

Water collection

The integrated water cycle



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1. The need to obtain and store water

Water is a fundamental element in the development of civilisations that has always been directly related with human evolution and adaptation to the environment.

From the earliest settlements, man has sought to settle near to rivers, lakes, springs and other sources where water is readily available. Over time the settlements became more stable, bigger and more numerous and soon it was necessary to increase the amount of water supplied by nature.

This led to the first attempts to collect, store and distribute it.



2. The water within the Community of Madrid

The Community of Madrid has two very distinct areas in terms of the amount and type of useable water resources: the mountains and the plain. These areas are very different in their rainfall regime, the nature of their rivers and size of their underground aquifers.

In the mountains there is more surface water, this is because there is more precipitation, as the mountains, with a height of over 2,000m, are more efficient at retaining the moisture-laden clouds. The plains, on the other hand, are areas of low rainfall, the few rivers that cross the plain experience significant reductions in flow in summer. However, they have important aquifers due to the terrain's permeability.



3. Collection and storage of the region's water

Canal makes use of both surface water and underground water in order to be able to provide the amount of water necessary to supply all of the Madrid region's inhabitants.

The surface waters are stored in a network of 13 reservoirs located in the basins of the 7 rivers located in the Sierra de Guadarrama. Their maximum storage capacity is 944 hm³, an amount equivalent to a year and a half of consumption.

In addition, Canal also has available 4 other diversion dams that intercept flowing water (waterwheels).

Complementing this system there are also 3 more surface water collection, 2 of them take water from the Rivers Alberche, Picadas-Majadahonda and San Juan-Valmayor and the third takes water directly from the River Tajo and diverts it to the Tajo DWTP.

On the other hand, the use of groundwater in the supply of water to Madrid started from a small private initiative in the 1970s and was integrated into the region's supply system in the early 1990s. The incorporation of groundwater into the Community of Madrid supply system marked an important milestone in the management of water resources, as it makes a greater volume of water available to address demand during periods of drought, when the volume stored in surface reservoirs decreases.



[Watch a video about water collection](#)



3.1 Surface waters

3.1.1 Reservoirs by basin

Lozoya basin

The River Lozoya forms the largest valley in the Sierra Guadarrama. It rises in the Peñalara Natural Park and flows through the northern Community of Madrid for its entire 90 km course. It is a tributary of the River Jarama, which in turn is a tributary of the River Tago.

The water of the River Lozoya is considered to be some of the highest quality in Spain and its abundant flow allows surface water storage in 5 reservoirs: Pinilla, Riosequillo, Puentes Viejas, El Villar and El Atazar. With a total storage capacity of 588.8 hm³ it is the region's most important water reserve, holding 73% of its water resources.

The reservoirs in the basin are also used for the production of electricity in 5 mini hydroelectric power stations constructed at the foot of the 5 dams where they are installed.



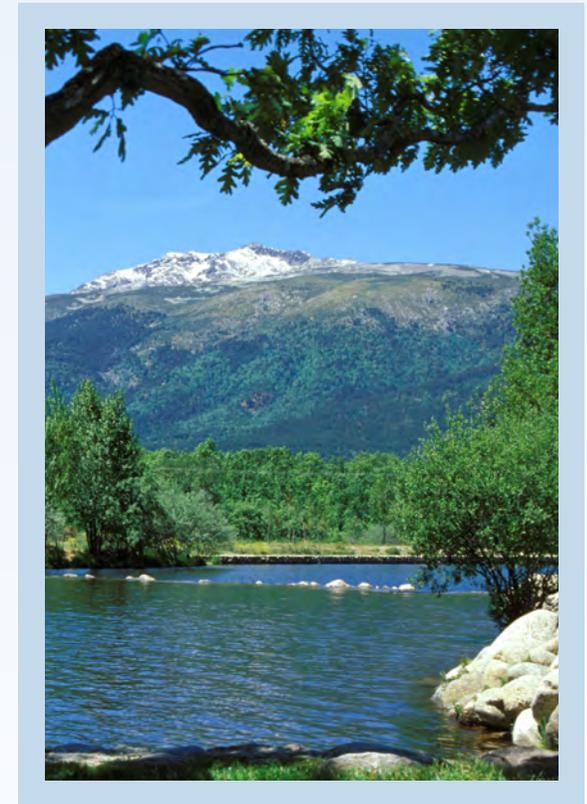
[Watch a video about El Atazar Reservoir](#)



[Watch a video about the Riosequillo reservoir](#)



[See a table of reservoirs](#)



Jarama basin

The River Jarama is one of the Tajo's most important tributaries and, with a length of 194 km it is the longest river that crosses the Community of Madrid.

Its basin covers an area of over 5,000 km². The Jarama and its surroundings constitute a biological corridor that crosses the Madrid region from north to south, making it highly important in maintaining the ecological balance of the environment. The upper part of the river's course contains the El Vado reservoir, which has a capacity of 55.7 hm³.

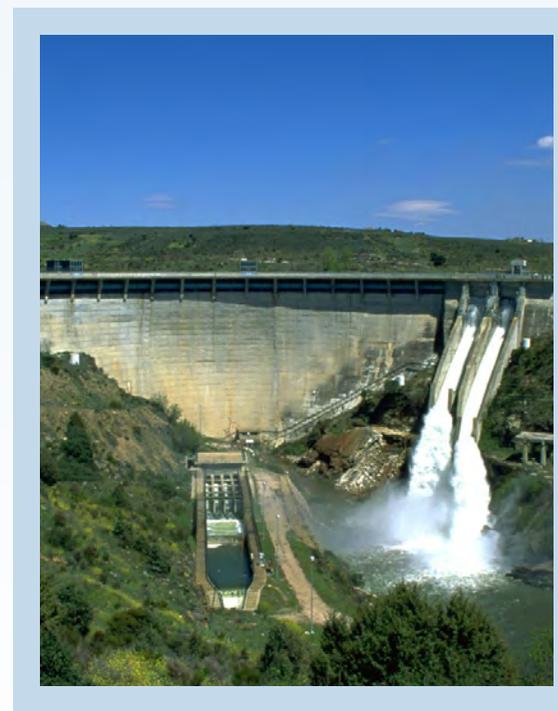
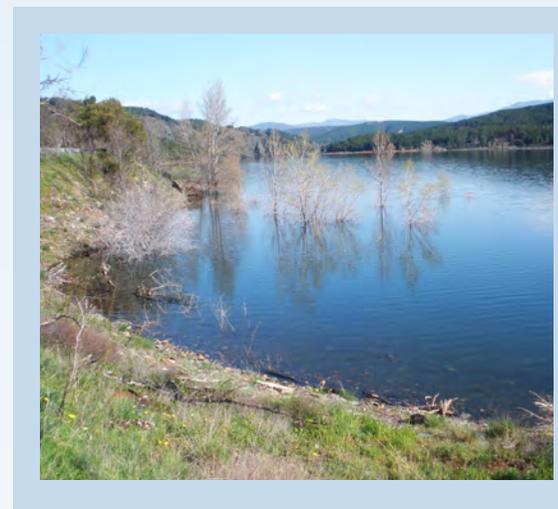
 [See a table of reservoirs](#)

Guadalix basin

The River Guadalix is a tributary of the Jarama and it rises in the Sierra Morcuera at an altitude of over 2,000 m. It is contained within the Community of Madrid for its entire length. Like the rest of the tributaries and streams feeding the River Tajo this river experiences a severe dry period as it is mainly fed by the thaw of the sierra's snows. It receives inputs from various creeks throughout its 33 km length.

This river has been historically linked to the supply of Madrid, as, in the first years of the history of the Canal de Isabel II, it served as a feed to the first canal to be constructed as the Pontón de la Oliva reservoir could not be supplied with water from the River Lozoya because of their leaks. The Pedrezuela reservoir is located on the river, which has a capacity of 40.9 hm³.

 [See a table of reservoirs](#)



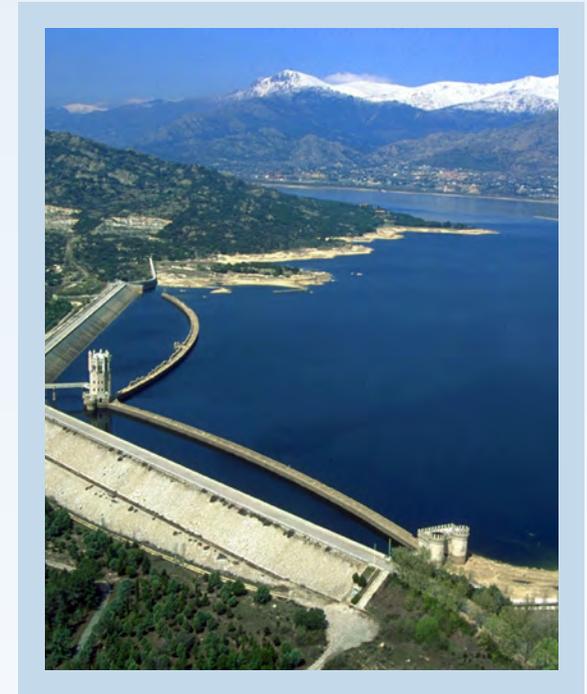
Manzanares basin

The River Manzanares rises in the Ventisquero de la Condesa snowfield in the Sierra de Guadarrama and all of its 92 kilometres are contained within the Community of Madrid. It passes through the capital for nearly 30 kilometres before flowing into the River Jarama in the municipality of Rivas-Vaciamadrid.

Its source, located at 2,010 m above sea level, is located in an area of springs, snowfields and snow banks that serve as a reserve of snow until well into spring. The river receives inflow from different creeks and streams. One of its main tributaries, the River Samburiel, flows into this river at the Manzanares el Real reservoir and it also includes the Navacerrada reservoir, which have a total maximum capacity of 102.2 hm³.



[See a table of reservoirs](#)



Guadarrama basin

The River Guadarrama rises in the Community of Madrid in the Fuenfría valley at a height of 1,900 m. The basin's middle section is located in the Curso Medio del Rio Guadarrama Regional Park, which is a protected space with a high ecological importance and which additionally fulfils the function of preserving the environmental richness of an area that has been subjected to urbanisation in recent decades.

The River Navalmedio is also a major tributary that flows into this basin, it gives its name to the reservoir that regulates its flow. Another tributary is the small creek that crosses the La Jarosa valley, which has a reservoir of the same name. This basin also feeds the Valmayor reservoir, which has the system's second largest storage capacity.

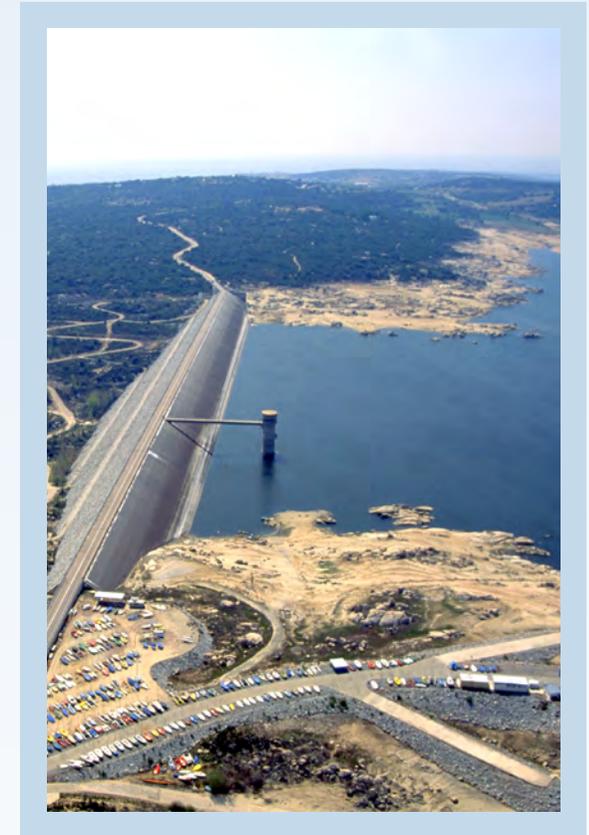
The reservoirs of the Guadarrama basin (Valmayor, Navalmedio and La Jarosa) have a combined maximum capacity of 132.3 hm³.



[Watch a video about the Valmayor reservoir](#)



[See a table of reservoirs](#)



Alberche basin

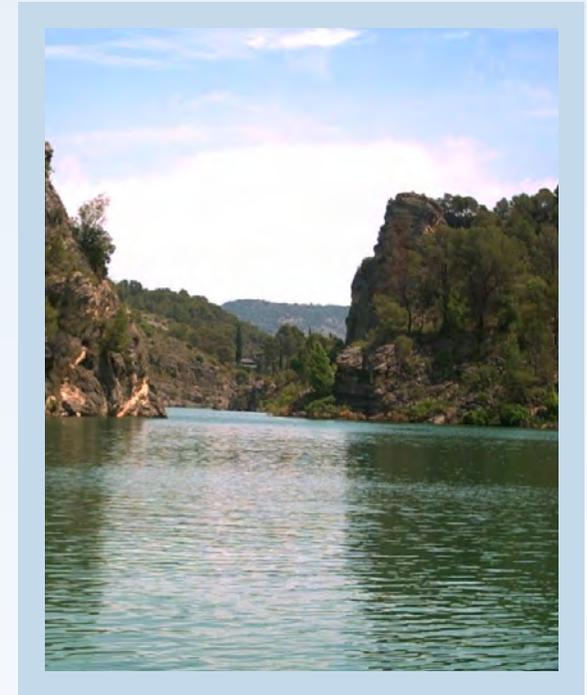
The River Alberche rises on the southern slopes of the Sierra de Villafranca (Ávila), located in the Central System, and after 177 km flows into the Tajo.

This river is highly regulated through the reservoirs of Burguillo and Charco del Cura in Ávila; San Juan and Picadas in Madrid, both with pumping stations that feed the region's supply system; and Cazalegas in Toledo.

The Tajo, like its tributaries, has a severe dry period. One of its tributaries, the River Aceña contains a reservoir of the same name, which is integrated into the Madrid water supply system; the reservoir's maximum capacity is 23.7 hm³.



[See a table of reservoirs](#)



3.1.2 Diversion dams

The water supply system has 4 diversion dams as a complement to the reservoirs. They are designed to divert water for its subsequent use.

The dams are constructed along the Rivers Lozoya, Guadalix, Sorbe and Guadarrama and are called:

- Pozo de los Ramos.
- Las Nieves.
- La Parra.
- El Mesto.



[See a table of diversion dams](#)



3.1.3 Tajo DWTP

Is an installation designed to be an alternative water supply source for the Community of Madrid, with its waters coming from the River Tajo. In addition to its strategic location and large treatment capacity it also has the most advanced technology in Spain and a European pioneering fresh water treatment process: ultrafiltration and reverse osmosis through a membrane.

 [Watch a video about the Tajo DWTP](#)

 [Read a PDF about the Tajo DWTP](#)



3.2 Groundwater

The extraction of groundwater as a support to the supply of surface water is a key element in the management of the Community of Madrid water supply system during the periods of drought or water scarcity and it can supply up to 90 hm³ per year of operation.

3.2.1 The main aquifers exploited

Cretaceous carbonate aquifer

Its underground water body is located in the Torrelaguna (Madrid) area and the outcrop has an area of 56 km².

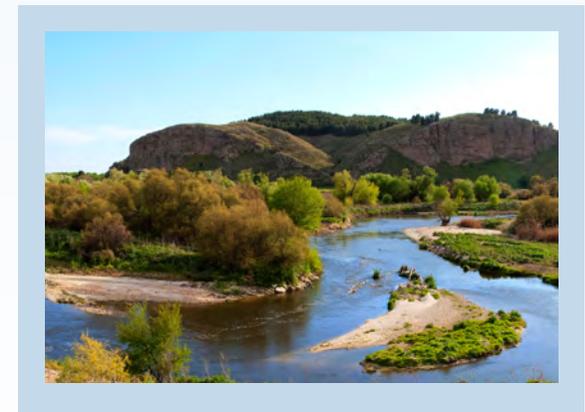
It behaves as an unconfined aquifer in the areas of outcropping and as a confined aquifer in other areas. The recharge occurs by the infiltration of rainwater in the areas of calcareous outcropping and from creeks from the mountains that cross the area.

 [Read a PDF on the cretaceous carbonate aquifer](#)

Tertiary detrital aquifer

In general terms it is considered a single, heterogeneous and anisotropic aquifer. It is recharged by the interfluvies of the Rivers Jarama, Manzanares and Guadarrama from rainwater. The download occurs both to the creeks and wetlands as well as to the major rivers in the region. It has an outcrop area of 2,600 km².

 [Read a PDF on the tertiary detrital aquifer](#)



3.2.2 The main collection areas

Location	Nr. of wells	Annual supply capacity (hm ³)
Northern area	28	32.0
Western area	15	18.0
Southern area	11	7.0
Guadarrama area	16	21.0
Torrelaguna area	6	12.0
Cadalso area	2	0.2
Total number of wells and capacity	78	90.2



Canal 
de Isabel II