

MARMARA RIVER BASIN



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Marmara Basin; covers the precipitation areas of all the rivers, except the Susurluk River, which flow into the Marmara Sea, the rivers that flow into the Gulf of Saros, and all the rivers that flow into the Black Sea between the Kocaeli-Sakarya border and the Bulgaria border.



Marmara River Basin

The annual water potential of the Marmara Basin has been calculated by State Hydraulic Works as 5.85 billion m³. The basin area is 2,308,464 ha and the ratio of the basin to the area of Türkiye is 3%. İstanbul, Kocaeli, Balıkesir, Bursa, Çanakkale, Kırklareli, Tekirdağ, Edirne and Yalova provinces are partially or completely in the basin's borders. Provinces and area information in the basin are given in the table below.

<i>Province</i>	<i>Population of the Province</i>	<i>Population in the Basin</i>	<i>Ratio of the Part in The Basin to the Total Province Area (%)</i>	<i>Ratio of the Population in the Basin to the Population of the Basin (%)</i>
İstanbul	14.804.116	14.804.116	100	82,5
Kocaeli	1830772	1830772	100	10,2
Çanakkale	519793	411429	55,5	2,3
Bursa	2901396	295083	9,3	1,6
Tekirdağ	972875	261227	51,2	1,5
Yalova	241665	241665	100	1,3
Balıkesir	1196176	69669	4,2	0,4
Kırklareli	351684	14647	2,4	0,1
Edirne	401701	12965	1,2	0,1
Total	23.220.178	17.941.573	-	100

RIVER BASIN PROTECTION ACTION PLANS

Türkiye prepared River Basin Protection Action Plans (RBPAP) for all 25 river basins in order to reduce pollution and protect and improve basins by defining short, medium and long-term measures with participation of all stakeholders in 2013. Main aim for these plans were determination of the pressure and effects caused by the urban, industrial, agricultural, economic, ...etc. activities and the amount, characteristics and pollution status of the existing surface, underground and coastal waters in basins; having a detailed basin scale examination of the amount and potential use of the existing water resources and pollution sources/loads; preparation of water quality maps; determination of environmental infrastructure status.

Meanwhile, Basin Management Committees were also formed and the implementation of the measures determined by the RBPAPs began to be followed since 2013.



Short, medium and long term measures for The Doğu Akdeniz River Basin can be grouped as below: The implementation of the following actions is monitored within the scope of the Basin Protection Action Plan.

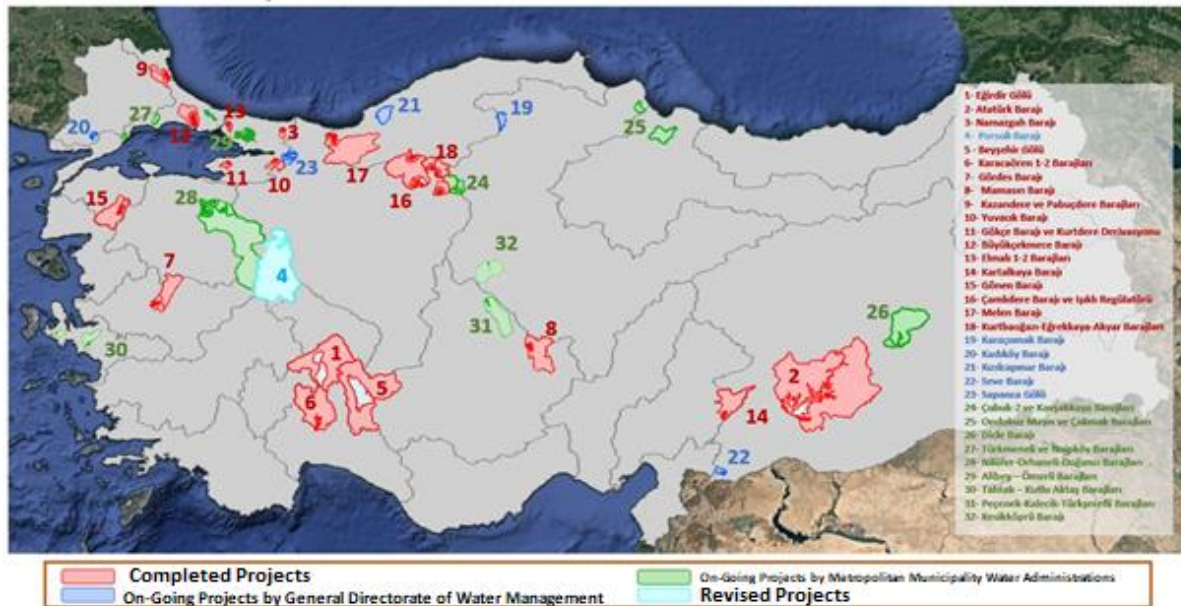
1. Urban Wastewater Management	9. Drought Management
2. Industrial Wastewater Management	10. Monitoring, Inventory and Water Information System Studies
3. Urban Waste Management	11. Water Investments
4. Non-Point Source Pollution Management	12. Water Re-use
5. Forestation, Erosion and Sedimentation Control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

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.

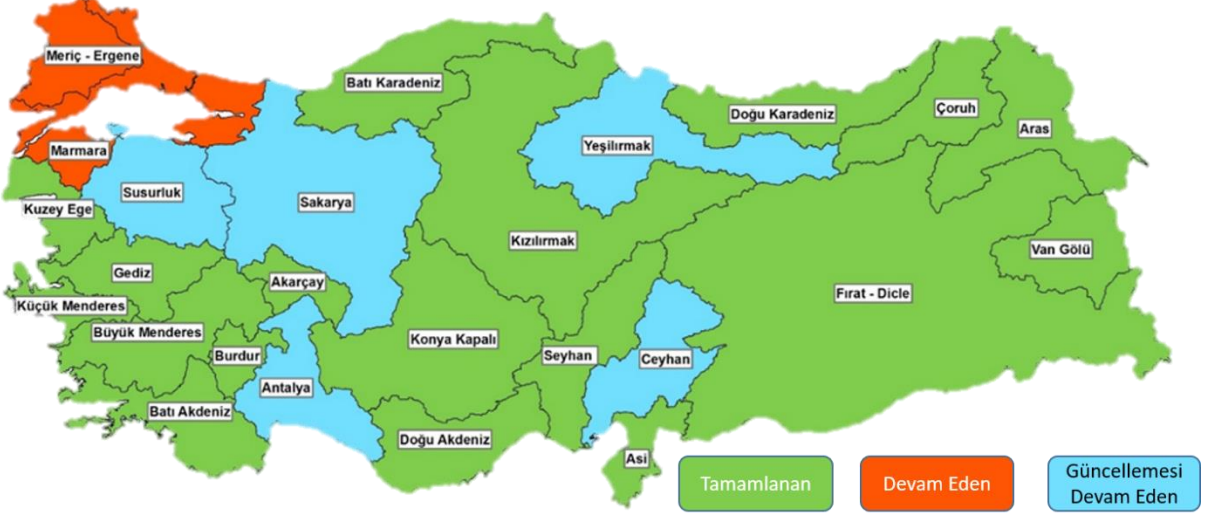
According to the Regulation on the Protection of Drinking-Water Basins:

- 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.

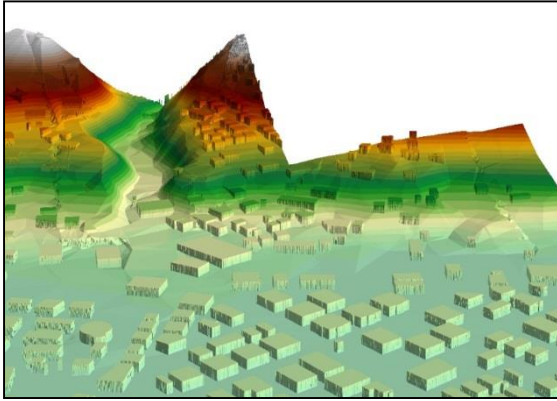


FLOOD MANAGEMENT PLAN

Marmara Basin Flood Management Plan (FMP) was completed in 2023.



Flood Hazard and Flood Risk maps are generated within the scope of Marmara 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 Marmara Basin, 1112 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
- Stream rehabilitation
- Improvement of the performance of regulators
- Flood forecasting and early warning system

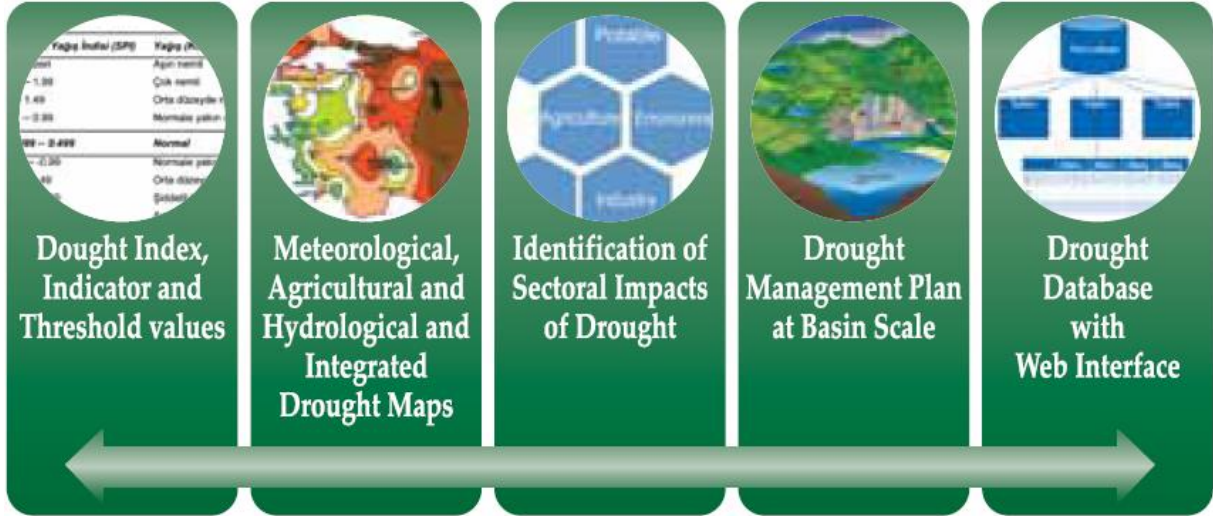
Mitigation measures determined within the scope of the plan are still being tracked via the Flood and Drought Plans Tracking Web Application in 2019 and the National Water Information System (USBS) in 2020.

DROUGHT MANAGEMENT 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. Kızılırmak Basin DMP was started at 2021 and it is planning to complete by 2023.



Studies During the Preparation of Drought Management Plans:



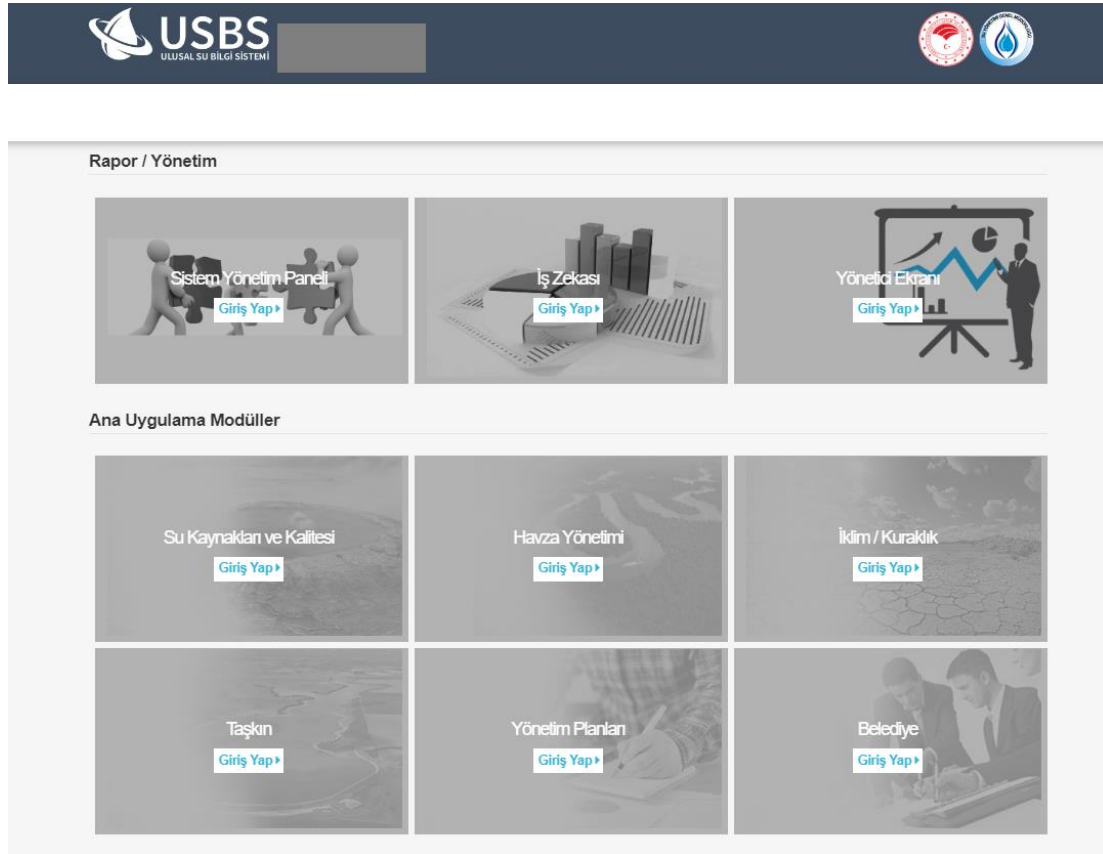
In order to minimize the negative effects of possible future droughts on the basins, the measures that will ensure the transition of the basin from drought crisis management to risk management, from the modernization of irrigation systems to the treatment and use of wastewater, will be determined in detail in the Drought Management Plans.

As of 2023, the measures determined within the scope of the plan will be started to be followed through the Flood and Drought Plans Tracking Web Application and 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 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)

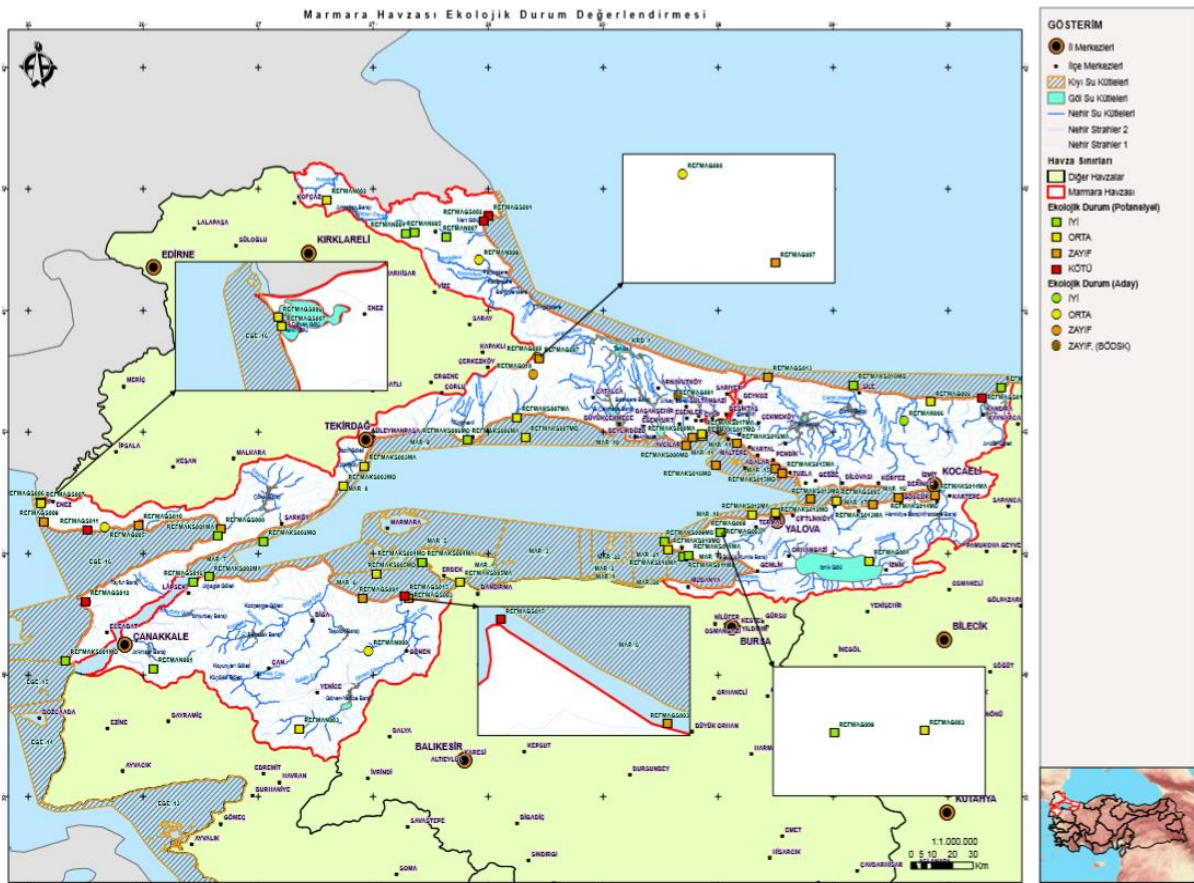
For the purpose of ecological-based assessment of water quality; biological, physicochemical, and hydromorphological monitoring studies were conducted in 25 basins across the country as part of the Project for the Establishment of a Reference Monitoring Network in Türkiye to

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 69 locations in the Marmara River Basin, including 9 rivers, 9 lakes (8 natural, 1 heavily modified), 16 transitional waters, and 35 coastal waters, and 55 reference (unpolluted) water sources were identified. In addition, the ecological status of the monitored water bodies in the Marmara 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 45 fish, 157 phytobenthos, 355 phytoplankton, 700 macroinvertebrate, 117 macroalgae/angiosperm and 62 macrophyte species were identified in the Marmara 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 Marmara River Basin

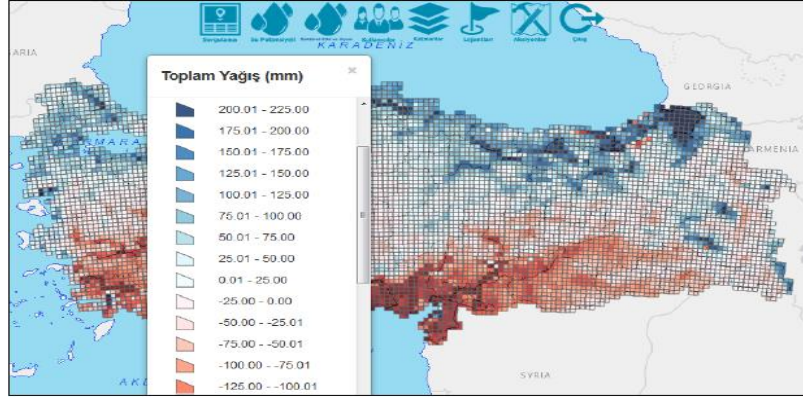
WATER REUSE



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 Marmara 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 **13,9°C** according to 1971-2000 observations, will **increase by at least 1,5°C, maximum 4,6°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 **679,2 mm**. According to the results of the projection carried out, there is an **increase tendency** in the total precipitation compared to the reference period (1971-2000), and it is predicted that the basin will receive **13% more** rainfall compared to the reference period in **2071-2100**. It is expected that rainfall increases for this period will predominate in the **Black Sea coasts** 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 **8.566 million³/year**. With the effect of climate change, it is predicted that in the period **2041-2070**, the gross water potential of the basin could **decrease up to 50%**. Water transfer from the Batı Karadeniz, Sakarya and Meriç-Ergene Basins to the Marmara Basin is carried out so that the water need in the basin can be met at all times.

As a result of the hydrogeological studies carried out, the hydrogeological reserve of groundwater of the basin was determined to be **53 km³**. The technically and economically usable amount of this reserve, the possible reserve is calculated to be **29 km³**. 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 **6%** and possible reserve by **10%**.