BURDUR RIVER BASIN

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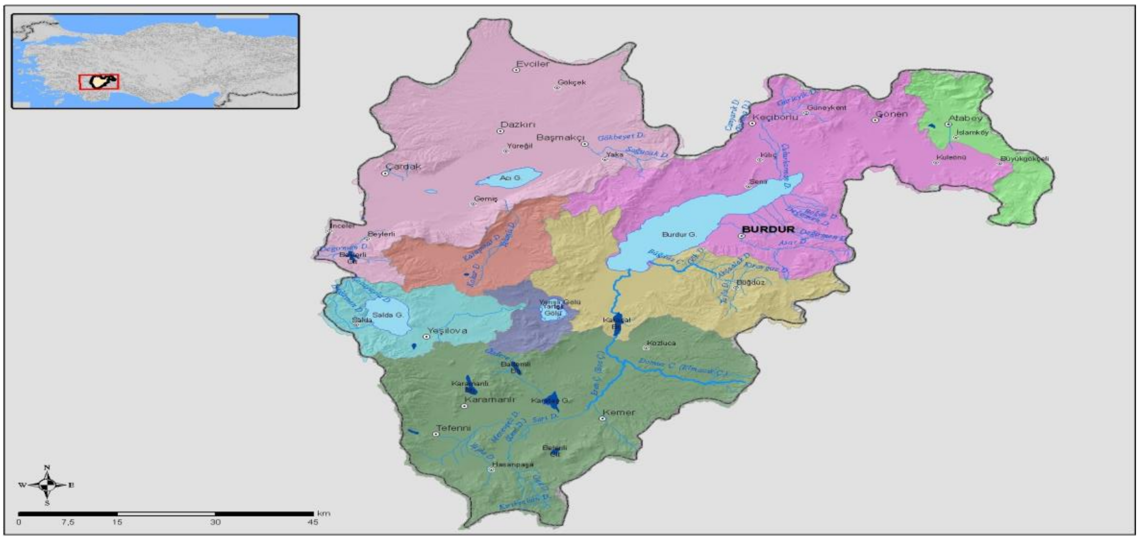
The basin covers the area located in the southwest of Türkiye, consisting of the catchments of Acı Göl, Salda Lake, Akgöl, Sıralı Lake, Karataş Lakes and the largest one Burdur Lake.



Burdur River Basin Map

The area of the basin is 6.296 km2. Afyonkarahisar, Burdur, Isparta, Denizli and Antalya are , the provinces of partially located within the borders of the basin. In terms of area, the biggest share belongs to Burdur Province with 55%. Burdur River Basin covers; Keçiborlu, Atabey, and Gonen districts of Isparta Province, Center, Karamanli, Kemer, Tefenni and Yesilova districts of Burdur Province, Çardak District of Denizli Province, Evciler, Başmakçı and Dazkırı Districts of Afyonkarahisar Province. An area of approximately 5,409 ha (about 1% of the basin area) of Antalya enters into the Burdur Basin, but there is no settlement in this area.

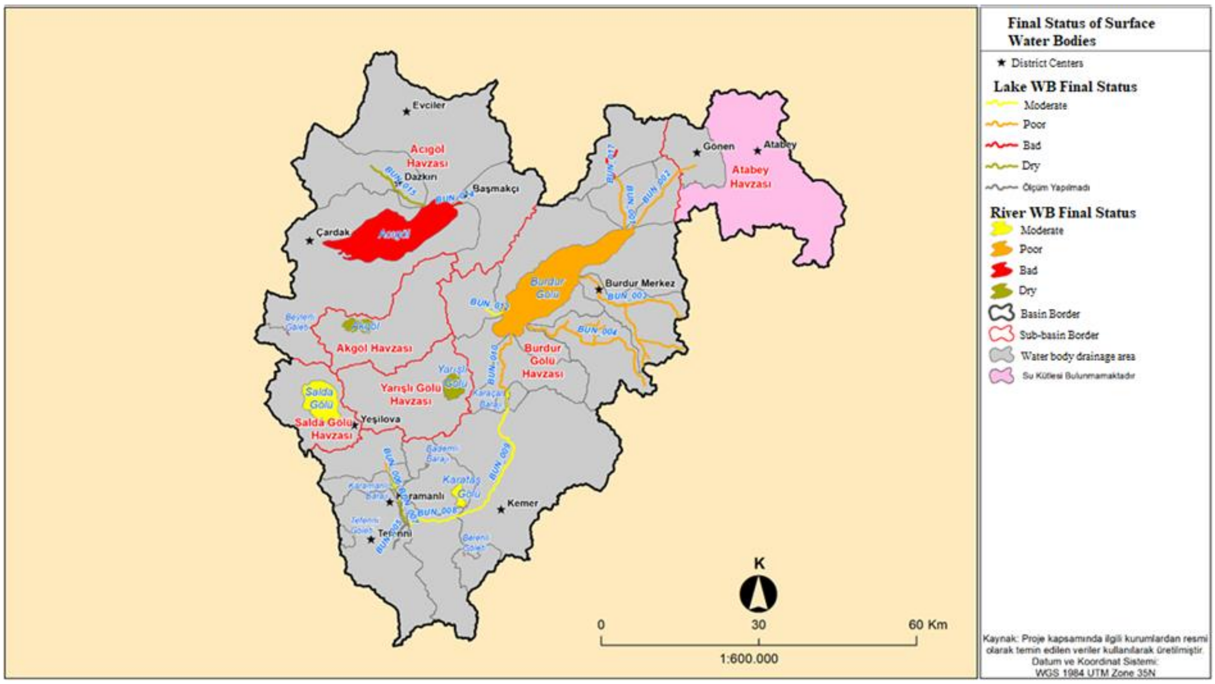
Provinces and their areas in the basin

Provinces	***Area of the Province (ha)***	***Part of the Province in The Basin (ha)***	***Ratio of the Part in The Basin to the Total Province Area (%)***	***Distribution of the Basin to the Provinces (%)***
ANTALYA	2.072.300	5.049	0,2	0,8
BURDUR	688.300	345.660	50,2	55,1
DENİZLİ	1.186.800	51.257	4,3	8,2
ISPARTA	893.300	123.974	13,9	19,8
AFYONKARAHİSAR	1.392.700	101.437	7,3	16,2

RIVER BASIN MANAGEMENT PLAN

Burdur Basin River Basin Management Plan (RBMP) was prepared in 2020. Determined measures within the scope of RBMP are monitored through the National Water Information System (NMIS) as of 2021.

In the Burdur Basin there are 14 river water bodies and 12 lake water bodies among the total 26 surface water bodies. In addition the total number of groundwater bodies is 27.



2280 measures have been determined in order to ensure that all water bodies in the Burdur Basin are in good condition and that the ones that are in good condition are protected. The main measures group are given below:

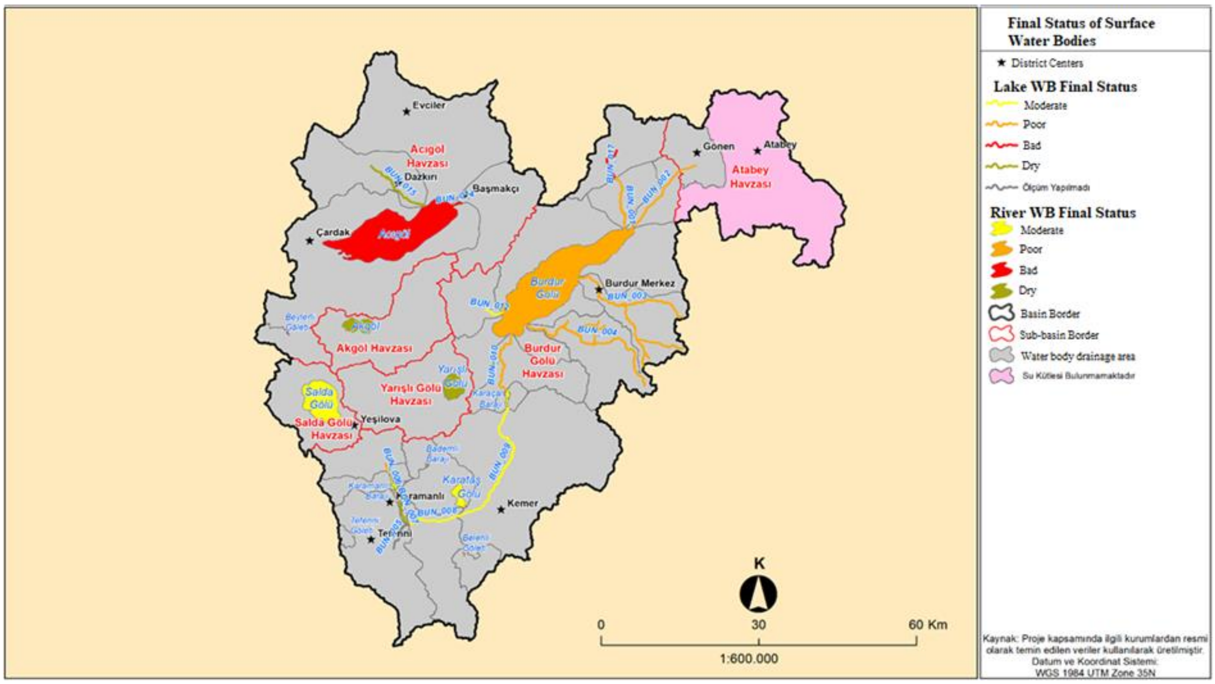
- Construction of WWTPs with Nitrogen and Phosphorus Removal.
- Construction of WWTPs with Secondary Treatment.
- Construction of Sewage Infrasracture System
- Construction of WWTPs with Package Treatment.
- Construction, Improvement or Repair of Septic Tanks.
- Construction of WWTPs with Appropriate Treatment
- Improvement of WWTPs
- Construction of Oil Trap Units in Fuel Stations,
- Construction of Sealed Pools in Rose Processing Facilities
- Construction of Industrial Wastewater Treatment Plants in the Organized Industrial Zone,
- Removal of Unsanitary Landfills and Construction of Solid Waste Transfer Station,
- Removal of Unsanitary Landfills
- Terracing of lands in those irrigated areas where slope is higher than 20%.
- Construction of Animal Manure Storage Tank in Animal Farm/Facility
- Delimitation of Green Buffer Strips in the Water Body Along the Line Where Water Bodies Intersect
- Implementation of Physical Treatment in Aquaculture Facilities.
- Good Management Practices in Aquaculture Facilities.
- Implementation of the Good Agricultural Practices Code Communiqué on the Prevention of Nitrate Pollution in Waters Caused by Agricultural Activities
- Construction of WWTPs for Mining Industry Wastewater
- Construction of waste dams that are not built in mine sites, ensuring their impermeability and arranging interception channels
- Construction of Fish Passage
- Solar Panel Application to Reduce Evaporation in Burdur Lake
- Transferring Water to Burdur Lake from outside the Basin
- Implementation of Environmental Flow Regime.
- Reducing loss/leakage rates by reducing pressure on supply pipes.
- Installing a Meter
- Modernization of Irrigation
- Combating Invasive Species and Control of Fishing
- Compliance with allocations in registered wells
- Detection of existing unregistered wells and prevention of opening new ones

WATER QUALITY

Surface Water Bodies Status

As a result of monitoring studies in rivers, lakes, coastal and transitional water bodies, ecological and chemical status of these water bodies were evaluated and their final status are determined. According to the study result, the all water bodies are classified as bad (for 4 water bodies), poor (for 9 water bodies) and moderate (for 8 water bodies).

Final Status of Surface Water Bodies



Phsicochemical Parameters failing to achieve Environmental Objectives in Surface Water Bodies
pH, Dissolved Oxygen, Electrical Conductivity, Color, BOD_5, COD, NO_x, Ammonium Nitrogen, TKN, TN, TP, Ortho-Phosphate, Selenium

Priority Substances failing to achieve Environmental Objectives in Surface Water Bodies
Lead, Nickel, Cadmium, Benzo(k)fluoranthene, Fluoranthene, Naphthalene, 4 nonylphenol(branched), 4-nonylphenol, Nonylphenols, Octylphenol, P-tert-Octylphenol, Chloroalkanes, C10-13 Chloroalkanes

Specific Pollutants failing to achieve Environmental Objectives in Surface Water Bodies
Aluminum, Boron, Iron, Cobalt, Chrome, Zinc, Silver, Beryllium, Titanium, Antimony, Vanadium, Ions, Bromide, Pesticides, Cyfluthrin, 1,2,4-trimethylbenzene, 1,2,4-trimethylbenzene, Xylene (m), Xylene (o), Tridecane, Decamethylcyclopentasiloxane, Phenols, 2,4,6 -tri-tert-butylphenol, Tris(Nonylphenyl) Phosphite, Phthalates, DEHP, Other Semi-Volatiles, 4-chloroaniline

Biological Quality Indıcators

Cladocora

Galathae bolivori

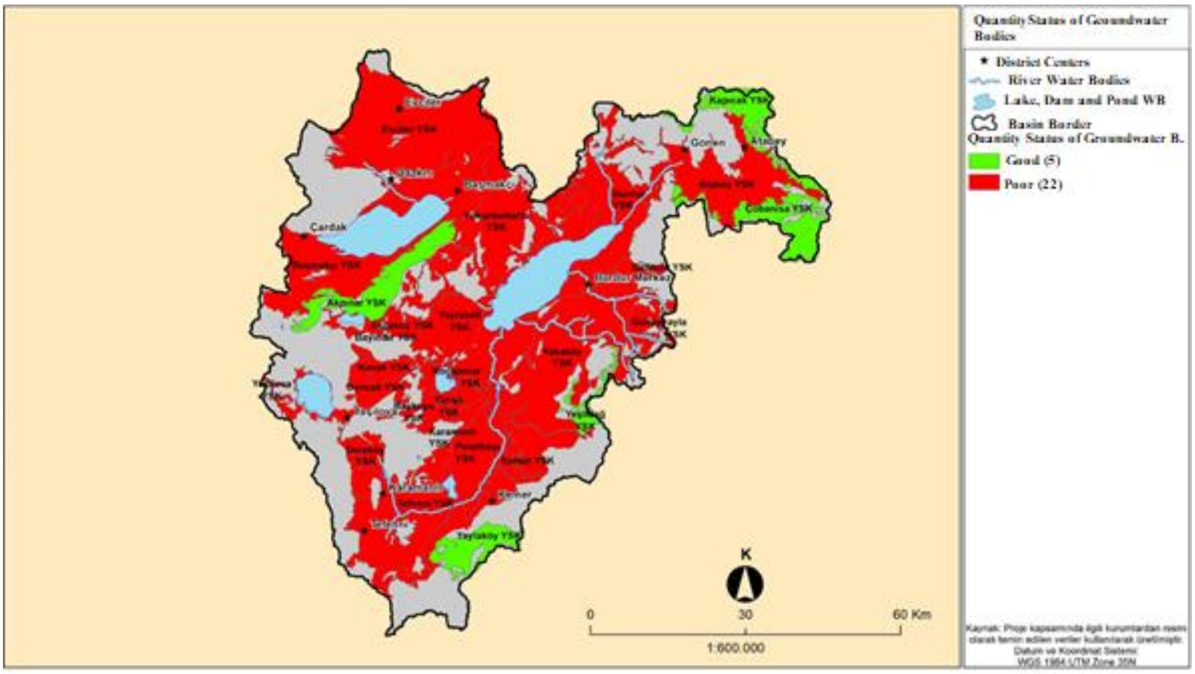
Oxynoemacheilus germencicus

Biological Parameters failing to achieve Environmental Objectives in Surface Water Bodies
Phytoplankton, Phytobentose, Macroinvertebrate, Macrofit, Fish

Groundwater Bodies Status

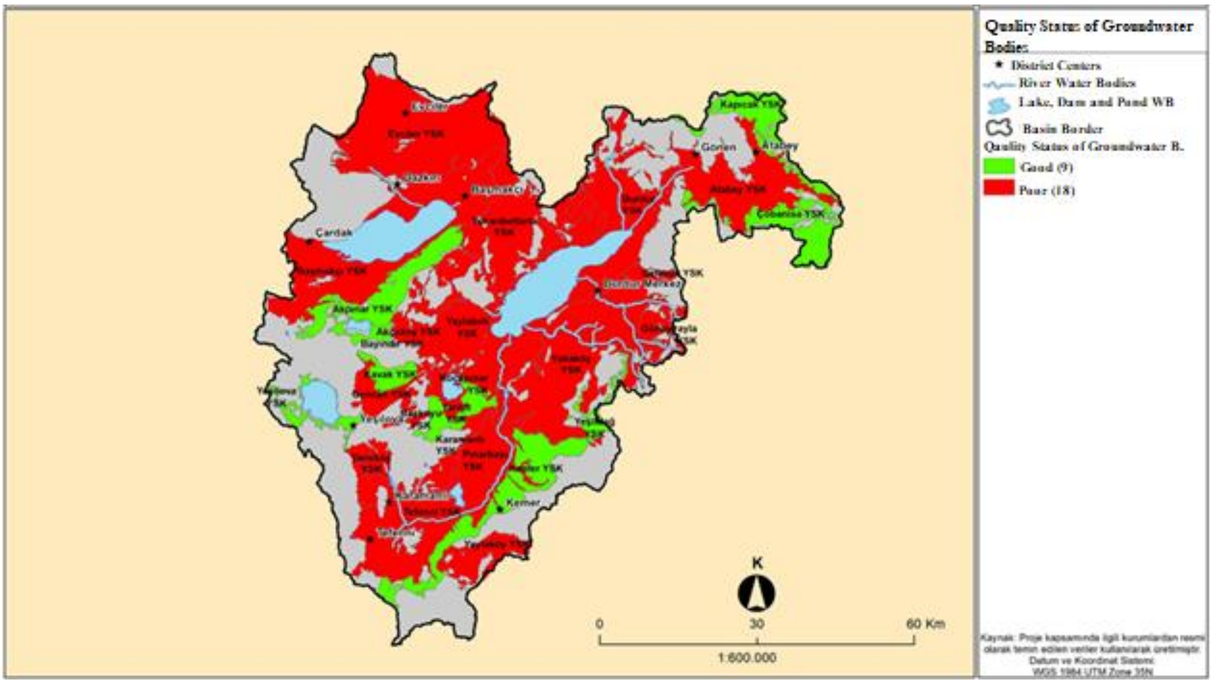
Quality Status of Groundwater Bodies

The quantity status of all groundwater bodies in the Burdur Basin is classified. According to this classification, 22 groundwater bodies are in“poor status” and 5 groundwater bodies are in“good status”.

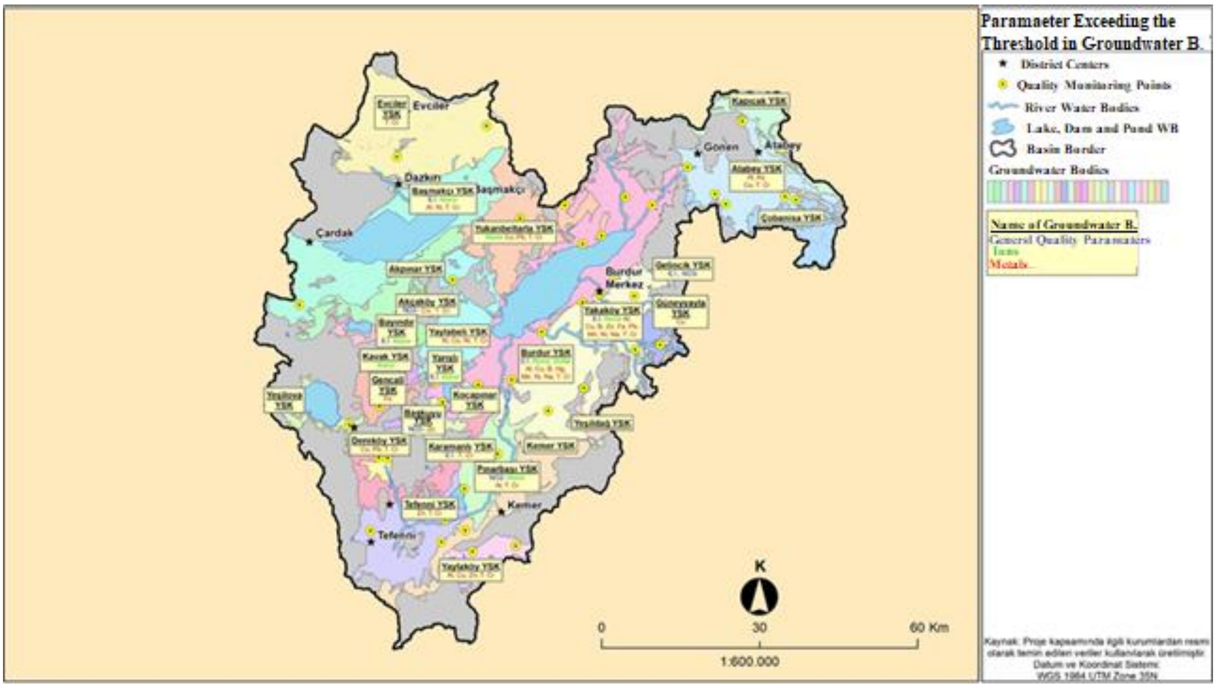


Quality Status of Groundwater Bodies

The quality status of all groundwater bodies in the Burdur Basin is classified. According to this classification, 18 groundwater bodies are in“poor status” and 9 groundwater bodies are in“good status”.



Parameters failing to Environmental Objectives in Groundwater Bodies



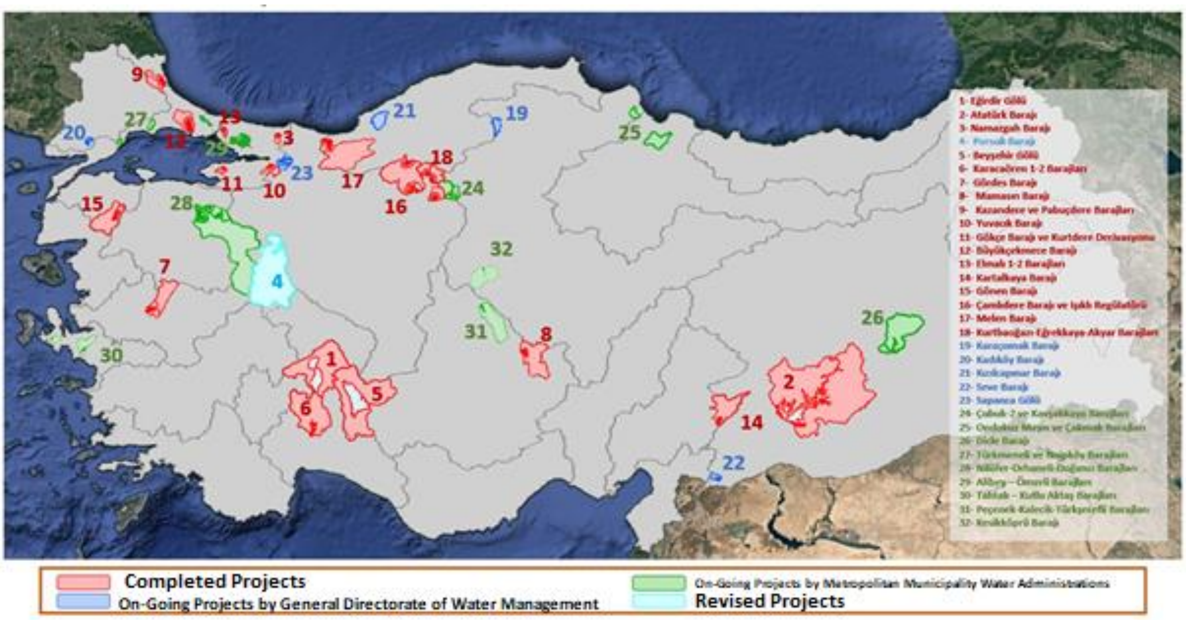
Parameters failing to achieve Environmental Objectives in Groundwater Bodies
Electrical Conductivity, Chloride, Aluminum, Arsenic, Copper, Boron, Mercury, Zinc, Iron, Lead, Manganese, Nickel, Nitrate, Sodium, Sulphate, Chrome.

DRINKING WATER PROTECTION PLANS

The purpose of drinking water protection plans is to determine basin-specific protection areas and principles based on scientific data to improve and sustainably manage the quality and quantity of drinking water sources.

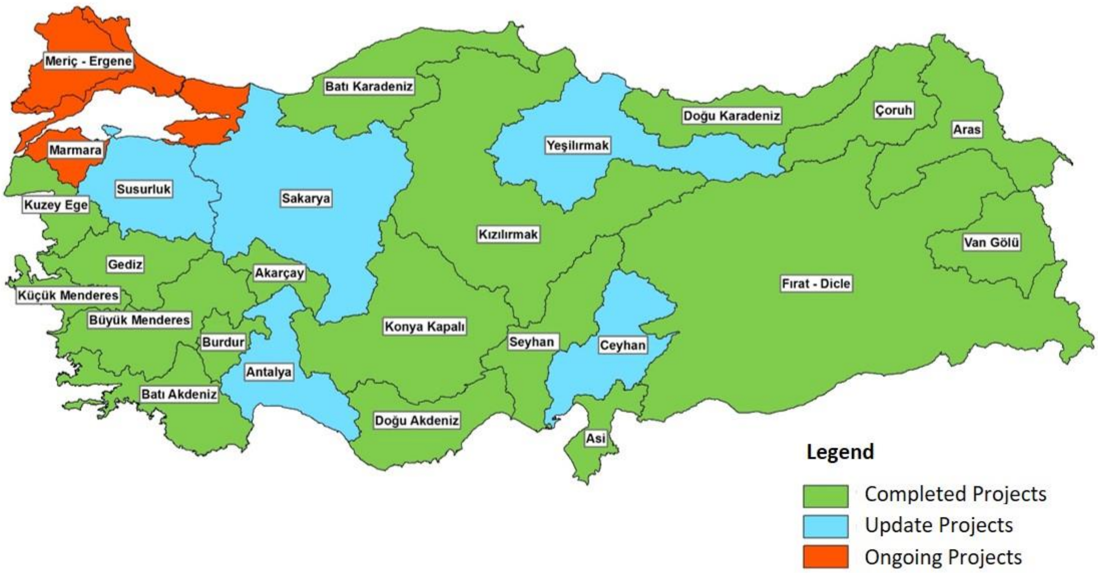
According to the Regulation on the Protection of Drinking-Water Basins:

- Protection plans for surface water sources that provide drinking water to metropolitan municipalities are prepared by the general directorates of water and sewage administrations of metropolitan municipalities in coordination with Ministry;
- Protection plans for surface water sources that provide drinking water to settlements outside of metropolitan municipalities are prepared by Ministry.

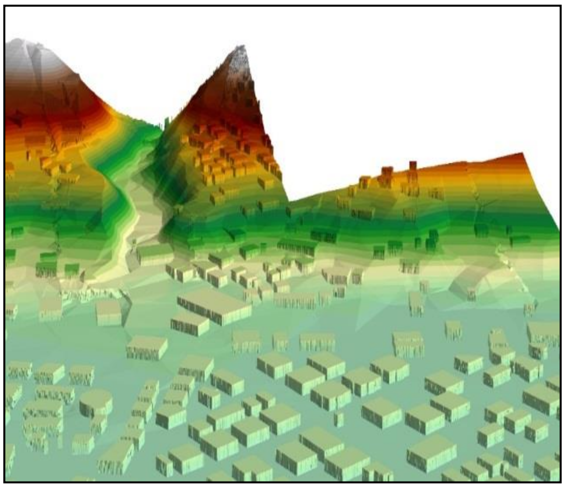


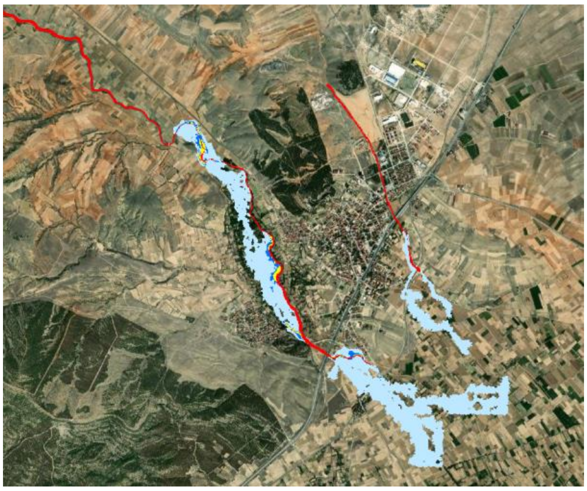
FLOOD MANAGEMENT PLANS

Burdur River Basin Flood Management Plan (FMP) started in 2016 and the plan was completed in 2019.



Flood Hazard and Flood Risk maps are generated within the scope of Burdur River Basin Flood Management Plan. The necessary measures to be taken to prevent risks before, during, and after floods have been determined using these maps, as have the responsible institutions and the time of implementation of the measures.






To mitigate the effects of potential flood events in the Burdur Basin, 67 measures have been identified under the following groups of mitigation measures within the scope of the Flood Management Plan.

- Improvement of bridges
- Cleaning of stream beds
- Improvement of banks well
- Improvement of culverts
- Improvement of walls
- Upper basin measures
- Data-Information Collection/ Production
- Education/ Informing/ Raising Awareness
- Disaster and Emergency Response Capacity
- Dam Failure
- Improving related legislations
- Stream rehabilitation
- Planning
- Crop pattern management
- Insurance System
- Improvement of the performance of regulators
- Agricultural applications
- Flood forecasting and early warning system

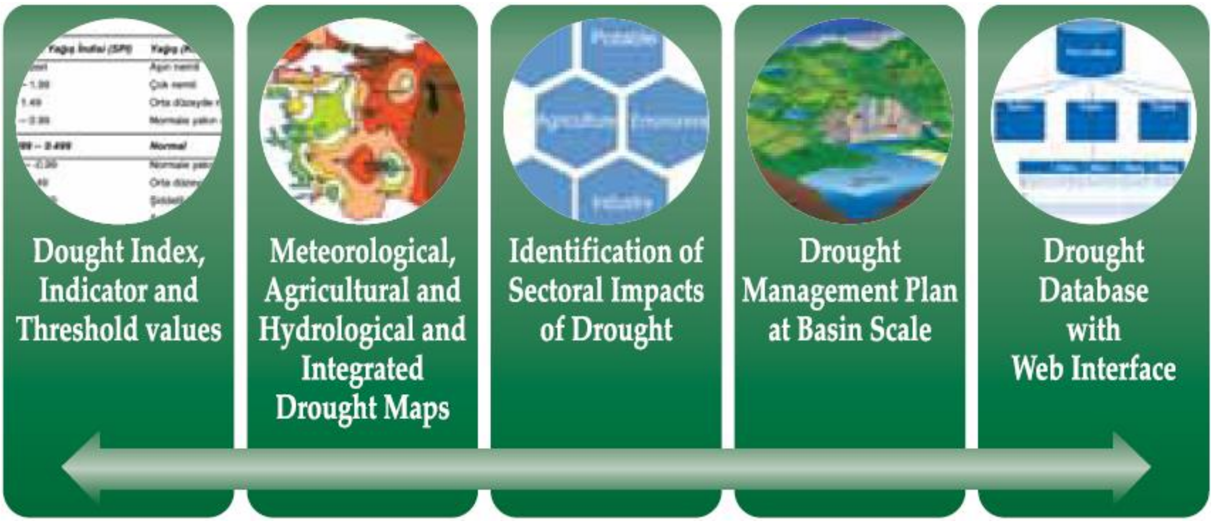
Mitigation measures determined within the scope of the plan are still being tracked via the Flood and Drought Plans Tracking Web Application in 2020 and the National Water Information System (USBS) in 2020.

DROUGHT MANAGEMENT PLAN

Drought Management Plans (DMPs) are being prepared at the basin level for all of the water user sectors, including agriculture, in order to minimize the negative effects of possible drought risks and be prepared for drought. The aim of DMPs is to mitigate and prevent the negative impacts of possible droughts by determining the measures to be taken during water scarcity and the measures to be taken before, during, and after the drought periods in order to solve the drought problem as quickly as possible. Drought analyses, climatic and hydrological studies, sectoral vulnerability analyses, and drought maps are used to plan and direct studies such as recovery and intervention.

Burdur Basin DMP was started at 2016 and completed at 2018.

Studies During the Preparation of Drought Management Plans:



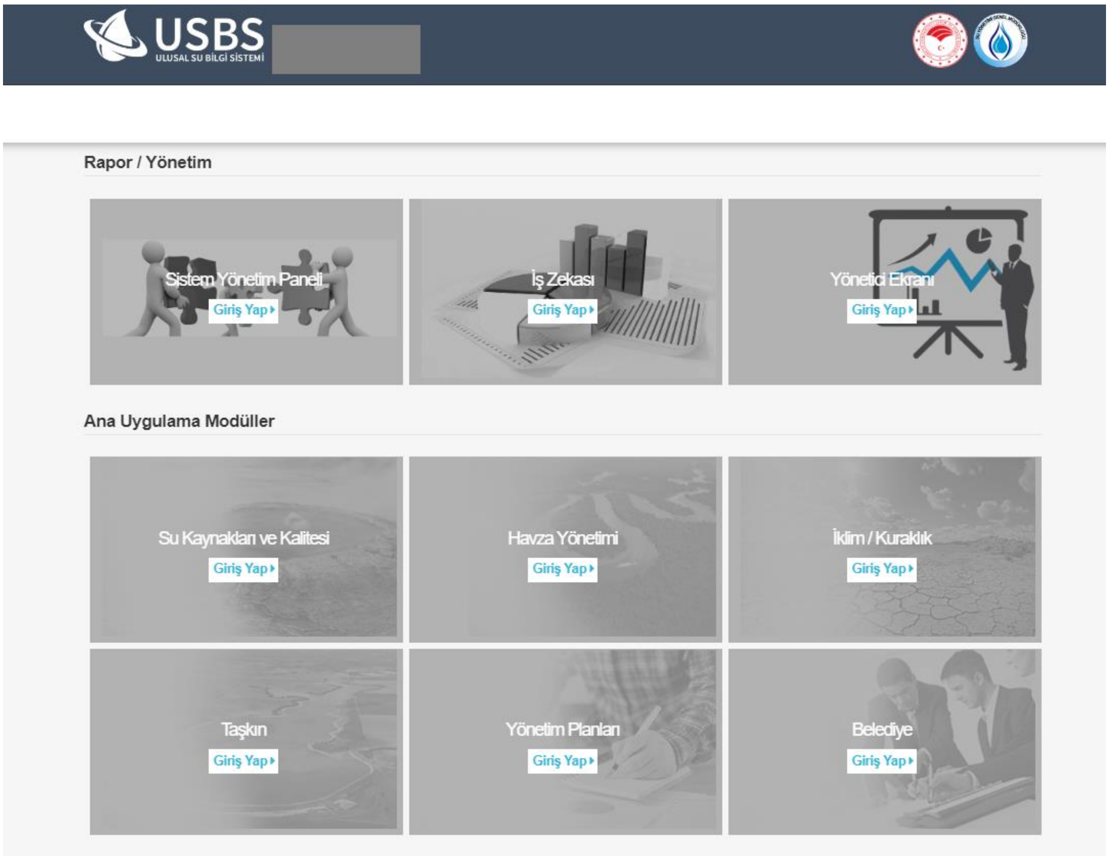
In order to prevent damage caused by possible droughts in the Burdur Basin, 30 measures have been determined under the measure groups of reducing water use/loss and Improving the Monitoring and Measurement Network within the scope of the Drought Management Plan.

Measures determined within the scope of the plan started to be followed via the Flood and Drought Plans Tracking Web Application as of 2019, and the National Water Information System (USBS) as of 2020.

MONITORING, INVENTORY and WATER INFORMATION SYSTEM

Actions that are taken about water quality and quantity as follows:

- To acquire the data that has been produced for various purposes by different organizations,
- To enhance the quality of data,
- To prevent the repetitive production of data,
- To enhance the accessibility of data,
- To determine and complete the missing/incomplete data,
- To set and apply a watershed-scale and sustainable monitoring system.



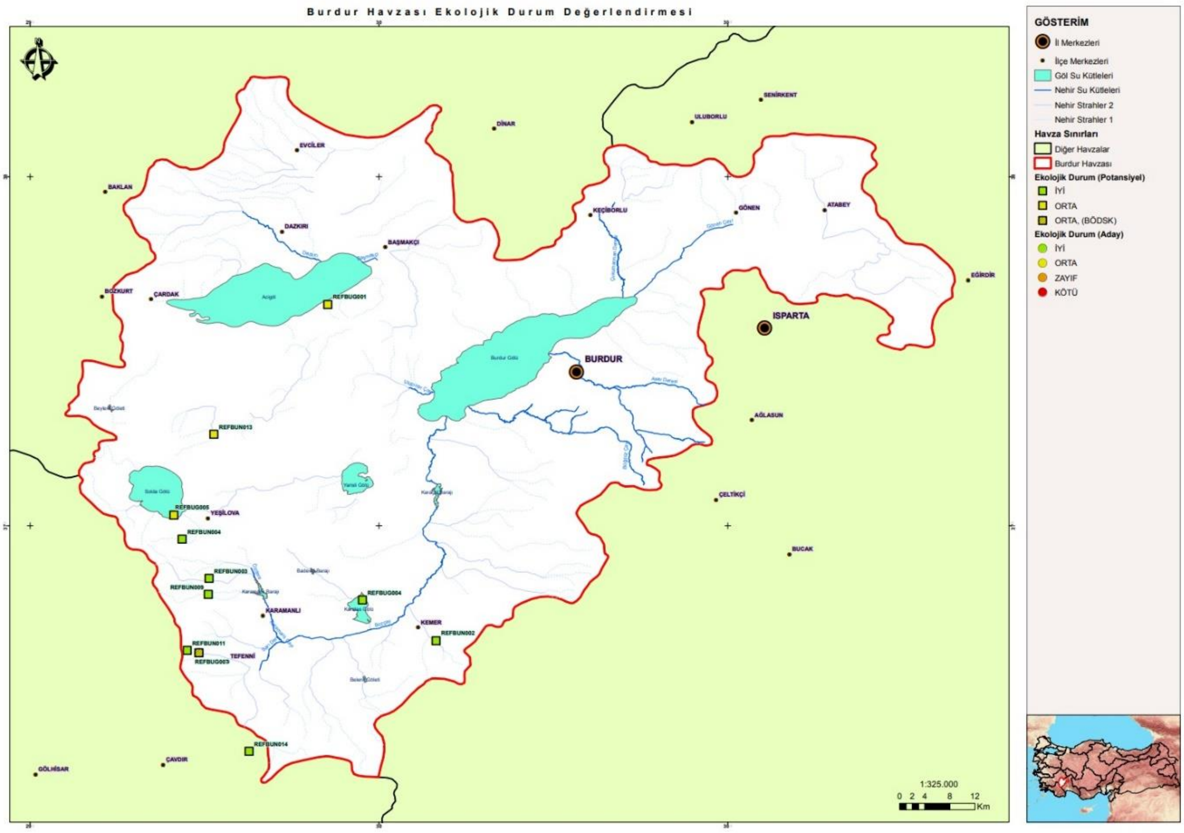
Graphical User Interface of National Water Information System (TRNWIS)

For the purpose of ecological-based assessment of water quality; biological, physicochemical, and hydromorphological monitoring studies were conducted in 25 basins across the country as part of the Project for the Establishment of a Reference Monitoring Network in Türkiye to identify natural and/or near-natural reference (unpolluted) sites that were not or minimally impacted by anthropogenic activities, and pristine water sources were identified.

Within the scope of the study, monitoring studies were carried out in a total of 17 locations in the Burdur River Basin, including 11 rivers, 6 lakes (4 natural, 2 heavily modified), and 12 reference (unpolluted) water sources were identified. In addition, the ecological status of the monitored water bodies in the Burdur River Basin was determined as a result of the monitoring activities.

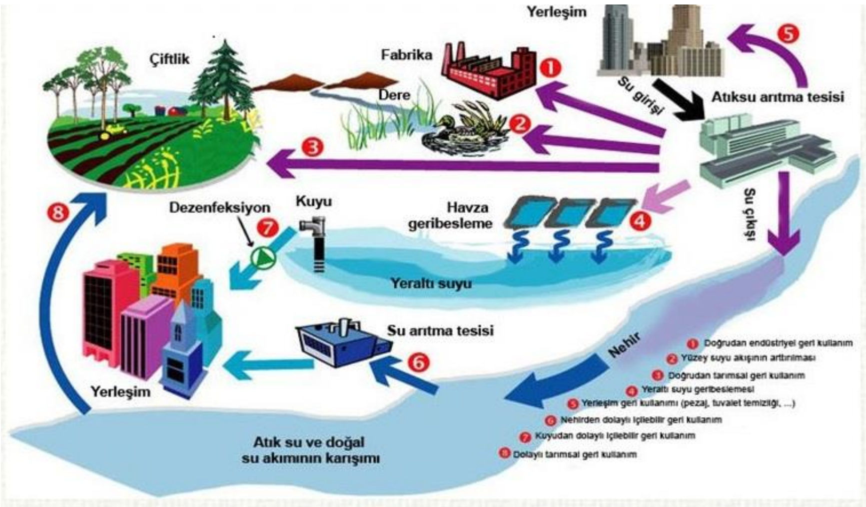
In the scope of monitoring activities, the smallest possible taxonomic level of all biological quality elements was identified and in this context 12 fish, 114 phytobenthos, 67 phytoplankton, 199 macroinvertebrate, and 24 macrophyte species were identified in the Burdur River Basin.

Additionally, for each biological quality element, the Reference Monitoring Network and Reference Monitoring Programs have been established, which include the monitoring stations determined in the reference sites, the parameters to be monitored at these stations, and the monitoring frequencies. In line with these monitoring programs, monitoring activities will be carried out regularly.



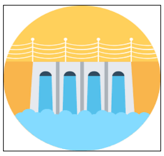
Ecological Status Assessment Results in the Burdur River Basin

WATER REUSE



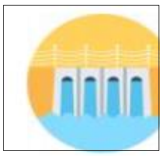
In the fight against possible water scarcity in our country in the future, it is necessary to develop practices related to the economical and planned use of existing water resources. One of these strategies, the option of reusing used water, is one of the most important methods of using water sparingly. With the recovery and use of used water, it is planned to reduce the need for existing water resources and to provide significant water savings. In the "Project for the Evaluation of Reuse Alternatives of Used Water", which was prepared specifically for 25 river basins in our country, both the reuse of wastewater treated in wastewater treatment plants and the water returned from agriculture were evaluated. With the evaluation, used water resources and reuse alternatives were determined. Used water resources was determined as waste water treated in wastewater treatment plants, drainage water returning from agriculture, cooling water and rain water. In the light of all this information, in the evaluation made specifically for the Burdur basin, the wastewater treated in the wastewater treatment plants and the water returned from the agriculture were determined as used water resources.

As a result of the calculations, the reuse potential, usage areas and gains of the used waters in the Burdur basin are given below.

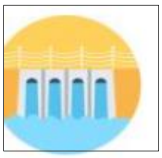


11,6 Milyon m^3
Depolama

2.973 ha
Tarım Alanı
Sulaması



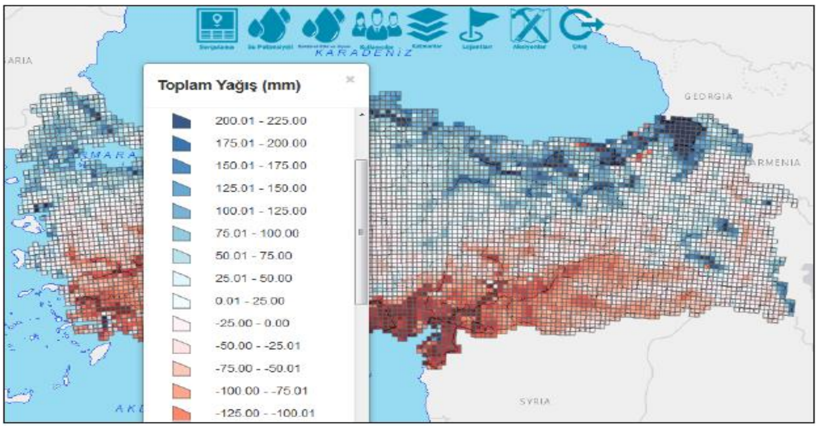
2,3 milyon m^2
Peyzaj Alanı
Sulaması



29,5 Milyon m^3
Çevresel Kullanım

IMPACTS OF CLIMATE CHANGE

The project on impacts of climate change on water resources was finalized in 2016.



According to the climate change projections made for 2015-2100 period:

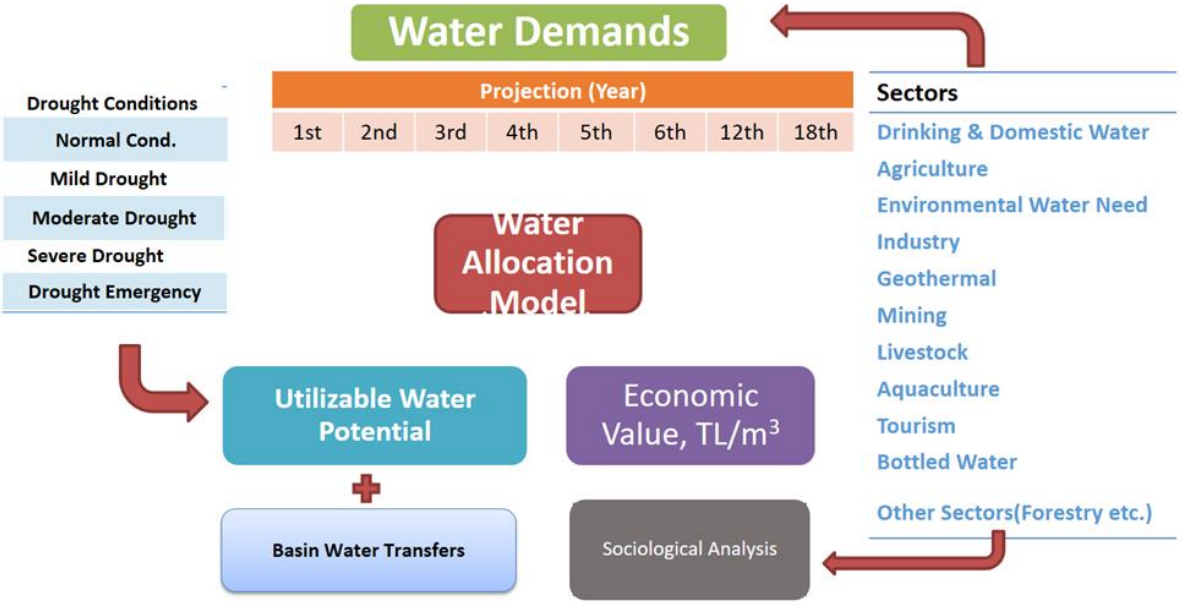
It is expected that there will be a continuous increase in average temperatures. It is expected that the average temperature of the basin, which was 12,3°C according to 1971-2000 observations, willincrease by at least 1,9°C, maximum 5,1°C in 2071-2100 period.

According to the observations of 1971-2000, the average annual precipitation amount of the reference period of the basin was determined to be 508,7 mm. According to the results of the projection carried out, there is a decrease tendency in the total precipitation compared to the reference period (1971-2000), and it is predicted that the basin will receive 25% less rainfall compared to the reference period in 2071-2100.

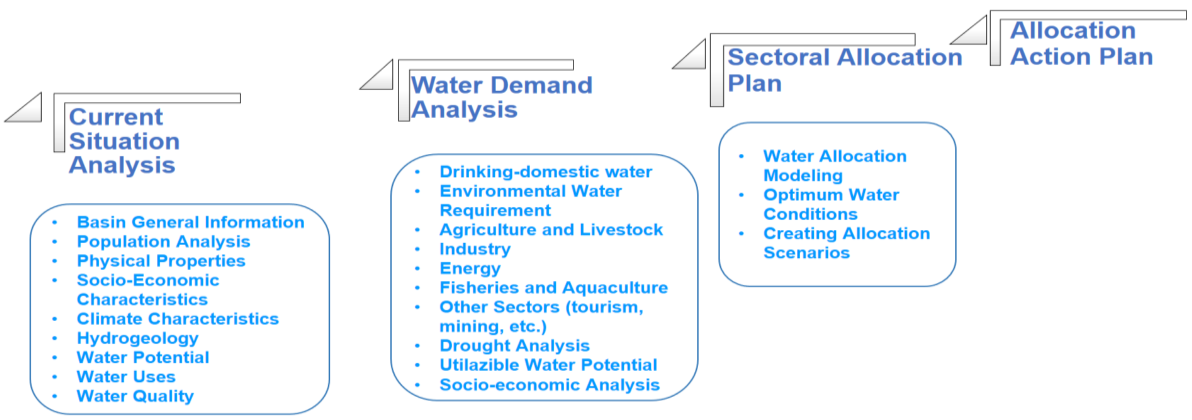
DSİ (Directorate General for State Hydraulic Works) data were used for hydrological model studies and the mean gross water potential of the basin for the reference period was determined to be 606 million ^{3}/year. With the effect of climate change, it is predicted that in the period 2071-2100, the gross water potential of the basin could decrease up to 85%. However, in the same period, it is expected that the annual amount of water available will notmeet the total water need, and the water deficit will be around 495 million m^3/year. As a result of the hydrogeological studies carried out, the hydrogeological reserve of groundwater of the basin was determined to be 49 km^3. The technically and economically usable amount of this reserve, the possible reserve is calculated to be 26 km^3. It is estimatedthat at the end of the century under the effects of the climate change, the hydrogeological reserve of the basin will decrease by 14% and possible reserve by 26%.

SECTORAL WATER ALLOCATION PLAN

The increasing need and demand for water resources and the lack of availability of them in the desired quantity and quality, both spatially and temporally, require the most efficient use of existing resources for economic, environmental, and social benefits. Sectoral Water Allocation Plans are prepared to ensure the sharing of water resources at the basin and sub-basin scale, to plan for the future and to meet the water needs of each sector in an efficient and sustainable way by taking into account all drought conditions (normal, mild, moderate, severe and drought emergency).

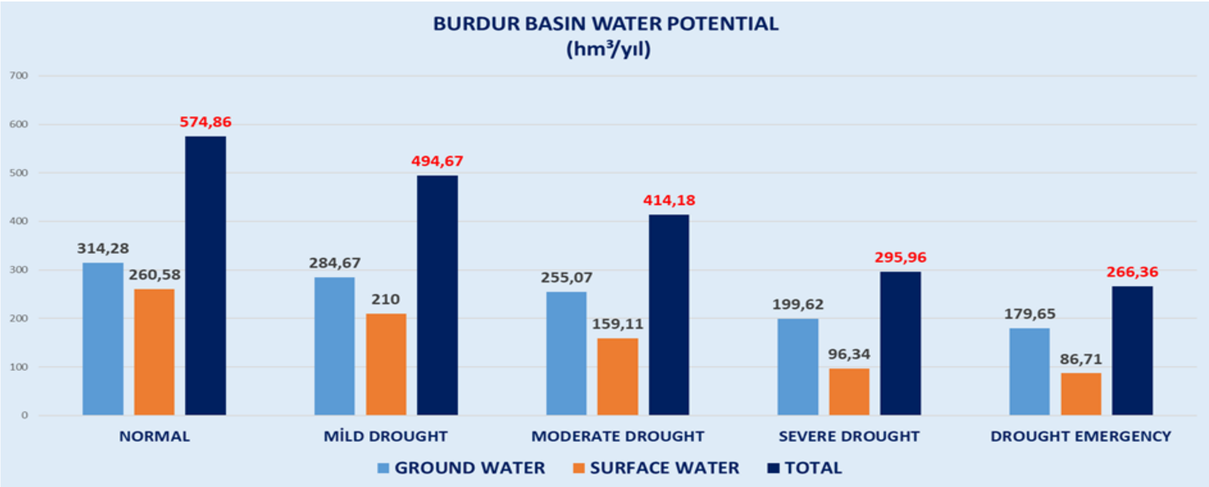


Within the scope of the Sectoral Water Allocation Plans, the current status of the water resources potential at the basin/sub-basin scale is determined. Afterward, based on the results of the drought and climate change adaptation studies; the normal, mild drought, moderate drought, severe drought, and drought emergency conditions and the temporal (the first 6 years, 12th, and 18th years following the end of the project) and sub-basin-wide sectoral changes of water potential are identified in the basin.



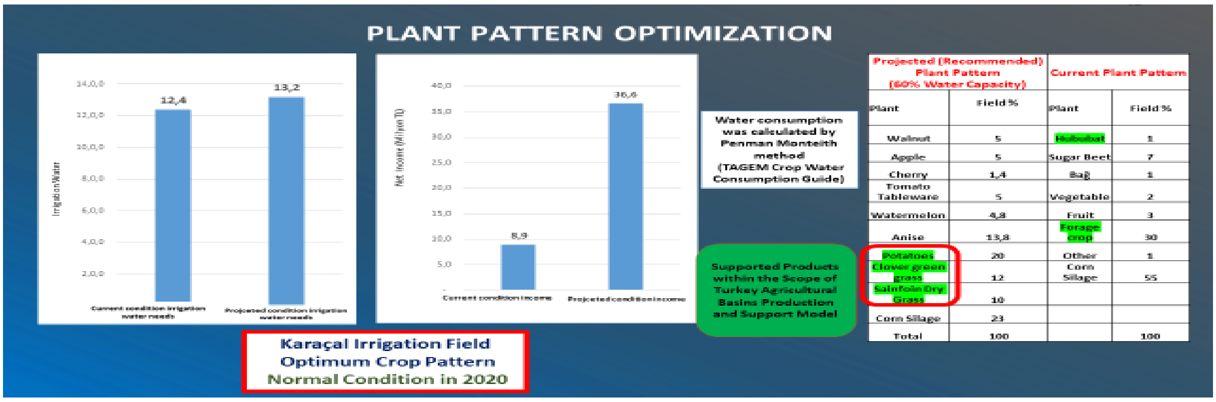
After calculating the water needs of each sector in all projection years; all physical, hydrological, socio-economic, and water quantity data obtained from the analysis studies are correlated with each other and sectoral water allocation plan scenarios are prepared through the model found appropriate. Moreover, in the water allocation model, sectoral prioritization is made by taking into account the socio-economic, hydrological structure, and water potential of the basin.

Burdur Basin Sectoral Water Allocation Plan studies were completed in 2020. In Burdur Basin, the total water potential was determined as 574,86 hm^3, 260,58 hm^3 above ground and 314,28 hm^3 underground in normal conditions and 40 water allocation scenarios have been studied.

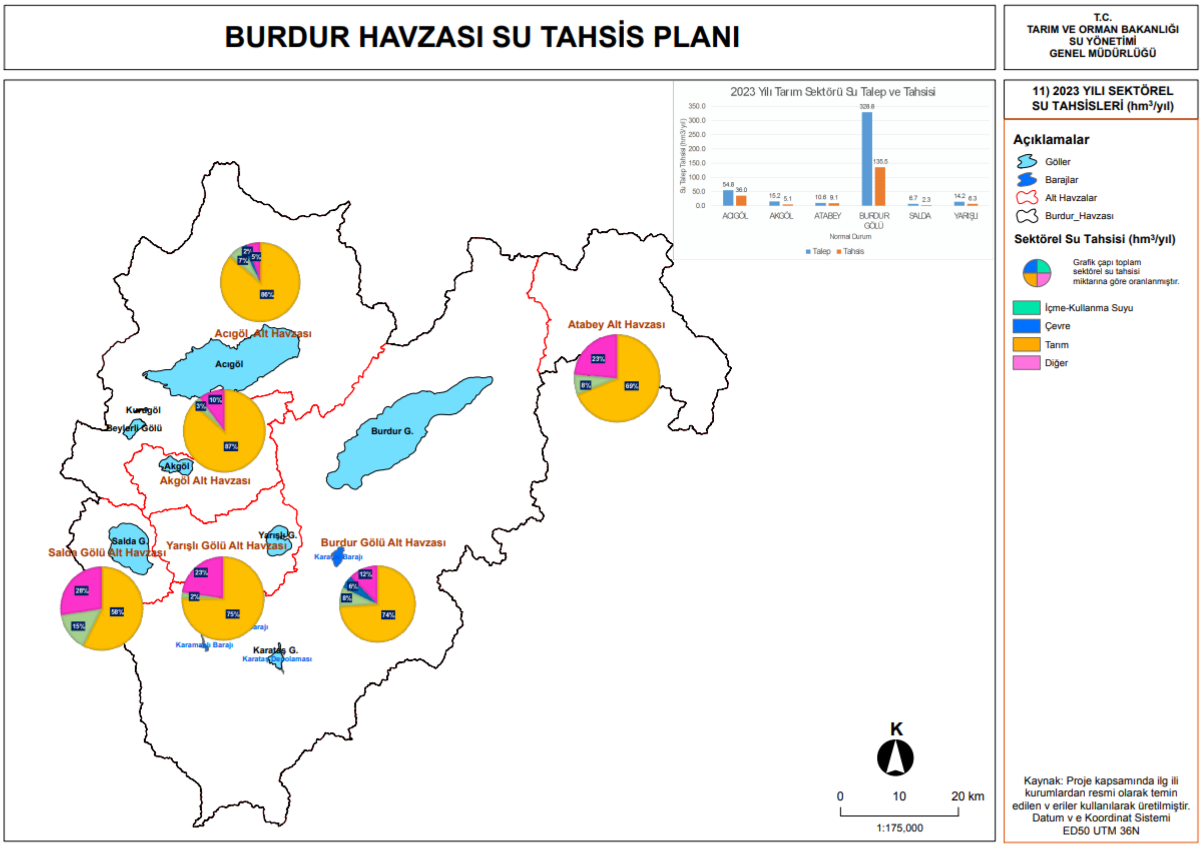


While prioritizing the sector in the water allocation model; criteria such as the hydrological structure of the basin, climatic conditions, drought situation, and socio-economic structure are taken into account. Therefore, sectoral prioritizations differ from basin to basin. However, the first priority is always given to drinking-domestic water and environmental water needs.

One of the most critical issues in Sectoral Water Allocation Plans is plant pattern optimization studies for different drought conditions in the agricultural sector, which uses a significant part of our country's water potential. By determining the water needs of the agricultural sector in advance and predicting possible droughts; optimum plant patterns are created that will enable the producers to continue production and increase their net income even they are faced with decreasing surface and groundwater resources.



In the plan, the economic added value of the currently allocated water in the sectors and the economic added values within the scope of the planned scenarios are calculated. By determining the optimization of the benefits of water allocation and taking into account all drought conditions, the allocation plan is created on a basin / sub-basin basis. By determining the potential of water resources, the changes, and sectoral developments; Optimum sectoral water usage conditions are decided by taking into account the social effects while maximizing the economic benefit.



Within the scope of Sectoral Water Allocation Plans, Action Plans are prepared in which all responsible/related institutions and organizations are determined for the measures and implementation of the measures. The measures determined in the Action Plan are followed up annually. Seyhan Basin Sectoral Water Allocation Plan and Action Plan entered into force with the Ministry Circular No. 2021/49.