

WATER USE EFFICIENCY EXPERTS MEETING 5 November 2008

Water Use Efficiency Report/Turkey

Selmin Burak



PNUE



plan
bleu

Municipal Water Use

Definitions and method used in municipal water management

Drinking water efficiency)

$$E_{pot} = V1/V2$$

V1 = drinking water volume ***invoiced*** and ***paid*** by consumer km³/year

V2 = total drinking water volume ***produced*** and ***distributed*** in km³/year



Municipal Water Use

- Invoiced (billed) water does not necessarily mean paid water.

$$\mathbf{V_p > V_d > V_b > V_c}$$

V_p = volume of water produced; (abstracted, treated);

V_d = volume of water distributed,

V_b = Volume of water billed (invoiced);

V_c = Volume of water corresponding to the volume sold (fee collected).



Municipal Water Use

- *housing areas, commercial districts, institutional and recreational facilities*
- *drinking, washing, bathing, culinary, waste removal, yard, cemetery and garden watering purposes.*
- customers are divided in three groups

*1-domestic (household),
2-commercial/industrial and
3-public*



PNUE



plan
bleu



Municipal Water Use

The sectoral efficiency index indicates both the physical efficiency of municipal drinking water network in terms of

- *physical losses and*
- *commercial efficiency,*

reflecting the institutional capacity of the water authority concerned to recover operation & maintenance costs through water bills.



PNUE



plan
bleu



Municipal Water Use

- **Technical performance**

***$Emun = Vb/Vs$** : the ratio of the volume billed to the customers by the volume supplied to the customers*

Water supplied: water produced (abstracted and treated) and distributed

- **Financial performance**

***Vc/Vb** : Revenue collection performance defines revenues collected divided by revenues billed in a specific year.*



PNUE



plan
bleu



Municipal Water Use

Sectoral efficiency is function of NRW

$$NRW = \frac{(V_s - V_b)}{V_s}$$

Sources of non-revenue water (NRW) are mainly:

- ***physical (real) (produced but not consumed)***
- ***non-physical (apparent or commercial) produced but unbilled/metered or unbilled/unmetered***

⇒ *unauthorized consumption*, which implies illegal connection to the municipal network.



Non-Revenue Water

Water Losses

Physical (Real) Losses

1. Leakage on Transmission and/or Distribution Mains
2. Leakage and Overflows at Utility's Storage Tanks
3. Leakage on Service Connections up to point of Customer metering

Commercial/Non-physical (Apparent) Losses

1. Unauthorized (Illegal) Consumption
2. Customer Metering / Billing Inaccuracies (Faulty/Inaccurate Meters; Meter reading errors)

Free-of-charge Water (Unbilled Authorized – Metered / Unmetered Consumption)

Public Consumption
Mosques and Holy Places,
Ornamental and Drinking
Water Fountains

Municipal Consumption
Firefighting,
Mains Flushing,
Street Cleansing,
Cemetery and Gardening Water



Municipal Water Use

- National municipal water use efficiency is $\sim 45\%$
- with $\sim 75\%$ (in Bursa) – 33% (in Mersin)
Both Greater Metropolitan Municipalities
- Free-of charge consumption is estimated to be 2% in three case studies carried out between 2004 and 2007 in medium-sized cities, this ratio is confirmed through the compilation of data issued by TurkStat in 2006 in 2695 municipalities.

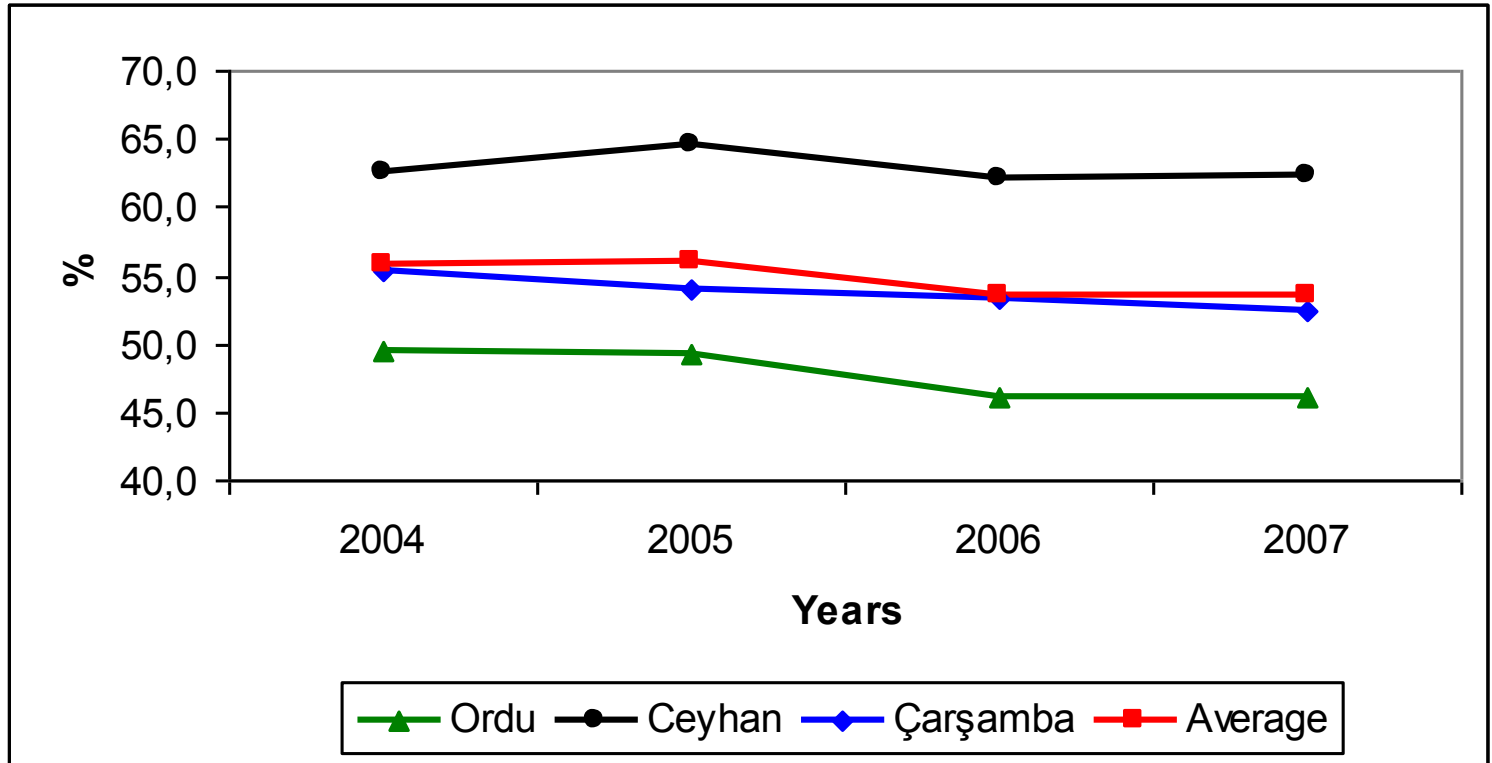


Municipal Water Use/Case Studies

- Ordu Central District Municipality (Black Sea)
- Çarşamba District Municipality of Samsun (Black Sea)
- Ceyhan District Municipality of Adana Province (Mediterranean)
(affordability analysis for ww treatment plant investment)
- Tarsus
(Enable (TASKI) to implement a large scale w/ww project co-financed by (KfW)&(EIB) by improving its institutional capacity)
- Mersin
(MESKI Water Network Rehabilitation. Improve the existing 67% of Non-Revenue-Water (NRW) level of MESKI)



Non-revenue water trend in case study areas (Burak and Mat, 2008)



Drinking Water Investment Need (2007-2023)

	Total	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Treatment Plant Investments	1.510	74	87	91	109	87	89	90	89	106	122	77	115	94	93	91	72	24
Network Investments	1.147	26	41	62	63	77	64	66	59	55	72	141	101	118	118	19	24	41
Treatment Plant Renewal Investments	3.822	136	147	158	170	181	192	203	214	225	236	247	258	269	280	291	302	313
Network Renewal Investments	6.264	224	242	260	278	296	314	332	350	368	387	405	423	441	459	477	495	513
Total	12.743	461	516	571	619	641	659	691	712	755	817	869	897	922	950	879	893	891



Agricultural Water Use

Agriculture land= 28 million ha (over 78 million ha national territory)

- 8.5 million ha is economically irrigable land

Target for 2030 is to reach 8.5% million ha equipped

6.5 million ha by DSI (76%), 1.5 million ha (18%) by abrogated GDRS?, 0.5 million ha by the public (6%)

- At present ~ 5 million ha equipped
- ~ 2.5 million ha equipped land developed by DSI (and ~90% transferred to WUAs)



Agricultural Water Use

- 2,5 million ha land equipped by DSI with irrigation system (approximately 1,7 million ha) was irrigated in 2007

Irrigation ratio of agricultural land = 65%

Reasons for under irrigation:

- 1-fallow land (13%), 2-sufficient rain (29%), 3-lack of water quantity (5%), 4-inadequacy of irrigation schemes (6%), 5-inadequacy of O&M, 6-increase of water table (2%), 7-soil salinity (3%), 8-social and economic reasons (22%); e.g. Failure in land consolidation, 9-loss of agricultural land in favor of tourism, urbanization and industrialization (15%), 10-topographical constraints



Agricultural Water Use

Use of water resource for irrigation

- 81% Surface water (13% pressurized, 68% gravity)
- 19% GW (3% in support to gravity irrigation, 16% GW Irrigation associations)



PNUE



plan
bleu



Agricultural Water Use

Actual Network efficiency

- Surface (open channel) 90% theoretical efficiency (5%+5% theoretical transmission loss)
89% of the equipped area
- Piped (pressurized) 100% theoretical efficiency
11% of the equipped area
- The highest water loss occurs in the farms (plots) after the intake point
- DSI overall efficiency effected in (2004-2007) is 45%

92% surface irrigation (60% theoretical efficiency)
6% sprinkler (80% theoretical efficiency)
2% drip irrigation (90% theoretical efficiency)



PNUE



plan
bleu



Agricultural Water Use

National Policies

More crop per drop instead of more water for more crop

- Target for (2023) is to decrease the water use ratio in irrigation from 74% in (2004) to 65%
- Target ratio for piped irrigation is 40% instead of 11% in 2007 (283 118 ha), (6% in 2004) (DSI)
- Incentives for micro-irrigation techniques by the MoA in the GAP regions (50% subsidies and loans)
- Modern techniques application may reach 40% of the plots at the ultimate target (optimistic!)
- Targeted efficiency for surface irrigation is 50-60%
- Target of the central government (DSI) is to increase this ratio to 40% in 2025. (11% of 2 573 801 ha area is equipped with piped system)



Agricultural Water Use National Policies

- unit water rate utilized per plot 10 007m³/ha
- water consumption and water requirement analyses ratio is 1.2 ⇒ evidence of over-irrigation.
(Chart 20, DSI, 2007)
- after 2004 a slow-down in the irrigation investments
(*general economic situation of the country, EU Accession process*)



PNUE



plan
bleu

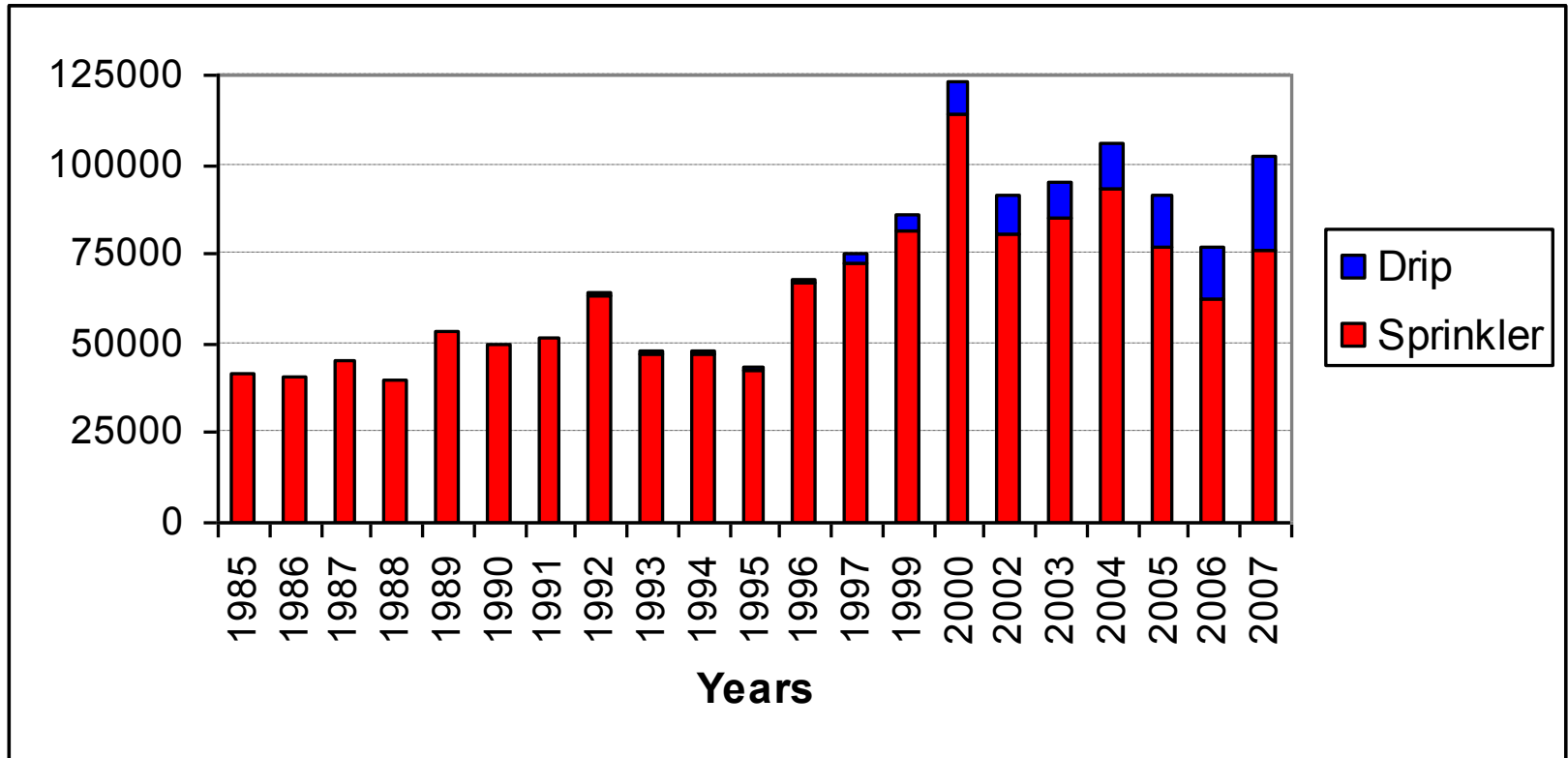


Evaluation of Irrigated land

Irrigated Areas	Net irrigated area (ha)	Evaluated Land (ha)
Operated by DSI	82420	
a) Tariff applied	36962	36962
b) Tariff not applied	45458	-
Constructed and Transferred irrigation by DSI	2 037101	1 930172
Constructed by DSI (Investment by others)	16066	-
Constructed by Irrigation cooperatives	438214	-
Total	2 573801	1 967134



Irrigated land (≥ 1000 ha) equipped with sprinkler and drip irrigation systems operated by DSI and WUAs



Industrial Use

- Turkey is committed to transpose its legislation with that of the EU and within this context Integrated Pollution Prevention and Control Directive (IPPC 96/61/EC) is the main document to comply with.
- TURKSTAT conducts regular study to assess industrial water utilized per industrial sector.



Industrial Use

- ***Large industrial premises having a share of 80% (approx. 3000) in the total production industry are taken into consideration by TurkStat.***



PNUE



plan
bleu



Industrial Use

Table 9. Basic environmental indicators of industrial production in 2004

No of industries questioned	3 217
Water supplied (1000 m ³ /year)	1 223 620
Water consumed (1000 m ³ /year)	1 215 060
Water reused (1000 m ³ /year)	410 300
Total discharged wastewater (1000 m ³ /year)	637 756
Treated	228 440
Untreated	409 316

* 18 percent of the establishments have wastewater discharge permits.



Industrial Use

- reuse (water used and treated to some extent to be reused) is questioned in countries, internal industrial recycle is not the subject of the questionnaire as commented by TurkStat.
- if used water remains within the factory fence, it is considered as recycled water which depends on production technology, methods used, raw materials and substances used during the process,

if the factory treats wastewater to reuse it (outside the factory fence) then it is considered as re-used water in the statistics.



Industrial Use/Case studies

- Textile wastewater minimization and reuse
- Harmonization Study with EU IPPC Directive in the Textile Industry
- BAT Application

Objective: Application of best available techniques as requested by the IPPC Directive, application of alternative treatment technologies in the selected textile factory, cost estimate and analysis of replicability in the textile industry. (2008)



Industrial Use/Case studies

- Land-Use, Environmental Concerns and Optimization of Water Demand Management in the Gebze Industrial Area

The objective of this project was to determine the total water demand of the industrial premises located in the industrial areas of Gebze, Dilovası and Çayırova, estimate the water demand variation and source of utilization (municipal network, groundwater or tanker) in accordance with the capacity utilization rate changes of the industries and to identify the potential of environmental stress generated by these activities both on fresh water resources and the marine environment.

Out of 686, 229 representative companies were sampled



PNUE



plan
bleu



Industrial Use/Case studies

Overexploitation of the freshwater resources and industrial pollution of the marine environment are the two most important problems of the study area.

an integrated environmental study covering the identification of industrial pollution at source should be initiated with regular monitoring so as to start installing an industrial pollution abatement program on a voluntary agreement basis by the industrial premises. (2006)



THANK YOU!



PNUE



plan
bleu

