

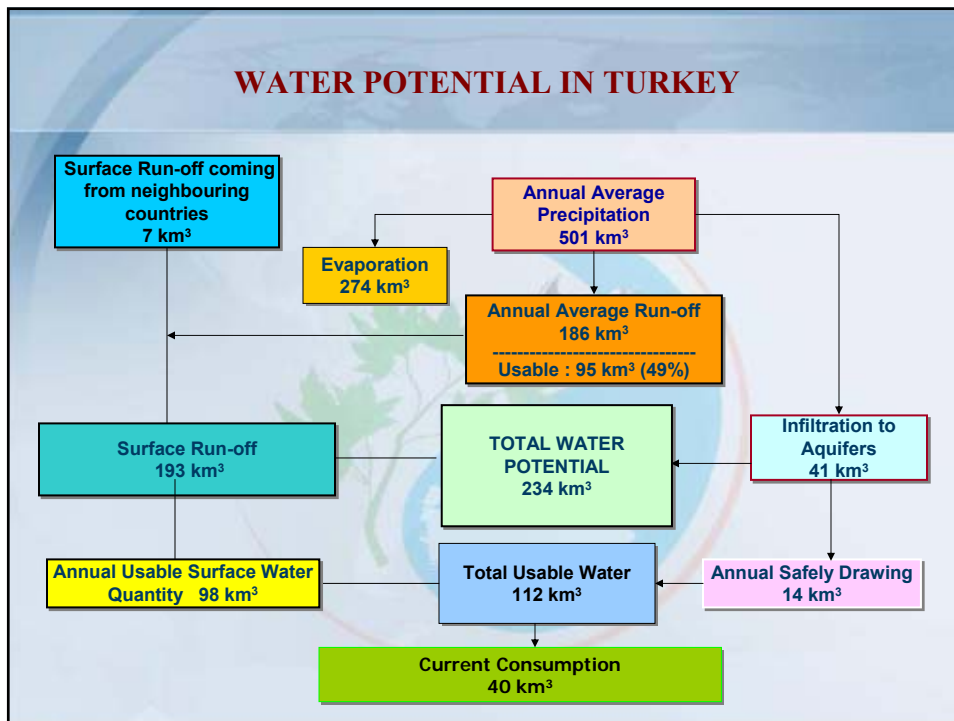
T.C.  
MINISTRY OF ENVIRONMENT AND FORESTRY

**LEGAL ISSUES PERTAINING  
WASTEWATER TREATMENT AND REUSE  
IN TURKEY**

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Innovative Processes and Practices for Wastewater Treatment and Reuse in the Mediterranean Region  
08 – 11 October 2007  
Ankara University – ANKARA

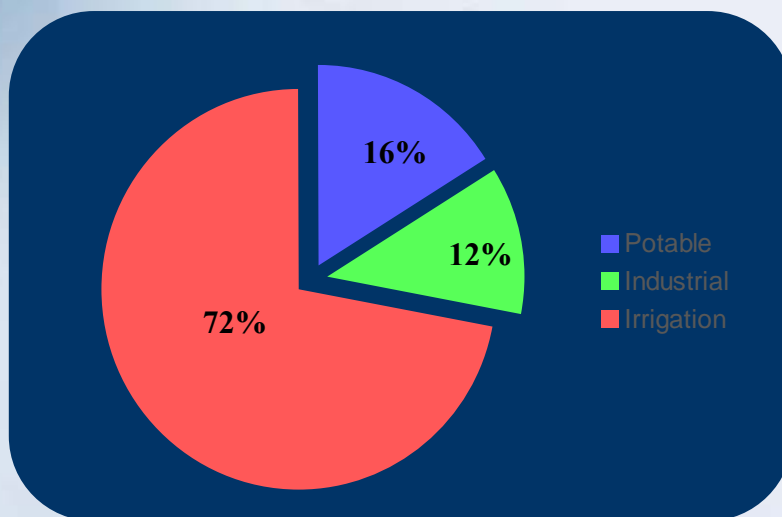
**WATER POTENTIAL IN TURKEY**



## CATEGORIZATION OF COUNTRIES ACCORDING TO WATER QUANTITY

Water Consumption per Capita (m <sup>3</sup> )	Category of Country
> 10000	Water Abundance
3000 – 10000	Self-Sustaining
1000 – 3000	Having Water Shortage
< 1000	Water - Poor

## WATER USE IN TURKEY



## CURRENT SITUATION IN TURKEY

Population Intervals	Number of municipalities	Population of municipalities	Number of municipalities with Sewage system	Population serviced with Sewage system	The rate of population serviced with Sewage system	Number of treatment plants (secondary + advanced)	Population served with treatment plants	The rate of population served with treatment plant
> 100.000	58	29 772 881	58	28.563.084	96	46	20.554.995	69
100.000-50.000	77	5 344 259	74	4.806.972	90	15	1.073.804	20
50.000-10.000	450	9 309 091	403	7.546.575	81	43	1.770.561	19
10.000-2000	2206	8 929 928	1396	4.923.454	55	33	449.956	5
<2000	345	578 891	208	309.395	53	1	27.114	5
	<b>3136</b>	<b>53 935 050</b>	<b>2139</b>	<b>46.149.480</b>	<b>87</b>	<b>138</b>	<b>23.876.430</b>	<b>44</b>

\* The district and sub-level municipalities having service from The Metropolitan Municipalities are evaluated within the metropolitan municipality population. For this reason the number of district and sub-level municipalities is not shown on the table.  
 \*\* The 2004 data of The Institution of Statistics of Turkey is valid.

Ref: National Environmental Strategy; 2007

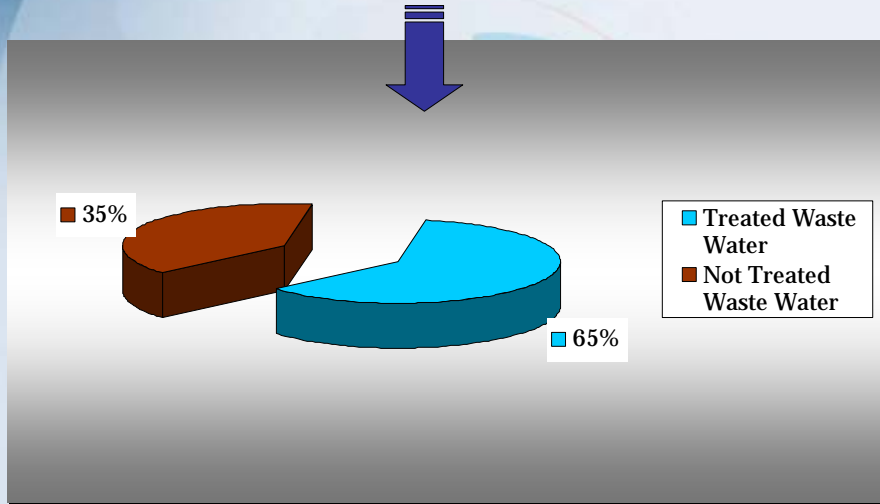
## MUNICIPAL WASTEWATER TREATMENT PLANTS IN TURKEY

- Provinces that have wastewater treatment plant
- Provinces that have not wastewater treatment plant
- Provinces where wastewater treatment plants are programmed in tendering process



### Wastewater Amount Discharged from Network System

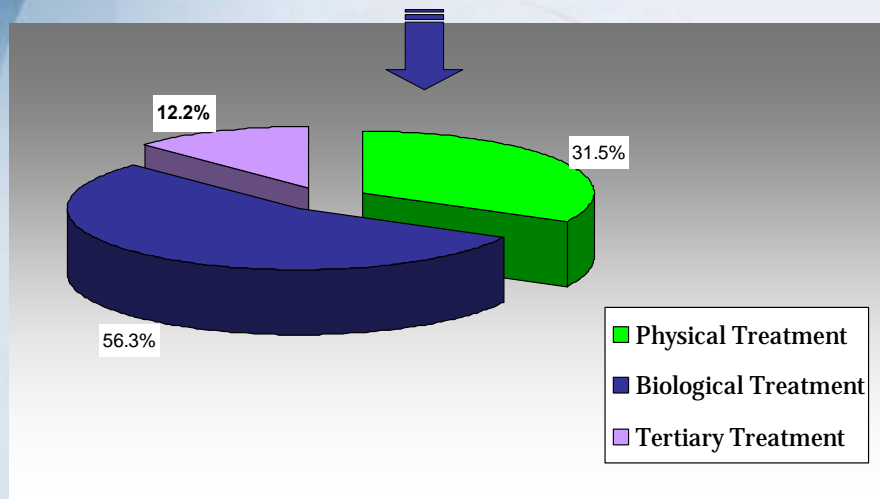
2,92 billion m<sup>3</sup> /year



(2004 – TURKSTAT)

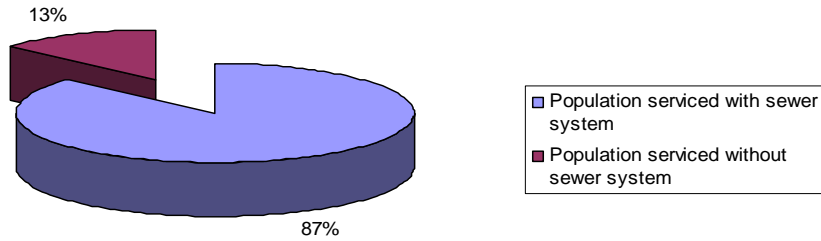
### Treated Wastewater Quantity

1,90 billion m<sup>3</sup>/year



(2004 – TURKSTAT)

## The Rate of Population Serviced with Sewage System

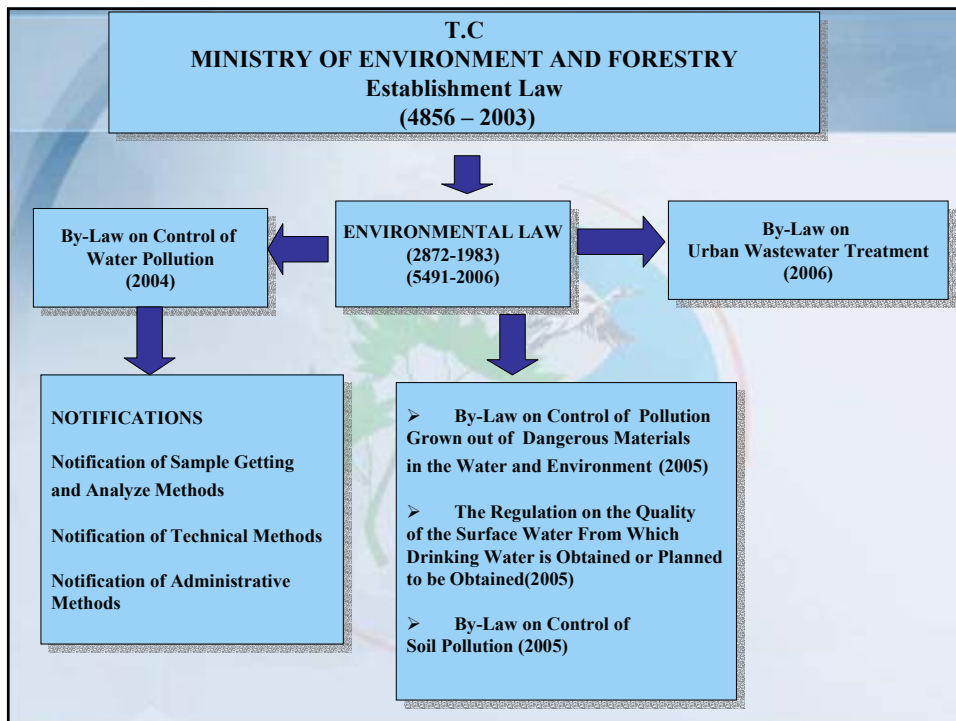


(2004 – TURKSTAT)

## Governmental Institutions Functioning in the Field of Wastewater and Their Tasks:

- ✓ Ministry of Environment and Forestry (Wastewater Discharge Principles, Sectoral Discharge Standarts, Legal Permissions Related discharging to the Receiving Environment and Sewage System, Controlling and Monitoring, Approval of Wastewater Treatment Plant Projects)
- ✓ The General Directorate of State Hydraulic Works (Monitoring Water Quality, Wastewater Treatment Plant Project-Design, Tendering and Construction)
- ✓ Ministry of Agriculture and Rural Affairs (Controlling and Monitoring)
- ✓ The General Directorate of Province Bank (Wastewater Treatment Plant Project-Design, Tendering and Construction)
- ✓ Metropolitan Municipality and Other Municipalities (Establishment of Sewage System and Wastewater Treatment Plants, Maintenance, Improvement and Operation)

# LEGISLATION



- ✓ **11 August 1983 Dated and 2872 Numbered**
- ✓ **26 April 2006 Amended and 5491 Numbered**

## **ENVIRONMENTAL LAW**

## **ENVIRONMENTAL LAW**

- ✓ The purpose of this Law is to maintain the protection of environment constituting the aura of all living things, in line with the principles sustainable environment and sustainable development.
- ✓ According to Article 8, discharging - to the receiving environment -, storing, moving, removing any waste and spoil, and acting in a similar way, periling the environment violating the standards and methods set forth in bylaws is prohibited.
- ✓ In cases when the potential of pollution exists, those involved are responsible for preventing the pollution. In cases when the pollution has occurred, polluters are responsible for taking necessary precautions to stop the pollution, to eliminate or reduce the impact of the pollution.



## ENVIRONMENTAL LAW

### Administration of Wastewater Substructure Facilities

- ✓ As for establishment, maintenance, repair, amendment and operation of the sewage system that collects wastewaters and wastewater infrastructure systems in which wastewaters are treated and treated wastewaters are disposed; institutions specified in accordance with the Law on Establishment and Functions of General Directorate of Istanbul Water and Sewage Administration No. 2560, dated 20/11/1981 shall be responsible in metropolitans; municipalities shall be responsible in municipal and rural boundaries; users shall be responsible in any and all utilization areas for settlement under the supervision of the governorship.
- ✓ As for establishment, maintenance, repair and operation of wastewater infrastructure systems; regional directorates shall be responsible in free and/or industrial regions; Ministry of Culture and Tourism or authorized units shall be responsible in cultural and touristic protection and development regions and touristic centers; management of organized industrial zones shall be responsible in organized industrial zones; directorates of cooperatives shall be responsible in small industrial sites; site managements or operators of facilities shall be responsible for utilization areas such as holiday villages, holiday sites, touristic facilities that are constructed out of current settlement areas.

### Contribution Fee

- ✓ Those that use and/or will use wastewater infrastructure systems, regardless of whether they have connection systems or not, shall contribute to any and all costs of investment, operation, maintenance, repair, amendment and cleaning activities performed by managements responsible for treatment systems in line with their pollution load and wastewater quantity. Fees that are collected in accordance with this paragraph shall not be used for services other than wastewater.

## 23 June 2006 Dated and 2006/15 Numbered CIRCULAR OF WORKING SCHEDULE FOR WASTEWATER TREATMENT PLANTS

### Environmental Law, Provisional Article 4:

- ✓ Municipalities that do not establish their wastewater treatment, and organized industrial zones shall apply within the three months and shall submit their working schedules concerning establishment of these plants to the Ministry within one year following enforcement of this Law.
- ✓ The condition of preparing working schedules shall not apply for wastewater treatment that are still under construction. Commissioning period of the plant shall not exceed the commissioning periods specified in this article.
- ✓ According to the relevant article of this Law, **Circular of Working Schedule for Wastewater Treatment Plants (2006/15) was established.**



## CIRCULAR OF WORKING SCHEDULE FOR WASTEWATER TREATMENT PLANTS

**Table:Deadline for Wastewater Infrastructrural Managements to Commence Operations and Submit Working Schedule (Year)**

	<b>Working Schedule Submitting Time (deadline 13.05.2007)</b>	<b>Commisionning time</b>
Municipalities (>100.000)	1	3
Municipalities (100.000 -50.000)	1	5
Municipalities (50.000-10.000)	1	7
Municipalities (10.000-2.000)	1	10
Industrial Areas, Small Industry Sites, Tourism Facilities, Solitary Insustrial Plants Constructed Apart From Settlement Areas, Holiday Villages, Holiday Sites etc.	1	2

CIRCULAR OF WORKING SCHEDULE FOR WASTEWATER TREATMENT PLANTS, NUMBERED 2006/15

## CIRCULAR OF WORKING SCHEDULE FOR WASTEWATER TREATMENT PLANTS

- ✓ Number of Municipalities that submit WS: 1730
- ✓ Number of Municipalities that do not need to submit WS (Population<2000): 354
- ✓ Number of Municipalities that did not submit WS: 821
- ✓ Number of Municipalities serviced with WWTP: 320

## 8 January 2006 Dated and 26047 Numbered BY-LAW ON URBAN WASTEWATER TREATMENT

### Purpose

- ✓ The purpose of this Regulation is to protect the environment against the adverse effects of urban waste water collection, treatment, and discharge as well as the waste water discharge from certain sectors.

### Scope

- ✓ This Regulation covers the technical and administrative principles pertaining to;
  - ✓ the collection of the urban and specific industrial wastewater that is discharged into the sewage,
  - ✓ their treatment and discharge
  - ✓ its monitoring, reporting and controlling.

## BY-LAW ON URBAN WASTEWATER TREATMENT

### Implementation

- ✓ Advanced treatment methods (tertiary treatment) are utilized in the sensitive water areas.
- ✓ In the less sensitive water areas, then it is essential that primary treatment is utilized in these areas.
- ✓ In situations where the establishment of a sewage system does not provide any added environmental benefits or when it is not economically feasible then individual systems or other systems that provide the same level of protection will be used.
- ✓ The wastewater that is treated under appropriate conditions can be re-used. The methods of disposal are determined in a way that will have the minimum adverse effect on the environment. The re-utilization of the treated waste water is subject to the provisions of Article 28 of the By-Law on The Control of Water Pollution that became effective after it was published in 31/12/2004 dated and 25687 numbered Official Gazette (Article 5).

## BY-LAW ON URBAN WASTEWATER TREATMENT

**Table 1- Discharge limits from Urban Wastewater Treatment Facilities pertaining to the secondary treatment**

Parameters	Concentration (mg/l)	Minimum Treatment efficiency(%)	Reference Measurement Methods
Biochemical Oxygen Demand (at 20°C) without nitrification	25	70-90 40 Article 8 (c)	Homogenized, unfiltered, undecanted sample. Determination of dissolved oxygen before and after five-day incubation at 20 °C ± 1 °C, in complete darkness. Addition of a nitrification inhibitor.
Chemical Oxygen Demand (COD)	125	75	Homogenized, unfiltered, undecanted sample. Potassium dichromate method.
Total Suspended Solid (TSS)	35 35 Article 8 (c) (more than 10000 P.E) 60 Article 8 (c) (2000-10000 P.E)	90 90 Article 8 (c) (more than 10000 P.E) 70 Article 8 (c) (2000-10000 P.E)	- Filtering of a representative sample through a 0,45 mm filter membrane. Drying at 105 ° C and weighing. - Centrifuging of a representative sample (for at least five min with mean acceleration of 2 800 to 3 200 g), drying at 105 ° C and weighing

## BY-LAW ON URBAN WASTEWATER TREATMENT

**Table 2- Discharge limits from Urban Wastewater Treatment Facilities pertaining to the Advanced Treatment**

Parameters	Concentration (mg/l)	Minimum Treatment efficiency(%)	Reference Measurement Methods
Total Phosphorus	2 mg/l P (10000-100000 P.E.) 1 mg/l P (more than 100 000 P.E.)	80	Molecular absorption spectrophotometry
Total Nitrogen	15 mg/l N (10000-100000 P.E) 10 mg/l N (more than 100 000 P.E)	70-80	Molecular absorption spectrophotometry

**31 December 2004 Dated and 25687 Numbered  
BY-LAW ON CONTROL OF WATER POLLUTION**

**Discharge to Sewage System (Article 25)**

Applied basic principles for wastewater discharge to sewage systems;

- ✓ The linkage of all kinds of wastewater to sewage systems in the places having sewage system is a right and necessity.
- ✓ Sewage systems can not be damaged and their usage aim can not be changed.
- ✓ The people causing wastewater must paid all expenses of sewage system, purification and/or removing purification and discharge facilities.
- ✓ For determination of wastewater amount, the people taking water except of drinking water system must show substructure facilities' documentation and use sewage system by paying its expenses.
- ✓ For direct linkage of an industrial wastewater to sewage system or discharge by transferring with a carrier or similar vehicles;
  - 1) It has no harmful effect on canalization system and its operating,
  - 2) It does not cause health problem for working personnel and other people,
  - 3) It provides operating of waste water purification facility tied with canalization system,
  - 4) It does not contain powerful materials which can not be purified in biological purification facilities,
  - 5) It has no problems for removing or discharge of mire and similar materials in purification facility and effect on environmental health.

**BY-LAW ON CONTROL OF WATER POLLUTION**

**Treated Water Usage in Irrigation (Article 28)**

✓ In the areas having lack of watering possibility and in which watering has got economical value, the usage of purified water for irrigation as providing the irrigation quality mentioned in Notification of Technical Methods of By-Law on Control of Water Pollution is encouraged. Processes for this aim and required investigations are realized on the basis of Notification of Technical Methods. Appropriateness of a wastewater mass to these kinds of usage is determined by a commission from Province Management of Environmental and Forestry, Province Management of Agriculture and Rural Affairs, and Province Management of State Water Works.

✓ Treatment method and discharge quality of wastewater, which is reused for irrigation, shift depending on the crop type and irrigation. According to the Notification of Technical Methods, relevant principles and technical limitations for the treated water usage in irrigation are given in Table 5.

## BY-LAW ON CONTROL OF WATER POLLUTION

### Industrial Wastewater Discharge Standards (Article 31)

- ✓ Industries have been grouped according to production types and sixteen sectors have been determined. The discharge standards are regulated between the Tables 5 to 20. for industrial wastewater sources. These sectors and industry types are mainly; food, textile, metal, petroleum, pulp and paper, and chemical industries.

### Domestic Wastewater Discharge Standards (Article 32)

- ✓ Desired discharge standards of wastewater from domestic wastewater sources to receiver water environment are given in Table 21.

		BY-LAW ON CONTROL OF WATER POLLUTION			BY-LAW ON URBAN WASTEWATER TREATMENT*
NO	PARAMETERS	TABLE 21.2 Population = 1000-10000	TABLE 21.3 Population = 10.000-100.000	TABLE 21.4 Population >100.000	TABLE 1
1	BIOCHEMICAL OXYGEN DEMAND (mg/L)	50	50	40	25
2	CHEMICAL OXYGEN DEMAND (mg/L)	160	140	120	125
3	SUSPENDED SOLIDS (mg/L)	60	45	40	35 (more than 10.000 P.E) 60 (2000-10.000 P.E)
4	pH	6-9	6-9	6-9	-

\* These will be implemented by 2014.



## BY-LAW ON CONTROL OF WATER POLLUTION

### Wastewater Connection Permission and Its Certificate (Article 44)

- ✓ Wastewater connection permission is given by administration of wastewater substructure facilities in exchange for a written document for domestic wastewater.
- ✓ Connection quality control permission is given with connection quality control certificate determining connection conditions of industrial wastewater to sewage system by administration of wastewater substructure facility. **(Wastewater connection permission can only be given by substructure administrations, if they present their working schedule.)**

## BY-LAW ON CONTROL OF WATER POLLUTION

### Wastewater Characteristics connect to Wastewater Substructure (Article 47)

- ✓ For acceptance of wastewater containing completely important pollutant wastewater sources, these waters must be appropriate to standard values mentioned in Table 25.
- ✓ The small industrial waste water sources passing over standard values mentioned in Table 25 can be tied to waste water substructure facility with the permission administrations of these facilities.

**TABLE 25: WASTEWATER STANDARDS IN THE DISCHARGE OF WASTEWATER TO SUBSTRUCTURE FACILITIES**

PARAMETERS	IN WASTE WATER SUBSTRUCTURE FACILITIES OF WHICH CANALIZATION SYSTEM WITH COMPLETE PURIFICATION	IN WASTE WATER SUBSTRUCTURE FACILITIES OF WHICH CANALIZATION SYSTEM WITH DEEP SEA DISCHARGE
Temperature (°C)	40	40
pH	6.5-10.0	6.0-10.0
Solid material (mg/L)	500	350
Oil and Grease (mg/L)	250	50
Oils with tar and petrol (mg/L)	50	10
Need for Chemical Oxygen (NCO) (mg/L)	4000	600
Sulphate (SO <sub>4</sub> <sup>2-</sup> ) (mg/L)	1700	1700
Total Sulphure (S) (mg/L)	2	2
Pheno(mg/L)	20	10
Free Chlore (mg/L)	5	5
Total nitrogen (N) (mg/L)	- <sup>00</sup>	40
Total Phosphorus (P) (mg/L)	- <sup>00</sup>	10
Arsenic (As) (mg/L)	3	10
TOTAL CYANIDE (Toplam CN <sup>-</sup> ) (mg/L)	10	10
Total Lead (Pb) (mg/L)	3	3
Total Cadmium (Cd) (mg/L)	2	2
Total Chrome (Cr) (mg/L)	5	5
Total Mercury (Hg) (mg/L)	0.2	0.2
Total Copper (Cu) (mg/L)	2	2
Total Nickel (Ni) (mg/L)	5	5
Total Zinc (Zn) (mg/L)	10	10
Total Tin (Sn) (mg/L)	5	5
Total Silver(Ag) (mg/L)	5	5
Cl <sup>-</sup> (Chlorure) (mg/L)	10000	-
Surface active materials giving reaction with Metilen blue (MBAS) (mg/L)	The discharge of materials, of which biological fragment is not appropriate to Turkish Standards of Standards Institute is prohibited.	

## 7 January 1991 Dated and 20748 Numbered NOTIFICATION OF TECHNICAL METHODS

### Purpose

- ✓ Generally accepted applicable methods for wastewater treatment,
- ✓ Required information for determination of the dilution at deep sea discharges
- ✓ **Treated wastewater standards for irrigation**
- ✓ Prevention of coastal water pollution from fosseptic tanks built nearby seashores.



## NOTIFICATION OF TECHNICAL METHODS

- ✓ Treatment method and discharge quality of wastewater, which is reused for irrigation, shift depending on the crop type and irrigation. According to the Notification of Technical Methods, relevant principles and technical limitations for the treated water usage in irrigation are given in Table 5.
- ✓ Treatment level and irrigation method are specified in this Notification considering agriculture type. Wastewater, treated mechanically and biologically, can be used for irrigation in fields without applying disinfection. On the other hand, effluents from aerobic stabilization tanks and lagoons can only be used with disinfection. In spite of this legislation in Turkey, it is known that effluents from stabilization tanks are more biologically reliable.

## NOTIFICATION OF TECHNICAL METHODS

### Usage of Treated Wastewater for Irrigation (Article 46 )

- ✓ The main parameters that should be investigated in order to determine whether wastewater is appropriate or not for discharging to land or used for irrigation are ;
  - ✓ Total concentration and conductivity of the dissolved materials in water
  - ✓ Sodium ion concentration and ratio of sodium ion to other cations,
  - ✓ Concentration of Boron, heavy metals ve toxic substances,
  - ✓ Total concentration of Ca<sup>++</sup> ve Mg<sup>++</sup> ions,
  - ✓ Total solids, organic loading ve floatable materials like grease
  - ✓ Amount of pathogen organism.

**Table.5 Relevant Principles and Technical Restrictions for Reusing Treated Wastewater in Agriculture**

<b>Agriculture Type</b>	<b>Technical Restriction</b>
Fruit Growing	- Irrigation is forbidden by sprinkling system - Dropped fruit shall not be eaten - Fecal Coliform Number 1000/100ml
Production of fibre plant and seed	Free release or sprinkling system can be applicable -Via sprinkling system, biologically treated and disinfected wastewater can be used - Fecal Coliform Number 1000/100m
Feed Grain, Oily Plant, Not rawly eaten plants ve Floriculture	Free releasing irrigation, Mechanically treated wastewater

**Tablo 7 : Conformity of Treated Industrial Wastewater for Irrigation Purposes**

<b>I</b>	<b>II</b>	<b>III</b>
<b>If appropriate area exist nearby, Can be used for irrigation</b>	<b>Suitable for Irrigation under certain circuntances</b>	<b>Not appropriate for Irrigation</b>
Beer, Malt, Wine, Potato, Vegetable Tinned food, Marmelade, Tinned fruit, Dairy, Starch Factories	Yeast, Sugar, Rice and Grain Starch, Leather Glue, Bone Glue, Slaughterhouse, Tannery, Margarine, Pulp and paper, Textile, Fish Flour, Tinned Fish, Minery.	Varnishing and dyeing, Soap , Inorganic Heavy Chemical, Pharmaceutical , Metal, Sulphide Cellulose, Artificial Silk, Pyrolyze, Generator Gas Turbine, Metallic Oil, Coal washing, Dynamite plants.

**Table 8 : Table Showing Whether Treated and Disinfected Domestic Wastewater can be Used for Irrigation or not**

	Field		Grass-Meadow		Vegetable		Feed Plant		Fruit Growing		Plantation Forestry
	PP	PA	PP	PA	PP	PA	PP	PA	PP	PA	
Biological Wastewater Treatment Effluents or Primary Treatment Effluents – Sedimentation Tank with Minimum 2 Hours Retention	+	+	+	+	-	-	+	-	-	-	+
Aerobic Stabilization Ponds or Lagoon Effluents	+	-	+	-	-	-	+	-	-	-	+

\*PP : Plant present  
PA : Plant absent

## APPLICATIONS OF WASTEWATER REUSE IN TURKEY

## APPLICATIONS OF WASTEWATER REUSE IN TURKEY

The goals of treated wastewater reuse are mentioned below;

- ✓ Irrigation
- ✓ Process water
- ✓ Injection to groundwater for feeding
- ✓ Reuse in Double Distribution Systems
- ✓ Recreational areas formation
- ✓ Others (construction, prevention of salt-water intrusion).

General applications in Turkey are irrigation, process water, and recreational areas formation.

## APPLICATIONS OF WASTEWATER REUSE IN TURKEY

✓ In Aegean and Mediterranean Regions, where touristic structuring and investments are concentrated, treatment plant effluents are started to be used for irrigation. In residential areas, these effluents are used for garden and park irrigation, and also in some places, wastewater collected in the stabilization tanks is used for agricultural purposes.

✓ The main reason why wastewater reuse become a charming issue is the increasing treated wastewater quantity and treatment level in order to control the environmental pollution. Also in some cases, treatment requirement for discharging to the receiving environment can be higher than those for irrigation. For instance, in Istanbul, although discharging the effluents to the Marmara Sea requires tertiary treatment (N and P removal), secondary treatment (biological treatment) will be enough in case of irrigation.

## WASTEWATER REUSE IN INDUSTRIES

- ✓ In Turkey, industrial wastewater reuse is applied as wastewater recovery. Recovered wastewater is used in the process. Especially, in industrial plants near Istanbul, due to the high water costs, wastewater recovery is also economically charming.
- ✓ For instance, in a textile mill, where 850 m<sup>3</sup>/day of wastewater recovered, recovered wastewater cost was 1878 TL (0.3 \$) for each m<sup>3</sup> of wastewater (1992). However, in same year, 1 m<sup>3</sup> of water from the water distribution system had cost of 40.000 TL. For this reason, this industry recovered its 75~80% of wastewater (Türkeli v.d., 1992).
- ✓ In Sugar Factories, cleaner production techniques are used in order to decrease water consumption. Rarely polluted waters are separated from highly polluted ones by forming closed loops (recycles). Therefore, fresh water consumption is decreased in factories.

## TRANSFER OF IRRIGATION MANAGEMENT TO WATER USER'S ORGANIZATION

- ✓ Recovery rate improvement 40% to more than 80% after (WUOs) since 1994
- ✓ Water overuse and consequent negative environmental impacts have gradually decreased.
- ✓ Promotion for less water-consuming techniques 7% in 10 years  
(Yaylak&Bozova irrigation cases)

Irrigation State	Number of Facilities	Net Area (ha)
Operated by State Hydraulic Works	63	95,647
Operated by Water User's Organization	650	1,976,094

(State Hydraulic Works,2006)

## EXAMPLES FOR REUSING IN TURKEY

WASTEWATER TREATMENT PLANT	YEAR OF START-UP	P.E.	PROCESS	FLOWRATE (m3/day)	IRRIGATED AREA (m2)
1.Muğla, Bodrum-Bitez	1999	30.000	Activated Sludge Physical and Biological Treatment	3500	3000
2.Afyon-Merkez	1995	150.000	Activated Sludge Physical and Biological Treatment	24.500	1000
3.Samsun-Ondokuz Mayıs	1997	12.000	Nitrogen Removal Tertiary Treatment	1000	4500-1500
4.Manisa-Akhisar	1984	83.600	Activated Sludge Physical and Biological Treatment	13.200	5000
5.Manisa-Alaşehir	1984	55.000	Activated Sludge Physical and Biological Treatment	15.500	240.000
6.İzmir-Karaburun	-	1500	Activated Sludge Physical and Biological Treatment	300	5000
7.Bursa-İnegöl	-	150.000	Nitrogen and Phosphorus Removal Tertiary Treatment	60.000	3000 ha

(Medaware,2004)

THANK YOU  
FOR YOUR ATTENTION...

