

Araştırma Makalesi/Research Article

Wastewater Problems of Adıyaman City and Probable Effects of Them on Atatürk Dam Lake

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Abstract: Atatürk Dam Lake which has a major position within Southeastern Anatolia Project-the biggest Project (GAP) in Turkey- is ranks first in Turkey; in the world it ranks fourth in terms of water volume and ninth in terms of dam volume. The wastewaters of Adıyaman City are discharged directly into Eğri stream and Sıtılce stream, and rivers without treatment; finally these streams flow into Atatürk Dam Lake. The quality of mixed industrial wastewater and municipal wastewater polluted water of Eğri Stream was 4th class (the color code) according to Regulation of Surface Water Quality Management. Having such an important position, Atatürk Dam is exposed to ever increasing domestic and industrial pollution. In this study, quantitative analysis have been carried out in streams flowing into Atatürk Dam Lake and it has been concluded from direct dialogues with people and observations that wastewaters discharged into streams without treatment pose a threat for the health of the people in receiving environment and around it. Besides, the increase of soil pollution in case measurements about discharge of Textile Industry and Food Industry wastewater are not taken will cause Eğri Stream and Atatürk Dam Lake to lose their water quality and usability as a water ecosystem and irrigation water.

Key words: Water pollution, Environmental pollution, Domestic and industrial pollution, Quantitative analysis, Atatürk Dam Lake.

Adıyaman Kenti Atıksu Problemleri ve Atatürk Baraj Gölü Üzerindeki Olası Etkileri

Özet: Atatürk Baraj Gölü, Türkiye'nin en büyük projesi olan Güneydoğu Anadolu Projesi (GAP) kapsamında büyük öneme sahip, ülkemizin en büyük, Dünya'da ise gövde hacmi bakımından dördüncü, su hacmi bakımından ise dokuzuncu büyük barajı konumunda yer almaktadır. Adıyaman kenti atıksuları arıtma yapılmadan doğrudan Eğri Çayı ve Sıtılce Çayı'na ve budan da sonuç olarak Atatürk Baraj Gölü'ne karışmaktadır. Karışık endüstriyel atıksu ile kirlenmiş Eğri Çayı suyu Yüzeysel Su Kalitesi Yönetimi Yönetmeliği'ne göre 4. sınıf su kalitesindedir. Böylesi önemli bir konuma sahip olan Atatürk Barajı Gölü, her geçen gün artan evsel ve endüstriyel nitelikli kirlenmeye maruz kalmaktadır. Bu çalışmada Atatürk Baraj Gölü'ne karışan derelerde nicel analizler yapılmıştır ve arıtılmadan derelere deşarj edilen atıksuların alıcı ortamda ve çevresinde bulunan halk sağlığını olumsuz yönde etkilediği doğrudan yapılan diyalog ve gözlemler ile görülmüştür. Ayrıca tekstil ve gıda endüstrisi atıksularının deşarjı ile ilgili önlemlerin alınmaması durumunda toprak kirliliğinin artmasına, Eğri Çayı ve Atatürk Baraj Gölü su kalitesini ve bu ortamların canlı su ekosistemi özelliğini kaybetmesine yol açacaktır.

Anahtar Kelimeler: Su kirliliği, Çevre kirliliği, Evsel ve endüstriyel kirlilik, Nicel analiz, Atatürk Baraj Gölü.

Introduction

Protection of Turkey's water resources potential and prevention of water pollution must be done in compliance with the economical and social development goals. The pollution level in some of the lakes and dams, which are needed as water resources, has been increasing gradually (Atıcı, 1997). Rapid industrialization, fast increase of

the population and urbanization, insufficient infrastructure and the lack of treatment facilities in most of industrial enterprises create environmental pollution. Dumping domestic and industrial wastes to receiving environments like rivers, lakes and seas without being treated adequately creates serious problems for the ecological system, especially in developing countries (Egemen, 1999). Furthermore, polluting substances in unhealthy waters

may cause contagious plagues like cholera, typhoid and dysentery and also may lead to mass poisoning (Bolu, 2007).

There are 3 provinces (Adiyaman, Şanlıurfa and Diyarbakır), 10 counties and 156 villages surrounding the Atatürk Dam Lake. With its population of 600,000 people, its wide cultivated areas and many industrial plants (textile, cement, paper and paper products, coke and oil products, chemistry, fertilizer, machine manufacturing, etc.), the province of Adiyaman is an important agricultural and touristic city extending along the dam's northern parts (Gönüllü, 2010).

The Adiyaman city center is the residential area which causes pollution in the Atatürk Dam Lake at most. As there is no waste water treatment plant in the province, the urban, industrial and agricultural waste waters are discharged to rivers from several points, and eventually these river currents reach the Atatürk Dam Lake (Anonymous, 2011). There is no seriously planned work in terms of aquaculture on the Atatürk Dam Lake, which constitutes one of the most important lakes throughout our country and the world (Gönüllü, 2010).

Therefore, in terms of protecting fresh water resources, which are of high importance nowadays, polluting substances should be removed and pollution risks should be minimalized on the dam.

Atatürk Dam Lake

With its length of 180 km, volume of 48.7 km³ and surface area of 817 km², the Atatürk Dam Lake is Turkey's largest lake after the Van Lake and the Salt Lake (Alhas, 2007). There are 3 provinces, 10 counties and 156 villages surrounding the Atatürk Dam Lake (Figure 1) (Gönüllü, 2010). This dam is the biggest dam in our country in all aspects. Additionally, it is the fourth biggest dam in terms of dam volume, and the ninth in terms of water volume in the world (Duman and Çelik, 2001). Furthermore it is among the top 30 dams in terms of energy production and lake volume (Alıcı, 2012).

Research Findings

With the scope of the research, a field survey was conducted to observe the existing situation in dry and rainy seasons. As part of this study, the Eğri and the Sıtlıce River, the sewage's



Figure 1. Satellite image of the Atatürk Dam Lake and surrounding provinces (GIS, 2013)

discharged here and the solid waste landfill area's potential effects to the Atatürk Dam Lake were defined. During the field study, it was found that there were discharging points apart from the points on the literature. Furthermore, the existing problems of the settlements along the riverside were tried to be defined by having talks with locals living there.

Current Infrastructure Situation of Adıyaman City

Like other provinces in the Southeastern Anatolia Region, the urban technical infrastructure in the province of Adıyaman is inadequate, too. Rapid development of urbanization and insufficient financial resources prevent the adequate provision of road, water, sewage and garbage services. Water resources and distribution networks are extremely insufficient. The biggest problem of the province is the insufficiency of water resources (Anonymous, 2011).

The reasons for the pollution of the surface and underground water throughout the province are the dumping of urban and industrial liquid, solid and gas wastes to the environment without treatment and agricultural applications based on excessive use of pesticides and fertilizers. In this pace, these various polluters reach the aquatic environment and they change the quality of the water, negatively affecting living creatures in that aquatic environment, if any (Gönüllü, 2008).

The Adıyaman city center is the residential area which causes pollution in the Atatürk Dam Lake at most. The population in the center of the province is 245,000 and they live in the residential area between the important arms of the dam lake. Benefiting from the topography and code difference of the Province of

Adıyaman, sewage waters are discharged non-treated and with their own beauty to the Eğri River from the west of the city and to the Sıtlıca River from the east.

Discharge of Domestic Wastewater

Domestic waste waters are discharged to the Eğri River from 4 different points (from 2 different points under the Eğri River bridge and from 200 m north of this point and the point where Altınşehir waste waters meet Eğri River) and to the Sıtlıca River from 5 different points (from the west of the Open Prison, 150 m south of the Old Cemetery, exit of the Old Slaughter House, The Vartana Road Bridge, and the east of the Provincial Special Administration). Wastewaters given to the receiving environment reach the Atatürk Dam Lake via two different arms (the Eğri River and the Sıtlıca River). Discharge of domestic sewage system to the Eğri River is shown in Figure 2.

Discharge of Industrial Wastewater

There is more textile industry in the organized industrial site (OSB) in the province center. There are weaving and dyeing industries among these textile industries and industrial waste waters are not treated. Waste waters are directly discharged to the receiving environment through open channels and they reach the Eğri River and then the Atatürk Dam from there. Additionally, industrial waste waters apart from the Adıyaman OSB are also discharged to the Eğri River (Alıcı, 2012). In the quantitative analyses conducted during the rainy and dry seasons, it was observed that the color of the Eğri River was reddish black (Figure 3). Taking this into consideration, it can be said that the Eğri River's water quality color code according to the surface water quality management code is IV. Class quality and there are serious changes in

the maximum ecological potential values for the biological quality elements (RSWQM, 2012).

Many observations were made till the point where the Eğri River meets the Atatürk Dam Lake and surrounding



Figure 2. A view of domestic waste waters discharged to the Eğri River

villages were visited as part of this research. Accordingly, it was observed that the Eğri River was flowing in a dark color till it mixes with the dam lake. Village inhabitants stated that they did

not use the Eğri River for watering and that it harmed the animals. Furthermore, many people stated that the rushes and wounds on their hands were caused by the water of the Eğri River.



Figure 3. (a) A view of the Eğri River in the rainy season
(b) A view of the Eğri River in the dry season

Again in the researches, it was seen that most of the studies on determining pollution loads carried to the Atatürk Dam Lake were done to define the heavy metal accumulation on fish and

that by interpreting the analysis results done on living creatures, the aim of these studies was to highlight the pollution occurring in the dam (Şahinöz, 2001;

Doğan, 2007; Fırat and Kargin, 2010; Alıcı, 2012).

Solid Waste Storage Area and Leachate Discharge

In cities like Adıyaman, where no healthy urbanization is observed, solid waste is an important element in putting environmental problems to a larger scale (Gönüllü, 2008). The problem of solid waste disposal has grown with the increasing population in Adıyaman and the counties. These wastes were poured around the surface water resources, forest

areas and road sides in the province (Figure 4) (Adıyaman Governorship, 2013).

It is estimated that 160 tons of domestic waste is disposed off in Adıyaman city center per day. These wastes are collected by the municipality and stored in a location approximately 1000 meters far from the Atatürk Dam Lake (Gönüllü, 2010). Solid waste landfill area leachates in the province are also reaching the dam lake through the river bed. Being poured to the surface water resources, agricultural lands and



Figure 4. The landfill situated in the north of the Atatürk Dam Lake

the Atatürk Dam Lake in the area, garbage leachates which have considerably high pollution values cause an important environmental pollution (Alıcı, 2012).

Results

After the researches, it was seen that no comprehensive scientific work was conducted which would state that the Atatürk Dam Lake was exposed to pollution through domestic and industrial wastewater. Additionally, it was observed that in the last 10 years, no research had been conducted to define the water

quality of the discharging points of the two rivers (Eğri River and Sıtlıce River) which carried these pollutions.

Adıyaman is the second prioritized dirty province in terms of water pollution. The lack of a wastewater treatment plant and regular landfill area affect the water quality of Eğri River and the Atatürk Dam Lake negatively. Therefore, both the Municipality of Adıyaman and the OSB Regional Directorate must immediately construct the wastewater treatment plants and operate them as soon as possible.

If these measures are not taken, domestic and industrial wastewaters, which are directly discharged to the receiving environment will cause the following:

- The very dense industrial waste with high toxicity will cause pollution in the aquatic ecosystem and kill fish.
- Discharging it via open channels endangers the health of the surrounding people and creates a smell problem.
- Wastewaters discharged in high flow rates will cause intensive mud formation in the dam lake and therefore will affect the lifecycle of the dam negatively.
- It may also cause eutrofication formation and may again kill fish.
- Located immediately north of the Atatürk Dam Lake, irregular solid waste landfill area leachates which may contain toxic substances in high concentrations are also mixing with the lake and cause an important pollution.

As a result, a regularly operating environment management system must be established in Adiyaman and common solutions should be found through associating pollution parameters with each other. Then, these solution proposals must be taken into consideration and they must be applied immediately. If these are not done, the direct discharge of Eğri River and Sitilce River waters to the Atatürk Dam Lake will increase the pollution level especially during summer months.

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