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Participant approach model in a basin: A case study from Turkey

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ABSTRACT

The Beyşehir Lake Basin, which is the study area, is the second largest sub-basin within the Konya province, located southwest of the Konya Closed Basin in terms of surface by 7,308 km^2. Some basin characteristics such as slope, elevation classes, land use, aspect groups, land capability class, erosion status were examined by a Geographic Information System. The aims of the study were to determine the problems and the requests and suggestions of the people living in the basin, and to reveal the needs and deficiencies. For these purposes, the current and potential situation of the basin was evaluated using a holistic evaluation approach, which represents the most important of the watershed management principles, and the solutions were concluded in the light of the findings of the study. Migration, inadequacy of agricultural activities, lack of pasture areas for livestock activities, lack and neglect of irrigation water and irrigation infrastructure, lack of basic infrastructure such as village roads, and soil losses due to lack of erosion structures were the most obvious problems of the basin based on the results of the Ask–Find–Resolve analyses.

Key words: Basin, Participatory approach, Problem, Watershed management

HIGHLIGHTS

- The aims of this study were to determine the problems in the basin.
- To create a plan for basin management by developing accordingly.
- Taking into consideration the wishes and suggestions of the people of the region.
- Evidence-based recommendations for policy, practice, and future research.

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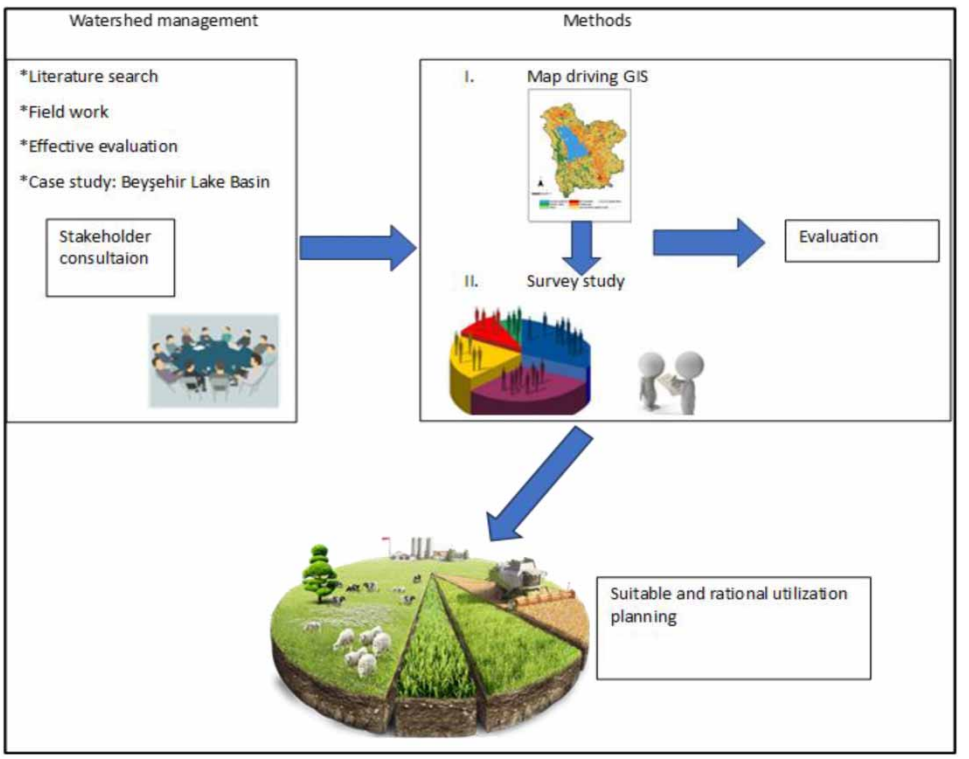
GRAPHICAL ABSTRACT



1. INTRODUCTION

The unconscious consumption of natural and cultural resources, and the awareness that ecological pollution is universal, have given rise to the need for recovery and restoration for the past many years. Besides, it has been determined that these problems could negatively affect future generations (Atil *et al*. 2005). Therefore, to solve the problems in watersheds, it has become necessary to plan the use of natural resources in a way that fully meets the demands of the communities living in and/or outside the watersheds. The plan to be made for the basins should be handled with a holistic approach for the protection and sustainable use of natural resources (Ozhan, 2004; Erol, 2008). The concept of integrated watershed management has emerged because of these situations. This management aims to reveal the socioeconomic structure of the people living in the region together with the characteristics of the resources in the field (Dengiz *et al.*, 2012).

It has been determined that some watershed rehabilitation projects implemented in practice were not successful previously because of not meeting the wishes, demands, and suggestions of the people in the basins. This unsuccessful planning resulted in public participation. One of the most important processes of integrated watershed planning is to identify the problems in a basin and develop their solutions. The Ask a Question–Detect the Problem–Implement the Solution (Ask–Find–Resolve) method that includes the planning, projecting, and implementing stages has been used widely in the identification of problems and determining of solutions in watershed management. In this process, there should be no time restrictions set for the planning stage and no rushing of the project construction, because when this process is managed well, the activities to be implemented in

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the basin can be determined clearly, and the sustainable management of the basin can be achieved more quickly (Cetin, 2015).

The natural resources in the basin generally provide detailed information about the basin in sociocultural and economic terms, and the people living in the basin undertake a complementary task for an applicable management. Although the people living in the basin are the main owners of that basin, they appear as the stakeholders that affect the environmental quality in the basin and are most affected by the watershed management (Baycan & Yavuz, 2017).

The Beyşehir Lake Basin is the biggest drinkable fresh water source in Turkey, and some problems have been observed here, which has been effective in determining it as a suitable study area. For instance, the young population's unwillingness to live in the basin, the deficiencies in agriculture and animal husbandry, the socioeconomic problems of the people living in the basin, and the increase in living standards. It is aimed that the transition to irrigated agriculture and mechanization in agriculture along with the developments in animal husbandry are used more effectively by the local people. To achieve these goals, the wishes, demands, and suggestions of the people in the region were considered. Thus, suggestions were presented to the implementers for future projects planned in the field.

The aims of this study were to determine the problems in the basin and to contribute to basin planning by developing solutions based on the wishes and suggestions of the people in the region.

2. MATERIALS AND METHODS

2.1. Materials

The research area is located within the boundaries of the Konya province, in the southern part of Turkey. The Konya main basin covers almost 7% of Turkey with an area of approximately 5.0 million hectares (mha) (Anonymous, 2017). The studied basin is a part of the Konya main basin and covers totally 730,800 ha included a 65,100 ha water surface. While a large part of the Beyşehir Lake Basin remains within the provincial borders of Konya, there are also parts within the provincial borders of Isparta and Antalya (Figure 1). So, the basin is managed by three provinces.

The 13 settlements within the basin were determined as the study material. The total population is 8,946 in these settlements, based on the latest inventory by the Turkish Statistical Institute (TUIK) (TUIK, 2020).

2.2. Methods

In this study, the documents and data of the area were obtained from the relevant institutions. The study had two stages: (1) evaluating the data obtained in the field and (2) in the office. In addition, a literature review on similar subjects was searched to be detailed in the study.

Some basin characteristics, such as slope, elevation classes, land use, aspect groups, land capability class, and erosion status, were determined by a geographic information system (GIS).

First, people living in the residential areas within the basin were informed about this study. In addition, interviews were held with local people and representatives of public institutions.

To identify and solve the problems from the perspective of the local people living in the basin, the Ask a Question–Detect the Problem–Implement the Solution (Ask–Find–Resolve) method was applied. The Ask–Find–Resolve method is used widely by the general directorates of the Ministry of Agriculture and Forestry when creating integrated watershed management plans and rehabilitation projects in micro-catchments. The basis of this method was the meetings to be held with the villagers. Therefore, the meetings that form the basis of the method were planned and held in residential areas. In line with these meetings, the problems and wishes of the residents of the settlements were determined by interviewing them.

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Fig. 1 | View of the Beyşehir Lake Basin.

A questionnaire was prepared for the local people of the settlements within the study to determine the physical, social, cultural, and economic conditions. Priority problems were identified by analyzing the results of the questionnaire.

The number of participants (n) for the study was calculated using Cochran's formula (Equation (1)) (Cochran, 1977):

$$n = \frac{N*t^2*p*q}{d^2*(N-1)+t^2*p*q} \tag{1}$$

where n is the number to be sampled, N is the population size (8,946), t is the confidence coefficient (1.96 for 95% confidence), p is the probability that the feature to be measured is in the population (0.5), q is the probability that the feature to be measured is not found in the population (0.5), and d is the accepted sampling error (5%). According to the formula, the number of samples was 369. However, 538 participants were reached at the meetings in September of 2021.

3. RESULTS

3.1. Basin characteristics of the study area

The aspect, slope, and altitude classifications of the basin are provided in Table 1. The flat area was the largest in the basin, covering 32.3% at the high altitude and 33.8% at the lowest altitude, with a flat aspect of 26.4% according to the ArcGIS environment (Figures 2(a)–(c) and Table 1).

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Table 1 | Some geographic details of the basin.

Aspect			Slope			Altitude (*A*)		
Class	**%**	**Area (ha)**	**Class (%)**	**%**	**Area (ha)**	**Class (m)**	**%**	**Area (ha)**
Flat	26.4	192,931	Flat (<5)	32.3	214,860	<1,091	33.8	247,010
North	6.1	44,578	Low (5–10)	25.8	171,622	$1{,}091 \leq A < 1{,}400$	24.2	176,853
South	14.1	103,042	Medium (10–15)	16.5	109,759	$1{,}401 \leq A < 1{,}600$	12.7	92,811
East	22.4	163,699	High (15–20)	12.2	81,154	$1{,}601 \leq A < 1{,}800$	16.4	119,851
West	2.8	20,462	Steep (20>)	13.2	87,807	$1{,}801 \leq A < 2{,}000$	6.3	46,040
Others[a]	28.2	206,085				2,000 <	4.2	30,693

[a]Northeast, northwest, southeast, and southwest.

According to the ArcGIS environment, the erosion risk status of the basin area was identified as high risk (32.6%), severe risk (16.2%), medium risk (14.8%), and no or little risk (12.5%), while water surface and risk-free area covered 23.9%. It could be said that the basin had mainly erosion risk. High rates of wind and water erosion were also observed in the basin. Some of the biggest factors observed for the high rates of erosion were unplanned urbanization and unsuitable practices in agriculture and livestock rearing (Figure 2(d)).

The land capability classifications included class-I (13.5%), class-II (7.7%), class-III (6.5%), class-IV (3.9%), class-V (4.7%), class-VI (5.2), class-VII (43.2%), and class-VIII (15.3%) (Figure 2(e)). The basin had forest (12.8%), meadow (5%), and residential (14.2%) areas, agricultural (22.3%) and dry agricultural (31.6%) lands, bare areas (2.4%), and water surfaces (11.5%), according to results of the ArcGIS environment. Considering the land-use distribution of the residential areas of the basin was 51,270.6 ha, it was 71.5% of the total area, while agricultural areas were 19,243.1 ha (26.8%) in the total area of the basin (Figure 2(f)).

3.2. Population distribution

The changes in permanent population obtained from the latest inventory of Turkish Statistical Institute are provided in Table 2 for neighborhoods in the basin for the years 1990 and 2020 (TUIK, 2020). In the neighborhoods in the basin, the population showed differences by increasing or decreasing in the summer and winter months, respectively. Neighborhoods were utilized as plateaus during the summer months and their population rates increased. Considering the 30-year population changed in the basin, there was a 38% decrease overall. The highest population change occurred in the Gencek district of the basin, decreasing by 61% during the last three decades (Table 2).

3.3. Educational status of the people living in the basin

There was bused education in the Çiftlikköy, Dumanlı, and Pınarbaşı neighborhoods that were taken as examples in the basin, and primary schools in other neighborhoods. When we looked at the literacy rate of the basin, while the rate was 95% for men, it was around 90% for women. If these rates are evaluated, the literacy rate of the young population could be considered as 98%, while the literacy rate of the population aged 65 and over is 84%.

3.4. Agriculture and animal husbandry in the basin

With the mechanization of agriculture and livestock, the workload decreased inversely with the increasing of productivity. In the basin both irrigated and unirrigated or dry farming are practiced in the basin. The amount of irrigated and unirrigated/dry farming lands of the basin are presented in Figure 3 and Table 3.

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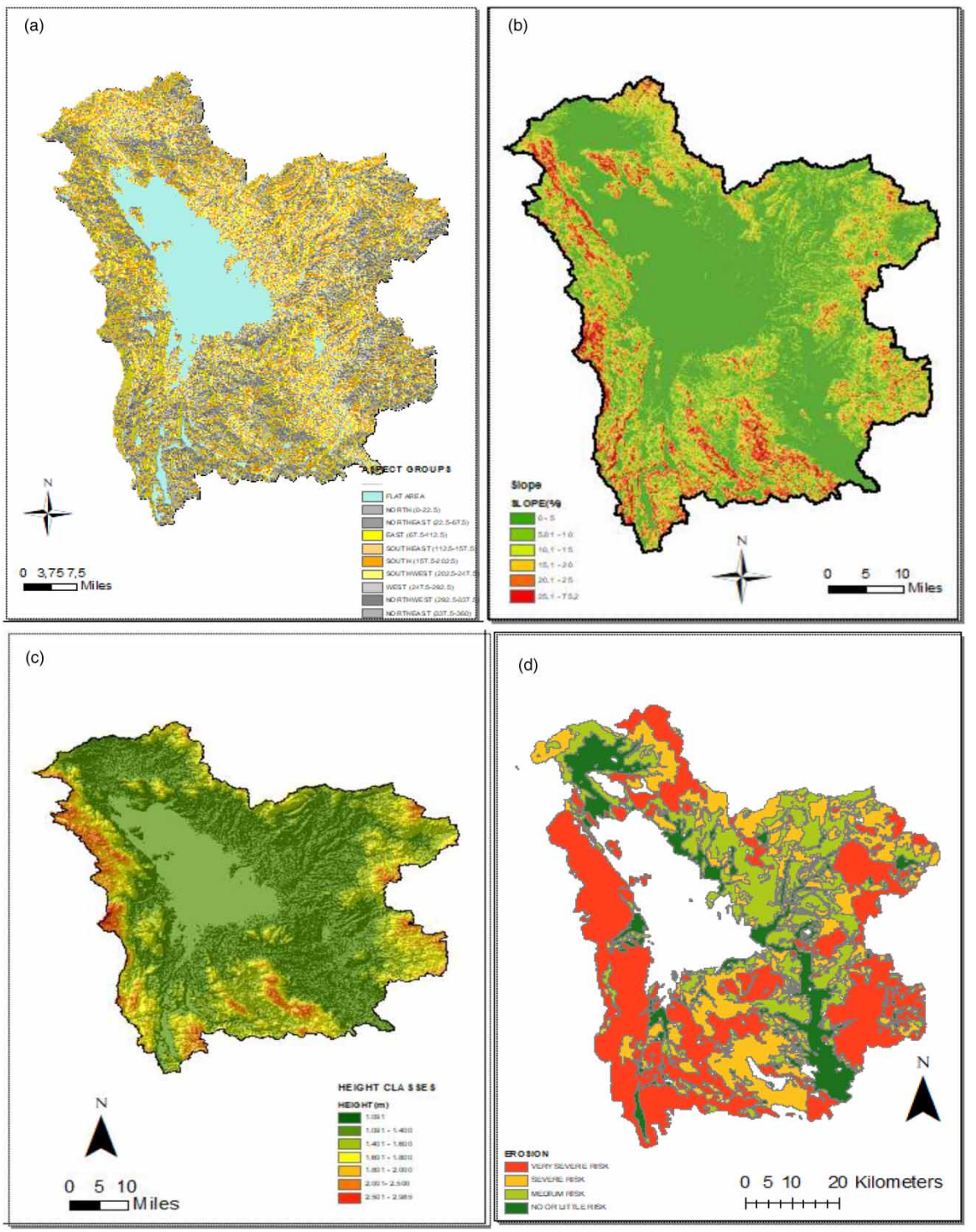

Fig. 2 | Basin characteristics of the study area. (*continued*.).

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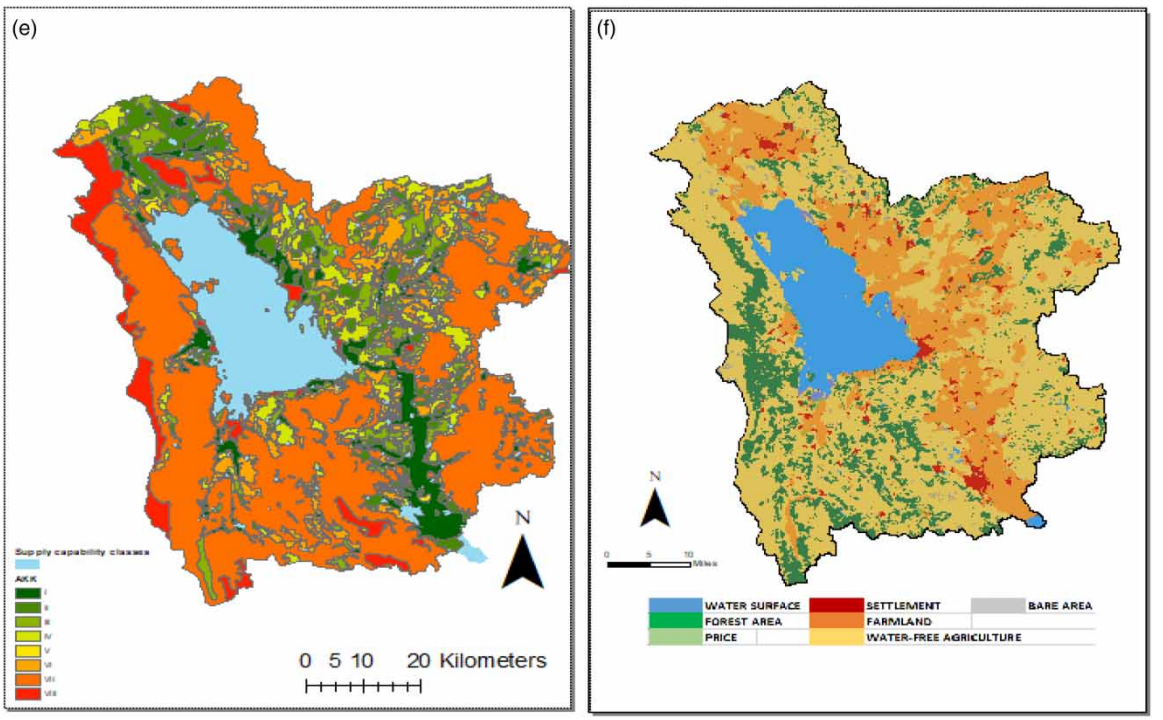

Fig. 2 | Continued.

Table 2 | Population changes of 13 residential areas in the basin.

	Populations		
Residential area	**1990**	**2020**	**Change (%)**
Adaköy	412	298	−28
Akburun	589	376	−36
Akçabelen	1,456	711	−51
Bademli	1,232	849	−31
Çiftlikköy	320	195	−39
Dumanlı	235	148	−37
Gencek	2,423	934	−61
Gölkaşı	672	293	−56
Huğlu	3,125	2,630	−16
Karadiken	462	311	−33
Kayabaşı	486	373	−23
Pınarbaşı	785	544	−31
Yeşildağ	2,368	1.284	−46
Total	14,565	8,946	−38

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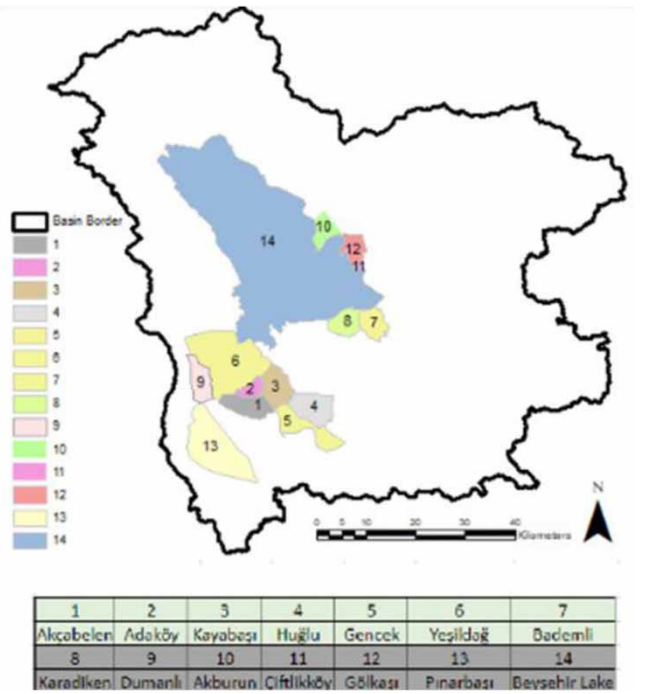

Fig. 3 | View of the basin.

In the neighborhoods taken as an example in the basin, wheat, barley, chickpea, sunflower, and other forage crops were produced by cultivations using the dry farming practice. With regard to irrigated agriculture, sugar beet, strawberry, various vegetables, and fruits were grown using the irrigated agricultural practices, which were also used for legumes and wheat in areas where there was no water shortage.

Oats, wheat, rye, corn, and barley were the main cereals produced in the basin, together with, lentils, chickpeas, and beans. Sugar beet, onion, potato, sunflower, and poppy were in the foreground as industrial products. Vineyards and horticulture also contributed to the agricultural production. Most of the agricultural products of the basin were consumed by marketing in the surrounding settlements. However, some of them produced in large quantities such as apples and pears were exported. They could be accepted as an important source of income for the basin people.

In recent years, animal husbandry and poultry have served to increase the income of the people. In the basin, bovine and ovine husbandries were also at the forefront. The animals fed in the basin were generally of native breed. In addition, fish farming was among the important livelihoods in the settlements on the lake shore in the basin (Table 4). The presence of small and bovine animals was determined in all settlements within the study area. There were a total of 2,459 sheep and goats in the area; and the number of cattle were 765 (Table 4). Huğlu neighborhood had the highest number of animals. Sarıkavak district was the only place where small cattle breeding was not found. The neighborhood with the least number of animals was Dumanlı (Table 4).

3.5. Natural resources problems of the basin

There were dense forest areas in the southeast of the lake. The existence of these forested areas led the people who settled in this region to deal with animal husbandry due to the inability to carry out agricultural activities.

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Table 3 | Extent of the irrigated and dry agricultural areas in the basin.

Residential area	Irrigated agricultural area (ha)	Dry agricultural area (ha)	Total (ha)
1	55	120	175
2	35	55	90
3	30	50	80
4	80	140	220
5	60	105	165
6	75	145	220
7	40	85	125
8	25	40	65
9	30	60	90
10	15	65	80
11	20	40	60
12	25	45	70
13	65	90	155

Table 4 | Livestock situation in the basin.

Residential area	Cattle	Sheep and goats	Fishery
1	79	300	No
2	42	150	No
3	32	56	No
4	152	423	No
5	112	367	No
6	84	352	No
7	94	232	Yes
8	25	63	No
9	27	45	No
10	23	60	Yes
11	17	60	Yes
12	12	95	Yes
13	56	256	No
Total	765	2,459	–

Likewise, forested areas covered a large part in the south of the lake. Hence, there were small plains in the area, and vineyards and gardens were grown in wet areas. In addition, grain products were grown in the nonirrigated areas.

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The geomorphological units to the east of the lake generally had a mountainous and rough terrain. Hence, especially toward the northwest of the field, the altitude increased highly; while small-scale gardening could be practiced in the south and southeast of the field, agricultural practices decreased to zero in the northwest.

The primary problems in the lake were the pesticides and fertilizers that mixed with the lake from the settlements and caused water pollution and eutrophication. With the formation of eutrophication, an oxygen-free environment began to form on the shore of the lake and an unpleasant odor was emitted. One of the main causes of eutrophication was that the lake plants cover the entire surface of the lake because of overgrowth, and as a result, the sun's rays cannot penetrate to the lower layers of the lake sufficiently (Figure 4). Furthermore, the lake was not covered with reeds all around, but the shores up to 100 m in some places started to bear reeds and the lake started to age biologically. In the future, if eutrophication continues to spread, it can cause extreme mass death and pose an incredible threat to the life in the lake.

Since most of the lake water was used for irrigation purpose, the water level of the lake changed seasonally (Anonymous, 1995). It decreased generally because of the irrigation. In addition, chemical pollution caused by agriculture, excessive and unconscious fishing, and unsuitable fishing disrupt the natural balance of the lake (Tustas, 1999).

Global balance disorders occurring in the world were also felt in Turkey in many ways. When the changes in the water level of the lake were examined, it was found that the level of the lake decreased with the effect of climatic conditions and global warming, and non-environmentally friendly practices. However, human-related factors are the biggest causes of the decreasing water level of the lake. For instance, the lake water is used for irrigation purposes in agricultural land and supplying water to the local people. Besides, the underground water level was also reduced by the building of many wells and dams to preserve water resources. These factors also caused a decrease in the water potential of the lake (Yarar, 2004).

Since the lake was the largest drinkable fresh water source in Turkey with a surface area of 651 km^2, it also had high biodiversity. Due to many factors such as unsuitable and unconscious agricultural practices in the basin, decreasing water level because of global warming, excessive utilization of water from the lake for irrigation and drinking, fishing techniques, domestic and industrial wastes, pollution, and deterioration of the natural balance, many fish and other living things in the lake have been destroyed. The fish that live in the lake are being caught in the nets less and less every year, which shows that their species is in danger of extinction (Buber, 2019).

Although the settlements in the basin had wastewater disposal methods, the lake was still polluted by wastewater. With the withdrawal of water, the level of pollution in the lake has increased and a very nasty odor permeates the air. This situation has caused diseases and created negativities for the living creatures in the environment.

3.6. Identified problems in the watershed with the Ask–Find–Solve method

The problems of the people living in the basin were determined by using the Ask–Find–Solve technique by meeting the 538 participants. In this context, each neighborhood was interviewed separately, and the problems were tried to be understood. The genders of the participants in the neighborhoods in the basin and their ratio to the general population are provided in Table 5.

The problems and expectations of the participants determined through the Ask–Find–Solve meetings were held within the scope of the study with the residents of 13 settlements within the study area. Considering the data obtained on the current problems and needs, the problems and needs identified in the settlements were numbered to prioritize them (Table 5).

The problems and needs identified in the 13 settlements because of the meetings are arranged and listed in order of priority (Table 6). The main problem determined according to the order of priority was migration in the settlements. However, increasing costs, transportation problems, lack of pasture areas for livestock, land

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Fig. 4 | Lake eutrophication problem.

Table 5 | Information of the meeting held in the basin.

	Number of people interviewed			
Residential area	**Male**	**Female**	**Total**	**Ratio to total population (%)**
1	21	28	49	14.5
2	18	11	29	10.3
3	15	9	24	15.5
4	52	21	73	36.0
5	37	23	60	15.6
6	34	26	60	21.4
7	43	21	64	13.3
8	8	11	19	16.4
9	12	14	26	5.7
10	22	14	36	10.5
11	21	6	27	7.2
12	16	19	35	8.4
13	32	4	36	15.1

problems in agriculture, inadequacy of irrigation infrastructure, and lake pollution were also among the prominent problems. Apart from these, damage caused by wild animals, product marketing needs, lack of personnel to work, and equipment shortages were some of the important problems expressed (Table 7).

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Table 6 | Identified current problems and needs, and their numbers.

Current issues and needs	Numbering of problems	Current issues and needs	Numbering of problems
Inadequate roads in the village	1	Lack of equipment in agriculture	23
Lake sourced pollution	2	Increasing diseases in livestock and agriculture	24
Education needs in agriculture	3	Inadequate keystone in the village	25
Drought	4	Increasing feed and wheat prices	26
Transportation problems	5	Demand for imported products	27
Immigration problem	6	Insufficient state support	28
Rising diesel fuel prices	7	Increasing wages	29
The need for support in agriculture		Market shortage	30
Lack of fisheries education	9	Sewage needs	31
Lack of knowledge in agriculture and animal husbandry	10	The problem of appointing schoolteachers	32
Lack of young population	11	Lack of tourism	33
Lack of health services	12	Fishing season problem	34
The need for pasture for livestock	13	Bused education problems	35
Insufficient purchasing power	14	Lack of mosque imam	36
Lack of access to cities	15	The need for social activity	37
Inability to market manufactured products	16	Variety of crops grown by climate	38
Insufficient staff to work	17	Lack of dining hall–culture hall	39
Insufficient purchasing power	18	Greenhouse needs to be supported	40
Boar damage	19	Insufficient irrigation infrastructure	41
Unemployment problem	20	Land problems in agriculture	42
Housing needs	21	Lack of government support for fisheries	43
Irrigation water shortage	22		

4. DISCUSSION

There was dramatic population change in the basin between 1990 and 2020, with an average decrease of 38% (Table 2). In the study conducted between 1985 and 2012, the rural population change in Turkey was in the direction of a decrease of 24.2% (Yilmaz, 2012). The population decreased by 23.2% in the 30-year period in a study conducted in Karanfilli Stream Basin (Sendaglı, 2019).

In the study conducted in Denizli between 1980 and 2012, the rural population decreased by 29.6% (Yilmaz, 2012). The results showed that migration in the Beyşehir Lake Basin is higher than the country and regional scale. The highest and lowest migrations in the basin were in Gencek (61%) and in Huğlu (16%), respectively (Table 2).

In the basin, the literacy rate for males is 95%. It is 90% for females and this value is lower than the Turkish average. Turkey's overall literacy rate was 99.2% for males, while it was found to be 95.5% for females (TUIK, 2021). In Konya, the literacy rates were 99.1% for males and 95.17% for females (TUIK, 2021).

Looking at Turkey in general, it has been determined that 34.6% of the total land assets were suitable for agriculture (I, II, III, and IV class land) (Erol, 2007). The agricultural areas of the field are 19,243.1 ha and constitute

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Table 7 | Priority order of the problems and needs in the districts.

	Residential area												
Prioritization of problems and needs in neighborhoods	**2**	**10**	**1**	**7**	**11**	**9**	**5**	**12**	**4**	**8**	**3**	**13**	**6**
	7	2	7	20	6	6	6	11	21	19	26	6	25
	27	1	19	21	41	22	19	2	7	5	20	19	26
	30	5	20	5	30	5	20	6	13	6	13	13	13
	26	11	5	22	7	19	27	18	30	30	19	22	21
	4	7	17	41	11	4	23	9	17	2	18	30	1
	19	18	16	2	9	23	5	33	19	1	7	26	4
	10	4	18	19	35	14	41	43	4	20	12	7	19
	5	10	22	5	17	42	12	30	27	36	23	39	27
	28	12	4	18	26	12	13	23	26	13	6	20	5
	21	9	23	9	18	26	30	5	23	43	30	18	20
	6	13	5	34	23	11	7	29	5	34	5	28	22
	29	8	3	23	5	12	21		22	17	38	17	17
	11	6	21	7		26	24		14	7	4	21	37
	40	3	27	30		11	26		25	37	32	35	14
			6	13			5					23	30
			24	32			28						
			25	3									

26.8% of the total area. When the basin is evaluated from this perspective, it is close to the average of Turkey. In a similar study of the Karanfilli Stream basin, when the agricultural area was evaluated (13.48%), it was below the Turkish average. In the neighborhoods located in the basin, agriculture and animal husbandry were at the forefront as sources of livelihood. In a similar study, the largest income type (public/private) was the working sector (Sendaglı, 2019).

As mentioned, one of the most important problems in the basin is the phenomenon of migration (Table 5). The population is declining. The desire of the young population to leave the rural areas and the preference for city life, besides the settlement of the rural population in the cities for reasons such as health and education in general, cause a decrease in farming. In studies like ours, the population was determined to decrease (Yilmaz, 2012; Sendaglı, 2019). Apart from the problems mentioned, the need for product marketing, unemployment, lack of grazing land for livestock, and wild animal damage were among the top problems expressed by the residents of the neighborhood.

In the meetings held in the settlements, it was understood that outward migration in the basin was largely due to the rural nature of the basin. As a result of out-migration, it has been observed that the population living in the 50–90 age group was more in the neighborhoods, since the young population chooses the city life. However, the numbers of individuals to work has decreased and the wages of workers have increased. Production also decreased as government support for agriculture and animal husbandry was limited. In a similar study, the migration of the young population living in the rural areas in the region because of reasons such as the desire to work in the service sector, the inability to get married in the village, the gradual decrease of the young population working in agriculture, and the aging of the working population was identified as an important problem (Buber, 2019).

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Considering the country's conditions, it has been determined that increasing feed prices, diesel-gasoline prices, and farming equipment prices puts farmers in difficult situations. As a result, it was observed that the production is often interrupted. In a similar study, problems such as expensive feed prices, insufficient government support, the decrease in the number of young people dealing with livestock owing to migration, and the elderly population dealing with livestock were identified (Buber, 2019).

5. CONCLUSIONS

Natural environment, economic situations, social situations, and problems were attempted to be determined in the study. The basin has an important place both in Turkey and the region. For instance, the largest freshwater lake in Turkey, Beysehir lake, is in this basin. The basin, which has agricultural practices and products, is an important sub-basin of the Konya Closed Basin.

Considering the land-use status of the basin, waterless agriculture comes to the fore. While oats, wheat, rye, corn, and barley stand out in dehydrated agriculture, lentils, chickpeas, and beans from legumes are among the most preferred products. In the basin, cattle, sheep and goats, poultry, turkey, duck, and goose production come to the fore. Pool fishing is also practiced in the settlements near the lake.

The problems existing in the settlement areas in the basin were evaluated and listed in order of importance as follows:

- Immigration problem,
- Increasing costs,
- Insufficient irrigation infrastructure,
- Lake pollution,
- Land problems in agriculture,
- Lack of transportation and the prominent problems in the basin.

It is necessary to raise awareness of the farmers to not use more of the chemical pesticides for agricultural practices than needed. The farmers in the basin should be informed on the importance of soil analysis to produce higher quality and quantity agricultural products which will contribute to their practices.

In addition, it is seen that low-quality products are grown in the region compared with the previous periods with the global warming, drought, increased lake water pollution, and irregular precipitation regimes. For this reason, it is thought that it would be right to encourage the people living in the basin to produce more with the support of the state. In addition, studies should be carried out to eliminate the activities that cause pollution of the lake water.

The area is an important basin both in our country and in the region. Turkey's largest freshwater lake is in this basin. To solve the problems identified in the basin, it is necessary to develop a planning that provides ecological protection–use balance in the basin. Considering the natural resources of the basin, the basin should be managed by integrated watershed management planning. In the projects related to the water source in the basin, it is important to plan the utilization of water correctly and not to harm the users. Institutions should be planned in such a way that they can cooperate and take decisions together. In ecosystems such as lakes, sustainability and participatory planning decisions should be considered, and the views of local governments and the public should be included in the planning.

For the protection and use of the basins, projects should be practiced and implemented in a way to include the people living in the region as well as the union of central institutions and local governments. Local governments and the public should be trained in the use of natural resources, and environmental education and participation of the people of the basin in the planning and implementation stages should be ensured in high-scale projects for the basin.

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DATA AVAILABILITY STATEMENT

All relevant data are included in the paper or its Supplementary Information.

CONFLICT OF INTEREST

The authors declare there is no conflict.

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