YEŞİLIRMAK RIVER BASIN

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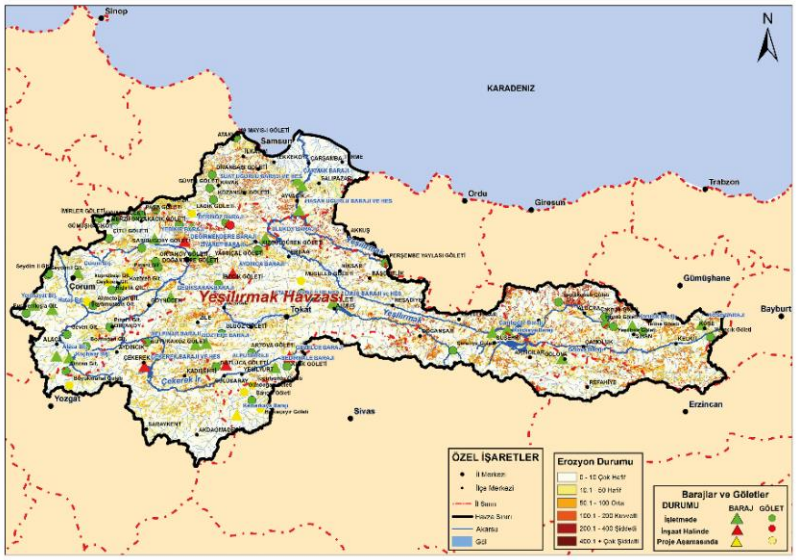
Yeşilırmak River Basin is located in the northern part of Anatolia and is surrounded by Canik, Giresun, Gümüşhane, Pulur, Çimen, Kızıldağ, Köse, Tekeli, Yıldız, Çamlıbel, Akdağlar, Karababa, İnegöl, water section line passing through Kunduz Mountain peaks and the Black Sea.



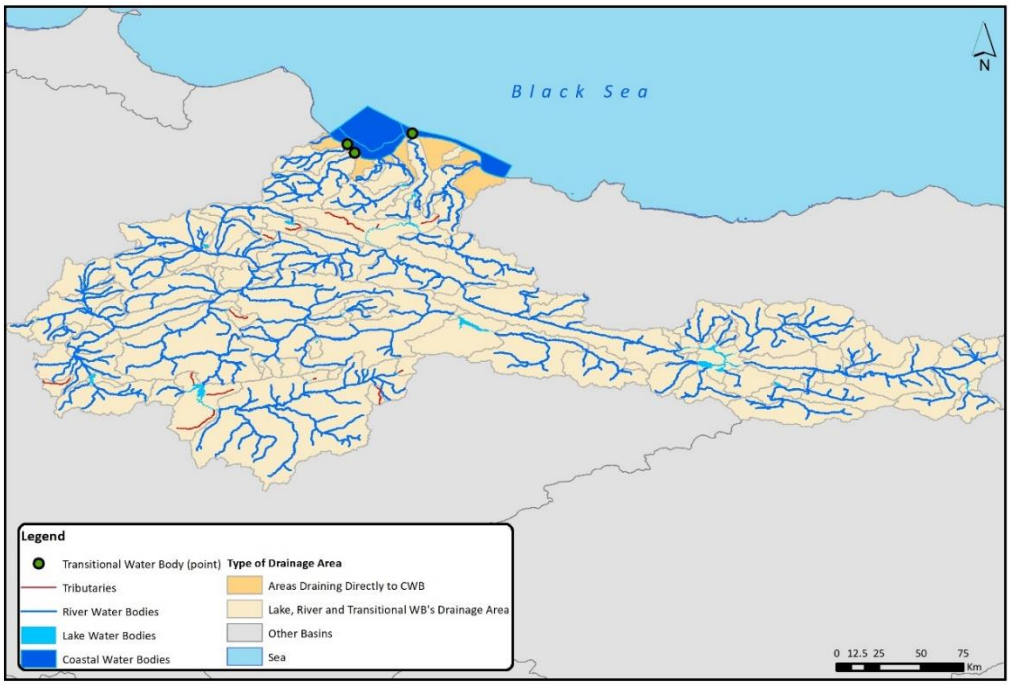
Yeşilırmak river basin area is approximately 3.873.280 hectares accounting to 5% of the overall area of Türkiye, and its long is 519 kilometres. There are 11 provinces within the Yeşilırmak Basin, namely, Tokat, Samsun, Amasya, Çorum, Sivas, Yozgat, Gümüşhane, Giresun, Erzincan, Ordu ve Bayburt. The spatial information of the provinces within the borders of the basin is given in the table below.

Provinces	***Area of the Province* (km^2)**	***Part of the Province in The Basin* (km^2)**	***Distribution of the Basin to the Provinces (%)***	***Ratio of the Part in The Basin to the Total Province Area (%)***
Tokat	998.200	998.200	26	100
Amasya	570.100	488.455	12	86
Samsun	957.900	480.732	12	50
Yozgat	1.412.300	423.801	11	30
Çorum	1.282.000	422.152	11	33
Sivas	2.848.800	411.489	10	14
Gümüşhane	658.500	282.805	7	43
Giresun	693.400	267.032	7	39
Erzincan	1.190.300	110.991	3	9
Ordu	600.100	61.381	1,5	10
Bayburt	365.200	3.191	0,1	1

RIVER BASIN MANAGEMENT PLAN

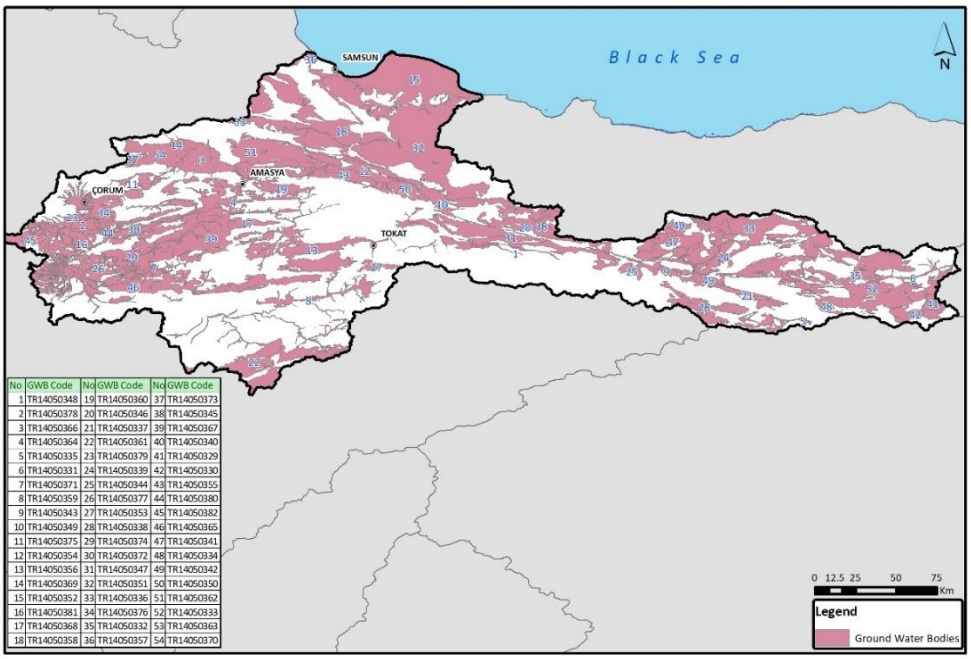
Yeşilırmak River Basin Management Plan (RBMP) was completed in 2021. Measures determined within the scope of RBMP are followed through the National Water Information System (USBS).

In the Yeşilırmak Basin; There are a total of 116 surface water bodies, of which 74 are river water bodies, 36 are lake water bodies, 3 are transitional water bodies and 3 are coastal water bodies.



Yeşilırmak Basin Surface Water Bodies

There are 54 groundwater bodies (GWB) in the Yeşilırmak Basin.



No	GWB Code	No	GWB Code	No	GWB Code
1	TR14050348	19	TR14050360	37	TR14050373
2	TR14050378	20	TR14050346	38	TR14050345
3	TR14050366	21	TR14050337	39	TR14050367
4	TR14050364	22	TR14050361	40	TR14050340
5	TR14050335	23	TR14050379	41	TR14050329
6	TR14050331	24	TR14050339	42	TR14050330
7	TR14050371	25	TR14050344	43	TR14050355
8	TR14050359	26	TR14050377	44	TR14050380
9	TR14050343	27	TR14050353	45	TR14050382
10	TR14050349	28	TR14050338	46	TR14050365
11	TR14050375	29	TR14050374	47	TR14050341
12	TR14050354	30	TR14050372	48	TR14050334
13	TR14050356	31	TR14050347	49	TR14050342
14	TR14050369	32	TR14050351	50	TR14050350
15	TR14050352	33	TR14050336	51	TR14050362
16	TR14050381	34	TR14050376	52	TR14050333
17	TR14050368	35	TR14050332	53	TR14050363
18	TR14050358	36	TR14050357	54	TR14050370

Yeşilırmak Basin Groundwater Bodies

3.594 measures have been determined in order to ensure that all water bodies in the Yeşilırmak Basin are in good status and that the ones that are in good status are protected. The main groups of measures are listed below.

- Construction of wastewater infrastructure
- Construction of a new WWTP with secondary treatment
- Control and management of sewage sludge in urban wastewater treatment plants
- Constructed wetland
- Construction, Improvement or Maintenance of leak-proof septic tanks
- Follow-up of areas designated for protection of economically significant aquatic species
- Surface Water discharges inventory, including monitoring and control
- Implementation of Action Plan for water efficiency in the agricultural sector
- Terracing sloping (>20%) agricultural lands
- Construction of Manure Gasification Plants
- Surface water abstractions inventory, including monitoring and control
- Good agricultural practices for the reduction and the control of the use of pesticides
- Good Agricultural Practices and Nutrient Management in non Nitrate Vulnerable Zones
- Implementation of Action Plan for water efficiency in the municipal sector
- Legal enforcement in mining, preparing and implementing waste management plans for disposal of mining wastes in mine waste storage facility
- Rehabilitation of mining sites that are abandoned or currently not in service

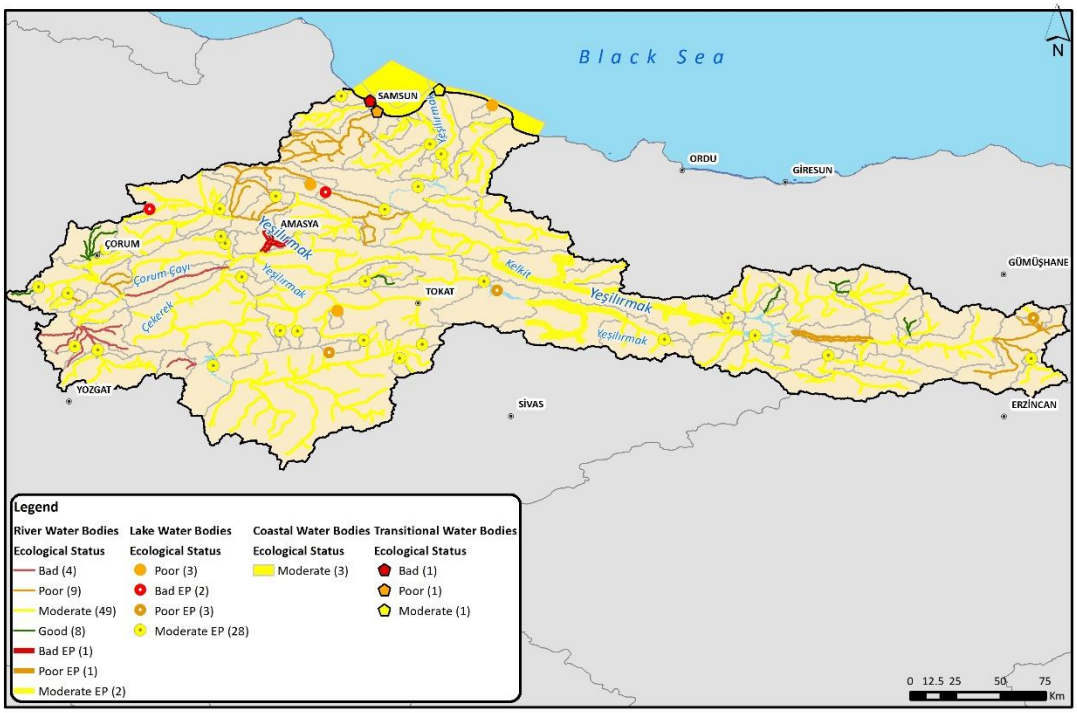
WATER QUALITY

Surface Water Status

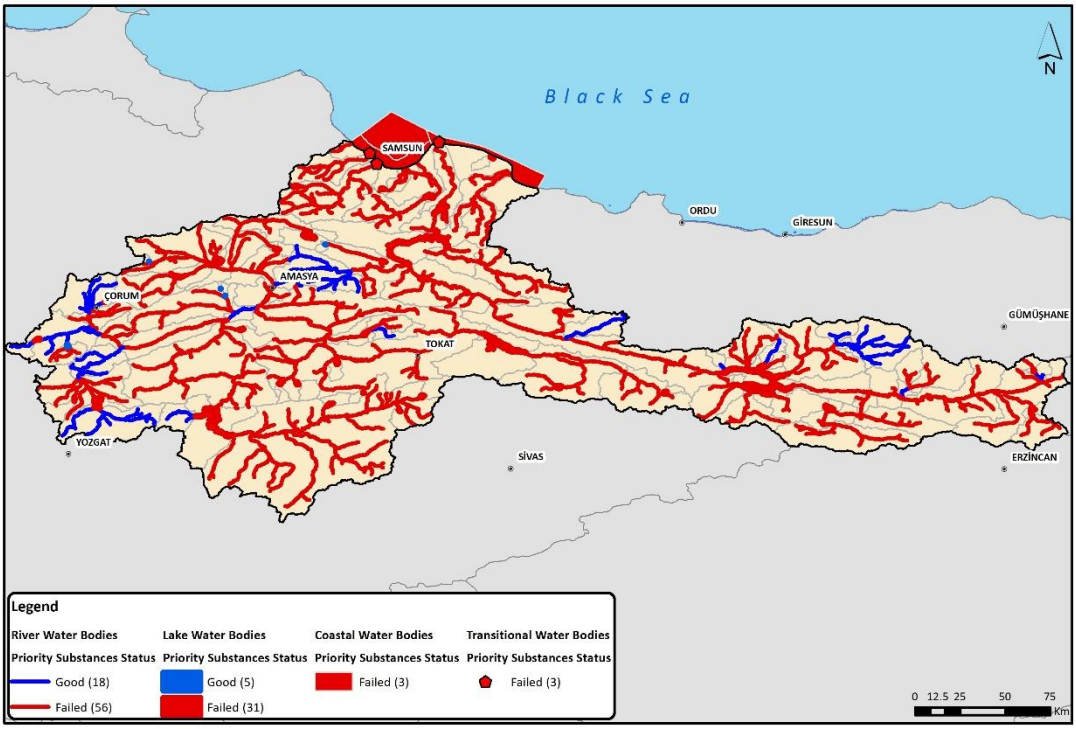
As a result of monitoring studies in rivers, lakes, coastal and transitional water bodies, their ecological and chemical status has been evaluated and their overall status has been determined. Accordingly, out of 116 water bodies, 8 are assigned as bad, 17 as poor and 84 as moderate status. There are 7 surface water bodies achieving the requirements related to the environmental objectives (good and above status) in the current situation.

Water Body Category	Good Status/ Potential and above	Moderate Status/ Potential	Poor Status/ Potential	Bad Status/ Potential
Rivers	7	52	10	5
Lakes	-	28	6	2
Coastal WB	-	3	-	-
Transitional WB	-	1	1	1
TOTAL	7	84	17	8

Yeşilırmak Basin Surface Water Bodies Overall Status



Yeşilırmak Basin Surface Water Bodies Ecological Status



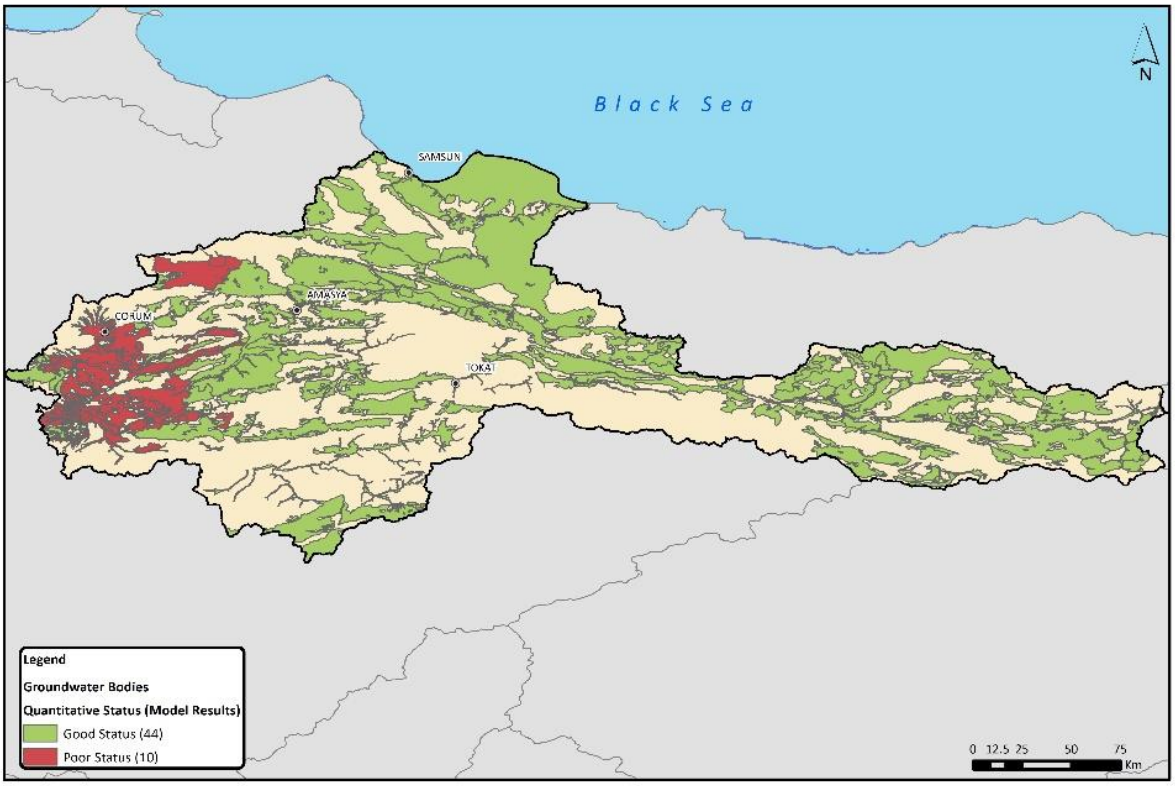
Yeşilırmak Basin Surface Water Bodies Chemical Status

Groundwater Status

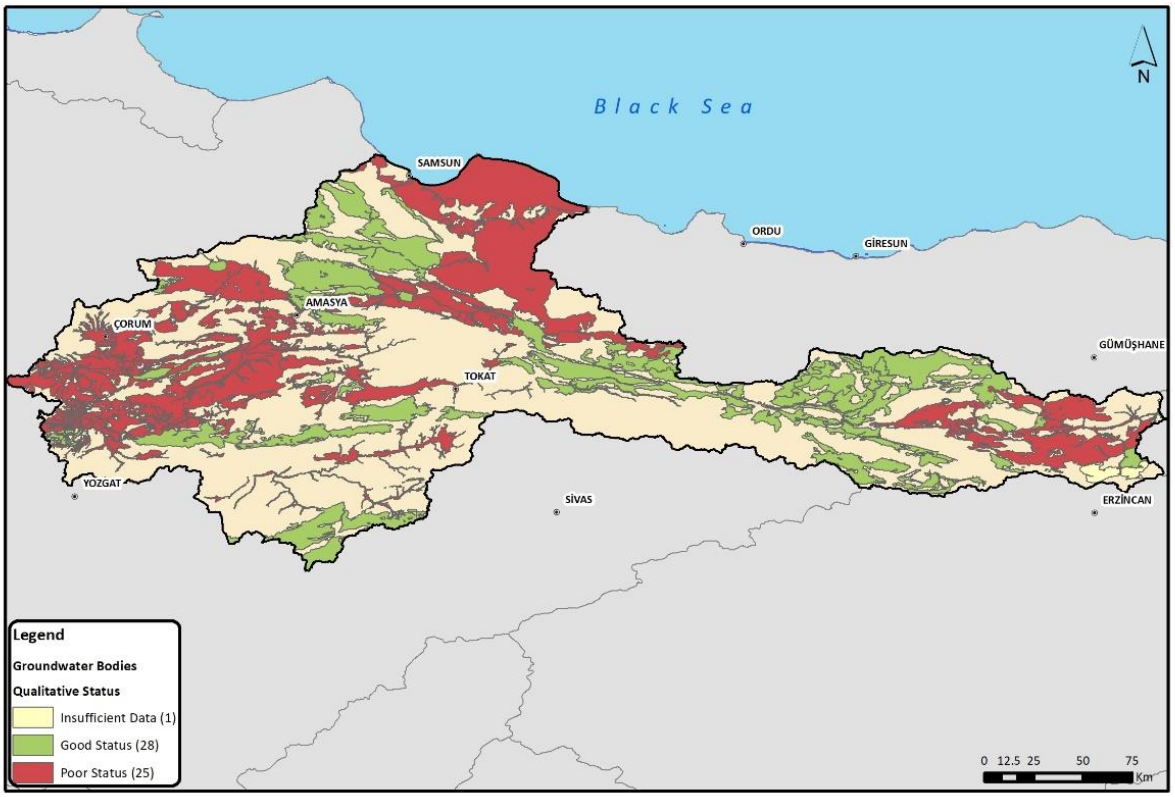
In Yeşilırmak Basin, groundwater bodies (GWB) status, both quantitative and chemical, are given in below maps. All in all, 26 GWBs have been classified as in "good status", 27 as in "poor status" and 1 as "insufficient data" out of 54 groundwater bodies.

Classification	Quantitative Status	Chemical Status	Overall Status
Good Status	44	28	26
Poor Status	10	25	27
Insufficient Data	0	1	1

Yeşilırmak Basin GWB Overall Status



Ground water bodies quantitative status assessment



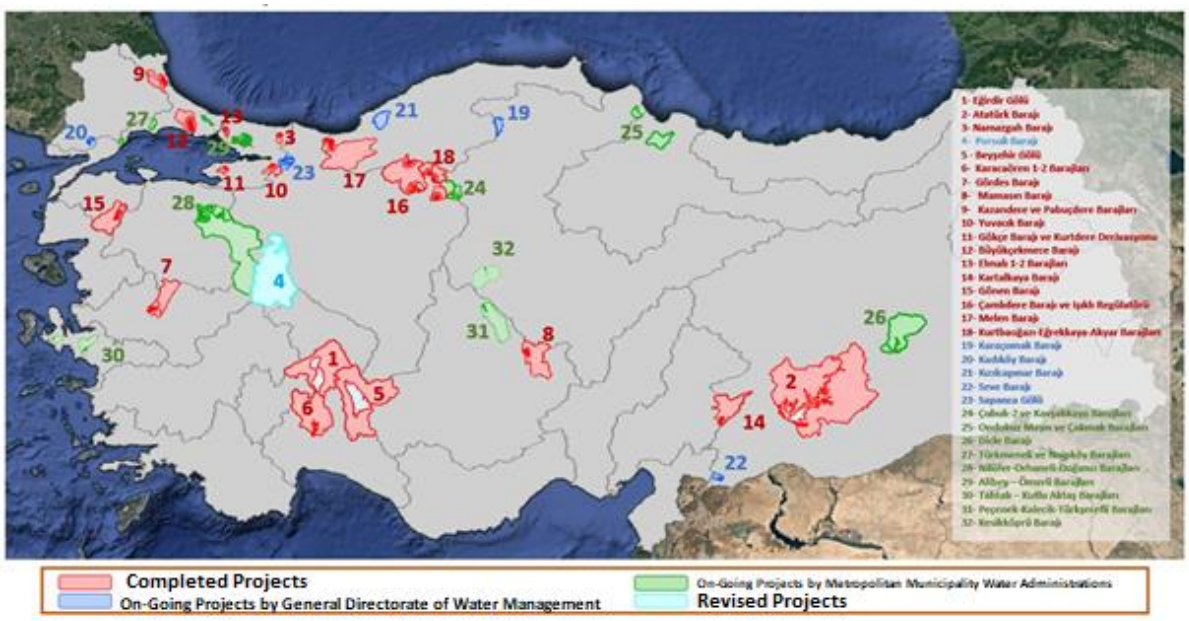
Ground water bodies qualitative status assessment

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.

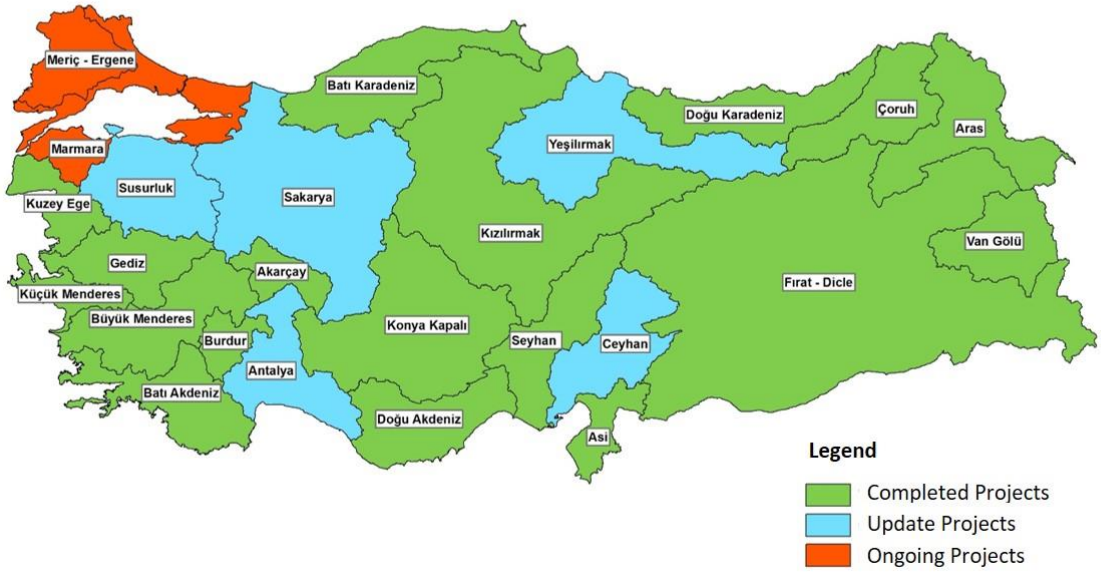
According to the Regulation on the Protection of Drinking-Water Basins:

- 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.

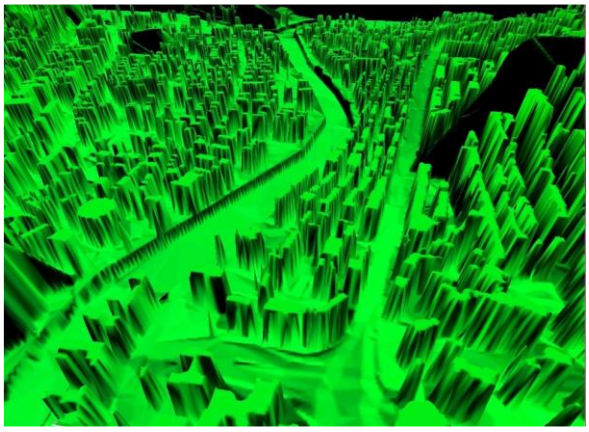


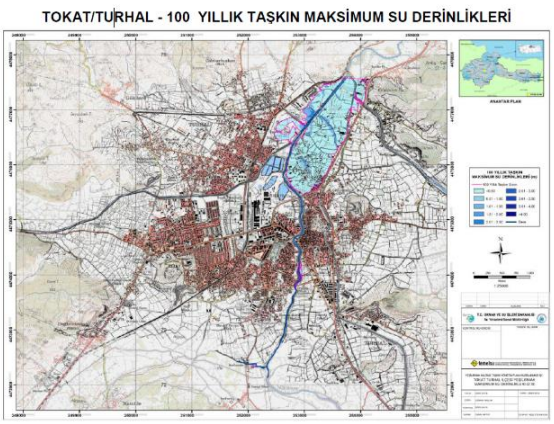
FLOOD MANAGEMENT PLANS

Yeşilırmak River Basin Flood Management Plan (FMP) was completed in 2015. The efforts to update the Flood Risk Management Plan began in 2021 and is expected to be completed in 2024.



Flood Hazard and Flood Risk maps are generated within the scope of Yeşilırmak 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 Yeşilırmak Basin, 71 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
- Improving related legislations
- Stream rehabilitation
- Crop pattern management
- Insurance System
- Improvement of the performance of regulators
- Agricultural applications
- Flood forecasting and early warning system

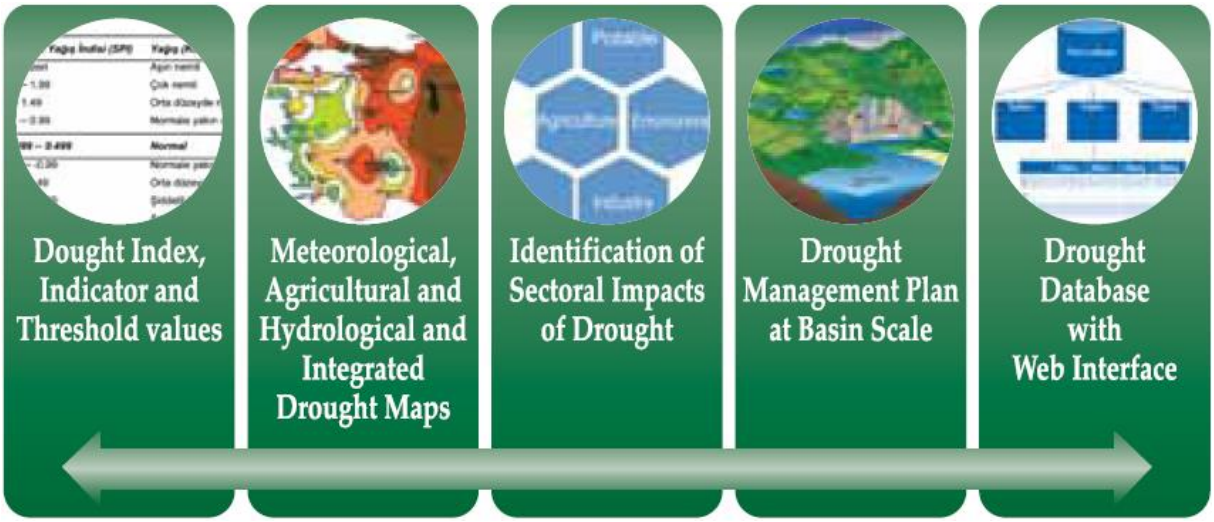
Mitigation measures determined within the scope of the plan are still being tracked via the Flood and Drought Plans Tracking Web Application in 2019 and the National Water Information System (USBS) in 2020.

DROUGHT MANAGEMENT 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.

Yeşilırmak Basin DMP is started at 2021 and expected to complete by 2023.

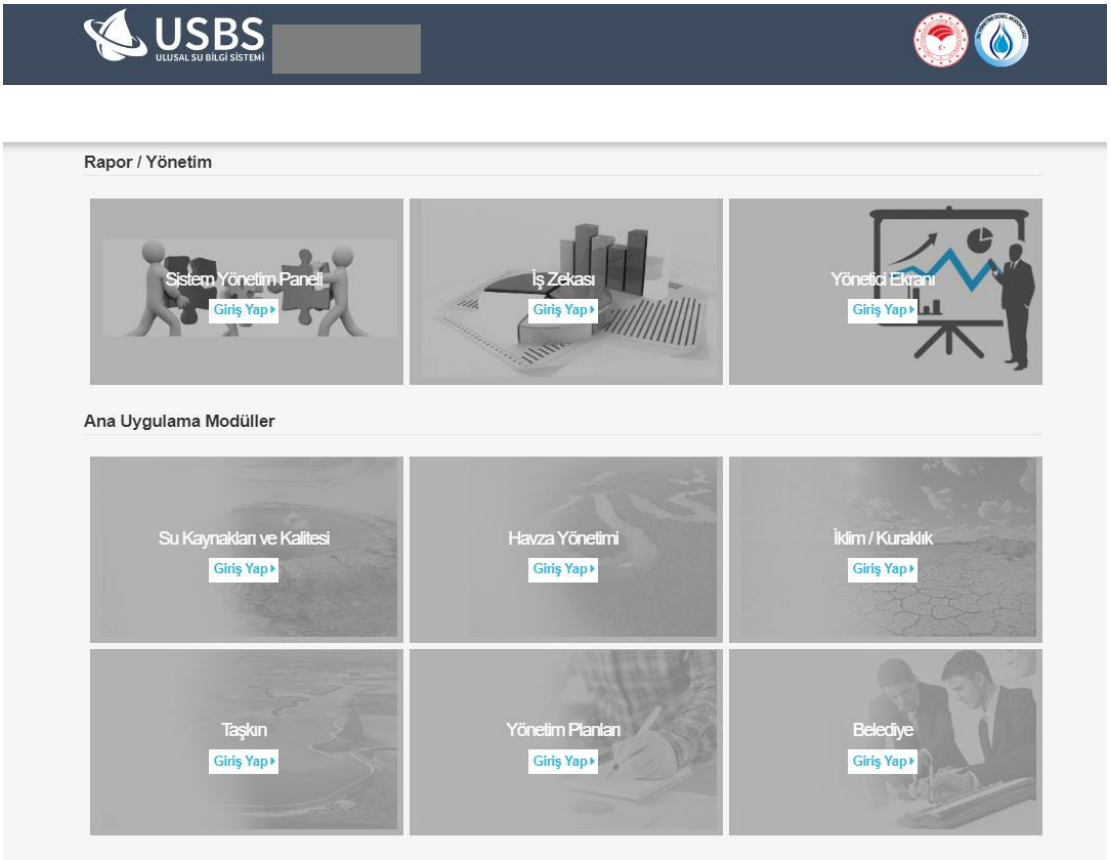
Studies During the Preparation of Drought Management Plans:



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.



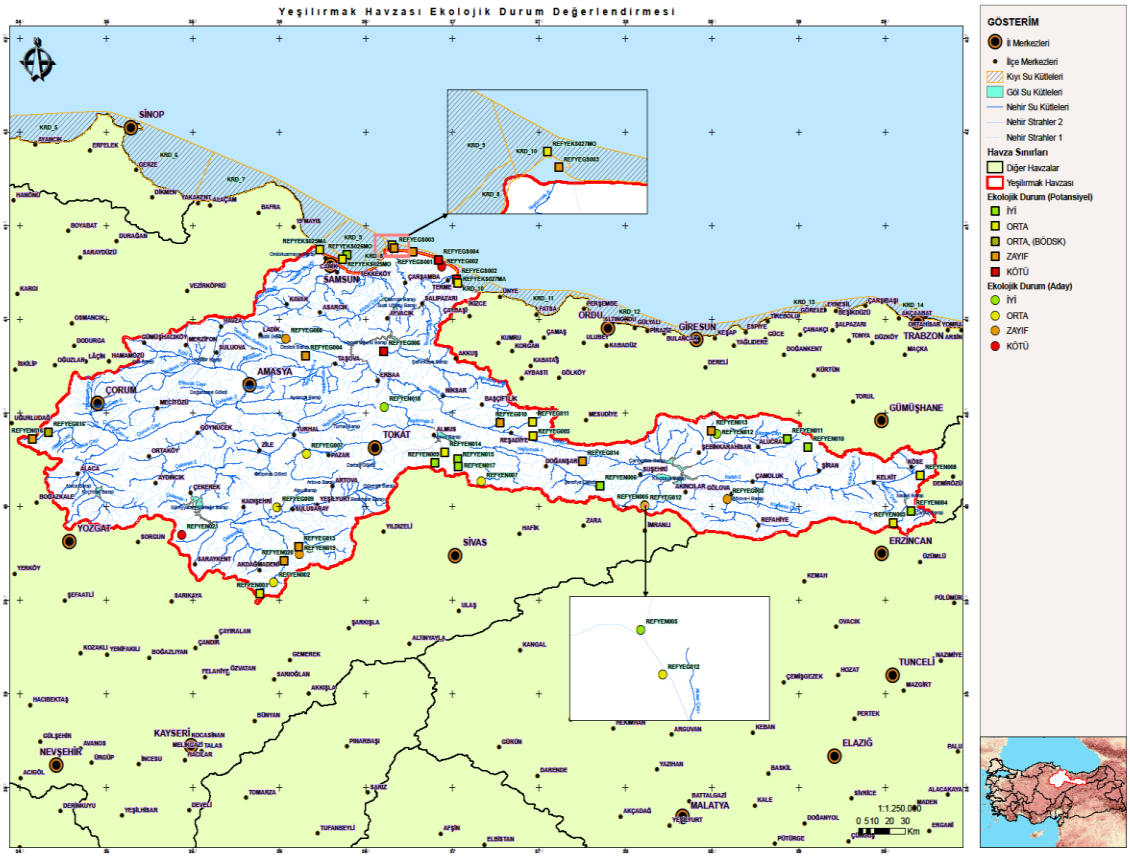
Graphical User Interface of National Water Information System (TRNWIS)

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 44 locations in the Yeşilırmak River Basin, including 21 rivers, 14 lakes (11 natural, 3 heavily modified), 4 transitional waters, and 5 coastal waters, and 36 reference (unpolluted) water sources were identified. In addition, the ecological status of the monitored water bodies in the Yeşilırmak 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 26 fish, 91 phytobenthos, 243 phytoplankton, 385 macroinvertebrate, 35 macroalgae/angiosperm and 74 macrophyte species were identified in the Yeşilırmak 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.



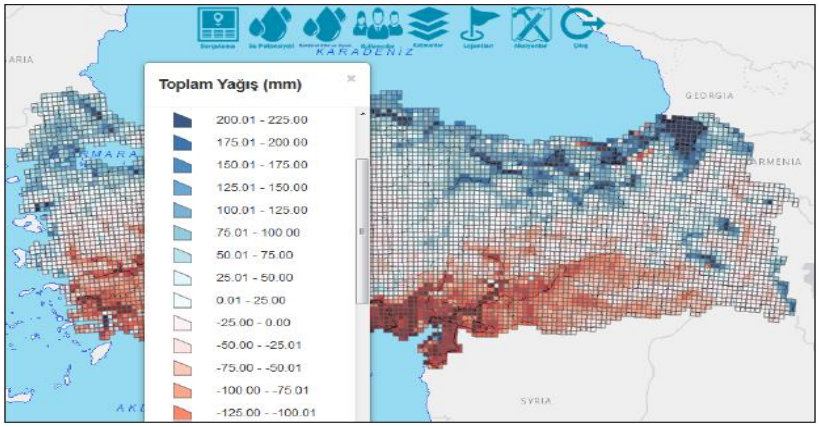
Ecological Status Assessment Results in the Yeşilırmak River Basin

REUSE WATER

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.

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 **11ºC** according to 1971-2000 observations, will **increase** by **at least 1,8°C**, **maximum 5ºC** in 2071-2100 period. It is expected that temperature increases for this period will predominate in the **southern** parts of the basin.

According to the observations of 1971-2000, the average annual precipitation amount of the reference period of the basin was determined to be **510,2 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 **6% more** rainfall compared to the reference period in **2071-2100**. It is expected that rainfall increases for this period will predominate in the **inner** 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 **6.432 million ^{3}/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 30%**. 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 **86 km^3**. The technically and economically usable amount of this reserve, the possible reserve is calculated to be **48 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 **9%** and possible reserve by **17%**.