

**DOKUZ EYLUL UNIVERSITY  
GRADUATE SCHOOL OF NATURAL AND APPLIED  
SCIENCES**

**PLANNING OF MANİSA CITY  
ENVIRONMENTAL MANAGEMENT WITH IN  
THE FRAMEWORK OF GEDİZ BASIN  
PROTECTION ACTION PLAN**

**İlkem SARIYER AKBAN**

**July, 2012**

**İZMİR**

**PLANNING OF MANİSA CITY  
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THE FRAMEWORK OF GEDİZ BASIN  
PROTECTION ACTION PLAN**

**A Thesis Submitted to the  
Graduate School of Natural and Applied Sciences of Dokuz Eylül University  
In Partial Fulfillment of the Requirements for the Degree of Master of Science  
in Mechanical Engineering, Energy Program**

**İlkem SARIYER AKBAN**

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**İZMİR**

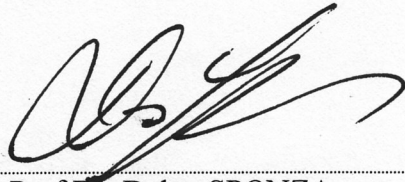
**M.Sc THESIS EXAMINATION RESULT FORM**

We have read the thesis entitled “**PLANNING OF MANİSA CITY ENVIRONMENTAL MANAGEMENT WITH IN THE FRAMEWORK OF GEDİZ BASIN PROTECTION ACTION PLAN** ” completed by **İLKEM SARIYER AKBAN** under supervision of **PROF. DR. AYŞEGÜL PALA** and we certify that in our opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.



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# **PLANNING OF MANİSA CITY ENVIRONMENTAL MANAGEMENT WITH IN THE FRAMEWORK OF GEDİZ BASIN PROTECTION ACTION PLAN**

## **ABSTRACT**

The purpose of this study, the activities within the framework of the Gediz River Basin Conservation Action Plan is being addressed within the case of Manisa. Wastewater treatment plants within the province of Manisa, environmental management, solid waste, dangerous waste and special waste disposal activities, Provincial Agriculture Directorates, Provincial Directorates of Environment and Forestry and the State Water Management II Regional Directorate should be examined in the scope of environmental management. Accordingly, the final status of these study and whether or not have reached its goals, evaluated and described with the reasons.

In the first part, the meaning and the importance of the study, purpose and the scope of the study are explained. In the second part, Gediz Basin's general situation has been discussed. In the third part, Gediz Basin Conservation Action Plan has been examined. In the fourth part, within the framework of Gediz Basin Conservation Action Plan, Manisa province's environmental management has been discussed. In the fifth part, the basis of the Gediz Basin Action Plan has been described including laws, regulations and guidelines. In the sixth part, according to Gediz Basin Action Plan, it is checked whether the targets have been realized or not, if not, the reasons behind it are discussed. Furthermore, in this part, suggestions have been made for unrealized targets. In the seventh part, according to Gediz Basin Action Plan, the results have been drawn from the studies have been conducted and the problems have been detected.

**Keywords:** Water, basin, action plan, wastewater, environment, solid waste, Gediz Basin

# GEDİZ HAVZASI KORUMA EYLEM PLANI ÇERÇEVESİNDE MANİSA İLİNİN ÇEVRE YÖNETİMİNİN HAZIRLANMASI

## ÖZ

Çalışmanın amacı, Gediz Havzası Koruma Eylem Planı çerçevesinde belirlenen faaliyetlerin Manisa ili özelinde ele alınması ve Manisa ilinin çevre yönetimi kapsamında atıksu arıtma tesilerinin, katı atık, tehlikeli atık ve özel atık bertaraf çalışmalarının, İl Tarım Müdürlüklerinin, İl Çevre ve Orman Müdürlüklerinin ve Devlet Su İşleri 2. Bölge Müdürlüğü'nün çalışmalarının incelenmesidir. Bu doğrultuda, bu çalışmaların son durumu, hedefe ulaşp ulaşmadığı, ulaşmadıysa sebepleri değerlendirilmiş ve betimlenmiştir.

Birinci bölümde, çalışmanın anlam ve önemi, amaç ve kapsamı açıklanmıştır. İkinci bölümde, Gediz Havzası'nın genel durumu ele alınmıştır. Üçüncü bölümde, Gediz Havzası Koruma Eylem Planı'nı incelenmiştir. Dördüncü bölümde, Gediz Havzası Koruma Eylem Planı çerçevesinde Manisa ilinin çevre yönetimi ele alınmıştır. Beşinci bölümde, Gediz Havzası Eylem Planı'nın dayanaklarını oluşturan kanun, mevzuat ve yönetmelikler açıklanmıştır. Altıncı bölümde, Gediz Havzası Eylem Planı doğrultusunda belirlenen hedeflerin gerçekleşip gerçekleşmediği, gerçekleşmediyse sebepleri tartışılmıştır. Ayrıca bu bölümde, gerçekleşemeyen hedefler için önerilerde bulunulmuştur. Yedinci bölümde, Gediz Havzası Eylem Planı'nı çerçevesinde yapılan çalışmalardan ve sorunlarda çıkartılabilecek sonuçlar tespit edilmiştir.

**Anahtar sözcükler:** Su, havza, eylem planı, atık su, çevre, katı atık, Gediz Havzası

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# **CHAPTER ONE**

## **INTRODUCTION**

### **1.1 Meaning and Importance**

The human beings' idea of economic progress has brought the usage of nature as required and the destruction of nature with the transition to industrialized society. Thereby, human beings isolated themselves from nature and the destruction of nature has increased day by day. The idea that is mentioned provided some negative effects towards nature and development of these negative effects' impact.

All over the world, contaminated water supplies and agricultural areas, climate change, declining biodiversity have ensured that environmental management is an important phenomenon. The necessity of execution of important regulations about environmental management has been come up when considering these are not only quantitative change but also the quality of life change. As a result, number of regulations related to the environment has become mandatory, starting with the industrialized countries. By the help of environmental management strategies, destructive regulations are tried to be prevented and more nature friendly approaches and regulations are tried to be produced. Environmental protection has become more and more important.

Increased sensitivity toward the environment has led to review of soil, water and air pollution related activities. Reduction of environmental pollution and improving the environment related national and international projects are put forward and general principles of environmental management have been started to be determined. This determination process includes the ministries of the countries, as well as local governments. By the help of these institutions and organizations' studies, environmental management principles have become more systematic and the basic elements of the activities and responsibilities become more distinctive. In our country, determination of water and soil resources have started in 1930s, but with respect to basin level, determination of the potential of soil resources with the

potential for surface and underground water, rainfall, temperature and other meteorological data collection, evaluation and publication have been put on scientific and technical basis as the early 1950s. Various public institutions and organizations have role in environmental management tasks until today (Akkaya, 2002).

According to the report that is prepared by Forestry and Water Management, in 1970s and 1980s watershed management activities and downstream assets, in particular the protection of dam reservoirs are given priority not only in our country but also in world. After the 1990s, watershed management approaches is more related to the conservation and rehabilitation of natural resources. Development activities on low-income rural communities dependent on the usage of these resources have been participated in planning and implementation (Anonymous, 2011).

The vision of watershed management is following according to the report entitled The National Watershed Management Strategy: "With the help of coordinated, participatory and ecosystem based management, our country's basins should be protected, improved and environmental, economic and socio-cultural services and benefits as a sustainable quality of life and welfare by providing and increasing the contributions required to provide the country's development "(Anonymous, 2011). In the light of determined vision, the basin management has set aside important. Maintenance of the basin governments are not targeting not only to reduce the environmental devastation but also increased levels of development and prosperity and emphasize the importance of watershed management.

Agricultural and industrial activities within the boundaries of the Gediz Basin are very high. As a result of the analyses conducted by the Ministry of Environment and Forests, Gediz River water pollution is declared as stage III and stage IV. Similarly, pollution on agricultural areas is declares as very high (Anonymous, 2008). Gediz Basin should be analyzed under the light of this information.

## 1.2 Purpose and Scope

The purpose of this study, the activities within the framework of the Gediz River Basin Conservation Action Plan is being addressed within the case of Manisa. Wastewater treatment plants within the province of Manisa, environmental management, solid waste, dangerous waste and special waste disposal activities, Provincial Agriculture Directorates, Provincial Directorates of Environment and Forestry and the State Water Management 2 Regional Directorate should be examined in the scope of environmental management. Accordingly, the final status of these study and whether or not have reached its goals, evaluated and described with the reasons.

In the first part, the meaning and the importance of the study, purpose and the scope of the study are explained.

In the second part, Gediz Basin's general situation has been discussed. Geographical and social characteristics, industrial activities, the overall situation of water resources and pollution sources are detailed under this section.

In the third part, Gediz Basin Conservation Action Plan has been examined. All the factors including stakeholders, the plan's vision and mission, problems, methods, content, and the Gediz Basin parts of the Izmir, Kutahya and Usak provinces related to environmental protection plan has been put forward.

In the fourth part, the basis of the Gediz Basin Action Plan has been described including laws, regulations and guidelines.

In the fifth part, within the framework of Gediz Basin Conservation Action Plan, Manisa province's environmental management has been discussed. With respect to Environmental Management, the state of wastewater treatment plants, solid, hazardous and special waste disposal activities, the Provincial Directorate of

Agriculture, the Provincial Directorate of Environment and Forestry, DSI 2 Regional Directorate work is described in detail.

In the sixth part, according to Gediz Basin Action Plan, it is checked whether the targets have been realized or not, if not, the reasons behind it are discussed. Furthermore, in this part, suggestions have been made for unrealized targets.

In the seventh part, according to Gediz Basin Action Plan, the results have been drawn from the studies have been conducted and the problems have been detected.

## CHAPTER TWO

### GENERAL CONDITION OF GEDIZ BASIN

In this section, we discussed the overall situation of Gediz Basin. General condition of the Gediz Basin, geographical characteristics, social characteristics, industrial zones, water resources and polluting the situation can be examined under the headings of factors.

#### 2.1 General Condition of the Basin

##### 2.1.1 Geographical Characteristics

Gediz Basin which is located in western Anatolia is the second largest basin in the region after the Menderes Basin. Its surface area is 17500 km<sup>2</sup> and it corresponds to 2.8% of all Turkey's surface area. It is located between 38<sup>0</sup> 04'– 39<sup>0</sup> 13' north latitude and 26<sup>0</sup> 02' – 29<sup>0</sup> 45' east latitude. The position of Gediz Basin in Turkey can be seen in Figure 2.1 and Google Earth satellite image can also be seen in Figure 2.2.

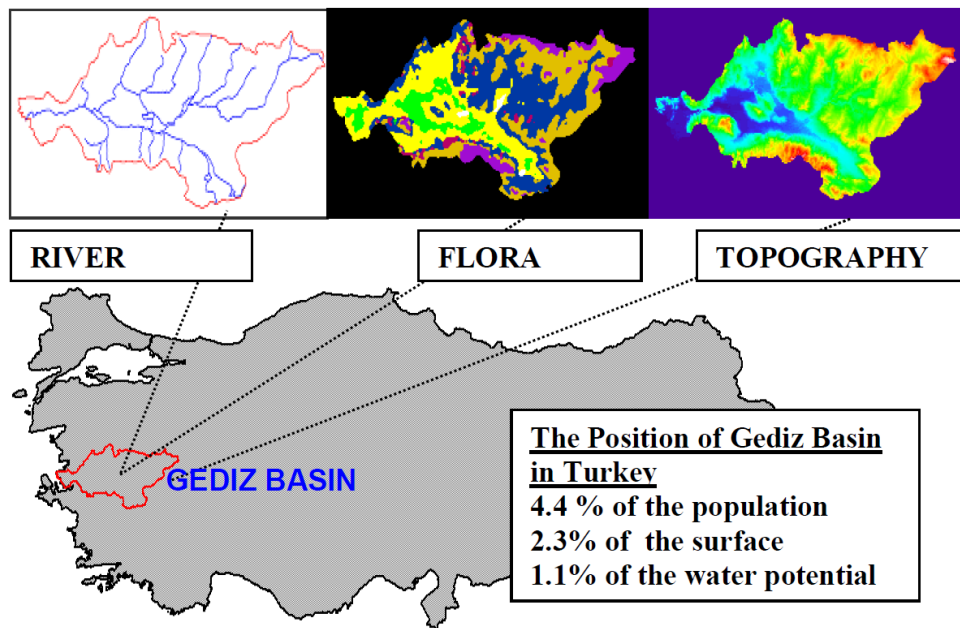


Figure 2.1 The Position of Gediz Basin in Turkey (Anonymous, 2008).

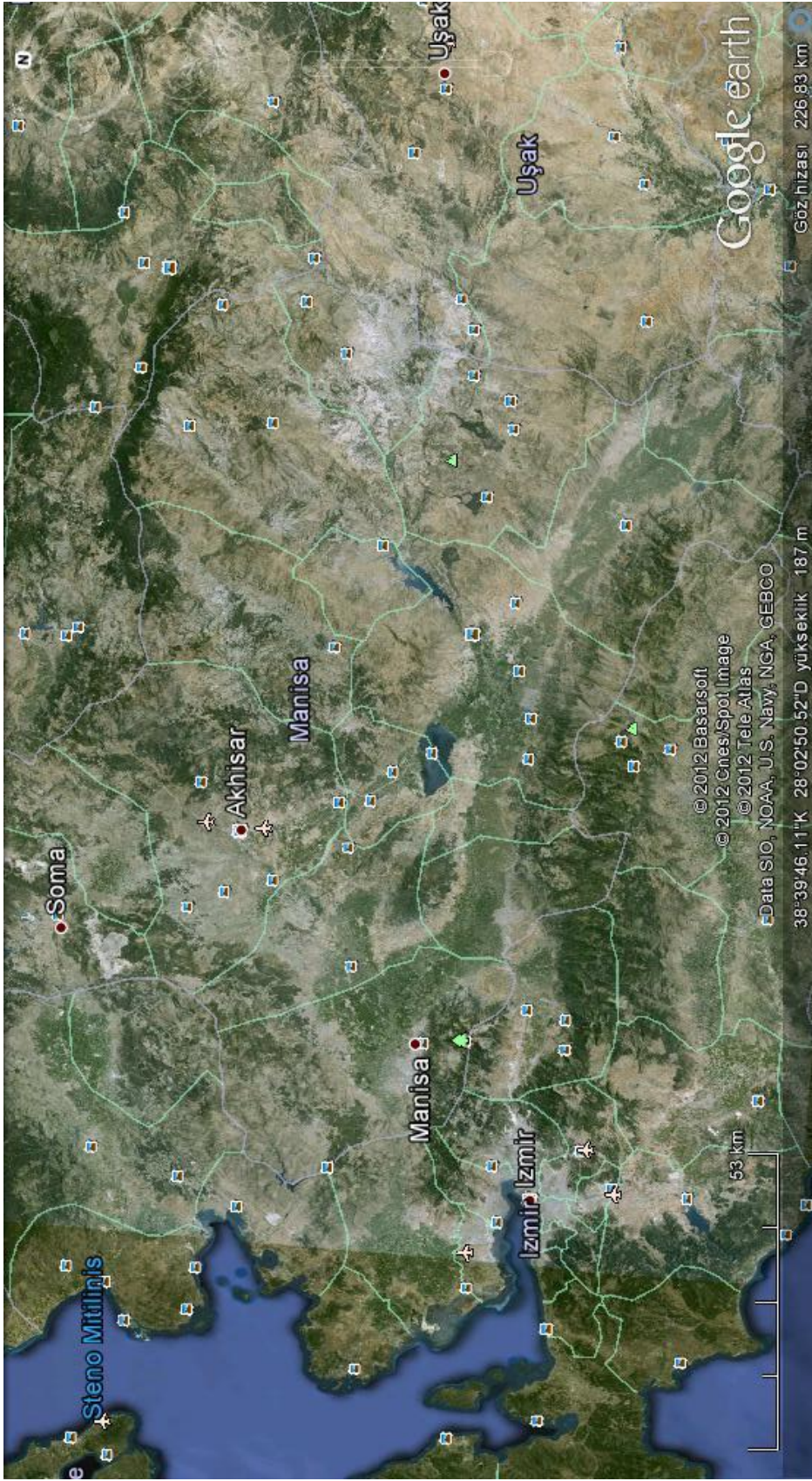


Figure 2.2 Google Earth satellite image of Gediz Basin (Google Earth, 2012)

In terms of climate characteristics, Gediz Basin has the characteristics of Mediterranean climate in which the summer is hot and dry whereas the winter is mild and rainy. Annual average rainfall in the basin is about 635 mm. The annual precipitation of Menemen province which is located at the west side of basin area and 10 m altitude is 484 mm whereas it reaches to 760 mm in the Gediz province which is located at the east side of the basin area and 850 m altitude. 75 percent of annual precipitation falls in the five month period from December to April (Anonymous, 2008). In Figure 2.3, the satellite image that shows the Gediz Basin's regime of precipitation can be seen.

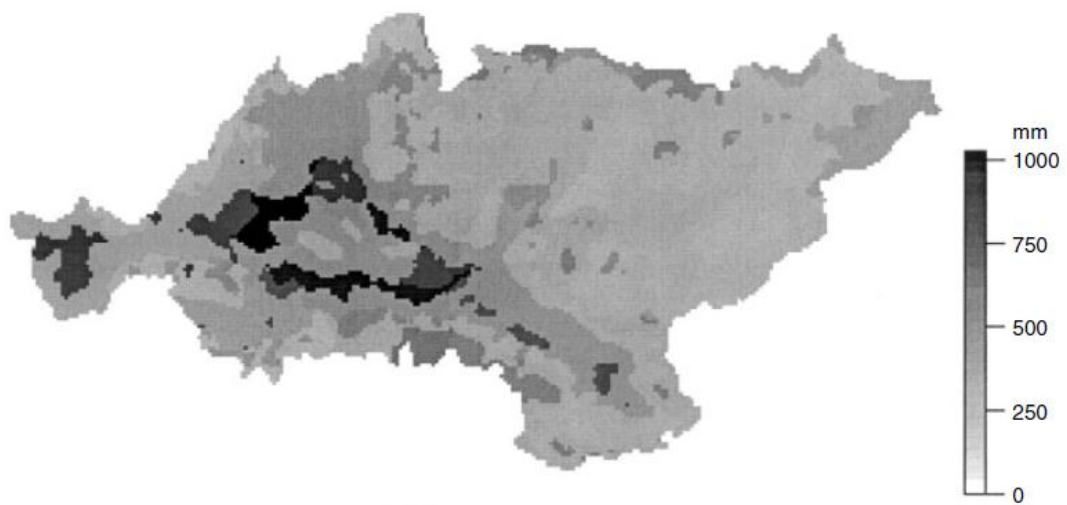


Figure 2.3 Satellite Image of Gediz Basin's Regime of Precipitation (Droogers and Kite, 2002)

2/3 of the Gediz Basin area is natural or unused (Anonymous, 2008). This mountainous region that covers the northern and northeastern areas prevents the development of transport infrastructures. Geographical features of Gediz Basin can be seen in Figure 2.4 and the satellite map can also be seen in Figure 2.5.

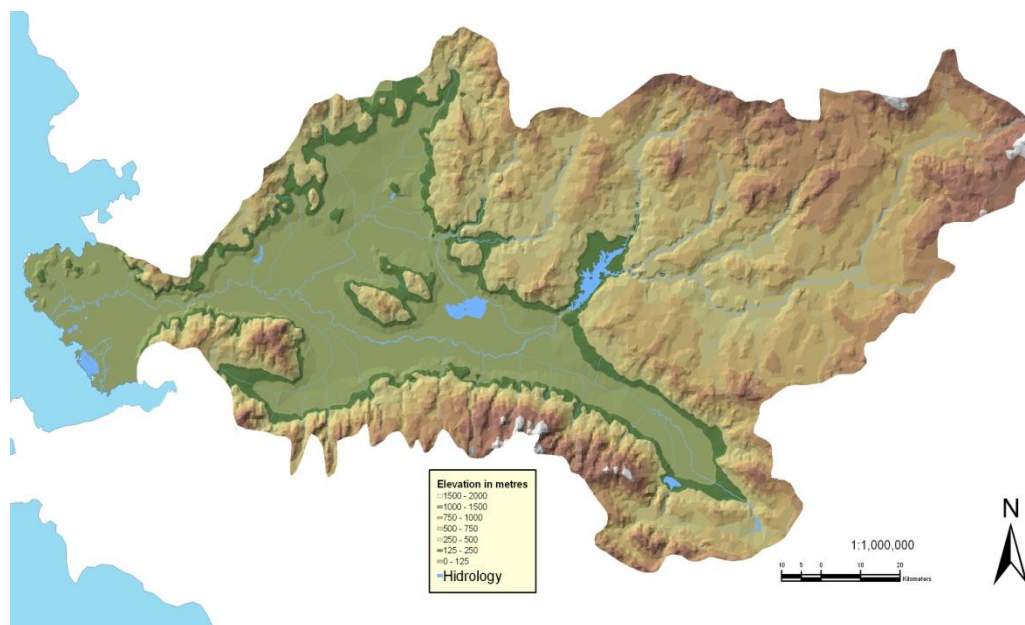


Figure 2.4 Geographical Map of Gediz Basin (Anonymous, 2008).

Another problem that arises due to this mountainous region is the lack of agricultural land. Therefore, considering the geographical features of Gediz Basin, it can be stated that agricultural activities are concentrated around the central plain. The basin's geographical characteristics causes that the action plans are concentrated to one third of the basin area which corresponds to central plain. The Ministry's perspective to that issue is also limited to that area (Anonymous, 2008).

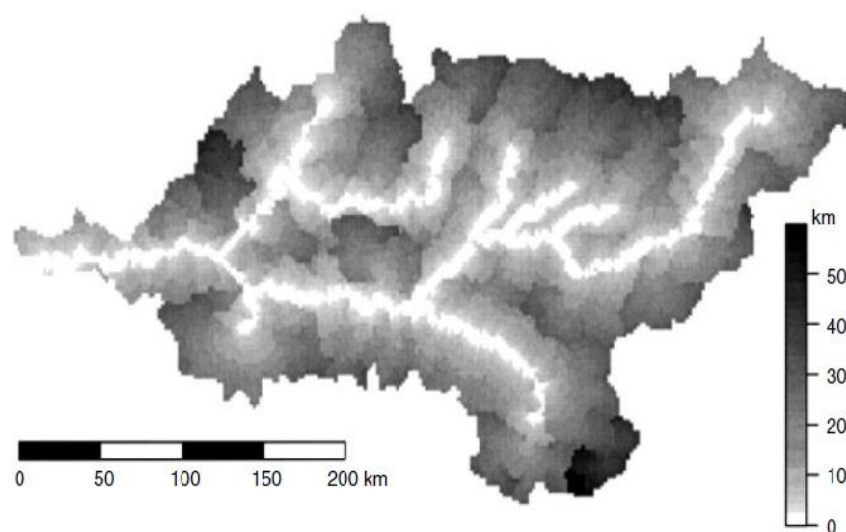


Figure 2.5 The Satellite Image of Gediz Basin (Metin, 1995)



If the central plain which constitutes of one third of all area considered in terms of land distribution, it can be said that there are large urban settlements and agricultural lands in this region. Woodlands and shrubs only cover the 35.5% of central plain. The lakes and salt marshes covers smaller part of the central plain which is 1.9% of central plain area. In total, 37.4% of central plain area has remained as natural areas. The remaining 62.6% of central plain area is covered by agricultural and urban areas. Agricultural lands have a share of 53.2% in this region. The remaining 10% is covered by industrial zones, urban infrastructure areas and residences. The percentage area distribution of central plain are is shown in Figure 2.6 (Anonymous, 2008).

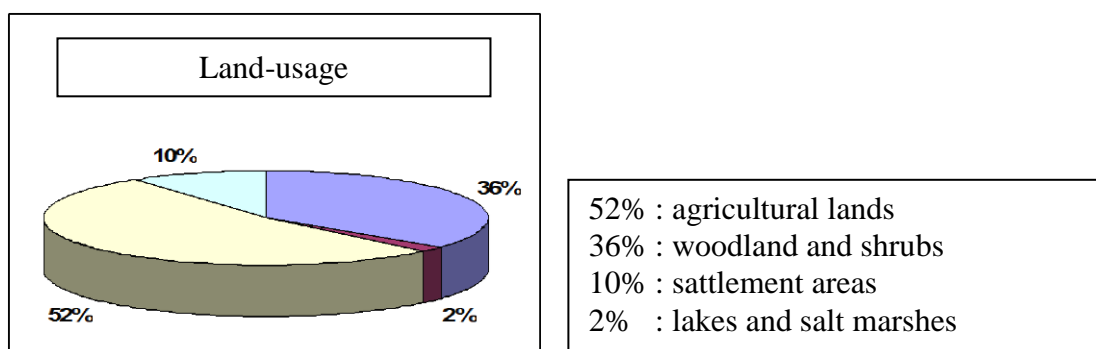


Figure 2.6 The percentage area distribution of central plain in Gediz Basin

It is seen that agricultural lands play a significant role in the Gediz Basin land-use. In terms of Turkey's total agricultural land, of 10% of the total agricultural production value is obtained from the Gediz Basin (Anonymous, 2008). 16% of Turkey's total vineyard areas, 10% of the olive fields, 5.6% of vegetable fields are found in this region. However, the most striking point that makes the Gediz Basin as one of the most important agricultural activity area is the production volume of seedless grapes. In Gediz Basin, 80% of seedless grapes production is provided. At that point, Gediz Basin is ranked first in the production of seedless grapes. These findings underline the value of Gediz Basin in terms of its geographical conditions and agricultural areas.

### ***2.1.2 Socio-Cultural Characteristics***

According to the Ministry of Environment and Forestry, the total population of Gediz Basin is around 870683 (Anonymous, 2008). It is foreseen that as the industrial business areas are spreading the population in this region is increased which also means that the urban population density is going to be increased. The Ministry has also a crucial effect with its action plans in the increase of the population in the Gediz Basin. To produce new solutions and to resolve incompatibilities of land use, this increase will be taken into consideration by the Ministry.

Including provinces, counties, towns, villages and districts there are totally 1720 settlements in Gediz Basin. 107 settlements are in Usak, 75 settlements are in Kutahya, 111 settlements are in Izmir and 1427 settlements are in Manisa. This distribution can be seen in Figure 2.7. This distribution is not in terms of population, is shown in terms of number of settlements. The importance of the province Manisa in Gediz Basin can also be noticed in terms of population distribution. The basin's population growth between 1990-2000 was determined as 8.8% (Anonymous, 2008).

Gediz Basin has a share of 2.37% if it is evaluated in terms of total population in our country. According to the 2000 population census, there are 731947 rural and 871500 urban people in basin. Therefore, in total, 1603447 people live in the basin. Rural and urban population is very close to each other.

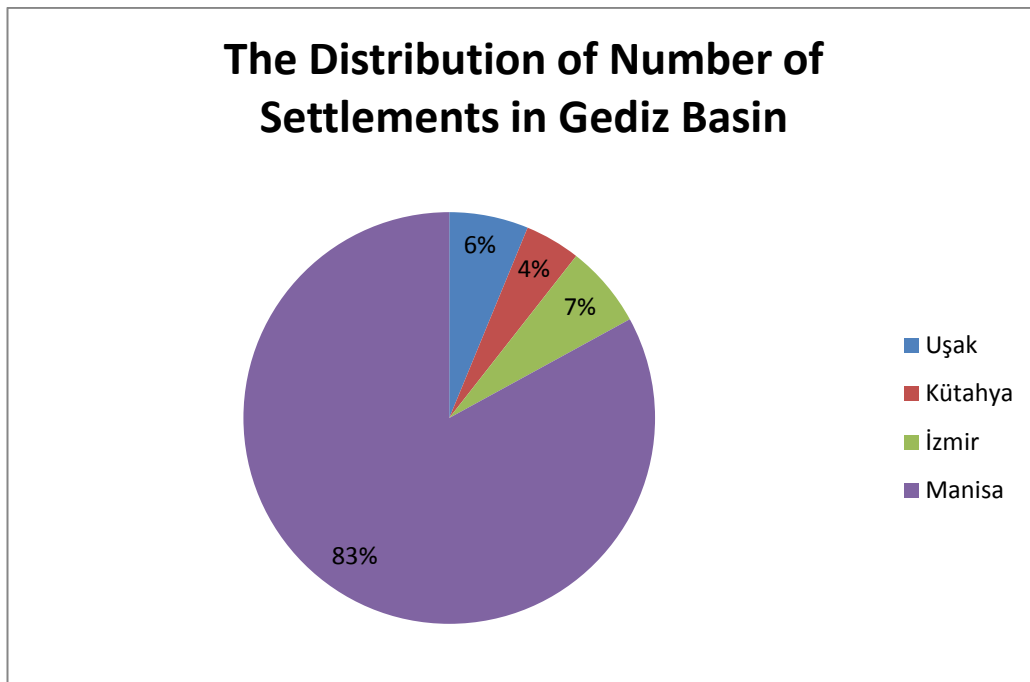


Figure 2.7 The distribution of number of settlements in Gediz Basin

Population density is usually concentrated around the industrial areas in the Gediz Basin. Almost all the provinces of Manisa are located within the basin (Figure 2.8).

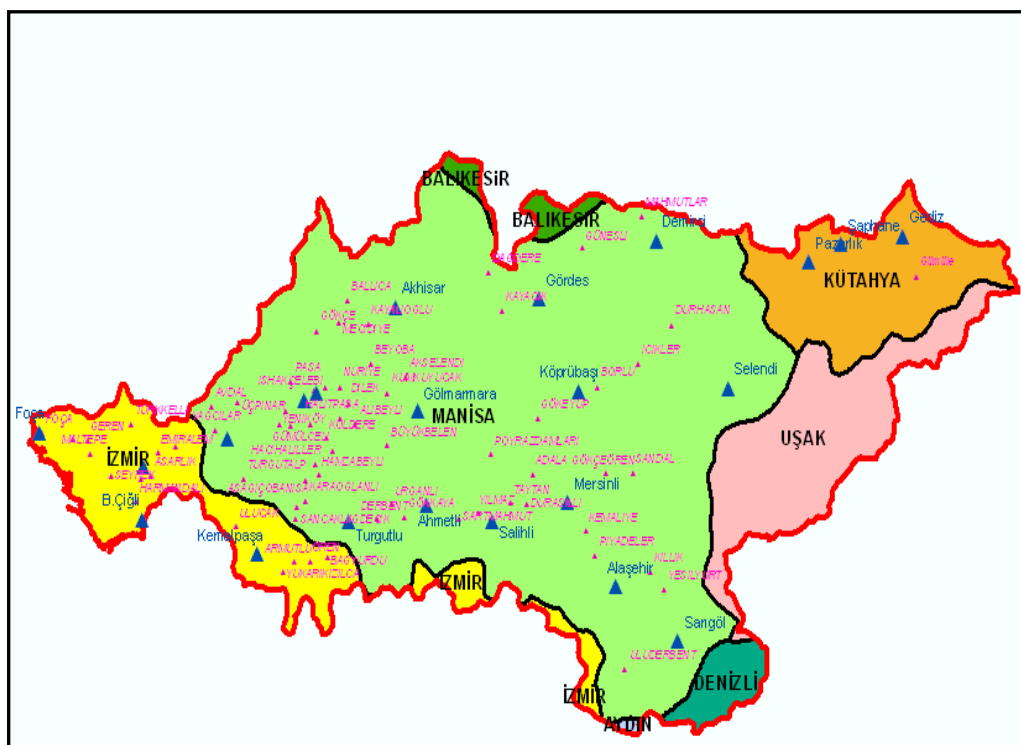


Figure 2.8 The provinces located in the Gediz Basin (Anonymous, 2008).

If it is considered in terms of population, it can be concluded that İzmir has the densest population in Gediz Basin. Figure 2.9 shows the increase in population in terms of provinces. According to Figure 2.9, it can be interpreted that a high population growth is expected in Kemalpaşa and Turgutlu between the years 2005-2030. Besides, the reduction in population growth is foreseen for the city Usak.

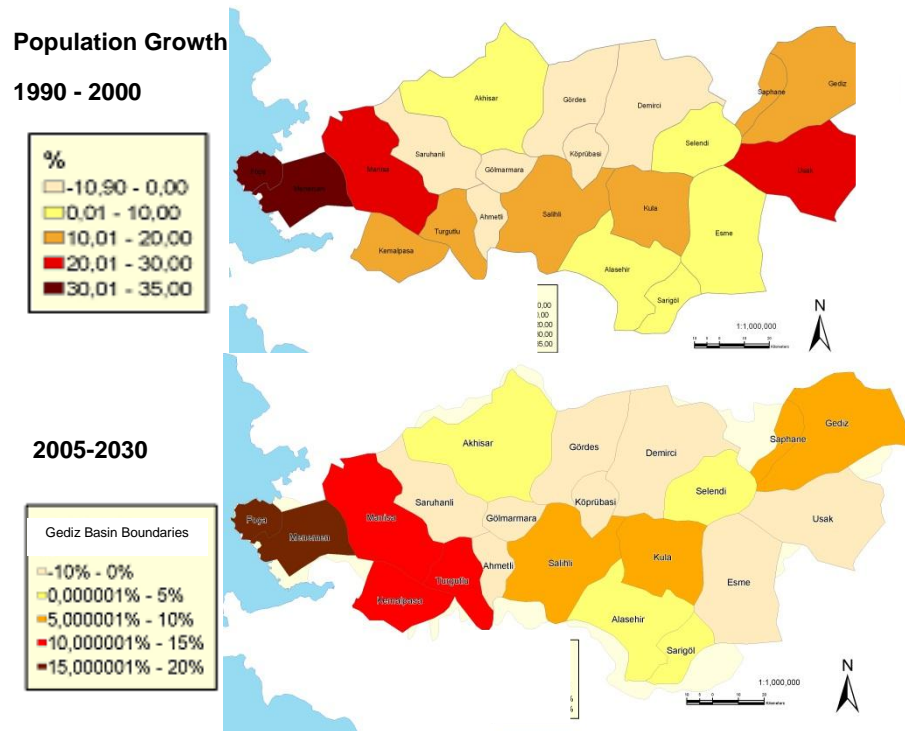


Figure 2.9 The population growth in Gediz Basin (Anonymous, 2008).

Thus, in terms of social characteristics of the Gediz Basin, the city Manisa has an important place. The city Manisa is also important in terms of socio-economic activities and population in the basin area. In addition, only 3 provinces of İzmir which has 28 provinces in total, is located in the region of the basin. However, İzmir Metropolitan Municipality should be considered as an important factor in the action plan of basin. Since the city İzmir has only 3 provinces in the region of basin, it has secondary importance compared to the city Manisa. For instance, İzmir is in the top in terms of water consumption. However, İzmir has enormous effects on Manisa in terms of socio-economic and industrial development. Table 2.1 shows the residential areas in Gediz Basin with their populations.

Table 2.1 The residential areas in Gediz Basin with their populations (Anonymous, 2008).

Gediz	18728
Şaphane	3262
Demirci	18642
Selendi	6903
Kula	23863
Sarıgöl	13045
Alaşehir	45971
Salihli	96594
Ahmetli	9517
Turgutlu	111166
Köprübaşı	5002
Gördes	10295
Akhisar	96393
Gölmarmara	9938
Saruhanlı	15151
Manisa	281890
Kemalpaşa	37126
Menemen	53940
Foça	13257
<b>Total</b>	<b>870683</b>

### *2.1.3 Industries and Organized Industrial Zones*

According to the findings of the Ministry of Environment and Forestry, in the Gediz Basin, there are 9 completed Organized Industrial Zone and there are 11 incomplete organized industrial zones (Anonymous, 2008). The information about industrial zones is given in Table 2.2.

Tablo 2.2 Organized Industrial Zones (OIZ)

	Completed OSB	Incompleted KSB
Manisa	3	2
Turgutlu	1	
Gediz		1
Alaşehir		1
Demirci		1
Çiğli	1	
Kemalpaşa		1
Menemen	1	
Salihli	1	
Saruhanlı		1
Akhisar	1	
Ahmetli		
Köprübaşı		1
Gördes		1
Selendi		1
Uşak	1	

According to Gediz Basin environmental management, organized industrial zones are significant factor. Therefore, Organized Industrial Zones' effect to Gediz Basin and their industrial fields should be mentioned briefly.

Uşak Organized Industrial Zone is located in 18 kilometers west side of the city and occupies 378.2 hectares of nonagricultural land. The region is operating since 1990 (Anonymous, 2008). According to OIZ (Organized Industrial Zone) 2008 data, there are 160 enterprises. The vast majority of enterprises are in textile industry (spinning, garments, woven fabrics, bodies, blankets, cotton weaving, rag pulling, etc.). Besides textile industry, food (milk and dairy products, food factories, etc.), chemical, ceramic, marble, wool wash (hot and cold) and steel companies in different sectors such as mineral oil are actively serve. Because of vast majority of the

enterprises are in textile industry, chemicals that is used in dyeing could be considered as waste. Waste water treatment plants have vital importance with respect to this point and they will be discussed in more detail in following parts. Domestic and industrial wastes in Usak Organized Industrial Zone are drained to Gediz River after the treatments. Furthermore, approximately 25 tones of solid waste and approximately 20-25 tons of sewage sludge occur on daily basis (Anonymous, 2008).

Kemalpasa Organized Industrial Zone is located in 29 kilometers south east side of the Izmir and occupies 1300 hectares of nonagricultural land. In total, there are 205 operating industrial plants and 43 commercial enterprises. In this region, metal processing, chemical, paper, plastic and the machinery sectors are usually operating (Turkish Ministry, 2008). Although majority of the organizations have declared that they have wastewater treatment plant, Nif River is exposed to relatively high pollution (Anonymous, 2008).

Manisa Organized Industrial Zone has 128 companies in the area of 510 hectares. In the Manisa OIZ there are 20000 workers are employed and mainly bicycle, television and refrigerator are produced and its distribution of the production is following: 17% of television produced for Europe, 65% of television produced for Turkey, 35% of the total bicycle production and 26% of refrigerator production realize in the region. Wastewater treatment and solid waste facilities will be discussed in the further part of the thesis.

Menemen Organized Leather Industry Free Zone occupies 168 hectares and it is the organized leather industry zone. This region was opened in 1998 to the usage of all industries. Water is taken from the Gediz River and after its usage; it is drained to the Gediz River, where into the Aegean Sea takes place at a point close to the point. Domestic and industrial wastewater is treated together (Anonymous, 2011).

Izmir Atatürk Organized Industrial Zone is located in north side of the Izmir and occupies 700 hectares. There are 318 large enterprises and 177 small enterprises in the industrial zone. Currently, 25000 workers are employed in the OIZ and there is a

potential for 40000 or 50000 workers to be employed (Anonymous, 2008). Textile dyeing and processing, sewing, leather and clothing, cotton processing, carpentry, iron and steel products, iron and steel castings, metal and metal products, mechanical engineering, construction machinery, heavy industry and agricultural machinery, metal furniture for offices and homes, metal coating, metal boxes, steel structure, motor vehicle spare parts, business machines and presses, printing and publishing, plastics and rubber, rubber hoses, medical, and agricultural pesticides, wood and wood articles, paper and cardboard packaging, electrical and electronics, radio-TV, and communication tools; electric household goods, soap, detergent and cleaning supplies, chemicals, paints, varnishes, roofing and building materials, marble and granite, elevators and escalators, heating and cooling systems, commercial-type refrigerators and freezers, solar energy collectors, glass, tobacco, canned food, dried figs, raisins and other dried fruits, vegetable oil and olive oil, salt, flour, dairy products and animal feed sectors are the main sectors in the region. Emerged wastewater as a result of activities in the region is treated in a wastewater treatment plant. Wastewater treatment plant drains the treated water into the Gulf of Izmir (Anonymous, 2011).

The 75 kilometers of drainage system is installed in order to protect the Organizations of the Atatürk Organized Industrial Zone from the floods by Dokuz Eylul University, Water Resources Management and Application Center (SUMER). There are nine pumping stations of the system (Anonymous, 2008).

When we analyze the industry in general, it is clearly seen that various industries are operating in the same region. In Figure 2.10 sectoral distribution of industry in the Gediz Basin shown with respect to geographical position. In the distribution olive oil mills and leather factories are noteworthy.



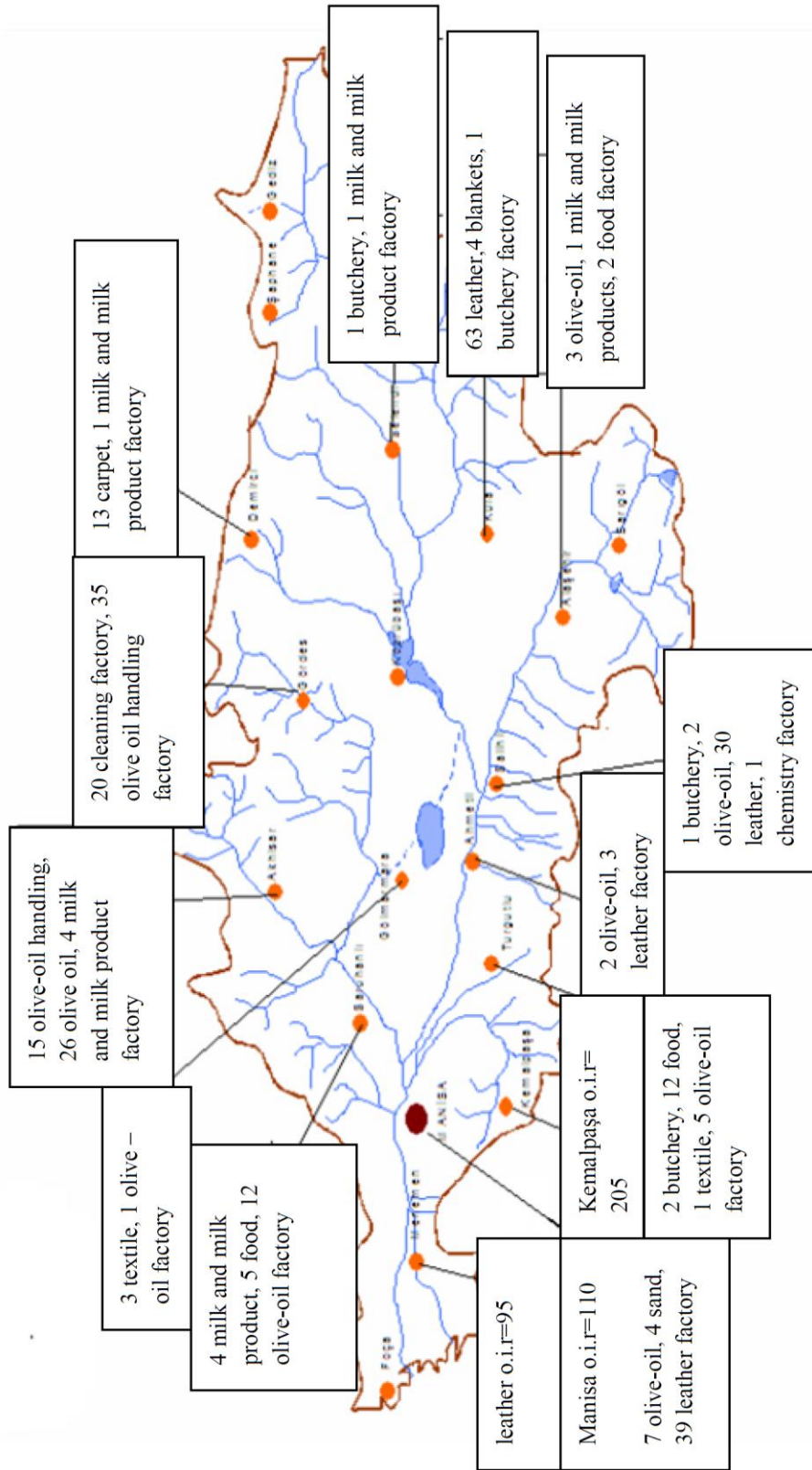


Figure 2.10 Sectoral distribution of industry in the Gediz Basin (Anonymous, 2008).

The statistics of the geographical distribution is shown in Figure 2.11.

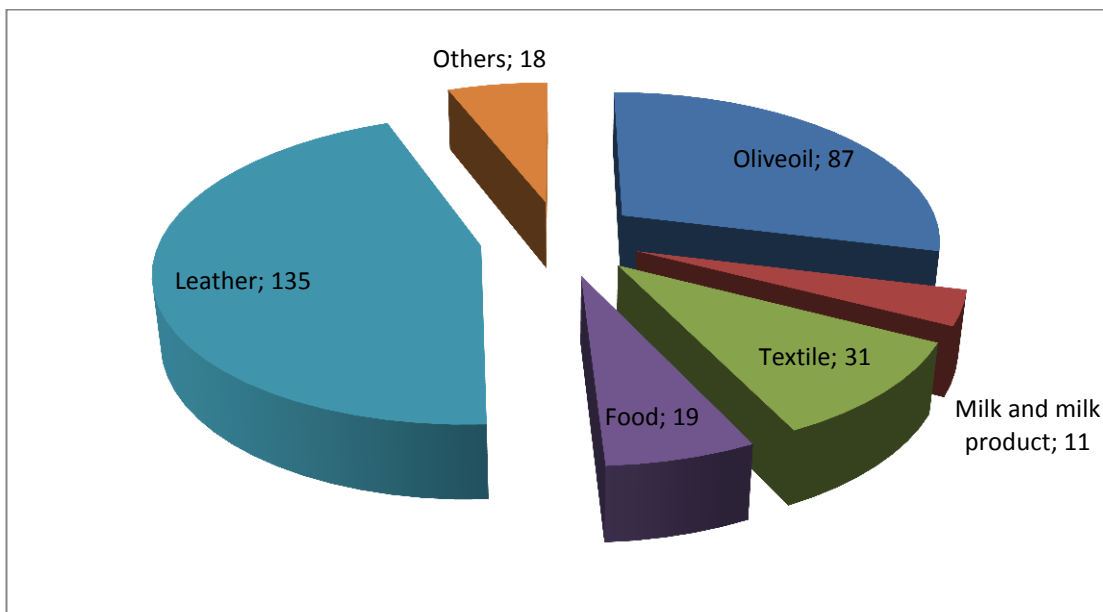


Figure 2.11 Sectoral distribution of industry in the Gediz Basin

As it can be seen in the Figure 2.11, leather industry and olive industry are the main industries in the Gediz Basin. Manisa has important share of the olive and olive oil production. According to the Ministry of Environment and Forestry, there are 15 olive oil producers in the Manisa and they have been distributed to the districts. In the Table 2.3, the distribution of olive oil production is shown by districts in tons/year basis.

Table 2.3 Olive-producing counties, the amount of produced olive oil and paste produced (Anonymous, 2011)

County	Olive Oil Production (tons/year)	Olive Paste Produced (tons/year)
Manisa	1110	2472
Ahmetli	160	360
Akhisar	5560	15499
Kırkağaç	247	660
Saruhanlı	643	1335
Soma	646	1332
Turgutlu	200	500

General condition of the Gediz Basin is summarized in Table 2.4 by taking OPTIMA (2006) and IWMI (2000) into consideration.

Table 2.4 General condition of the Gediz Basin (OPTIMA, 2006)

Information on Basin	Definition
The settlements in the region of basin	Foça, Kemalpaşa, Akhisar, Alaşehir, Demirci, Gediz, Manisa, Menemen, Salihli, Turgutlu, Gördes, Kula, Saruhanlı, Selendi, Ahmetli, Gölarmara, Köprübaşı; as well as İzmir, Ödemiş, Simav, Sarıgöl, Eşme and some part of Uşak
Location	Latitude: N 38°04' - 39°13' Longitude: E 26°42' - 29°45'
Basin Area	17600 km <sup>2</sup>
Min – Max Height	0 m – 2108 m
Woodland	20400 ha
Agricultural Land	7.64% of the total area is irrigated(110000 ha)
Natural Areas	8000 ha (Izmir Birds Heaven)
Rainfall Depth	700 mm/year
Flood and Drought	There have been serious drought cases in 1989-1994
Pumping	9 mm/year
Annual Water Budget	Supply: 61 mm/year (52 mm/year is supplied from surface sources, and 9 mm/year is supplied from underground sources)
The Main Reservoirs and Water Structures	Emiralem Junction Marmara Junction Ahmetli Junction Demirköprü Junction Adala Junction Afsar Junction Afşar Dam Buldan Junction Buldan Dam

Table 2.4 Cont.

Sectoral Water Usage	Agriculture: 78.6% Industry: 6% Environmental, wetland area: 0.4% Urban: 14.9%
Total Population	1700000
Urban / Rural population percentages	Rural: 43.3% Urban: 56.7% There is a 2% increase in urban population, while there is a 0.7% decrease in rural population
Population Growth Rate	1.5% (There is a 2% increase in urban population, while there is a 0.7% decrease in rural population)
Birth / Death ratio	Death Ratio: 0.114% / year Birth Ratio: 0.9% / year
Migration Rate	0.4% / year
Territorial distribution of population	112 people / 2000 km <sup>2</sup>
Fundamental Activities	Agriculture (cotton, grapes, corn, wheat) Industry (textile factories, weaving, salt production and leather goods)
Income Distribution	Agricultural Income Distribution: Grain: 31 million Euro / year Fruit: 399 million Euro / year Vegetables: 139 million Euro / year Industrial Goods: 256 million Euro / year Plants for oil: 1 million Euro / year Legumes: 4 million Euro / year Root Plants: 12 million Euro / year

## 2.2 General Condition of Water Resources and Water Quality

Gediz Basin is ranked as the 20<sup>th</sup> with respect to drainage and 21<sup>st</sup> with respect to water potential within 26 major rivers (Anonymous, 2008). The information related to population density and settlements are given before. According to the data and the Gediz Basin Union calculations, in 2040, 400 hm<sup>3</sup> of drinking water is thought to be needed. In addition, because of drought and increase in urban and industrial water requirement, there is a doubt about the meeting the demand. Therefore, these changes must be taken into account and should be more emphasis on status of water resources in the Gediz Basin (Nostrum, 2005).

Since the structure of the basin is based on agriculture (irrigated agriculture is intensive in the region) relevant studies on the use of water and wastewater management are available on the literature. In addition, with the industrialized region Alaşehir-Manisa-Menemen, population density is increasing and so, importance of the Gediz River is increasing with respect to water usage and wastewater drain (Gediz Briefing). Furthermore, not only increase in water pollution but also decreases in productivity in agricultural production are emerged with the metal pollution. Because of this reason, Gediz River Basin's water resources are determined and studies on surface water pollution is done.

The most important river in the Gediz Basin is the Gediz River which is rise 26 kilometers west side of the Gediz County (close to Cukurviran and Murat mountains). After that it combines with Deli İnis (Kocaçay), Demrek (Demirci), Kum brook, Alaşehir brook and Nif brook. Furthermore, it combines with Kurşunlu, Tabak, Sert, Gencer, Yeniköy, Karacali, Irlamaz and Kecili brooks. The length of the river is 401 kilometers. (Gediz Briefing) Gediz River, along the waters of the rivers passing through the Menemen and Salihli plains combines with the Aegean Sea (Anonymous, 2008).

Gediz River has irregularities throughout the year. While in winter and spring time flow of the river is increasing, in summer time, flow of the river decreases.



Figure 2.12 Gediz River's Basin (Anonymous, 2008)

204 kilometers of Gediz River is located in Manisa, 50 kilometers of Gediz River is located in Kutahya, 92 kilometers of Gediz River is located in Uşak and 40 kilometers of Gediz River is located in İzmir (Anonymous, 2008). In the Figure 2.12, cities, drainage area, annual total flow and rainfall are shown. In Figure 2.13 elevation and drainage are shown. In addition, in Table 2.5, water reserves in Gediz Basin with respect to provinces are shown (Anonymous, 2008).



Figure 2.13 Elevation of the water resources in Gediz River Basin (Anonymous, 2008).

Table 2.5 Gediz Basin water reserves of the provinces (Anonymous, 2008).

Province	Water Qualification	Reserves: Hm <sup>3</sup> /year	Usage of potable water Hm <sup>3</sup> /year	Irrigation and Industrial usage Hm <sup>3</sup> /year	Unused Water Reserve Hm <sup>3</sup> /year
Izmir	Underground	374	97	229	48
	Spring water	120	64	9	47
Manisa	Underground	210	47	128	35
	Spring water	233	131	64	38
Uşak	Underground	79	20.5	22.5	36
	Spring water	18	3	5	-
Total	Underground	663	153.5	349.5	158
	Spring water	371	198	88	85

Brooks and small streams can be grouped into Manisa and the ones that or not in Manisa since the thesis' focus is Manisa. The important water streams and brooks which are located in Manisa and feed Gediz River are following: Selendi brook, Eynes brook, Demirci brook, Alaşehir brook, Kum brook, Nif brook, Delicay, Gencer stream, Sarma brook and Irlamaz brook. The rivers that feed Gediz and outside of the Manisa are following: Canbulat stream, Gediz brook, Yatkı stream, Hamam brook, Conkara stream, Karabol brook, İmren stream, Kunduzlu brook, Süle stream, Akarca stream (Anonymous, 2008).

According to the Gediz Basin Environmental Protection Service Union, surface water sources that feed Gediz River should be mentioned briefly (Anonymous, 2008). In the Figure 2.8, information about streams and brooks and their capacities and geographic position are shown;

Alasehir brook's length is 115 kilometers and it has 2680 km<sup>2</sup> potential to collect water. It combines with Gediz River at 3 kilometers west side of the Salihli Country.

Selendi brook rises between Salhane and Derbent mountains, which are located in 10-16 kilometers south side of the Simav. Its water collection basin width is 702 km<sup>2</sup> and while digging deep valleys, it drains to Tahtacı and combines with Gediz River.

Deli Inis brook (Kocacay) is rising from the south part of the Simav Mountain. It combines with Gediz River 8 kilometers south of the Borlu.

Demrek brook is consisting of Ilge brook and Demirci brook. It is rising between the Simav Mountains and Demirci mountains. It combines with Gediz River at the east part of the Adala.

Derbent brook is sub-part of Alasehir brook. It is rising between Kasikci and Karincalik which are located in 10 km North West part of the Buldan. It combines with Alasehir at 4 kilometers north of the Hacıaliler.

Gordes brook is rising from the Turkmen mountain which is located in south part of the Demirci Mountain with the name of Sarmasik stream. Its length is 86 kilometers. Its water collection basin width is 1560 km<sup>2</sup>. It combines with Medar brook. After the 60<sup>th</sup> kilometers of the brook, it takes the name of Kum brook. It combines with Gediz River at 5 kilometers north of the Manisa.

Medar brook is rising from Celikkaya slopes which are located in 14 kilometers west side of Sindirgi. Its length is 80 kilometers. After it drains Akhisar and Kapaklı, it combines with Gordes brook and takes the name of Kum brook.

Kum brook is consisting of Medar and Gordes brooks and takes the name of Kum brook. It combines with Gediz River.

Nif brook is rising between the Yamanlar Mountain and 14 kilometers northeast of the Izmir. It combines with Gediz River.



The streams and brooks constitute Gediz River. According to IWMI, the effects of these brooks and streams are shown in Figure 2.14 with various colors. By the help of this methodology, basins are seen topographically. While forming this map, IWMI's database has been used.



Figure 2.14 The topographic map of the Gediz Basin and sub-basins (SLURP, b.t.)

Gediz basin is fed by number of brooks and steams, while it is encountering with a major water quality problem. Until the 1960s, structure of the industry is based on traditional agriculture with some exception (Anonymous, 2008). However, with the increase in industrial activities and increase in diversity of the industries in industrial zones, water pollution has become important. The main reasons of pollution of Gediz Basin are following, heavy metal pollution and dispose of industrial organizations. In Figure 2.15, water quality map is shown according to DSI 2002 measurements. Class I: High-quality water, Class II: Less contaminated water, Class III: Dirty water, Class IV represents the very dirty water.

However, the 2006 measurements indicate that the water quality improves. According to the DSI's measurements, 2006, in the participation of the upper basin Usak it is II. Class, Alasehir Brook it is III. Class, after the Demirkopru Dam to the participation of Nif Brook it is II. Class. The quality of water in Nif Brook is II. Class whereas after the participation of Nif Brook it decreases to III. Class (Anonymous, 2008).

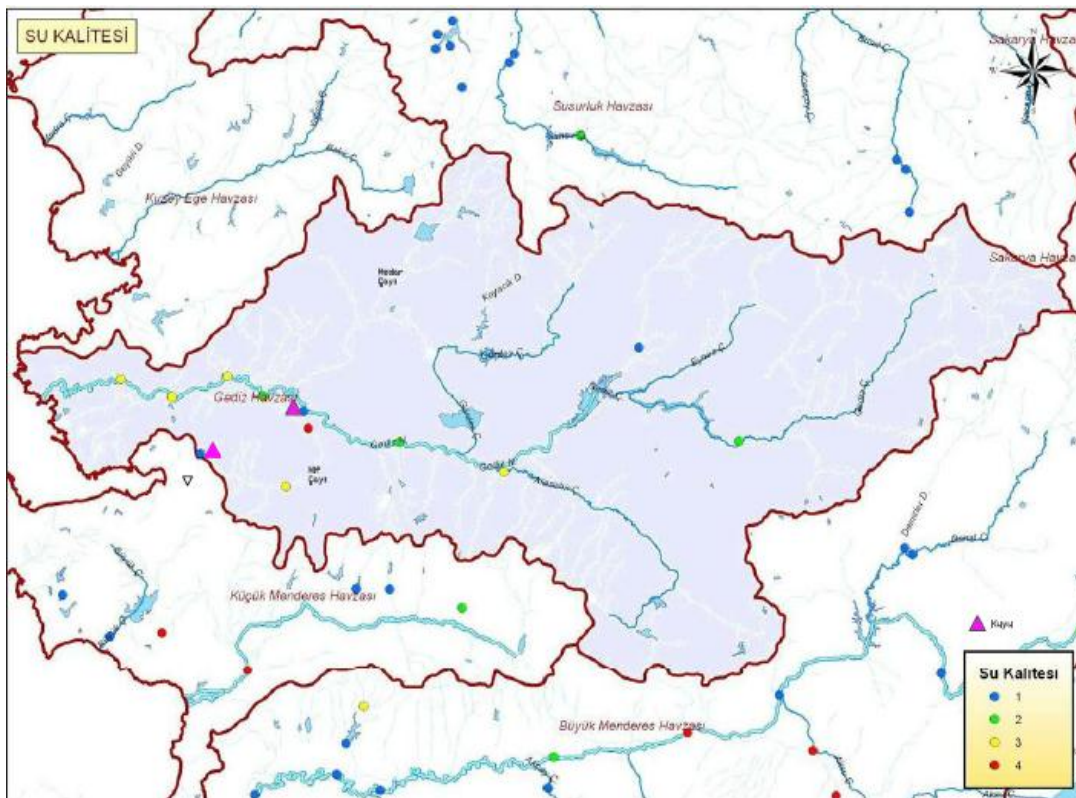


Figure 2.15 Water quality map of Gediz Basin (Anonymous, 2008).

In addition, water quality reduction in terms of heavy metal and nitrate is remarkable, especially in the north of the basin. Because of the biological decomposition and deposition of pollutants, after the dam river mouth, water quality is improving greatly. In the long term, accumulation of heavy metals at the agricultural lands leads to problems. Groundwater levels are falling rapidly due to excessive water extractions (Anonymous, 2011).

According to the studies of Gundogdu and his colleagues in 2007, heavy metal pollution in Gediz Basin is detected. Sub-basin is located within the boundaries of the city Izmir. According to the result of this study, in 2006, increases up to 149% have been occurred in terms of aluminum. This study also shows that aluminum pollution arises due to metal industry, fertilizers and agricultural drugs. Similarly, lead contamination and chromium pollution has increased too. The increase in phosphorus reaches up to 2220%. Especially, this increase has been detected in the samples taken on Nif Brook. The main cause of it is the pesticides and domestic wastewaters (Gündoğdu et al., 2007).

Sariyildiz and his colleagues have been collected samples from various observation points, and concluded that there is a pollution tendency in 2008. Figure 2.16 shows the observation stations in the Gediz Basin. In this study, in order to examine all of the Gediz Basin, the samples that are taken from 5, 6, 24, 26, 41 and 49 observation stations have been analyzed and they are compared with the previous analysis. Hence, pollution trend analysis has been revealed.

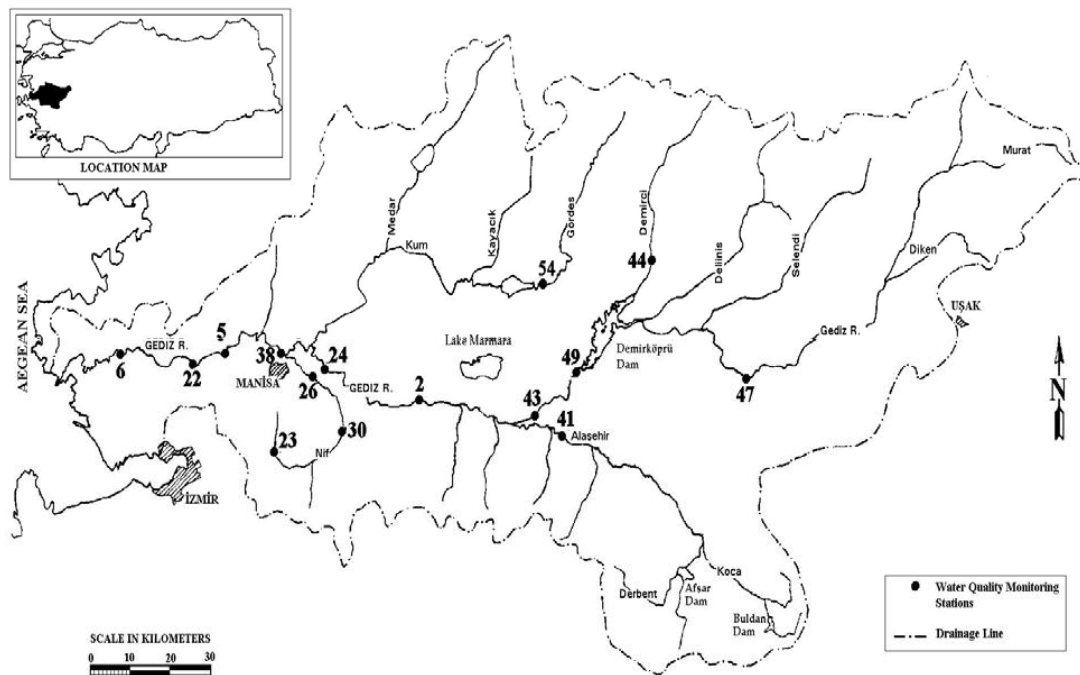


Figure 2.16 Observation stations in Gediz Basin (Sariyildiz et al, 2004)

In the study of Sariyildiz and his colleagues, the quality parameters BOD, Cl, COD, DO, EC, Na, NH<sub>4</sub>-N, o-PO<sub>4</sub>, pH and the SS have been evaluated in order to understand the effects of household and industrial pollutions on the Gediz Basin. According to the findings of the study, it is stated that population growth, increased agricultural and industrial activities has an enormous effect on the degree of pollution. Increase in pollution of the phosphorus and nitrogen were analyzed around the city Usak. Around the Nif Brook where there are many agricultural activities, it causes chemical oxygen demand (COD), concentration of chlorine in the water due to solids, electrical conductivity and pH value increases. Similar increases are seen

near the city Manisa. Especially around the city Manisa, an enhancement in the water quality could not be detected. The usage of agricultural drugs that are arisen due to increased agricultural activity causes a decline in the water quality (Sarıyıldız et al., 2004).

In conclusion, with the help of both academic researches and the works of Ministry of Environment and Forestry, The water quality of Gediz Basin and possible causes are analyzed. Table 2.6 which is carried out taking samples from 17 different points indicates the details of water contamination with presenting the possible causes.

Table 2.6 The data related to water quality of Gediz River (Anonymous, 2008).

<b>Sample Study Areas</b>	<b>Problems</b>	<b>Possible Causes</b>
1. Usak OIZ drain point	High organic, inorganic and heavy metal concentrations.	Usak OIZ textile factories industrial wastewater draining with no treatment
2. Kula - Gediz 1 Bridge	High organic, inorganic and heavy metal concentrations.	Usak OIZ textile factories industrial wastewater draining with no treatment and industrial wastewater with no treatment in leather factories at Kula
3. Demirkopru Dam	Low level of development in organic, inorganic and heavy metal concentrations due to dam	Usak OIZ factories industrial wastewater draining with no treatment and industrial wastewater with no treatment in factories at Kula
4. Juncture point Gediz River	Worsening level of organic, inorganic and heavy metal concentrations	Worsening water quality due to household and industrial wastewater drain in Salihli (84000 people's household wastewater ) Wastewater due to industries and leather factories (30 factories)

Table 2.6 Cont.

5. Ahmetli Regulator - Manisa	Insufficient development in the level organic, inorganic concentrations High concentrations of heavy metals	Insufficient development in the quality of water due to juncture of Alasehir River and Gediz River
6. Turgutlu Irlamaz River	High organic and inorganic parameter concentrations	Worsening of the water quality due to draining of Turgutlu household and industrial wastewater (94000 people's household wastewater) and wastewater due to food industry and other industries (19 factories)
7. Nif II Bridge – İzmir	Very high organic, inorganic and heavy metal concentrations	Worsening of water quality due to draining of industrial waste water that 205 factories in Kemalpaşa generate Industrial waste water that stem from main industries such as food processing, metal, paper & chemistry Domestic waste water of 24000 people living in Kemalpaşa
8. Dursunlar Sand Pits	Water quality is the same with the previous sample study point (7)Nif II Bridge	Industrial waste water w/o treatment in Kemalpaşa An increase of solid waste in the river due to sand processing plant
9. Nif River – Suspension Bridge	Very high organic, inorganic and heavy metal concentrations	Industrial waste water w/o treatment in Kemalpaşa
11. Down Cobanisa Bridge	Worsening level of organic, inorganic and heavy metal concentrations	Deterioration of water quality due to the water coming from Irlamaz River
12.Akhisar Kilik Sand River	High organic, inorganic concentrations	Bad water quality due food industry located in Akhisar region (olive oil production), Low level of efficiency in Akhisar water treatment plant
13. Manisa Bridge	Worsening level of organic, inorganic concentrations	Bad water quality due to the water that come from Kilik Sand River
14.Manisa Municipality Waste Water Treatment Plant	High organic, inorganic and heavy metal concentrations.	Low level of efficiency & bad water quality due to high load in waste water treatment plant, High level of heavy metal concentrations due to untreated industrial waste water that come from northern regions of the basin
15.Manisa OIZ+ Leather Factories	High organic, inorganic and heavy metal concentrations.	Low level of efficiency in current waste water treatment plant

Table 2.6 Cont.

16. Emiralem Regulator– İzmir	The sample point concentrations are very same with the sample 15	Bad water quality due to the untreated domestic & industrial waste water that come from northern regions of the basin
17. Maltepe Province – İzmir	Worsening level of organic, inorganic concentrations	Deterioration of water quality due to the waste water that come from Menemen

### 2.3 Resources of Contamination

The resources of pollution in Gediz Basin can be gathered under 3 headings: Domestic (Household) waste water, industrial waste water and agricultural activities.

Domestic waste water has a significant role in the pollution of Gediz Basin. The consumption rates that Ministry of Environment & Forestry uses to forecast domestic waste water consumption levels can be seen in Table 2.7. These rates change with respect to the population.

Table 2.7 Consumption Rates (Anonymous, 2008).

Population	Consumption Rate (liters/ capita × day)
>5000	70
>10000	80
>30000	100
>50000	120
>100000	170
>200000	200
>300000	225

The domestic waste water flows that are calculated in 2008 via consumption rates are as follows: Total flow of Manisa is 82255 m<sup>3</sup>/day, total flow of Akhisar is 26561 m<sup>3</sup>/day, total flow of Salihli 26275 m<sup>3</sup>/day, total flow of Turgutlu is 23684 m<sup>3</sup>/day; total flow of Menemen is 14667 m<sup>3</sup>/day (Anonymous, 2008). This data is shown in Figure 2.17, statistically.

When domestic waste water loads are of concern; there are 6 domestic waste water treatment plants that are owned by municipalities of Manisa, Akhisar, Alasehir, Golmarmara, Ahmetli & Foca. All waste treatment plants, except Foca, are highly loaded since the flow exceeds the capacity of the plants.

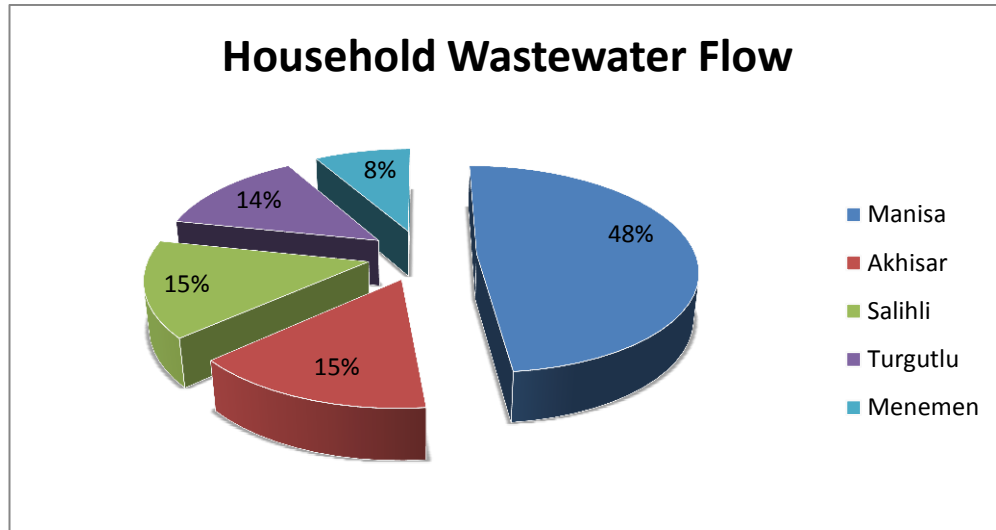


Figure 2.17 Household Wastewater Flow

Household solid waste is one of the important factors as well that cause the pollution of Gediz Basin. The Gediz Briefing data is shown in Table 2.8.

Table 2.8 The distribution of household solid waste in terms of cities (Anonymous, 2008).

province	counties	2005		2010		2015		2020		2025		2030	
		Ratio (kg/inh/day)	Total msw (ton/year)	Ratio (kg/inh/day)	Total msw (ton/year)	Ratio (kg/inh/day)	Total msw (ton/year)	Ratio (kg/inh/day)	Total msw (ton/year)	Ratio (kg/inh/day)	Total msw (ton/year)	Ratio (kg/inh/day)	Total msw (ton/year)
İzmir	Foça	3.86	46771	4.05	53909	4.26	58725	4.48	63557	4.71	68457	4.95	73462
	Kemalpaşa	1.70	41673	1.78	46624	1.87	50222	1.97	54013	2.07	57760	2.18	61764
	Menemen	1.02	36525	1.09	42356	1.16	46568	1.23	50716	1.31	55248	1.39	59777
Manisa	Manisa	1.46	148410	1.57	172685	1.69	191574	1.82	211493	1.96	232596	2.11	254986
	Ahmetli	0.99	6809	1.07	7310	1.15	7833	1.24	8424	1.34	9084	1.44	9743
	Akhisar	1.17	65331	1.26	70207	1.36	75794	1.47	81938	1.58	88082	1.7	94784
	Alaşehir	0.97	33323	1.02	35264	1.07	37146	1.12	39015	1.18	41228	1.24	43438
	Demirci	1.09	23569	1.14	24536	1.20	25765	1.26	26998	1.32	28234	1.39	29686
	Göl-marmara	1.16	7551	1.25	8009	1.35	8594	1.45	9180	1.56	9830	1.68	10542
	Gördes	1.37	19008	1.44	19549	1.51	20294	1.59	21187	1.67	22087	1.76	23124
	Köprübaşı	1.02	4058	1.08	4067	1.14	4203	1.2	4345	1.26	4489	1.32	4636
	Kula	0.85	16352	0.89	17845	0.94	19117	0.99	20374	1.04	21623	1.09	22864
	Salihli	0.89	48576	0.96	54270	1.03	59099	1.11	64484	1.2	70456	1.29	76445
	Sarıgöl	1.66	21592	1.75	22994	1.84	24278	1.93	25557	2.03	26964	2.13	28368
	Saruhanlı	1.32	32942	1.41	34248	1.50	36083	1.60	38171	1.7	40265	1.81	42596
Selendi	1.85	17626	1.95	18733	2.05	19772	2.15	20806	2.26	21934	2.38	23157	
Turgutlu	1.14	50233	1.23	57924	1.33	64205	1.43	70462	1.54	77216	1.66	84501	
Kütahya	Gediz	1.42	40178	1.51	45091	1.61	49108	1.71	53084	1.82	57352	1.94	61936
	Şaphane	0.49	2095	0.51	2290	0.54	2472	0.57	2651	0.6	2829	0.63	3006
Uşak	Uşak	1.17	1500	1.23	1571	1.29	1648	1.36	1737	1.43	1827	1.5	1916
	Eşme	1.84	2011	1.93	2113	2.03	2223	2.13	2332	2.24	2453	2.35	2573



The whole city of Manisa, if it is evaluated statistically, it is ranked first in solid waste pollution since it is completely in the region of Gediz Basin. Moreover, the forecasts have been made in Table 2.8. Solid waste generation by 2030 is expected to reach nearly doubled of 2005. This data is shown graphically on the basis of province in Figure 2.18. The gray slices correspond to industrial solid waste whereas the red ones correspond to household solid waste. According to this graphically figure, it can be interpreted that industrial solid waste generation is more than the household solid waste generation.

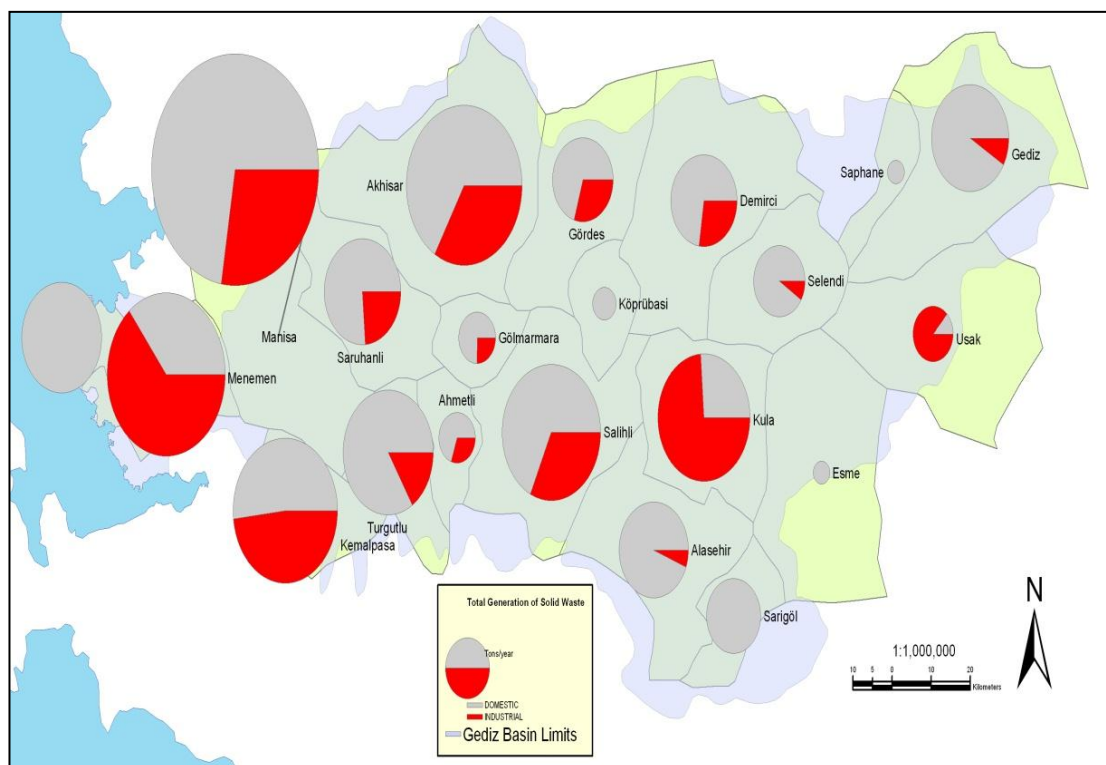


Figure 2.18 Solid waste generation in provinces (Anonymous, 2009)

Industrial waste is another polluting factor of Gediz Basin. The industrial waste that has the highest flow is determined as follows: The total wastewater flow for Menemen province is  $16102 \text{ m}^3 / \text{day}$ , the total wastewater flow for Kemalpaşa province is  $6694 \text{ m}^3/\text{day}$ , the total wastewater flow for Uşak city is  $7500 \text{ m}^3/\text{day}$ , the total wastewater flow for Turgutlu province is  $1235 \text{ m}^3/\text{day}$ . Besides these data, the industrial sectors that have the highest flow rate of wastewater drain are given in

Table 2.9. It is seen that the leather sector takes attention and more than half of the wastewater flow is generated in this sector.

Table 2.9 The industrial sectors that have the highest flow rate of wastewater drain (Anonymous, 2008)

Industrial Sectors	Industrial Volume (%)
Leather	57.7
Food	18.8
Textile	9.7
Automotive	3.0
Metal	3.0
Paper	2.9

Agricultural based pollutants can be compared in terms of nutrients. According to Figure 2.19, it is seen that nutrients that the agricultural fertilizers generate is more than the nutrients that is based on household consumption.

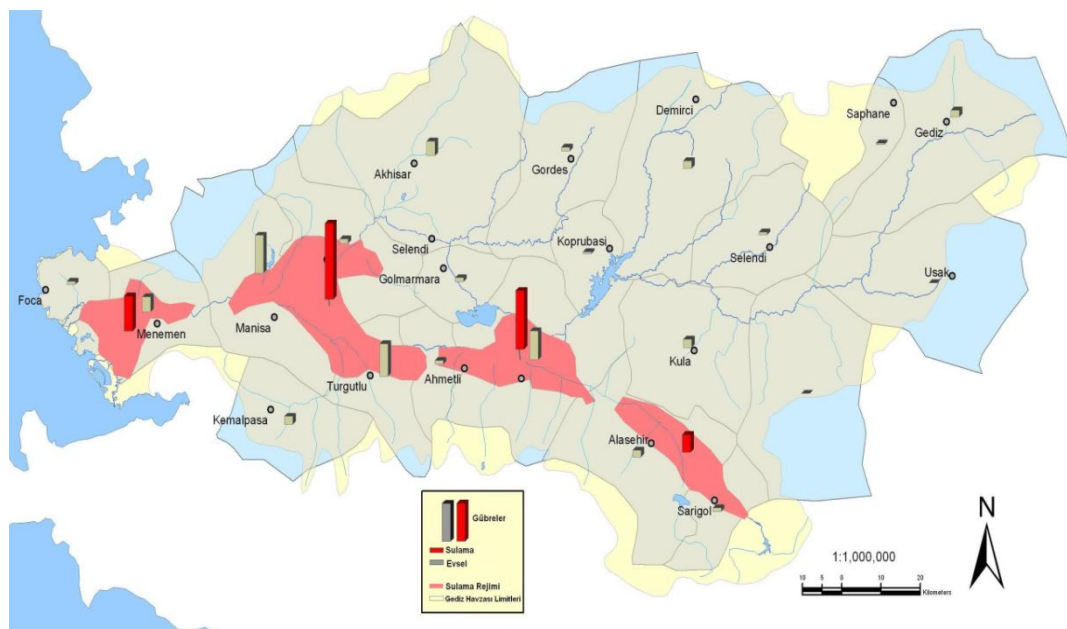


Figure 2.19 Nutrients generated by household and agriculture (Anonymous, 2008)

According to data from the Ministry of Environment and Forestry, 2008, if the household and industrial pollutants are compared with each other, it is seen that the

household pollutant loads are 86754 BOD (tons / year) and industrial pollutant loads are 26711 BOD (tons / year). The distribution of loads by districts is given in Figure 2.20.

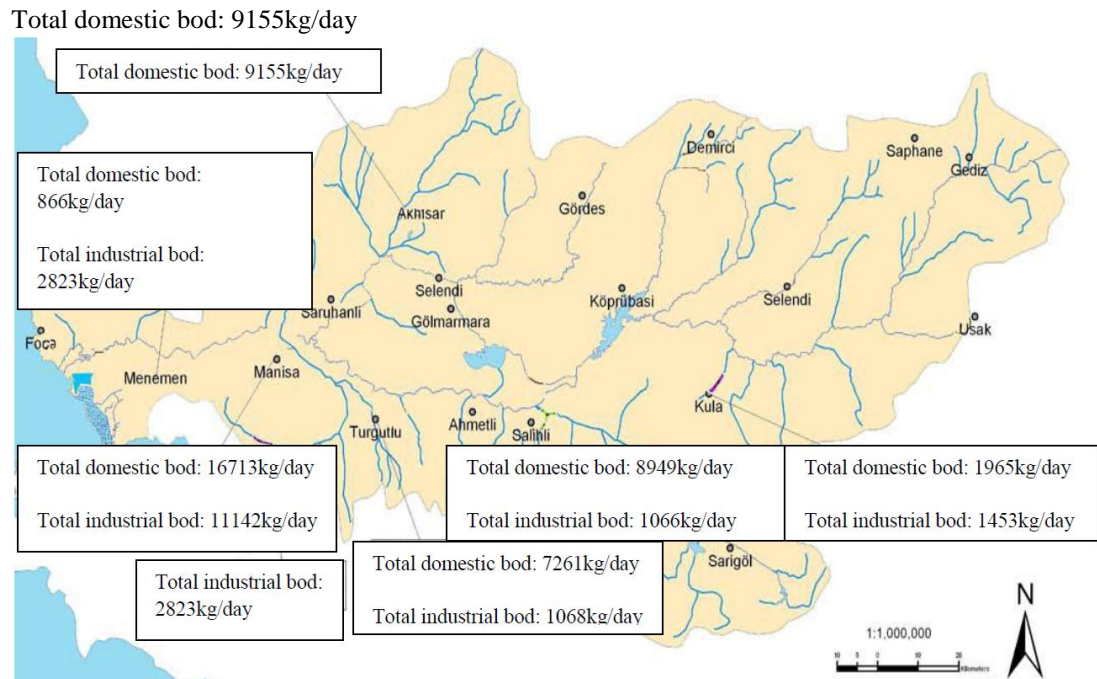


Figure 2.20 The distribution of household and industrial loads by districts (Anonymous, 2008)

In conclusion, in the second part of this thesis, the geographical and socio-cultural characteristics of Gediz Basin were examined. Besides, it is tried to evaluate the position of Gediz Basin with respect to industrial zones. Knowing the pollutant resources of the Gediz Basin is very significant issue for developing action plans to protect the basin. In the next section of the thesis, Gediz Basin Action Plan will be examined in detail.

## **CHAPTER THREE**

### **GEDIZ BASIN CONSERVATION ACTION PLAN**

Gediz Basin Conservation Action Plan is conducted by the Ministry of Environment and Forest as a part of Basin Conservation Action Plans. Identification of current condition of water resources and determination of protection principles of water resources with protection-usage balance is crucial. The basins in Turkey have been evaluated considering the water quality, protected areas, contamination resources and watersheds in order to protect the basins. In this aspect, Gediz Basin takes places within the first five basins which have priority. In January 2008, the pre-workshop of Gediz Basin Conservation Action Plan has been done and action plan has been put forward in May. In this section, conservation action plan's principles that the Ministry has determined will be examined.

#### **3.1 Vision and Mission**

The text entitled "Action Plan for Protection of Gediz Basin Study" is published by Ministry of Environment and Forestry in May 2008 and it covers all aspects of the Gediz Basin conservation action plan.

According to the report of Ministry of Environment and Forestry, the aim of action plan is improving the quality of water in Gediz Basin. In other studies, this target has been narrowed down. Elimination of pollution and water scarcity are shown as a target (OPTIMA, 2006).

Aygun has identified four missions for the Gediz Basin Conservation Action Plan in his thesis: raising the quality of water from fourth class to first class, 90% percent satisfaction of water users with 90% insurance, protection of natural environment of the basin, making the Gediz Basin one of the world's major bird watching areas, ensuring the consciousness of people live around the basin in terms of water resources and related problems through education and making people participating actively in water resources management (Aygün, 2007).

### 3.2 Participant Institutions

There are many national and international participants to the Gediz Basin Conservation Action Plan. Dokuz Eylul University Water Resources Management Research and Application Center (SUMER) is an example. Usage and management of water resources in Gediz Basin is analyzed in the scope of the project entitled Sustainable Management of Scarce Resources in Coastal Zone that is carried out by SUMER. Thus, within the framework of Gediz Basin Conservation Action Plan, several scenarios are developed and they are evaluated as well (SMART, 2005).

The General Directorate of Rural Services is one other participant. The project that is carried out in collaboration with IWMI (International Water Management Institute) is significant for Gediz Basin Conservation Action Plan. This project was started in 1997 and the project was completed in 1999. The project consists of two parts including irrigation methods and basin management. The ideas that have been proposed are basin irrigation performance assessment, evaluation of data regarding the land and water resources and water management (IWMI, 2000).

Other participants are as follows: State Hydraulic Works (DSI), General Directorate of İller Bankası, Electrical Power Resources Survey and Development Administrations General Directorate of Rural Services that are closed by the Law 5286 and carrying out their duties in charge of Special Provincial Administration, Water and Sewerage Industry, Ministry of Forestry and Environment, The Ministry of Health, Ministry of Agriculture and Rural Affairs. Local authorities are also included within the framework of action plan as participants. Local authorities as a participant are as follows: Metropolitan municipalities, provincial municipalities, villages and irrigation associations. Besides, Wildlife Conservation Society (DHKD), Promotion and Protection of the Environment and Cultural Foundation (CEKUL), Environment Foundation of Turkey (TCV), Turkey Foundation for Combating Soil Erosion, for Reforestation and the Protection of Natural Habitats (TEMA), Environment and Development in the Gediz Basin Reforestation Foundation (GEMA) is among the participants (Aygün, 2007).

### 3.3 Problems

Identification of the problems related to Gediz Basin is an important step to put forward solutions. The problems are identified by the OPTIMA project that is put forward by Dokuz Eylul University Water Resources Center (SUMER) (OPTIMA, 2006).

Increase in water pollution in the basin stands out as an important first problem. Causes of pollution are waste water due to urban, industrial and agricultural irrigation water use. Agricultural irrigation water is generally contaminated by fertilizers and other agricultural chemicals. If this contaminated water goes to underground water resources or surface water resources, the chemical contamination problem arises. It is a fact that the 60% of surface water in Gediz Basin and 30% of underground water is fourth class quality according to Water Quality Classification (SMART, 2005; OPTIMA, 2006).

Another serious problem addition to the pollution is the lack of legal regulations. Increasing sanctions with legal regulations can be a deterrent. In addition, public awareness of pollution, such as the transfer of funds for the construction of treatment plants quickly is also important points (OPTIMA, 2006). In Table 3.1, the classification of problems and degrees of importance can be seen.

Table 3.1 Problems of Gediz Basin and its priorities (OPTIMA, 2006).

TOPIC TITLE	PROBLEMS	PRIORITY
PHYSICAL CONDITION		
	Basin pollution	1
	Ground water level and quality	2
	Water shortage	3
	Drought	4
	Flood	5
	Interaction with coastal areas	6
WATER MANAGEMENT		
	Education and raising awareness	1
	Institutional obligations	2
	Active participation	3
	Maintenance and old technologies	4
	Techno-economic obstacles	5
	Water quality standards and investment	6
	Water rights and the solution of problems	7
	Participation of private sector	8
	Rights of public access to information	9
	Equality in education and training	10
	Charging problem	11
	Very high fees, restricting water usage fees	12
	The role of women in related institutions	13
Too low wages, low impact on the water usage	14	
WATER REQUIREMENT		
	Surface water requirement	1
	Underground water requirement	2
	Surface water pollution caused by agricultural reasons	3
	Irrigation technologies	4
	excessive extraction of groundwater	5
	Groundwater pollution caused by agricultural reasons	6
	Groundwater pollution	7
	Domestic wastewater	8
	Excessive usage of surface water	9
Groundwater pollution caused by industry	10	

Table 3.1 Cont.

	Uncontrolled disposal of solid waste	11
	Water saving technologies (domestic)	12
	Surface water usage by industry	13
	Effects of industrial development	14
	Groundwater pollution (domestic)	15
	Flood	16
	Water saving technologies (quality)	17
	Extraction of surface water by industries	18
	Allocation of water because of environmental reasons	19
	Effects of population growth	20
	Agricultural growth and field increase	21
	Surface water usage by industry	22
	Surface water requirement for tourism	23
	Surface water pollution caused by tourism	24
	Water saving technologies (tourism)	25
	Groundwater pollution caused by tourism	26
	Increase in requirements due to sectorial growth	27
	Groundwater requirement for tourism	28
<b>WATER SUPPLY</b>		
	Surface water quality	1
	Groundwater quality	2
	Restrictive conditions of agricultural water usage	3
	Water extraction, accumulation tanks, water catchment	4
	Conflicts caused by scarcity of surface water	5
	Conflicts caused by scarcity of groundwater	6
	Restrictive conditions of domestic water usage	7
	Sewerage and treatment plants	8
	Distribution lost (channels, pipes)	9
	Restrictive conditions of industrial water usage	10
	Alternative water resources	11
	Restrictive conditions of recreation water usage	12
	Infrastructure for the protection against natural disasters	13
	Effects of infrastructure on biological diversity	14
	Requirement of transfers from close basins	15



### 3.4 Gediz Basin Conservation Action Plan's Method and Content

Within the context of the Ministry of Environment and Forestry' studies, Gediz Basin Conservation Action Plan is consisting of 8 major points which are as follows:

1. Establishing the strategies of Gediz Basin Conservation Action Plan
2. Coordination of Institutions and Agencies
3. Wastewater infrastructure management
  - a. To bring forward of Wastewater treatment plants' due dates
  - b. Wastewater infrastructure of rural settlements and disposal of the wastewater
  - c. OIZ and singular industries' infrastructure and water treatment condition
  - d. Rain water infrastructure
  - e. Inspection of disposals
  - f. Inspection of the commitment dates
4. Solid waste infrastructure in basin
  - a. By the help of new waste collecting plant, there will be waste collecting centers, pilot composting plant, transfer stations and leakage treatment facilities
  - b. Improvement in existing irregular storage areas
  - c. Management of dangerous and special wastes such as medical waste and electronic waste
5. Resource Pollution Management and Control
  - a. Pollution management for agricultural pollution
6. Activities for Soil Erosion
7. Water Resources Management
  - a. Decision support system for Gediz River in order to observe water quality
8. Establishing Gediz Basin Environmental Information System (Anonymous, 2008)

Points which are determined by the Ministry of Environment and Forestry are consisting of different strategies and they are parallel as well. The coordination of the institutions and organizations, including management, and studies of different types

for the prevention of pollution are defined in this context. In addition, it is tried to create more integrated content in the wastewater management, solid waste management and source pollution. Erosion is one of the subparts of the content.

### **3.5 Environmental Protection Infrastructure Studies**

Environmental Protection Infrastructure is going to be analyzed in 4 main parts including: Existing Treatment Plants, Solid Waste Disposal, Hazardous Waste Disposal and other applications.

#### ***3.5.1 Wastewater Treatment Plants***

In Figure 3.1, existing water treatment plants are shown according to Gediz Basin Conservation Action Plan Progress Report dated 15 February 2011. According to the report, there are 7 water treatment plants for industry and there are 7 water treatment plants for domestic users. 2 of the water treatment plants (domestic) are planned to be revised.

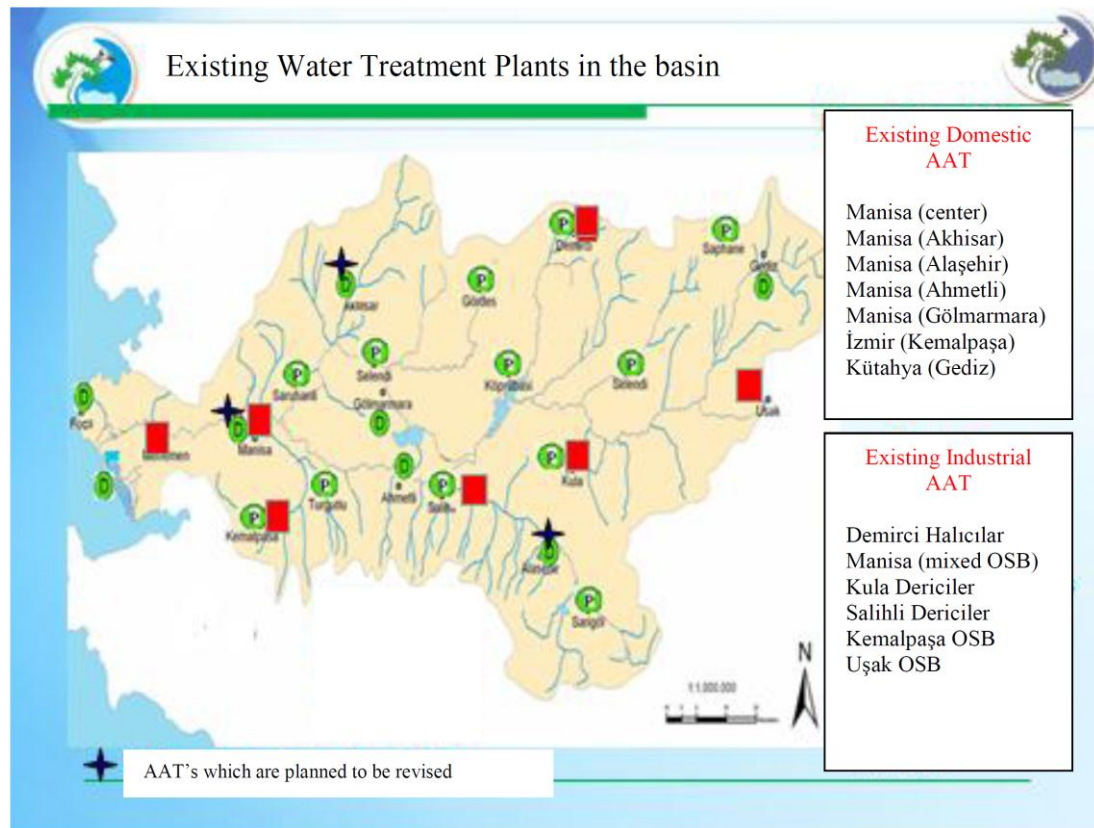


Figure 3.1 Existing Water Treatment Plants in the basin (Anonymous, 2011)

IZSU General Directorate of Wastewater Treatment Plant's due dates are prepared in Menemen and Kemalpaşa which are at the boundary of Izmir Metropolitan Municipality. There is a plan for construction of 3 wastewater treatment plants in Menemen and 2 wastewater treatment plants in Kemalpaşa. Furthermore, Menemen Advanced Biological Wastewater Treatment Plants was activated in 2010. Wastewater treatment plant's capacity is 21600 m<sup>3</sup> and it is designed for 100000 people. Kemalpaşa Advanced Biological Wastewater Treatment Plants was activated in 2010. Wastewater treatment plant's capacity is 14000 m<sup>3</sup> (Anonymous, 2011). Pre-feasibility studies are in progress for other plants. Hamzababa's wastewater which is under the responsibility of Special Provincial Administration is going to be combined with Kemalpaşa Wastewater Treatment Plant. Protocol studies are in progress with Metropolitan Municipality.

Izmir Gediz Basin wastewater treatment facilities' conditions in municipalities are shown in Table 3.2. Plants which are activated in 2011 are shown in the table.

Municipalities within the boundaries of the Izmir Gediz basin are shown whether they have wastewater treatment plants. In this area, there are 10 active wastewater treatment plants. Only Bozdag County does not have wastewater treatment plant. There is no information related to ongoing projects from Ministry of Environment and Forestry. Existing wastewater treatment plants are disposing the water to Sevindik stream and Bakircay.

Remaining regions within the boundaries of the Kutahya Gediz basin have only Gediz Municipal Wastewater Treatment plant which is activated in 1992. There is no wastewater treatment plant in any other region. However there are business appointment plan for wastewater treatment plants which are going to be activated in 2017 except Gumele, Karamanca, Yenikent, Ucbas and Altinkent municipals. As reported in the same report, Gediz and IZSU Foca Municipality's wastewater treatment plants do not have discharge permits (Anonymous, 2011).

Güre Municipal Wastewater Treatment Plant is only active plant in Usak and in table 3.2 Usak is not included. Gure Municipal Wastewater Treatment Plant is active since 2007.

Tablo 3.2 Gediz Basın Municipalities & Information (Anonim, 2011)

İzmir	Province	Municipality	Municipal State	WPT Exist?	Affiliated WTP	WTP Name	Type of Treatment	Capacity (m3/day)
	Foça	Foça	Province	Affiliated	İZSU FOÇA WTP			
	Kemalpaşa	Kemalpaşa	Province	Affiliated	İZSU KEMALPAŞA WTP			
	Menemen	Menemen	Province	Affiliated	İZSU MENEMEN WTP			
	İzmir	Büyükşehir	City	Exists	*	İzsu-Northern(çiğli) region WTP	Advanced Treatment	605000
	İzmir	Büyükşehir	City	Exists	*	İzsu-Foça-Bağarası WTP	Physical-Biological	2100
	İzmir	Büyükşehir	City	Exists	*	İzsu-Kemalpaşa-Halilbeyli WTP	Physical-Biological	1300
	İzmir	Büyükşehir	City	Exists	*	İzsu-Foça-KOzbeyli-WTP	Physical-Biological	500
	İzmir	Büyükşehir	City	Exists	*	İzsu-Foça WTP	Advanced Treatment	9763
	İzmir	Büyükşehir	City	Exists	*	İzsu-Menemen WTP	Advanced Treatment	21600
	İzmir	Büyükşehir	City	Exists	*	İzsu-Kemalpaşa WTP	Advanced Treatment	12960
	Ödemiş	Bozdağ	County	Does not exist	*	*	*	-
Kütahya	Gediz	Akçaalan	County	Does not exist				
	Gediz	Altinkent	County	Does not exist				
	Gediz	Cebrail	County	Does not exist				
	Gediz	Erdoğmuş	County	Does not exist				

Tablo 3.2 Cont.

	Gediz	Eskigediz	County	Does not exist				
	Gediz	Firdan	County	Does not exist				
	Gediz	Gediz	Province	Exists		Gediz Municipality WTP	Physical-Biological	4200
	Gediz	Gökler	County	Does not exist				
	Gediz	Gümele	County	Does not exist				
	Gediz	Gürlek	County	Does not exist				
	Gediz	Kayaköy	County	Does not exist				
	Gediz	Üzümlü	County	Does not exist				
	Gediz	Yenikent	County	Does not exist				
	Gediz	Yeşilçay	County	Does not exist				
	Gediz	Yunuslar	County	Does not exist				
	Pazarlar	Pazarlar	Province	Does not exist				
	Pazarlar	Sofular	Municipality	Does not exist				
	Şaphane	Karamanca	County	Does not exist				
	Şaphane	Şaphane	Province	Does not exist				
	Şaphane	Üçbaş	County	Does not exist				

In addition, as described in detail, Izmir, Kutahya and Usak municipals were inspected regularly. Financial penalties were given to inappropriate institutions when audits are conducted in 2010. These studies also form the portion of the municipals' studies. The numbers of actual inspections that are realized are given in the Table 3.3.

Tablo 3.3. # of Controls Applied in Gediz Basin (Anonim, 2011)

#of Controls	Kemalpaşa		Menemen		Çiğli		Foça		Basin-Total	
	Jan-Dec 2010	May 2008-Dec 2010	Jan-Dec 2010	May 2008-Dec 2010	Jan-Dec 2010	May 2008-Dec 2010	Jan-Dec 2010	May 2008-Dec 2010	Jan-Dec 2010	May 2008-Dec 2010
In-Basin	313	730	68	174	146	357	44	95	571	1356
İzmir-Total	Jan-Dec 2010 : 2434									
	May 2008-Dec 2010 : 4679									

In the fifth part, Wastewater Treatment Plants of Manisa will be analyzed in detail.

### 3.5.2 Solid Waste Disposal

The studies against solid waste disposal by municipals are presented in detail in the fourth progress report of December 2011.

Izmir Metropolitan Municipality has 28 forest villages in the Gediz Basin. After including of Hamzababa Village, there are 49 villages. The amount of daily solid waste of those villages is determined and as well as number of containers required. The studies to investigate how this solid waste is disposed are an ongoing issue.

Moreover, storage areas in Armutlu, Oren, Ulucak, Yukari Kizilca and Bagyurdu which are located in Kemalpaşa region are closed by Izmir Metropolitan Municipality. Solid waste from these regions is directed to solid waste storage area of Kemalpaşa Municipality. Transfer station that is planned to be established is out of scope of ÇED and there are some studies ensuring that transfer station is going to

be settled according to 1/100000 scale environmental scheme and plan implementation provisions. In the scope of project, garbage container and garbage trucks are foreseen to be used in a certain amount in Kemalpaşa Province Villages.

Compost Facility that has a capacity of 100 ton/day in Menemen Province is not currently active. Because the facility is closed, Harmandalı, Ulukent, Koyundere, Sasalı and Seyrek transfer their waste to the Harmandalı Solid Waste Storage Area. Moreover, the garbage storage area of Menemen Municipality is closed and waste is transferred to Harmandalı Solid Waste Storage Area.

Furthermore, according to findings by Alten and Erdin, "In the southern İzmir at Uzundere Compost Facility, approximately 500 ton/day waste is converted to compost which is a soil conditioner. 2000-2500 ton/day waste sourced by the other parts of the city is stored at Harmandalı Solid Waste Storage Area after it is sorting out." (Alten, 2006). As a result, Alten and Erdin have foreseen that composting enables up to 50% savings in solid waste storage areas. This also creates a solid waste management field.

It is planned that second solid waste disposal facility is established at Usak's three provinces that are in the Gediz Basin. The first storage area collects 15 tons in winter and it collects 11 tons in summer. Solid waste storage area is at Esme Elvanlar district. Storage is irregular. Storage area is approximately 50,000 meter-square (Anonymous, 2006). The storage life is approximately 50 years. The studies that aim to open a new solid waste disposal facility are conducted and ongoing by municipalities of Simav, Gediz, Pazarlar and Saphane.

For the three municipalities of Kutahya that is in Gediz Basin, the establishment of solid waste disposal facility is planned. Solid Waste Association of Municipalities is formed in 2005 by the municipalities of Simav, Gediz, Pazarlar and Saphane. To collect the household solid waste and dispose the waste, the facilities that are planned to be opened in Perli Village at the end of 2012 is foreseen that these facilities give service between 2009 and 2028. In addition to that, composting facility with full



capacity is planned for 2015 and collection system and material recovery facilities are planned for 2020 which can be followed in Table 3.4(Anonymous, 2008).

Table 3.4 Planned Solid Waste Disposal Plants in Kutahya (Anonim,2008)

Solid Waste Storage Plant	It is planned to store 2.246.132 tons of solid waste during project period at the planned solid waste storage plant which will be constructed & located at village of Perli- Sabanozu region.
Material Separation & Recycling Plant	It is planned to open a full-capacity recycling plant in 2020. Initial capacity projections show that 37000 tons/year will be enough.
Composting Plant	It is planned to construct a new storage plant in 2009, which will have 2500 tons/year of capacity & be located at the same place with current storage area. In 2015, it is planned to have a composting plant with 150000 tons/year capacity.
Transfer Stations	It is planned to construct two compressing in Emet & Tavsanlı, and one non-compressing in Altıntaş.
Waste Collectors & Bins	In order to collect recyclable material before they mix with other waste, there are plans to place easily accessible waste collectors & bins to Kutahya, Altıntaş, Aslanapa, Emet & Tavsanlı.
Collection & Recycling Plants	It is planned to construct 4 collection & recycling plants, two in Kutahya, one in Emet & one in Tavsanlı.

According to the interpretation of Yilmaz and Bozkurt, sanitary conditions related to solid waste disposal will be satisfied thanks to the project KÜKAB that can be seen in Table 3.4. They claim that “In Kutahya, the waste is collected mixed and only small portion of recyclable waste is decomposed by the street collectors. This

circumstance creates a hazard for environmental health. Since the large portion of recyclable waste is mixed with the food waste, this waste cannot be decomposed. If the recyclable waste that is not decomposed is transferred to storage area, it increases the contaminated volume and also causes economical losses. Therefore, it can be claimed that the services that are conducted with inadequate means will be strengthened with the project KUKAB in sanitary conditions.” (Yılmaz and Bozkurt 2010).

The studies that are carried out for solid waste disposal will be examined in detail in the following sections.

### ***3.5.3 Hazardous Waste Disposal***

Hazardous waste category includes medical waste, electrical and electronic equipments waste, batteries and so on. There are serious studies made in Kutahya for this issue. Mutlu Aku that is in Kutahya province at 5 km of Usak Road has a Recycling Plant Licence with APAKY-43-001 number that is issued by General Directorate of Environmental Management and valid until 08.06.2012. There are inspections carried out in Kutahya for this issue. Besides, the data regarding medical waste management is shown in Table 3.5.

Table 3.5 Kutahya Province Medical Waste Management Plan (Anonim, 2008)

Actual # of beds	Total Amount of Medical Waste		Current Standing	Planned Disposal Method	Project Standing	Planned Date of Launch
	kg/day	kg/year				
1581	2193	800598	Burying in special holes by liming	sterilization	Sterilization plant will be constructed.it isin the process of EIA&feasibility. Kütahya Solid Waste Disposal Plant was established. 6 municipalities and special provincial administration were participated. Facilities are planned to be opened.	2012

In the province of Usak, leather, ceramics and textile sectors causes hazardous waste. Liquid wastes containing Cr are spread usually from leather factories. Organic

acids in the textile and wool washing plants, grease emissions, paints, solvents are collected. Current condition of the hospitals' medical waste and planned status of the project is shown in Table 3.6 (Anonymous, 2008).

Table 3.6 Uşak province medical waste management Plan (Anonim, 2008)

Actual # of beds	Total Amount of Medical Waste		Current Standing	Planned Disposal Method	Project Standing	Planned Date of Launch
	kg/day	kg/year				
960	1299	474148	Burrying in special holes by liming	sterilization	Sterilization plant construction project is in process .	2012

In Kucukgul's studies entitled "Waste Management in Izmir, Current Situation, Problems and Solutions", it is stated that Izmir faces serious problems related to hazardous waste. Despite intensive industrial production in the province of Izmir, of inadequate waste management arises. Kucukgul states that the amount of hazardous waste generated is at least 1-2 million annually. However, he also asserts that the rate of processing this waste is only about 10% (Küçükgül, 2009).

Regular inspections on collection of medical waste without hazard to public health, temporary storage, recycling, transportation and final disposal are conducted in hospitals. Table 3.7 shows the data regarding the management of medical waste in the province of Izmir. The facility that is mentioned in table started to operate in 2008. Besides, various educations related to hazardous waste is given in the city. Medical Waste Education and Waste Management was some of the educations that are enabled in 2010 (Anonymous, 2008).

Table 3.7 Izmir Province Medical Waste Management Plan (Anonim, 2008)

Actual # of beds	Total Amount of Medical Waste		Current Standing	Planned Disposal Method	Project Standing	Planned Date of Launch
	kg/day	kg/year				
10686	14464	5579430	Regular storage	sterilization	Sterilization plant will be constructed, its EIA was submitted to the ministry. Technical specification report is in process of preparation. It is planned to become operational at the end of 2007.	2008

### 3.5.4 Other Applications

Along with the different studies, establishment of wastewater treatment plants, establishment of solid and hazardous waste disposal facilities and planning and the activation processes are carried out by the stakeholders.

Discharge of the wastewater's controls are carried out by the Directorate of Environment and Forestry of Izmir and also within the scope of erosion control, reforestation efforts are being made. Within the boundaries of Izmir Gediz Basin, 6071 ha area are afforested in the framework of Action Plan. After the Gediz Action Plan dated May 2008, 6245 ha area have been afforested and 174 ha have been afforested since 24.11.2009. There are 1300 ha potential areas for the forestation within the provincial boundaries whereas the subcontracts are not available. In 2010, over an area of 65 ha in Emiralem 33000 saplings were planted. In 2010, the 25 ha public area in Foca have been afforested by 41000 saplings (Anonymous, 2011).

According to Izmir Provincial Directorate of Agriculture, groundwater samples are taken from 3 stations in Kemalpaşa in May of 2010 and surface water of the Gediz River's samples are taken from 2 stations in March, June and September 2010. The related reports of the taken samples of the Gediz River are shown in the Table 3.8, 3.9 and 3.10 respectively.

Table 3.8 Analysis results of the samples taken from Gediz River Station 2010, March  
(Anonymous, 2011)

PARAMETERS	Acceptable Values taken from water and water products instructions- Appendix V (mg/l)	Analysis results (photometer or laboratory tests ) (mg/l)
Copper (mg/l)	0.010	0.28
Zinc(mg/l)	0.003	0.06
Sulfite(mg/l)	0.500	34

Table 3.9 Analysis results of the samples taken from Gediz River Station 2010, June  
(Anonymous, 2011)

PARAMETERS	Acceptable Values taken from water and water products instructions- Appendix V (mg/l)	Analysis results (photometer or laboratory tests ) (mg/l)
Oxygen (mg/l)	>6	4.79
Ammonium (mg/l)	0.020	2.92
Copper (mg/l)	0.010	0.30
Chlorine (mg/l)	0.010	3.00
Sulphate (mg/l)	90.000	142.00
Phospate (mg/l)	15.000	16.00
Zinc (mg/l)	0.003	0.11
Sulfite (mg/l)	0.500	10.00

Table 3.10 Analysis results of the samples taken from Gediz River Station 2010, September  
(Anonymous, 2011)

PARAMETERS	Acceptable Values taken from water and water products instructions- Appendix V (mg/l)	Analysis results (photometer or laboratory tests ) (mg/l)
Oxygen (mg/l)	>6	3.93
Ammonium (mg/l)	0.020	1.70
Copper (mg/l)	0.010	0.80
Chlorine (mg/l)	0.010	4.00
Sulphate (mg/l)	90.000	114.00
Zinc (mg/l)	0.003	0.09
Sulfite (mg/l)	0.500	31.00

Furthermore, educations are given to the farmers in order to reduce the use of chemical fertilizers, balance the usage of water and provide training for the selection of drugs that are not harmful to the environment. In the basin, 56 farmers have started to use good agricultural practices in 5234 acres area and 32 farmers have started to use the practices of organic farming in 13103 acres area (Anonymous, 2011).

Reforestation studies of the Regional Directorate of Forest Protection in Izmir are the part of Gediz Basin Protection Action Plan. The total forest area is shown in Izmir and Manisa provinces in Table 3.11.

Table 3.11 Forestland areas of Izmir & Manisa (Anonymous, 2011)

CITY	Forestland (ha)	Non-forested land (ha)	Total (ha)
Manisa	393258	727255	1120513
İzmir	77150	121326	198386
Total	470408	848491	1318899

Regional Directorate of Forestry' studies on forestation are in progress on the areas that are used formerly for mining. Numbers of seeding that are planted are shown in table 3.12. Mining activities ended with a total area of 124 hectares. It has been reported that 83 hectares are not suitable for forestation due to rocky surface. The remaining 41 hectares are afforested. So far, oak, pine, almond, ailanthus, species such as cypress were planted. The Gediz Basin erosion control activities conducted by the Directorate between 2004 and 2010 are shown in Figure 3.2.

Table 3.12 Number of newly planted seedlings in Izmir, Manisa & Gediz Basin (Anonymous, 2011)

	IZMIR and MANISA	GEDIZ BASIN
2006-2007 Season	1187000	480000
2007-2008 Season	1490000	500000
2008-2009 Season	2724000	110000
2009-20010 Season	450000	250000

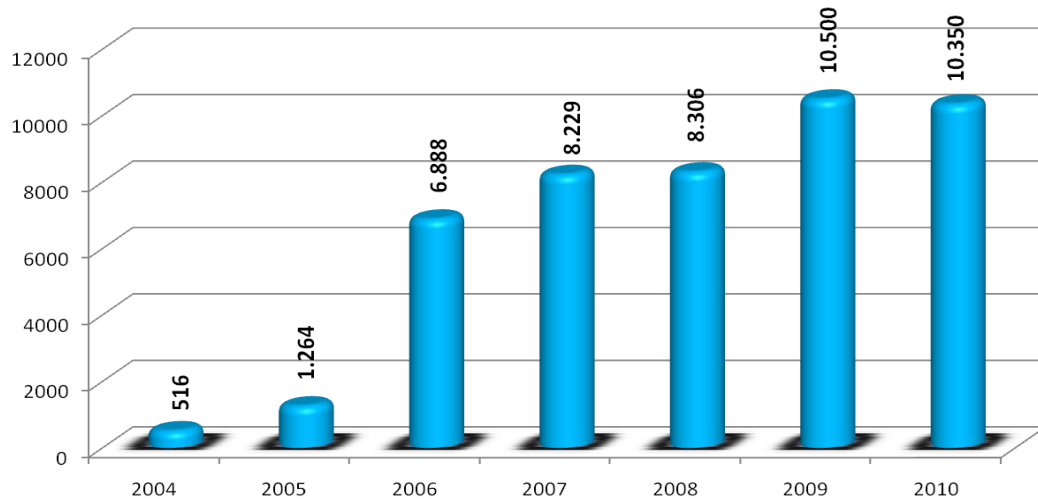


Figure 3.2 Gediz River Basin Rehabilitation and Erosion Control Studies (Anonymous, 2011)

Similarly, in the province of Usak, there have been reforestation activities in order to control the erosion by the Directorate of Environment and Forestry of Usak. In Usak province, 300 hectares plantation in 2010, 300 hectares of rehabilitation, 150 hectares of pasture improvement, and 200 hectares of special forestation and 300 hectares of erosion study was carried out.

Provincial Directorate of Agriculture inspections and studies on the agricultural areas have been focused on the amount of nitrate. There is no station that is reached to the legal limit of 25 mg/l of nitrate in the total of 5 stations within the boundaries of the Usak Gediz Basin. The average amount of nitrates of agricultural originated is observed as 1 mg/l in the stations that is within the boundaries of the Usak Gediz Basin (Anonymous, 2011). March, June and September 2010 nitrate analysis values are shown in Table 3.13. Furthermore, educational activities such as organic farming, water usage and good agricultural practices are in progress. In order to keep pollution under control, fertilizer and pesticide sales are kept under control.

Table 3.13 Usak Province analysis results of the samples taken from Nitrate Level Monitoring Stations. (Anonymous, 2011)

Name of the Station	Months (2010)		
	March	June	September
Karaağaç pond	0.80	0.26	0.08
Uşak Gediz river-Emirfaki region	0.66	0.86	1.52
Güneli bridge	0.72	0.44	0.94
Alanyurt village	0.32	0.66	0.48
Derbent village	0.66	3.70	0.66

Reforestation activities of Kutahya are one of the major activities among all the others. Forestation and erosion studies have been done in 342 ha in 2010. The study has been described in detail in the Table 3.14.

Table 3.14 Kutahya province forestation studies (Anonymous, 2011)

Project Name		Area (ha)	Province
Locations in Gediz Basin	Agari-Kalfalar Foreststion & Rehabilitation Project	97	Çavdarhisar
	Ilçıkören-Afsar Villages & Rehabilitation Project	74	Çavdarhisar
	Karaağaç Rehabilitation Project	78	Gediz
	Y. Susuz-Yeğinler Forestation Project	13	Gediz
	Akdağ Appendix-I Forestation Project	80	Simav
	TOTAL	342	

Furthermore, State Water Works has launched the project called GOLSU and 46 ponds have been studied under the project. 8 of the ponds are in the investment program and 38 ponds' progress is ongoing. The details of the project are shown in Table 3.15.



Table 3.15 Investments under the project GOLSU (Anonymous, 2011)

Item No	Name of the Planned Project	Benefits (ha)
1	Izmir Menemen Emiralem Pond and Irrigation Project	212
2	Manisa Gordes Doğanpınar Pond and Irrigation Project	423
3	Manisa Kula Çelengöz Pond and Irrigation Project	403
4	Manisa Kula Bebekli Pond and Irrigation Project	129
5	Manisa Alaşehir Kavaklıdere Pond and Irrigation Project	295
6	Manisa Pelitalan Pond and Irrigation Project	171
7	Manisa Selendi Ayanlar Pond and Irrigation Project	893
8	Uşak Derbent Pond and Irrigation Project	502
	TOTAL	3028

Another project of State Water Works has been started in 2008 in order to control the flood. While 45 pieces of work expected to be finished in the year 2012, there are just 4 pieces of work completed and there are ongoing 13 pieces of work and there are 18 contracts and 10 tender stages.

Manisa's environmental management and studies carried out in Manisa will be examined in the fifth part.

## **CHAPTER FOUR**

### **MATERIAL – METHOD**

In this section, legislations, regulations and laws forming the basis of the Gediz River Basin Conservation Action Plan, will be examined.

The first spots on the protection of watersheds are located in the fifth substance of Water Pollution Control Ordinance that is published in Turkey Official Gazette No. 25687 in 2004. In this regulation, to use all kinds of resources, Inland water conservation, pollution prevention and contaminated water sources in order to improve water quality in the basin are taken into account as the essential characteristics of the watershed protection plan. As a result of the watershed protection plan, a long-term conservation program and protection measures are determined. Protection plan will be prepared in this way (Anonymous, 2012).

In this context, duties of making plans for protection and utilization of water resources, integrated inland water resources and land resources management at the basin level are given to the General Directorate of Environmental Management by the Ministry of Environment and Forests with the law on the Organization and Duties. Thus, the Watershed Protection Action Plan is started in 2008 by the Ministry in Turkey.(Anonymous, 2012).

Provincial Environment and Forestry Directorates perform studies in accordance with the Water Pollution Control Regulation which is come into force in 2004 and published in Official Gazette No. 25687. Within the scope of this regulation, sampling and Analysis Methods, Technical Procedures, Administrative Procedures, Sensitive and Less Water Areas, Watersheds in the Procedures and Principles for Determination of Special Provisions are available. This regulation covers water quality classifications of environment, planning principles and prohibitions relating to the protection of water quality, wastewater discharge permit policies, and excretory principles, the principles related to wastewater infrastructure facilities, individual monitoring and auditing principles to prevent water pollution. This is

closely related to the regulations for EU candidacy. Regulations that are passed to national legislation are as follows: Protection of Waters Against Pollution Caused by Nitrates from Agricultural Sources Regulations (published in 2007 in the Official Gazette No. 25337), Human Water Consumption Regulation (published in 2005 in the Official Gazette No. 25730), Quality of Surface Water Regulations (published in 2005 in the Official Gazette No. 25999), Pollution Caused by Dangerous Substances in Water and its Environment control Regulation (published in 2005 in the Official Gazette No. 26005), Urban Waste Water Treatment Directive (published in 2006 in the Official Gazette No. 26047) (Anonymous, 2010).

Provincial Environment and Forestry Directorates conduct studies in accordance within the regulations and in the context of erosion control. These studies are carried out under the regulation of the Ministry of Environment and Forest Principles and Procedures for Afforestation and Erosion Control Services which were published in the Official Gazette on 03.09.2005 (Posts: 25925).

The legislation related to waste management can be examined under the legislation related to waste management framework. Legislation and general principles of this framework include work carried out by municipalities. Framework legislations are as follows: Environmental Law, Metropolitan Municipality Law, Municipal Law, the Special Environment Agency Establishment Law, the Turkish Penal Code, and the Regulation on the General Principles of Waste Management.

Waste management regulations determined by the type of special waste are also available. The guidelines are shown in Table 4.1. General principles were determined by the Regulations Concerning the General Waste Management published in the Official Gazette No. 26927. Other regulations are as follows: Urban Waste Water Treatment Directive (published in 2010 in the Official Gazette No. 26047), Regulations on the Use of Municipal Sewage Sludge and Soil (published in 2010 in the Official Gazette No. 27661), Solid Waste Control Regulation (published in 199 in the Official Gazette No. 20814) , Hazardous Waste Control Regulation ( published in 2005 in the Official Gazette No. 25755), Medical Waste Control Regulation

(published in 2005 in the Official Gazette No. 25883), Packaging Waste Control Regulation (published in 2011 in the Official Gazette No. 28035), Water Pollution Control Regulation (published in 2008 in the Official Gazette No. 26852), Waste Vegetable Oil Control Regulations (published in 2005 in the Official Gazette No. 25791), Excavation Soil, Construction and Demolition Waste Control Regulation (published in 2004 in the Official Gazette No. 25406), Waste Batteries and Accumulators Control Regulation (published in 2004 in the Official Gazette No. 25569), Regulation on Waste Electrical and electronic goods (published in 2012 in the Official Gazette No. 28300).

Table 4.1 Regulations corresponding to the types of waste

Regulations	Year	Official Gazette
Municipal waste water treatment regulations	2006	26047
Regulations regarding the use of domestic & municipal sewage sludge	2010	27661
Control of solid waste regulations	1991	20814
Control of hazardous waste regulations	2005	25755
Control of medical waste regulations	2005	25883
Control of packaging waste regulations	2011	28035
Control of waste oil regulations	2008	26852
Control of herbal waste oil regulations	2005	25971
Control of excavation construction & debris waste oil regulations	2004	25406
Control of battery waste regulations	2004	25569
Control of electrically powered & electronic goods waste regulations	2012	28300

Operation of waste management and disposal regulations are as follows: Wastewater Infrastructure and Municipal Solid Waste Disposal Facilities Regarding the issues and on the Basis for Determination of Tariff Regulations (published in 2010 in the Official Gazette No. 27742), Regulation on waste entering the Landfill (published in 2010 in the Official Gazette No. 27533, Incineration of Waste Regulation (published in 2010 in the Official Gazette No. 27721. (Table 4.2)

Table 4.2 Business &amp; Disposal Regulations in Waste Management

Regulations	Year	Official Gazette
Regulations regarding wastewater infrastructure & tariff determination procedure of domestic waste water treatment plants	2010	27742
Regulations regarding regular storage of wastes	2010	27533
Regulations regarding burning of wastes	2010	27721

Furthermore, there is also Environmental Audit Regulation which determines procedures and principles of environmental control and the obligations of auditing of personnel, environmental management unit / environmental officer during the process until the termination of the study with the qualities of the authorized companies (published in 2004 in the Official Gazette No.25337).

The studies of Directorates of State Hydraulic Works, is determined by different regulations. The most important regulations in terms of the duties and responsibilities within Directorate of State Hydraulic Works are as follows: Water Pollution Control Regulation and Environmental Impact Assessment Regulation (published in 2008 in Official Gazette No. 26939. In addition, there are also Floods and River Beds Regulation (published in 2006 in Official Gazette No. 26284) and Prime Minister Circulars related with reformation of river beds and rivers (published in 2004 in Official Gazette No. 27499). In terms of forestation, studies are carried out under the principles and procedures of Afforestation and Erosion Control Services within the Ministry of Environment and Forests (Published in 2004 in Official Gazette No. 25337).

Considering the issue of İller Bankası's aid to municipalities, studies are being carried out within the scope of the regulation of City and Town Water Supply Projects in Drinking Water Project Preparation (published in 1985 in Official Gazette No. 18783). In this regulation, the building processes of wastewater treatment plants are explained in detail.

The works of Provincial and District Directorates of Agriculture are based on the Regulation of the Agricultural Basin which was published in 2010 in the Official

Gazette No. 27695). In this regulation, frameworks for the issues such as the development of appropriate ecological agricultural production, agricultural activities in an integrated way for the execution of the agricultural basins, support, organization, preparation of an inventory of agricultural products are determined. Table 4.3 shows the scope of work performed by Directorates of Agriculture.

Table 4.3 Regulations defining the studies of Directorate of Agriculture.

Regulations	Year	Official Gazette
Agricultural basins regulations	2010	27695
Regulations regarding agricultural chemical fertilizers	2004	25406
Regulations regarding organic organomineral fertilizers & soil improvers and production import & supply of microbial enzyme ingredient & other products	2010	27601
Regulations regarding authorization of pesticides & similar material used in agricultural protection	1999	23614
Practice regulations of soil protection & land usage law	2005	26024
Regulations regarding the basics & practices of organic agriculture	2011	28076
Regulations regarding the good agricultural practices	2010	27778
Regulations regarding the establishment process & services of rehabilitation based livestock raising associations	2011	27899

Regulations related with fertilizers and pesticides are as follows: Fertilizers used in Agriculture Regulations (published in 2004 in Official Gazette No. 25406), use of organic and Organic Microbial Fertilizers and soil conditioners and Other products Containing Enzyme Production in Agriculture Regulation (published in 2010 in Official Gazette No. 27601), the Regulation of Imports and Their Placing on the Market, Pesticide and Similar Substances Regulation (published in 1999 in Official Gazette No. 23614).

In addition, regulations for organic and good agriculture for the orientation of farmers are also available. They are as follows: Soil Conservation and Land Use Law Practice Regulation (published in 2005 in Official Gazette No. 26024), History and Principles and Practices on Organic Farming Regulation (published in 2011 in Official Gazette No. 28076), Regulation on Good Agricultural Practice (published in 2010 in Official Gazette No. 27778), Correctional Services on the Establishment and

Purpose Animal Breeder Associations Regulations (published in 2011 in Official Gazette No. 27899).

Audits, studies and applications in the scope of Gediz Basin Conservation Action Plan are aforementioned above.

## CHAPTER FIVE

### ENVIRONMENTAL MANAGEMENT IN MANISA

The main branch of Gediz River is 401 km. 210 km is in Manisa, 52 km is in Kutahya, 96 km is in Usak and 41 km is in Izmir. If we consider this fact, it can be easily recognized that 50% of Gediz River resides in Manisa. In addition, as it is seen in Figure 5.1, 83% of the settlements are within the city Manisa. In Gediz Basin, there are 14 provinces, 60 counties and 695 villages that are within the boundaries of Manisa. Soma and Kirkagac provinces are the only two provinces of Manisa that do not reside in the Gediz Basin (Anonymous, 2012).



Figure 5.1a The settlements in Gediz Basin and the location of the city Manisa (Tübitak, 2012).



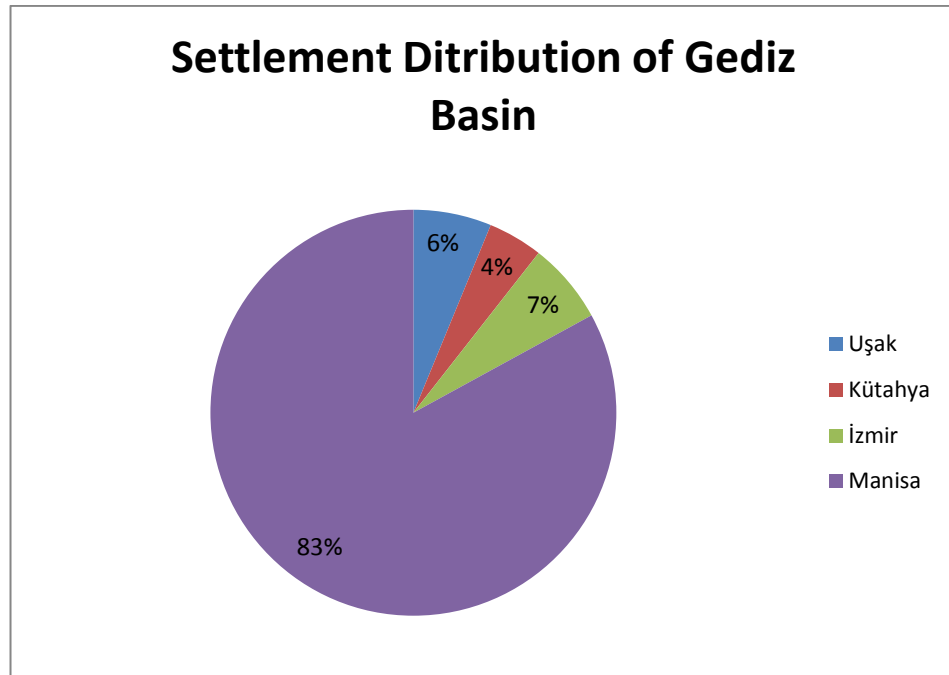


Figure 5.1b Settlement Distribution of Gediz Basin

The cities, provinces and counties that reside in Gediz Basin are shown in Table 5.1. As it can be seen in Table 5.1, Manisa is an important city for Gediz Basin in terms of number of provinces and counties reside in Gediz Basin.

Table 5.1 Cities, Provinces & Counties within Gediz Basin (Anonymous, 2012)

City	Province	County
Manisa	14	60
İzmir	3	3
Uşak	1	2
Kütahya	3	16
In Total	There are 21 provinces, 81 counties and 830 villages within Gediz	

In this section of thesis, the studies that are important for Gediz Basin are going to be investigated. These studies are conducted for Gediz Basin Conservation Action Plan.

## 5.1 Wastewater Treatment Plants

Wastewater treatment plants located in Gediz Basin are shown in Figure 5.2. According to this table, household wastewater treatment plants that reside in Manisa are as follows: Manisa Center, Akhisar, Alasehir, Ahmetli, Golmarmara. Industrial wastewater treatment plants in Manisa are as follows: Karma OSB and Dericiler, Kula, Salihli, Salihli Dericiler, Salihli Organized Industry Region. The facilities that reside in Manisa Center, Akhisar and Alasehir are planned to be overhauled. Besides, the opening new facilities in Saruhanli, Turgutlu, Selendi, Salihli, Kula, Koprubasi, Gördes and Saphane are taken into consideration.

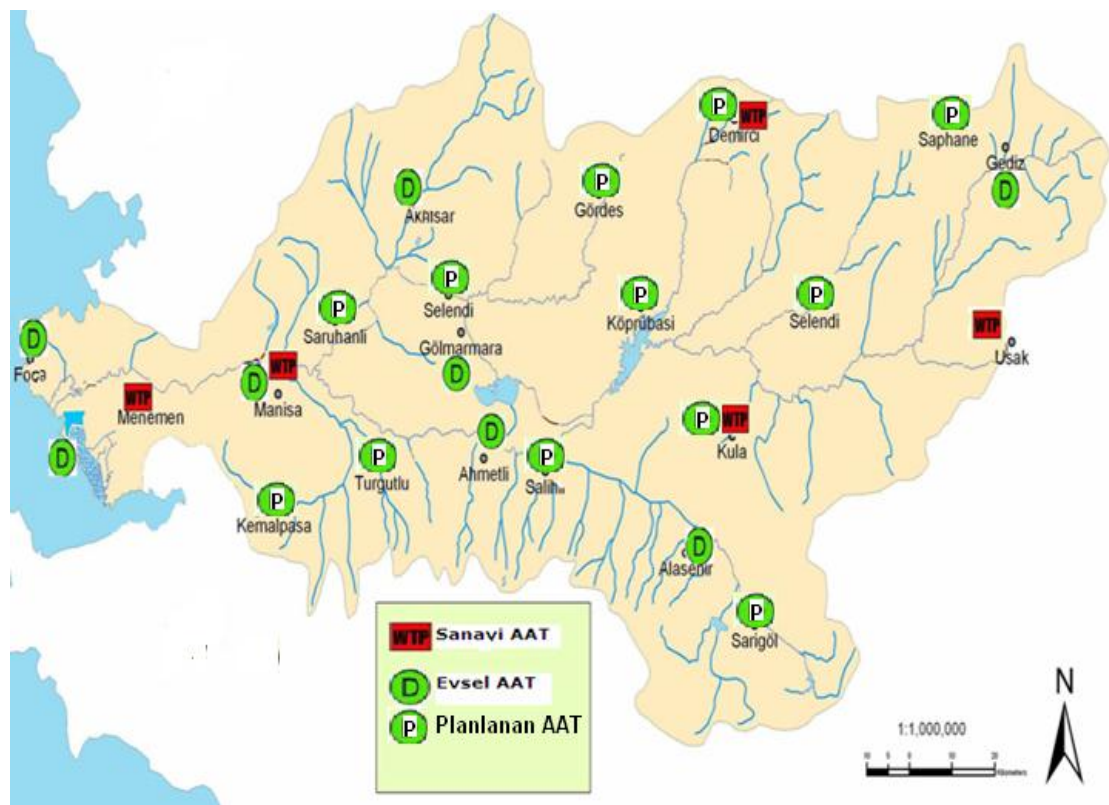


Figure 5.2 Wastewater treatment plants in Gediz Basin (Anonymous, 2012)

The wastewater treatment plants in Manisa can be categorized into two as the studies conducted by municipalities and studies conducted by Organized Industry Region.

### 5.1.1 Studies Conducted by Municipalities

Manisa Municipality household wastewater treatment plant capacity is 31060 m<sup>3</sup>/day and the flow rate is approximately 45000 m<sup>3</sup>/day by the year 2011. The facility has started to operate before the year 2008 and currently it serves for 316973 people (Anonymous, 2012). However, the facility does not meet the flow demands that are increased due to increasing population. The studies are initiated to increase the capacity of the current household wastewater treatment plant facility to 350000 people and 90000 m<sup>3</sup>/day by the Manisa Municipality Administration (Anonymous, 2011). The related studies are shown in Table 5.2. The date for the revision of the existing facility is determined as December of 2012. The facility has a permit for discharge to Gediz River (Anonymous, 2012).

Table 5.2 Manisa Municipality Waste Water Treatment Plant Progress Analysis (Anonymous, 2012)

MANISA	Situation before 2011		State of progress by February 2012
Population	316973	Trickling filter type WTP exists, however it does not satisfy the needs.  WTP Revision Project approval was given on September 7, 2009.  EIA process has been completed on September 13, 2010.	The location assesment & site investigation was conducted by İller Bankası Regional Directorate. Dimensional drawing studies were completed and submitted to İller Bankası  Implementation Project is expected to be complete just after the first quarter of 2012 by İller Bankası
Action Plan Schedule	December 2012	WTP Implementation Project has been completed on December 29, 2010	

Status of municipalities in the Central district of Manisa in Table 5.3 is shown. According to this data, the Central district of Manisa province has only 1 domestic household wastewater facility. No studies related to construction of facilities are found in the municipalities connected to Manisa. It can be said that 80-90% of population is connected to sewer system. Moreover, the business plan of the municipalities to start the facilities operate is exist in the table. However, in Karaoglanlı and Sancakli Bozkoy municipalities the facilities could not start to operate on time and there are not any related works yet.

Table 5.3 WTP Progress Report of the municipalities that are affiliated with Manisa City (Anonymous, 2011).

Municipality	Population (2009)	Work Due date Schedules	Date of Launch	Percent of the population who reach sewer system	Disposal Location	Progress Report
Asagi Cobanisa	3071	Available	December 31, 2015	90%	Nif River	No sign of progress in the construction of WTP
Hacihaliller	1343	Available	January 1, 2016	95%	Gediz River	No sign of progress in the construction of WTP
Hamzabeyli	905	Available	January 1, 2016	100%	Disposal Tube	No sign of progress in the construction of WTP
Kirkagacli	2216	Available	December 31, 2011	-	Disposal Tube	No sign of progress in the construction of WTP
Karaoglanli	2069	Available	January 5, 2012	99%	Kuru River	The court case regarding the location of WTP has been won by the Municipality. However, location conflict with the Finace Office has restrained the construction of the WTP. Ministry has granted a total of 250.000 TL for the construction project.
Muradiye	5976	Available	September 1, 2015	60%	Disposal Tube	No sign of progress in the construction of WTP
Sancaklıbozkoy	2416	Available		98%	Selverci River	No sign of progress in the construction of WTP
Sancaklı Igdecik	1349			95%	Ismailbey River	
Selimsahlar	1478	Available	January 1, 2016	-	Gediz River	No sign of progress in the construction of WTP
Ucpinar	1414			90%	Disposal Tube	-
Yagcilar	1051			80%	Gediz River	-
Yeniköy	1236	Available	December 31, 2016	100%		No sign of progress in the construction of WTP

There is not any wastewater treatment plant that is currently operating in Turgutlu Province. The studies that are carried out by Turgutlu Municipality Administration are shown in Table 5.4. In the land in which the facility is going to be constructed, the ground survey work has finished. But for the expropriation of the facility, the legal processes are continued. According to the business delivery plan, it is expected that the facility is going to start to operate in December 2012.

Table 5.4 Turgutlu Municipality Waste Water Treatment Plant Progress Analysis (Anonymous, 2012)

TURGUTLU	Situation before 2011		State of progress by February 2012
Population	117632	There is no WTP.  WTP Revision Project approval was given on July 28, 2009.  EIA process has been completed on April 13, 2010.	Whole construction process and studies regarding to Project is being conducted to İller Bankası.  Implementation Project is expected to be complete in April 2012.  Legal procedures of 53 decares of 72 decares expropriation site has been completed. An expropriation case was opened for the remaining area.
Action Plan Schedule	December 2012		

In addition, a new facility is planned to be opened in the province of Turgutlu, Derbent Village. It is foreseen that this facility is going to start to operate in 2010 according to the business delivery plan. There is not any improvement made for the construction of wastewater treatment plant. Besides, it is foreseen that the facility that is planned to be opened in Urganli County is going to operate in 2014. However, any progress related to construction of the facility is not made according to the report 2011.

Current status of the facility in the province of Akhisar is shown in Table 4.5. The facility that becomes operational in 1987 has a capacity of 9500 m<sup>3</sup>/day and discharge location is Gorduk Brook. The revision project of the trickling filter plant has been approved (Anonymous, 2012).

Table 5.5 Akhisar Municipality Waste Water Treatment Plant Progress Analysis (Anonymous, 2012)

AKHISAR	Situation before 2011		State of progress by February 2012
Population	102167	<p>WTP exists, but it does not satisfy the needs.</p> <p>Site investigation studies has been completed and feasibility report has been prepared.</p> <p>Expraparation process has started.</p> <p>EIA Process has been completed on July 2, 2010.</p>	<p>The construction tender bidding took place on June 1, 2011 for the WTP Project that was approved by İller Bankası.</p> <p>Construction site delivery to the tender bid winning firm was completed on September 22, 2011.</p> <p>Construction process has started on February 11, 2012 with a ground breaking ceremony.</p>
Action Plan Schedule	December 2012		

The status of wastewater treatment plant in the counties connected to Akhisar province is shown in Table 5.6. The counties Akselendi, Baker, Beyoba, Dagdere, Kayaoğlu, Mecidiye, Medar and Suleymanlı have business delivery plans. However, any progress has not been made for the construction of new facility.

Applications of Beyoba wastewater treatment plant which is expected to be operating in 2010 according to the business delivery plan have been made. Similarly, there is not any progress made for the construction of the plant that is expected to be operating in 2011.

Table 5.6 WTP Progress Report of the municipalities that are affiliated with Akhisar Province (Anonymous, 2011)

Municipality	Population	Work Due date Schedules	Date of Launch	Percent of the population who reach sewer system	Disposal Location	Progress Report
Akselendi	2618	Available	May 15, 2011	100%	Kuru River	No sign of progress in the construction of WTP
Ballica	1835	Available	May 31, 2012	99%	Ulucak River	No sign of progress in the construction of WTP
Beyoba	2193	Available	31.09.2010	100%	Kumcay	A WTP project application to Iller Bankasi was completed.
Dagdere	2597	Available	January 3, 2017	90%	Tekke River	No sign of progress in the construction of WTP
Kayalioglu	2059	Available	June 30, 2009	99%	Gorduk River	Iller Bankasi evaluation report stated that the county is close to Akhisar Municipality, therefore a collector system should be constructed to establish a connection with Akhisar Municipality WTP. The negotiations are in the stage of contract preparation & signature.
Mecidiye	1746	Available	December 31, 2009	100%	Kuru River	A WTP project application to Iller Bankasi was completed.
Medar	1938			-		
Suleymanli	2263	Available	December 1, 2016	95%	Gorduk River	No sign of progress in the construction of WTP. A 50.000 TL was granted to use in the construction of sewer system.

The studies that are conducted by Salihli Municipality indicates that construction phase of wastewater treatment plant has not been initiated yet (Table 5.7). The construction can be initiated after examination of construction tender by commission.

Table 5.7 Salihli Municipality Waste Water Treatment Plant Progress Analysis (Anonymous, 2012)

SALİHLİ	Situation before 2011		State of progress by February 2012
Population	97323	<p>There is no WTP.</p> <p>Expreparation of WTP site was completed on July 1, 2007.</p> <p>EIA Process has been completed on September 18, 2007.</p> <p>WTP Implementation Project has been approved on August 6, 2009.</p>	<p>Tender bidding for WTP construction was completed on September 13, 2011.</p> <p>Cmmision continues to investigate the files and results are not announced yet.</p>
Action Plan Schedule	May 2012		

The status of the wastewater treatment plants in the other counties of Salihli Province can be seen in Table 5.8. In Adalan, Durasıllı, Gökeyüp, Sartmahmut, Taytan and Yilmaz counties, the plants are expected to start operating in 2015-2016. For the Poyrazdamlari plant that is expected to be operating in 2011, the project is in progress.



Table 5.8 WTP Progress Report of the municipalities that are affiliated with Salihli Province (Anonymous, 2011).

Municipality	Population	Work Due date Schedules	Date of Launch	Percent of the population who reach sewer system	Disposal Location	Progress Report
Adala	2153	Available	January 1, 2016	95%	Gediz	There is a work on the extension of sewer system to the location of WTP.
Durasilli	4947	Available	December 31, 2015	100%	Drying Canal	Project plan for WTP is in progress. The tender bid process for WTP project plan was completed according to Iller Bankasi report. It is expected to be complete in March 2012.
Gokeyup	2173	Available	January 1, 2016	90%	Dry River	A WTP project application to Iller Bankasi was completed.
Mersinli	1564	Not Available	-	90%	Hayitli River	
Poyrazdamlari	1951	Available	June 1, 2011	80%	Feed Canal	A WTP project application to Iller Bankasi was completed.
Sartmahmut	5393	Available	January 3, 2017	10%		No sign of progress in the construction of WTP
Taytan	2691	Available	January 1, 2016	80%	Gediz	No sign of progress in the construction of WTP
Yilmaz	5681	Available	January 1, 2016	98%	Gediz	A study was conducted by Iller Bankasi in 2009. There is a demand from ministry for a prototype project. Construction site application was submitted to Ministry of Finance.

There is a wastewater treatment plant in the province Alasehir with a capacity of 22063 m<sup>3</sup> /day. However, it does not meet the demands. Table 5.9 shows studies on the plant that has started to operate in Alasehir by 1994. Physical biological treatment methods are used at the facility. According to the Action Plan, revision process that is expected to be ended in December 2011 still continues.

Table 5.9 Alasehir Municipality Waste Water Treatment Plant Progress Analysis (Anonymous, 2012)

ALAŞEHİR	Situation before 2011		State of progress by February 2012
Population	54082	<p>WTP exists, but it does not satisfy the needs.</p> <p>WTP Revision Project approval was given on December 2, 2009.</p> <p>Loan application for WTP Implementation Project was submitted to İller Bankası. İller Bankası has answered that the Project was approved only if the site investigation study will be renewed.</p>	<p>The first Project was submitted to ministry was revised and changed to a new Kırşehir WTP like Project. The reason for that is to reduce the construction and operation costs . This new Project is presented to ministry, and there is an improvement study.</p>
Action Plan Schedule	December 2011		<p>All Project work is expected to be fully completed in June 2012.</p>

If the counties of Alasehir Province are considered, it is foreseen that the plants in Kavaklıdere, Kemaliye, Killik, Uluderbent and Yesilyurt counties are going to be operating in 2012. However, this target has not been reached yet (Table 5.10).

Table 5.10 WTP Progress Report of the municipalities that are affiliated with Alasehir Province (Anonymous, 2011).

Municipality	Population	Work Due date Schedules	Date of Launch	Percent of the population who reach sewer system	Disposal Location	Progress Report
Kavaklıdere	5216	Available	March 29, 2009	90%	x	No sign of progress in the construction of WTP
Kemaliye	1744	Available	June 1, 2011	90%	Alasehir River	A 70.000 TL was granted by the ministry, to be used in the construction of WTP by the ministry.
Killik	2550	Available	June 1, 2011	99%		A WTP project application to Iler Bankasi was completed.
Piyadeler	1579	Available	January 1, 2016	-	Alasehir River	No sign of progress in the construction of WTP
Uluderbent	2932	Available	December 1, 2011	38%		A WTP project application to Iler Bankasi was completed.
Yeşilyurt	3684	Available	February 15, 2010	98%	Alasehir River	A WTP project application to Iler Bankasi was completed.

There is not any wastewater treatment plant in the province Kula. The studies conducted to make the facility operating are shown in Table 5.11. According to the business delivery plan, the plant is going to start its operations in November 2011. However, as of February 2012, it is seen that only construction phase is finished yet.

Table 5.11 Kula Municipality Waste Water Treatment Plant Progress Analysis (Anonymous, 2012)

KULA	Situation before 2011		State of progress by February 2012
Population	24372	<p>There is no WTP.</p> <p>WTP Project was approved by 3rd regional directorate of İller Bankası on April 18, 2008.</p> <p>Construction tender bid was made on July 7, 2010.</p> <p>According to the Action plan that is approved by İller Bankası, the construction will be finished on November 20, 2011.</p>	<p>Excavation and construction started in September 2010.</p> <p>The agreement which was signed between Municipality and contractor company was terminated on October 17, 2011. A new tender bid for the Project will be made just after the legal procedure ends for Contract termination.</p>
Action Plan Schedule	December 2012		

Moreover, the construction of plant is planned in Gokceoren and Sandal counties that are connected to Kula Province. The initiation of operations is planned to be as the end of 2011. However, any studies have not been made related to construction of these plants in these countries.

There is an existing wastewater treatment plant in the province Demirci. Table 5.12 presents the status of the plant that is in ongoing process. This plant is in the consideration of Demirci Municipality. The plant that is expected to start its operations in December 2012, procurement is planned to be held by the year 2012.

Table 5.12 Demirci Municipality Waste Water Treatment Plant Progress Analysis (Anonymous, 2012)

DEMİRCİ	Situation before 2011		State of progress by February 2012
Population	20160	<p>There is no WTP.</p> <p>Expreparation work of construction site was completed in January 2011.</p> <p>Pre-construction analysis report was finished by İller Bankası on November 6, 2009.</p> <p>Tender bid for WTP Project was made in January 2011, and it is planned to be complete on April 20,2011.</p>	<p>WTP Project was approved by the Ministry on November 17, 2011 with the approval number of 5418.</p> <p>It is planned to go for a tender bid fort he construction in Februaray 2012.</p>
Action Plan Schedule	December 2012		

Moreover, the construction of wastewater treatment plant is planned in Durhasan, Icikler, Mahmutlar and Borlu counties connected to Demirci Province. The business delivery plans of Borlu and Icikler plants are prepared and these plants are planned to be operating in June 2015. However, there are not any studies conducted yet.

The studies that are conducted by Saruhanli Municipality are not only for construction of wastewater treatment plant but also for improvement of sewer infrastructure. The facility is foreseen to be operational in December of 2012.

Table 5.13 Saruhanli Municipality Waste Water Treatment Plant Progress Analysis  
(Anonymous, 2012)

SARUHANLI	Situation before 2011		State of progress by February 2012
Population	15350	<p>There is no WTP &amp; sewer system.</p> <p>Exprapration work of construction site was completed .</p> <p>Construction of collector channels and sewer system network is in progress. The aggreement was made on April 13, 2009, and it is planned to be complete on November 14, 2011.</p>	<p>WTP &amp; sewer system Project was approved by İller Bankası</p> <p>Tender bidding for WTP construction was completed by İller Bankası on SEptember 29, 2011. Construction site deli,very was made to the contractor copmpany on January 12, 2012. The Project will be completed in 450 days.</p>
Action Plan Schedule	December 2012	<p>WTP end Project was approved by İller Bankası and construction site delivery was made to the contractor in August 26, 2009.</p>	<p>According to İller Bankası, Saruhanlı was recognized as High Priority İnfrastructure Investment and the half of the cost of the construction will be met by SPO grants. Remaining 50% will be financed by a bank loan or ministrat grant.</p>

The business delivery plans of the counties in Saruhanli Province are available. The status of plants that are planning to be constructed in these counties can be seen in Table 5.14. According to the business delivery plans, the plants in Alibeyli, Gumulcile, Hacirahmanlı, Ishakcelebi, Mutevelli and Nuriye counties are planned to be operating in 2012. However, any progress has not been made yet.

Table 5.14 WTP Progress Report of the municipalities that are affiliated with Saruhanli Province (Anonymous, 2011)

Municipality	Population	Work Due date Schedules	Date of Launch	Percent of the population who reach sewer system	Disposal Location	Progress Report
Alibeyli	1351	Available	December 31, 2011	99%	Alibeyli River	No sign of progress in the construction of WTP
Buyukbelen	3002	Available	January 1, 2016	98%	Gokbeydin River	No sign of progress in the construction of WTP
Dilek	2441	Available	October 1, 2016	-	-	A WTP project application to Iller Bankasi was completed.
Gokcekoy	1714	Not Available	-	99%	-	-
Gumulcile	1464	Available	December 31, 2011	100%	Gediz River	Municipality states that the studies are in the stage of project planning.
Hacirahmanli	3209	Available	December 1, 2011	-	Disposal Canal	A Sewer system project application to Iller Bankasi was completed.
Halitpasa	3096	Available	January 1, 2016	95%	Kumcay	Site location was made on April 16, 2010. It is planned to make WTP as a natural treatment plant.
Ishakcelebi	1771	Available	December 1, 2011	-	Disposal Canal	No sign of progress in the construction of WTP
Koldere	3669	Available	May 1, 2016	100%	Disposal Canal	WTP Project & Sewer system project are in stage of construction by Iller Bankasi.
Kumkuyucak	774	Available	December 31, 2015	100%	Kumcay	No sign of progress in the construction of WTP
Mutevelli	3031	Available	December 31, 2010	100%	Kumcay	No sign of progress in the construction of WTP
Nuriye	1330	Available	December 31, 2010	100%	Kumcay	No sign of progress in the construction of WTP
Pasakoy	1949	Available	January 1, 2018	-	-	No sign of progress in the construction of WTP

There is not any plant that is within boundaries of Sarıgöl Province. . Only one wastewater treatment plant is planned by the municipality. Wastewater treatment plant project was approved by the Ministry in 2010. The project could not be initiated since İller Bankası allowance cannot be achieved. The facility is foreseen to be operational in May of 2012. However, in February 2010, it is seen that only the property is expropriated and the ground survey work is in progress (Anonymous, 2012).

There is not any wastewater treatment plant in Gordes Province. Facility construction approval is given by the Ministry in 2010. Calculation of the grant that will be determined by the Bank of Provinces is an ongoing issue. The date determined for start of operations in the facility is March 2013 (Anonymous, 2012). Besides, another plant construction is planned in Gordes Province, Cicekli County. However, there is not any business delivery yet. The facilities that are planning to be constructed in Gunesli and Kayacik have business delivery plans. Starting to operate in between 2013 and 2017 is foreseen for these counties. However, any progress has not been made yet (Anonymous, 2011).

Wastewater treatment plant with a capacity of 95 m<sup>3</sup>/hr in Ahmetli Province started its operations in 2008 (Anonymous, 2011). However, works continue to get the permit of discharge. Physical biological treatment is performed and discharge is done in Gediz River. In addition, another plant is planned to be established in Ahmetli Province, Gokkaya County (Anonymous, 2012).

In the province of Gölbaşı, there is a wastewater treatment plant that started its operations in 2007 and got the permit of discharge in 2009 with a capacity of 87 m<sup>3</sup>/hr (Anonymous, 2011). Physical biological treatment is carried out and it is discharged to Kumcağı Derivasyan Canal (Anonymous, 2012).

There is not any plant in Selendi Province. Expropriation of the facility is an ongoing process. A project that targets 10000 people is prepared. According to the



business delivery plan, it is foreseen that the plant is going to be operating in May 2017 (Anonymous, 2012).

There is not any plant in Koprubasi Province. Inadequate sewerage network are being undertaken to improve. Besides, expropriation of the facility is an ongoing process. It is foreseen that the plant is going to be operating in May 2015 (Anonymous, 2012).

### ***5.1.2 Studies in Organized Industrial Zones***

Wastewater treatment plant is operational in the Manisa Organized Industrial Zone. First of all, it is built in 1993 with capacity 6500 m<sup>3</sup>/day. After the increase in number of enterprises, new facility is realized and the total capacity has become 21500 m<sup>3</sup>/day. There are in total 188 enterprises in the organized industrial zones and the average wastewater flow rate is approximately 14000 m<sup>3</sup>/day in 2010. In the first place, the sewage sludge of 40 m<sup>3</sup> which is the output of operational phases of wastewater treatment were stored in the solid waste storage facilities whereas with the 2010, they are sent to the Sureko's waste disposal facilities (Anonymous, 2011). The facility does not have discharge permit. Environmental permit was taken in 2011 (Anonymous, 2012).

There is no wastewater treatment plant in the Akhisar Organized Industrial Zone. There are 25 enterprises in the Akhisar Organized Industrial Zone as of March 25, 2011. In the business plan, a new wastewater treatment plant's construction is foreseen as May 2009 whereas it is not realized. In the Akhisar Organized Industrial Zone, 95% of the sewer line was completed and the section line has been allocated space for the wastewater treatment plant (Anonymous, 2011). Sewerage infrastructure work continues as of 2012. Because of small number of enterprises and economic reasons, the foreseen projects are not realized. The power line and the transformers which are used in the construction of plant are completed. After the sampling devices and wastewater flow meter, the amount of wastewater and the characterization of the wastewater is going to be determined. Membrane Bio-Reactor

technology is going to be used in the plant. The facility will operate in the second half of the 2012 (Anonymous, 2012).

There is no wastewater treatment plant in the Salihli Organized Industrial Zone. There are 28 enterprises in the Salihli Organized Industrial Zone. 21 of them is still operation while the remaining 7 enterprises are in the break. The wastewater treatment plant which has the capacity of 4000 m<sup>3</sup>/day is completed with the additional concrete sedimentation pool. There is no accomplished tender stage for the second stage with the capacity of 8000 m<sup>3</sup>/day (Anonymous, 2012). Facility that has is 12000 m<sup>3</sup>/day total capacity is under construction (Anonymous, 2012).

There is no wastewater treatment plant in the Turgutlu Organized Industrial Zone. There are 18 enterprises in the Turgutlu Organized Industrial Zone and 12 enterprises are under construction. In the business plan, a new wastewater treatment plant's construction is foreseen as May 2009 whereas it is not realized. Municipality and the District administration continue to work in parallel manner (Anonymous, 2012). The flow rate, flow rate sizing, the route of expropriation, the pumping line studies are in progress. Due to characteristics of wastewater, Seramiksan has individual wastewater treatment plant (Anonymous, 2011).

There is no wastewater treatment plant in the Kemalpaşa Organized Industrial Zone. Business plan is presented to the Ministry in 2009. The wastewater treatment plant's construction has started in 2009 and it is going to be completed in 2012 (Anonymous, 2011). 13 enterprises are connected to the plant as of February 2011. The amount of wastewater enters the plant 6000 m<sup>3</sup>/day. Plant's capacity is 20000 m<sup>3</sup>/day (Anonymous, 2011).

There are approximately 52 leather enterprises in Kula and approximately 15 enterprises are operational. Establishment of Kula Leather Organized Industrial Zone has started. For leather firms that are operating in the county, a wastewater treatment plant which has the capacity of 600 m<sup>3</sup>/day is established by the Kula Chamber of

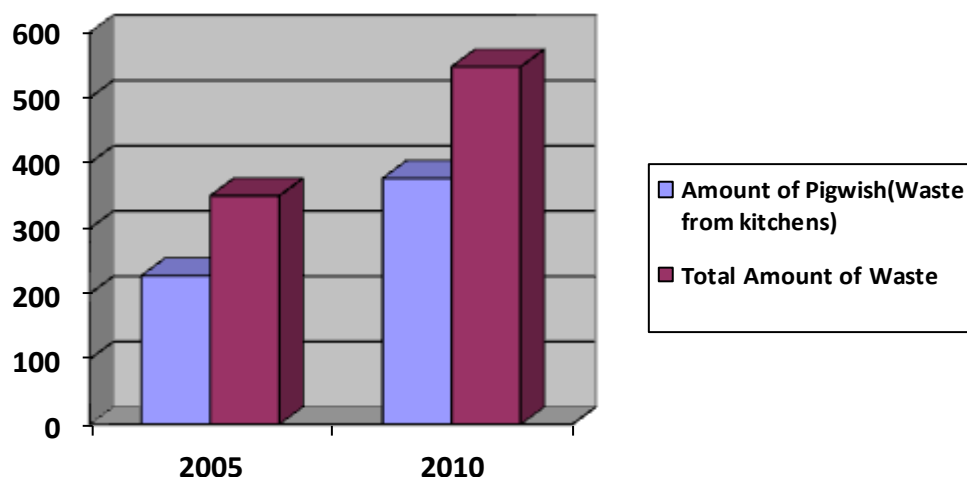
Leather while the transition to the OIZ is being realized. Temporary facility has been commissioned (Anonymous, 2011).

The Water Treatment Plant that is constructed by S.S. Demsan Demirci Manufacturers is operation. The Wastewater treatment plant that is constructed for Carpet enterprises has the capacity of 200 m<sup>3</sup>/day. Revisions have been completed (Anonymous, 2011).

## 5.2 Solid Waste Disposal

In the province of Manisa, changes in consumption patterns and growth in population has resulted not only increasing in the amount of waste but also changing composition of waste. In 2005, the total quantity of waste is 350 tons, while in 2010; the total quantity of waste is 547581 tons. In 2005, the composition of kitchen waste is 65% while the composition of kitchen waste is 68.81% in 2010 (Anonymous, 2011). The values are shown in the table 4.15.

Table 4.15 Total amount of pig wish (Kitchen waste) & total waste in 2005 & 2010 (tons/year) (Anonymous, 2011).



It has been decided in the meeting of the Gediz River Basin Conservation Action Plan Evaluation in December 2011 that 6 Solid Waste Association will be established according to population and settlements (Anonymous, 2012). These associations in Figure 5.3 are shown in different colors and numbers.

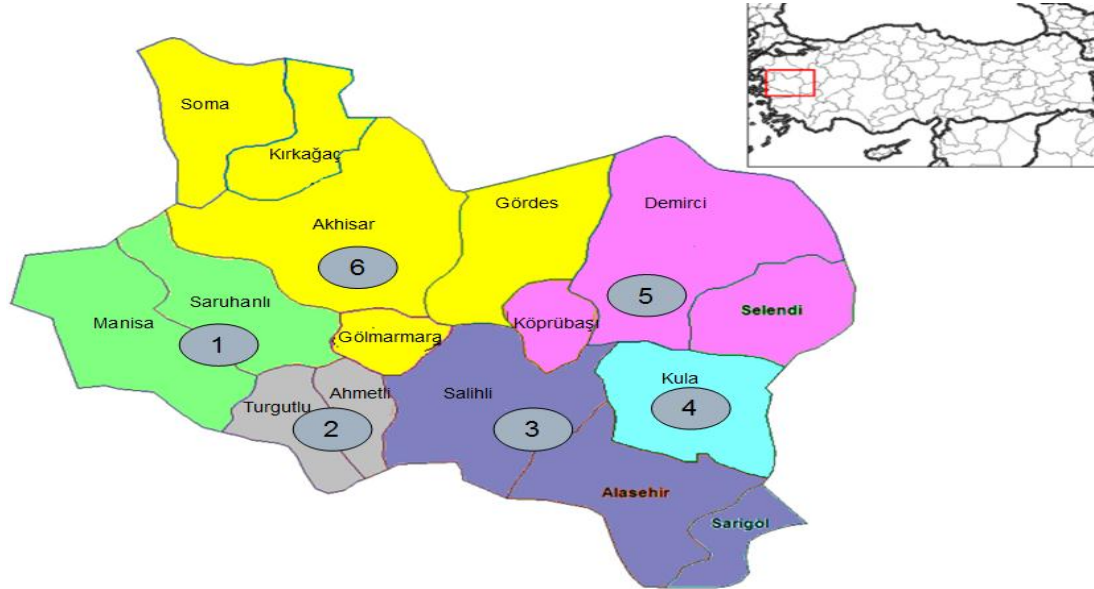


Figure 5.3 Solid Waste Association of Manisa Province (Anonymous, 2012).

Accordance with decisions taken at the meeting of Assessment, the first unions are consisting of Manisa and Saruhanli. Manisa Province Environmental Services Associations (MACEB) is established and it is consisting of Manisa, Saruhan, Koldere, Mutevelli, Alibeyli and Halitpasa municipals. According to the Union's studies, solid waste disposal facility that is planned for the village of Saruhan-Develi is pending litigation. There have been meetings about Alternative Solid Waste Disposal Facility with local and foreign companies (Anonymous, 2012).

Solid Waste Association which is consisting of Turgutlu and Ahmetli provinces and Urganli Gokkaya and Derbent municipals was founded in 2010. 143160 m<sup>2</sup> area are underway for the expropriating process (Anonymous, 2012).

There is a study to form an association which is consisting of Salihli, Alasehir, Sarigol towns and municipals. Legal processes are under investigation in Kabazli. Dokuz Eylul University, Department of Environmental Engineering is giving

technical assistance to the project. There are 5 suitable that is accordance with the criteria. Sart, Adala, Poyrazdamlari, Yilmaz, Taytan, Durasalli are part of association and they are located in Mersin (Anonymous, 2012).

Kula and village Municipals Association is consisting of Kula, Gokceoren and Sanal municipals. EIA process related to the Solid Waste Landfill has been completed. Town of Kula, Sandal village has initiated expropriation of parcel 21 sheet 1507 (Anonymous, 2012).

Association of Demirci, Selendi, Koprubasi and its villages' municipals has not been established. However, there is a recommendation of Ministry about the association of Demirci, Selendi, Koprubasi and its villages. Studies are in progress (Anonymous, 2012).

Akhisar, Gordes and Golmarmara have formed the AKCEB and Soma and Kırkagac have formed the SOMKIRCEB. Akhisar, Gordes, Golmarmara and Soma Kırkagac and their municipals are going to form municipals association. There are studies in order to realize these goals and to determine the area. A scientific committee is established in Dokuz Eylul University in 23.09.2011 related to the preceding area choice and there has been evaluation and assessment. The area which is determined for solid waste is found as permeable area which is hydro geologically problematic because there is a high risk of mixing the spring water and wastewater, so it is not appropriate for the given task (Anonymous, 2012).

### **5.3 Hazardous Waste Disposal**

Waste Management Regulations are applied within context of waste management. Hazardous Waste Disposal System has important role in solid waste management in Manisa. In order to connect to the system, producer of hazardous waste facilities are provided user name and password. Therefore, these enterprises declare their hazardous waste by the help of this system. The companies which are determined

after the inspection are also included to the system. There are 306 enterprises which have declared their hazardous waste by entering the system (Anonymous, 2011).

There are 5 licensed hazardous waste recycling facilities, 1 waste battery recycling plant, 1 temporary vegetable oil waste storage area and 2 non-hazardous inert waste recycling company that is temporarily certified (Anonymous, 2011).

According to the Environmental Status Report for the province of Manisa in 2009, there was composed 37886237.43 kg of hazardous waste. The percentages of the waste are following; 98.96% of recycling, 0.48% of disposal, 0.23% of exported and 0.34% of stock. In 2009, 1221036 kg of waste oil was collected and transferred to the disposal facilities (Anonymous, 2011).

Hazardous Wastes reported by facilities in 2010 are following: tank bottom sludge, sulfuric acid and sulphurous acid, organic solvents or other hazardous sludge containing paint or varnish, the other engine, gear and lubricating oils, mineral-based chlorine-free motor , gear and lubricating oils, hazardous materials containing packaging or contaminated with hazardous substances packages, hazardous substances, contaminated absorbents, filter materials (including oil filters if otherwise not specified), wiping cloths, protective clothing, fluorescent lamps and other mercury-containing waste, saturated or ion exchange resins in the wan, lead batteries, paint or varnish remover wastes, salt slag from secondary production, other hydraulic oils, flue-gas dust, nickel-cadmium batteries, fuel oil and diesel, oil-containing metal sludge (grinding, honing and milling residues), chlorine-free emulsions, oil, tar and cables containing dangerous substances, soil and rocks that contain hazardous substances, sludge, halogen-free machining emulsions and solutions (Anonymous, 2011).

#### **5.4 Special Wastes**

According to Manisa Province Environmental Status Report for the year 2011, special wastes include following: medical wastes, waste oils, vegetable and animal

waste oils, batteries and accumulators, chips and ashes from incinerators, electric and electronic waste, vehicles that is turned into salvage.

The total amounts of medical waste in Manisa's hospitals are 2485 kg/day and it is equivalent to 907025 kg/year. Medical wastes are collected with special vehicle that is specific to medical waste within the content of clean-up services. Accordance with Ministry's 2010/17 report wastes are taken to the sterilization facilities in order to dispose. Medical wastes' amounts are shown in table 5.16.

Table 5.16 The amount of medical waste that health centers in Manisa City generate in 2010 (Anonymous, 2011)

Institution	Yearly Medical Waste (kg)
Manisa Central PHC s	743
Akhisar State Hospital	43107
Akhisar PHC	222
Alaşehir State Hospital	34801
Demirci State Hospital	12023
Gördes State Hospital	2000
Köprübaşı State Hospital	450
Kula State Hospital	18979
Manisa State Hospital	84247
Manisa Merkez Efendi State Hospital	58908
Mental Health State Hospital	8157
Salihli State Hospital	75752
Salihli PHC	184
Sarıgöl State Hospital	6430
Saruhanlı State Hospital	5665
Selendi State Hospital	4000
Soma State Hospital	52434
Turgutlu State Hospital	47853
Turgutlu PHC	380
	907025

There are management of medical waste in the centre of Manisa and its some counties: Akhisar, Turgutlu, Kula, Salihli, Saruhanlı, Gördes, Selendi, Kırkağaç, Soma, Alaşehir, Sarıgöl, Gölarmara, Demirci. In these counties, the destruction of medical wastes is made by sterilization method.

Only in the county of Ahmetli there is not any medical waste management (Anonymous, 2011).

Table 5.17 Total amount of medical waste collected by the municipalities within city borders in 2009-2010 term (Anonymous, 2011)

Municipality	Amount of Medical Waste (kg/day)	Amount of Medical Waste (kg/year)
Center	863	315000
Akhisar	400	146000
Turgutlu	258.72	67269
Kula	22	7590
Salihli	487.72	152167
Saruhanlı	24	8790
Gördes	13	4745
Ahmetli	2	750
Selendi	10	3600
Kırkağaç	10	3600
Soma	189.71	69245
Alaşehir	145.93	53268
Sarıgöl	30	10800
Gölarmara	3	1095
Demirci	20	7200

The Directive on the Control of Waste Oils 26952 no, dated to 30.07.2008 and then was published in the Official Gazette is the base for waste oils.

Since 2010 there have been 68 waste oil declaration form taken into processed. The firms were inspected so as to oblige them to practice in accordance with the



rules of the directive. In 2009, the total of 1221036 kg of oil waste was collected and sent to the licensed recycle facilities (Anonymous, 2011).

In relation to vegetable and animal oils "Regulation on Waste Vegetable Oil" is available. In this context, Manisa, Soma, and Salihli Municipalities have a project that is separating the residential waste vegetable oils from others. In the province of Manisa, a waste vegetable oil company has temporary storage license (Anonymous, 2011).

According to the Regulation of Control of Waste Batteries, the waste batteries collection, transportation and disposal project application protocol has been signed between Manisa Municipality and Portable Battery Manufacturers Association (PBMA) in 02.05.2006. According to this protocol, waste battery boxes, posters and brochures were placed in Manisa. With the help of waste bins and waste battery boxes, it is provided separate collection of waste batteries in the province of Manisa. Collected battery wastes are stored temporarily in the containers in order to transfer to PBMA. PBMA's vehicle that is responsible for transferring the waste batteries to the facility to recycle and dispose in regular basis.

There is no study related to the Chips and ashes from incinerators and other related animal cadaver in the province of Manisa. Slaughterhouse waste is considered as an additive to animal feed in the district of Turgutlu (Anonymous, 2011).

Regarding electrical and electronically waste, there have been inspections with respect to regulations.

## 5.5 Studies of Provincial Directorate of Agriculture

Many different actions that related with agricultural fields and farmers are performed in Manisa by the provincial directorate of agriculture.

In 2010, 18 water samples are collected from 3 underground and 3 aboveground water sources in order to determine the level of nitrate pollution in agricultural fields. (Anonymous, 2011)

Furthermore, 24 short term courses are organized to raise awareness among farmers in 2011. 630 people attended these courses. Besides, educational programs are broadcasted in local TV channels. (Anonymous, 2011) These studies aim to raise the awareness of farmers in the following issues: earth, water, preservation and erosion, forming natural ribbons of life between agricultural fields, eco-friendly handling with waste products of agricultural fight drugs, ecological agriculture, eco-friendly agricultural techniques, integrated and sustainable agricultural techniques (Anonymous, 2011).

Controlling the sales of fertilizers and pesticides is another of the studies conducted by the Provincial Directorate of Agriculture. Agricultural Directorate determined amount of pesticide use for the year 2009 and the values are shown in Table 5.18. It is aimed to minimize these usages.

Table 5.18 The amount of pesticide used in Manisa City (Anonymous, 2011)

Total Consumption of Agrochemicals in 2009	Insecticide	46200.5 kg
		302487 l
	Fungicides	2140543 kg
		6742.5 l
	Herbicides	627 kg
		71747 l
	Acaricide	7000kg
		62528 l
	Rodenticide	30 kg
	Others	17071.5 kg
		15984 l

Evaluation of data on fertilizer use reveals that fertilizer use is very little in some areas, while it is used more than required in some other areas. Type and amount of fertilizers consumed in the year 2009 are shown in Table 5.19 (Anonymous, 2011).

Table 5.19 The fertilizer types & corresponding amount of consumption in 2009 (Anonymous, 2011)

No	Type of the fertilizer	Amount of Consumption in 2009 (ton)
1	A.Sulphate (21% N)	15077
2	Calcium A.Nitrate (26% N)	9477
3	A.Nitrate (33% N)	20781
4	Urea (46% N)	18628
5	TSP (42-44% P <sub>2</sub> O <sub>5</sub> )	1286
6	DAP (18-46%)	7341
7	MIXED (20.20.0)	14193
8	MIXED (20.20.0 + ZN added)	396
9	MIXED (15.15.15)	11197
10	MIXED (15.15.15 + ZN added)	2837
11	Potassium Nitrate (13.0.46)	675
12	Potassium Sulphate (50% K <sub>2</sub> O <sub>5</sub> )	1667
13	Calcium Nitrate (15%, 5 N- 25.5 CaO)	5
14	MAP (11.52.0)	71
15	MIXED (13.24.12)	840
TOTAL		104471

295 units of Plant Protection Products Reseller are located across the province. Training and supervision of these enterprises are regularly held. Inspections are also carried out on the use of chemical fertilizers under the Regulation of Control of Fertilizers. In this context of chemical fertilizers in 2010, 485 dealers were inspected 355 times (Anonymous, 2011).

Operating applications of livestock enterprises are evaluated and 43 permits are given to 336 applications in total (Anonymous, 2011).

## **5.6 Provincial Directorate of Environment and Forestry Studies**

The first work of Provincial Directorate of Environment and Forestry is the control of the discharges to receiving environments. In 2010, 11 enterprises are permitted for discharge. (Anonymous, 2011).

Erosion in the province of Manisa presents a severe hazard. The area that is exposed to little or no effect by this problem constitutes 17.17% of the total land. Very severe erosion is observed in 292898 ha of land (22.73%), which has extremely destroyed natural vegetation. This 22.73% of land covers 17199 ha of dry farming, 74 ha of olive groves, 16021 ha of grassland and 257747 ha of forest-heath (Anonymous, 2011). Studies intended to prevent this problem are performed by the Provincial Directorate of Environment and Forestry.

Within the framework of reforestation and erosion control throughout the province, 618 ha afforestation studies and 828 ha erosion control work were conducted in the Central, Kula, Demirci and Akhisar in 2010. Also, Manisa - Akhisar Highway Road Reforestation and Rehabilitation Project, River Erosion Control Project and the Philadelphia Aydoğdu Delemenler Village Project implementation activities are carried out (Anonymous, 2011).

## **5.7 Studies of State Water Works 2. Regional Directorate**

28 projects were carried out until Gediz Basin Conservation Action Plan. 4 towns, 10 villages, three parishes and 6673 ha of land are protected from flood damage and the sediments by the rehabilitation of about 101 km in 37 creeks. 45 projects were aimed to be implemented within the scope of the action plan. Within the framework of these projects, approximately 253 km long rehabilitation in 73 creeks and protection of 6751 ha of land, 6 districts, 4 towns and 12 villages from the damage of flood and sediments are planned. In addition, the movement of sediments from the Gediz River bed is required to be taken under control. 4 of these projects are

completed, 13 are ongoing, 18 are under contract and 10 of them are at tender stage (Anonymous, 2011).

All of the flood and sediment control activities conducted by the Directorate covers Manisa and its counties.

## **CHAPTER SIX**

### **DISCUSSION**

As part of Gediz Basin Conservation Activity Plan, some are predicted about the neighborhood administration of Manisa and goals are designated. In this context, some studies are performed throughout Manisa which contains massive part of Gediz Basin.

Whether plans and aims within the Gediz Basin Conservation Activity Plan, arranged by Ministry of Environment and Forest in 2008, are accomplished or not will be discussed in this chapter.

The increase in capacity of drain water refinement facility in Centre town of Manisa in 2008 is planned from 31000 m<sup>3</sup>/day to 90000 m<sup>3</sup>/day. According to report of February 2012, studies for the overhaul of this facility are in progress. The overhaul project expected to be completed in December 2012, is in the approval stage of Iller Bankasi. During this period, Revise Project Approval and ÇED process are just finished.

In city corporations of Centre city of Manisa, establishment of drain water facilities are planned. In city corporations like Aşağıçobanisa, Hacıhaliller, Hamzabeyli, Karaagaçlı, Muradiye, Sancaklı Bozkoy, Selimsahlar and Yenikoy, nothing has made progress about establishment of these facilities. Building facility initiative of City Corporation of Karaoglanlı is hindered by financial troubles. Dates of completion for projects are predicted in Work Practicing Plans. However, it is not possible that these facilities will be active until these specified dates because of the lack of any prior studies.

Drain water facility expected be built in Turgutlu town is planned to be active in December 2012. On the other hand, there are some ongoing expropriation cases about the establishment place of the facility. Therefore, it is reasonable to think that only the expropriation case will end up on predicted date. The facility predicted to

be built in province of Derbent of Turgutlu town was expected to be active in 2010. But, there are no recorded studies about this facility.

The facility began its operations in 1987 at Akhisar, the current capacity is insufficient. According to business delivery plan, construction of the facility that is expected to be operational in 2011 has just began in February 2012. Applications to Iller Bankasi for the new facilities were just made in the municipalities that are connected to Akhisar Municipality in 2010 and 2011. These facilities may be considered to be operating within the next 3-4 years.

The auction of the facility that is expected to be operational in May 2012 in Salihli Province still continues. The applications of these municipalities to Iller Bankasi have not been finalized yet.

The negotiations on the facility that is foreseen to be operational in Alasehir Province in December 2011 are ongoing issue and it is forecasted that the project will be completed in June 2012. In the municipalities that are connected to this province, no progress has been made for facilities that must be completed in 2012.

80 % of the facility was built in Kula but, due to the contract termination it will go out to tender. Therefore, the construction of this facility is stopped. . The process of building the facility projected to be operational in 2011 will be resumed.

Wastewater treatment plant planned for the Demirci Province, which is foreseen to be operational in December 2012. According to a report in February 2012, the construction tenders are not yet completed.

Wastewater treatment plant construction process continues in Saruhanli Province. The facility is considered to be operating in the second half of 2013. In December of 2012, according to business delivery plan it foreseen that the facility will be completed. No progress has been made in the municipalities that are connected to this province.

In Sarıgöl, regarding the facility that should be operating in 2012, no progress has been made due to lack of funds of the İller Bankası. Similarly, the fund is expected for the facility in Gordes Province.

Wastewater treatment plant in Manisa Organized Industrial Zone was in trial stage in 2008. It is as stated in the report 2012, the facility received environmental permit document.

The sewerage infrastructure of the facility that is planned to be constructed in Akhisar Organized Industrial Zone is ongoing issue. Even though, the approval of the project of this facility is done, the construction phase of this facility has not been initiated yet.

The facility in Salihli Organized Industrial Zone is in trial stage. For increasing the capacity of the facility, the progress in the stage two of the project is expected.

The wastewater treatment plant in Turgutlu Organized Industrial Zone is foreseen to be operational in 2009. It is stated that municipality continues to work in parallel with regional government of municipality. Apart from this no progress has been made.

In the stage of the construction of wastewater treatment plants it is seen that one of the problem is lack of funds. In these studies conducted by municipalities, it can be said that funding approval processes, approval of projects by İller Bankası caused disruption.

Aydin and Kucuksezgin put forward some evaluations about the pollution in Gediz River in the article 2012. The analysis of the samples that are taken from Nil Brook, Alasehir Brook, Selendi Brook and Menemen is conducted in this article. The pollution of Gediz River has been found very risky while Copper, zinc, lead, chromium, nickel, manganese and iron amounts were analyzed. The researchers claimed that the high risk level of these heavy metals can be mixed with food and it



can cause increase in health problems. Given the total concentrations of the samples, the Gediz River was determined as highly polluted in terms of, Mn, Ni, Pb, Zn, Cr and Cd. There are some evaluations that especially Mn pollution may be due to the use of pesticides (Aydin and Küçüksezgin, 2012). In light of this article, if the Gediz Basin Conservation Action Plan is considered, there are insufficient treatment plants. The risk of pollution resourced by discharges remains significant in terms of health. In addition, it can be said that studies conducted by Provincial Agriculture Directorates for reducing the use of pesticides are insufficient. Farmers are not conscious about that issue too. The high level of Mn concentrations that is found in the article of Aydin and Kucuksezgin's article led us to think in this way.

One of the important statistics about situation of wastewater facilities is put forward by the Ministry of Environment and Urbanism. According to data from the year 2009, only 42% of the discharged wastewater in the sewer network is treated. If the planned facilities come into being, reaching the ratio of 80-90% of wastewaters could be treated. At the beginning of the Action Plan on the Gediz, water pollution in the Gediz River is 4th class. Hence, the urgency to take action can be seen clearly.

Furthermore, no project has been planned related to the reuse of domestic wastewater in the province of Manisa. Development of such a project means the acquisition of the water used for irrigation. For example, establishing new units for disinfection in the treatment facilities could be provided. Thus, it would ease the burden of sewerage systems, and reduce otrafication (N, P input reduction) in water supplies. Furthermore, it could naturally provide the nutrients like nitrogen in recycling waters and diminish the need for additional fertilizers so it would reduce need in synthetic fertilizers.

After 2008, the Solid Waste Associations were founded in 2009 regarding the solid waste disposal. Thus, they aimed to ease the follow-up of the projects, and to accelerate the projects. Solid waste disposal facilities are planned to be established after the establishment of unions.

Solid waste disposal facilities planned in the town of Saruhan paused because of the lawsuit concerning the selection of the place. According to a report in February of 2012, the exploration for a proper site for the establishment of solid waste disposal facilities are not yet completed. Only the establishment of the unity in the 2-3 year period was completed, but the selection of a proper site for units did not result yet.

Recycling is an important point with respect to treatment of solid wastes. In this context, education and awareness activities in the subjects of recovery and recycling gain importance. There should be planned actions in this direction. In addition, the legislation of the European Union regulations on proper disposal and recycling facilities should be expanded.

However, the rapid population growth, urbanization and rising prosperity in the province of Manisa has created problems in waste management. According to the report of the Ministry of Environment and Forestry in 2011, the amount of waste increased, and the waste composition has changed. One of the most important problems of the province is the storage of solid wastes, coming from municipality and some industrial sectors, in a haphazard way, and without waiting the finalization of studies of solid waste unities.

The studies for the implementation of alternative technologies in disposal of medical wastes applied in developed countries are at an early stage. There are also other points to attract the attention to the management of medical wastes. There are available licensed firms for the disposal of these wastes, but the separation of wastes constitutes an important point. So, firstly, the groups that collect medical waste, and people from health care facilities should get an education within their service programs. Making the appropriate waste collection depots, introduction of separated waste colored bags and teaching all the personnel the meaning of colors is very crucial (Anonymous, 2000).

In addition, the role of remote sensing and geographic information systems at watershed management should be increased. Thus, for the management of the

watershed will be provided to obtain more reliable and more comprehensive data. The data will not be missing. Therefore, in light of the data facilitated the development of strategies about watershed management. Gediz basin management in this sense, combined with modern information technology infrastructure will become a more effective. Thus, use of land, rainfall, water pollution and similar information will be predictable with realistic models.

In addition, according to the report of the Ministry of Environment and Forestry, coordination, integrity, stakeholder participation and ownership are the major issues in order to overcome current problems in watershed management. Many institutions and organizations are working within the scope of watershed management. Thus, the forming of a planned environmental management, distribution of tasks among participants is a significant point. There is no problem in the Gediz River Basin Management Plan in this sense because responsibilities defined in 2008 clarified the distribution of tasks. But there is little participation of municipalities in the city of Manisa. So it should be increased.

In the report National Watershed Management Strategy that is conducted by the Ministry of Environment and Forests in 2012, watershed management-related problems are expressed. In the light of this information, the suggestions can be made for Gediz Basin Action Plan. First of all, distribution of tasks among different institutions is one of the problems due to lack of legislation. This also causes uncertainties about who is responsible for the project. In addition, prioritization should be done right. In order to do that, the national database studies are required.

The current lack of information in terms of watershed management is an important point to see the stages of it. The current lack of systematic data causes some serious problems in observing the efficiency level of the studies that are conducted difficult. Indirectly, this lack of database prevents the more efficient business plans. Therefore, in order to provide updated data the database management studies should be initiated.

Overcoming the problems in ownership and tenancy will enable the planned works in Gediz Basin finalized quicker since there are constructions of facilities that are not completed yet due to public prosecution. Overcoming these problems enable following the indicated dates in the business delivery plans better.

Increasing sanctions may be a step to avoid pollution. Waste resourced from private institutions and agencies should be well analyzed. Therefore, the penalties can be applicable for that sense. This also constitutes a legal basis to prevent pollution. Applying these sanctions carefully is important in this respect.

Compliance with European Union legislation may enable watershed management more effective. This legislation should be handled in the adaptability of our country's regulations and the planning should be done in this direction. Thus, accelerated process of the preparation of legislation is enabled. Considering the fact that time management is also an important factor in watershed management, speeding up the business processes can be seen as extremely important for contribution to watershed management.

Non-governmental organizations are also an important factor in the management of the watershed. These organizations can arrange activities for all age groups in order to enable education and awareness about this issue. In addition, the other supports that these organizations can provide would be very useful since it will relieve the duties of government agencies. Non-governmental organizations should be supported to participate in watershed management in national and local levels.

## **CHAPTER SEVEN**

### **CONCLUSION**

In this study, the environmental management of the province of Manisa is discussed within the framework of Gediz Basin Conservation Action Plan. First, it must be said that when the Gediz Basin Conservation Action Plan was formed in 2008, the Gediz River was facing a serious pollution. Predictions are made within the framework of this action plan against the domestic, industrial and agricultural pollution and environmental management is shared among participants. To improve water and soil quality of basin, controlling of domestic, industrial and agricultural pollution, reproduction of forested areas, erosion, flooding and sediments are the issues that the studies are conducted for.

Studies conducted within the scope of legal regulations and legislation, a struggle against the pollution in Gediz Basin has been made. Since whole city of Manisa is in the region of basin, it plays crucial role in the Gediz Basin Conservation Action Plan. Usak, Kutahya and Izmir provinces are located in the basin with limited number provinces. In this study, environmental management, particularly in the province of Manisa, were examined in watershed conservation action plan.

As a result of these assessments, potential problems of environmental management of the province Manisa have been evaluated and some proposals have been made. Conclusion drawn from here presents the details of both the environmental management and the Gediz Basin Conservation Action Plan.

To prevent the disruption of the planned works within the framework of Gediz Basin Conservation Action Plan, a more comprehensive effort is required in terms of technical and administrative manner. Widening the scope of legislation and clarifying of regulations in terms of institutions and organizations make the environmental management more effective. Considering the fact that there is some passiveness in the counties of the city Manisa, it can be said that watershed management plant has not been taken into consideration seriously. Therefore, the

official institutions' awareness should be increased about the environmental management.

Awareness and educational activities in agricultural areas are very important. The introduction of more efficient and environmentally friendly forms of agriculture is significant issue.

In addition, the implementation of modern technologies, such as the current data collection has an important share in the environmental management strategies. In this context, environmental management and the Gediz River Basin Conservation Action Plan for the province of Manisa have some shortcomings. If the financial challenges are exceeded in addition to overcoming those deficiencies, environmental management plans will be carried out quickly.

As a result, the environmental management within the framework of Gediz Basin Conservation Action Plan in Manisa has serious enhancements. But, the process should be accelerated. More importantly, after completing the activities planned in 2008, development of facilities that handle with wastewater reuse, recovery and recycling in addition spreading the environmentally sensitive farming practices all over the basin are required processes. Environmental management objectives should be put forward without wasting time. In this sense, studies, planning, project design should continue unabated.

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