2	15.4	30.0	85.1	30.0	198.6
	80	8.9	17.1	18.6	36.2	102.8	36.2	239.9
	90	10.6	20.4	22.2	43.2	122.6	43.2	286.0
	100	12.5	24.0	26.1	50.9	144.3	50.9	336.8
	110		28.0	30.5	59.3		59.3	
120		32.3	35.2	68.4		68.4		
Tire Cost at Economic Price (YTL/1000km)	5	2.7	5.1	5.5	10.8	30.6	10.8	71.4
	10	2.8	5.4	5.9	11.4	32.3	11.4	75.4
	20	3.0	5.8	6.3	12.2	34.6	12.2	80.8
	30	3.4	6.4	7.0	13.6	38.7	13.6	90.2
	40	3.9	7.5	8.2	15.9	45.0	15.9	105.0
	50	4.6	8.8	9.6	18.7	53.1	18.7	123.9
	60	5.4	10.3	11.2	21.8	61.7	21.8	144.1
	70	6.3	12.0	13.1	25.4	72.1	25.4	168.3
	80	7.6	14.5	15.8	30.7	87.1	30.7	203.3
	90	9.0	17.3	18.8	36.6	103.9	36.6	242.3
	100	10.6	20.4	22.2	43.1	122.3	43.1	285.4
	110		23.7	25.8	50.2		50.2	
120		27.4	29.8	58.0		58.0		

Note : The average wearing rate is applied to the tires running at 55 km/hr.

(5) Repair and Maintenance Cost

Table A-8 Vehicle Repairing and Maintenance Cost

	Motorcycle	Taxi	Passenger Car	Minibus	Bus	Small Truck	Truck
Vehicle Price with Tax	3,640	22,500	39,120	38,600	250,000	42,000	126,700
Tire Set Price with Tax	236	566	617	1,200	4,085	1,200	9,532
Vehicle Body Price except Tire	3,404	21,934	38,503	37,400	245,915	40,800	117,168
Yearly Rate of R&M Cost per Vehicle Body Price	1.0	2.5	0.6	4.0	4.0	6.0	6.0
Yearly R&M Cost at Market Price	34	548	231	1,496	9,837	2,448	7,030
Yearly R&M Cost at Economic Price	29	465	196	1,268	8,336	2,075	5,958
Yearly Running Distance (km)	17,000	83,000	21,000	68,000	68,000	41,000	79,000
R & M Cost (YTL/1000km) at Market Price	2.0	6.6	11.0	22.0	144.7	59.7	89.0
R & M Cost (YTL/1000km) at Economic Price	1.7	5.6	9.3	18.6	122.6	50.6	75.4

Note : According to Consumer Prices Indices Database, maintenance and repair equipment/service for vehicle was estimated at 141 YTL in Istanbul in 2007.

Table A-9 Vehicle Repair and Maintenance Cost by Speed

Repair Rate Index		Motorcycle	Taxi	Passenger Car	Minibus	Bus	Small Truck	Truck
Repair Cost Index by Driving Speed	5	135	151	151	155	155	142	142
	10	122	133	133	131	131	128	128
	20	106	118	118	111	111	112	112
	30	104	105	105	89	89	93	93
	40	100	95	95	74	74	82	82
	50	98	94	94	72	72	74	74
	60	102	100	100	79	79	79	79
	70	108	108	108	88	88	86	86
	80	114	115	115	100	100	92	92
	90	121	122	122	112	112	102	102
	100	126	127	127	117	117	107	107
	110	132	133	133	123	123	113	113
120	139	140	140	130	130	120	120	
Financial Cost	5	2.7	10.0	16.6	34.1	224.2	84.8	126.4
	10	2.4	8.8	14.6	28.8	189.7	76.4	113.9
	20	2.1	7.8	13.0	24.4	160.7	66.9	99.7
	30	2.1	6.9	11.6	19.6	128.6	55.5	82.8
	40	2.0	6.3	10.5	16.4	107.7	49.0	73.0
	50	2.0	6.2	10.3	15.9	104.5	44.2	65.9
	60	2.0	6.6	11.0	17.4	114.1	47.2	70.3
	70	2.2	7.1	11.9	19.3	127.0	51.3	76.5
	80	2.3	7.6	12.7	22.0	144.7	54.9	81.9
	90	2.4	8.1	13.4	24.7	162.3	60.9	90.8
	100	2.5	8.4	14.0	25.8	169.6	63.9	95.2
	110	2.6	8.8	14.6	27.1	178.2	67.5	100.6
120	2.8	9.2	15.4	28.6	188.4	71.6	106.8	
Economic Cost	5	2.3	8.5	14.1	28.9	190.0	71.9	107.1
	10	2.1	7.4	12.4	24.4	160.7	64.8	96.5
	20	1.8	6.6	11.0	20.7	136.2	56.7	84.5
	30	1.8	5.9	9.8	16.6	109.0	47.1	70.1
	40	1.7	5.3	8.9	13.9	91.3	41.5	61.8
	50	1.7	5.3	8.8	13.5	88.5	37.4	55.8
	60	1.7	5.6	9.3	14.7	96.7	40.0	59.6
	70	1.8	6.0	10.1	16.4	107.6	43.5	64.9
	80	1.9	6.4	10.7	18.6	122.6	46.6	69.4
	90	2.1	6.8	11.4	20.9	137.6	51.6	76.9
	100	2.1	7.1	11.8	21.9	143.7	54.1	80.7
	110	2.2	7.4	12.4	23.0	151.1	57.2	85.2
120	2.4	7.8	13.1	24.3	159.6	60.7	90.5	

(6) Depreciation Cost

Table A-10 Depreciation Cost of Vehicle Body

	Motorcycle	Taxi	Passenger Car	Minibus	Bus	Small Truck	Truck
Vehicle Body except Tire							
Market Price (YTL)	3,404	21,934	38,503	37,400	245,915	40,800	117,168
Economic Price (YTL)	2,630	14,534	24,497	28,994	206,305	31,940	91,341
Durable Years	10	10	12	15	20	15	15
Scrapping Value (%)	10	10	10	5	1	5	5
Yearly Depreciation Cost							
Market Price (YTL)	306	1,974	2,888	2,369	12,173	2,584	7,421
Economic Price (YTL)	237	1,308	1,837	1,836	10,212	2,023	5,785
Yearly Running Distance (km)	17,000	83,000	21,000	68,000	68,000	41,000	79,000
Yearly Running Hour (Hour)	680	2,767	600	2,720	2,720	1,171	1,975
Distance Related (%)	50	50	50	70	70	70	70
Time Related (%)	50	50	50	30	30	30	30
Depreciation Cost (/1,000km)							
Market Price (YTL)	9	12	69	24	125	44	66
Economic Price (YTL)	7	8	44	19	105	35	51
Depreciation Cost (/Hour)							
Market Price (YTL)	0.23	0.36	2.41	0.26	1.34	0.66	1.13
Economic Price (YTL)	0.17	0.24	1.53	0.20	1.13	0.52	0.88

Table A-11 Financial and Economic Depreciation Cost subject to Use

	Speed (Km/hour)	Motorcycle	Taxi	Car	Minibus	Bus	Small Truck	Truck
Indices for Depreciation Cost subject to Use (Av. Speed = 100)	5	125	136	136	131	131	131	131
	10	120	130	130	123	123	123	123
	20	116	119	119	108	108	108	108
	30	113	108	108	92	92	92	92
	40	100	100	100	81	81	81	81
	50	100	100	100	80	80	80	80
	60	104	104	104	84	84	84	84
	70	110	110	110	91	91	91	91
	80	116	116	116	99	99	99	99
	90	121	121	121	109	109	109	109
	100	121	121	121	109	109	109	109
	110	121	121	121	109	109	109	109
120	121	121	121	109	109	109	109	
Financial Depreciation Cost subject to Use (R\$/1000km)	5	11.3	16.2	93.8	31.9	163.9	57.7	86.0
	10	10.8	15.5	89.5	30.1	154.4	54.4	81.0
	20	10.5	14.1	81.6	26.4	135.5	47.7	71.1
	30	10.2	12.9	74.5	22.4	115.1	40.5	60.4
	40	9.0	11.9	68.8	19.6	100.9	35.5	53.0
	50	9.0	11.9	68.8	19.5	100.2	35.3	52.6
	60	9.4	12.4	71.6	20.6	105.7	37.2	55.4
	70	9.9	13.1	75.9	22.1	113.8	40.1	59.7
	80	10.4	13.8	79.5	24.3	124.6	43.9	65.4
	90	10.9	14.4	83.1	26.6	136.8	48.2	71.8
	100	10.9	14.4	83.1	26.6	136.8	48.2	71.8
	110	10.9	14.4	83.1	26.6	136.8	48.2	71.8
120	10.9	14.4	83.1	26.6	136.8	48.2	71.8	
Economic Depreciation Cost subject to Use (R\$/1000km)	5	8.7	10.8	59.7	24.7	137.5	45.2	67.1
	10	8.4	10.3	57.0	23.3	129.6	42.6	63.2
	20	8.1	9.4	51.9	20.4	113.6	37.3	55.4
	30	7.9	8.5	47.4	17.4	96.6	31.7	47.1
	40	7.0	7.9	43.7	15.2	84.7	27.8	41.3
	50	7.0	7.9	43.7	15.1	84.1	27.6	41.0
	60	7.3	8.2	45.6	15.9	88.6	29.1	43.2
	70	7.7	8.7	48.3	17.2	95.5	31.4	46.5
	80	8.0	9.1	50.6	18.8	104.6	34.4	51.0
	90	8.4	9.5	52.9	20.6	114.8	37.7	56.0
	100	8.4	9.5	52.9	20.6	114.8	37.7	56.0
	110	8.4	9.5	52.9	20.6	114.8	37.7	56.0
120	8.4	9.5	52.9	20.6	114.8	37.7	56.0	

(7) Capital Opportunity Cost

Table A-12 Capital Opportunity Cost by Type of Vehicle

	Unit	Motorcycle	Taxi	Passenger Car	Minibus	Bus	Small Truck	Truck
Vehicle Cost								
Financial	R\$	3,640	22,500	39120	38,600	250,000	42,000	126,700
Economic	R\$	2,830	15,014	25020	30,011	209,767	32,957	99,419
Tire Cost								
Financial	R\$	236	566	617	1,200	4,085	1,200	9,532
Economic	R\$	200	480	523	1,017	3,462	1,017	8,078
Vehicle Cost w/o Tire								
Financial	R\$	3404	21934	38503	37400	245915	40800	117168
Economic	R\$	2630	14534	24497	28994	206305	31940	91341
Residual Value								
% of Vehicle Cost	%	10	10	10	5	1	5	5
Financial	R\$	340	2,193	3,850	1,870	2,459	2,040	5,858
Economic	R\$	263	1,453	2,450	1,450	2,063	1,597	4,567
Annual Operation.	Km	17000	83000	21000	68000	68000	41000	79000
Average Speed	Km/Hr	25	30	35	25	25	35	40
Vehicle Life	Year	10	10	12	15	20	15	15
Interest rate(i = 12%)		0.12	0.12	0.12	0.12	0.12	0.12	0.12
Capital Opportunity Cost								
Financial	R\$/Day R\$/Hr	0.62 0.33	3.97 0.52	6.96 4.24	6.46 0.87	40.83 5.48	7.04 2.19	20.22 3.74
Economic	R\$/Day R\$/Hr	0.48 0.26	2.63 0.35	4.43 2.69	5.00 0.67	34.25 4.60	5.51 1.72	15.77 2.91

(8) Crew Cost

Table A-13 Crew Cost

	Taxi	Minibus	Bus	Small Truck	Truck
No. of Crew per Vehicle	2.5	2.5	3.1	1.3	2.5
Ave. Monthly Salary	1,000	2,000	2,420	2,000	1,500
Indirect Personnel Cost Rate on Direct Cost	33.0%				
Yearly Direct Cost					
Market Price (YTL)	32,500	65,000	97,526	33,800	48,750
Economic Price (YTL)	24,375	48,750	73,145	25,350	36,563
Yearly Indirect Cost					
Market Price (YTL)	10,725	21,450	32,184	11,154	16,088
Economic Price (YTL)	8,044	16,088	24,138	8,366	12,066
Yearly Running Time (Hours)	2,767	2,720	2,720	1,171	1,975
Crew Cost per hour					
Market Price (YTL)	15.62	31.78	47.69	38.38	32.83
Economic Price (YTL)	11.72	23.84	35.77	28.78	24.62

Note 1: Bus data regarding staff number and personnel cost come from IETT in 2007.

Note 2: Indirect personnel cost includes the company's obligation for employee's social insurance (21.5%) and other management cost.

Note 3: Direct personnel cost excludes tax (10%) and social insurance (15%).

(9) Insurance Cost

Table A-14 Insurance

	Motorcycle	Taxi	Passenger Car	Minibus	Bus	Small Truck	Truck
Yearly Premium Cost(YTR/Yr)	20.0	480.0	128.0	407.0	981.0	205.0	322.0
Its Economic Cost(YTR/Yr)	16.4	393.6	105.0	333.7	804.4	168.1	264.0
Annual running Time	680	2767	600	2720	2720	1171	1975
Insurance Cost per hour							
Financial Cost	0.03	0.17	0.21	0.15	0.36	0.18	0.16
Economic Cost	0.02	0.14	0.17	0.12	0.30	0.14	0.13

(10) VOC Summary

Total A-15 VOC of Distance Proportional and Time Proportional VOC (YTL/1000km)

	Speed (Km/hour)	Motorcycle	Taxi	Passenger Car	Minibus	Bus	Small Truck	Truck
Market Price	5	479.1	4,178.0	1,976.4	8,103.0	19,296.9	9,786.4	12,361.1
	10	292.7	2,164.3	1,111.3	4,177.0	10,128.7	5,067.9	6,618.3
	20	192.3	1,153.5	669.5	2,205.8	5,524.6	2,693.9	3,739.4
	30	144.8	814.9	516.4	1,542.6	3,990.8	1,889.2	2,801.9
	40	128.3	645.2	437.4	1,210.2	3,207.5	1,485.0	2,329.4
	50	115.5	549.9	400.5	1,022.6	2,853.5	1,254.8	2,151.8
	60	126.8	494.2	387.3	911.1	2,734.0	1,121.7	2,147.0
	70	142.4	461.3	387.7	843.2	2,743.9	1,041.5	2,238.5
	80	159.7	444.6	397.5	806.9	2,824.9	997.8	2,381.0
	90	174.2	441.4	416.9	794.9	2,900.7	985.4	2,511.7
	100	190.2	443.0	434.9	790.0	2,995.9	978.9	2,666.4
	110	208.0	451.7	458.1	797.8	3,137.6	987.7	2,839.6
120	228.2	466.5	486.1	816.4	3,319.5	1,009.6	3,048.0	
Economic Price	5	226.7	2,624.6	1,123.2	5,200.7	9,336.7	6,558.2	6,554.1
	10	137.5	1,341.2	623.5	2,655.4	4,904.6	3,366.5	3,478.8
	20	90.1	697.9	368.5	1,378.5	2,669.4	1,761.2	1,933.1
	30	69.0	482.8	280.1	948.5	1,906.3	1,216.1	1,418.7
	40	61.0	375.3	234.7	733.6	1,518.1	942.8	1,165.4
	50	55.6	313.6	212.9	610.5	1,330.7	784.2	1,051.3
	60	60.0	275.4	203.9	534.7	1,251.2	689.5	1,019.3
	70	65.4	250.9	202.3	485.7	1,230.2	629.0	1,032.6
	80	72.3	235.6	205.5	456.0	1,247.4	591.0	1,076.4
	90	78.6	227.1	213.0	439.3	1,272.1	571.3	1,127.5
	100	85.3	221.9	219.6	427.0	1,295.8	554.9	1,186.5
	110	93.0	220.4	228.7	421.7	1,345.6	547.3	1,250.7
120	101.6	221.8	240.0	422.1	1,412.1	547.0	1,329.8	

Table A-16 Summary of Fixed Costs (YTL/hour)

	Motorcycle	Taxi	Passenger Car	Minibus	Bus	Small Truck	Truck
Market Price							
Depreciation	0.23	0.36	2.41	0.26	1.34	0.66	1.13
Capital Opportunity Cost	0.48	2.63	4.43	5.00	34.25	5.51	15.77
Crew	0.00	15.62	0.00	31.78	47.69	38.38	32.83
Insurance	0.03	0.17	0.21	0.15	0.36	0.18	0.16
Total	0.73	18.78	7.05	37.20	83.64	44.73	49.89
Economic Price							
Depreciation	0.17	0.24	1.53	0.20	1.13	0.52	0.88
Capital Opportunity Cost	0.26	0.35	2.69	0.67	4.60	1.72	2.91
Crew	0.00	11.72	0.00	23.84	35.77	28.78	24.62
Insurance	0.02	0.14	0.17	0.12	0.30	0.14	0.13
Total	0.45	12.44	4.40	24.83	41.78	31.16	28.55

Table A-17 Time Proportional VOC (YTL/1000km)

	Speed (Km/hour)	Motorcycle	Taxi	Passenger Car	Minibus	Bus	Small Truck	Truck
Market Price	5	146.0	3,756.4	1,409.9	7,439.7	16,728.6	8,945.0	9,977.0
	10	73.0	1,878.2	704.9	3,719.8	8,364.3	4,472.5	4,988.5
	20	36.5	939.1	352.5	1,859.9	4,182.1	2,236.3	2,494.3
	30	24.3	626.1	235.0	1,239.9	2,788.1	1,490.8	1,662.8
	40	18.3	469.5	176.2	930.0	2,091.1	1,118.1	1,247.1
	50	14.6	375.6	141.0	744.0	1,672.9	894.5	997.7
	60	12.2	313.0	117.5	620.0	1,394.0	745.4	831.4
	70	10.4	268.3	100.7	531.4	1,194.9	638.9	712.6
	80	9.1	234.8	88.1	465.0	1,045.5	559.1	623.6
	90	8.1	208.7	78.3	413.3	929.4	496.9	554.3
	100	7.3	187.8	70.5	372.0	836.4	447.3	498.9
	110	6.6	170.7	64.1	338.2	760.4	406.6	453.5
120	6.1	156.5	58.7	310.0	697.0	372.7	415.7	
Economic Price	5	90.7	2,488.6	880.1	4,966.8	8,356.8	6,232.2	5,709.6
	10	45.3	1,244.3	440.1	2,483.4	4,178.4	3,116.1	2,854.8
	20	22.7	622.1	220.0	1,241.7	2,089.2	1,558.0	1,427.4
	30	15.1	414.8	146.7	827.8	1,392.8	1,038.7	951.6
	40	11.3	311.1	110.0	620.9	1,044.6	779.0	713.7
	50	9.1	248.9	88.0	496.7	835.7	623.2	571.0
	60	7.6	207.4	73.3	413.9	696.4	519.3	475.8
	70	6.5	177.8	62.9	354.8	596.9	445.2	407.8
	80	5.7	155.5	55.0	310.4	522.3	389.5	356.8
	90	5.0	138.3	48.9	275.9	464.3	346.2	317.2
	100	4.5	124.4	44.0	248.3	417.8	311.6	285.5
	110	4.1	113.1	40.0	225.8	379.9	283.3	259.5
120	3.8	103.7	36.7	207.0	348.2	259.7	237.9	

(11) Integrated VOC for Computer Input

Table A-18 Input to Program (YTL/1000km/Vehicle)

	Speed (Km/hour)	Car	Service	Bus	Metro-Bus
Market Price	5	2,636.9	8,103.0	14,819.4	96,484.7
	10	1,427.2	4,177.0	7,748.0	50,643.5
	20	814.7	2,205.8	4,197.1	27,623.0
	30	605.9	1,542.6	3,011.5	19,953.8
	40	499.7	1,210.2	2,408.6	16,037.5
	50	445.3	1,022.6	2,121.2	14,267.6
	60	419.3	911.1	2,004.8	13,669.8
	70	409.8	843.2	1,983.6	13,719.4
	80	411.6	806.9	2,017.7	14,124.7
	90	424.3	794.9	2,058.4	14,503.6
	100	437.3	790.0	2,113.5	14,979.5
	110	456.2	797.8	2,201.7	15,688.0
120	480.2	816.4	2,318.3	16,597.5	
Economic Price	5	1,573.6	5,200.7	7,682.3	46,683.6
	10	838.8	2,655.4	4,004.9	24,523.0
	20	467.3	1,378.5	2,153.0	13,346.9
	30	340.9	948.5	1,523.2	9,531.7
	40	276.9	733.6	1,204.3	7,590.3
	50	243.1	610.5	1,042.6	6,653.6
	60	225.4	534.7	964.6	6,255.9
	70	216.9	485.7	932.4	6,150.8
	80	214.5	456.0	930.8	6,236.9
	90	217.2	439.3	939.0	6,360.3
	100	220.3	427.0	948.3	6,478.9
	110	226.2	421.7	976.0	6,728.0
120	234.5	422.1	1,016.1	7,060.5	

Table A-19 Input to Program All Mode (US\$/Passenger/Km)

No.	km/hr	Car	Service	OT Bus	Tram	Sea (Hatları Route)	Bus (Mini Bus)	Dolmes	Bus (Temsili)
1	0	0.802	0.416	0.615	0.183	0.281	0.615	0.615	0.615
2	5	0.802	0.416	0.615	0.183	0.281	0.615	0.615	0.615
3	10	0.427	0.212	0.320	0.183	0.281	0.320	0.320	0.320
4	20	0.238	0.110	0.172	0.183	0.281	0.172	0.172	0.172
5	30	0.174	0.076	0.122	0.183	0.281	0.122	0.122	0.122
6	40	0.141	0.059	0.096	0.183	0.281	0.096	0.096	0.096
7	50	0.124	0.049	0.083	0.183	0.281	0.083	0.083	0.083
8	60	0.115	0.043	0.077	0.183	0.281	0.077	0.077	0.077
9	70	0.111	0.039	0.075	0.183	0.281	0.075	0.075	0.075
10	80	0.109	0.036	0.074	0.183	0.281	0.074	0.074	0.074
11	90	0.111	0.035	0.075	0.183	0.281	0.075	0.075	0.075
12	100	0.112	0.034	0.076	0.183	0.281	0.076	0.076	0.076
13	110	0.115	0.034	0.078	0.183	0.281	0.078	0.078	0.078
14	120	0.120	0.034	0.081	0.183	0.281	0.081	0.081	0.081
15	999	0.120	0.034	0.081	0.183	0.281	0.081	0.081	0.081

No.	km/hr	Sea (Deniz OTbus)	LRT	National Railway	Marmarai	Metro	Sea (Deniz Birlestiri)	Sea (Deniz Birlestiri)
1	0	0.281	0.212	0.212	0.212	0.256	0.281	0.281
2	5	0.281	0.212	0.212	0.212	0.256	0.281	0.281
3	10	0.281	0.212	0.212	0.212	0.256	0.281	0.281
4	20	0.281	0.212	0.212	0.212	0.256	0.281	0.281
5	30	0.281	0.212	0.212	0.212	0.256	0.281	0.281
6	40	0.281	0.212	0.212	0.212	0.256	0.281	0.281
7	50	0.281	0.212	0.212	0.212	0.256	0.281	0.281
8	60	0.281	0.212	0.212	0.212	0.256	0.281	0.281
9	70	0.281	0.212	0.212	0.212	0.256	0.281	0.281
10	80	0.281	0.212	0.212	0.212	0.256	0.281	0.281
11	90	0.281	0.212	0.212	0.212	0.256	0.281	0.281
12	100	0.281	0.212	0.212	0.212	0.256	0.281	0.281
13	110	0.281	0.212	0.212	0.212	0.256	0.281	0.281
14	120	0.281	0.212	0.212	0.212	0.256	0.281	0.281
15	999	0.281	0.212	0.212	0.212	0.256	0.281	0.281

No.	km/hr	Metro Bus	New Rail	Tram	LRT	National Railway	Marmarai	Metro
1	0	0.051	0.212	0.183	0.212	0.212	0.212	0.256
2	5	0.051	0.212	0.183	0.212	0.212	0.212	0.256
3	10	0.051	0.212	0.183	0.212	0.212	0.212	0.256
4	20	0.051	0.212	0.183	0.212	0.212	0.212	0.256
5	30	0.051	0.212	0.183	0.212	0.212	0.212	0.256
6	40	0.051	0.212	0.183	0.212	0.212	0.212	0.256
7	50	0.051	0.212	0.183	0.212	0.212	0.212	0.256
8	60	0.051	0.212	0.183	0.212	0.212	0.212	0.256
9	70	0.051	0.212	0.183	0.212	0.212	0.212	0.256
10	80	0.051	0.212	0.183	0.212	0.212	0.212	0.256
11	90	0.051	0.212	0.183	0.212	0.212	0.212	0.256
12	100	0.051	0.212	0.183	0.212	0.212	0.212	0.256
13	110	0.051	0.212	0.183	0.212	0.212	0.212	0.256
14	120	0.051	0.212	0.183	0.212	0.212	0.212	0.256
15	999	0.051	0.212	0.183	0.212	0.212	0.212	0.256

3.3 Travel Time Cost

The HIS (2006-2007) interviewed household income and obtained the result: 3.64 YTL/hour as working earnings per hour. It is acceptable when comparing with the minimum wage in Istanbul in 2007: 562 YTL/month or 3.12 YTL/hour. It is therefore suggested that travel time cost during working hours such as trips on business be set at 3.64 YTL and the following discounted rates be adapted to other travel time costs.

- (1) Business trip 1.0 times of 3.65 YTL/hour
- (2) To/From Work 0.5 times of 3.65 YTL/Hour
- (3) Other Purpose 0.0 times of 3.65 YTL/Hour

3.4 Economic Evaluation

Economic evaluation was conducted on proposed projects in “Do Maximum” network in order to determine their priority. Then, main purpose on analysis is to know their relative importance, not their absolute feasibility. By this reason, the analysis was simplified by adopting several assumptions. Main assumptions for economic analysis are as follows.

- (1) Project life of all the projects is assumed to be 30 years starting 2011 to 2040.
- (2) Construction period was assumed to be three years from 2008 to 2010. Project cost was distributed over three years at the rate of 20%, 40% and 40%, respectively.
- (3) Economic cost of all the project was assumed at 85% of the financial cost.
- (4) Annual operating and maintenance cost of road project was assumed at 1.5% of the initial investment amount. the O&M cost of railway was estimated individually, ranging 3.0 to 5.0% of initial cost.
- (5) Benchmark year is 2011 and 2023, for which years annual benefit was estimated based on the results of traffic assignment. For each year between 2011 to 2023, benefit was linearly interpolated.
- (6) Net present value (NPV) was calculated using the discount rate at 12%.
- (7) All the calculation was done at 2008 constant price, Related to this, unit VOC stated in 3.2 was assumed constant, not to change by year while unit TTC stated in 3.3 was changed by year. It is assumed to grow at the same rate of the Gross Regional Domestic Product per capita.

Table 3.4.1 Economic Cost and Benefit of Projects in “Do Maximum” Network

(1) Road Project

Code	Project	Length (km)	Economic Cost (US\$ mil.)	O&M Cost (US\$ Mil.)	Benefit (US\$ Million)		IRR (%)
					2011	2023	
RD001	Tophane - Iplikci Tunnel	1.67	53.4	0.8	66.0	130.1	77.5
RD002	Widening of Hatboyu street (Coastal road Linkage) in Ümraniye	8.07	165.9	2.5	41.9	90.4	26.4
RD003	Bakırköy between D-100 Land Route (İncirli Junction) - Coastal Road (Ataköy Junction) underpass - flyover project	9.45	100.6	1.5	50.3	7.5	29.6
RD004	Widening project between Kıraç and Esenyurt construction road	2.83	8.0	0.1	27.4	41.5	140.0
RD005	Between Hadimköy bridge- Yassıören road, road, junction project	9.23	24.3	0.4	80.9	14.1	131.1
RD006	Beykoz, Mihrabat Street-TEM Highway Linkage project	1.44	10.5	0.2	37.7	20.9	139.6
RD007	Ümraniye, between Küçüksu junction- İsfalt association (Küçüksu street) road rehabilitation project	12.85	43.0	0.6	62.1	140.6	86.9
RD008	Beylerbeyi - Harem Tunnel	4.15	178.5	2.7	81.5	119.1	36.9
RD009	Beylerbeyi - Hekimbasi Tnnel	3.09	157.9	2.4	-13.9	61.2	11.9
RD010	Kadikoy - Moda Tunnel	1.03	41.1	0.6	58.2	12.5	74.7
RD011	Tophane - Haskoy Tunnel	1.19	21.2	0.3	35.0	66.6	92.7
RD012	Road Construction For W. Trade Center by Private Sector	9.24	34.3	0.5	55.2	65.1	87.6
RD013	Küçükçekmece D-100 Highway Çobançeşme Junction - Olympics Road Linkage Road and Junction Project	26.54	248.0	3.7	24.8	84.2	16.2
RD014	Yakuplu Kumcular Servis Road Project	7.29	20.8	0.3	30.6	22.2	80.0
RD015	Derbent Haciosman Tunnel Project	2.87	52.6	0.8	14.4	37.1	29.8
RD016	Armutlualti - Poligon Mah. Tunnel Project	2.68	57.9	0.9	90.1	139.5	87.5
RD017	Armutlualti - Ayazağa Tunnel Project	2.55	62.5	0.9	2.4	94.7	31.5
RD018	Kuyumcu Kent - Otogar - Eyüp Tunnel Project	13.83	282.9	4.2	119.5	51.1	27.4
RD019	Road rehabilitation project between Bağcılar, Malazgirt underpass-Mehmet Akif avenue (8.St-1/3St-1/13 St-2/13 St)	3.10	7.5	0.1	0.3	0.6	2.6
RD020	Tuzla Formula-1 Road Network 6 numbered road project	5.70	21.3	0.3	25.0	10.5	66.4
RD021	Link Road between Malazgirt Rd and Mahmat Akif Bulbari	0.90	3.7	0.1	3.4	16.9	76.1
RD022	Road project in Bakırköy,(D-100 Highway Sefaköy junction - airport A-14 Apron linkage road)	0.52	8.2	0.1	16.2	2.8	93.7
RD023	Sultanbeyli Necip Fazıl street - Kartal TEM linkage road project	0.33	3.5	0.1	2.6	18.6	73.4
RD024	Between Ümraniye Mandıra st - Bağ st road project	0.60	3.8	0.1	0.5	0.1	-5.2
RD025	New linkage road project between Ümraniye Karadeniz street - Mandıra street (continuous section of Hatboyu street)	0.21	3.8	0.1	6.6	4.3	88.4
RD026	Kartal Şehit Ahmet Yalçın St - Arkoz St - Çavuşoğlu St, Adnan Kahveci Viaduct Linkage road junction project	2.02	10.8	0.2	28.5	48.2	121.5
RD027	Ümraniye, between Şile Road Yenidoğan junction - Paşaköy junction road, junction implementation project	4.24	16.4	0.2	24.3	4.2	76.9
RD028	Re-organizing The existing road in Ümraniye Çekmeköy Çavuşbaşı street according to the construction plan as 20m	2.49	6.4	0.1	8.1	1.4	68.6
RD029	Kartal between Tekel street - D-100 road, junction implementation project	2.48	21.3	0.3	54.5	29.8	113.7
RD030	Üsküdar between Zübeyde Hanım Street - Hekimbaşı Çiftlik street construction roads implementation projects	1.34	11.7	0.2	13.7	11.4	68.8
RD031	Beykoz , between Kavacık junction – Çekmeköy junction (Çavuşbaşı road) road, junction implementation project	11.10	26.9	0.4	3.0	68.5	41.9
RD032	West Buyukcekmece Road Network Package	40.46	421.3	6.3	276.3	9.1	37.9
RD033	East Silivri Road network Package	66.30	715.7	10.7	81.6	185.2	14.4
RD034	Silivri Center Road network Package	74.57	703.1	10.5	148.5	192.3	18.9
RD035	West Silivri (Port Area and University Area)	91.85	717.9	10.8	170.4	169.2	19.0

Road Network Package							
RD037	Tuzla Center Road Network Package	58.51	406.0	6.1	154.2	204.7	31.2
RD038	New Motorway west section Package	102.43	820.6	12.3	609.5	426.1	48.2
RD039	New Motorway Kucucekmece section Package	40.49	465.5	7.0	138.8	126.4	22.9
RD040	New Motorway Kagithane section Package	17.30	442.4	6.6	61.7	143.4	17.3
RD041	New Bosphorus Crossing	7.77	716.6	10.7	-17.7	52.6	0.5
RD042	New Motorway Kadikoy Branch Package	10.97	282.6	4.2	57.6	164.5	25.1
RD043	New Motorway Uskdar-Umraniye Package	20.75	306.0	4.6	71.5	33.3	14.2
RD044	New Motorway Umraniye-Tuzla Package	55.98	581.0	8.7	136.9	101.4	17.0
RD045	Widening of TEM Highway (Umranye-Tuzla) Package	69.48	416.8	6.3	97.2	102.6	19.1
RD046	Widening of Connection road (TEM-D100) in Kartal	15.23	95.2	1.4	26.8	53.9	28.0
RD047	Kucucekmece Road Network Package	17.50	115.4	1.7	74.4	105.4	47.5
RD048	Bahcesehir Road Network Package in Avcilar	10.68	172.3	2.6	28.4	220.4	32.9
RD049	New Truck Route for Ambarli Port - Logistic Center(tunnel for about half length)	11.89	305.1	4.6	70.6	127.6	23.2
RD050	E-W Missing Linkage in Gungoren (tunnel)	1.10	48.8	0.7	80.9	14.1	83.4
RD051	N-S Missing Link inBahcelievler (tunnel)	2.40	103.2	1.5	3.9	98.6	25.1
RD052	Connection Tunnel between Bosna Bulvari and Hatboyu St (tunnel)	1.13	44.5	0.7	48.5	8.5	61.0
RD053	Re-Construction of Ankara Road between Pendik and Baglanti Road (incl. 2km new road)	15.43	53.6	0.8	34.3	91.5	53.4
RD054	Connection Road between New Motorway and Uskudar Tunnel (50% tunnel)	4.06	105.3	1.6	80.9	14.1	45.4
RD055	Widening of Kennedy Street between Road Tunnel and Mustafa Kemal St. in Eminonu	1.93	32.5	0.5	10.9	127.3	56.2

(2) Railway Project

Code	Project	Length (km)	Economic Cost (US\$ million)	O&M Cost (US\$ Mil.)	Benefit (US\$ Million)		IRR (%)
					2011	2023	
RL001	Bagcilar - Halkali Light Metro (Extension of C-5 line)	7.30	741.0	17.5	97.3	158.4	13.0
RL002	Tekstilkent - Istoc - Olimpiyat Koyu - Bahcesehir (Ispartakule) Metro (Extension of D-2 line)	11.67	1795.5	52.0	136.9	456.9	12.0
RL003	Umraniye - Bostanci Metro	15.25	1837.5	55.0	39.4	162.7	1.4
RL004	Kartal - Pendik (S. Gokcen Airport) - Tuzla Metro (Extension of C-3)	33.75	1891.5	57.0	108.7	563.5	12.7
RL005	Seyrantepe - Alibeykoy - Gop - Kazlicesme Metro	18.90	1780.5	58.0	117.8	316.0	8.3
RL006	Kartal D-100 - Kartal IDO Monorail	3.46	141.0	5.0	102.9	13.1	41.6
RL007	S. Gokcen Airport - Formula 1 Monorail	8.25	363.0	13.0	23.0	271.9	22.0
RL008	Darusafaka - Cayirbasi Metro (Extension of C-4 line)	1.06	289.5	8.0	100.9	143.2	28.9
RL009	4. Levent - Gultepe Mah. - Sanayi Mah. - Celiktepe Mah. Monorail	4.71	372.0	10.0	27.3	253.9	21.7
RL010	Besiktas - Sariyer Metro	15.05	1180.5	24.0	79.3	290.5	12.0
RL011	Ispartakule -Ambarli - Yakuplu Metro	10.34	1795.5	53.0	69.6	396.1	9.5
RL012	Ispartakule - Kirac - Buyukcekmece - Silivri Suburban Railway	25.02	1978.5	69.0	392.4	654.3	18.5
RL013	Uskdar - Beykoz Metro	15.45	1321.5	37.0	17.5	91.6	-0.6
RL014	Ikitelli Olimpiyat Koyu - Altinsehir Metro (Extension of C-6 line)	15.22	1398.0	40.0	88.1	98.5	1.2
RL015	Ataturk Airport Access Rail (Extension of Marmaray railway)	2.40	240.0	3.0	4.7	69.7	12.4
RL016	Sabiha Gokcen Airport Access Rail	9.27	330.0	0.0	59.9	65.3	16.4
RL017	Seyrantepe - Bosphorus Crossing - Umraniye metro	11.17	1224.0	28.0	-2.2	323.3	10.3
RL018	Topkapi - 2nd Bosphorus Bridge - Goztepe AGT	32.64	1164.0	35.0	98.8	288.1	12.0
RL019	Kadikoy - Ibrahimaga - Esensehir - Sabiha Gokcen Airport Metro	33.83	3547.5	104.0	88.3	350.3	2.5
RL020	Bakirkoy - Beylikpuzu Extension	1.17	90.0	2.0	0.0	36.6	14.3
RL021	Silivri - Gumusyaka Extension	51.79	3300.0	90.0	220.8	847.2	11.9
RL022	Halkali - Hadimkoy Suburban Railway (Extension of Marmaray Project)(Electrification)	20.00	804.0	34.0	452.2	683.6	42.0

Table 3.4.2 Economic Cash Flow and E-IRR of Road Project (1)-(55)

RD001 Tophane - Iplikci Tunnel					RD002 Widening of Hatboyu street (Coastal road Linkage) in Ümraniye					RD003 Bakirkoy between D-100 Land Route (Incirli Junction) - Coastal Road (Atakoy Junction) underpass - flyover project				
(YTL million)					(YTL million)					(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow	Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow	Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	10.7			-10.7										
2009	21.4			-21.4										
2010	21.4			-21.4										
2011		0.8	66.0	65.2										
2012		0.8	71.3	70.5										
2013		0.8	76.7	75.9										
2014		0.8	82.0	81.2										
2015		0.8	87.4	86.5										
2016		0.8	92.7	91.9										
2017		0.8	98.0	97.2										
2018		0.8	103.4	102.6										
2019		0.8	108.7	107.9										
2020		0.8	114.1	113.3										
2021		0.8	119.4	118.6										
2022		0.8	124.8	124.0										
2023		0.8	130.1	129.3										
2024		0.8	130.1	129.3										
2025		0.8	130.1	129.3										
2026		0.8	130.1	129.3										
2027		0.8	130.1	129.3										
2028		0.8	130.1	129.3										
2029		0.8	130.1	129.3										
2030		0.8	130.1	129.3										
2031		0.8	130.1	129.3										
2032		0.8	130.1	129.3										
2033		0.8	130.1	129.3										
2034		0.8	130.1	129.3										
2035		0.8	130.1	129.3										
2036		0.8	130.1	129.3										
2037		0.8	130.1	129.3										
2038		0.8	130.1	129.3										
2039		0.8	130.1	129.3										
2040		0.8	130.1	129.3										
Total	53.4	24.0	3486.4	3409.0										
Economic IRR (%)				77.5%										
NPV (DR=12%, YTL mill.)				587.9										
2008	33.2			-33.2										
2009	66.4			-66.4										
2010	66.4			-66.4										
2011		2.5	41.9	39.4										
2012		2.5	45.9	43.5										
2013		2.5	50.0	47.5										
2014		2.5	54.0	51.5										
2015		2.5	58.1	55.6										
2016		2.5	62.1	59.6										
2017		2.5	66.1	63.6										
2018		2.5	70.2	67.7										
2019		2.5	74.2	71.7										
2020		2.5	78.2	75.8										
2021		2.5	82.3	79.8										
2022		2.5	86.3	83.8										
2023		2.5	90.4	87.9										
2024		2.5	90.4	87.9										
2025		2.5	90.4	87.9										
2026		2.5	90.4	87.9										
2027		2.5	90.4	87.9										
2028		2.5	90.4	87.9										
2029		2.5	90.4	87.9										
2030		2.5	90.4	87.9										
2031		2.5	90.4	87.9										
2032		2.5	90.4	87.9										
2033		2.5	90.4	87.9										
2034		2.5	90.4	87.9										
2035		2.5	90.4	87.9										
2036		2.5	90.4	87.9										
2037		2.5	90.4	87.9										
2038		2.5	90.4	87.9										
2039		2.5	90.4	87.9										
2040		2.5	90.4	87.9										
Total	165.9	74.7	2395.9	2155.3										
Economic IRR (%)				26.4%										
NPV (DR=12%, YTL mill.)				280.7										
2008	20.1			-20.1										
2009	40.2			-40.2										
2010	40.2			-40.2										
2011		1.5	50.3	48.8										
2012		1.5	46.8	45.2										
2013		1.5	43.2	41.7										
2014		1.5	39.6	38.1										
2015		1.5	36.0	34.5										
2016		1.5	32.5	31.0										
2017		1.5	28.9	27.4										
2018		1.5	25.3	23.8										
2019		1.5	21.7	20.2										
2020		1.5	18.2	16.7										
2021		1.5	14.6	13.1										
2022		1.5	11.0	9.5										
2023		1.5	7.5	5.9										
2024		1.5	7.5	5.9										
2025		1.5	7.5	5.9										
2026		1.5	7.5	5.9										
2027		1.5	7.5	5.9										
2028		1.5	7.5	5.9										
2029		1.5	7.5	5.9										
2030		1.5	7.5	5.9										
2031		1.5	7.5	5.9										
2032		1.5	7.5	5.9										
2033		1.5	7.5	5.9										
2034		1.5	7.5	5.9										
2035		1.5	7.5	5.9										
2036		1.5	7.5	5.9										
2037		1.5	7.5	5.9										
2038		1.5	7.5	5.9										
2039		1.5	7.5	5.9										
2040		1.5	7.5	5.9										
Total	100.6	45.2	502.3	356.4										
Economic IRR (%)				29.6%										
NPV (DR=12%, YTL mill.)				86.0										
RD004 Widening project between Kırac and Esenyurt construction road					RD005 Between Hadimkoy bridge- Yassiren road, road, junction project					RD006 Beykoz, Miharabat Street-TEM Highway Linkage project				
(YTL million)					(YTL million)					(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow	Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow	Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	1.6			-1.6										
2009	3.2			-3.2										
2010	3.2			-3.2										
2011		0.1	27.4	27.3										
2012		0.1	28.6	28.4										
2013		0.1	29.7	29.6										
2014		0.1	30.9	30.8										
2015		0.1	32.1	32.0										
2016		0.1	33.3	33.2										
2017		0.1	34.5	34.3										
2018		0.1	35.6	35.5										
2019		0.1	36.8	36.7										
2020		0.1	38.0	37.9										
2021		0.1	39.2	39.1										
2022		0.1	40.4	40.2										
2023		0.1	41.5	41.4										
2024		0.1	41.5	41.4										
2025		0.1	41.5	41.4										
2026		0.1	41.5	41.4										
2027		0.1	41.5	41.4										
2028		0.1	41.5	41.4										
2029		0.1	41.5	41.4										
2030		0.1	41.5	41.4										
2031		0.1	41.5	41.4										
2032		0.1	41.5	41.4										
2033		0.1	41.5	41.4										
2034		0.1	41.5	41.4										
2035		0.1	41.5	41.4										
2036		0.1	41.5	41.4										
2037		0.1	41.5	41.4										
2038		0.1	41.5	41.4										
2039		0.1	41.5	41.4										
2040		0.1	41.5	41.4										
Total	8.0	3.6	1153.9	1142.4										
Economic IRR (%)				140.0%										
NPV (DR=12%, YTL mill.)				214.8										
2008	4.9			-4.9										
2009	9.7			-9.7										
2010	9.7			-9.7										
2011		0.4	80.9	80.5										
2012		0.4	75.3	75.0										
2013		0.4	69.8	69.4										
2014		0.4	64.2	63.8										
2015		0.4	58.6	58.3										
2016		0.4	53.1	52.7										
2017		0.4	47.5	47.1										
2018		0.4	41.9	41.6										
2019		0.4	36.4	36.0										
2020		0.4	30.8	30.4										
2021		0.4	25.2	24.9										
2022		0.4	19.7	19.3										
2023		0.4	14.1	13.7										
2024		0.4	14.1	13.7										
2025		0.4	14.1	13.7										
2026		0.4	14.1	13.7										
2027		0.4	14.1	13.7										
2028		0.4	14.1	13.7										
2029		0.4	14.1	13.7										
2030		0.4	14.1	13.7										
2031		0.4	14.1	13.7										
2032		0.4	14.1	13.7										
2033		0.4	14.1	13.7										
2034		0.4	14.1	13.7										
2035		0.4	14.1	13.7										
2036		0.4	14.1	13.7										
2037		0.4	14.1	13.7										
2038		0.4	14.1	13.7										
2039		0.4	14.1	13.7										
2040		0.4	14.1	13.7										
Total	24.3	10.9	857.2	821.9										
Economic IRR (%)				131.1%										
NPV (DR=12%, YTL mill.)				268.9										
2008	2.1			-2.1										
2009	4.2			-4.2										
2010	4.2			-4.2										
2011		0.2	37.7	37.6										
2012		0.2	36.3	36.2										
2013		0.2	34.9	34.8										
2014		0.2	33.5	33.4										
2015		0.2	32.1	32.0										
2016		0.2	30.7	30.6										
2017		0.2	29.3	29.2										
2018		0.2	27.9	27.8										
2019		0.2	26.5	26.4										
2020		0.2	25.1	25.0										
2021		0.2	23.7	23.6										
2022		0.2	22.3	22.2										
2023		0.2	20.9	20.8										
2024		0.2	20.9	20.8										
2025		0.2	20.9	20.8										
2026		0.2	20.9	20.8										
2027		0.2	20.9	20.8										
2028		0.2	20.9	20.8										
2029		0.2	20.9	20.8										
2030		0.2	20.9	20.8										
2031		0.2	20.9	20.8										
2032		0.2	20.9	20.8										
2033		0.2	20.9	20.8										
2034		0.2	20.9	20.8										
2035		0.2	20.9	20.8										
2036		0.2	20.9	20.8										
2037		0.2	20.9	20.8										
2038		0.2	20.9	20.8										
2039		0.2	20.9	20.8										
2040		0.2	20.9	20.8										
Total	10.5	4.7	737.3	722.1										
Economic IRR (%)				139.6%										
NPV (DR=12%, YTL mill.)				174.5										

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RD007 Umraniye, between Kukuksu junction- Isfalt association (Kukuksu street) road rehabilitation project

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	8.6			-8.6
2009	17.2			-17.2
2010	17.2			-17.2
2011		0.6	62.1	61.5
2012		0.6	68.6	68.0
2013		0.6	75.2	74.5
2014		0.6	81.7	81.1
2015		0.6	88.3	87.6
2016		0.6	94.8	94.2
2017		0.6	101.3	100.7
2018		0.6	107.9	107.2
2019		0.6	114.4	113.8
2020		0.6	121.0	120.3
2021		0.6	127.5	126.9
2022		0.6	134.0	133.4
2023		0.6	140.6	139.9
2024		0.6	140.6	139.9
2025		0.6	140.6	139.9
2026		0.6	140.6	139.9
2027		0.6	140.6	139.9
2028		0.6	140.6	139.9
2029		0.6	140.6	139.9
2030		0.6	140.6	139.9
2031		0.6	140.6	139.9
2032		0.6	140.6	139.9
2033		0.6	140.6	139.9
2034		0.6	140.6	139.9
2035		0.6	140.6	139.9
2036		0.6	140.6	139.9
2037		0.6	140.6	139.9
2038		0.6	140.6	139.9
2039		0.6	140.6	139.9
2040		0.6	140.6	139.9
Total	43.0	19.4	3707.5	3645.2
Economic IRR (%)				86.9%
NPV (DR=12%, YTL mill.)				620.8

RD008 Beylerbeyi - Harem Tunnel

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	35.7			-35.7
2009	71.4			-71.4
2010	71.4			-71.4
2011		2.7	81.5	78.8
2012		2.7	84.6	81.9
2013		2.7	87.8	85.1
2014		2.7	90.9	88.2
2015		2.7	94.0	91.3
2016		2.7	97.1	94.5
2017		2.7	100.3	97.6
2018		2.7	103.4	100.7
2019		2.7	106.5	103.9
2020		2.7	109.7	107.0
2021		2.7	112.8	110.1
2022		2.7	115.9	113.3
2023		2.7	119.1	116.4
2024		2.7	119.1	116.4
2025		2.7	119.1	116.4
2026		2.7	119.1	116.4
2027		2.7	119.1	116.4
2028		2.7	119.1	116.4
2029		2.7	119.1	116.4
2030		2.7	119.1	116.4
2031		2.7	119.1	116.4
2032		2.7	119.1	116.4
2033		2.7	119.1	116.4
2034		2.7	119.1	116.4
2035		2.7	119.1	116.4
2036		2.7	119.1	116.4
2037		2.7	119.1	116.4
2038		2.7	119.1	116.4
2039		2.7	119.1	116.4
2040		2.7	119.1	116.4
Total	178.5	80.3	3327.8	3068.9
Economic IRR (%)				36.9%
NPV (DR=12%, YTL mill.)				485.0

RD009 Beylerbeyi - Hekimbasi Tnnel

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	31.6			-31.6
2009	63.2			-63.2
2010	63.2			-63.2
2011		2.4	-13.9	-16.3
2012		2.4	-7.7	-10.0
2013		2.4	-1.4	-3.8
2014		2.4	4.9	2.5
2015		2.4	11.1	8.7
2016		2.4	17.4	15.0
2017		2.4	23.6	21.3
2018		2.4	29.9	27.5
2019		2.4	36.2	33.8
2020		2.4	42.4	40.1
2021		2.4	48.7	46.3
2022		2.4	55.0	52.6
2023		2.4	61.2	58.9
2024		2.4	61.2	58.9
2025		2.4	61.2	58.9
2026		2.4	61.2	58.9
2027		2.4	61.2	58.9
2028		2.4	61.2	58.9
2029		2.4	61.2	58.9
2030		2.4	61.2	58.9
2031		2.4	61.2	58.9
2032		2.4	61.2	58.9
2033		2.4	61.2	58.9
2034		2.4	61.2	58.9
2035		2.4	61.2	58.9
2036		2.4	61.2	58.9
2037		2.4	61.2	58.9
2038		2.4	61.2	58.9
2039		2.4	61.2	58.9
2040		2.4	61.2	58.9
Total	157.9	71.1	1348.1	1119.1
Economic IRR (%)				11.9%
NPV (DR=12%, YTL mill.)				22.0

RD010 Kadikoy - Moda Tunnel

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	8.2			-8.2
2009	16.5			-16.5
2010	16.5			-16.5
2011		0.6	58.2	57.6
2012		0.6	54.4	53.8
2013		0.6	50.6	50.0
2014		0.6	46.8	46.2
2015		0.6	43.0	42.4
2016		0.6	39.2	38.5
2017		0.6	35.4	34.7
2018		0.6	31.5	30.9
2019		0.6	27.7	27.1
2020		0.6	23.9	23.3
2021		0.6	20.1	19.5
2022		0.6	16.3	15.7
2023		0.6	12.5	11.9
2024		0.6	12.5	11.9
2025		0.6	12.5	11.9
2026		0.6	12.5	11.9
2027		0.6	12.5	11.9
2028		0.6	12.5	11.9
2029		0.6	12.5	11.9
2030		0.6	12.5	11.9
2031		0.6	12.5	11.9
2032		0.6	12.5	11.9
2033		0.6	12.5	11.9
2034		0.6	12.5	11.9
2035		0.6	12.5	11.9
2036		0.6	12.5	11.9
2037		0.6	12.5	11.9
2038		0.6	12.5	11.9
2039		0.6	12.5	11.9
2040		0.6	12.5	11.9
Total	41.1	18.5	672.1	612.5
Economic IRR (%)				74.7%
NPV (DR=12%, YTL mill.)				180.1

RD011 Tophane - Haskoy Tunnel

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	4.2			-4.2
2009	8.5			-8.5
2010	8.5			-8.5
2011		0.3	35.0	34.7
2012		0.3	37.6	37.3
2013		0.3	40.3	40.0
2014		0.3	42.9	42.6
2015		0.3	45.5	45.2
2016		0.3	48.2	47.9
2017		0.3	50.8	50.5
2018		0.3	53.4	53.1
2019		0.3	56.1	55.8
2020		0.3	58.7	58.4
2021		0.3	61.3	61.0
2022		0.3	64.0	63.7
2023		0.3	66.6	66.3
2024		0.3	66.6	66.3
2025		0.3	66.6	66.3
2026		0.3	66.6	66.3
2027		0.3	66.6	66.3
2028		0.3	66.6	66.3
2029		0.3	66.6	66.3
2030		0.3	66.6	66.3
2031		0.3	66.6	66.3
2032		0.3	66.6	66.3
2033		0.3	66.6	66.3
2034		0.3	66.6	66.3
2035		0.3	66.6	66.3
2036		0.3	66.6	66.3
2037		0.3	66.6	66.3
2038		0.3	66.6	66.3
2039		0.3	66.6	66.3
2040		0.3	66.6	66.3
Total	21.2	9.5	1792.9	1762.2
Economic IRR (%)				92.7%
NPV (DR=12%, YTL mill.)				310.2

RD012 Road Construction For W. Trade Center by Private Sector

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	6.9			-6.9
2009	13.7			-13.7
2010	13.7			-13.7
2011		0.5	55.2	54.7
2012		0.5	56.0	55.5
2013		0.5	56.9	56.3
2014		0.5	57.7	57.2
2015		0.5	58.5	58.0
2016		0.5	59.3	58.8
2017		0.5	60.1	59.6
2018		0.5	61.0	60.4
2019		0.5	61.8	61.3
2020		0.5	62.6	62.1
2021		0.5	63.4	62.9
2022		0.5	64.2	63.7
2023		0.5	65.1	64.5
2024		0.5	65.1	64.5
2025		0.5	65.1	64.5
2026		0.5	65.1	64.5
2027		0.5	65.1	64.5
2028		0.5	65.1	64.5
2029		0.5	65.1	64.5
2030		0.5	65.1	64.5
2031		0.5	65.1	64.5
2032		0.5	65.1	64.5
2033		0.5	65.1	64.5
2034		0.5	65.1	64.5
2035		0.5	65.1	64.5
2036		0.5	65.1	64.5
2037		0.5	65.1	64.5
2038		0.5	65.1	64.5
2039		0.5	65.1	64.5
2040		0.5	65.1	64.5
Total	34.3	15.4	1887.6	1837.9
Economic IRR (%)				87.6%
NPV (DR=12%, YTL mill.)				354.0

RD013 Kucukcekmece D-100 Highway Cobancesme Junction - Olympics Road Linkage Road and Junction Project

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	49.6			-49.6
2009	99.2			-99.2
2010	99.2			-99.2
2011		3.7	24.8	21.1
2012		3.7	29.8	26.1
2013		3.7	34.7	31.0
2014		3.7	39.7	36.0
2015		3.7	44.6	40.9
2016		3.7	49.6	45.9
2017		3.7	54.5	50.8
2018		3.7	59.5	55.8
2019		3.7	64.4	60.7
2020		3.7	69.4	65.7
2021		3.7	74.3	70.6
2022		3.7	79.3	75.6
2023		3.7	84.2	80.5
2024		3.7	84.2	80.5
2025		3.7	84.2	80.5
2026		3.7	84.2	80.5
2027		3.7	84.2	80.5
2028		3.7	84.2	80.5
2029		3.7	84.2	80.5
2030		3.7	84.2	80.5
2031		3.7	84.2	80.5
2032		3.7	84.2	80.5
2033		3.7	84.2	80.5
2034		3.7	84.2	80.5
2035		3.7	84.2	80.5
2036		3.7	84.2	80.5
2037		3.7	84.2	80.5
2038		3.7	84.2	80.5
2039		3.7	84.2	80.5
2040		3.7	84.2	80.5
Total	248.0	111.6	2141.0	1781.4
Economic IRR (%)				16.2%
NPV (DR=12%, YTL mill.)				134.9

RD014 Yakuplu Kumcular Servis Road Project

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	4.2			-4.2
2009	8.3			-8.3
2010	8.3			-8.3
2011		0.3	30.6	30.3
2012		0.3	29.9	29.6
2013		0.3	29.2	28.9
2014		0.3	28.5	28.2
2015		0.3	27.8	27.5
2016		0.3	27.1	26.8
2017		0.3	26.4	26.1
2018		0.3	25.7	25.4
2019		0.3	25.0	24.7
2020		0.3	24.3	24.0
2021		0.3	23.6	23.3
2022		0.3	22.9	22.6
2023		0.3	22.2	21.9
2024		0.3	22.2	21.9
2025		0.3	22.2	21.9
2026		0.3	22.2	21.9
2027		0.3	22.2	21.9
2028		0.3	22.2	21.9
2029		0.3	22.2	21.9
2030		0.3	22.2	21.9
2031		0.3	22.2	21.9
2032		0.3	22.2	21.9
2033		0.3	22.2	21.9
2034		0.3	22.2	21.9
2035		0.3	22.2	21.9
2036		0.3	22.2	21.9
2037		0.3	22.2	21.9
2038		0.3	22.2	21.9
2039		0.3	22.2	21.9
2040		0.3	22.2	21.9
Total	20.8	9.4	721.0	690.8
Economic IRR (%)				80.0%
NPV (DR=12%, YTL mill.)				148.1

RD015 Derbent Haciosman Tunnel Project

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	10.5			-10.5
2009	21.0			-21.0
2010	21.0			-21.0
2011		0.8	14.4	13.7
2012		0.8	16.3	15.5
2013		0.8	18.2	17.4
2014		0.8	20.1	19.3
2015		0.8	22.0	21.2
2016		0.8	23.9	23.1
2017		0.8	25.8	25.0
2018		0.8	27.6	26.9
2019		0.8	29.5	28.7
2020		0.8	31.4	30.6
2021		0.8	33.3	32.5
2022		0.8	35.2	34.4
2023		0.8	37.1	36.3
2024		0.8	37.1	36.3
2025		0.8	37.1	36.3
2026		0.8	37.1	36.3
2027		0.8	37.1	36.3
2028		0.8	37.1	36.3
2029		0.8	37.1	36.3
2030		0.8	37.1	36.3
2031		0.8	37.1	36.3
2032		0.8	37.1	36.3
2033		0.8	37.1	36.3
2034		0.8	37.1	36.3
2035		0.8	37.1	36.3
2036		0.8	37.1	36.3
2037		0.8	37.1	36.3
2038		0.8	37.1	36.3
2039		0.8	37.1	36.3
2040		0.8	37.1	36.3
Total	52.6	23.7	965.3	889.0
Economic IRR (%)				29.8%
NPV (DR=12%, YTL mill.)				120.8

RD016 Armutlualti - Poligon Mah. Tunnel Project

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	11.6			-11.6
2009	23.2			-23.2
2010	23.2			-23.2
2011		0.9	90.1	89.2
2012		0.9	94.2	93.4
2013		0.9	98.3	97.5
2014		0.9	102.4	101.6
2015		0.9	106.6	105.7
2016		0.9	110.7	109.8
2017		0.9	114.8	113.9
2018		0.9	118.9	118.0
2019		0.9	123.0	122.2
2020		0.9	127.1	126.3
2021		0.9	131.3	130.4
2022		0.9	135.4	134.5
2023		0.9	139.5	138.6
2024		0.9	139.5	138.6
2025		0.9	139.5	138.6
2026		0.9	139.5	138.6
2027		0.9	139.5	138.6
2028		0.9	139.5	138.6
2029		0.9	139.5	138.6
2030		0.9	139.5	138.6
2031		0.9	139.5	138.6
2032		0.9	139.5	138.6
2033		0.9	139.5	138.6
2034		0.9	139.5	138.6
2035		0.9	139.5	138.6
2036		0.9	139.5	138.6
2037		0.9	139.5	138.6
2038		0.9	139.5	138.6
2039		0.9	139.5	138.6
2040		0.9	139.5	138.6
Total	57.9	26.0	3863.5	3779.5
Economic IRR (%)				87.5%
NPV (DR=12%, YTL mill.)				687.9

RD017 Armutlualti - Ayazaga Tunnel Project

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	12.5			-12.5
2009	25.0			-25.0
2010	25.0			-25.0
2011		0.9	2.4	1.5
2012		0.9	10.1	9.2
2013		0.9	17.8	16.9
2014		0.9	25.5	24.6
2015		0.9	33.2	32.3
2016		0.9	40.9	39.9
2017		0.9	48.6	47.6
2018		0.9	56.2	55.3
2019		0.9	63.9	63.0
2020		0.9	71.6	70.7
2021		0.9	79.3	78.4
2022		0.9	87.0	86.0
2023		0.9	94.7	93.7
2024		0.9	94.7	93.7
2025		0.9	94.7	93.7
2026		0.9	94.7	93.7
2027		0.9	94.7	93.7
2028		0.9	94.7	93.7
2029		0.9	94.7	93.7
2030		0.9	94.7	93.7
2031		0.9	94.7	93.7
2032		0.9	94.7	93.7
2033		0.9	94.7	93.7
2034		0.9	94.7	93.7
2035		0.9	94.7	93.7
2036		0.9	94.7	93.7
2037		0.9	94.7	93.7
2038		0.9	94.7	93.7
2039		0.9	94.7	93.7
2040		0.9	94.7	93.7
Total	62.5	28.1	2240.7	2150.1
Economic IRR (%)				31.5%
NPV (DR=12%, YTL mill.)				269.5

RD018 Kuyumcu Kent - Otogar - Eyup Tunnel Project

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	56.6			-56.6
2009	113.2			-113.2
2010	113.2			-113.2
2011		4.2	119.5	115.2
2012		4.2	113.8	109.5
2013		4.2	108.1	103.8
2014		4.2	102.4	98.1
2015		4.2	96.7	92.4
2016		4.2	91.0	86.7
2017		4.2	85.3	81.0
2018		4.2	79.6	75.3
2019		4.2	73.9	69.6
2020		4.2	68.2	63.9
2021		4.2	62.5	58.2
2022		4.2	56.8	52.5
2023		4.2	51.1	46.8
2024		4.2	51.1	46.8
2025		4.2	51.1	46.8
2026		4.2	51.1	46.8
2027		4.2	51.1	46.8
2028		4.2	51.1	46.8
2029		4.2	51.1	46.8
2030		4.2	51.1	46.8
2031		4.2	51.1	46.8
2032		4.2	51.1	46.8
2033		4.2	51.1	46.8
2034		4.2	51.1	46.8
2035		4.2	51.1	46.8
2036		4.2	51.1	46.8
2037		4.2	51.1	46.8
2038		4.2	51.1	46.8
2039		4.2	51.1	46.8
2040		4.2	51.1	46.8
Total	282.9	127.3	1977.1	1566.9
Economic IRR (%)				27.4%
NPV (DR=12%, YTL mill.)				276.8

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RD019 Road rehabilitation project between Bagcilar, Malazgirt underpass-Mehmet Akif avenue (8.St-1/3St-1/13 St-2/13 St)

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	1.5			-1.5
2009	3.0			-3.0
2010	3.0			-3.0
2011		0.1	0.3	0.2
2012		0.1	0.3	0.2
2013		0.1	0.3	0.2
2014		0.1	0.4	0.2
2015		0.1	0.4	0.3
2016		0.1	0.4	0.3
2017		0.1	0.4	0.3
2018		0.1	0.4	0.3
2019		0.1	0.5	0.4
2020		0.1	0.5	0.4
2021		0.1	0.5	0.4
2022		0.1	0.5	0.4
2023		0.1	0.6	0.4
2024		0.1	0.6	0.4
2025		0.1	0.6	0.4
2026		0.1	0.6	0.4
2027		0.1	0.6	0.4
2028		0.1	0.6	0.4
2029		0.1	0.6	0.4
2030		0.1	0.6	0.4
2031		0.1	0.6	0.4
2032		0.1	0.6	0.4
2033		0.1	0.6	0.4
2034		0.1	0.6	0.4
2035		0.1	0.6	0.4
2036		0.1	0.6	0.4
2037		0.1	0.6	0.4
2038		0.1	0.6	0.4
2039		0.1	0.6	0.4
2040		0.1	0.6	0.4
Total	7.5	3.4	15.0	4.1
Economic IRR (%)				2.6%
NPV (DR=12%, YTL mill.)				-4.0

RD020 Tuzla Formula-1 Road Network 6 numbered road project

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	4.3			-4.3
2009	8.5			-8.5
2010	8.5			-8.5
2011		0.3	25.0	24.7
2012		0.3	23.8	23.5
2013		0.3	22.6	22.3
2014		0.3	21.4	21.1
2015		0.3	20.2	19.9
2016		0.3	19.0	18.6
2017		0.3	17.8	17.4
2018		0.3	16.6	16.2
2019		0.3	15.3	15.0
2020		0.3	14.1	13.8
2021		0.3	12.9	12.6
2022		0.3	11.7	11.4
2023		0.3	10.5	10.2
2024		0.3	10.5	10.2
2025		0.3	10.5	10.2
2026		0.3	10.5	10.2
2027		0.3	10.5	10.2
2028		0.3	10.5	10.2
2029		0.3	10.5	10.2
2030		0.3	10.5	10.2
2031		0.3	10.5	10.2
2032		0.3	10.5	10.2
2033		0.3	10.5	10.2
2034		0.3	10.5	10.2
2035		0.3	10.5	10.2
2036		0.3	10.5	10.2
2037		0.3	10.5	10.2
2038		0.3	10.5	10.2
2039		0.3	10.5	10.2
2040		0.3	10.5	10.2
Total	21.3	9.6	409.7	378.9
Economic IRR (%)				66.4%
NPV (DR=12%, YTL mill.)				91.5

RD021 Link Road between Malazgirt Rd and Mahmat Akif Bulbari

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	0.7			-0.7
2009	1.5			-1.5
2010	1.5			-1.5
2011		0.1	3.4	3.3
2012		0.1	4.5	4.4
2013		0.1	5.6	5.6
2014		0.1	6.7	6.7
2015		0.1	7.9	7.8
2016		0.1	9.0	8.9
2017		0.1	10.1	10.1
2018		0.1	11.2	11.2
2019		0.1	12.4	12.3
2020		0.1	13.5	13.4
2021		0.1	14.6	14.6
2022		0.1	15.7	15.7
2023		0.1	16.9	16.8
2024		0.1	16.9	16.8
2025		0.1	16.9	16.8
2026		0.1	16.9	16.8
2027		0.1	16.9	16.8
2028		0.1	16.9	16.8
2029		0.1	16.9	16.8
2030		0.1	16.9	16.8
2031		0.1	16.9	16.8
2032		0.1	16.9	16.8
2033		0.1	16.9	16.8
2034		0.1	16.9	16.8
2035		0.1	16.9	16.8
2036		0.1	16.9	16.8
2037		0.1	16.9	16.8
2038		0.1	16.9	16.8
2039		0.1	16.9	16.8
2040		0.1	16.9	16.8
Total	3.7	1.6	417.9	412.7
Economic IRR (%)				76.1%
NPV (DR=12%, YTL mill.)				63.5

RD022 Road project in Bakirkoy,(D-100 Highway Sefakoy junction - airport A-14 Apron linkage road)

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	1.6			-1.6
2009	3.3			-3.3
2010	3.3			-3.3
2011		0.1	16.2	16.1
2012		0.1	15.1	14.9
2013		0.1	14.0	13.8
2014		0.1	12.8	12.7
2015		0.1	11.7	11.6
2016		0.1	10.6	10.5
2017		0.1	9.5	9.4
2018		0.1	8.4	8.3
2019		0.1	7.3	7.1
2020		0.1	6.2	6.0
2021		0.1	5.0	4.9
2022		0.1	3.9	3.8
2023		0.1	2.8	2.7
2024		0.1	2.8	2.7
2025		0.1	2.8	2.7
2026		0.1	2.8	2.7
2027		0.1	2.8	2.7
2028		0.1	2.8	2.7
2029		0.1	2.8	2.7
2030		0.1	2.8	2.7
2031		0.1	2.8	2.7
2032		0.1	2.8	2.7
2033		0.1	2.8	2.7
2034		0.1	2.8	2.7
2035		0.1	2.8	2.7
2036		0.1	2.8	2.7
2037		0.1	2.8	2.7
2038		0.1	2.8	2.7
2039		0.1	2.8	2.7
2040		0.1	2.8	2.7
Total	8.2	3.7	171.4	159.5
Economic IRR (%)				93.7%
NPV (DR=12%, YTL mill.)				50.7

RD023 Sultanbeyli Necip Fazil street - Kartal TEM linkage road project

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	0.7			-0.7
2009	1.4			-1.4
2010	1.4			-1.4
2011		0.1	2.6	2.5
2012		0.1	3.9	3.9
2013		0.1	5.2	5.2
2014		0.1	6.6	6.5
2015		0.1	7.9	7.9
2016		0.1	9.3	9.2
2017		0.1	10.6	10.5
2018		0.1	11.9	11.9
2019		0.1	13.3	13.2
2020		0.1	14.6	14.6
2021		0.1	15.9	15.9
2022		0.1	17.3	17.2
2023		0.1	18.6	18.6
2024		0.1	18.6	18.6
2025		0.1	18.6	18.6
2026		0.1	18.6	18.6
2027		0.1	18.6	18.6
2028		0.1	18.6	18.6
2029		0.1	18.6	18.6
2030		0.1	18.6	18.6
2031		0.1	18.6	18.6
2032		0.1	18.6	18.6
2033		0.1	18.6	18.6
2034		0.1	18.6	18.6
2035		0.1	18.6	18.6
2036		0.1	18.6	18.6
2037		0.1	18.6	18.6
2038		0.1	18.6	18.6
2039		0.1	18.6	18.6
2040		0.1	18.6	18.6
Total	3.5	1.6	454.2	449.2
Economic IRR (%)				73.4%
NPV (DR=12%, YTL mill.)				67.2

RD024 Between Umraniye Mandira st - Bag st road project

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	0.8			-0.8
2009	1.5			-1.5
2010	1.5			-1.5
2011		0.1	0.5	0.4
2012		0.1	0.4	0.4
2013		0.1	0.4	0.4
2014		0.1	0.4	0.3
2015		0.1	0.3	0.3
2016		0.1	0.3	0.2
2017		0.1	0.3	0.2
2018		0.1	0.2	0.2
2019		0.1	0.2	0.1
2020		0.1	0.2	0.1
2021		0.1	0.1	0.1
2022		0.1	0.1	0.0
2023		0.1	0.1	0.0
2024		0.1	0.1	0.0
2025		0.1	0.1	0.0
2026		0.1	0.1	0.0
2027		0.1	0.1	0.0
2028		0.1	0.1	0.0
2029		0.1	0.1	0.0
2030		0.1	0.1	0.0
2031		0.1	0.1	0.0
2032		0.1	0.1	0.0
2033		0.1	0.1	0.0
2034		0.1	0.1	0.0
2035		0.1	0.1	0.0
2036		0.1	0.1	0.0
2037		0.1	0.1	0.0
2038		0.1	0.1	0.0
2039		0.1	0.1	0.0
2040		0.1	0.1	0.0
Total	3.8	1.7	4.5	-1.1
Economic IRR (%)				-5.2%
NPV (DR=12%, YTL mill.)				-1.8

RD025 new linkage road project between Umraniye Karadeniz street - Mandira street (continuous section of Hatboyu street)

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	0.8			-0.8
2009	1.5			-1.5
2010	1.5			-1.5
2011		0.1	6.6	6.5
2012		0.1	6.4	6.3
2013		0.1	6.2	6.1
2014		0.1	6.0	5.9
2015		0.1	5.8	5.8
2016		0.1	5.6	5.6
2017		0.1	5.4	5.4
2018		0.1	5.2	5.2
2019		0.1	5.0	5.0
2020		0.1	4.8	4.8
2021		0.1	4.6	4.6
2022		0.1	4.5	4.4
2023		0.1	4.3	4.2
2024		0.1	4.3	4.2
2025		0.1	4.3	4.2
2026		0.1	4.3	4.2
2027		0.1	4.3	4.2
2028		0.1	4.3	4.2
2029		0.1	4.3	4.2
2030		0.1	4.3	4.2
2031		0.1	4.3	4.2
2032		0.1	4.3	4.2
2033		0.1	4.3	4.2
2034		0.1	4.3	4.2
2035		0.1	4.3	4.2
2036		0.1	4.3	4.2
2037		0.1	4.3	4.2
2038		0.1	4.3	4.2
2039		0.1	4.3	4.2
2040		0.1	4.3	4.2
Total	3.8	1.7	142.9	137.3

Economic IRR (%)	88.4%
NPV (DR=12%, YTL mill.)	30.7

RD028 Re-organizing The existing road in Umraniye Cekmekoy Cavusbasi street according to the construction plan as 20m

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	1.3			-1.3
2009	2.6			-2.6
2010	2.6			-2.6
2011		0.1	8.1	8.0
2012		0.1	7.5	7.4
2013		0.1	7.0	6.9
2014		0.1	6.4	6.3
2015		0.1	5.9	5.8
2016		0.1	5.3	5.2
2017		0.1	4.7	4.7
2018		0.1	4.2	4.1
2019		0.1	3.6	3.5
2020		0.1	3.1	3.0
2021		0.1	2.5	2.4
2022		0.1	2.0	1.9
2023		0.1	1.4	1.3
2024		0.1	1.4	1.3
2025		0.1	1.4	1.3
2026		0.1	1.4	1.3
2027		0.1	1.4	1.3
2028		0.1	1.4	1.3
2029		0.1	1.4	1.3
2030		0.1	1.4	1.3
2031		0.1	1.4	1.3
2032		0.1	1.4	1.3
2033		0.1	1.4	1.3
2034		0.1	1.4	1.3
2035		0.1	1.4	1.3
2036		0.1	1.4	1.3
2037		0.1	1.4	1.3
2038		0.1	1.4	1.3
2039		0.1	1.4	1.3
2040		0.1	1.4	1.3
Total	6.4	2.9	85.7	76.5

Economic IRR (%)	68.6%
NPV (DR=12%, YTL mill.)	23.3

RD026 Kartal Sehitt Ahmet Yalcin St - Arkoz St - Cavusoglu St, Adnan Kahveci Viaduct Linkage road junction project

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	2.2			-2.2
2009	4.3			-4.3
2010	4.3			-4.3
2011		0.2	28.5	28.4
2012		0.2	30.2	30.0
2013		0.2	31.8	31.7
2014		0.2	33.5	33.3
2015		0.2	35.1	34.9
2016		0.2	36.7	36.6
2017		0.2	38.4	38.2
2018		0.2	40.0	39.9
2019		0.2	41.7	41.5
2020		0.2	43.3	43.1
2021		0.2	44.9	44.8
2022		0.2	46.6	46.4
2023		0.2	48.2	48.1
2024		0.2	48.2	48.1
2025		0.2	48.2	48.1
2026		0.2	48.2	48.1
2027		0.2	48.2	48.1
2028		0.2	48.2	48.1
2029		0.2	48.2	48.1
2030		0.2	48.2	48.1
2031		0.2	48.2	48.1
2032		0.2	48.2	48.1
2033		0.2	48.2	48.1
2034		0.2	48.2	48.1
2035		0.2	48.2	48.1
2036		0.2	48.2	48.1
2037		0.2	48.2	48.1
2038		0.2	48.2	48.1
2039		0.2	48.2	48.1
2040		0.2	48.2	48.1
Total	10.8	4.9	1318.9	1303.3

Economic IRR (%)	121.5%
NPV (DR=12%, YTL mill.)	238.3

RD029 Kartal between Tekel street - D-100 road, junction implementation project

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	4.3			-4.3
2009	8.5			-8.5
2010	8.5			-8.5
2011		0.3	54.5	54.2
2012		0.3	52.5	52.2
2013		0.3	50.4	50.1
2014		0.3	48.4	48.0
2015		0.3	46.3	46.0
2016		0.3	44.2	43.9
2017		0.3	42.2	41.9
2018		0.3	40.1	39.8
2019		0.3	38.0	37.7
2020		0.3	36.0	35.7
2021		0.3	33.9	33.6
2022		0.3	31.9	31.5
2023		0.3	29.8	29.5
2024		0.3	29.8	29.5
2025		0.3	29.8	29.5
2026		0.3	29.8	29.5
2027		0.3	29.8	29.5
2028		0.3	29.8	29.5
2029		0.3	29.8	29.5
2030		0.3	29.8	29.5
2031		0.3	29.8	29.5
2032		0.3	29.8	29.5
2033		0.3	29.8	29.5
2034		0.3	29.8	29.5
2035		0.3	29.8	29.5
2036		0.3	29.8	29.5
2037		0.3	29.8	29.5
2038		0.3	29.8	29.5
2039		0.3	29.8	29.5
2040		0.3	29.8	29.5
Total	21.3	9.6	1054.8	1024.0

Economic IRR (%)	113.7%
NPV (DR=12%, YTL mill.)	245.1

RD027 Umraniye, between Sile Road Yenidogan junction - Pasakoy junction road, junction implementation project

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	3.3			-3.3
2009	6.6			-6.6
2010	6.6			-6.6
2011		0.2	24.3	24.0
2012		0.2	22.6	22.4
2013		0.2	20.9	20.7
2014		0.2	19.3	19.0
2015		0.2	17.6	17.3
2016		0.2	15.9	15.7
2017		0.2	14.2	14.0
2018		0.2	12.6	12.3
2019		0.2	10.9	10.7
2020		0.2	9.2	9.0
2021		0.2	7.6	7.3
2022		0.2	5.9	5.7
2023		0.2	4.2	4.0
2024		0.2	4.2	4.0
2025		0.2	4.2	4.0
2026		0.2	4.2	4.0
2027		0.2	4.2	4.0
2028		0.2	4.2	4.0
2029		0.2	4.2	4.0
2030		0.2	4.2	4.0
2031		0.2	4.2	4.0
2032		0.2	4.2	4.0
2033		0.2	4.2	4.0
2034		0.2	4.2	4.0
2035		0.2	4.2	4.0
2036		0.2	4.2	4.0
2037		0.2	4.2	4.0
2038		0.2	4.2	4.0
2039		0.2	4.2	4.0
2040		0.2	4.2	4.0
Total	16.4	7.4	257.2	233.4

Economic IRR (%)	76.9%
NPV (DR=12%, YTL mill.)	72.5

RD030 Uskudar between Zubeyde Hanim Street - Hekimbasi Ciftlik street construction roads implementation projects

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	2.3			-2.3
2009	4.7			-4.7
2010	4.7			-4.7
2011		0.2	13.7	13.5
2012		0.2	13.5	13.4
2013		0.2	13.3	13.2
2014		0.2	13.1	13.0
2015		0.2	13.0	12.8
2016		0.2	12.8	12.6
2017		0.2	12.6	12.4
2018		0.2	12.4	12.2
2019		0.2	12.2	12.0
2020		0.2	12.0	11.8
2021		0.2	11.8	11.6
2022		0.2	11.6	11.4
2023		0.2	11.4	11.2
2024		0.2	11.4	11.2
2025		0.2	11.4	11.2
2026		0.2	11.4	11.2
2027		0.2	11.4	11.2
2028		0.2	11.4	11.2
2029		0.2	11.4	11.2
2030		0.2	11.4	11.2
2031		0.2	11.4	11.2
2032		0.2	11.4	11.2
2033		0.2	11.4	11.2
2034		0.2	11.4	11.2
2035		0.2	11.4	11.2
2036		0.2	11.4	11.2
2037		0.2	11.4	11.2
2038		0.2	11.4	11.2
2039		0.2	11.4	11.2
2040		0.2	11.4	11.2
Total	11.7	5.3	357.4	340.4

Economic IRR (%)	68.8%
NPV (DR=12%, YTL mill.)	69.1

RD031 Beykoz , between Kavacik junction – Cekmekoy junction (Cavusbasi road) road, junction implementation project

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	5.4			-5.4
2009	10.7			-10.7
2010	10.7			-10.7
2011		0.4	3.0	2.6
2012		0.4	8.5	8.1
2013		0.4	13.9	13.5
2014		0.4	19.4	19.0
2015		0.4	24.8	24.4
2016		0.4	30.3	29.9
2017		0.4	35.7	35.3
2018		0.4	41.2	40.8
2019		0.4	46.6	46.2
2020		0.4	52.1	51.7
2021		0.4	57.6	57.1
2022		0.4	63.0	62.6
2023		0.4	68.5	68.1
2024		0.4	68.5	68.1
2025		0.4	68.5	68.1
2026		0.4	68.5	68.1
2027		0.4	68.5	68.1
2028		0.4	68.5	68.1
2029		0.4	68.5	68.1
2030		0.4	68.5	68.1
2031		0.4	68.5	68.1
2032		0.4	68.5	68.1
2033		0.4	68.5	68.1
2034		0.4	68.5	68.1
2035		0.4	68.5	68.1
2036		0.4	68.5	68.1
2037		0.4	68.5	68.1
2038		0.4	68.5	68.1
2039		0.4	68.5	68.1
2040		0.4	68.5	68.1
Total	26.9	12.1	1628.3	1589.4
Economic IRR (%)				41.9%
NPV (DR=12%, YTL mill.)				215.1

RD032 West Buyukcekmece Road Network Package

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	84.3			-84.3
2009	168.5			-168.5
2010	168.5			-168.5
2011		6.3	276.3	270.0
2012		6.3	254.1	247.8
2013		6.3	231.8	225.5
2014		6.3	209.5	203.2
2015		6.3	187.3	180.9
2016		6.3	165.0	158.7
2017		6.3	142.7	136.4
2018		6.3	120.4	114.1
2019		6.3	98.2	91.9
2020		6.3	75.9	69.6
2021		6.3	53.6	47.3
2022		6.3	31.4	25.0
2023		6.3	9.1	2.8
2024		6.3	9.1	2.8
2025		6.3	9.1	2.8
2026		6.3	9.1	2.8
2027		6.3	9.1	2.8
2028		6.3	9.1	2.8
2029		6.3	9.1	2.8
2030		6.3	9.1	2.8
2031		6.3	9.1	2.8
2032		6.3	9.1	2.8
2033		6.3	9.1	2.8
2034		6.3	9.1	2.8
2035		6.3	9.1	2.8
2036		6.3	9.1	2.8
2037		6.3	9.1	2.8
2038		6.3	9.1	2.8
2039		6.3	9.1	2.8
2040		6.3	9.1	2.8
Total	421.3	189.6	2009.9	1399.0
Economic IRR (%)				37.9%
NPV (DR=12%, YTL mill.)				483.0

RD033 East Silivri Road network Package

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	143.1			-143.1
2009	286.3			-286.3
2010	286.3			-286.3
2011		10.7	81.6	70.9
2012		10.7	90.2	79.5
2013		10.7	98.9	88.1
2014		10.7	107.5	96.8
2015		10.7	116.1	105.4
2016		10.7	124.8	114.0
2017		10.7	133.4	122.6
2018		10.7	142.0	131.3
2019		10.7	150.6	139.9
2020		10.7	159.3	148.5
2021		10.7	167.9	157.2
2022		10.7	176.5	165.8
2023		10.7	185.2	174.4
2024		10.7	185.2	174.4
2025		10.7	185.2	174.4
2026		10.7	185.2	174.4
2027		10.7	185.2	174.4
2028		10.7	185.2	174.4
2029		10.7	185.2	174.4
2030		10.7	185.2	174.4
2031		10.7	185.2	174.4
2032		10.7	185.2	174.4
2033		10.7	185.2	174.4
2034		10.7	185.2	174.4
2035		10.7	185.2	174.4
2036		10.7	185.2	174.4
2037		10.7	185.2	174.4
2038		10.7	185.2	174.4
2039		10.7	185.2	174.4
2040		10.7	185.2	174.4
Total	715.7	322.1	4881.9	3844.1
Economic IRR (%)				14.4%
NPV (DR=12%, YTL mill.)				224.7

RD034 Silivri Center Road network Package

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	140.6			-140.6
2009	281.2			-281.2
2010	281.2			-281.2
2011		10.5	148.5	137.9
2012		10.5	152.1	141.6
2013		10.5	155.8	145.2
2014		10.5	159.4	148.9
2015		10.5	163.1	152.5
2016		10.5	166.7	156.2
2017		10.5	170.4	159.8
2018		10.5	174.0	163.5
2019		10.5	177.7	167.1
2020		10.5	181.3	170.8
2021		10.5	185.0	174.4
2022		10.5	188.6	178.1
2023		10.5	192.3	181.8
2024		10.5	192.3	181.8
2025		10.5	192.3	181.8
2026		10.5	192.3	181.8
2027		10.5	192.3	181.8
2028		10.5	192.3	181.8
2029		10.5	192.3	181.8
2030		10.5	192.3	181.8
2031		10.5	192.3	181.8
2032		10.5	192.3	181.8
2033		10.5	192.3	181.8
2034		10.5	192.3	181.8
2035		10.5	192.3	181.8
2036		10.5	192.3	181.8
2037		10.5	192.3	181.8
2038		10.5	192.3	181.8
2039		10.5	192.3	181.8
2040		10.5	192.3	181.8
Total	703.1	316.4	5484.2	4464.6
Economic IRR (%)				18.9%
NPV (DR=12%, YTL mill.)				461.1

RD035 West Silivri (Port Area and University Area) Road Network Package

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	143.6			-143.6
2009	287.2			-287.2
2010	287.2			-287.2
2011		10.8	170.4	159.7
2012		10.8	170.3	159.6
2013		10.8	170.2	159.5
2014		10.8	170.1	159.4
2015		10.8	170.0	159.3
2016		10.8	169.9	159.2
2017		10.8	169.8	159.1
2018		10.8	169.7	159.0
2019		10.8	169.6	158.9
2020		10.8	169.5	158.8
2021		10.8	169.4	158.7
2022		10.8	169.3	158.6
2023		10.8	169.2	158.5
2024		10.8	169.2	158.5
2025		10.8	169.2	158.5
2026		10.8	169.2	158.5
2027		10.8	169.2	158.5
2028		10.8	169.2	158.5
2029		10.8	169.2	158.5
2030		10.8	169.2	158.5
2031		10.8	169.2	158.5
2032		10.8	169.2	158.5
2033		10.8	169.2	158.5
2034		10.8	169.2	158.5
2035		10.8	169.2	158.5
2036		10.8	169.2	158.5
2037		10.8	169.2	158.5
2038		10.8	169.2	158.5
2039		10.8	169.2	158.5
2040		10.8	169.2	158.5
Total	717.9	323.1	5084.5	4043.5
Economic IRR (%)				19.0%
NPV (DR=12%, YTL mill.)				436.2

RD037 Tuzla Center Road Network Package

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	81.2			-81.2
2009	162.4			-162.4
2010	162.4			-162.4
2011		6.1	154.2	148.1
2012		6.1	158.4	152.3
2013		6.1	162.6	156.5
2014		6.1	166.8	160.7
2015		6.1	171.0	164.9
2016		6.1	175.2	169.1
2017		6.1	179.4	173.3
2018		6.1	183.7	177.6
2019		6.1	187.9	181.8
2020		6.1	192.1	186.0
2021		6.1	196.3	190.2
2022		6.1	200.5	194.4
2023		6.1	204.7	198.6
2024		6.1	204.7	198.6
2025		6.1	204.7	198.6
2026		6.1	204.7	198.6
2027		6.1	204.7	198.6
2028		6.1	204.7	198.6
2029		6.1	204.7	198.6
2030		6.1	204.7	198.6
2031		6.1	204.7	198.6
2032		6.1	204.7	198.6
2033		6.1	204.7	198.6
2034		6.1	204.7	198.6
2035		6.1	204.7	198.6
2036		6.1	204.7	198.6
2037		6.1	204.7	198.6
2038		6.1	204.7	198.6
2039		6.1	204.7	198.6
2040		6.1	204.7	198.6
Total	406.0	182.7	5813.0	5224.3
Economic IRR (%)				31.2%
NPV (DR=12%, YTL mill.)				787.0

RD038 New Motorway west section Package

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	164.1			-164.1
2009	328.2			-328.2
2010	328.2			-328.2
2011		12.3	609.5	597.2
2012		12.3	594.3	581.9
2013		12.3	579.0	566.7
2014		12.3	563.7	551.4
2015		12.3	548.4	536.1
2016		12.3	533.1	520.8
2017		12.3	517.8	505.5
2018		12.3	502.6	490.2
2019		12.3	487.3	475.0
2020		12.3	472.0	459.7
2021		12.3	456.7	444.4
2022		12.3	441.4	429.1
2023		12.3	426.1	413.8
2024		12.3	426.1	413.8
2025		12.3	426.1	413.8
2026		12.3	426.1	413.8
2027		12.3	426.1	413.8
2028		12.3	426.1	413.8
2029		12.3	426.1	413.8
2030		12.3	426.1	413.8
2031		12.3	426.1	413.8
2032		12.3	426.1	413.8
2033		12.3	426.1	413.8
2034		12.3	426.1	413.8
2035		12.3	426.1	413.8
2036		12.3	426.1	413.8
2037		12.3	426.1	413.8
2038		12.3	426.1	413.8
2039		12.3	426.1	413.8
2040		12.3	426.1	413.8
Total	820.6	369.3	13976.3	12786.4
Economic IRR (%)				48.2%
NPV (DR=12%, YTL mill.)				2,528.4

RD039 New Motorway Kucekmece section Package

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	93.1			-93.1
2009	186.2			-186.2
2010	186.2			-186.2
2011		7.0	138.8	131.8
2012		7.0	137.8	130.8
2013		7.0	136.8	129.8
2014		7.0	135.7	128.7
2015		7.0	134.7	127.7
2016		7.0	133.7	126.7
2017		7.0	132.6	125.6
2018		7.0	131.6	124.6
2019		7.0	130.6	123.6
2020		7.0	129.5	122.5
2021		7.0	128.5	121.5
2022		7.0	127.5	120.5
2023		7.0	126.4	119.4
2024		7.0	126.4	119.4
2025		7.0	126.4	119.4
2026		7.0	126.4	119.4
2027		7.0	126.4	119.4
2028		7.0	126.4	119.4
2029		7.0	126.4	119.4
2030		7.0	126.4	119.4
2031		7.0	126.4	119.4
2032		7.0	126.4	119.4
2033		7.0	126.4	119.4
2034		7.0	126.4	119.4
2035		7.0	126.4	119.4
2036		7.0	126.4	119.4
2037		7.0	126.4	119.4
2038		7.0	126.4	119.4
2039		7.0	126.4	119.4
2040		7.0	126.4	119.4
Total	465.5	209.5	3873.5	3198.4
Economic IRR (%)				22.9%
NPV (DR=12%, YTL mill.)				424.1

RD040 New Motorway Kagithane section Package

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	88.5			-88.5
2009	177.0			-177.0
2010	177.0			-177.0
2011		6.6	61.7	55.1
2012		6.6	68.5	61.9
2013		6.6	75.3	68.7
2014		6.6	82.1	75.5
2015		6.6	88.9	82.3
2016		6.6	95.7	89.1
2017		6.6	102.6	95.9
2018		6.6	109.4	102.7
2019		6.6	116.2	109.5
2020		6.6	123.0	116.3
2021		6.6	129.8	123.1
2022		6.6	136.6	129.9
2023		6.6	143.4	136.7
2024		6.6	143.4	136.7
2025		6.6	143.4	136.7
2026		6.6	143.4	136.7
2027		6.6	143.4	136.7
2028		6.6	143.4	136.7
2029		6.6	143.4	136.7
2030		6.6	143.4	136.7
2031		6.6	143.4	136.7
2032		6.6	143.4	136.7
2033		6.6	143.4	136.7
2034		6.6	143.4	136.7
2035		6.6	143.4	136.7
2036		6.6	143.4	136.7
2037		6.6	143.4	136.7
2038		6.6	143.4	136.7
2039		6.6	143.4	136.7
2040		6.6	143.4	136.7
Total	442.4	199.1	3770.6	3129.1
Economic IRR (%)				17.3%
NPV (DR=12%, YTL mill.)				270.0

RD041 New Bosphorus Crossing

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	143.3			-143.3
2009	286.6			-286.6
2010	286.6			-286.6
2011		10.7	-17.7	-28.4
2012		10.7	-11.8	-22.6
2013		10.7	-6.0	-16.7
2014		10.7	-0.1	-10.9
2015		10.7	5.8	-5.0
2016		10.7	11.6	0.9
2017		10.7	17.5	6.7
2018		10.7	23.3	12.6
2019		10.7	29.2	18.5
2020		10.7	35.1	24.3
2021		10.7	40.9	30.2
2022		10.7	46.8	36.0
2023		10.7	52.6	41.9
2024		10.7	52.6	41.9
2025		10.7	52.6	41.9
2026		10.7	52.6	41.9
2027		10.7	52.6	41.9
2028		10.7	52.6	41.9
2029		10.7	52.6	41.9
2030		10.7	52.6	41.9
2031		10.7	52.6	41.9
2032		10.7	52.6	41.9
2033		10.7	52.6	41.9
2034		10.7	52.6	41.9
2035		10.7	52.6	41.9
2036		10.7	52.6	41.9
2037		10.7	52.6	41.9
2038		10.7	52.6	41.9
2039		10.7	52.6	41.9
2040		10.7	52.6	41.9
Total	716.6	322.4	1122.1	83.1
Economic IRR (%)				0.5%
NPV (DR=12%, YTL mill.)				-520.3

RD042 New Motorway Kadikoy Branch Package

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	56.5			-56.5
2009	113.1			-113.1
2010	113.1			-113.1
2011		4.2	57.6	53.4
2012		4.2	66.5	62.3
2013		4.2	75.4	71.2
2014		4.2	84.3	80.1
2015		4.2	93.2	89.0
2016		4.2	102.1	97.9
2017		4.2	111.1	106.8
2018		4.2	120.0	115.7
2019		4.2	128.9	124.6
2020		4.2	137.8	133.5
2021		4.2	146.7	142.5
2022		4.2	155.6	151.4
2023		4.2	164.5	160.3
2024		4.2	164.5	160.3
2025		4.2	164.5	160.3
2026		4.2	164.5	160.3
2027		4.2	164.5	160.3
2028		4.2	164.5	160.3
2029		4.2	164.5	160.3
2030		4.2	164.5	160.3
2031		4.2	164.5	160.3
2032		4.2	164.5	160.3
2033		4.2	164.5	160.3
2034		4.2	164.5	160.3
2035		4.2	164.5	160.3
2036		4.2	164.5	160.3
2037		4.2	164.5	160.3
2038		4.2	164.5	160.3
2039		4.2	164.5	160.3
2040		4.2	164.5	160.3
Total	282.6	127.2	4240.4	3830.6
Economic IRR (%)				25.1%
NPV (DR=12%, YTL mill.)				472.3

RD043 New Motorway Uskdar-Umraniye Package

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	61.2			-61.2
2009	122.4			-122.4
2010	122.4			-122.4
2011		4.6	71.5	66.9
2012		4.6	68.3	63.7
2013		4.6	65.1	60.6
2014		4.6	62.0	57.4
2015		4.6	58.8	54.2
2016		4.6	55.6	51.0
2017		4.6	52.4	47.8
2018		4.6	49.2	44.6
2019		4.6	46.0	41.4
2020		4.6	42.8	38.2
2021		4.6	39.6	35.0
2022		4.6	36.4	31.9
2023		4.6	33.3	28.7
2024		4.6	33.3	28.7
2025		4.6	33.3	28.7
2026		4.6	33.3	28.7
2027		4.6	33.3	28.7
2028		4.6	33.3	28.7
2029		4.6	33.3	28.7
2030		4.6	33.3	28.7
2031		4.6	33.3	28.7
2032		4.6	33.3	28.7
2033		4.6	33.3	28.7
2034		4.6	33.3	28.7
2035		4.6	33.3	28.7
2036		4.6	33.3	28.7
2037		4.6	33.3	28.7
2038		4.6	33.3	28.7
2039		4.6	33.3	28.7
2040		4.6	33.3	28.7
Total	306.0	137.7	1246.5	802.8
Economic IRR (%)				14.2%
NPV (DR=12%, YTL mill.)				51.9

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RD044 New Motorway Umraniye-Tuzla Package

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	116.2			-116.2
2009	232.4			-232.4
2010	232.4			-232.4
2011		8.7	136.9	128.2
2012		8.7	133.9	125.2
2013		8.7	131.0	122.3
2014		8.7	128.0	119.3
2015		8.7	125.1	116.3
2016		8.7	122.1	113.4
2017		8.7	119.2	110.4
2018		8.7	116.2	107.5
2019		8.7	113.2	104.5
2020		8.7	110.3	101.6
2021		8.7	107.3	98.6
2022		8.7	104.4	95.7
2023		8.7	101.4	92.7
2024		8.7	101.4	92.7
2025		8.7	101.4	92.7
2026		8.7	101.4	92.7
2027		8.7	101.4	92.7
2028		8.7	101.4	92.7
2029		8.7	101.4	92.7
2030		8.7	101.4	92.7
2031		8.7	101.4	92.7
2032		8.7	101.4	92.7
2033		8.7	101.4	92.7
2034		8.7	101.4	92.7
2035		8.7	101.4	92.7
2036		8.7	101.4	92.7
2037		8.7	101.4	92.7
2038		8.7	101.4	92.7
2039		8.7	101.4	92.7
2040		8.7	101.4	92.7
Total	581.0	261.4	3273.3	2430.9
Economic IRR (%)				17.0%
NPV (DR=12%, YTL mill.)				230.4

RD045 Widening of TEM Highway (Umraniye-Tuzla) Package

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	83.4			-83.4
2009	166.7			-166.7
2010	166.7			-166.7
2011		6.3	97.2	90.9
2012		6.3	97.6	91.4
2013		6.3	98.1	91.8
2014		6.3	98.5	92.3
2015		6.3	99.0	92.7
2016		6.3	99.4	93.2
2017		6.3	99.9	93.6
2018		6.3	100.3	94.1
2019		6.3	100.8	94.5
2020		6.3	101.2	95.0
2021		6.3	101.7	95.4
2022		6.3	102.1	95.9
2023		6.3	102.6	96.3
2024		6.3	102.6	96.3
2025		6.3	102.6	96.3
2026		6.3	102.6	96.3
2027		6.3	102.6	96.3
2028		6.3	102.6	96.3
2029		6.3	102.6	96.3
2030		6.3	102.6	96.3
2031		6.3	102.6	96.3
2032		6.3	102.6	96.3
2033		6.3	102.6	96.3
2034		6.3	102.6	96.3
2035		6.3	102.6	96.3
2036		6.3	102.6	96.3
2037		6.3	102.6	96.3
2038		6.3	102.6	96.3
2039		6.3	102.6	96.3
2040		6.3	102.6	96.3
Total	416.8	187.6	3041.7	2437.2
Economic IRR (%)				19.1%
NPV (DR=12%, YTL mill.)				262.3

RD046 Widening of Connection road (TEM-D100) in Kartal

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	19.0			-19.0
2009	38.1			-38.1
2010	38.1			-38.1
2011		1.4	26.8	25.3
2012		1.4	29.0	27.6
2013		1.4	31.3	29.9
2014		1.4	33.6	32.1
2015		1.4	35.8	34.4
2016		1.4	38.1	36.6
2017		1.4	40.3	38.9
2018		1.4	42.6	41.2
2019		1.4	44.9	43.4
2020		1.4	47.1	45.7
2021		1.4	49.4	47.9
2022		1.4	51.6	50.2
2023		1.4	53.9	52.5
2024		1.4	53.9	52.5
2025		1.4	53.9	52.5
2026		1.4	53.9	52.5
2027		1.4	53.9	52.5
2028		1.4	53.9	52.5
2029		1.4	53.9	52.5
2030		1.4	53.9	52.5
2031		1.4	53.9	52.5
2032		1.4	53.9	52.5
2033		1.4	53.9	52.5
2034		1.4	53.9	52.5
2035		1.4	53.9	52.5
2036		1.4	53.9	52.5
2037		1.4	53.9	52.5
2038		1.4	53.9	52.5
2039		1.4	53.9	52.5
2040		1.4	53.9	52.5
Total	95.2	42.8	1440.5	1302.4
Economic IRR (%)				28.0%
NPV (DR=12%, YTL mill.)				176.1

RD047 Kucucekmece Road Network Package

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	23.1			-23.1
2009	46.2			-46.2
2010	46.2			-46.2
2011		1.7	74.4	72.7
2012		1.7	77.0	75.2
2013		1.7	79.6	77.8
2014		1.7	82.1	80.4
2015		1.7	84.7	83.0
2016		1.7	87.3	85.6
2017		1.7	89.9	88.2
2018		1.7	92.5	90.7
2019		1.7	95.1	93.3
2020		1.7	97.6	95.9
2021		1.7	100.2	98.5
2022		1.7	102.8	101.1
2023		1.7	105.4	103.7
2024		1.7	105.4	103.7
2025		1.7	105.4	103.7
2026		1.7	105.4	103.7
2027		1.7	105.4	103.7
2028		1.7	105.4	103.7
2029		1.7	105.4	103.7
2030		1.7	105.4	103.7
2031		1.7	105.4	103.7
2032		1.7	105.4	103.7
2033		1.7	105.4	103.7
2034		1.7	105.4	103.7
2035		1.7	105.4	103.7
2036		1.7	105.4	103.7
2037		1.7	105.4	103.7
2038		1.7	105.4	103.7
2039		1.7	105.4	103.7
2040		1.7	105.4	103.7
Total	115.4	51.9	2960.2	2792.8
Economic IRR (%)				47.5%
NPV (DR=12%, YTL mill.)				474.3

RD048 Bahcesehir Road Network Package in Avcilar

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	34.5			-34.5
2009	68.9			-68.9
2010	68.9			-68.9
2011		2.6	28.4	25.9
2012		2.6	44.4	41.9
2013		2.6	60.4	57.8
2014		2.6	76.4	73.8
2015		2.6	92.4	89.8
2016		2.6	108.4	105.8
2017		2.6	124.4	121.8
2018		2.6	140.4	137.8
2019		2.6	156.4	153.8
2020		2.6	172.4	169.8
2021		2.6	188.4	185.8
2022		2.6	204.4	201.8
2023		2.6	220.4	217.8
2024		2.6	220.4	217.8
2025		2.6	220.4	217.8
2026		2.6	220.4	217.8
2027		2.6	220.4	217.8
2028		2.6	220.4	217.8
2029		2.6	220.4	217.8
2030		2.6	220.4	217.8
2031		2.6	220.4	217.8
2032		2.6	220.4	217.8
2033		2.6	220.4	217.8
2034		2.6	220.4	217.8
2035		2.6	220.4	217.8
2036		2.6	220.4	217.8
2037		2.6	220.4	217.8
2038		2.6	220.4	217.8
2039		2.6	220.4	217.8
2040		2.6	220.4	217.8
Total	172.3	77.5	5363.8	5114.0
Economic IRR (%)				32.9%
NPV (DR=12%, YTL mill.)				671.6

RD049 New Truck Route for Ambarli Port - Logistic Center(tunnel for about half length)

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	61.0			-61.0
2009	122.0			-122.0
2010	122.0			-122.0
2011		4.6	70.6	66.0
2012		4.6	75.4	70.8
2013		4.6	80.1	75.5
2014		4.6	84.9	80.3
2015		4.6	89.6	85.0
2016		4.6	94.3	89.8
2017		4.6	99.1	94.5
2018		4.6	103.8	99.3
2019		4.6	108.6	104.0
2020		4.6	113.3	108.7
2021		4.6	118.1	113.5
2022		4.6	122.8	118.2
2023		4.6	127.6	123.0
2024		4.6	127.6	123.0
2025		4.6	127.6	123.0
2026		4.6	127.6	123.0
2027		4.6	127.6	123.0
2028		4.6	127.6	123.0
2029		4.6	127.6	123.0
2030		4.6	127.6	123.0
2031		4.6	127.6	123.0
2032		4.6	127.6	123.0
2033		4.6	127.6	123.0
2034		4.6	127.6	123.0
2035		4.6	127.6	123.0
2036		4.6	127.6	123.0
2037		4.6	127.6	123.0
2038		4.6	127.6	123.0
2039		4.6	127.6	123.0
2040		4.6	127.6	123.0
Total	305.1	137.3	3456.7	3014.3
Economic IRR (%)				23.2%
NPV (DR=12%, YTL mill.)				367.1

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RD050 E-W Missing Linkage in Gungoren (tunnel)

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	9.8			-9.8
2009	19.5			-19.5
2010	19.5			-19.5
2011		0.7	80.9	80.2
2012		0.7	75.3	74.6
2013		0.7	69.8	69.0
2014		0.7	64.2	63.5
2015		0.7	58.6	57.9
2016		0.7	53.1	52.3
2017		0.7	47.5	46.8
2018		0.7	41.9	41.2
2019		0.7	36.4	35.6
2020		0.7	30.8	30.1
2021		0.7	25.2	24.5
2022		0.7	19.7	18.9
2023		0.7	14.1	13.4
2024		0.7	14.1	13.4
2025		0.7	14.1	13.4
2026		0.7	14.1	13.4
2027		0.7	14.1	13.4
2028		0.7	14.1	13.4
2029		0.7	14.1	13.4
2030		0.7	14.1	13.4
2031		0.7	14.1	13.4
2032		0.7	14.1	13.4
2033		0.7	14.1	13.4
2034		0.7	14.1	13.4
2035		0.7	14.1	13.4
2036		0.7	14.1	13.4
2037		0.7	14.1	13.4
2038		0.7	14.1	13.4
2039		0.7	14.1	13.4
2040		0.7	14.1	13.4
Total	48.8	22.0	857.2	786.4
Economic IRR (%)				83.4%
NPV (DR=12%, YTL mill.)				246.8

Re-Construction of Ankara Road between Pendik and Baglantı Road (incl. 2km new road)

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	10.7			-10.7
2009	21.4			-21.4
2010	21.4			-21.4
2011		0.8	34.3	33.5
2012		0.8	39.1	38.3
2013		0.8	43.9	43.1
2014		0.8	48.6	47.8
2015		0.8	53.4	52.6
2016		0.8	58.1	57.3
2017		0.8	62.9	62.1
2018		0.8	67.7	66.9
2019		0.8	72.4	71.6
2020		0.8	77.2	76.4
2021		0.8	82.0	81.2
2022		0.8	86.7	85.9
2023		0.8	91.5	90.7
2024		0.8	91.5	90.7
2025		0.8	91.5	90.7
2026		0.8	91.5	90.7
2027		0.8	91.5	90.7
2028		0.8	91.5	90.7
2029		0.8	91.5	90.7
2030		0.8	91.5	90.7
2031		0.8	91.5	90.7
2032		0.8	91.5	90.7
2033		0.8	91.5	90.7
2034		0.8	91.5	90.7
2035		0.8	91.5	90.7
2036		0.8	91.5	90.7
2037		0.8	91.5	90.7
2038		0.8	91.5	90.7
2039		0.8	91.5	90.7
2040		0.8	91.5	90.7
Total	53.6	24.1	2373.0	2295.3
Economic IRR (%)				53.4%
NPV (DR=12%, YTL mill.)				362.7

RD051 N-S Missing Link in Bahçelievler (tunnel)

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	20.6			-20.6
2009	41.3			-41.3
2010	41.3			-41.3
2011		1.5	3.9	2.4
2012		1.5	11.8	10.2
2013		1.5	19.7	18.1
2014		1.5	27.6	26.0
2015		1.5	35.5	33.9
2016		1.5	43.4	41.8
2017		1.5	51.3	49.7
2018		1.5	59.1	57.6
2019		1.5	67.0	65.5
2020		1.5	74.9	73.4
2021		1.5	82.8	81.3
2022		1.5	90.7	89.2
2023		1.5	98.6	97.1
2024		1.5	98.6	97.1
2025		1.5	98.6	97.1
2026		1.5	98.6	97.1
2027		1.5	98.6	97.1
2028		1.5	98.6	97.1
2029		1.5	98.6	97.1
2030		1.5	98.6	97.1
2031		1.5	98.6	97.1
2032		1.5	98.6	97.1
2033		1.5	98.6	97.1
2034		1.5	98.6	97.1
2035		1.5	98.6	97.1
2036		1.5	98.6	97.1
2037		1.5	98.6	97.1
2038		1.5	98.6	97.1
2039		1.5	98.6	97.1
2040		1.5	98.6	97.1
Total	103.2	46.4	2342.5	2192.8
Economic IRR (%)				25.1%
NPV (DR=12%, YTL mill.)				250.5

RD054 Connection Road between New Motorway and Uskudar Tunnel (50% tunnel)

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	21.1			-21.1
2009	42.1			-42.1
2010	42.1			-42.1
2011		1.6	80.9	79.3
2012		1.6	75.3	73.7
2013		1.6	69.8	68.2
2014		1.6	64.2	62.6
2015		1.6	58.6	57.1
2016		1.6	53.1	51.5
2017		1.6	47.5	45.9
2018		1.6	41.9	40.4
2019		1.6	36.4	34.8
2020		1.6	30.8	29.2
2021		1.6	25.2	23.7
2022		1.6	19.7	18.1
2023		1.6	14.1	12.5
2024		1.6	14.1	12.5
2025		1.6	14.1	12.5
2026		1.6	14.1	12.5
2027		1.6	14.1	12.5
2028		1.6	14.1	12.5
2029		1.6	14.1	12.5
2030		1.6	14.1	12.5
2031		1.6	14.1	12.5
2032		1.6	14.1	12.5
2033		1.6	14.1	12.5
2034		1.6	14.1	12.5
2035		1.6	14.1	12.5
2036		1.6	14.1	12.5
2037		1.6	14.1	12.5
2038		1.6	14.1	12.5
2039		1.6	14.1	12.5
2040		1.6	14.1	12.5
Total	105.3	47.4	857.2	704.5
Economic IRR (%)				45.4%
NPV (DR=12%, YTL mill.)				196.0

RD052 Connection Tunnel between Bosna Bulvarı and Hatboyu St (tunnel)

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	8.9			-8.9
2009	17.8			-17.8
2010	17.8			-17.8
2011		0.7	48.5	47.9
2012		0.7	45.2	44.5
2013		0.7	41.9	41.2
2014		0.7	38.5	37.8
2015		0.7	35.2	34.5
2016		0.7	31.8	31.2
2017		0.7	28.5	27.8
2018		0.7	25.2	24.5
2019		0.7	21.8	21.2
2020		0.7	18.5	17.8
2021		0.7	15.1	14.5
2022		0.7	11.8	11.1
2023		0.7	8.5	7.8
2024		0.7	8.5	7.8
2025		0.7	8.5	7.8
2026		0.7	8.5	7.8
2027		0.7	8.5	7.8
2028		0.7	8.5	7.8
2029		0.7	8.5	7.8
2030		0.7	8.5	7.8
2031		0.7	8.5	7.8
2032		0.7	8.5	7.8
2033		0.7	8.5	7.8
2034		0.7	8.5	7.8
2035		0.7	8.5	7.8
2036		0.7	8.5	7.8
2037		0.7	8.5	7.8
2038		0.7	8.5	7.8
2039		0.7	8.5	7.8
2040		0.7	8.5	7.8
Total	44.5	20.0	514.3	449.7
Economic IRR (%)				61.0%
NPV (DR=12%, YTL mill.)				134.4

RD055 Widening of Kennedy Street between Road Tunnel and Mustafa Kemal St. in Eminonu

(YTL million)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	6.5			-6.5
2009	13.0			-13.0
2010	13.0			-13.0
2011		0.5	10.9	10.4
2012		0.5	20.6	20.1
2013		0.5	30.3	29.8
2014		0.5	40.0	39.5
2015		0.5	49.7	49.2
2016		0.5	59.4	58.9
2017		0.5	69.1	68.6
2018		0.5	78.8	78.3
2019		0.5	88.5	88.0
2020		0.5	98.2	97.7
2021		0.5	107.9	107.4
2022		0.5	117.6	117.1
2023		0.5	127.3	126.8
2024		0.5	127.3	126.8
2025		0.5	127.3	126.8
2026		0.5	127.3	126.8
2027		0.5	127.3	126.8
2028		0.5	127.3	126.8
2029		0.5	127.3	126.8
2030		0.5	127.3	126.8
2031		0.5	127.3	126.8
2032		0.5	127.3	126.8
2033		0.5	127.3	126.8
2034		0.5	127.3	126.8
2035		0.5	127.3	126.8
2036		0.5	127.3	126.8
2037		0.5	127.3	126.8
2038		0.5	127.3	126.8
2039		0.5	127.3	126.8
2040		0.5	127.3	126.8
Total	32.5	14.6	3061.5	3014.4
Economic IRR (%)				56.2%
NPV (DR=12%, YTL mill.)				431.6

Table 3.4.3 Economic Cash Flow and E-IRR of Railway Project (1)-(22)

RL001 Bağcilar - Halkali Light Metro (Extension of C-5 line)

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	148.2			-148.2
2009	296.4			-296.4
2010	296.4			-296.4
2011		17.5	97.3	79.8
2012		17.5	102.4	84.9
2013		17.5	107.5	90.0
2014		17.5	112.6	95.1
2015		17.5	117.7	100.2
2016		17.5	122.8	105.3
2017		17.5	127.9	110.4
2018		17.5	132.9	115.4
2019		17.5	138.0	120.5
2020		17.5	143.1	125.6
2021		17.5	148.2	130.7
2022		17.5	153.3	135.8
2023		17.5	158.4	140.9
2024		17.5	158.4	140.9
2025		17.5	158.4	140.9
2026		17.5	158.4	140.9
2027		17.5	158.4	140.9
2028		17.5	158.4	140.9
2029		17.5	158.4	140.9
2030		17.5	158.4	140.9
2031		17.5	158.4	140.9
2032		17.5	158.4	140.9
2033		17.5	158.4	140.9
2034		17.5	158.4	140.9
2035		17.5	158.4	140.9
2036		17.5	158.4	140.9
2037		17.5	158.4	140.9
2038		17.5	158.4	140.9
2039		17.5	158.4	140.9
2040		17.5	158.4	140.9
Total	741.0	525.0	4355.2	3089.2
Economic IRR (%)				13.0%
NPV (DR=12%, YTL mill.)				118.5

RL002 Tekstilkent - Istoc - Olimpiyat Koyo - Bahcesehir (Ispartakule) Metro (Extension of D-2 line)

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	359.1			-359.1
2009	718.2			-718.2
2010	718.2			-718.2
2011		52.0	136.9	84.9
2012		52.0	163.6	111.6
2013		52.0	190.2	138.2
2014		52.0	216.9	164.9
2015		52.0	243.6	191.6
2016		52.0	270.2	218.2
2017		52.0	296.9	244.9
2018		52.0	323.6	271.6
2019		52.0	350.2	298.2
2020		52.0	376.9	324.9
2021		52.0	403.6	351.6
2022		52.0	430.2	378.2
2023		52.0	456.9	404.9
2024		52.0	456.9	404.9
2025		52.0	456.9	404.9
2026		52.0	456.9	404.9
2027		52.0	456.9	404.9
2028		52.0	456.9	404.9
2029		52.0	456.9	404.9
2030		52.0	456.9	404.9
2031		52.0	456.9	404.9
2032		52.0	456.9	404.9
2033		52.0	456.9	404.9
2034		52.0	456.9	404.9
2035		52.0	456.9	404.9
2036		52.0	456.9	404.9
2037		52.0	456.9	404.9
2038		52.0	456.9	404.9
2039		52.0	456.9	404.9
2040		52.0	456.9	404.9
Total	1795.5	1560.0	11626.5	8271.0
Economic IRR (%)				12.0%
NPV (DR=12%, YTL mill.)				174.2

RL003 Umraniye - Bostanci Metro

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	367.5			-367.5
2009	735.0			-735.0
2010	735.0			-735.0
2011		55.0	39.4	-15.6
2012		55.0	49.7	-5.3
2013		55.0	59.9	4.9
2014		55.0	70.2	15.2
2015		55.0	80.5	25.5
2016		55.0	90.8	35.8
2017		55.0	101.1	46.1
2018		55.0	111.3	56.3
2019		55.0	121.6	66.6
2020		55.0	131.9	76.9
2021		55.0	142.2	87.2
2022		55.0	152.4	97.4
2023		55.0	162.7	107.7
2024		55.0	162.7	107.7
2025		55.0	162.7	107.7
2026		55.0	162.7	107.7
2027		55.0	162.7	107.7
2028		55.0	162.7	107.7
2029		55.0	162.7	107.7
2030		55.0	162.7	107.7
2031		55.0	162.7	107.7
2032		55.0	162.7	107.7
2033		55.0	162.7	107.7
2034		55.0	162.7	107.7
2035		55.0	162.7	107.7
2036		55.0	162.7	107.7
2037		55.0	162.7	107.7
2038		55.0	162.7	107.7
2039		55.0	162.7	107.7
2040		55.0	162.7	107.7
Total	1837.5	1650.0	4079.9	592.4
Economic IRR (%)				1.4%
NPV (DR=12%, YTL mill.)				-1,161.0

RL004 Kartal - Pendik (S. Gokcen Airport) - Tuzla Metro (Extension of C-3)

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	378.3			-378.3
2009	756.6			-756.6
2010	756.6			-756.6
2011		57.0	108.7	51.7
2012		57.0	146.6	89.6
2013		57.0	184.5	127.5
2014		57.0	222.4	165.4
2015		57.0	260.3	203.3
2016		57.0	298.2	241.2
2017		57.0	336.1	279.1
2018		57.0	374.0	317.0
2019		57.0	411.9	354.9
2020		57.0	449.8	392.8
2021		57.0	487.7	430.7
2022		57.0	525.6	468.6
2023		57.0	563.5	506.5
2024		57.0	563.5	506.5
2025		57.0	563.5	506.5
2026		57.0	563.5	506.5
2027		57.0	563.5	506.5
2028		57.0	563.5	506.5
2029		57.0	563.5	506.5
2030		57.0	563.5	506.5
2031		57.0	563.5	506.5
2032		57.0	563.5	506.5
2033		57.0	563.5	506.5
2034		57.0	563.5	506.5
2035		57.0	563.5	506.5
2036		57.0	563.5	506.5
2037		57.0	563.5	506.5
2038		57.0	563.5	506.5
2039		57.0	563.5	506.5
2040		57.0	563.5	506.5
Total	1891.5	1710.0	13950.0	10348.5
Economic IRR (%)				12.7%
NPV (DR=12%, YTL mill.)				339.2

RL005 Seyrantepe - Alibeykoy - Gop - Kazlıcesme Metro

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	356.1			-356.1
2009	712.2			-712.2
2010	712.2			-712.2
2011		58.0	117.8	59.8
2012		58.0	134.3	76.3
2013		58.0	150.9	92.9
2014		58.0	167.4	109.4
2015		58.0	183.9	125.9
2016		58.0	200.4	142.4
2017		58.0	216.9	158.9
2018		58.0	233.4	175.4
2019		58.0	250.0	192.0
2020		58.0	266.5	208.5
2021		58.0	283.0	225.0
2022		58.0	299.5	241.5
2023		58.0	316.0	258.0
2024		58.0	316.0	258.0
2025		58.0	316.0	258.0
2026		58.0	316.0	258.0
2027		58.0	316.0	258.0
2028		58.0	316.0	258.0
2029		58.0	316.0	258.0
2030		58.0	316.0	258.0
2031		58.0	316.0	258.0
2032		58.0	316.0	258.0
2033		58.0	316.0	258.0
2034		58.0	316.0	258.0
2035		58.0	316.0	258.0
2036		58.0	316.0	258.0
2037		58.0	316.0	258.0
2038		58.0	316.0	258.0
2039		58.0	316.0	258.0
2040		58.0	316.0	258.0
Total	1780.5	1740.0	8192.8	4672.3
Economic IRR (%)				8.3%
NPV (DR=12%, YTL mill.)				-382.9

RL006 Kartal D-100 - Kartal IDO Monorail

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	28.2			-28.2
2009	56.4			-56.4
2010	56.4			-56.4
2011		5.0	102.9	97.9
2012		5.0	95.4	90.4
2013		5.0	87.9	82.9
2014		5.0	80.4	75.4
2015		5.0	72.9	67.9
2016		5.0	65.4	60.4
2017		5.0	58.0	53.0
2018		5.0	50.5	45.5
2019		5.0	43.0	38.0
2020		5.0	35.5	30.5
2021		5.0	28.0	23.0
2022		5.0	20.5	15.5
2023		5.0	13.1	8.1
2024		5.0	13.1	8.1
2025		5.0	13.1	8.1
2026		5.0	13.1	8.1
2027		5.0	13.1	8.1
2028		5.0	13.1	8.1
2029		5.0	13.1	8.1
2030		5.0	13.1	8.1
2031		5.0	13.1	8.1
2032		5.0	13.1	8.1
2033		5.0	13.1	8.1
2034		5.0	13.1	8.1
2035		5.0	13.1	8.1
2036		5.0	13.1	8.1
2037		5.0	13.1	8.1
2038		5.0	13.1	8.1
2039		5.0	13.1	8.1
2040		5.0	13.1	8.1
Total	141.0	150.0	975.5	684.5
Economic IRR (%)				41.6%
NPV (DR=12%, YTL mill.)				208.1

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RL007 S. Gokcen Airport - Formula 1 Monorail

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	72.6			-72.6
2009	145.2			-145.2
2010	145.2			-145.2
2011		13.0	23.0	10.0
2012		13.0	43.7	30.7
2013		13.0	64.5	51.5
2014		13.0	85.2	72.2
2015		13.0	106.0	93.0
2016		13.0	126.7	113.7
2017		13.0	147.4	134.4
2018		13.0	168.2	155.2
2019		13.0	188.9	175.9
2020		13.0	209.7	196.7
2021		13.0	230.4	217.4
2022		13.0	251.2	238.2
2023		13.0	271.9	258.9
2024		13.0	271.9	258.9
2025		13.0	271.9	258.9
2026		13.0	271.9	258.9
2027		13.0	271.9	258.9
2028		13.0	271.9	258.9
2029		13.0	271.9	258.9
2030		13.0	271.9	258.9
2031		13.0	271.9	258.9
2032		13.0	271.9	258.9
2033		13.0	271.9	258.9
2034		13.0	271.9	258.9
2035		13.0	271.9	258.9
2036		13.0	271.9	258.9
2037		13.0	271.9	258.9
2038		13.0	271.9	258.9
2039		13.0	271.9	258.9
2040		13.0	271.9	258.9
Total	363.0	390.0	6539.0	5786.0
Economic IRR (%)				22.0%
NPV (DR=12%, YTL mill.)				608.9

RL008 Darusafaka - Cayirbasi Metro (Extension of C-4 line)

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	57.9			-57.9
2009	115.8			-115.8
2010	115.8			-115.8
2011		8.0	100.9	92.9
2012		8.0	104.4	96.4
2013		8.0	107.9	99.9
2014		8.0	111.5	103.5
2015		8.0	115.0	107.0
2016		8.0	118.5	110.5
2017		8.0	122.0	114.0
2018		8.0	125.6	117.6
2019		8.0	129.1	121.1
2020		8.0	132.6	124.6
2021		8.0	136.1	128.1
2022		8.0	139.7	131.7
2023		8.0	143.2	135.2
2024		8.0	143.2	135.2
2025		8.0	143.2	135.2
2026		8.0	143.2	135.2
2027		8.0	143.2	135.2
2028		8.0	143.2	135.2
2029		8.0	143.2	135.2
2030		8.0	143.2	135.2
2031		8.0	143.2	135.2
2032		8.0	143.2	135.2
2033		8.0	143.2	135.2
2034		8.0	143.2	135.2
2035		8.0	143.2	135.2
2036		8.0	143.2	135.2
2037		8.0	143.2	135.2
2038		8.0	143.2	135.2
2039		8.0	143.2	135.2
2040		8.0	143.2	135.2
Total	289.5	240.0	4020.6	3491.1
Economic IRR (%)				28.9%
NPV (DR=12%, YTL mill.)				501.3

RL009 4. Levent - Gultepe Mah. - Sanayi Mah. - Celiktepe Mah. Monorail

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	74.4			-74.4
2009	148.8			-148.8
2010	148.8			-148.8
2011		10.0	27.3	17.3
2012		10.0	46.2	36.2
2013		10.0	65.1	55.1
2014		10.0	84.0	74.0
2015		10.0	102.9	92.9
2016		10.0	121.7	111.7
2017		10.0	140.6	130.6
2018		10.0	159.5	149.5
2019		10.0	178.4	168.4
2020		10.0	197.2	187.2
2021		10.0	216.1	206.1
2022		10.0	235.0	225.0
2023		10.0	253.9	243.9
2024		10.0	253.9	243.9
2025		10.0	253.9	243.9
2026		10.0	253.9	243.9
2027		10.0	253.9	243.9
2028		10.0	253.9	243.9
2029		10.0	253.9	243.9
2030		10.0	253.9	243.9
2031		10.0	253.9	243.9
2032		10.0	253.9	243.9
2033		10.0	253.9	243.9
2034		10.0	253.9	243.9
2035		10.0	253.9	243.9
2036		10.0	253.9	243.9
2037		10.0	253.9	243.9
2038		10.0	253.9	243.9
2039		10.0	253.9	243.9
2040		10.0	253.9	243.9
Total	372.0	300.0	6143.9	5471.9
Economic IRR (%)				21.7%
NPV (DR=12%, YTL mill.)				573.3

RL010 Besiktas - Sariyer Metro

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	236.1			-236.1
2009	472.2			-472.2
2010	472.2			-472.2
2011		24.0	79.3	55.3
2012		24.0	96.9	72.9
2013		24.0	114.5	90.5
2014		24.0	132.1	108.1
2015		24.0	149.7	125.7
2016		24.0	167.3	143.3
2017		24.0	184.9	160.9
2018		24.0	202.5	178.5
2019		24.0	220.1	196.1
2020		24.0	237.7	213.7
2021		24.0	255.3	231.3
2022		24.0	272.9	248.9
2023		24.0	290.5	266.5
2024		24.0	290.5	266.5
2025		24.0	290.5	266.5
2026		24.0	290.5	266.5
2027		24.0	290.5	266.5
2028		24.0	290.5	266.5
2029		24.0	290.5	266.5
2030		24.0	290.5	266.5
2031		24.0	290.5	266.5
2032		24.0	290.5	266.5
2033		24.0	290.5	266.5
2034		24.0	290.5	266.5
2035		24.0	290.5	266.5
2036		24.0	290.5	266.5
2037		24.0	290.5	266.5
2038		24.0	290.5	266.5
2039		24.0	290.5	266.5
2040		24.0	290.5	266.5
Total	1180.5	720.0	7341.8	5441.3
Economic IRR (%)				12.0%
NPV (DR=12%, YTL mill.)				114.0

RL011 Ispartakule - Ambarli - Yakuplu Metro

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	359.1			-359.1
2009	718.2			-718.2
2010	718.2			-718.2
2011		53.0	69.6	16.6
2012		53.0	96.8	43.8
2013		53.0	124.0	71.0
2014		53.0	151.2	98.2
2015		53.0	178.4	125.4
2016		53.0	205.6	152.6
2017		53.0	232.8	179.8
2018		53.0	260.1	207.1
2019		53.0	287.3	234.3
2020		53.0	314.5	261.5
2021		53.0	341.7	288.7
2022		53.0	368.9	315.9
2023		53.0	396.1	343.1
2024		53.0	396.1	343.1
2025		53.0	396.1	343.1
2026		53.0	396.1	343.1
2027		53.0	396.1	343.1
2028		53.0	396.1	343.1
2029		53.0	396.1	343.1
2030		53.0	396.1	343.1
2031		53.0	396.1	343.1
2032		53.0	396.1	343.1
2033		53.0	396.1	343.1
2034		53.0	396.1	343.1
2035		53.0	396.1	343.1
2036		53.0	396.1	343.1
2037		53.0	396.1	343.1
2038		53.0	396.1	343.1
2039		53.0	396.1	343.1
2040		53.0	396.1	343.1
Total	1795.5	1590.0	9761.0	6375.5
Economic IRR (%)				9.5%
NPV (DR=12%, YTL mill.)				-239.0

RL012 Ispartakule - Kirac - Buyukcekmece - Silivri Suburban Railway

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	395.7			-395.7
2009	791.4			-791.4
2010	791.4			-791.4
2011		69.0	392.4	323.4
2012		69.0	414.2	345.2
2013		69.0	436.0	367.0
2014		69.0	457.9	388.9
2015		69.0	479.7	410.7
2016		69.0	501.5	432.5
2017		69.0	523.4	454.4
2018		69.0	545.2	476.2
2019		69.0	567.0	498.0
2020		69.0	588.8	519.8
2021		69.0	610.7	541.7
2022		69.0	632.5	563.5
2023		69.0	654.3	585.3
2024		69.0	654.3	585.3
2025		69.0	654.3	585.3
2026		69.0	654.3	585.3
2027		69.0	654.3	585.3
2028		69.0	654.3	585.3
2029		69.0	654.3	585.3
2030		69.0	654.3	585.3
2031		69.0	654.3	585.3
2032		69.0	654.3	585.3
2033		69.0	654.3	585.3
2034		69.0	654.3	585.3
2035		69.0	654.3	585.3
2036		69.0	654.3	585.3
2037		69.0	654.3	585.3
2038		69.0	654.3	585.3
2039		69.0	654.3	585.3
2040		69.0	654.3	585.3
Total	1978.5	2070.0	17927.0	13878.5
Economic IRR (%)				18.5%
NPV (DR=12%, YTL mill.)				1,351.2

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RL013 Uskudar - Beykoz Metro

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	264.3			-264.3
2009	528.6			-528.6
2010	528.6			-528.6
2011		37.0	17.5	-19.5
2012		37.0	23.7	-13.3
2013		37.0	29.9	-7.1
2014		37.0	36.1	-1.0
2015		37.0	42.2	5.2
2016		37.0	48.4	11.4
2017		37.0	54.6	17.6
2018		37.0	60.8	23.8
2019		37.0	66.9	29.9
2020		37.0	73.1	36.1
2021		37.0	79.3	42.3
2022		37.0	85.5	48.5
2023		37.0	91.6	54.6
2024		37.0	91.6	54.6
2025		37.0	91.6	54.6
2026		37.0	91.6	54.6
2027		37.0	91.6	54.6
2028		37.0	91.6	54.6
2029		37.0	91.6	54.6
2030		37.0	91.6	54.6
2031		37.0	91.6	54.6
2032		37.0	91.6	54.6
2033		37.0	91.6	54.6
2034		37.0	91.6	54.6
2035		37.0	91.6	54.6
2036		37.0	91.6	54.6
2037		37.0	91.6	54.6
2038		37.0	91.6	54.6
2039		37.0	91.6	54.6
2040		37.0	91.6	54.6
Total	1321.5	1110.0	2267.4	-164.1
Economic IRR (%)				-0.6%
NPV (DR=12%, YTL mill.)				-936.5

RL014 İkitelli Olimpiyat Koyu - Altınşehir Metro
(Extension of C-6 line)

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	279.6			-279.6
2009	559.2			-559.2
2010	559.2			-559.2
2011		40.0	88.1	48.1
2012		40.0	89.0	49.0
2013		40.0	89.8	49.8
2014		40.0	90.7	50.7
2015		40.0	91.6	51.6
2016		40.0	92.4	52.4
2017		40.0	93.3	53.3
2018		40.0	94.2	54.2
2019		40.0	95.0	55.0
2020		40.0	95.9	55.9
2021		40.0	96.7	56.7
2022		40.0	97.6	57.6
2023		40.0	98.5	58.5
2024		40.0	98.5	58.5
2025		40.0	98.5	58.5
2026		40.0	98.5	58.5
2027		40.0	98.5	58.5
2028		40.0	98.5	58.5
2029		40.0	98.5	58.5
2030		40.0	98.5	58.5
2031		40.0	98.5	58.5
2032		40.0	98.5	58.5
2033		40.0	98.5	58.5
2034		40.0	98.5	58.5
2035		40.0	98.5	58.5
2036		40.0	98.5	58.5
2037		40.0	98.5	58.5
2038		40.0	98.5	58.5
2039		40.0	98.5	58.5
2040		40.0	98.5	58.5
Total	1398.0	1200.0	2886.6	288.6
Economic IRR (%)				1.2%
NPV (DR=12%, YTL mill.)				-781.8

RL015 Atatürk Airport Access Rail (Extension of Marmaray railway)

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	48.0			-48.0
2009	96.0			-96.0
2010	96.0			-96.0
2011		3.0	4.7	1.7
2012		3.0	10.1	7.1
2013		3.0	15.5	12.5
2014		3.0	20.9	17.9
2015		3.0	26.4	23.4
2016		3.0	31.8	28.8
2017		3.0	37.2	34.2
2018		3.0	42.6	39.6
2019		3.0	48.1	45.1
2020		3.0	53.5	50.5
2021		3.0	58.9	55.9
2022		3.0	64.3	61.3
2023		3.0	69.7	66.7
2024		3.0	69.7	66.7
2025		3.0	69.7	66.7
2026		3.0	69.7	66.7
2027		3.0	69.7	66.7
2028		3.0	69.7	66.7
2029		3.0	69.7	66.7
2030		3.0	69.7	66.7
2031		3.0	69.7	66.7
2032		3.0	69.7	66.7
2033		3.0	69.7	66.7
2034		3.0	69.7	66.7
2035		3.0	69.7	66.7
2036		3.0	69.7	66.7
2037		3.0	69.7	66.7
2038		3.0	69.7	66.7
2039		3.0	69.7	66.7
2040		3.0	69.7	66.7
Total	240.0	90.0	1669.3	1339.3
Economic IRR (%)				12.4%
NPV (DR=12%, YTL mill.)				36.6

RL016 Sabiha Gokcen Airport Access Rail

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	66.0			-66.0
2009	132.0			-132.0
2010	132.0			-132.0
2011		0.0	59.9	59.9
2012		0.0	60.4	60.4
2013		0.0	60.8	60.8
2014		0.0	61.3	61.3
2015		0.0	61.7	61.7
2016		0.0	62.2	62.2
2017		0.0	62.6	62.6
2018		0.0	63.1	63.1
2019		0.0	63.5	63.5
2020		0.0	64.0	64.0
2021		0.0	64.4	64.4
2022		0.0	64.9	64.9
2023		0.0	65.3	65.3
2024		0.0	65.3	65.3
2025		0.0	65.3	65.3
2026		0.0	65.3	65.3
2027		0.0	65.3	65.3
2028		0.0	65.3	65.3
2029		0.0	65.3	65.3
2030		0.0	65.3	65.3
2031		0.0	65.3	65.3
2032		0.0	65.3	65.3
2033		0.0	65.3	65.3
2034		0.0	65.3	65.3
2035		0.0	65.3	65.3
2036		0.0	65.3	65.3
2037		0.0	65.3	65.3
2038		0.0	65.3	65.3
2039		0.0	65.3	65.3
2040		0.0	65.3	65.3
Total	330.0	0.0	1924.4	1594.4
Economic IRR (%)				16.4%
NPV (DR=12%, YTL mill.)				134.7

RL017 Seyrantepe - Bosphorus Crossing -
Umraniye metro

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	244.8			-244.8
2009	489.6			-489.6
2010	489.6			-489.6
2011		28.0	-2.2	-30.2
2012		28.0	24.9	-3.1
2013		28.0	52.1	24.1
2014		28.0	79.2	51.2
2015		28.0	106.3	78.3
2016		28.0	133.5	105.5
2017		28.0	160.6	132.6
2018		28.0	187.7	159.7
2019		28.0	214.8	186.8
2020		28.0	242.0	214.0
2021		28.0	269.1	241.1
2022		28.0	296.2	268.2
2023		28.0	323.3	295.3
2024		28.0	323.3	295.3
2025		28.0	323.3	295.3
2026		28.0	323.3	295.3
2027		28.0	323.3	295.3
2028		28.0	323.3	295.3
2029		28.0	323.3	295.3
2030		28.0	323.3	295.3
2031		28.0	323.3	295.3
2032		28.0	323.3	295.3
2033		28.0	323.3	295.3
2034		28.0	323.3	295.3
2035		28.0	323.3	295.3
2036		28.0	323.3	295.3
2037		28.0	323.3	295.3
2038		28.0	323.3	295.3
2039		28.0	323.3	295.3
2040		28.0	323.3	295.3
Total	1224.0	28.0	7584.3	5520.3
Economic IRR (%)				10.3%
NPV (DR=12%, YTL mill.)				-81.1

RL018 Topkapi - 2nd Bosphorus Bridge -
Goztepe AGT

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	232.8			-232.8
2009	465.6			-465.6
2010	465.6			-465.6
2011		35.0	98.8	63.8
2012		35.0	114.6	79.6
2013		35.0	130.3	95.3
2014		35.0	146.1	111.1
2015		35.0	161.9	126.9
2016		35.0	177.7	142.7
2017		35.0	193.5	158.5
2018		35.0	209.2	174.2
2019		35.0	225.0	190.0
2020		35.0	240.8	205.8
2021		35.0	256.6	221.6
2022		35.0	272.3	237.3
2023		35.0	288.1	253.1
2024		35.0	288.1	253.1
2025		35.0	288.1	253.1
2026		35.0	288.1	253.1
2027		35.0	288.1	253.1
2028		35.0	288.1	253.1
2029		35.0	288.1	253.1
2030		35.0	288.1	253.1
2031		35.0	288.1	253.1
2032		35.0	288.1	253.1
2033		35.0	288.1	253.1
2034		35.0	288.1	253.1
2035		35.0	288.1	253.1
2036		35.0	288.1	253.1
2037		35.0	288.1	253.1
2038		35.0	288.1	253.1
2039		35.0	288.1	253.1
2040		35.0	288.1	253.1
Total	1164.0	1050.0	7412.9	5198.9
Economic IRR (%)				12.0%
NPV (DR=12%, YTL mill.)				107.8

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RL019 Kadikoy - Ibrahimaga - Esensehir - Sabiha Gokcen Airport Metro

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	709.5			-709.5
2009	1419.0			-1419.0
2010	1419.0			-1419.0
2011		104.0	88.3	-15.7
2012		104.0	110.1	6.1
2013		104.0	132.0	28.0
2014		104.0	153.8	49.8
2015		104.0	175.6	71.6
2016		104.0	197.5	93.5
2017		104.0	219.3	115.3
2018		104.0	241.1	137.1
2019		104.0	262.9	158.9
2020		104.0	284.8	180.8
2021		104.0	306.6	202.6
2022		104.0	328.4	224.4
2023		104.0	350.3	246.3
2024		104.0	350.3	246.3
2025		104.0	350.3	246.3
2026		104.0	350.3	246.3
2027		104.0	350.3	246.3
2028		104.0	350.3	246.3
2029		104.0	350.3	246.3
2030		104.0	350.3	246.3
2031		104.0	350.3	246.3
2032		104.0	350.3	246.3
2033		104.0	350.3	246.3
2034		104.0	350.3	246.3
2035		104.0	350.3	246.3
2036		104.0	350.3	246.3
2037		104.0	350.3	246.3
2038		104.0	350.3	246.3
2039		104.0	350.3	246.3
2040		104.0	350.3	246.3
Total	3547.5	3120.0	8805.2	2137.7
Economic IRR (%)				2.5%
NPV (DR=12%, YTL mill.)				-2,069.1

RL020 Bakirkoy - Beylikpuzu Extension

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	18.0			-18.0
2009	36.0			-36.0
2010	36.0			-36.0
2011		2.0	0.0	-2.0
2012		2.0	3.1	1.1
2013		2.0	6.1	4.1
2014		2.0	9.2	7.2
2015		2.0	12.2	10.2
2016		2.0	15.3	13.3
2017		2.0	18.3	16.3
2018		2.0	21.4	19.4
2019		2.0	24.4	22.4
2020		2.0	27.5	25.5
2021		2.0	30.5	28.5
2022		2.0	33.6	31.6
2023		2.0	36.6	34.6
2024		2.0	36.6	34.6
2025		2.0	36.6	34.6
2026		2.0	36.6	34.6
2027		2.0	36.6	34.6
2028		2.0	36.6	34.6
2029		2.0	36.6	34.6
2030		2.0	36.6	34.6
2031		2.0	36.6	34.6
2032		2.0	36.6	34.6
2033		2.0	36.6	34.6
2034		2.0	36.6	34.6
2035		2.0	36.6	34.6
2036		2.0	36.6	34.6
2037		2.0	36.6	34.6
2038		2.0	36.6	34.6
2039		2.0	36.6	34.6
2040		2.0	36.6	34.6
Total	90.0	60.0	861.0	711.0
Economic IRR (%)				14.3%
NPV (DR=12%, YTL mill.)				38.2

RL021 Silivri - Gumusyaka Extension

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	660.0			-660.0
2009	1320.0			-1320.0
2010	1320.0			-1320.0
2011		90.0	220.8	130.8
2012		90.0	273.0	183.0
2013		90.0	325.2	235.2
2014		90.0	377.4	287.4
2015		90.0	429.6	339.6
2016		90.0	481.8	391.8
2017		90.0	534.0	444.0
2018		90.0	586.2	496.2
2019		90.0	638.4	548.4
2020		90.0	690.6	600.6
2021		90.0	742.8	652.8
2022		90.0	795.0	705.0
2023		90.0	847.2	757.2
2024		90.0	847.2	757.2
2025		90.0	847.2	757.2
2026		90.0	847.2	757.2
2027		90.0	847.2	757.2
2028		90.0	847.2	757.2
2029		90.0	847.2	757.2
2030		90.0	847.2	757.2
2031		90.0	847.2	757.2
2032		90.0	847.2	757.2
2033		90.0	847.2	757.2
2034		90.0	847.2	757.2
2035		90.0	847.2	757.2
2036		90.0	847.2	757.2
2037		90.0	847.2	757.2
2038		90.0	847.2	757.2
2039		90.0	847.2	757.2
2040		90.0	847.2	757.2
Total	3300.0	2700.0	21344.5	15344.5
Economic IRR (%)				11.9%
NPV (DR=12%, YTL mill.)				288.3

RL022 Halkali - Hadimkoy Suburban Railway (Extension of Marmaray Project)(Electrification)

(YTL millio)				
Year	Economic Cost	O&M Cost	Benefit	Net Cash Flow
2008	160.8			-160.8
2009	321.6			-321.6
2010	321.6			-321.6
2011		34.0	452.2	418.2
2012		34.0	471.5	437.5
2013		34.0	490.8	456.8
2014		34.0	510.1	476.1
2015		34.0	529.3	495.3
2016		34.0	548.6	514.6
2017		34.0	567.9	533.9
2018		34.0	587.2	553.2
2019		34.0	606.5	572.5
2020		34.0	625.8	591.8
2021		34.0	645.0	611.0
2022		34.0	664.3	630.3
2023		34.0	683.6	649.6
2024		34.0	683.6	649.6
2025		34.0	683.6	649.6
2026		34.0	683.6	649.6
2027		34.0	683.6	649.6
2028		34.0	683.6	649.6
2029		34.0	683.6	649.6
2030		34.0	683.6	649.6
2031		34.0	683.6	649.6
2032		34.0	683.6	649.6
2033		34.0	683.6	649.6
2034		34.0	683.6	649.6
2035		34.0	683.6	649.6
2036		34.0	683.6	649.6
2037		34.0	683.6	649.6
2038		34.0	683.6	649.6
2039		34.0	683.6	649.6
2040		34.0	683.6	649.6
Total	804.0	1020.0	19003.9	17179.9
Economic IRR (%)				42.0%
NPV (DR=12%, YTL mill.)				2,796.0

3.5 Financial Evaluation

Financial evaluation was conducted on proposed railway projects in “Do Maximum” network in order to check their financial viability. Main assumptions are same as those of the economic analysis.

- (1) Project life of all the projects is assumed to be 30 years starting 2011 to 2040.
- (2) Construction period was assumed as three years from 2008 to 2010. Project cost was distributed over three years at the rate of 20%, 40% and 50%, respectively. the 10% exceeding 100% is for taking tax into account which is not completely included in the estimated cost.
- (3) Annual operating and maintenance cost was estimated individually as stated chapter 15 in the main text.
- (4) Benchmark year is 2011 and 2023, for which years annual revenue was estimated based on the results of traffic assignment assuming YTL 0.2 per kilometer. For each year between 2011 to 2023, benefit was linearly interpolated.
- (5) Net present value (NPV) was calculated using the discount rate at 12%.

Table 3.5.1 Cost and Revenue of Railway Projects in “Do Maximum” Network

Code	Project	Length (km)	Project Cost (US\$ mill.)	O&M (US\$million)	1000 Pax/km in 2023	Revenue		F-IRR (%)
						2011	2023	
RL001	Bagcilar - Halkali Light Metro (Extension of C-5 line)	7.5	494	17.5	2323.4	64.3	141.3	13.3
RL002	Tekstilkent - Istoc - Olimpiyat Koyu - Bahcesehir (Ispartakule) Metro	16.7	1197	52.0	3862.4	176.8	235.0	10.3
RL003	Umraniye - Bostanci Metro	11.6	1225	55.0	3085.3	77.0	187.7	5.2
RL004	Kartal - Pendik (S. Gokcen Airport) - Tuzla Metro (Extension of C-3)	27.5	1261	57.0	5453.8	60.3	331.8	9.3
RL005	Seyrantepe - Alibeykoy - Gop - Kazlicesme Metro	17.7	1187	58.0	4800.3	133.0	292.0	10.5
RL006	Kartal D-100 - Kartal IDO Monorail	3.0	94	5.0	282.8	3.9	17.2	5.4
RL007	S. Gokcen Airport - Formula 1 Monorail	7.7	242	13.0	533.0	1.8	32.4	1.5
RL008	Darusafaka - Cayirbasi Metro (Extension of C-4 line)	2.7	193	8.0	65.1	2.5	4.0	N.A.
RL009	4. Levent - Gultepe Mah. - Sanayi Mah. - Celiktepe Mah. Monorail	8.6	248	10.0	26.1	0.6	1.6	N.A.
RL010	Besiktas - Sariyer Metro	14.1	787	24.0	321.7	8.0	19.6	N.A.
RL011	Ispartakule - Ambarli - Yakuplu Metro	16.7	1197	53.0	3736.3	29.7	227.3	5.9
RL012	Ispartakule - Kirac - Buyukcekmece - Silivri Suburban Railway	25.0	1319	69.0	14518.7	228.4	883.2	21.9
RL013	Uskdar - Beykoz Metro	15.0	881	37.0	1323.8	60.9	80.5	1.1
RL014	Ikitelli Olimpiyat Koyu - Altinsehir Metro (Extension of C-6 line)	13.0	932	40.0	1677.4	11.8	102.0	0.9
RL015	Ataturk Airport Access Rail (Extension of Marmaray railway)	2.5	160	3.0	99.1	2.4	6.0	-4.5
RL016	Sabiha Gokcen Airport Access Rail	5.5	220	0.0	362.5	4.4	22.1	4.7
RL017	Seyrantepe - Bosphorus Crossing - Umraniye metro	10.0	816	28.0	3130.1	63.5	190.4	9.9
RL018	Topkapi - 2nd Bosphorus Bridge - Goztepe AGT	30.0	776	35.0	7851.6	124.7	477.6	20.9
RL019	Kadikoy - Ibrahimaga - Esensehir - Sabiha Gokcen Airport Metro	33.0	2365	104.0	7021.9	201.0	427.2	7.3
RL020	Bakirkoy - Beylikpuzu Extension	1.0	60	2.0	441.9	12.4	26.9	20.1
RL021	Silivri - Gumusyaka Extension	47.0	2200	90.0	15003.3	13.0	912.7	12.6
RL022	Halkali - Hadimkoy Suburban Railway (Extension of Marmaray Project)	20.0	536	21.9	4254.2	120.0	258.8	21.0

Table 3.5.2 Financial Cash Flow and F-IRR of Railway Project (1)-(22)

RL001 Bagcilar - Halkali Light Metro (Extension of C-5 line)

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	98.8			-98.8
2009	197.6			-197.6
2010	247.0			-247.0
2011		17.5	64.3	46.8
2012		17.5	70.3	52.8
2013		17.5	76.2	58.7
2014		17.5	82.1	64.6
2015		17.5	88.0	70.5
2016		17.5	93.9	76.4
2017		17.5	99.9	82.4
2018		17.5	105.8	88.3
2019		17.5	111.7	94.2
2020		17.5	117.6	100.1
2021		17.5	123.6	106.1
2022		17.5	129.5	112.0
2023		17.5	141.3	123.8
2024		17.5	141.3	123.8
2025		17.5	141.3	123.8
2026		17.5	141.3	123.8
2027		17.5	141.3	123.8
2028		17.5	141.3	123.8
2029		17.5	141.3	123.8
2030		17.5	141.3	123.8
2031		17.5	141.3	123.8
2032		17.5	141.3	123.8
2033		17.5	141.3	123.8
2034		17.5	141.3	123.8
2035		17.5	141.3	123.8
2036		17.5	141.3	123.8
2037		17.5	141.3	123.8
2038		17.5	141.3	123.8
2039		17.5	141.3	123.8
2040		17.5	141.3	123.8
Total	494.0	525.0	3707.0	2638.6
Financial IRR (%)				13.3%
NPV (DR=12%, YTL)				114.3

RL002 Tekstilkent - Istoc - Olimpiyat Koyu - Bahcesehir (Ispartakule) Metro

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	239.4			-239.4
2009	478.8			-478.8
2010	598.5			-598.5
2011		52.0	176.8	124.8
2012		52.0	181.2	129.2
2013		52.0	185.7	133.7
2014		52.0	190.2	138.2
2015		52.0	194.7	142.7
2016		52.0	199.1	147.1
2017		52.0	203.6	151.6
2018		52.0	208.1	156.1
2019		52.0	212.6	160.6
2020		52.0	217.1	165.1
2021		52.0	221.5	169.5
2022		52.0	226.0	174.0
2023		52.0	235.0	183.0
2024		52.0	235.0	183.0
2025		52.0	235.0	183.0
2026		52.0	235.0	183.0
2027		52.0	235.0	183.0
2028		52.0	235.0	183.0
2029		52.0	235.0	183.0
2030		52.0	235.0	183.0
2031		52.0	235.0	183.0
2032		52.0	235.0	183.0
2033		52.0	235.0	183.0
2034		52.0	235.0	183.0
2035		52.0	235.0	183.0
2036		52.0	235.0	183.0
2037		52.0	235.0	183.0
2038		52.0	235.0	183.0
2039		52.0	235.0	183.0
2040		52.0	235.0	183.0
Total	1197.0	1560.0	6645.9	3769.2
Financial IRR (%)				10.3%
NPV (DR=12%, YTL)				-66.4

RL003 Umraniye - Bostanci Metro

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	245.0			-245.0
2009	490.0			-490.0
2010	612.5			-612.5
2011		55.0	77.0	22.0
2012		55.0	85.5	30.5
2013		55.0	94.0	39.0
2014		55.0	102.6	47.6
2015		55.0	111.1	56.1
2016		55.0	119.6	64.6
2017		55.0	128.1	73.1
2018		55.0	136.6	81.6
2019		55.0	145.1	90.1
2020		55.0	153.6	98.6
2021		55.0	162.1	107.1
2022		55.0	170.7	115.7
2023		55.0	187.7	132.7
2024		55.0	187.7	132.7
2025		55.0	187.7	132.7
2026		55.0	187.7	132.7
2027		55.0	187.7	132.7
2028		55.0	187.7	132.7
2029		55.0	187.7	132.7
2030		55.0	187.7	132.7
2031		55.0	187.7	132.7
2032		55.0	187.7	132.7
2033		55.0	187.7	132.7
2034		55.0	187.7	132.7
2035		55.0	187.7	132.7
2036		55.0	187.7	132.7
2037		55.0	187.7	132.7
2038		55.0	187.7	132.7
2039		55.0	187.7	132.7
2040		55.0	187.7	132.7
Total	1225.0	1650.0	4864.4	1866.9
Financial IRR (%)				5.2%
NPV (DR=12%, YTL)				-575.7

RL004 Kartal - Pendik (S. Gokcen Airport) - Tuzla Metro (Extension of C-3)

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	252.2			-252.2
2009	504.4			-504.4
2010	630.5			-630.5
2011		57.0	60.3	3.3
2012		57.0	81.2	24.2
2013		57.0	102.0	45.0
2014		57.0	122.9	65.9
2015		57.0	143.8	86.8
2016		57.0	164.7	107.7
2017		57.0	185.6	128.6
2018		57.0	206.5	149.5
2019		57.0	227.4	170.4
2020		57.0	248.2	191.2
2021		57.0	269.1	212.1
2022		57.0	290.0	233.0
2023		57.0	331.8	274.8
2024		57.0	331.8	274.8
2025		57.0	331.8	274.8
2026		57.0	331.8	274.8
2027		57.0	331.8	274.8
2028		57.0	331.8	274.8
2029		57.0	331.8	274.8
2030		57.0	331.8	274.8
2031		57.0	331.8	274.8
2032		57.0	331.8	274.8
2033		57.0	331.8	274.8
2034		57.0	331.8	274.8
2035		57.0	331.8	274.8
2036		57.0	331.8	274.8
2037		57.0	331.8	274.8
2038		57.0	331.8	274.8
2039		57.0	331.8	274.8
2040		57.0	331.8	274.8
Total	1261.0	1710.0	8073.6	4976.5
Financial IRR (%)				9.3%
NPV (DR=12%, YTL)				-206.3

RL005 Seyrantepe - Alibeykoy - Gop - Kazlıcesme Metro

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	0.0			0.0
2009	0.0			0.0
2010	0.0			0.0
2011		0.0	0.0	0.0
2012		0.0	0.0	0.0
2013		0.0	0.0	0.0
2014		0.0	0.0	0.0
2015		0.0	0.0	0.0
2016		0.0	0.0	0.0
2017		0.0	0.0	0.0
2018		0.0	0.0	0.0
2019		0.0	0.0	0.0
2020		0.0	0.0	0.0
2021		0.0	0.0	0.0
2022		0.0	0.0	0.0
2023		0.0	0.0	0.0
2024		0.0	0.0	0.0
2025		0.0	0.0	0.0
2026		0.0	0.0	0.0
2027		0.0	0.0	0.0
2028		0.0	0.0	0.0
2029		0.0	0.0	0.0
2030		0.0	0.0	0.0
2031		0.0	0.0	0.0
2032		0.0	0.0	0.0
2033		0.0	0.0	0.0
2034		0.0	0.0	0.0
2035		0.0	0.0	0.0
2036		0.0	0.0	0.0
2037		0.0	0.0	0.0
2038		0.0	0.0	0.0
2039		0.0	0.0	0.0
2040		0.0	0.0	0.0
Total	0.0	0.0	0.0	0.0
Financial IRR (%)				-
NPV (DR=12%, YTL)				0.0

RL006 Kartal D-100 - Kartal IDO Monorail

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	18.8			-18.8
2009	37.6			-37.6
2010	47.0			-47.0
2011		5.0	3.9	-1.1
2012		5.0	4.9	-0.1
2013		5.0	6.0	1.0
2014		5.0	7.0	2.0
2015		5.0	8.0	3.0
2016		5.0	9.0	4.0
2017		5.0	10.0	5.0
2018		5.0	11.1	6.1
2019		5.0	12.1	7.1
2020		5.0	13.1	8.1
2021		5.0	14.1	9.1
2022		5.0	15.2	10.2
2023		5.0	17.2	12.2
2024		5.0	17.2	12.2
2025		5.0	17.2	12.2
2026		5.0	17.2	12.2
2027		5.0	17.2	12.2
2028		5.0	17.2	12.2
2029		5.0	17.2	12.2
2030		5.0	17.2	12.2
2031		5.0	17.2	12.2
2032		5.0	17.2	12.2
2033		5.0	17.2	12.2
2034		5.0	17.2	12.2
2035		5.0	17.2	12.2
2036		5.0	17.2	12.2
2037		5.0	17.2	12.2
2038		5.0	17.2	12.2
2039		5.0	17.2	12.2
2040		5.0	17.2	12.2
Total	94.0	150.0	424.0	170.6
Financial IRR (%)				5.4%
NPV (DR=12%, YTL)				-46.4

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RL007 S. Gokcen Airport - Formula 1 Monorail

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	48.4			-48.4
2009	96.8			-96.8
2010	121.0			-121.0
2011		13.0	1.8	-11.2
2012		13.0	4.2	-8.8
2013		13.0	6.5	-6.5
2014		13.0	8.9	-4.1
2015		13.0	11.2	-1.8
2016		13.0	13.6	0.6
2017		13.0	15.9	2.9
2018		13.0	18.3	5.3
2019		13.0	20.7	7.7
2020		13.0	23.0	10.0
2021		13.0	25.4	12.4
2022		13.0	27.7	14.7
2023		13.0	32.4	19.4
2024		13.0	32.4	19.4
2025		13.0	32.4	19.4
2026		13.0	32.4	19.4
2027		13.0	32.4	19.4
2028		13.0	32.4	19.4
2029		13.0	32.4	19.4
2030		13.0	32.4	19.4
2031		13.0	32.4	19.4
2032		13.0	32.4	19.4
2033		13.0	32.4	19.4
2034		13.0	32.4	19.4
2035		13.0	32.4	19.4
2036		13.0	32.4	19.4
2037		13.0	32.4	19.4
2038		13.0	32.4	19.4
2039		13.0	32.4	19.4
2040		13.0	32.4	19.4
Total	242.0	390.0	760.8	104.6
Financial IRR (%)				1.5%
NPV (DR=12%, YTL)				-184.4

RL008 Darusafaka - Cayirbasi Metro (Extension of C-4 line)

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	38.6			-38.6
2009	77.2			-77.2
2010	96.5			-96.5
2011		8.0	2.5	-5.5
2012		8.0	2.6	-5.4
2013		8.0	2.7	-5.3
2014		8.0	2.8	-5.2
2015		8.0	3.0	-5.0
2016		8.0	3.1	-4.9
2017		8.0	3.2	-4.8
2018		8.0	3.3	-4.7
2019		8.0	3.4	-4.6
2020		8.0	3.5	-4.5
2021		8.0	3.6	-4.4
2022		8.0	3.7	-4.3
2023		8.0	4.0	-4.0
2024		8.0	4.0	-4.0
2025		8.0	4.0	-4.0
2026		8.0	4.0	-4.0
2027		8.0	4.0	-4.0
2028		8.0	4.0	-4.0
2029		8.0	4.0	-4.0
2030		8.0	4.0	-4.0
2031		8.0	4.0	-4.0
2032		8.0	4.0	-4.0
2033		8.0	4.0	-4.0
2034		8.0	4.0	-4.0
2035		8.0	4.0	-4.0
2036		8.0	4.0	-4.0
2037		8.0	4.0	-4.0
2038		8.0	4.0	-4.0
2039		8.0	4.0	-4.0
2040		8.0	4.0	-4.0
Total	193.0	240.0	108.7	-343.6
Financial IRR (%)				-
NPV (DR=12%, YTL)				-199.5

RL009 4. Levent - Gultepe Mah. - Sanayi Mah. - Celiktepe Mah. Monorail

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	49.6			-49.6
2009	99.2			-99.2
2010	124.0			-124.0
2011		10.0	0.6	-9.4
2012		10.0	0.7	-9.3
2013		10.0	0.7	-9.3
2014		10.0	0.8	-9.2
2015		10.0	0.9	-9.1
2016		10.0	1.0	-9.0
2017		10.0	1.0	-9.0
2018		10.0	1.1	-8.9
2019		10.0	1.2	-8.8
2020		10.0	1.3	-8.7
2021		10.0	1.4	-8.6
2022		10.0	1.4	-8.6
2023		10.0	1.6	-8.4
2024		10.0	1.6	-8.4
2025		10.0	1.6	-8.4
2026		10.0	1.6	-8.4
2027		10.0	1.6	-8.4
2028		10.0	1.6	-8.4
2029		10.0	1.6	-8.4
2030		10.0	1.6	-8.4
2031		10.0	1.6	-8.4
2032		10.0	1.6	-8.4
2033		10.0	1.6	-8.4
2034		10.0	1.6	-8.4
2035		10.0	1.6	-8.4
2036		10.0	1.6	-8.4
2037		10.0	1.6	-8.4
2038		10.0	1.6	-8.4
2039		10.0	1.6	-8.4
2040		10.0	1.6	-8.4
Total	248.0	300.0	40.6	-532.2
Financial IRR (%)				-
NPV (DR=12%, YTL)				-274.2

RL010 Besiktas - Sariyer Metro

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	157.4			-157.4
2009	314.8			-314.8
2010	393.5			-393.5
2011		24.0	8.0	-16.0
2012		24.0	8.9	-15.1
2013		24.0	9.8	-14.2
2014		24.0	10.6	-13.4
2015		24.0	11.5	-12.5
2016		24.0	12.4	-11.6
2017		24.0	13.3	-10.7
2018		24.0	14.2	-9.8
2019		24.0	15.1	-8.9
2020		24.0	16.0	-8.0
2021		24.0	16.9	-7.1
2022		24.0	17.8	-6.2
2023		24.0	19.6	-4.4
2024		24.0	19.6	-4.4
2025		24.0	19.6	-4.4
2026		24.0	19.6	-4.4
2027		24.0	19.6	-4.4
2028		24.0	19.6	-4.4
2029		24.0	19.6	-4.4
2030		24.0	19.6	-4.4
2031		24.0	19.6	-4.4
2032		24.0	19.6	-4.4
2033		24.0	19.6	-4.4
2034		24.0	19.6	-4.4
2035		24.0	19.6	-4.4
2036		24.0	19.6	-4.4
2037		24.0	19.6	-4.4
2038		24.0	19.6	-4.4
2039		24.0	19.6	-4.4
2040		24.0	19.6	-4.4
Total	787.0	720.0	506.8	-1078.9
Financial IRR (%)				-
NPV (DR=12%, YTL)				-754.5

RL011 Ispartakule -Ambarli - Yakuplu Metro

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	239.4			-239.4
2009	478.8			-478.8
2010	598.5			-598.5
2011		53.0	29.7	-23.3
2012		53.0	44.9	-8.1
2013		53.0	60.1	7.1
2014		53.0	75.3	22.3
2015		53.0	90.5	37.5
2016		53.0	105.7	52.7
2017		53.0	120.9	67.9
2018		53.0	136.1	83.1
2019		53.0	151.3	98.3
2020		53.0	166.5	113.5
2021		53.0	181.7	128.7
2022		53.0	196.9	143.9
2023		53.0	227.3	174.3
2024		53.0	227.3	174.3
2025		53.0	227.3	174.3
2026		53.0	227.3	174.3
2027		53.0	227.3	174.3
2028		53.0	227.3	174.3
2029		53.0	227.3	174.3
2030		53.0	227.3	174.3
2031		53.0	227.3	174.3
2032		53.0	227.3	174.3
2033		53.0	227.3	174.3
2034		53.0	227.3	174.3
2035		53.0	227.3	174.3
2036		53.0	227.3	174.3
2037		53.0	227.3	174.3
2038		53.0	227.3	174.3
2039		53.0	227.3	174.3
2040		53.0	227.3	174.3
Total	1197.0	1590.0	5451.0	2544.3
Financial IRR (%)				5.9%
NPV (DR=12%, YTL)				-558.5

RL012 Ispartakule - Kirac - Buyukcekmece - Silivri Suburban Railway

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	263.8			-263.8
2009	527.6			-527.6
2010	659.5			-659.5
2011		69.0	228.4	159.4
2012		69.0	278.8	209.8
2013		69.0	329.1	260.1
2014		69.0	379.5	310.5
2015		69.0	429.9	360.9
2016		69.0	480.2	411.2
2017		69.0	530.6	461.6
2018		69.0	581.0	512.0
2019		69.0	631.4	562.4
2020		69.0	681.7	612.7
2021		69.0	732.1	663.1
2022		69.0	782.5	713.5
2023		69.0	883.2	814.2
2024		69.0	883.2	814.2
2025		69.0	883.2	814.2
2026		69.0	883.2	814.2
2027		69.0	883.2	814.2
2028		69.0	883.2	814.2
2029		69.0	883.2	814.2
2030		69.0	883.2	814.2
2031		69.0	883.2	814.2
2032		69.0	883.2	814.2
2033		69.0	883.2	814.2
2034		69.0	883.2	814.2
2035		69.0	883.2	814.2
2036		69.0	883.2	814.2
2037		69.0	883.2	814.2
2038		69.0	883.2	814.2
2039		69.0	883.2	814.2
2040		69.0	883.2	814.2
Total	1319.0	2070.0	21963.1	18442.2
Financial IRR (%)				21.9%
NPV (DR=12%, YTL)				1,977.3

RL013 Uskudar - Beykoz Metro

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	176.2			-176.2
2009	352.4			-352.4
2010	440.5			-440.5
2011		37.0	60.9	23.9
2012		37.0	62.4	25.4
2013		37.0	63.9	26.9
2014		37.0	65.4	28.4
2015		37.0	66.9	29.9
2016		37.0	68.4	31.4
2017		37.0	69.9	32.9
2018		37.0	71.5	34.5
2019		37.0	73.0	36.0
2020		37.0	74.5	37.5
2021		37.0	76.0	39.0
2022		37.0	77.5	40.5
2023		37.0	80.5	43.5
2024		37.0	80.5	43.5
2025		37.0	80.5	43.5
2026		37.0	80.5	43.5
2027		37.0	80.5	43.5
2028		37.0	80.5	43.5
2029		37.0	80.5	43.5
2030		37.0	80.5	43.5
2031		37.0	80.5	43.5
2032		37.0	80.5	43.5
2033		37.0	80.5	43.5
2034		37.0	80.5	43.5
2035		37.0	80.5	43.5
2036		37.0	80.5	43.5
2037		37.0	80.5	43.5
2038		37.0	80.5	43.5
2039		37.0	80.5	43.5
2040		37.0	80.5	43.5
Total	881.0	1110.0	2279.8	200.7
Financial IRR (%)				1.1%
NPV (DR=12%, YTL)				-556.7

RL014 İkitelli Olimpiyat Koyu - Altınşehir Metro
(Extension of C-6 line)

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	186.4			-186.4
2009	372.8			-372.8
2010	466.0			-466.0
2011		40.0	11.8	-28.2
2012		40.0	18.7	-21.3
2013		40.0	25.6	-14.4
2014		40.0	32.6	-7.4
2015		40.0	39.5	-0.5
2016		40.0	46.5	6.5
2017		40.0	53.4	13.4
2018		40.0	60.4	20.4
2019		40.0	67.3	27.3
2020		40.0	74.3	34.3
2021		40.0	81.2	41.2
2022		40.0	88.2	48.2
2023		40.0	102.0	62.0
2024		40.0	102.0	62.0
2025		40.0	102.0	62.0
2026		40.0	102.0	62.0
2027		40.0	102.0	62.0
2028		40.0	102.0	62.0
2029		40.0	102.0	62.0
2030		40.0	102.0	62.0
2031		40.0	102.0	62.0
2032		40.0	102.0	62.0
2033		40.0	102.0	62.0
2034		40.0	102.0	62.0
2035		40.0	102.0	62.0
2036		40.0	102.0	62.0
2037		40.0	102.0	62.0
2038		40.0	102.0	62.0
2039		40.0	102.0	62.0
2040		40.0	102.0	62.0
Total	932.0	1200.0	2436.2	211.0
Financial IRR (%)				0.9%
NPV (DR=12%, YTL)				-704.9

RL015 Atatürk Airport Access Rail (Extension of Marmaray railway)

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	32.0			-32.0
2009	64.0			-64.0
2010	80.0			-80.0
2011		3.0	2.4	-0.6
2012		3.0	2.7	-0.3
2013		3.0	2.9	-0.1
2014		3.0	3.2	0.2
2015		3.0	3.5	0.5
2016		3.0	3.8	0.8
2017		3.0	4.1	1.1
2018		3.0	4.3	1.3
2019		3.0	4.6	1.6
2020		3.0	4.9	1.9
2021		3.0	5.2	2.2
2022		3.0	5.5	2.5
2023		3.0	6.0	3.0
2024		3.0	6.0	3.0
2025		3.0	6.0	3.0
2026		3.0	6.0	3.0
2027		3.0	6.0	3.0
2028		3.0	6.0	3.0
2029		3.0	6.0	3.0
2030		3.0	6.0	3.0
2031		3.0	6.0	3.0
2032		3.0	6.0	3.0
2033		3.0	6.0	3.0
2034		3.0	6.0	3.0
2035		3.0	6.0	3.0
2036		3.0	6.0	3.0
2037		3.0	6.0	3.0
2038		3.0	6.0	3.0
2039		3.0	6.0	3.0
2040		3.0	6.0	3.0
Total	160.0	90.0	155.5	-110.5
Financial IRR (%)				-4.5%
NPV (DR=12%, YTL)				-132.4

RL016 Sabiha Gokcen Airport Access Rail

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	44.0			-44.0
2009	88.0			-88.0
2010	110.0			-110.0
2011		0.0	4.4	4.4
2012		0.0	5.7	5.7
2013		0.0	7.1	7.1
2014		0.0	8.4	8.4
2015		0.0	9.8	9.8
2016		0.0	11.2	11.2
2017		0.0	12.5	12.5
2018		0.0	13.9	13.9
2019		0.0	15.2	15.2
2020		0.0	16.6	16.6
2021		0.0	18.0	18.0
2022		0.0	19.3	19.3
2023		0.0	22.1	22.1
2024		0.0	22.1	22.1
2025		0.0	22.1	22.1
2026		0.0	22.1	22.1
2027		0.0	22.1	22.1
2028		0.0	22.1	22.1
2029		0.0	22.1	22.1
2030		0.0	22.1	22.1
2031		0.0	22.1	22.1
2032		0.0	22.1	22.1
2033		0.0	22.1	22.1
2034		0.0	22.1	22.1
2035		0.0	22.1	22.1
2036		0.0	22.1	22.1
2037		0.0	22.1	22.1
2038		0.0	22.1	22.1
2039		0.0	22.1	22.1
2040		0.0	22.1	22.1
Total	220.0	0.0	539.0	297.0
Financial IRR (%)				4.7%
NPV (DR=12%, YTL)				-107.9

RL017 Seyrantepe - Bosphorus Crossing -
Umraniye metro

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	163.2			-163.2
2009	326.4			-326.4
2010	408.0			-408.0
2011		28.0	63.5	35.5
2012		28.0	73.3	45.3
2013		28.0	83.0	55.0
2014		28.0	92.8	64.8
2015		28.0	102.5	74.5
2016		28.0	112.3	84.3
2017		28.0	122.1	94.1
2018		28.0	131.8	103.8
2019		28.0	141.6	113.6
2020		28.0	151.4	123.4
2021		28.0	161.1	133.1
2022		28.0	170.9	142.9
2023		28.0	190.4	162.4
2024		28.0	190.4	162.4
2025		28.0	190.4	162.4
2026		28.0	190.4	162.4
2027		28.0	190.4	162.4
2028		28.0	190.4	162.4
2029		28.0	190.4	162.4
2030		28.0	190.4	162.4
2031		28.0	190.4	162.4
2032		28.0	190.4	162.4
2033		28.0	190.4	162.4
2034		28.0	190.4	162.4
2035		28.0	190.4	162.4
2036		28.0	190.4	162.4
2037		28.0	190.4	162.4
2038		28.0	190.4	162.4
2039		28.0	190.4	162.4
2040		28.0	190.4	162.4
Total	816.0	840.0	4833.8	3096.2
Financial IRR (%)				9.9%
NPV (DR=12%, YTL)				-78.7

RL018 Topkapi - 2nd Bosphorus Bridge - Goztepe
AGT

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	155.2			-155.2
2009	310.4			-310.4
2010	388.0			-388.0
2011		35.0	124.7	89.7
2012		35.0	151.8	116.8
2013		35.0	179.0	144.0
2014		35.0	206.1	171.1
2015		35.0	233.3	198.3
2016		35.0	260.4	225.4
2017		35.0	287.6	252.6
2018		35.0	314.7	279.7
2019		35.0	341.9	306.9
2020		35.0	369.0	334.0
2021		35.0	396.2	361.2
2022		35.0	423.3	388.3
2023		35.0	477.6	442.6
2024		35.0	477.6	442.6
2025		35.0	477.6	442.6
2026		35.0	477.6	442.6
2027		35.0	477.6	442.6
2028		35.0	477.6	442.6
2029		35.0	477.6	442.6
2030		35.0	477.6	442.6
2031		35.0	477.6	442.6
2032		35.0	477.6	442.6
2033		35.0	477.6	442.6
2034		35.0	477.6	442.6
2035		35.0	477.6	442.6
2036		35.0	477.6	442.6
2037		35.0	477.6	442.6
2038		35.0	477.6	442.6
2039		35.0	477.6	442.6
2040		35.0	477.6	442.6
Total	776.0	1050.0	11885.5	9981.9
Financial IRR (%)				20.9%
NPV (DR=12%, YTL)				1,032.7

The Study on Integrated Urban Transportation Master Plan for Istanbul Metropolitan Area in the Republic of Turkey
Technical Report

RL019 Kadikoy - Ibrahimaga - Esensehir - Sabiha Gokcen Airport Metro

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	473.0			-473.0
2009	946.0			-946.0
2010	1182.5			-1182.5
2011		104.0	201.0	97.0
2012		104.0	218.4	114.4
2013		104.0	235.8	131.8
2014		104.0	253.2	149.2
2015		104.0	270.6	166.6
2016		104.0	288.0	184.0
2017		104.0	305.4	201.4
2018		104.0	322.8	218.8
2019		104.0	340.2	236.2
2020		104.0	357.6	253.6
2021		104.0	375.0	271.0
2022		104.0	392.4	288.4
2023		104.0	427.2	323.2
2024		104.0	427.2	323.2
2025		104.0	427.2	323.2
2026		104.0	427.2	323.2
2027		104.0	427.2	323.2
2028		104.0	427.2	323.2
2029		104.0	427.2	323.2
2030		104.0	427.2	323.2
2031		104.0	427.2	323.2
2032		104.0	427.2	323.2
2033		104.0	427.2	323.2
2034		104.0	427.2	323.2
2035		104.0	427.2	323.2
2036		104.0	427.2	323.2
2037		104.0	427.2	323.2
2038		104.0	427.2	323.2
2039		104.0	427.2	323.2
2040		104.0	427.2	323.2
Total	2365.0	3120.0	11249.2	5527.7
Financial IRR (%)				7.3%
NPV (DR=12%, YTL)				-723.8

RL020 Bakirkoy - Beylikpuzu Extension

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	12.0			-12.0
2009	24.0			-24.0
2010	30.0			-30.0
2011		2.0	12.4	10.4
2012		2.0	13.5	11.5
2013		2.0	14.6	12.6
2014		2.0	15.7	13.7
2015		2.0	16.9	14.9
2016		2.0	18.0	16.0
2017		2.0	19.1	17.1
2018		2.0	20.2	18.2
2019		2.0	21.3	19.3
2020		2.0	22.4	20.4
2021		2.0	23.5	21.5
2022		2.0	24.7	22.7
2023		2.0	26.9	24.9
2024		2.0	26.9	24.9
2025		2.0	26.9	24.9
2026		2.0	26.9	24.9
2027		2.0	26.9	24.9
2028		2.0	26.9	24.9
2029		2.0	26.9	24.9
2030		2.0	26.9	24.9
2031		2.0	26.9	24.9
2032		2.0	26.9	24.9
2033		2.0	26.9	24.9
2034		2.0	26.9	24.9
2035		2.0	26.9	24.9
2036		2.0	26.9	24.9
2037		2.0	26.9	24.9
2038		2.0	26.9	24.9
2039		2.0	26.9	24.9
2040		2.0	26.9	24.9
Total	60.0	60.0	706.3	580.3
Financial IRR (%)				20.1%
NPV (DR=12%, YTL)				60.5

RL021 Silivri - Gumusyaka Extension

(YTL million)				
Year	Financial Cost	O&M Cost	Revenue	Net Cash Flow
2008	440.0			-440.0
2009	880.0			-880.0
2010	1100.0			-1100.0
2011		90.0	13.0	-77.0
2012		90.0	82.2	-7.8
2013		90.0	151.4	61.4
2014		90.0	220.6	130.6
2015		90.0	289.8	199.8
2016		90.0	359.0	269.0
2017		90.0	428.3	338.3
2018		90.0	497.5	407.5
2019		90.0	566.7	476.7
2020		90.0	635.9	545.9
2021		90.0	705.1	615.1
2022		90.0	774.3	684.3
2023		90.0	912.7	822.7
2024		90.0	912.7	822.7
2025		90.0	912.7	822.7
2026		90.0	912.7	822.7
2027		90.0	912.7	822.7
2028		90.0	912.7	822.7
2029		90.0	912.7	822.7
2030		90.0	912.7	822.7
2031		90.0	912.7	822.7
2032		90.0	912.7	822.7
2033		90.0	912.7	822.7
2034		90.0	912.7	822.7
2035		90.0	912.7	822.7
2036		90.0	912.7	822.7
2037		90.0	912.7	822.7
2038		90.0	912.7	822.7
2039		90.0	912.7	822.7
2040		90.0	912.7	822.7
Total	2200.0	2700.0	21152.5	16032.5
Financial IRR (%)				12.6%
NPV (DR=12%, YTL)				491.4

RL022 Halkali - Hadimkoy Suburban Railway (Extension of Marmaray Project)

(YTL million)				
Year	Financial Cost	O&M Cost	Benefit	Net Cash Flow
2008	107.2			-107.2
2009	214.4			-214.4
2010	268.0			-268.0
2011		21.9	120.0	98.1
2012		21.9	130.7	108.7
2013		21.9	141.4	119.4
2014		21.9	152.0	130.1
2015		21.9	162.7	140.8
2016		21.9	173.4	151.5
2017		21.9	184.1	162.1
2018		21.9	194.7	172.8
2019		21.9	205.4	183.5
2020		21.9	216.1	194.2
2021		21.9	226.8	204.8
2022		21.9	237.4	215.5
2023		21.9	258.8	236.9
2024		21.9	258.8	236.9
2025		21.9	258.8	236.9
2026		21.9	258.8	236.9
2027		21.9	258.8	236.9
2028		21.9	258.8	236.9
2029		21.9	258.8	236.9
2030		21.9	258.8	236.9
2031		21.9	258.8	236.9
2032		21.9	258.8	236.9
2033		21.9	258.8	236.9
2034		21.9	258.8	236.9
2035		21.9	258.8	236.9
2036		21.9	258.8	236.9
2037		21.9	258.8	236.9
2038		21.9	258.8	236.9
2039		21.9	258.8	236.9
2040		21.9	258.8	236.9
Total	536.0	657.8	6803.1	5555.7
Financial IRR (%)				21.0%
NPV (DR=12%, YTL)				603.8

Part 4 Supplementary Explanation on selected Tables in Main Text

Some tables and figures in the main text volume may be incompletely explained because statement on how to calculate is short or none to avoid complicatedness. Here, supplementary explanation is added to selected issues and tables.

4.1 Estimation of Road Project Cost (Table 13.4.4)

Contents

1. Basic Composition of the Project Cost
2. Construction Cost
3. Engineering Cost
4. Land Acquisition Cost
5. Calculation Examples

Followings are the details of the calculation process in the estimation sheet attached. Note that referring alphabets are shown in the estimation sheet. Table below shows the table header and the first project.

Worksheet for Road Project Cost Estimation

S/N	Code	Package	Project Name (Origin - Destination or Intersection)	Project type	Project Length
					m
1	PC01	1	Tophane - Iplikci Tunnel	New	a
					1,275

Quantity							
Lane Numbers		Additional	Road	Bridge	Tunnel	Total	Planned
Before	After	Lane		2% of Road			Junction
Nos.	Nos	Nos.	m	m	m	m	/Interchange
b	c	d	e	f	g		h
0	4	4	0	0	1,275	1,275	

Construction Cost						Engineering Cost	
Road	Bridge	Tunnel	Junction	Constuction	Detail Design	Supervision	+Engineering
\$650.00	\$8,000.00	\$11,000.00	/Interchange	Total	4%	8%	Cost
US\$	US\$	US\$	US\$	US\$	US\$	US\$	US\$
i	j	k	l	m	n	p	q
0	0	56,100,000		56,100,000		4,488,000	60,588,000

Land Acquisition					
Required Area	Unit Market Land Price	Total Market Land Price		Total Cost	Remarks
m2	YTL/m2	YTL	US\$	US\$	
r	s	t	u	v	
4,000	700	2,800,000	2,204,724	62,792,724	

1. Basic Composition of the Project Cost

(Total Project Cost US\$; **v**) = (Construction Cost + Encngineering Cost; **q**) + (Total Market Land Price; **u**)

(Construction Cost + Encngineering Cost; **q**) = (Construction Cost;**m**)+ (Detail Design Cost;**n**) + (Supervision Cost;**q**)

2. Construction Cost

(1) Composition of the Construction Cost

(Construction Cost; **m**)=(Road Cost; **i**)+(Bridge Cost; **j**)+(Tunnel Cost; **k**)+(Junction Cost; **l**)

(Road Cost; **i**) = (Road Length;**e**) x (Additional Lane Number;**d**) x 650.00US\$/m²

(Bridge Cost; **j**) = (Bridge Length;**e**) x (Additional Lane Number;**d**) x 8000.00US\$/m²

(Tunnel Cost; **k**) = (Tunnel Length;**e**) x (Additional Lane Number;**d**) x 11000.00US\$/m²

(Junction Cost; **l**) = (Trumpet Junction number (tp); **h**) x 4,400,000 US\$/u

+ (Clover Junction number (cl); **h**) x 13,200,000US\$/u + (Over-pass number (op); **h**) x 3,000,000US\$/u

*Unit construction costs are assumed from the obtained data (see attached and final report) through discussions with the counterparts.

(2) Project Length and Additional Lane Number

For existing project (Project Code: PC, PD and PE), (Project Length; **a**) and (Additional Lane Number;**d**) are measured from the electronic data of the project map provided by ibid.

(3) Other Conditions

Followings are the consideration depending on the road structures and construction types.

New construction

“Additional Lane Number;**d**” is a lane number of the new road.

Lane Number for Widening Project

“Additional Lane Number;**d**” is the widened lane number from the existing road: **d = c – b**.

Lane Number for Rehabilitation Project

“Additional Lane Number;**d**” is considered to be a half of the existing lane number for the convenience of the cost estimation.

Bridge Length

“Bridge Length;**e**” is considered to be 2% of the (Project Length; **a**) for the convenience of the cost estimation unless otherwise the specific length is obtained or a rolling topography is observed.

Tunnel Length

“Tunnel Length;**e**” is measured from the project map provided by ibid for the existing projects (PC, PD and PE).

Junctions

The number and type of junction is obtained from the project map provided by ibid for the existing projects (PC, PD and PE).

(Abbreviation of the junction type in the table: tp: Trumpet type, cl: Clover type, op: Over-pass)

3. Engineering Cost

(1) Composition of the Engineering Cost

(Detail Design Cost;n) = (Construction Cost;n) x 0.04

(Supervision Cost;q) = (Construction Cost;n) x 0.08

4. Land Acquisition Cost

(1) Composition of the Land Acquisition Cost

(Total Market Land Price; u) = (Unit Market Land Price a) x (Required Area; r)

(2) Unit Market Land Price

Unit market land prices employed in this calculation were estimated based on following data through the discussions with counterparts. In addition, some adjustments for developed/undeveloped condition of the area have been made.

- land unit prices used in the study of the cost estimation of road project prepared by IMM (attached)
- Official land price of 2006 (attached)

(3) Required Land Area

Required land area for each project type are estimated based on the following assumption:

New construction

Area (m²) = (Project Length;a) x {(Additional Lane Number;d) x 3.5m + 10m}

*Width of one lane is 3.5m

*A 10m is considered as an additional right of way

Widening

Area (m²) = (Project Length;a) x {(Additional Lane Number;d) x 3.5m + 5m}

*A 5m is considered as an additional right of way

Rehabilitation

Area (m²) = (Project Length;a) x 10m

*A 10m is considered as an additional right of way

Tunnel Project

4000m² is considered for tunnel portals.

Junctions

Length of the ramp-way is Included in the project length.

5. Calculation Examples

(1) New construction

[Project Code: PE19]

Project features

Project Length (a): 6600m

Lane Numbers (d) : 6

Bridge Length (f) : 1935m=360+425+475+275+280+120 (data were obtained)

Tunnel Length (g) : 425m

Road Length (e) : 4240m=6600m-1935m-425m

Junction (h) : 1 Clover Type

Construction Cost(m): \$150,666,000 =(i)+(j)+(k)+(l)

Road (i) : \$1,653,6000=4240(e)x6(d)x\$650

Bridge (j) : \$92,880,000=1935 (f)x6(d)x\$8000

Tunnel (k) : \$28,050,000=425(g) x6(d)x\$11000

Junction (l) : \$13,200,000=1 Clover type (h)x\$13,200,000
Engineering Cost
Detail Design (n): \$6,026,640=\$150,666,000x0.04
Supervision (p) : \$12,053,280=\$150,666,000x0.08
Land Acquisition Cost (u): \$112,771,654=204600m²(r)xYTL700(s)/1.27(YTL/US\$)
Land Unit Price (s) : YTL700 (KAĞITHANE)
Required Area (r) : 204600m²=6600m(a)x{6(d) x 3.5m+10m}
Total Project Cost : \$281,517,574(v)= \$150,666,000(m)+ \$6,026,640(n)+ \$12,053,280(p)+ \$112,771,654(u)

[Project Code: PF03]

Project features

Project Length (a): 16000m

Lane Numbers (d) : 4

Bridge Length (f) : 320m=16000mx0.02

Tunnel Length (g) : -

Road Length (e) : 15680m=16000m-320m

Junction (h) : 1 Trumpet Type

Construction Cost(m): \$55,408,000 =(i)+(j)+(k)+(l)

Road (i) : \$1,653,6000=4240(e)x6(d)x\$650

Bridge (j) : \$92,880,000=1935 (f)x6(d)x\$8000

Tunnel (k) : -

Junction (l) : \$4,400,000=1 Trumpet type (h)x\$4,400,000

Engineering Cost

Detail Design (n): \$2,216,320=\$55,408,000x0.04

Supervision (p) : \$44,32,640=\$55,408,000x0.08

Land Acquisition Cost (u): \$60,472,441=384,000m²(r)xYTL200(s)/1.27(YTL/US\$)

Land Unit Price (s): YTL200 (SİLİVRİ)

Required Area (r) : 384000m²=16000m(a) x {4(d)x3.5m+10m}

Total Project Cost : \$122,529,401(v)= \$55,408,000 (m)+ \$2,216,320 (n)+ \$44,32,640 (p)+ \$60,472,441 (u)

(2) Widening

[Project Code: PE07]

Project features

Project Length (a): 1278m

Additional Lane Numbers (d) : 2 (2-lane => 4-lane)

Bridge Length (f) : 26m=1278mx0.02

Tunnel Length (g) : -

Road Length (e) : 1252m=1278m-26m

Junction (h) : -

Construction Cost(m): \$2,037,137 =(i)+(j)+(k)+(l)

Road (i) : \$1,628,176=1252(e)x2(d)x\$650

Bridge (j) : \$408,961=26 (f)x2(d)x\$8000

Tunnel (k) : -

Junction (l) : -

Engineering Cost

Detail Design (n): \$81,485=\$2,037,137x0.04

Supervision (p) : \$162,971=\$2,037,137x0.08

Land Acquisition Cost (u): \$5,192,516=15,335m²(r) x YTL430(s)/1.27(YTL/US\$)

Land Unit Price (s): YTL430 (ÜMRANİYE)

Required Area (r) : 15,335m²=1278m(a)x{2(d)x3.5m+5m}

Total Project Cost : \$7,474,109(v)= \$2,037,137 (m)+ \$81,485 (n)+ \$162,971 (p)+ \$5,192,516 (u)

(3) Rehabilitation

[Project Code: PD05]

Project features

Project Length (a): 1660m

Additional Lane Numbers (d) : 4 (8-lane x 0.5)

Bridge Length (f) : 33m=1660m x 0.02

Tunnel Length (g) : -

Road Length (e) : 1627m=1660m-33m

Junction (h) : -

Construction Cost(m): \$5,293,540 =(i)+(j)+(k)+(l)

Road (i) : \$4,230,847=1627(e)x4(d)x\$650

Bridge (j) : \$1,062,693=33 (f)x4(d)x\$8000

Tunnel (k) : -

Junction (l) : -

Engineering Cost

Detail Design (n): - (Design completed)

Supervision (p) : \$423,483=\$5,293,540x0.08

Land Acquisition Cost (u): \$6,537,236=16,605m²(r) x YTL500(s)/1.27(YTL/US\$)

Land Unit Price (s): YTL500 (developed area of BEYKOZ)

Required Area (r) : 16,605m²=1660m(a)x10m

Total Project Cost : \$12,254,260(v)= \$5,293,540 (m)+ \$0 (n)+ \$423,483 (p)+ \$6,537,236

(u)

(4) Tunnel Project

[Project Code: PF44]

Project features

Project Length (a): 1100m

Lane Numbers (d) : 4

Bridge Length (f) : -

Tunnel Length (g) : 1100m

Road Length (e) : -

Junction (h) : -

Construction Cost(m): \$48,400,000 =(i)+(j)+(k)+(l)

Road (i) : -

Bridge (j) : -

Tunnel (k) : \$48,400,000=1100(g) x4(d)x\$11000

Junction (l) : -

Engineering Cost

Detail Design (n): \$1,936,000=\$48,400,000x0.04

Supervision (p) : \$3,872,000=\$48,400,000x0.08

Land Acquisition Cost (u): \$3,149,606=4000m²(r)xYTL1000(s)/1.27(YTL/US\$)

Land Unit Price (s) : YTL1000 (developed area of GÜNGÖREN)

Required Area (r) : 204600m²=6600m(a)x{6(d) x 3.5m+10m}

Total Project Cost : \$57,375,606(v)= \$48,400,000(m)+ \$1,936,000 (n)+ \$3,872,000 (p)+ \$3,149,606 (u)

Construction Period

The construction period of the projects is tentatively determined on the basis of the following assumptions;

A. Case of the projects included in the Base Network

- (1) The projects under construction at present (Category A) are assumed to be completed within one year, because of the lack of information on the implementation progress.
- (2) For the projects to be implemented from now (Category B to D), it is assumed as follows.

- Firstly one year will be required for detailed design and land acquisition.
- The construction period is likely to change depending on the project scale, therefore, accounted to be one year for the project less than US\$10 million, two years for those of approximately US\$10million – US\$150million, and three to four years for those exceeding about US\$150million.
- In case of tunnel projects, some additional period, say one year will be added to the above construction period, taking the engineering difficulty into account.

B. Case of the projects included in the maximum network

Basically above determination procedure is applied for the projects in the maximum network as well. However, some modifications are additionally made taking into account the following considerations.

- Compared to the base network projects, slightly longer construction period will be generally adopted considering the tendering process period of about half year to one year prior to the construction.
- As for the package projects, further longer period will be applied because the projects are to be implemented in harmonious manner with the urban development of the surrounding area.

4.2 Estimation of Railway O&M Cost (Table 14.5.9 – 14.5.11)

Table 14.5.9 Assumed Unit of No. of Staff and O&M Expenses

	No. of Staff			Expenses (YTL) *5
	General Administration Staff *1	Station Staff *2	Other Staff *4	
	Per route-km	Per station	Per 1000 car-km/day	Per car-km
Metro/ LRT	3.0	10.0 *3	6.7	3.34
Tramway	3.0	8.3	25.0	13.6
Suburban	3.0	9.9	3.4	2.07
Monorail	3.0	3.4	7.2	2.85
AGT	3.0	3.4	3.0	1.85

Source:

*1: $188/62.4\text{km} = 3.0$ (Ulasim A.S.)

*2: Table 14.5.6

*3: Assumed from 9.5 of Metro in Japan and 13.3 of Light Rail in Istanbul

*4: Table 14.5.7 (minor change: 25.1 → 25.0)

*5: Table 14.5.8

Table 14.5.10 Operation Type of Metro for O&M Estimation

	Peak		Off-Peak		No. of cars per train	No. of trains per day	No. of cars per day
	Hours	Head-way (minutes)	Hours	Head-way (minutes)			
	A	B	C	D	E	F*1	D = E*F
Metro	4	4	12	7.5	8	312	2,496
LRT	4	4	12	7.5	4	312	1,248
Tramway	4	4	12	7.5	3	312	936
Marmaray	4	4	12	7.5	10	312	3,120
Suburban	4	6	12	7.5	8	272	2,176
Monorail	4	4	12	7.5	3 or 5	312	936 or 1,560
AGT	4	4	12	7.5	5	312	1,560

Note *1: $F = (A * 60/B + C * 60/D) * 2$

Source: Calculation by the JICA Study Team

Table 14.5.11 Estimation of Railway O&M Costs

Length (km): (a)
 No. of stations: (b)
 Car-km per day in 1000: (c)
 (c) = (a) * No of cars per day (calculated in Table 14.5.10)
 No. of staff: (d)
 (d) = K1 * (a) + K2 * (b) + K3 * (c)
 Where, K1 = General administration staff per route km (Table 14.5.9)

Project Code	Railway Section	System	Length (km)	No. of stations	Car-km per day in 1000	No. of staff	Cost (Million US\$)		
							Personnel Expense	Other Expense	Total
Existing Lines									
E-1	Taksim - 4.Levent	Metro	8.5	6	21.2	228	6	21	27
E-2	Aksaray - Airport	Light Metro	19.3	18	24.1	399	11	24	35
E-3	Kabatas - Zeytinburnu	Tram	14.1	24	13.2	571	15	53	69
E-4	Zeytinburnu - Bagcilar	Tram	5.5	9	5.1	220	6	21	27
E-12	Edirnekapi – Sultanciftligi	Light Metro	12.4	18	15.5	321	9	15	24
	Total		59.8			1,739	47	134	181
Under Construction Project									
C-1	Taksim - Yenikapi	Metro	5.2	4	13.0	143	4	13	17
C-2	Edirnekapi - Topkapi	Tram	3.0	2	3.9	123	3	16	19
C-3	Kadikoy - Kartal	Metro	21.7	16	54.2	588	16	54	70
C-4	4. Levent - Ayazoga - Haciosman	Metro	8.0	5	20.0	208	6	20	25
C-5	Otogar - Bagcilar (Kilazli)	Light Metro	5.6	4	6.7	101	3	7	9
C-6	Bagcilar - Ikitelli - Olimpiyat Koyu	Metro	15.9	11	39.7	424	11	39	51
C-7	Marmaray Project	Suburban	76.5	45	238.8	1,487	40	147	187
C-8	Aksaray - Yenikapi	Light Metro	0.7	1	0.9	18	0	1	1
	Total		136.6			3,091	83	296	379
Tender Stage Project									
T-1	Uskdar - Cekmekoy	Light Metro	19.0	17	23.7	386	10	24	34
T-2	Bakirkoy - Beylikduzu	Light Metro	25.0	19	31.2	474	13	31	44
	Total		44.0			860	23	54	78
Design Stage Project									
D-1	Bakirkoy-Bahcelievler-Bagcilar	Metro	9.0	7	22.5	248	7	22	29
D-2	Kabatas - Besiktas - Sisli - Giyimkent - Bagcilar	Metro	25.0	19	61.2	673	18	61	79
D-3	Yenikapi - Bakirkoy	Metro	7.0	6	17.5	198	5	17	23
D-4	Halic - Cevresi	Tram	9.6	13	9.0	361	10	36	46
D-5	Yesilkoy - Ataturk Airport - Ikitelli	Metro	14.3	10	35.7	382	10	35	46
D-6	Sishane - Kulakasisiz - Cemal kamaci Guzergahi	Monorail	5.8	10	9.4	131	4	8	11
	Total		70.7			1,994	54	180	234
Planning Stage Project (1)									
P1-1	Bagcilar - Halkali	Light Metro	7.5	6	9.4	145	4	9	13
P1-2	Tekstilkent - Istoc - Olimpiyat Koyu - Ispartakule	Metro	12.0	7	41.7	399	11	41	52
P1-3	Umraniye - Bostanci Metro	Metro	14.0	13	42.7	467	13	42	55
P1-4	Kartal - S. Gokcen Airport - Tuzla	Metro	18.1	14	43.9	487	13	44	57
	Total		51.6			1,499	40	137	177
Planning Stage Project (2)									
P2-1	Seyrantepe - Alibeykoy - Gop - Kazlıcesme	Metro	16.3	14	45.2	497	13	45	58
P2-2	Kartal D-100 - Kartal IDO	Monorail	3.0	3	4.7	53	1	4	5
P2-3	S. Gokcen Airport - Formula 1	Monorail	7.7	4	12.0	123	3	10	13
P2-4	Haciosman - Cayirbasi Metro	Metro	2.7	1	6.7	63	2	7	8
P2-5	4. Levent-Gultepe Mah.-Celiktepe Mah.	Monorail	8.7	8	8.0	111	3	7	10
P2-6	Besiktas - Sariyer	LIM	14.5	10	17.6	260	7	17	24
P2-7	Esenyurt-Avcilar Merkez Metro	Metro	10.5	10	41.7	429	12	41	53
P2-8	Ispartakule - Kirac - Buyukcekmece - Silivri	Metro	25.8	13	54.4	569	15	54	69
P2-9	Uskudar - Beykoz	LIM	15.0	10	28.1	333	9	28	37
P2-10	Basaksehir - Olimpiyat Koyu Metro	Metro	13.0	4	32.4	296	8	32	40
P2-11	Ataturk Airport Access	Suburban	2.6	2	2.7	37	1	2	3
	Total		119.8			2,772	75	247	322
Planning Stage Project (2)									
PP-1	Seyrantepe - Bosphorus Crossing - Umraniye	Metro	9.8	3	25.0	227	6	25	31
PP-2	Topkapi - 2nd Bosphorus Bridge - Goztepe	AGT	34.7	12	46.8	271	7	26	33
PP-3	Kadikoy-Ibrahimaga-Esensehir-S. G. Airport	Metro	36.8	17	82.4	821	22	82	104
PP-4	Halkali - Hadimkoy	Suburban	20.4	5	43.5	257	7	27	34
PP-5	Bakirkoy - Beylukzudu Extension	Light Metro	1.0	1	1.2	21	1	1	2
PP-6	Celaliye Silivri Extension	Metro	18.9	30	102.3	1,126	30	101	132
	Total		121.6			2,724	74	262	335
	Grand Total		604.1			14,679	396	1,310	1,706

Note: 1YTL = 0.9 US\$

4.3 Future Household Income (Table 10.2.1)

The report shows the following future data in Table 10.2-1 in the Draft Final Report. The growth ratio of the average household income is the same as growth rate of GDP/capita.

Table 10.2.1 Future Socio-economic Framework in Istanbul

Items	2005	2023	2023/2005	Growth Ratio /annum
Population in Istanbul	11,608,349	16,000,000	1.378	0.0180
GDP			2.490	0.0520
GDP/capita (YTL)	5,482	9,681	1.766	0.0321
Household Income/month (YTL)	1,144	2,020	1.766	0.0321

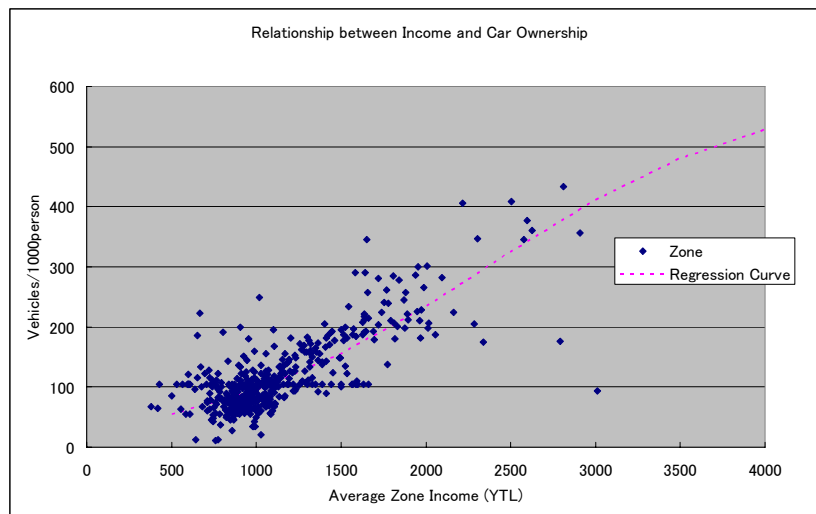
Source: IMM

4.4 Future Car Ownership (Table 10.2.3)

- 1) Estimate of the relationship between Cars/1000persons and Household income based on the PT survey data
- 2) The following equation is estimated based on the regression analysis.

- $Cars/1000 = K / (1 + e^{-a}) * e^{-b * income}$

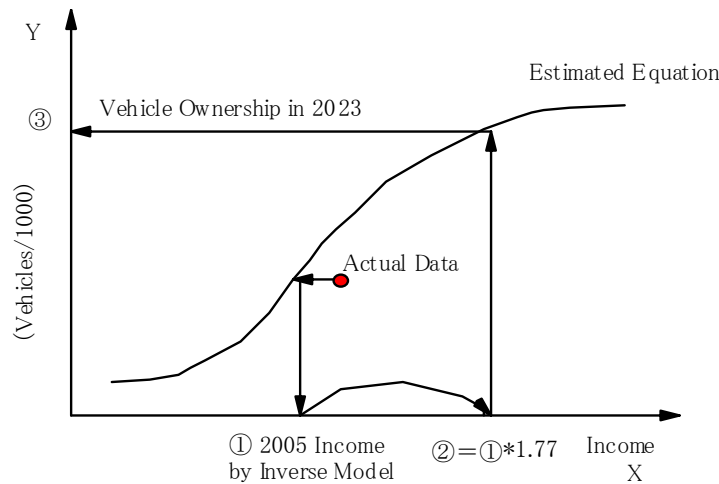
K	600
a	-2.89
b	0.00122



- 3) Estimate of 2005 zone income: (Converted Income) by the estimated equation. see the following Figure (1), because it is necessary to adjust the difference between actual income data and income estimated by equation.

- $Converted\ Income: (1) = - (a + \ln(K / C - 1)) / b$

$$C = Cars/1000$$



- 4) Estimate of Future Income (2)= (1) * Future income growth ratio (1.77)
- 5) Estimate of Future Car Ownership : (3) by substitution of (2) in the equation
- 6) Estimated vehicle ownership/1000 persons shows in Table 10.2.2 in Main Text
- 7) Estimated number of vehicles = (3) * population

Table 10.2.2 Estimated Vehicle Ownership and Number of Vehicles in 2023 in Study Area

	2005	2023	2023/2005
No. of Vehciles/1000 persons	111.1	244.9	2.20
No. of Vehicles	1,334,630	4,194,569	3.14

4.5 Environmental Benefit (Table 15.3.4)

- 1) It is speed related emission factor which include 3 types of engine namely petrol with catalyst, petrol without catalyst and diesel engines.
- 2) The speed related emission factor's interval is 5km/h
- 3) This was developed in 1990s by EU (Germany and UK).
- 4) Emission factors are listed below. However, these factors were a little dated so the results shall be taken in account as a reference for plan alternatives comparison.

Table 0.4 Environmental Benefit on Proposed Transport Plan Alternatives

Unit: Kg/day	HC	CO	CO2	NOX	Total Suspended Particulate
Base Net 2023	197,439	1,546,546	19,186,900	189,162	12,532
Max Net 2023	164,900	1,299,448	16,369,790	158,487	9,742
Benefit	16.5%	16.0%	14.7%	16.2%	22.3%

Source: Study Team

Number of Road Motor Vehicle by Engine Type 2002-2006

Istanbul		2002	2003	2004	2005	2006	
	Gasoline	1,015,434	977,567	1,168,760	1,201,124	1,188,339	51.9%
Diesel	127,011	144,908	465,887	608,268	768,509	33.6%	
LPG			111,508	133,878	151,272	6.6%	
Unknown			256,883	214,995	181,150	7.9%	
	1,142,445	1,122,475	2,003,038	2,158,265	2,289,270	100.0%	

Turkey	Gasoline	3,709,068	3,749,493	3,314,641	3,215,773	3,166,674	47.8%
	Diesel	730,433	816,268	1,479,645	1,812,696	2,186,026	33.0%
	LPG			571,466	861,770	1,033,489	15.6%
	Unknown			356,835	287,647	242,996	3.7%
		4,439,501	4,565,761	5,722,587	6,177,886	6,629,185	100.0%

Istanbul		2002	2003	2004	2005	2006
	Gasoline	88.9%	87.1%	58.3%	55.7%	51.9%
Diesel	11.1%	12.9%	23.3%	28.2%	33.6%	
LPG			5.6%	6.2%	6.6%	
Unknown			12.8%	10.0%	7.9%	
	100.0%	100.0%	100.0%	100.0%	100.0%	

Applied Emission Factor

Car Type	Fuel	Engine Type	Applied Emission Factor	2006	2011	2018	2023
P.Car	Petrol	Non-catalyst	Petrol non-Catalyst	21.0%	36.0%	48.0%	60.0%
	Petrol	with catalyst	Petrol with-Catalyst	39.0%	24.0%	12.0%	0.0%
	Diesel	Diesel	Diesel	40.0%	40.0%	40.0%	40.0%
				100%	100%	100%	100%
Service	Diesel	Diesel	Diesel	100.0%	100.0%	100.0%	100.0%
Public	Diesel	Diesel	Diesel	100.0%	100.0%	100.0%	100.0%

P.Car Petrol and Diesel Ratio

	Petrol	Diesel
2006	60.0%	40.0%
2011	60.0%	40.0%
2018	60.0%	40.0%
2023	60.0%	40.0%

P.Car Catalyst and non Catalyst ratio on Petrol Engine

	Catalyst	Non Catalyst
2006	35.0%	65.0%
2011	60.0%	40.0%
2018	80.0%	20.0%
2023	100.0%	0.0%

Service (Mini Bus)

	Petro	Diesel
2006	0.0%	100.0%
2011	0.0%	100.0%
2018	0.0%	100.0%
2023	0.0%	100.0%

Public (Bus)

	Petro	Diesel
2006	0.0%	100.0%
2011	0.0%	100.0%
2018	0.0%	100.0%
2023	0.0%	100.0%

(1) Emission Factors For Catal yst Cars

Based on a fleet of cars with different engine sizes.

It is assumed 48% are less than 1.4 Litre, 45% are between 1.4 Litre and 2.0 Litre and 7% are greater than 2.0 Litre. The pollutants in the table are given in grammes/km.

Speed (Km/hour)	HC	CO	CO2	NOX	TSP
5	1.37	17.45	642.97	0.76	0.02
10	0.57	8.82	382.83	0.51	0.02
15	0.44	6.55	305.43	0.42	0.02
20	0.38	5.46	267.00	0.38	0.02
25	0.33	4.84	242.63	0.37	0.02
30	0.29	4.40	209.18	0.36	0.02
35	0.25	3.84	193.46	0.34	0.02
40	0.21	3.32	181.02	0.33	0.02
45	0.17	2.49	174.48	0.30	0.02
50	0.13	1.87	158.84	0.27	0.02
55	0.10	1.42	143.57	0.24	0.02
60	0.08	1.22	139.61	0.23	0.02
65	0.07	0.87	137.16	0.24	0.02
70	0.06	0.68	136.16	0.25	0.02
75	0.05	0.56	137.02	0.25	0.02
80	0.05	0.53	137.39	0.25	0.02
85	0.05	0.55	140.78	0.27	0.02
90	0.05	0.59	144.99	0.29	0.02
95	0.05	0.66	151.61	0.30	0.02
100	0.05	0.72	159.06	0.32	0.02
105	0.05	0.82	169.17	0.33	0.02
110	0.05	0.92	176.37	0.35	0.02
115	0.06	1.09	186.55	0.37	0.02
120	0.06	1.33	207.82	0.41	0.02
125	0.07	1.52	234.40	0.45	0.02
130	0.08	1.81	273.66	0.51	0.02

(2) Emission Factors For Petrol Cars

Based on a fleet of cars with different engine sizes. It is assumed 48% are less than 1.4 Litre 45% are between 1. 4 Litre and 2.0 Litre and 7%, are greater than 2.0 Litre. The, pollutants, in the table are given in grammes/km

Speed (Km/hour)	HC	CO	CO2	NOX	TSP
5	10.03	84.13	510.49	4.21	0.04
10	4.90	36.40	286.35	2.34	0.04
15	3.82	30.00	224.29	2.17	0.04
20	3.15	26.78	192.71	2.16	0.04
25	2.92	23.86	175.78	2.28	0.04
30	2.61	21.20	164.45	2.34	0.04
35	2.19	17.36	147.53	2.31	0.04
40	1.91	15.44	141.90	2.19	0.04
45	1.61	12.97	136.35	2.11	0.04
50	1.37	10.91	130.44	2.12	0.04
55	1.15	8.64	125.15	2.11	0.04
60	1.05	7.57	123.19	2.14	0.04

65	0.92	6.94	121.80	2.16	0.04
70	0.79	6.02	122.01	2.19	0.04
75	0.76	5.40	121.88	2.23	0.04
80	0.68	4.60	121.80	2.30	0.04
85	0.68	4.62	123.38	2.40	0.04
90	0.69	4.76	125.45	2.52	0.04
95	0.71	4.96	127.59	2.70	0.04
100	0.71	5.31	132.05	2.90	0.04
105	0.72	5.82	138.03	3.11	0.04
110	0.73	6.26	147.37	3.45	0.04
115	0.75	7.95	162.79	3.88	0.04
120	0.77	9.17	175.55	4.35	0.04
125	0.84	10.12	188.90	4.87	0.04
130	0.90	11.88	199.79	5.42	0.04

(3) Emission Factors For Diesel Cars

Engine size 84%, greater than 2.0L, 16% less than 2.0L Based on a fleet of cars with different engine sizes. It is assumed 48% are less than 1.4 Litre, 45% are between 1.4 Litre and 2.0 Litre and 7% are greater than 2.0 Litre. The pollutants in the table are given in grammes/km

Speed (Km/hour)	HC	CO	CO2	NOX	TSP
5	0.45	1.52	394.52	6.08	0.55
10	0.22	0.94	237.29	2.29	0.38
15	0.18	0.77	192.19	1.54	0.19
20	0.15	0.69	181.54	1.19	0.17
25	0.13	0.62	171.74	1.04	0.14
30	0.11	0.56	167.78	0.84	0.12
35	0.10	0.50	161.79	0.64	0.11
40	0.09	0.46	152.48	0.60	0.11
45	0.08	0.43	144.78	0.59	0.11
50	0.07	0.39	138.34	0.59	0.11
55	0.07	0.36	130.38	0.55	0.11
60	0.06	0.34	125.68	0.56	0.11
65	0.06	0.32	124.60	0.55	0.11
70	0.06	0.30	123.27	0.56	0.11
75	0.05	0.29	123.60	0.57	0.11
80	0.05	0.27	123.68	0.58	0.11
85	0.05	0.27	126.01	0.61	0.11
90	0.05	0.27	130.85	0.65	0.11
95	0.05	0.28	138.52	0.68	0.11
100	0.06	0.30	146.52	0.72	0.11
105	0.06	0.32	159.01	0.79	0.11
110	0.06	0.34	171.48	0.88	0.11
115	0.06	0.38	192.43	1.00	0.11
120	0.07	0.42	213.37	1.19	0.11
125	0.07	0.48	239.67	1.38	0.11
130	0.08	0.54	262.93	1.61	0.11

Average Vehicle Speed by Link (km/h)
CO2 (g-CO2/km. car)

km/h	Small	Large
5	547	2110
10	342	1515
15	269	1277
20	229	1133
25	204	1042
30	186	963
35	172	894
40	161	836
45	152	788
50	146	750
55	141	723
60	138	706
65	137	700
70	137	705
75	139	719
80	142	744
85	146	780
90	152	826

Source: Road Information Center, Japan, 2005

4.6 Urbanization and Land Value (Figure 24.3.1)

1) Assumption

- It could not find correlation between land value and population density and other factors so it was decided to establish an assumption as follows:
- In accordance with Land Use Plan, 5 new CBDs would be established such as Silever (western end of Istanbul), between Kucuk and Byuiku, Kavacik (northern part of the second Bosphorus Bridge), Koz (surrounding of Bostanci) and Kartel.
- Hence land value in those new CBDs would be increased to closer land value of present CBDs, but not same, it is discounted approximately 60% (I am trying to find out more detail) due that distance from the center and it is subject to urbanized area.

2) Applied future land value:

- New CBD is 1200YTL/m² (this is 60% of highest CBD land value in 2006)
- Adjacent area is 600YTL/m² (median value)
- Further area is 300YTL/m². (similar to 2006)
(Detail is shown in ArcGIS file at IMP PC that Selim was using.)

3) Present land value (year 2006)

Published land value along the road in year 2006 issued by Ministry of Finance was applied.

4) Future value (year 2003) in Istanbul by district

Future land value of each Mahalle was estimated based on future land use plan 2023 and the official land price 2006, and finally these were assigned on a map by ArcGIS. The report shows exported file from ArcGIS. (ArcGIS was operated by Selim)

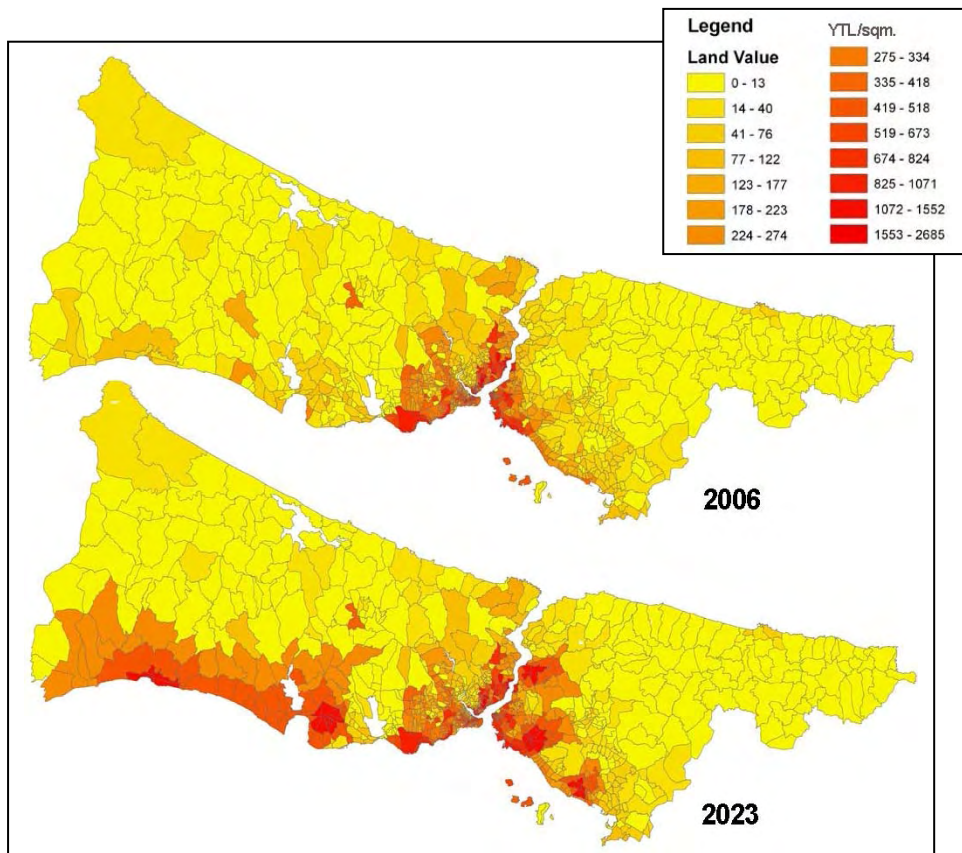


Figure 24.3.1 Urbanization and Land Value