



**REPUBLIC OF TÜRKİYE**  
**MINISTRY OF FORESTRY AND AGRICULTURE**

**Assessment of Potential Reuse Alternatives of Used  
Water Project**



# OUTLINE

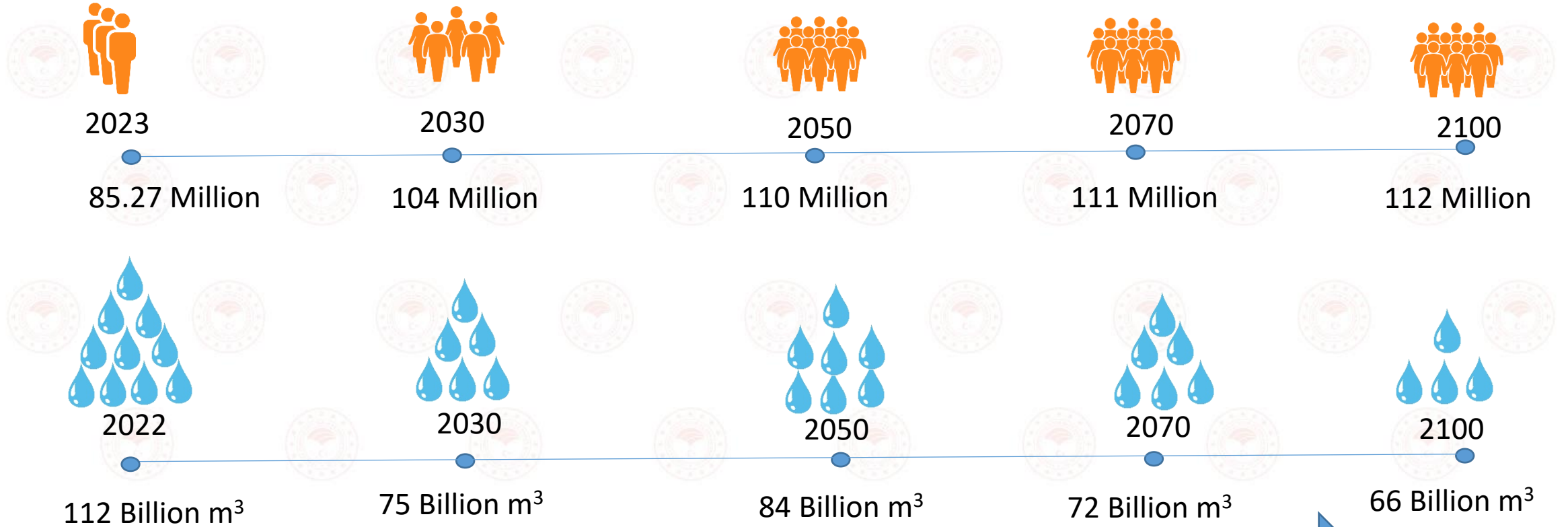
- ✓ **Project Purpose and Scope**
- ✓ **Project Methodology**
- ✓ **Draft of Action Plans**
- ✓ **Application Projects**
- ✓ **Other Project Outcomes**
- ✓ **Conclusion and Recommendations**



REPUBLIC OF TÜRKİYE  
MINISTRY OF  
AGRICULTURE AND  
FORESTRY



# Project Purpose and Scope



Average 25-30% decrease in usable water potential

**Water supply security is under threat!**



# Project Purpose and Scope

- **Project Aim:** Evaluate the potential for reusing treated wastewater to mitigate water scarcity in Turkey.
- **Duration:** 2017-2019.
- **Key Activities:** Identification of water sources, potential reuse areas, and creation of feasibility reports and action plans.



Works carried out within the scope of the project;

- ✓ Determination of the used water potential and quality in Türkiye
- ✓ Identifying the areas where used water can be reused in Türkiye
- ✓ Preparation of Pre-Feasibility Report and Draft Action Plan for the Reuse of Used Water on Basin Basis in Türkiye
- ✓ Preparing a guide document that will guide the institutions related to reuse practices
- ✓ Preparation of reuse application projects in 3 pilot provinces



REPUBLIC OF TÜRKİYE  
MINISTRY OF  
AGRICULTURE AND  
FORESTRY



# Project Methodology



## Identification of Water Sources:

- Domestic Wastewater Treatment Plants
- Drainage Water from Agricultural Irrigation
- Rainwater
- Cooling Waters

## Data Collection

### Sample Collection and Analysis :

- Collected samples from 601 WWTPs, 328 irrigation facilities, 23 thermal power plants, and rainwater collection systems in 4 provinces.
- Analyzed different parameters from collected samples.
- Detailed parameters such as temperature, pH, turbidity, electrical conductivity, and various pollutants.





## IDENTIFICATION OF WATER SOURCES

### Used water resources

- Domestic Wastewater Treatment Plants
- Drainage Water Returning from Agricultural Irrigation
- Cooling Waters
- Rain water

### Potential reuse areas

- Agricultural irrigation
- Landscape irrigation
- Industrial use
- Environmental feeding
- Groundwater recharge
- Drinking and utility water



### SUPPLY

Quantity /  
Quality



Need  
Risks  
Legislation  
Technology  
Cost  
etc.



### DEMAND

Quantity /  
Quality

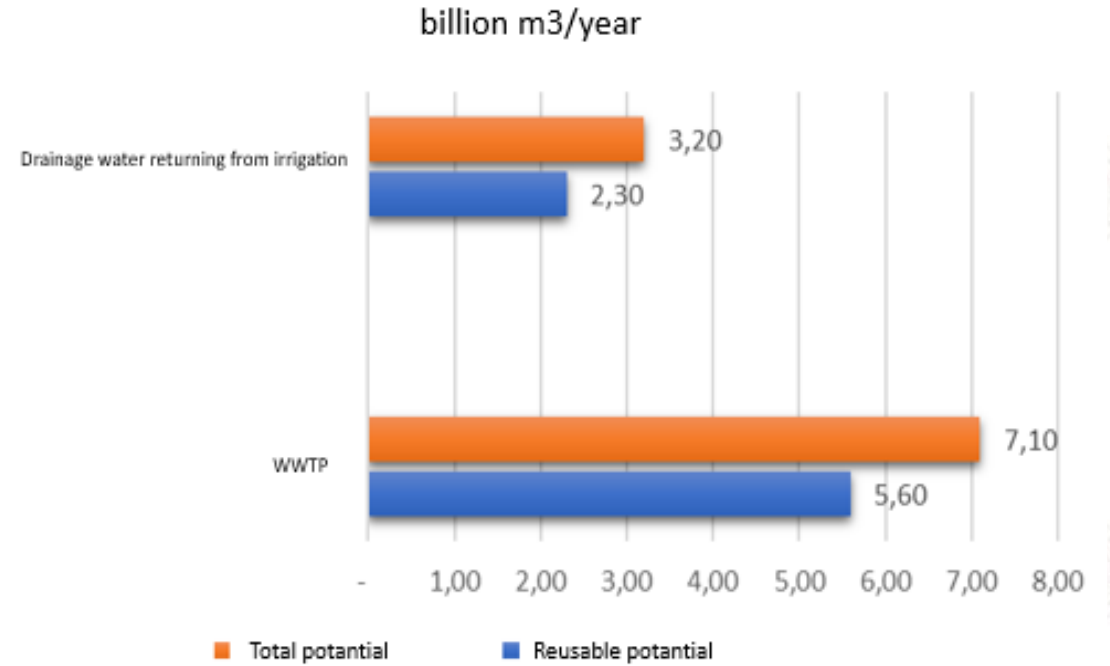
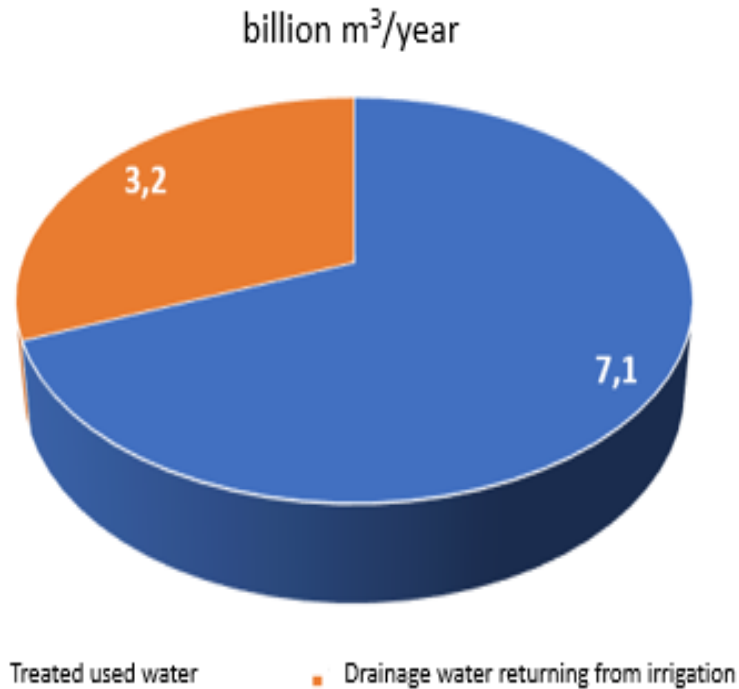




## USED WATER POTENTIAL IN TURKIYE

10.3 billion m<sup>3</sup>/year

Total Potential and Reusable Potential





# Data Collection

- All necessary data were obtained from the relevant institutions with official letters.
- Meetings were held at DSI Regional Directorates to introduce the project and get information.
- Technical investigations were carried out at Wastewater Treatment Plants and Irrigation Plants.
- Samples were taken from used water sources to determine quality.
- Pre-feasibility and action plan reports were prepared by evaluating all data.





## Sample Collection and Analysis

No	Used Water Resource	Number of Samples	Number of Parameters
1	Domestic Wastewater Treatment Plants	242	41
2	Drainage Water Returning from Agricultural Irrigation	96	97
3	Rain water (collected with a split system)	8	40
4	Cooling Waters	10	40
	<b>TOTAL</b>	<b>356</b>	





REPUBLIC OF TÜRKİYE  
MINISTRY OF  
AGRICULTURE AND  
FORESTRY



# Draft of Action Plans



## used water resources

- Domestic Wastewater Treatment Plants
- Cooling Waters
- Rain water

## potential reuse areas

- Agricultural irrigation
- Landscape irrigation
- Industrial use
- Drinking and utility water
- Environmental feeding
- Groundwater recharge

### SUPPLY

Quantity /  
Quality

Need  
Risks  
Legislation  
Technology  
Cost  
etc.

### DEMAND

Quantity /  
Quality

# BURSA DOĞU ATIKSU ARITMA TESİSİ'NDEN ÇIKAN KULLANILMIŞ SULARIN YENİDEN KULLANIM ALTERNATİFLERİ

1:35.000



**ÖNCELİKLENDİRİLMİŞ KULLANIM - TARIMSAL SULAMA**

Talep Edilen Su Miktarı: 36.000.000 m<sup>3</sup>/yıl  
 Beslenecek Su Miktarı: 135.432 m<sup>3</sup>/gün  
 Besleme Süresi: 5 ay (Mayıs - Eylül)  
 Toplam Beslenecek Su Miktarı: 20.314.800 m<sup>3</sup>/yıl  
 Sulama Alanı Tipi: Bursa YAS Sulaması  
 Sulanacak Alan: 1.650 ha  
 Suyun İletimi: 5 km uzunluğunda 9 m terfili boru hattı  
 Arıtılması Gerekli Parametreler: EC (1,237 µS/cm), SAR (5,01), Sodyum (151,8753 mg/L), Klorür (185,4 mg/L), E. Koli (7.200 KOB/100 mL)  
 AAT Revizyon İhtiyacı: Disk filtre + UV dezenfeksiyon  
 Kazanımlar: Mevcut durumda kullanılan yeraltı su kaynaklarının korunması  
 Toplam Yatırım Maliyeti: 46.127.370 TL (8.092.521 \$)  
 Yıllık İşletme Maliyeti: 4.845.010 TL/yıl (850.002 \$/yıl)  
 Suyun Birim Maliyeti: 0,479 TL/m<sup>3</sup> (0,084 \$/m<sup>3</sup>)

**ÖNCELİKLENDİRİLEN KULLANIM – SANAYİ KULLANMA SUYU**

Talep Edilen Su Miktarı: 16.013.280 m<sup>3</sup>/yıl  
 Beslenecek Su Miktarı: 43.872 m<sup>3</sup>/gün  
 Besleme Süresi: 12 ay  
 Toplam Beslenecek Su Miktarı: 16.013.280 m<sup>3</sup>/yıl  
 Sanayi Adı: Demirtaş OSB  
 Suyun İletimi: 3,5 km uzunluğunda iletim hattı  
 Arıtılması Gerekli Parametreler: F. Koliform (23.000 KOB/100mL)  
 AAT Revizyon İhtiyacı: Disk filtre + UV dezenfeksiyon  
 Kazanımlar: Mevcut durumda kullanılan yeraltı su kaynaklarının korunması  
 Toplam Yatırım Maliyeti: 4.295.634 TL (753.620 \$)  
 Yıllık İşletme Maliyeti: 380.336 TL/yıl (66.726 \$/yıl)  
 Suyun Birim Maliyeti: 0,052 TL/m<sup>3</sup> (0,009 \$/m<sup>3</sup>)

**ÖNCELİKLENDİRİLMİŞ KULLANIM - PEYZAJ SULAMA**

Talep Edilen Su Miktarı: 12.840.324 m<sup>3</sup>/yıl  
 Beslenecek Su Miktarı: 60.696 m<sup>3</sup>/gün  
 Besleme Süresi: 6 ay (Nisan-Eylül)  
 Toplam Beslenecek Su Miktarı: 10.925.280 m<sup>3</sup>/yıl  
 Peyzaj Alanı Tipi: Park ve bahçe sulaması  
 Sulanacak Alan: 599.662 m<sup>2</sup>  
 Suyun İletimi: 3,3 km uzunluğunda 12 m terfili iletim hattı  
 Arıtılması Gerekli Parametreler: F. Koliform (23.000 KOB/100mL)  
 AAT Revizyon İhtiyacı: Disk filtre + UV dezenfeksiyon + Klorlama  
 Kazanımlar: Mevcut durumda kullanılan şebeke suyu ve yeraltı su kaynaklarının korunması  
 Toplam Yatırım Maliyeti: 23.150.158 TL (4.061.431 \$)  
 Yıllık İşletme Maliyeti: 1.209.420 TL/yıl (212.179 \$/yıl)  
 Suyun Birim Maliyeti: 0,335 TL/m<sup>3</sup> (0,059 \$/m<sup>3</sup>)

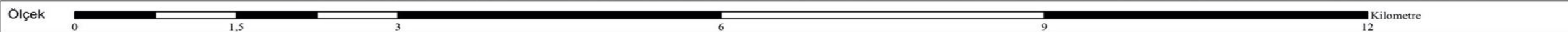
**ÖNCELİKLENDİRİLMİŞ KULLANIM – ÇEVRESEL BESLEME**

Talep Edilen Su Miktarı: 87.600.000 m<sup>3</sup>/yıl  
 Beslenecek Su Miktarı: 187.659 m<sup>3</sup>/gün  
 Besleme Süresi: 7 ay (Ekim - Nisan)  
 Toplam Beslenecek Su Miktarı: 40.346.640 m<sup>3</sup>/yıl  
 Su Kütlesi Adı: Teke Deresi  
 Suyun İletimi: Cazibeli iletim  
 Arıtılması Gerekli Parametreler: F. Koliform (23.000 KOB/100mL)  
 AAT Revizyon İhtiyacı: UV dezenfeksiyon  
 Kazanımlar: Nilüfer çayı su kalitesinin iyileştirilmesi  
 Toplam Yatırım Maliyeti: 744.240 TL/yıl (130.568 \$/yıl)  
 Yıllık İşletme Maliyeti: 0,018 TL/m<sup>3</sup> (0,003 \$/m<sup>3</sup>)

**BURSA DOĞU ATIKSU ARITMA TESİSİ**

Proses: İleri Biyolojik Arıtma  
 Proje Debisi: 240.000 m<sup>3</sup>/gün  
 Deşarj Noktası: Deliçay  
 Çıktı Suyu Kalitesi: EC (1,237 µS/cm), SAR (5,01), BOI<sub>5</sub> (6,88 mg/L), TN (2,93 mg/L), TP (0,3843 mg/L), F. Koliform (23.000 KOB/100 mL)

- Lejant**
- Önerilen Tesisler**
- Önerilen Tarımsal Sulama Alanı
  - Tarımsal Sulama İletim Hattı (Pompaj)
  - Sanayi İletim Hattı (Cazibe)
  - Peyzaj Sulama İletim Hattı (Pompaj)
  - Çevresel Kullanım İletim Hattı (Cazibe)
- Mevcut Tesis ve Yapılar**
- Akarsu
  - Drenaj Kanalı
  - Sulama Kanalı
  - Sulama Ana Kanalı
  - Su Kalite Gözlem İstasyonları
  - Sanayi Tesisleri
  - Atıksu Arıtma Tesisi
- DSİ Sulama Alanları - Aşama**
- İşletmede





## used water resources

- Drainage Water Returning from Agricultural Irrigation

## potential reuse areas

- cyclic use
- new irrigation area
- quality improvement

### SUPPLY

Quantity /  
Quality

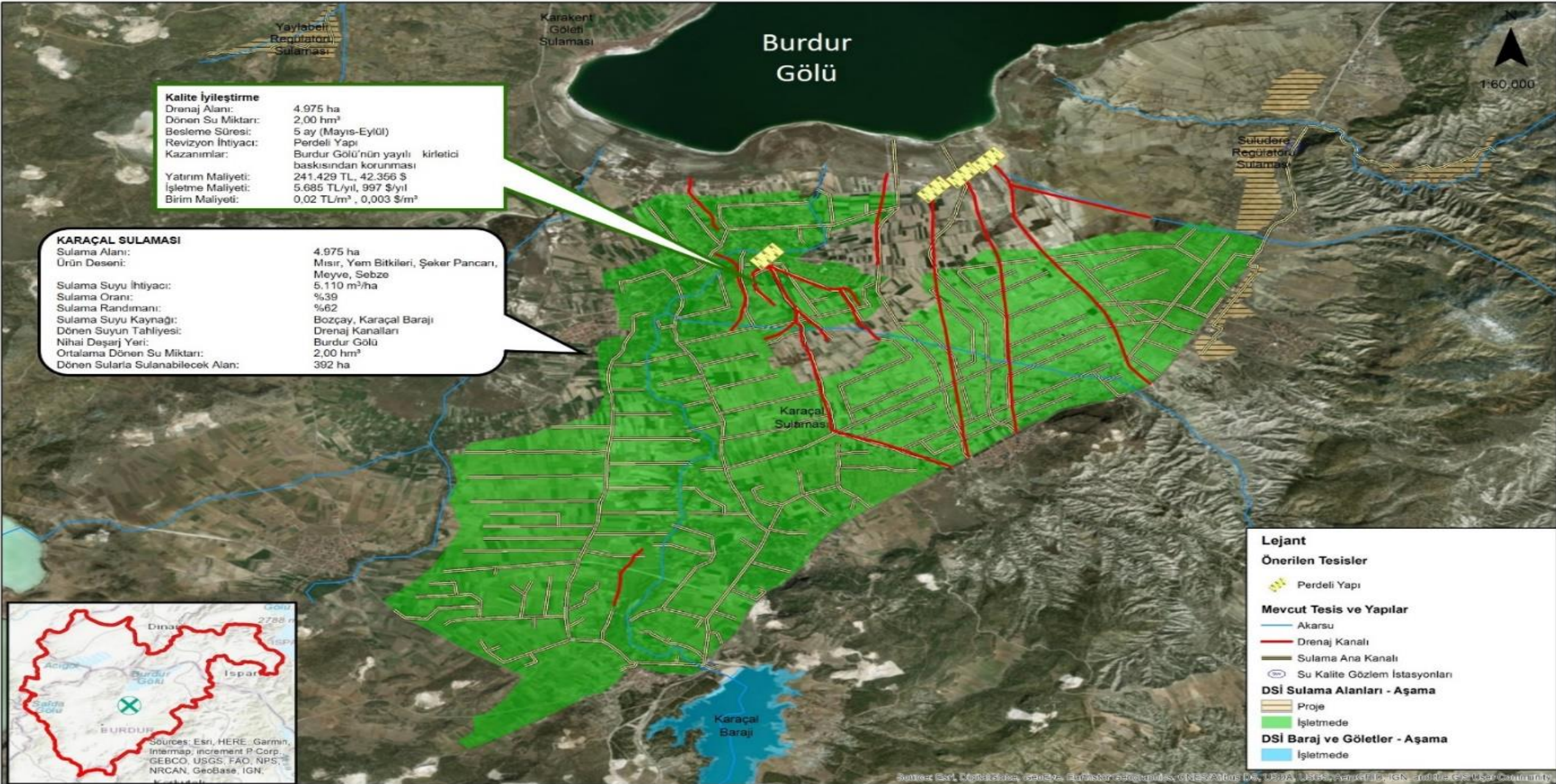
Need  
Risks  
Legislation  
Technology  
Cost  
etc.

### DEMAND

Quantity /  
Quality



# KARAÇAL SULAMASI'NDAN DÖNEN SULARIN YENİDEN KULLANIM ALTERNATİFLERİ





REPUBLIC OF TÜRKİYE  
MINISTRY OF  
AGRICULTURE AND  
FORESTRY



# Application Projects



# Scope of the Application Projects

- ✓ Selection of pilot plants for application projects
- ✓ Identifying the potential users of the recovered water
- ✓ Determination of the effluent quality of WWTPs
- ✓ Process selection of the recovery unit
- ✓ Site selection and field measurements of the recovery unit
- ✓ Preparation of the application projects with project reports





# Tatlar WWTP Application Project



Capacity: 800.000 m<sup>3</sup>/day

✓ Reason for selection:

✓ Size of plant capacity

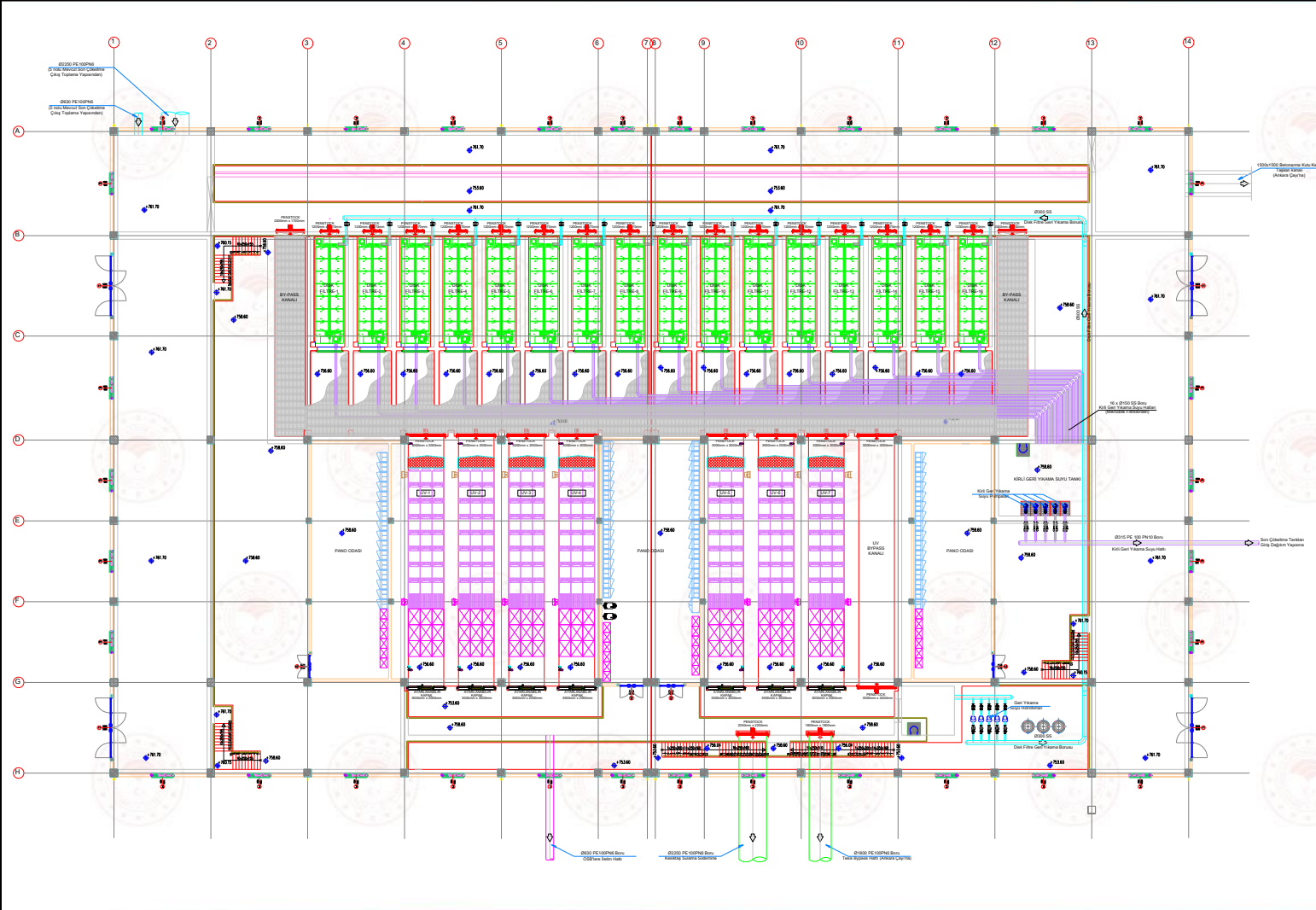
✓ Presence of agricultural lands



## Tatlar WWTP treated wastewater reuse areas

No	Use Area	Use purpose	Water Need	Water Resource
1	Başkent OIZ	Industrial process water	16,000 m <sup>3</sup> /day	Groundwater
2	Anadolu OIZ	Industrial process water	835 m <sup>3</sup> /day	Groundwater
3	Baymina Energy	Cooling Water	13,108 m <sup>3</sup> /day	Ankara Creek
4	DSI Ankara Creek Irrigation Kesiktaş Regulator- I.Stage	Agricultural Irrigation Water	389,000 m <sup>3</sup> /day	Ankara Creek
5	DSI Ankara Creek Irrigation Kesiktaş Regulator- II.Stage	Agricultural Irrigation Water	243,000 m <sup>3</sup> /day	Ankara Creek





Tatlar WWTP Recovery Unit  
(Filtration + Disinfection) Plan



# Malatya WWTP Application Project



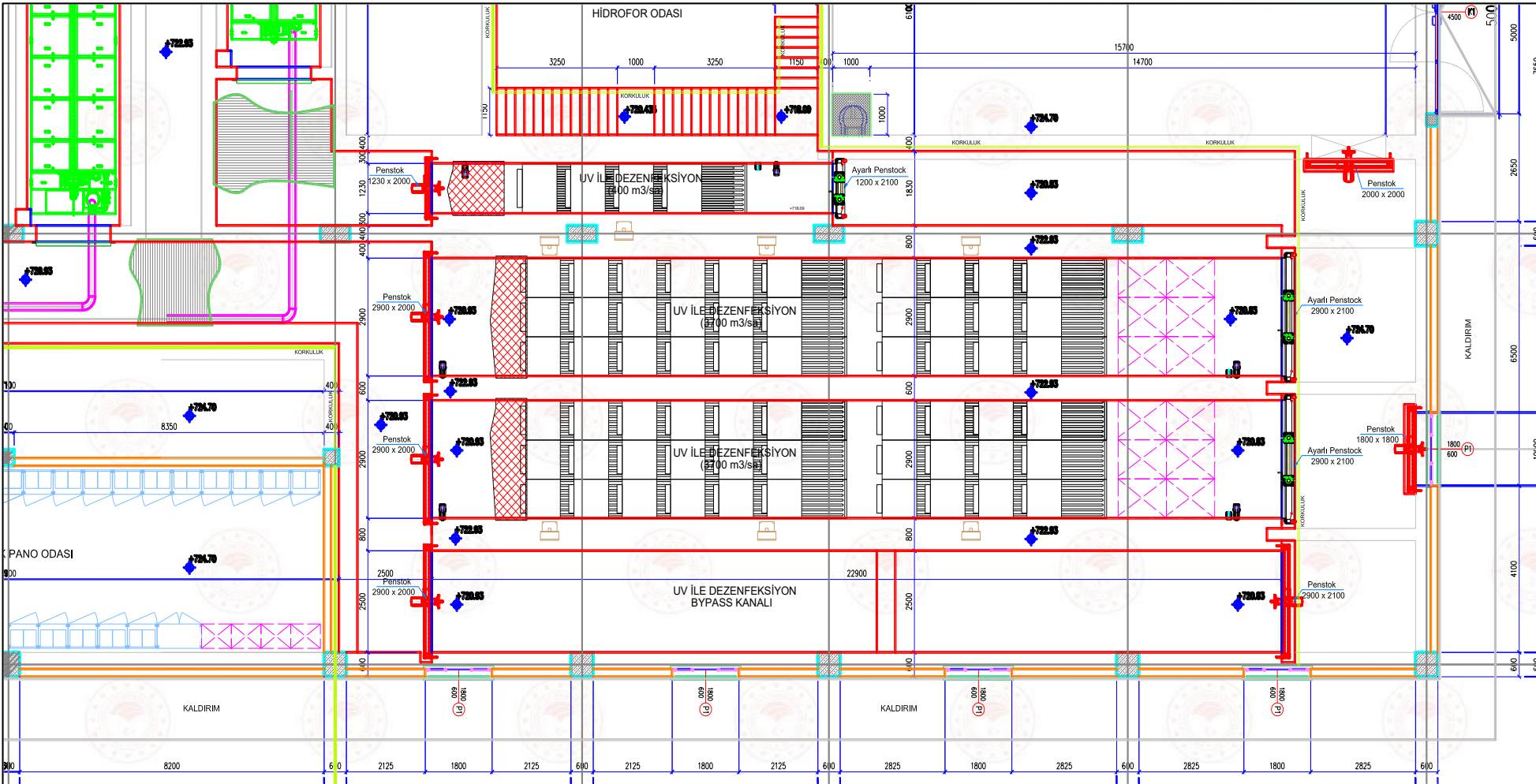
Capacity: 135,000 m<sup>3</sup> /day

✓ Reason for selection:

✓ Insufficient agricultural  
irrigation water







Malatya WWTP Recovery  
Unit (Filtration +  
Disinfection) Plan

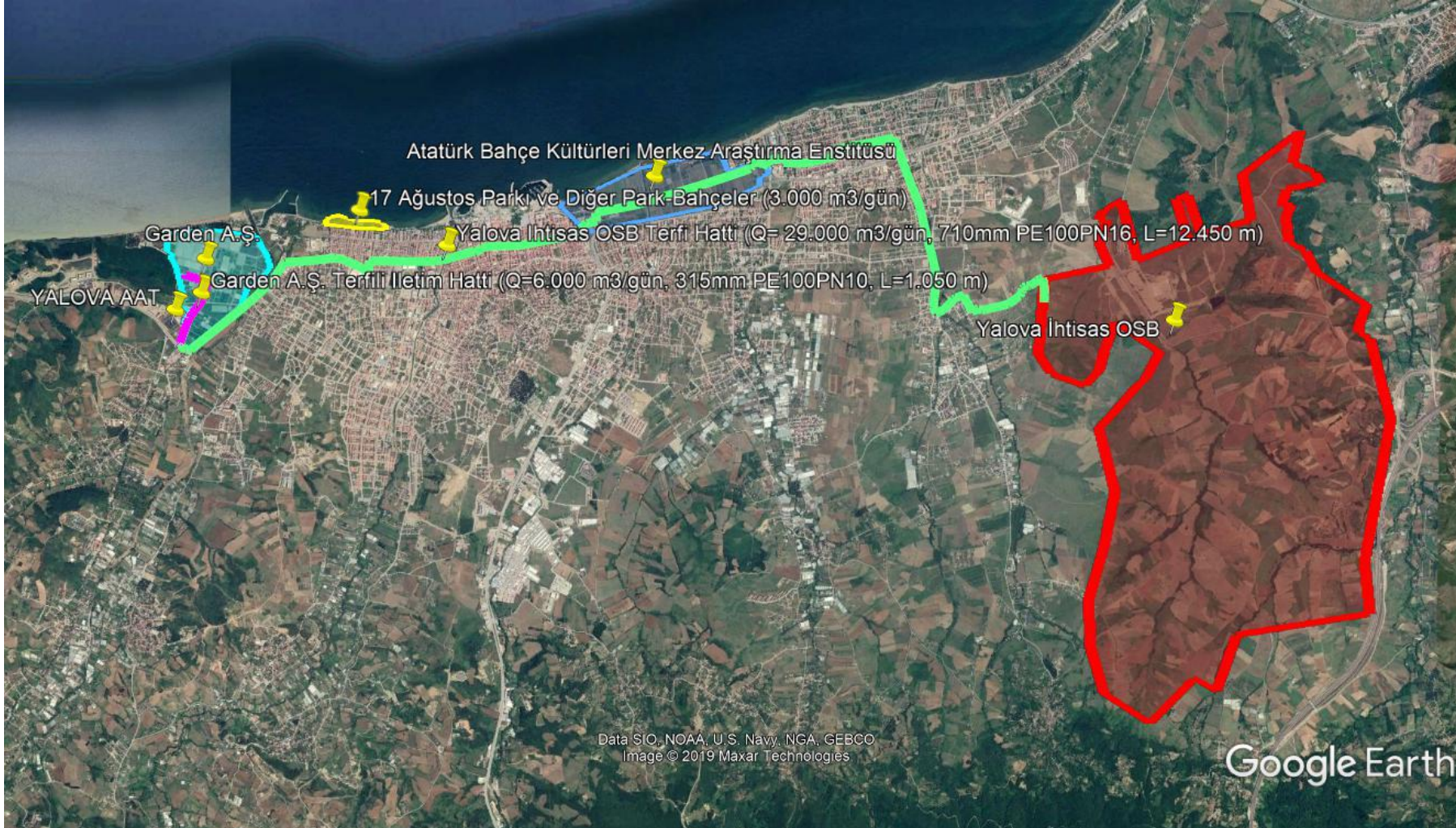


# Yalova WWTP Application Project



- ✓ Capacity: 35,000 m<sup>3</sup>/day
- ✓ Reason for selection:
  - ✓ Drinking water shortage experienced in 2014





## Yalova WWTTP Application Project



# COST ANALYSIS

## COST SUMMARY OF RECOVERY UNIT AND TRANSMISSION LINES WORKS

NO	SECTION
<b>RECOVERY UNIT</b>	
1	CONSTRUCTION WORKS
2	MECHANICAL WORKS
3	ELECTRICAL WORK
<b>TRANSMISSION LINES</b>	
4	CONSTRUCTION WORKS OF IRRIGATION AND INDUSTRIAL WATER TRANSMISSION LINES
5	MECHANICAL WORKS OF IRRIGATION AND INDUSTRIAL WATER TRANSMISSION LINES
6	<b>OPERATION EXPENCES</b>



# Other Project Outcomes



T.C.  
Tarım ve Orman Bakanlığı  
Su Yönetimi Genel Müdürlüğü



KULLANILMIŞ SULARIN  
YENİDEN KULLANIM ALTERNATİFLERİNİN  
DEĞERLENDİRİLMESİ PROJESİ

HAVZA ÖN FİZİBİLİTE RAPORU VE TASLAK  
EYLEM PLANI

2019

The Used Water Potential of each basin and the possible reuse areas of the used waters were determined. The reports prepared at the Basin Scale were converted into Provincial-Based reports and shared with the relevant units (Municipalities, Governorates)



T.C.  
Tarım ve Orman Bakanlığı  
Su Yönetimi Genel Müdürlüğü



KULLANILMIŞ SULARIN  
YENİDEN KULLANIM ALTERNATİFLERİNİN  
DEĞERLENDİRİLMESİ PROJESİ

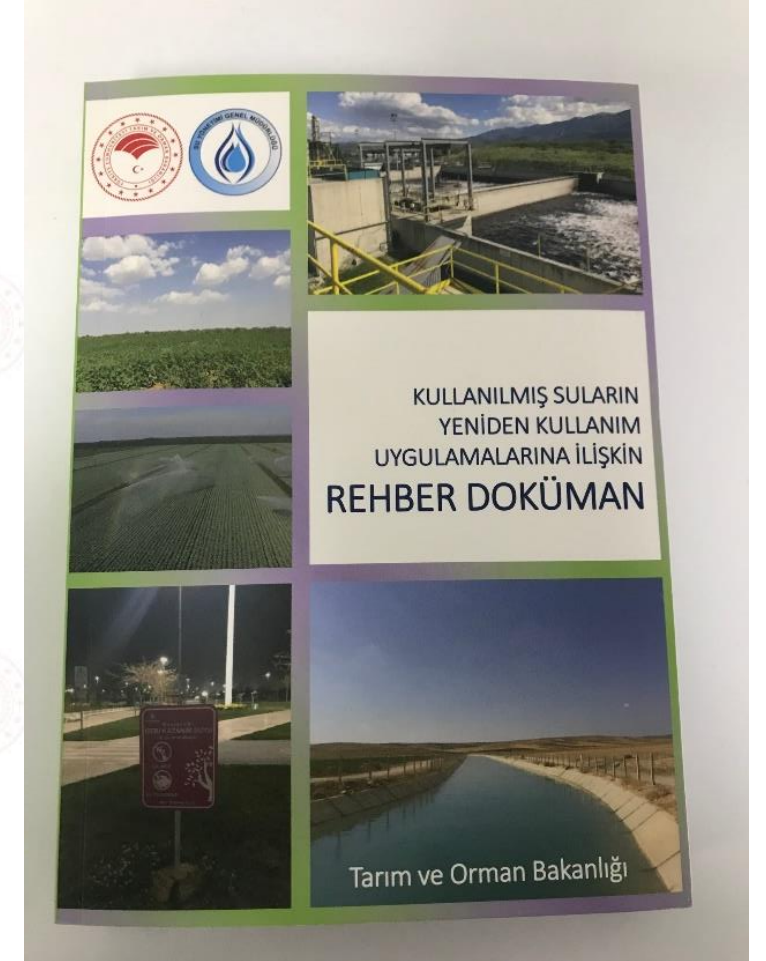
İL DEĞERLENDİRME RAPORU

2019





- ✓ Public Service
- ✓ Integration of Data into the National Water Information System in accordance with the Geographic Information System Studies Circular
- ✓ Opening Meeting, Training, Seminar and Closing Meeting





REPUBLIC OF TÜRKİYE  
MINISTRY OF  
AGRICULTURE AND  
FORESTRY



# Conclusion and Recommendations



- Türkiye's used water potential (10.3 billion m<sup>3</sup>/year) and its quality have been determined. Areas that can benefit from this potential have been identified and it has been revealed that approximately half of this potential can be used.
- As a result of the evaluation of all used water resources, annual reuse is recommended as:
  - Agricultural irrigation of **3.3 billion m<sup>3</sup>** of water
  - **49 million m<sup>3</sup>** of water in landscape irrigation
  - **378 million m<sup>3</sup>** of water in industry
  - **2 billion m<sup>3</sup>** of water in environmental use
  - Feeding **57 million m<sup>3</sup>** of underground water resources
  - **34 million m<sup>3</sup>** of water is indirectly used as drinking water
- Draft Action Plans have been prepared for each basin, taking into account the water problems that may be experienced in the long term, and the gains, risks and costs have been revealed.
- Application projects have been prepared for the provinces of Ankara, Malatya and Yalova.
- A guide document has been prepared to guide the institutions for future applications.
- An important step has been taken towards establishing Turkey's strategy for reusing used water.



REPUBLIC OF TÜRKİYE  
MINISTRY OF  
AGRICULTURE AND  
FORESTRY



**THANK YOU**

[serhat.gunaydin@tarimorman.gov.tr](mailto:serhat.gunaydin@tarimorman.gov.tr)

#ÜretiminÜreticininYüzyılı