SEYHAN RIVER BASIN

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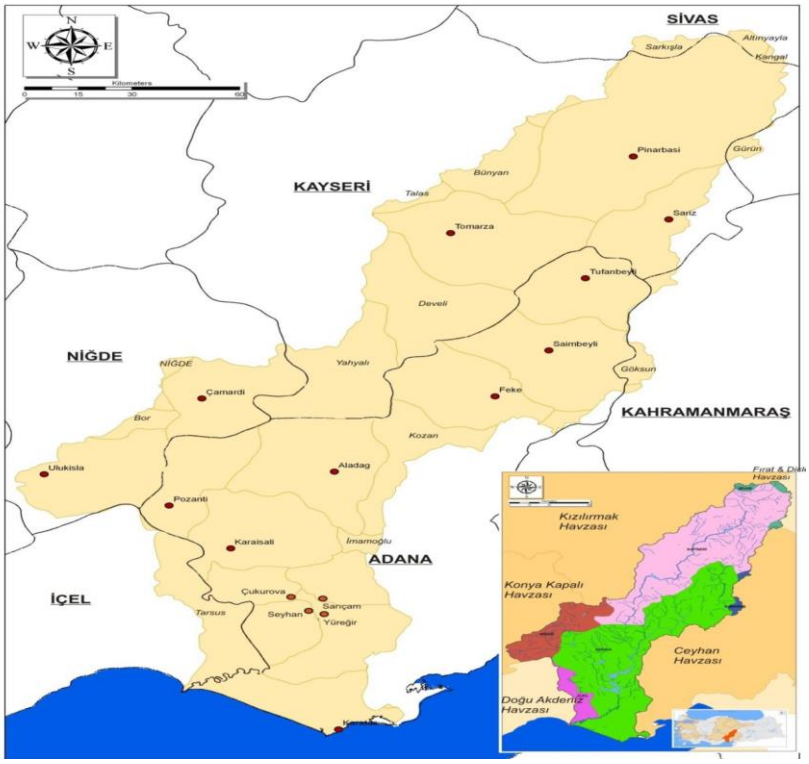
Seyhan River Basin covers the catchment area of Seyhan River with its Göksu and Zamantı branches. With a total area of 20.731 km^2, Seyhan River Basin has an avarage annual precipitation of rainfall depth is 624 mm and annual flow is 211,07 m^3/sn.



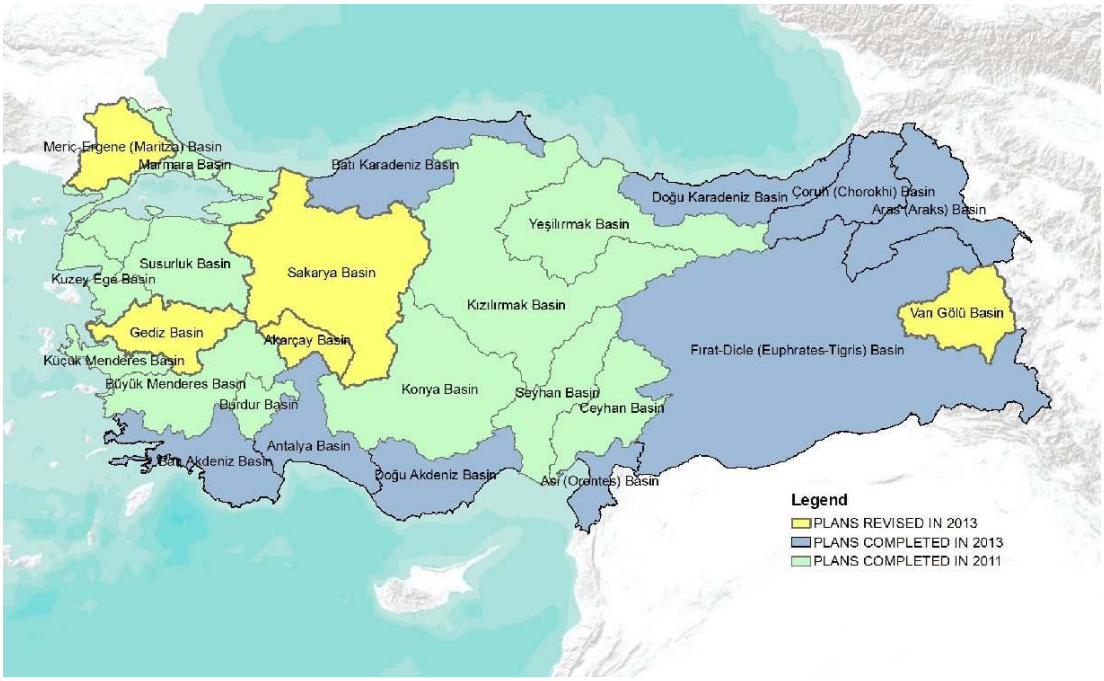
Seyhan River Basin

Adana, Kayseri, Niğde, İçel, Sivas and Kahramanmaraş provinces are located within the borders of the Seyhan Basin. There are no settlements in the parts of Sivas and Kahramanmaraş provinces within the Seyhan Basin. The spatial information of the provinces within the borders of the basin is given in the table below.

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 (%)*
KAYSERİ	1.691.700	854.893,68	50,53	38,62
SİVAS	2.848.800	29.240,21	1,03	1,32
NİĞDE	1.429.400	222.827,30	15,59	10,07
ADANA	1.725.300	1.003.479,44	58,16	45,34
K.MARAŞ	1.432.700	19.187,70	1,34	0,87
İÇEL	1.585.300	83.786,49	5,29	3,79

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 Seyhan River Basin can be grouped as below:

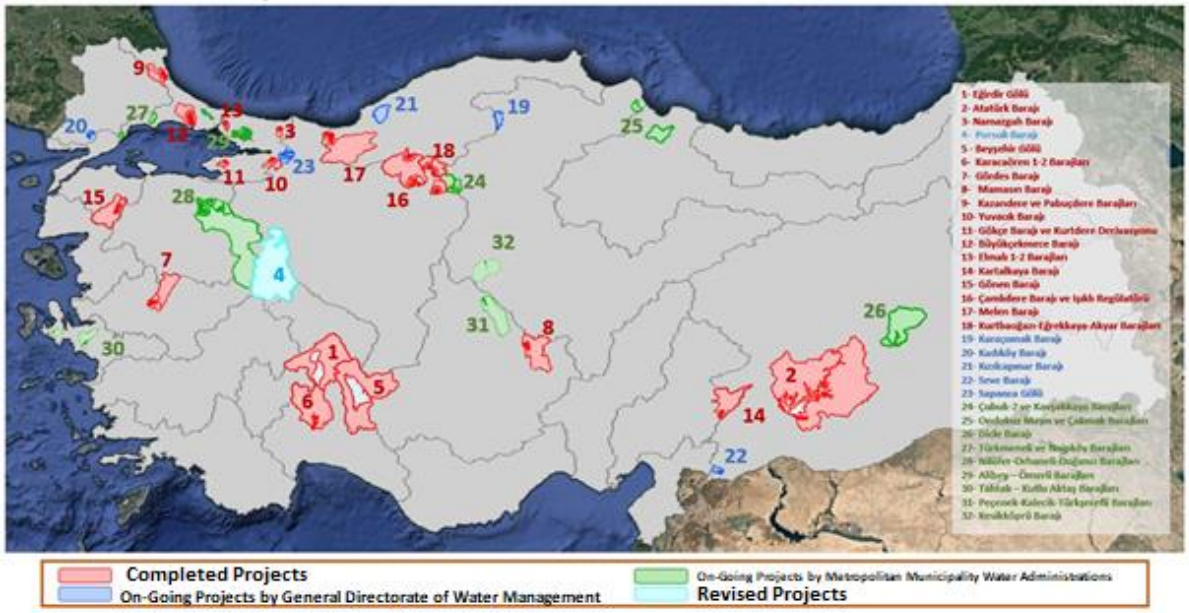
1. Urban Wastewater Management 2. Industrial Wastewater Management 3. Urban Waste Management 4. Non-Point Source Pollution Management 5. Forestation, Erosion and Sedimantation Control 6. Sewage Sludge Management 7. Conservation Studies for Drinking Water Basins 8. Flood Management	9. Drought Management 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.

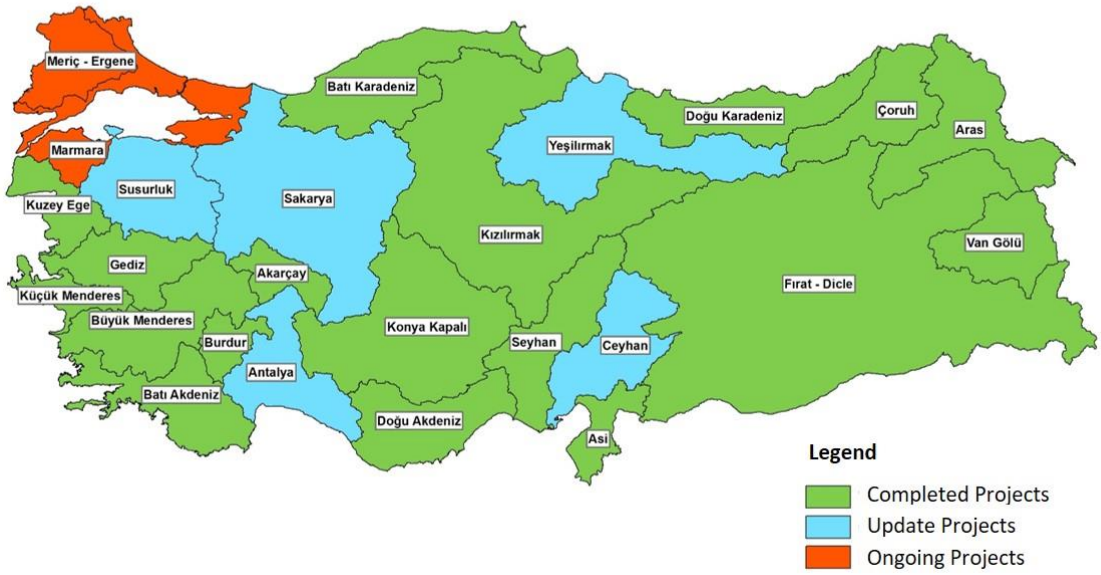
According to the Regulation on the Protection of Drinking-Water Basins:

- 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.



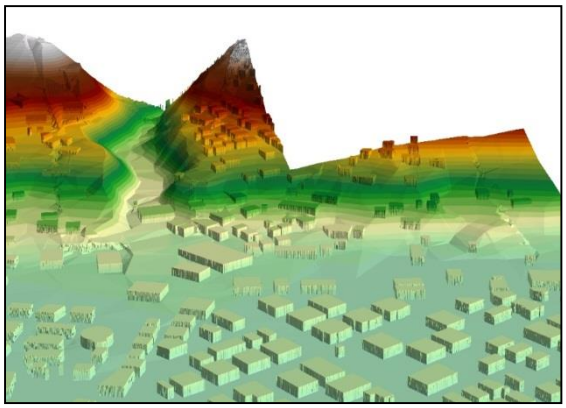
FLOOD MANAGEMENT PLANS

"Flood Management Plans," which include flood hazard maps and flood risk maps, are created by examining the flood, which has become a major problem in our country, taking into account not just a portion of a stream, but the entire stream and its tributaries.



Seyhan River Basin Flood Management Plan (FMP) was completed in 2020. Mitigation measures determined within the scope of the plan are still being tracked via the National Water Information System (USBS) in 2020.

Flood Hazard and Flood Risk maps are generated within the scope of Seyhan 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 Seyhan Basin, 216 measures have been identified under the following groups of mitigation measures within the scope of the Flood Management Plan.

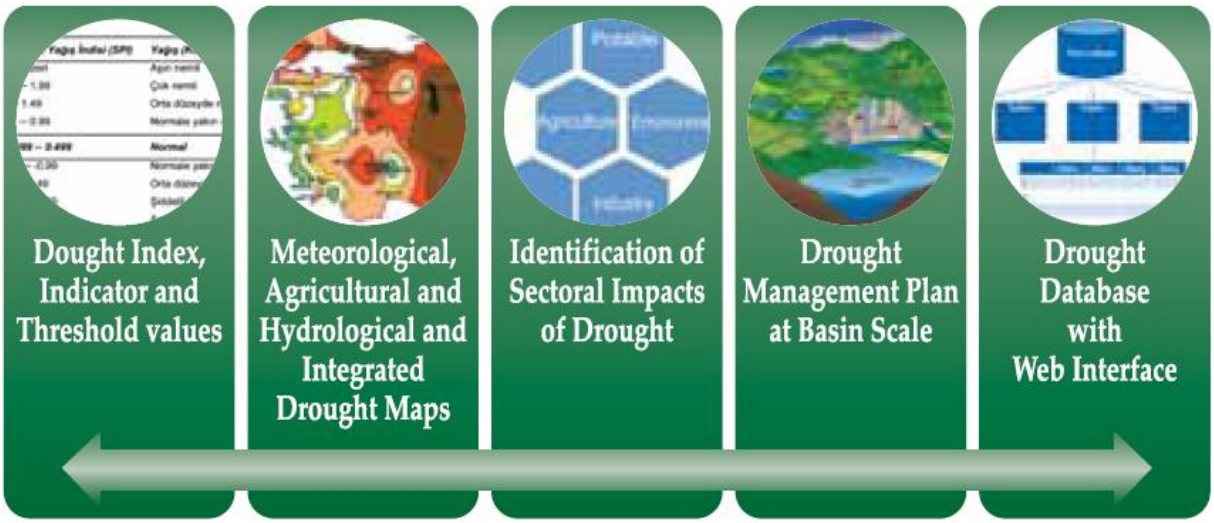
- Stream-bed regulation
- Education/ Informing/ Raising Awareness
- Improvement of transition structures
- Arrangement of closed transition structures
- Improvement of monitoring capacity
- Cleaning of stream beds

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.

Seyhan Basin DMP was started at 2017 and completed at 2019.

Studies During the Preparation of Drought Management Plans:



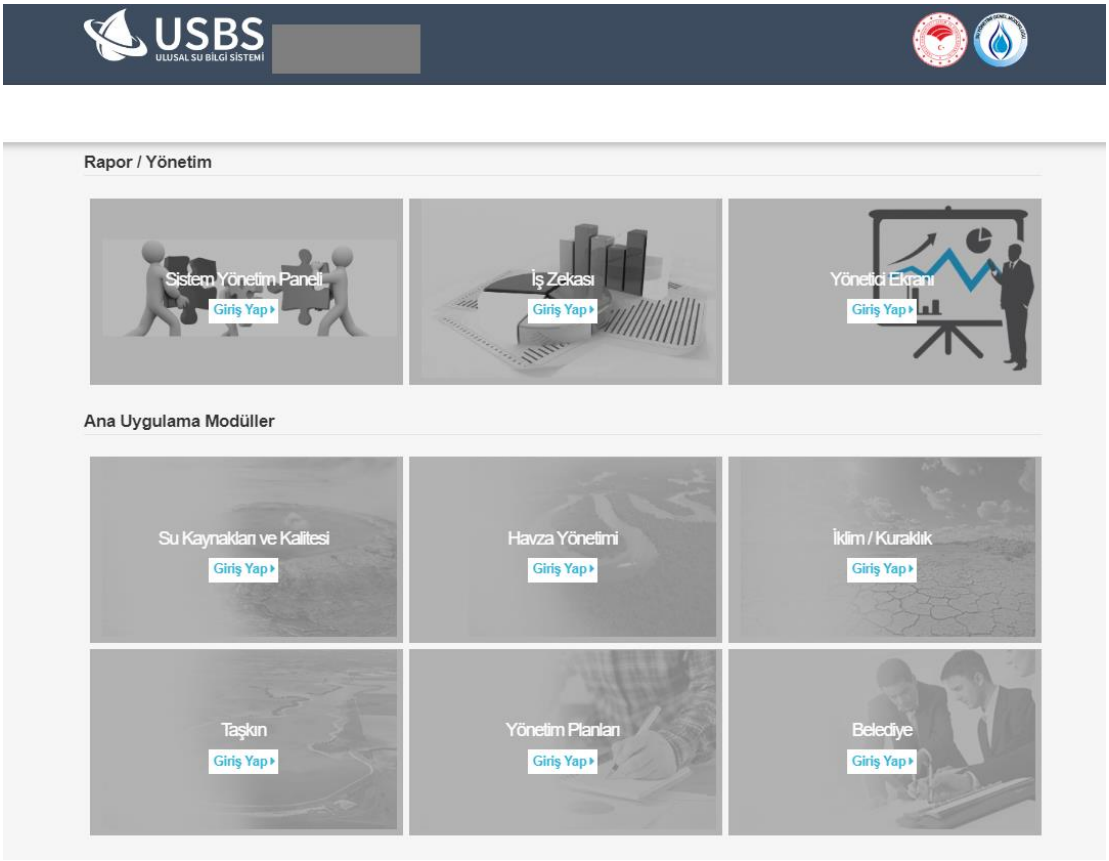
In order to prevent damage caused by possible droughts in the Seyhan Basin, 40 measures have been determined under the measure groups of reducing water use/loss and Improving the Monitoring and Measurement Network within the scope of the Drought Management Plan.

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.



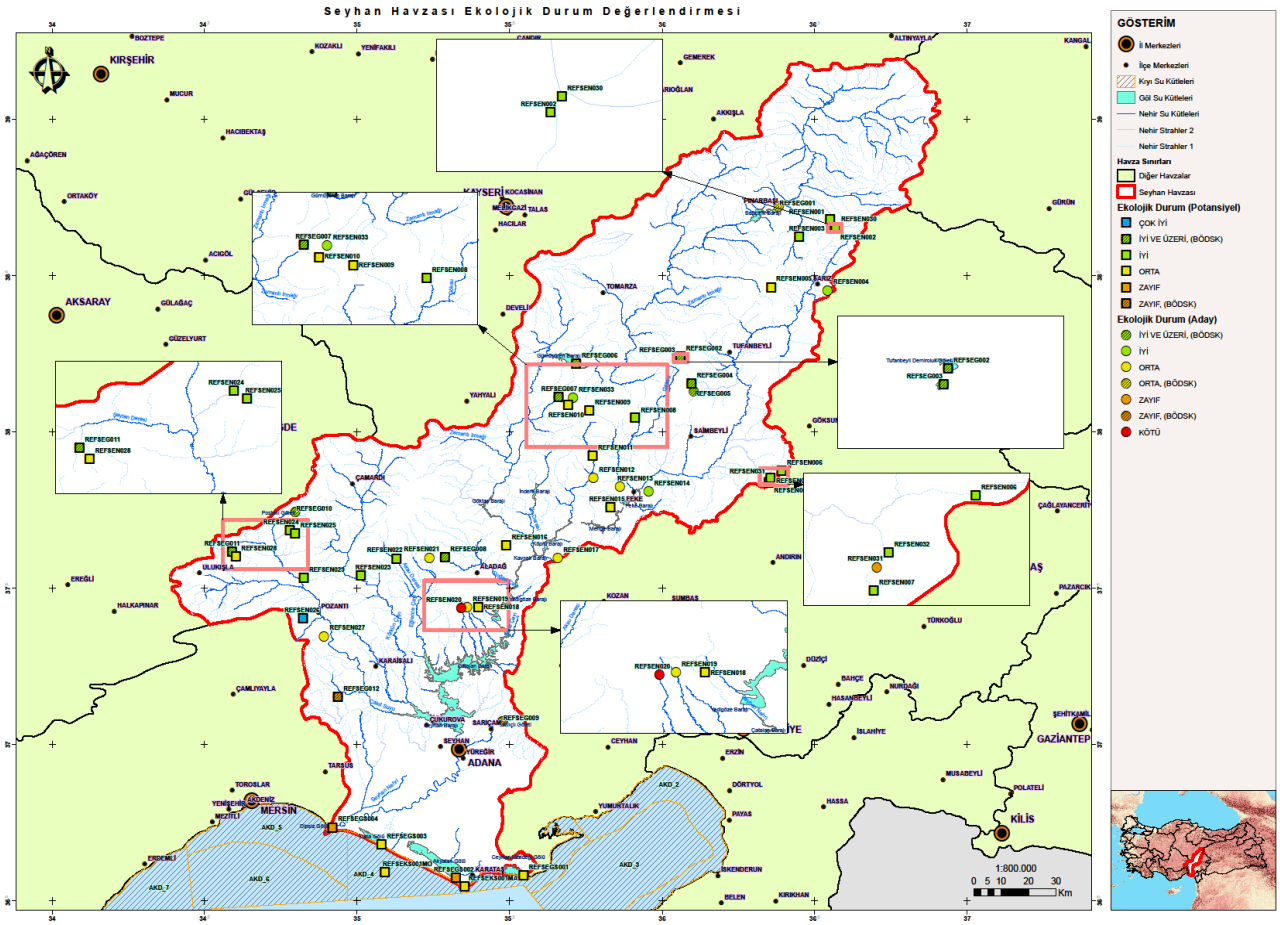
Graphical User Interface of National Water Information System (TRNWIS)

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 49 locations in the Seyhan 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 Seyhan River Basin was determined as a result of the monitoring activities.

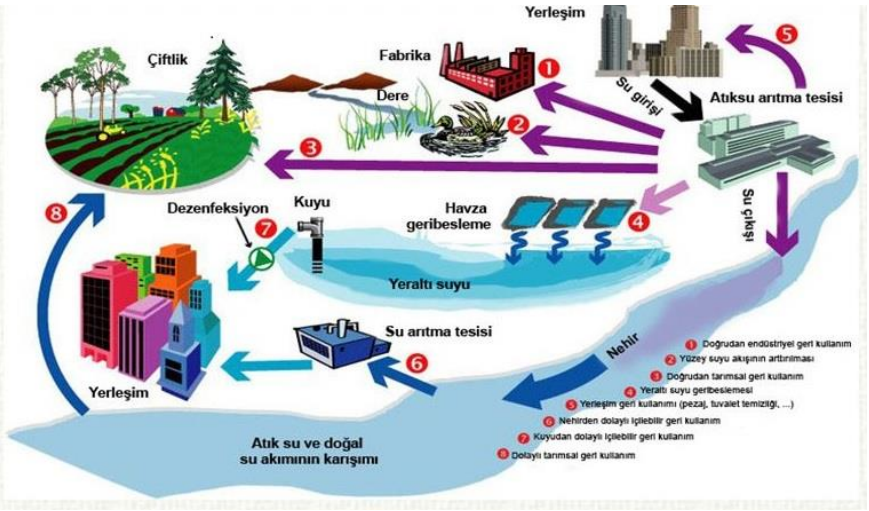
In the scope of monitoring activities, the smallest possible taxonomic level of all biological quality elements was identified and in this context 24 fish, 101 phytobenthos, 181 phytoplankton, 375 macroinvertebrate, 42 macroalgae/angiosperm and 74 macrophyte species were identified in the Seyhan River 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 Seyhan River Basin

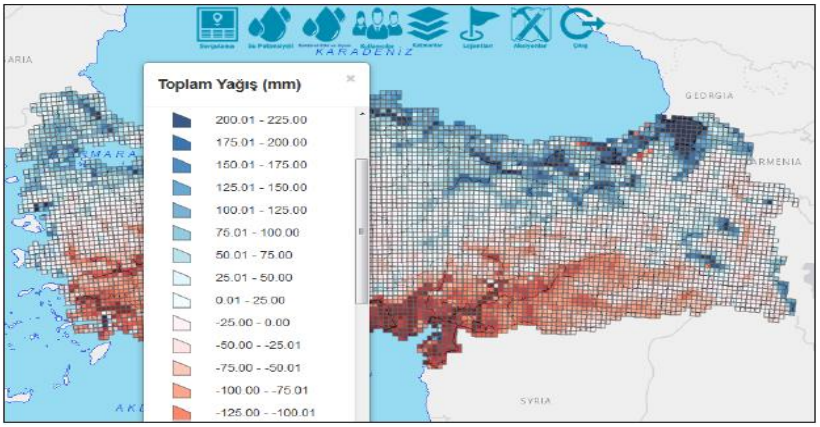
WATER REUSE



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.

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 verage temperature of the basin, which was **12,3ºC** according to 1971-2000 observations, will **increase** by **at least 2°C**, **maximum 5,3ºC** 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 **545,3 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 **15% less** rainfall compared to the reference period in **2071-2100**. It is expected that rainfall decreases for this period will predominate in the **southern** parts of the basin.

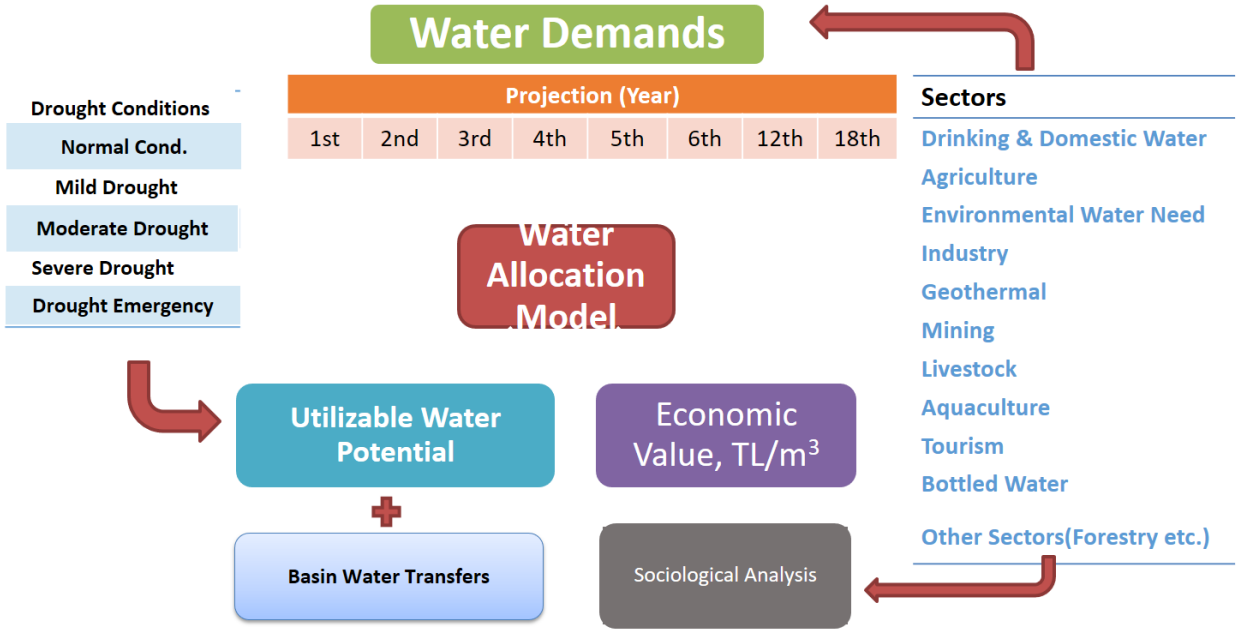
DSİ (Directorate General for State Hydraulic Works) data were used for hydrological model studies and the mean gross water potential of the basin for the reference period was determined to be **8.711 million ^{3}/year**. With the effect of climate change, it is predicted that in the period **2071-2100**, the gross water potential of the basin could **decrease up to 30%**. However, in the same period, it is expected that the annual amount of water available will not meet the total water need, and the **water deficit** will be around **2.325 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 **112 km^3**. The technically and economically usable amount of this reserve, the possible reserve is calculated to be **70 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 **5%** and possible reserve by **8%**.

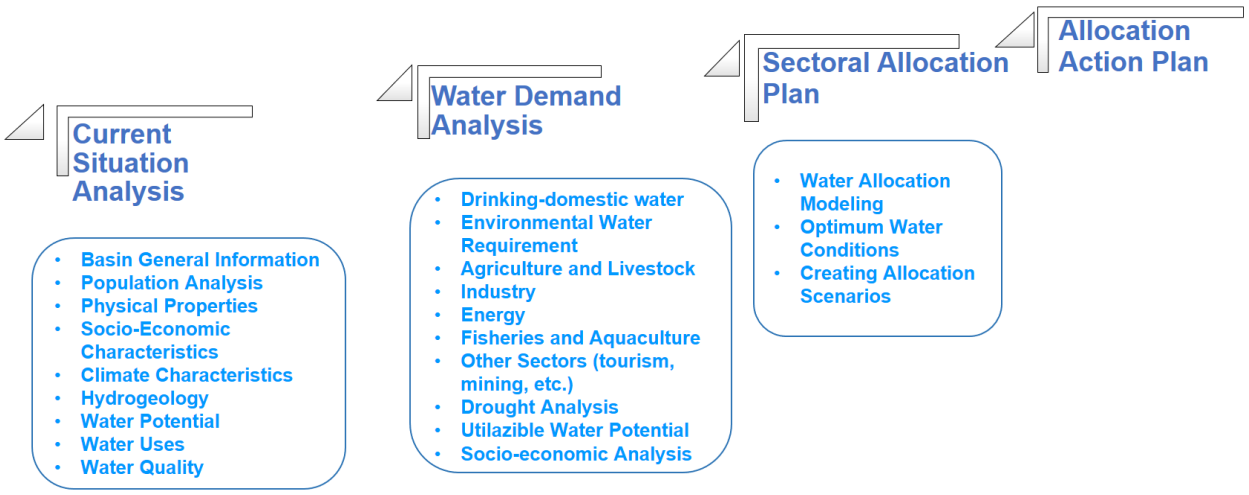
SECTORAL WATER ALLOCATION PLAN

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).

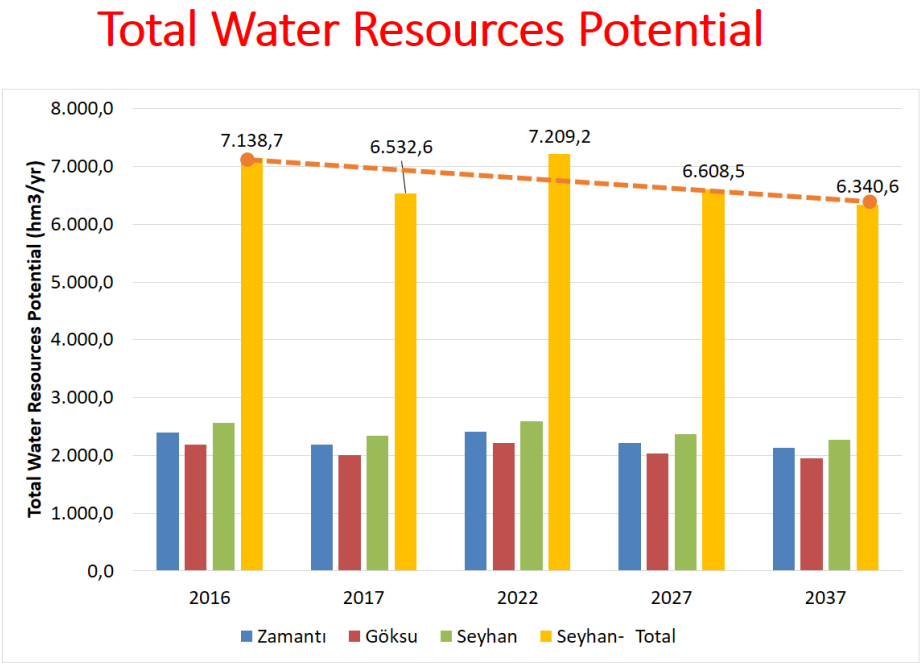
Within the scope of the Sectoral Water Allocation Plans, the current status of the water resources potential at the basin/sub-basin scale is determined. Afterward, based on the results of the drought and climate change adaptation studies; the normal, mild drought, moderate drought, severe drought, and 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.



In 2016, for the first time in our country, the Sectoral Water Allocation Plan was prepared for the Seyhan Basin. In the basin water allocation plan, 16 water allocation scenarios were created in the projection years for the drinking-domestic, environment, agriculture, industry, and energy sectors in drought periods by using the water allocation model.



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.

Water Need, Production Amount and Economical Value of Agriculture					
Year	2016	2017	2022	2027	2037
Total Agricultural Area (million da)	2.08	2.93	3.14	3.21	3.27
Avarage Irrigation Efficiency	0.567	0,572	0.60	0.64	0.72
Irrigation Water Usage-Need (billion m3)	1.53	2.15	2.14	2.06	1.89
Economical Value* (milyar TL)	3.9	4.3	8.2	7.8	13.1
Production (million tonne)	6.3	9.0	9.5	9.7	9.8

* The year 2015 values are used as the base price.

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.

SECANARIO 6 BASIN SUMMARY (2022)		WATER POTENTIAL (hm3/yr)	AGRICULTURE (hm3/yr)			ENERGY (GW-hr/yr)			ENERGY (hm3/yr)	INDUSTRY (hm3/yr)			DRINKING (hm3/yr)			ENVIRONMENTAL WATER		TOTAL CONSUMPTION (Environmental need excluded)	TOTAL USAGE
		TOTAL	Usage/	Allocation/	%	Usage/	Allocation/	%	Total Vol	Usage/	Allocation/	%	Usage/	Allocation/	%	m^3/sn	(hm3/yr	(hm3/yr)	(hm3/yr)
BASIN TOTAL	Normal	7282,7	2195,1	2136,9	97,3	7376	6321,3	85,7	2.250,5	58,3	58,3	100,0	203,2	203,2	100,0	28	883,7	2.398,4	5.532,6
	MD	6445,7	2195,1	2135,4	97,3	7376	5960,4	80,8	2.141,4	58,3	58,3	100,0	203,2	203,2	100,0	28	883,7	2.396,9	5.422,0
	MOD	5762,7	2195,1	2086	95,0	7376	4849,3	65,7	1.517,7	58,3	58,3	100,0	203,2	203,2	100,0	28	883,7	2.347,5	4.748,9
	SD	4866,7	2195,1	1807,7	82,4	7376	4062,1	55,1	1.639,4	58,3	58,3	100,0	203,2	203,2	100,0	28	883,7	2.069,2	4.592,3
	DE	4333,7	2195,1	1550,5	70,6	7376	3582,2	48,6	1.238,6	58,3	58,3	100,0	203,2	203,2	100,0	28	883,7	1.812,0	3.934,3

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. 2017/6.