

Transboundary Groundwater Aspect in the Past Water Management Practices and in the New Water Policies of Turkey

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ABSTRACT

So far, groundwater exploitation has not well managed or controlled in many cases, and groundwater sources have been exploited intensively without considering their recharge rates. In many cases, an intensive use caused drawdowns of water tables that were associated with other environmental problems such as land subsidence, saltwater intrusion, water pollution. The problems were often irreversible or have not been remedied up to now.

In this paper, technical, administrative and legislative challenges of a successful groundwater management is analyzed in the light of data and information obtained from some previous case studies. Furthermore, challenges and opportunities introduced into surface and groundwater management context by means of new water policy of Turkey will be discussed.

Key words: exploitation, policy, pollution, transboundary aspects.

1. INTRODUCTION

Technically and economically available water potential of Turkey is 112 bcm. About 14 bcm of this potential is from groundwaters. Average annual water consumption of Turkey (620 m³/cap) is highly below the OECD average (890 m³/cap). Moreover, per capita available water resources have been decreasing as a result of population increase, as well as climate change. As of 2010 per capita available water resources is 1 550 m³, which is quite below the world average (7 600 m³). Hence, Turkey is not a country rich in water resources but a country expected to be a water-stressed by 2030 (DSİ, 2007).

Most of Turkey's territory is situated in a semi-arid region, and precipitation is limited to five to six months per year. In addition, areal and spatial distribution of precipitation is not homogeneous. Herewith, in order to meet increasing water demand, Turkey has to construct dams, hydropower plants and irrigation networks throughout the country (DSİ, 2007).

Although most of the large water development projects have realized on surface water resources so far, groundwater resources are expected to be more charming in the near future because of the increasing stress on water resources. Already started explorations for deep groundwater aquifers especially in the west parts of Turkey can be considered as signals of this attraction (Simsek *et.al.*, 2009).

2. LEGAL AND INSTITUTIONAL SETUP

According to Turkish Civil Law, spring waters in the privately owned lands are subject to land registry. All other surface and groundwaters are under the public sovereignty. State Planning

Organization prepares five year development plans, which specify the general principles and priorities of the implementation of medium and long term economic, technical, environmental, social and cultural policies.

General Directorate of State Hydraulic Works (DSI) under the Ministry of Environment and Forestry has the responsibility for designating amount of groundwater available and the extent to which boreholes may be drilled. It also gives licences and controls implementation with the aim of damage prevention.

Bank of Provinces, Special Provincial Administrations under the auspices of Governorships, Municipalities, Ministry of Agriculture and Rural Affairs (MARA), and General Directorate of Environmental Management affiliated to Ministry of Environment and Forestry are other organizations, which have responsibilities on water supply for different purposes, as well as pollution prevention and control. The Ministry of Health determines quality standards for drinking waters, and follows efficiency in compliance with the standards.

Any direct discharge of wastewaters or treated wastewaters to groundwater bodies is forbidden according to the Turkish Environment Law, with the exception of geothermal waters. As geothermal waters are of concern, all responsibilities about research, licences, as well as control of discharge and reinjection procedure are given to the General Directorate of Mineral Research and Exploration (MTA) under the Ministry of Energy and Natural Resources.

Within the catchments of groundwater resources used for domestic purposes, all the activities, which use substances given in the Turkish Dangerous Substances Decree-Law are forbidden. Any material, which may seep to the groundwaters via wastewaters or rain water can not be stored directly within the groundwater drainage area. In these areas, agricultural activities are carried out in the way that possible negative impacts to groundwater quality are minimized. Similarly, use of treated wastewaters in irrigation, as well as mining activities are carried out only with special permissions.

Environmental Impact Assessment Decree-Law, first enacted in 1993 and finally amended in 2008, is one of the main milestones of water protection. In this regard, activities such as solid waste disposal, mining or groundwater abstraction are subject to detailed investigation in order to take necessary measures. Execution of the by-law is under the responsibility of the Ministry of Environment and Forestry.

3. TRANSBOUNDARY GROUNDWATER RESOURCES OF TURKEY

3.1. Quantity of Groundwater Resources in Turkey

Plain and valley alluvium deposits and carbonate formations constitute the most productive aquifers in Turkey. Mostly karstified carbonate formations cover one third of the country. Large limestone aquifers with more than 1000 m thickness have considerable groundwater potential for local and regional demands, and they are mainly located in the Taurus Belt, which lies in the south of Turkey from Antalya City to Syrian border (Apaydın, 2009).

Although there is not an exact figure about the groundwater potential with transboundary nature, 3,8 bcm of the already designated potential is in the locations adjacent to a neighbour country. Among these, about 1,6 bcm potential at Şanlıurfa city at the border of Syria particularly takes attention because of its high volume of transboundary nature (Hirsch, 1959).

The aquifer lies between the Ceylanpınar village in Turkey and Res-ul Ayn village in Syria. The general groundwater movement is towards the springs, and there is well developed porosity in the area near to springs due to groundwater circulation. There are 18 springs, 5 of which are in Turkey, and

remaining 13 are in Syria. All of the springs are in the streambed of the Habur (Khabur) river. Habur river with 7000 km² drainage area is one of the four seasonal creeks, which born at the Karacadag mountains and flows to the south more or less parallel to each other. Every creek has up to 50-70 m depth and they are becoming shallower as they flows to the south. They are all dry during June-October period. The groundwater surface intersects with the land surface over a larger area in Syria. So, Habur river flows throughout the year in Syrian land (Atuk, 1995; TUMAS, 1995).

3.2. Quality of Groundwater Resources in Turkey

DSİ has around 200 regular groundwater quality measurement stations in nationwide scale. According to the DSI data, nitrates concentration slightly increases from urban to rural areas, and from the west to the east of the country (OECD, 2008).

MARA has started to monitor water quality at 550 wells within the scope of a project for adoption of EC Nitrates Directive. Results of the measurements showed that Nitrates concentrations were below 50 mg/l, which is the maximum drinking water treshold level in corresponding Turkish regulations. However, Nitrates concentrations were slightly above the EC suggested drinking water treshold level of 10 mg/l at Burdur, Antalya, Konya-Aksaray, Erzurum, Adana-Osmaniye, Şanlıurfa and Mardin. Among the cities, last two are at the Turkish south-east border (Ulger, 2008; OECD, 2008).

3.3. Present and Planed Uses of Groundwater Resources

Until now, total water extracted from surface and ground waters for various reasons was around 46 bcm, and nearly 12 bcm of this amount was exploited from groundwater. 8 bcm of the groundwaters was used for irrigation, and remaining part was directed for domestic and industrial water supply (DSI, 2007).

Groundwater is especially used in areas where the usage of surface water is not possible or not convenient. İzmir, Elazığ, Antalya, Kahramanmaraş, Konya and Diyarbakır are the cities at which domestic water is supplied by means of groundwater resources. Konya, İsparta, Eskişehir, Kayseri, Edirne, Samsun and İzmir, situated in the mid, west and north-west of the country are the locations with higher density of groundwater irrigation (OECD, 2008).

Ninth Development Plan period of 2007-2013, energy and transportation infrastructure development, environmental protection and urban infrastructure development are among the basic development axles. It is also aimed that the percentage of irrigated areas will be increased as investment opportunities are favorable (DPT, 2006).

Groundwater irrigations as part of Southern Anatolian Project (GAP) have particular importance from transboundary aspect, since they are very close to Turkish Syrian border. Within the context of the project, Akcakale, Ceylanpınar and Suruc irrigation projects under operation currently aims at irrigation of 10 255 ha, 9 000 ha and 7 000 ha area respectively. Transition to pressurized systems in irrigation, as well as initialization of farmer education programs for best agricultural practices are main efforts spent for water conservation and protection in the area (TUMAS, 1995; Ulger, 2008).

According to the hydrogeological investigations carried out in the area, it is possible to abstract upto 1,2 bcm/year water from Harran and Ceylanpınar aquifers in Şanlıurfa. This amount can be met with the irrigation water requirement of more than 150 000 ha area (TUMAS, 1995).

4. MAJOR CHALLENGES AND OPPORTUNITIES OF GROUNDWATER MANAGEMENT IN TURKEY

4.1. Decline in Grounwater Levels

The major threats on the aquifers in Turkey are overexploitation, contamination, urbanization and removal by excavations. The problem related to water shortage is a part of the nationwide agenda, which in turn contributes overexploitation.

Groundwater level declined and well yields were reduced, moreover water quality was spoiled in some large plains of Turkey particularly for the last 15–20 years because of uncontrolled excessive consumption. For example, in the Konya closed basin with average precipitation of 378 mm, which is extremely below the Turkey average (643 mm), groundwater levels declined as a result of both drought faced in the last 8 dry years and overexploitation. Unfortunately, about half of the 60 000 wells active in the area have not licences (OECD, 2008).

One of the most dangerous threat is removal of the aquifers via excavations in quarries and mines. Alluvial aquifers in the plains and valleys are destructed by sand-gravel quarries, and limestone aquifers are removed by stone quarries and mines.

4.2. Contamination

Mostly limestone aquifers have clean fresh waters since they are located on uncontaminated high regions. Groundwaters in the low-gradient areas, on the other hand, has been subject to increasing stress in terms of quantity and quality. Contamination increases with the increase of population, the use of agricultural chemicals and fertilizers, urbanization and industrialization, as well as seapages through several other sources such as inaccurate site selection or mismanagement of waste disposal sites.

4.3. Legislative and Administrative Challenges

Carefull assessment of the legal framework of Turkey shows that there is a significant paucity in legislation on groundwater management and transboundary aquifers. National legislation concerning groundwater management is embedded in other (Turkish Water Pollution Control Decree-Law) water resource or environmental management regulations. And, there is no provision or arrangement concerning transboundary issues.

Turkey has transposed and adopted most of the EU legislation so far. However, there are some overlapping issues in legislation, as well as shared responsibilities among competitive bodies, which in turn, cause failures in implementation, especially in "control issues". Although potable water resources have been protected better, pollution treat on surface and groundwaters has been increasing in national level.

4.4. Challenges in Implementation

There is a growing awareness of effective supply optimization and demand management. Build up of a nationwide water database, as well as shifting closed systems and transfer of operations to water user associations in irrigation are main dimensions of progress. So far, a number of capacity building projects have been implemented jointly by Turkey and various European partners in an effort to closing the gaps in transposition, implementation and control of legislations between Turkey and the EU. However, applicable river basin management plans relating surface and groundwater resources,

strategy reports or action plans have not been prepared, mostly due to the lack of data, unsuccessful data share, and lack of coordination among the stakeholders.

4.5. Overriding Issues Related to Policies of Turkey and Its Neighbours

When transboundary water use is of concern, regional and country-specific challenges come forward. For example, in the Euphrates-Tigris basin, large parts of the region face the problem of climate change, drought and salinity. Moreover, Turkey's lower riparians, who are strongly dependent on the surface and groundwaters incoming from Turkish border for their development projects, are strongly opposed to its investments on transboundary water bodies (Attahaki, 2009, Dellapenna 1996). This situation sometimes causes Turkey to delay its projects even though it fulfills the necessary prerequisites to commence construction.

5. TURKISH POLICIES ON TRANSBOUNDARY WATER ISSUES

The challenges Turkey faced in water sector call for a new approach to water resources management. Its central objective is to promote efficient, equitable, and sustainable development through coordinated development and water resources management. In line with these policy principles and objective, a number of European Community legislation has been transposed and adopted so far.

From Turkey's point of view, transboundary waters should be utilized in an equitable, reasonable and optimal manner in the interest of all riparian countries. Long lasting solutions to transboundary water issues can be reached through confidence building measures and genuine cooperation among riparian states. The riparian countries should mutually abstain from causing any significant harm to each other while utilising transboundary waters. And, natural meteorological and hydrological conditions should be considered in allocating the transboundary waters.

With this intention, Turkey continues bilateral and trilateral cooperation activities with its neighbours concerning transboundary water courses. Number of memorandum of understandings on many fields including water were signed with Iraq and Syria in October and December 2009 respectively. In this regard, across examination of the relations linked to the water issues would provide better understanding of the status of the conflicts in the transboundary water basins. Furthermore, cooperation via lateral and multilateral meetings, seminars, workshops and courses have great help in building better understanding and confidence atmosphere.

6. CONCLUSIONS AND RECOMMENDATIONS

Conflicts related to transboundary water issues seems to be hidden under the more protective policies. Power, trust, political will, and incentives lie at the basis of all attempts at cooperation. This reflects the modernist conviction that strong government agencies staffed by scientifically trained experts should be delegated responsibilities for policy design and implementation in water resources management.

Concerning the policy, management, and technological aspects, the transboundary surface and groundwater basin management needs to make environmentally sustainable increases in agricultural and hydroelectrical productivity with better management. Careful examination of international dynamics, establishment of a functional legislative and administrative infrastructure, better governance including stakeholder participation, preparation of an inventory, determination of methodologies, dissemination of knowledge, experience and research findings, improvements in technologies (modernization), integration of better control mechanisms will prepare a strong base supporting decisions in national and transboundary basins.

In the semi arid region Turkey lies, the water conservation issue should be made prominent in the management of water resources, especially in the planning stage, and more importance should be attached to demand management, as well as use of green, grey and black waters (treated wastewaters). By and large, efforts that promote more economically efficient use of surface waters also alleviate stress on groundwater resources. Moreover, countries should put more effort to find new methods apart from conventionally used ones. In this regard, water transmission between basins, artificial recharge and potential improvement of aquifers, as well as use of non-renewable groundwater resources should be (re)considered within the management concept. Last but not least, national and international donor organizations should be encouraged to fund investments necessary for better demand management and pollution prevention.

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