WATER SUPPLY PROBLEMS OF ISTANBUL

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POPULATION AND WATER DEMAND

Presently the population of Istanbul city varies between 10 and 12 million. Population growth rate is about two fold of average Turkish growth. The main reason for this increment is migration from other parts of the country. The average rate of migration to Istanbul every year is about 400.000 person. This number corresponds to the population of any city in Anatolia and therefore a city is being added to Istanbul as a result of migration. Consequently any planned prediction for projects remain under the real level and due to this in Istanbul water supply and sewerage as well as waste water treatment in addition to transportation cannot be solved and these are always suspended for future solutions. On the other hand. Istanbul is the most significant industrial and trade center in Turkey and almost 50 % of Turkish industry is located in this city.

Population growth rates and actual number of population are presented in Table 1. As is obvious from this table that population growth rate has increased about 4.9 %. Subsequently the population of the city has reached to 7 million in 1990. However in 1995 the population is estimated to between 10 and 12 million. It is expected that the population will assume 13, 20, and 30 million in years 2000, 2010 and 2020, respectively. The estimated values based on different methods are exposed in Figure 1.

In the calculations of domestic water demand 250 lt./day per capita was adopted. Along the years the industrial water demand additions are taken into consideration in finding the total water demand. These values are presented in Table 2.

Table 1. Population of Istanbul and Growth Rates

(Adalar, Bakırköy, Bayrampaşa, Beşiktaş, Beykoz, Beyoğlu, Eminönü, Eyüp, Fatih, Gaziosmanpaşa, Kadıköy, Kağıthane, Kartal, K.Çekmece, Pendik, Sarıyer, Şişli, Ümraniye, Üsküdar, Zeytinburnu .)

Years	Population	Growth rate (%)
1955	1 268 771	
		2.9
1960	1 466 535	
		3.5
1965	1 742 978	
		4.1
1970	2 132 407	
		3.6
1975	2 547 364	
		1.7
1980	2 772 708	
		14.6
1985	5 475 982	
		3.9
1990	6 620 241	
	Average	4.9

Table 2. Istanbul Water Demand

YEARS	POPU-LATION (Million)	DOMESTIC WATER DEMAND		INDUSTRY WATER DEMAND		TOTAL WATER DEMAND	
		m³/day	mil.m³/day	m³/day	mil.m³/day	m³/day	mil.m³/day
1990	7	1.750.000	640	340.000	120	2.090.000	760
1995	10	2.500.000	910	370.000	140	2.870.000	1.050
2000	13	3.250.000	1.190	450.000	160	3.700.000	1.350
2010	20	5.000.000	1.825	460.000	175	5.460.000	2.000
2020	30	7.500.000	2.740	520.000	190	8.020.000	2.930.

Population rate is taken as 4,6 % and the values are rounded.

WATER RESOURCES AND DEMAND MEETING

Presently, about 65 % of the city population lives on the European side and the remaining 35 % on the Asian side.. However the distribution of the water resources is conversely 65 % on the Asian side and 35 % on the other side. As a result of this it is necessary to transport water from the Asian to European side. Nevertheless, water transportation is actually effective by two pipe lines of 1 meter diameter each under the Bosphorus.. Currently the total safe yield of surface reservoirs that supply water to Istanbul is 600 million cubic meter per year during normal years but 400 million cubic meter per year along dry periods. The general information about the water resources of the city that are presently effective in practice are given in Table 3. Under the same table planned water resources are indicated.

Yearly total water demand in 1995 is 1.05 billion cubic meter. Existing water resources meet only 600 million cubic meter per year. Accordingly there is about 450 million cubic meter water deficit for the city of Istanbul. In order to offset this deficit there are the following water resources alternatives.

a) To get into service the planned surface water resources

b) To benefit from ground water possibilities

c) Desalinization plants

d) Reduction of water losses

e) Water saving

f) Groundwater recharge from waste water after advanced treatment

Table 3. Water Resources and Capacities in Istanbul

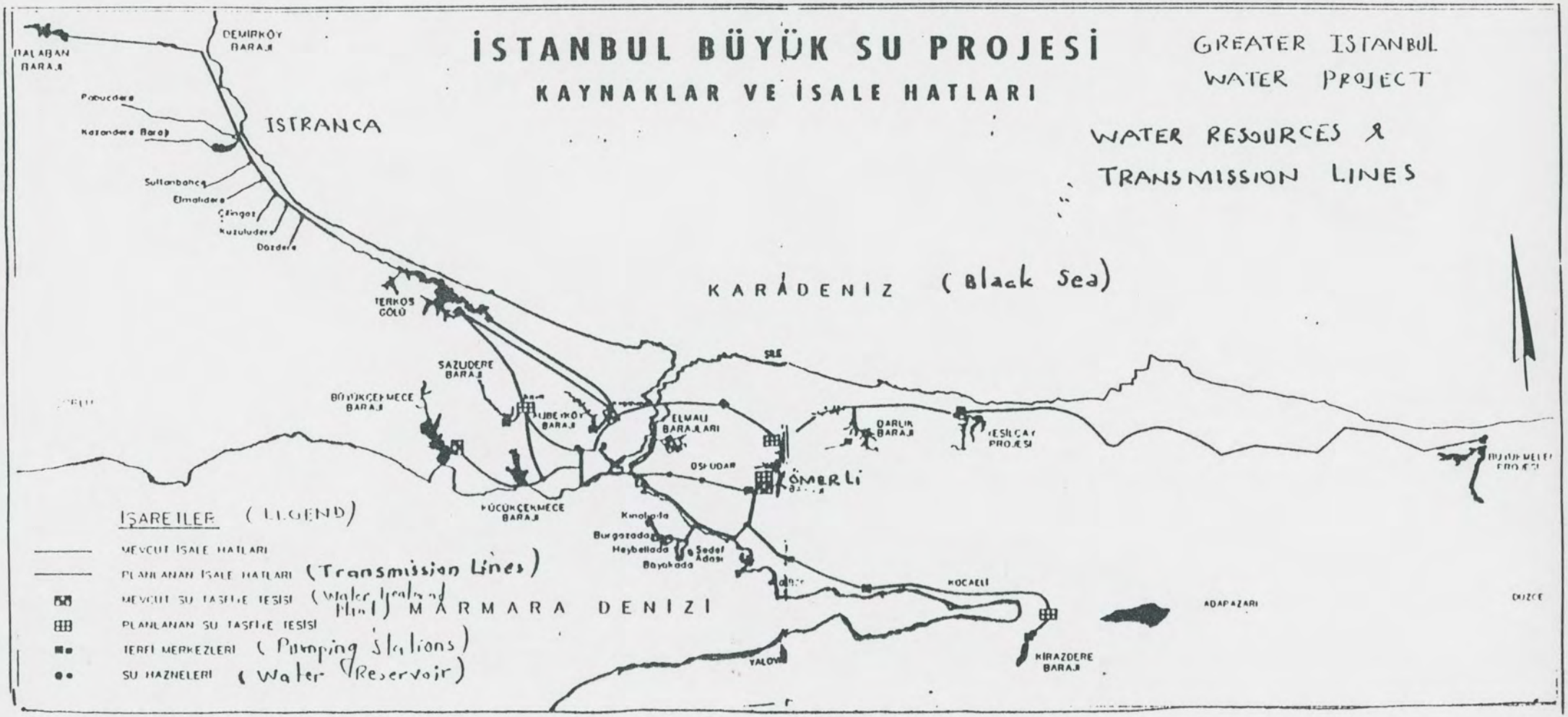
PRESENT WATER RESOURCES

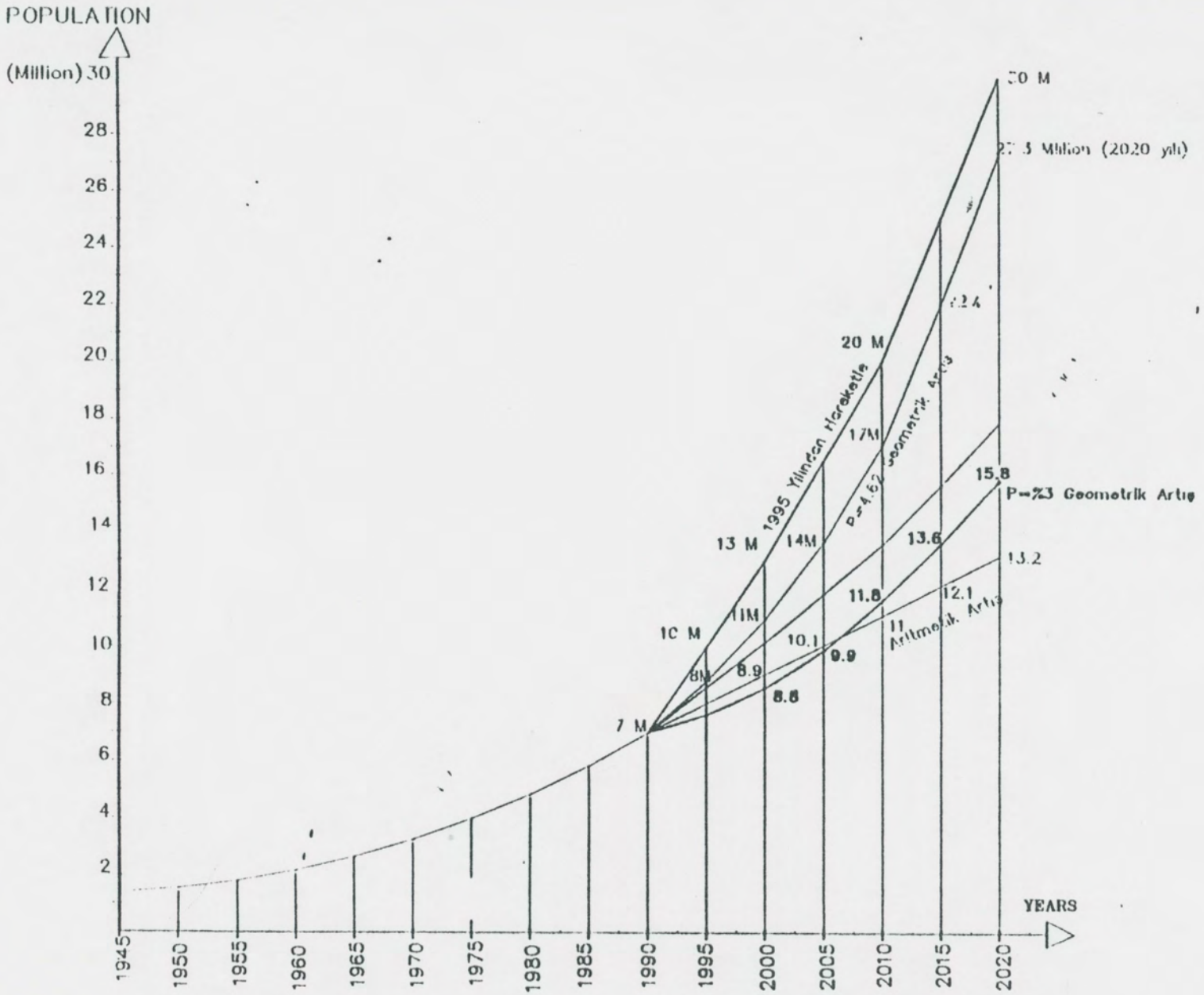
WATER RESOURCE	INITIAL SERVICE YEAR	ANNUAL YIELD Million m^3 /year	
DAMS AND GROUNDWATER.		10	
ELMALI I and II	1893, 1950	15	(12)
TERKOS	1883	142	(80)
ALIBEYKÖY	1972	36	(21)
ÖMERLI	1972	220	(164)
DARLIK	1982	97	(72)
BÜYÜKÇEKMECE	1989	70 *	(45)
YESILVADI REGULATOR.	1992	10	(6)
PRESENT ANNUAL AVERAGE TOTAL		600	(410)

NOTE: Values within parenthesis are averages of dry years.
* Büyükçekmece yield is 70 million m^3 instead of 100 million m^3 per year..

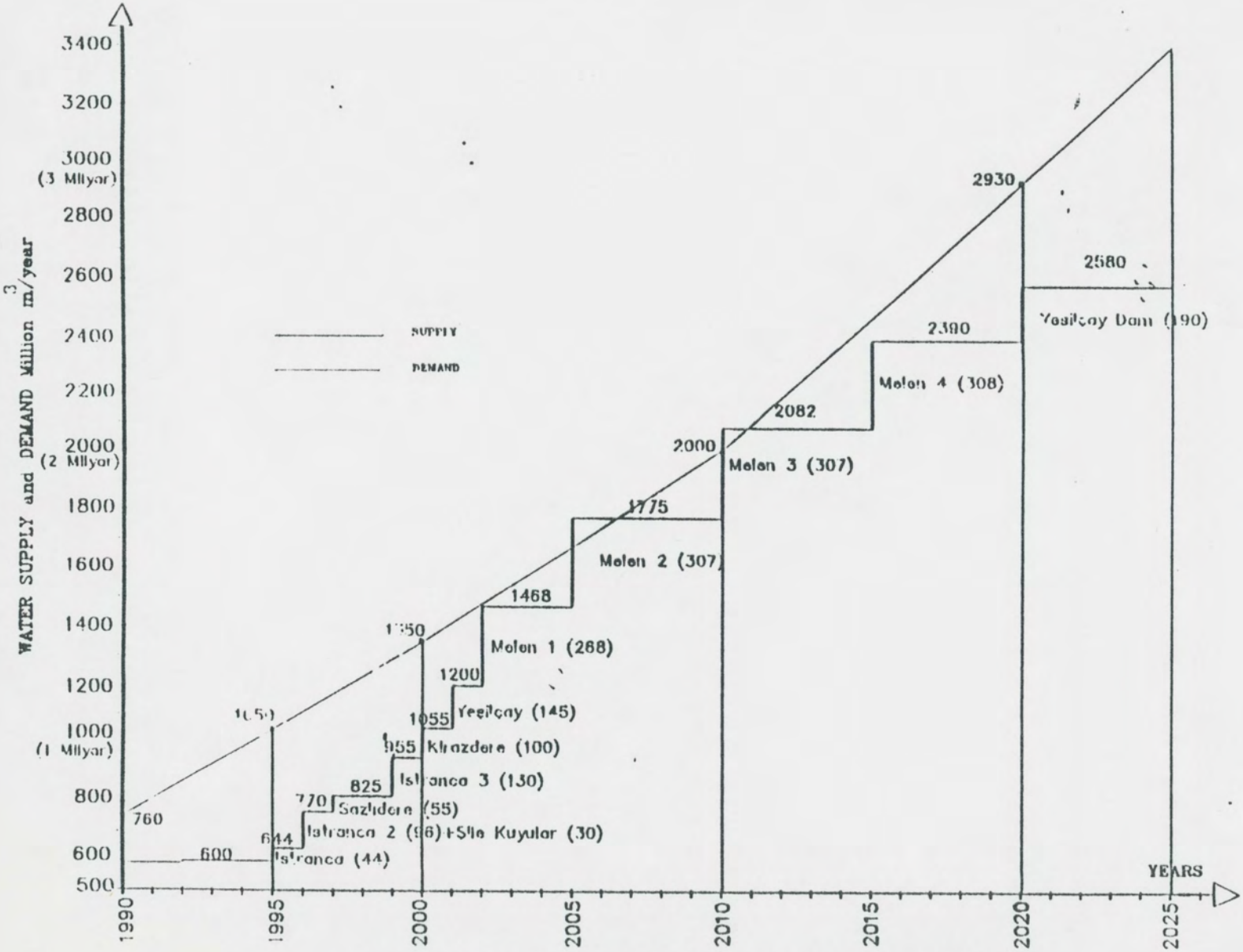
PLANNED WATER RESOURCES

WATER RESOURCE	PLANNED YEAR FOR SERVICE	ANNUAL AVERAGE YIELD Million m^3/year
Istranca 1. stage (3 streams)	1995	44
Istranca, 2.stage (4 streams)	1996	96
Şile Hand dug Wells	1996	30
Sazlıdere Dam	1997	55
Istranca3.and 4.Stage (5 Streams	1999	130
Kirazdere Dam	2000	145
Yeşilçay Regulator	2001	100
Büyükmelen 1	2002	268
Büyükmelen 2	2005	307
Büyükmelen 3	2010	307
Büyükmelen 4	2015	308
Yesilcay Dam	2020(2030)	190
PLANNED TOTAL		1980


İSTANBUL BÜYÜK SU PROJESİ
KAYNAKLAR VE İSALE HATLARI
GREATER ISTANBUL WATER PROJECT
WATER RESOURCES & TRANSMISSION LINES
DEMİRKÖY BARAJI
ISTRANCA
KARADENIZ (Black Sea)
TERKOS GÖLÜ
SAZLIDERE BARAJI
BÜYÜKÇEKMECE BARAJI
ELMALI BARAJLARI
DARLIK BARAJI
ÖMERLİ
KÜÇÜKÇEKMECE BARAJI
MARMARA DENIZI
KOCAELİ
ADAPAZARI
KİRAZDERE BARAJI
İŞARETLER (LEGEND)
MEVCUT İSALE HATLARI
PLANLANAN İSALE HATLARI (Transmission Lines)
MEVCUT SU TASFİYE TESİSİ (Water Treatment Plant)
PLANLANAN SU TASFİYE TESİSİ
TERFİ MERKEZLERİ (Pumping Stations)
SU HAZNELERİ (Water Reservoir)



Population Estimation of Istanbul



EVALUATION of ISTANBUL WATER SUPPLY and DEMAND