BATI KARADENİZ RIVER BASIN

BATI KARADENİZ RIVER BASIN

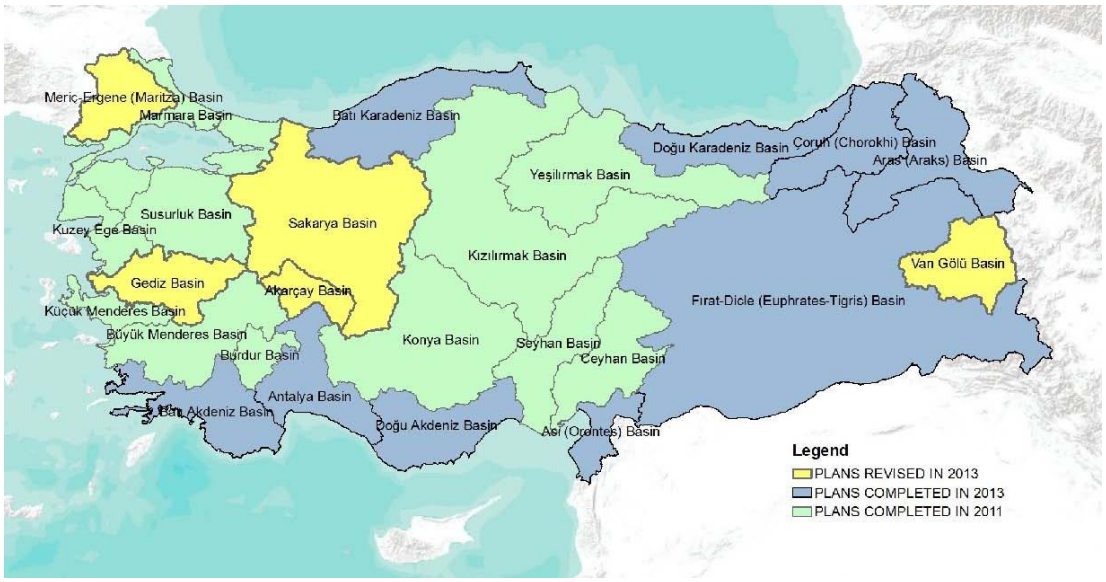
Batı Karadeniz (Western Black Sea) River Basin; consists of a collection of precipitation areas of small streams flowing into the Black Sea. From the east, surrounded by the catchtment division Çangal Mountain, Zindan Mountain, Küre Mountains, Ilgaz Mountains, Benli Mountain, Bolu Mountains, Kara Mountain, Işık Mountain, Elmacık Mountain are and from the north by the Black Sea.

The basin area is approximately 2,892,239 ha. The ratio of the basin to the area of Türkiye is 3.69%. The precipitation area of the Western Black Sea Basin is 29,682 km2. The annual average precipitation is 335 mm per m2. The average annual flow is 9.93 km³ and the average catchment yield is 10.6 l/s/km². Provinces and their areas in the Basin are given in the table below.

Province	Province Area (ha)	Province Area in the Basin (ha)	Ratio of the Province in the Basin (%)	Ratio of the Part in The Basin to the Total Province Area (%)
Bartın	229.427	229.427	8,0	100
Bolu	840.777	390.923	13,6	46,5
Düzce	316.564	261.641	9,1	82,7
Karabük	407.668	407.668	14,2	100
Sinop	570.850	312.704	10,9	54,7
Zonguldak	328.481	328.481	11,4	100
Kastamonu	1.314.292	737.188	25,6	56,1
Çankırı	721.772	163.559	5,7	22,7
Sakarya	486.367	28.285	1,0	5,8
Samsun	994.927	20.619	0,7	2,1

RIVER BASIN PROTECTION ACTION PLANS

The quantities, densities and weights of the existing surface, thickness and coastal waters in the basin and excessive, industrial, user, economic etc. in the heap. Determination of the pressure and load due to acquisition; detailed analysis of the current amount of water savings and use in the basin, and the protection and loads determined on the basis of the basin; creation of water quality maps; identification of building infrastructure structures; Operations and plans, programs and finalizations for the protection of the basin, the reduction and accumulation of pollution, the spread of all erosions in the basin and the conservation of short, medium and long-lasting lives were prepared in 2013.



Short, medium and long term measures for Batı Karadeniz River Basin can be grouped as below:

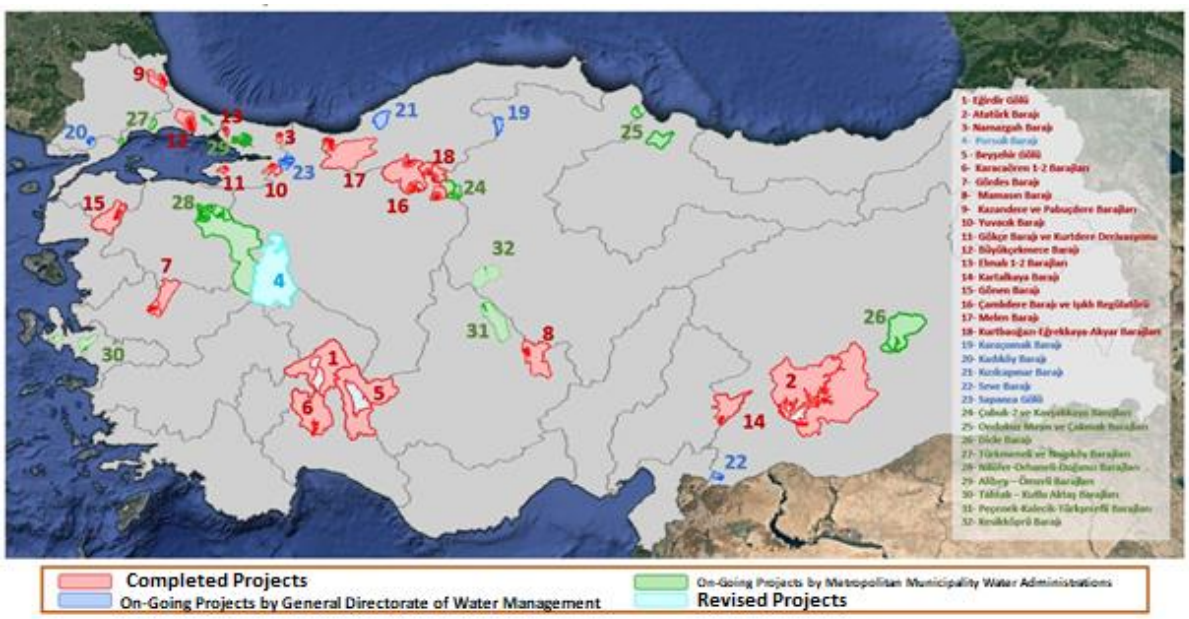
1. Urban Wastewater Management 2. Industrial Wastewater Management 3. Urban Waste Management 4. Non-Point Source Pollution Management 5. Forestation, Erosion and Sedimantation Control 6. Sewage Sludge Management 7. Conservation Studies for Drinking Water Basins 8. Flood Management	9. Drought Management 10. Monitoring, Inventory and Water Information System Studies 11. Water Investments 12. Water Re-use 13. Impacts of Climate Change on Water Resources 14. Sectoral Allocation Plans 15. Planning for Hotspots

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.

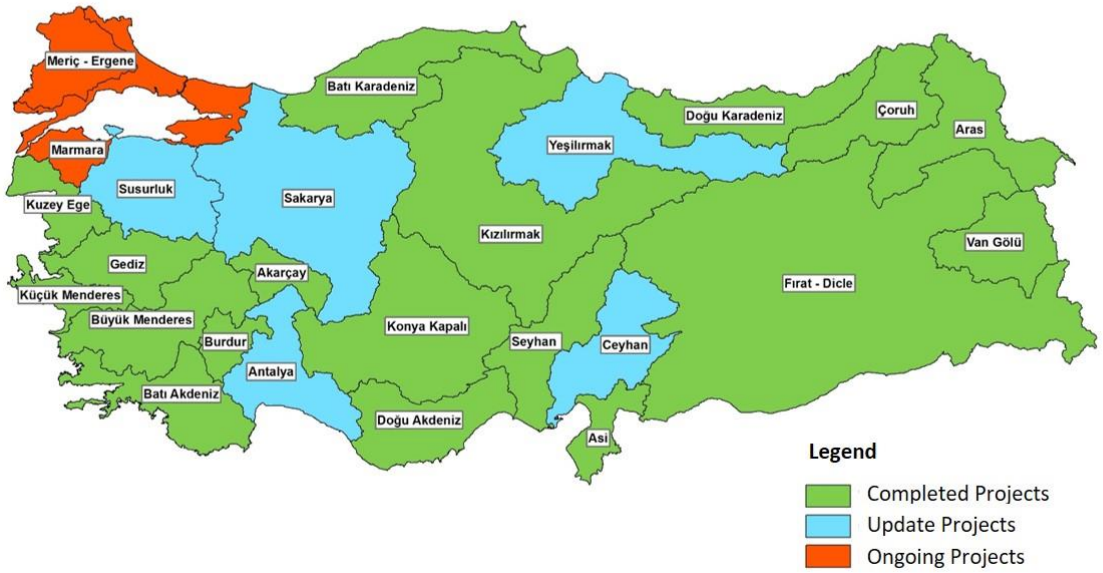
According to the Regulation on the Protection of Drinking-Water Basins:

- 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.

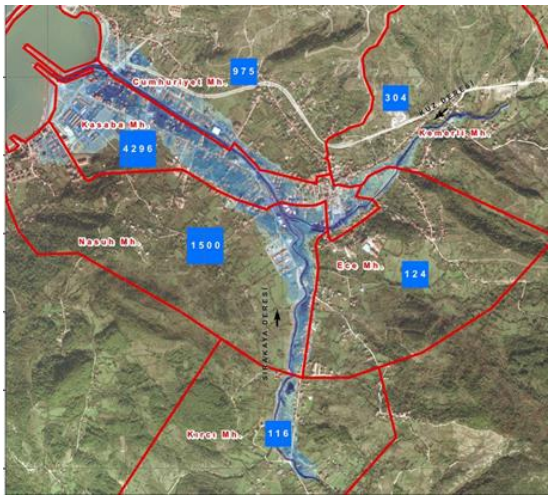


FLOOD MANAGEMENT PLANS

Batı Karadeniz River Basin Flood Management Plan (FMP) was completed in 2019.



Flood Hazard and Flood Risk maps are generated within the scope of Batı Karadeniz 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 Batı Karadeniz Basin, 239 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

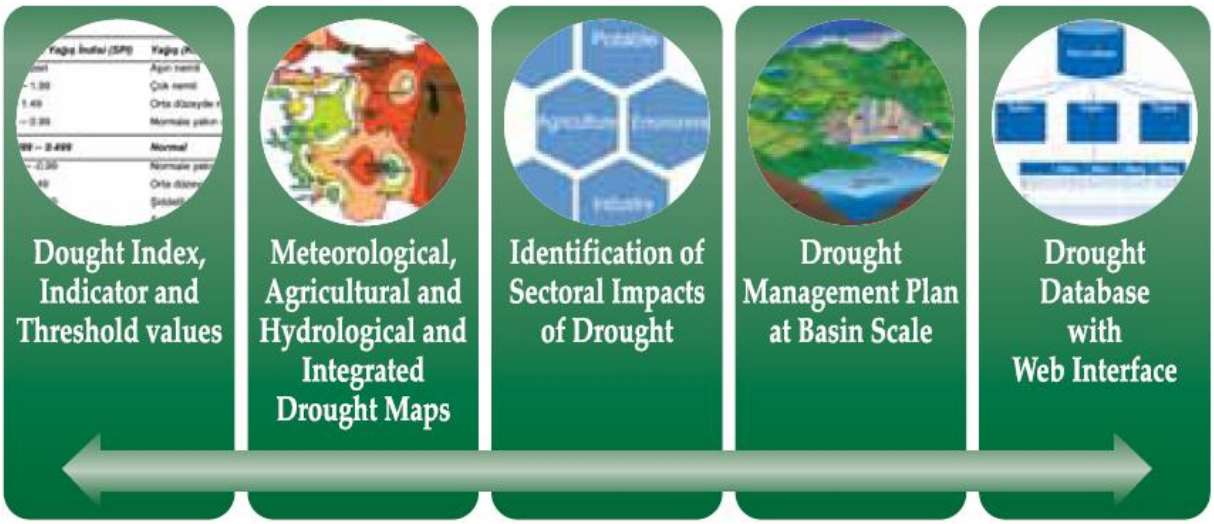
Mitigation measures determined within the scope of the plan are still being tracked via the Flood and Drought Plans Tracking Web Application in 2019 and the National Water Information System (USBS) in 2020.

DROUGHT MANAGEMENT

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.

Batı Karadeniz Basin DMP is expected to complete by 2023.

Studies During the Preparation of Drought Management Plans:

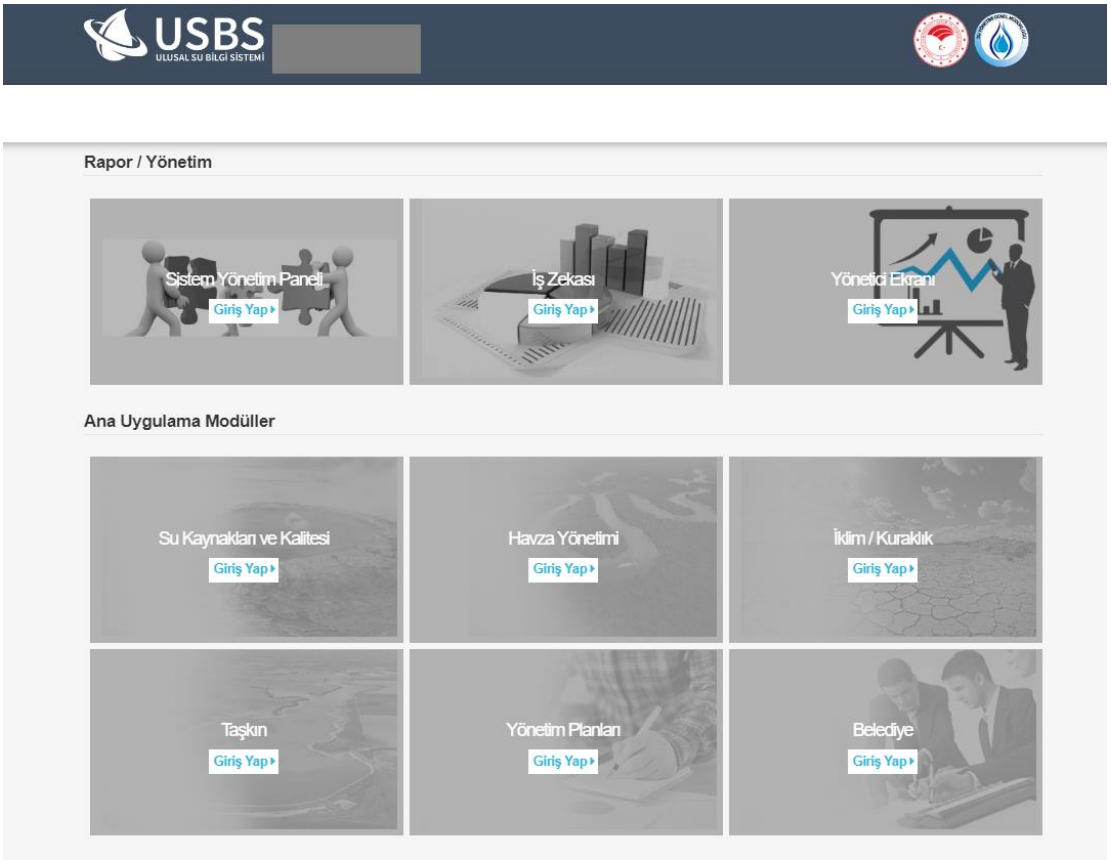


The measures to be determined within the scope of the plan will be followed through the tracking system of our General Directorate, the National Water Information System (USBS).

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 production of data repeatedly,
- 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.



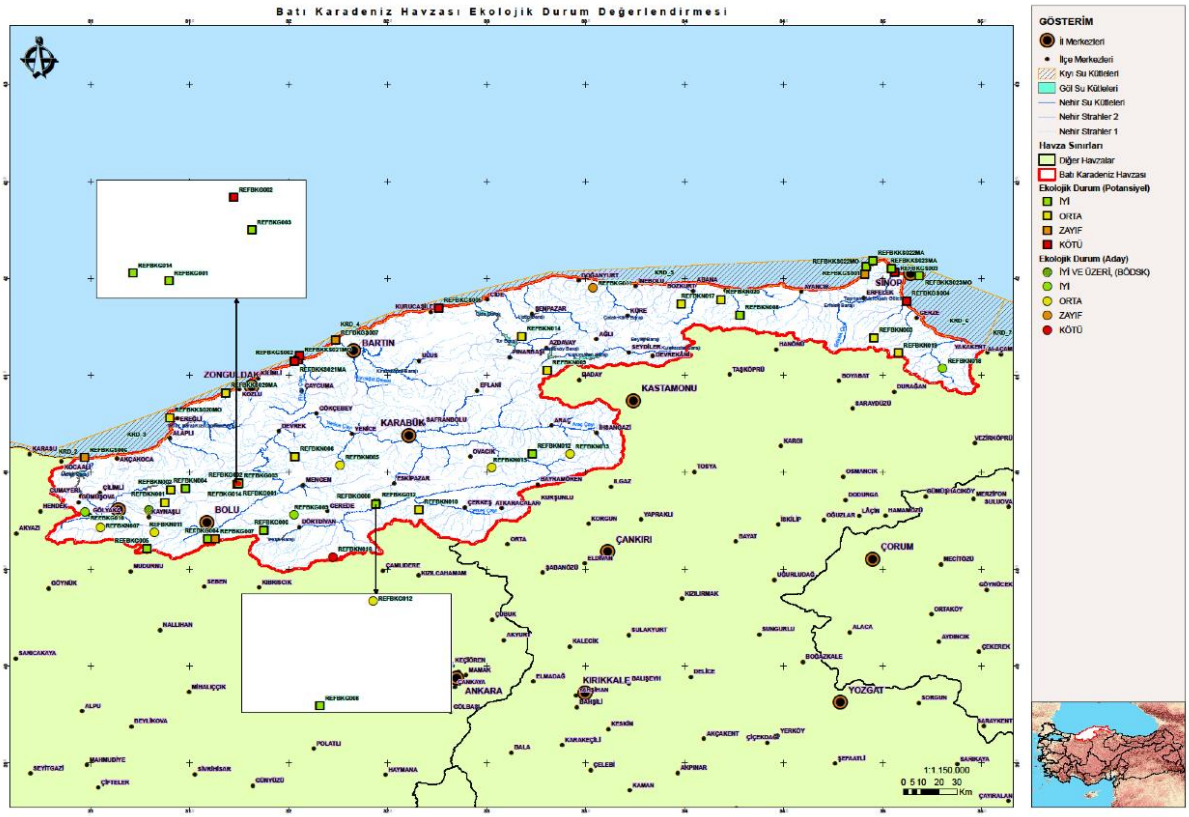
Graphical User Interface of National Water Information System (TRNWIS)

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 49 locations in the West Black Sea River Basin, including 20 rivers, 14 lakes (13 natural, 1 heavily modified), 7 transitional waters, and 8 coastal waters, and 42 reference (unpolluted) water sources were identified. In addition, the ecological status of the monitored water bodies in the West Black Sea 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 17 fish, 174 phytobenthos, 413 phytoplankton, 782 macroinvertebrate, 138 macroalgae/angiosperm, and 85 macrophyte species were identified in the West Black Sea 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.



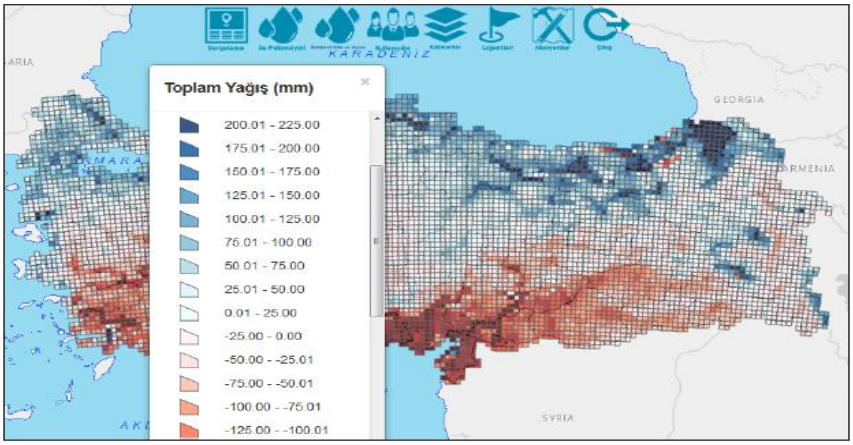
Ecological Status Assessment Results in the West Black Sea River Basin

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 Western Black Sea basin, the wastewater treated in the wastewater treatment plants and the water returned from agriculture were determined as used water resources.

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 **11,6ºC** according to 1971-2000 observations, will **increase** by **at least 1,6°C**, **maximum 4,7ºC** 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 **741,6 mm**. According to the results of the projection carried out, the amount of precipitation is above the reference period (1971-2000), and it is predicted that the basin will receive **8% more** rainfall compared to the reference period in **2015-2020**. It is expected that rainfall increases for this period will predominate in the **coastal** parts of the basin.

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 **10.346 million ^{3}/year**. With the effect of climate change, it is predicted that in the period **2015-2020**, the gross water potential of the basin could **decrease up to 50%**. Despite this, it is expected that the total water need of the basin can be met until 2100 and there will be no water deficit in the basin.

As a result of the hydrogeological studies carried out, the hydrogeological reserve of groundwater of the basin was determined to be **93 km^3**. The technically and economically usable amount of this reserve, the possible reserve is calculated to be **55 km^3**. It is estimated that at the end of the century under the effects of the climate change, the hydrogeological reserve of the basin will decrease by **11%** and possible reserve by **18%**.