

Basin Profile: Guadiana River Basin

Original Report By: Ricky Passarelli, University of Virginia

Profile Prepared By: Laura Szczyrba

Water Scarcity Status

- The extremely variable climate, overuse of water, and damming have depleted river flows, resulting in the destruction of ecosystems and causing extreme water scarcity.
- Agriculture accounts for over 95% of total water consumption.
- Tablas de Daimiel National Park in Spain has been severely affected in recent years by agricultural withdrawals. In 2009, overuse of the river became so great that the aquifer that feeds the wetlands dropped 20 meters, and only about 1% of the park's surface remained submerged.

Basin Overview

Portugal and Spain

Area: 66,800 sq km

Climate: Arid to semi arid

Basin population: 4,000,000



Figure 1. Map of Guadiana River Basin (<https://en.wikipedia.org/wiki/Guadiana>)

The Guadiana River itself runs approximately 778 km from central Spain, near Ciudad Real, westward into Portugal, near the city of Badajoz, and then turns south and follows the national border to an estuary along the southern coast of the Iberian Peninsula. The river originates at an altitude of approximately 1700 meters near the Tablas de Daimiel National Park, a preserved wetland in the upper Guadiana Basin. It then winds its way across half of Spain, through the Salt Marsh of Castro Marim and Vila Real de St António, ending in the Gulf of Hadiz.

Despite its location near the Atlantic, the basin has a primarily Mediterranean climate, and has the highest summer temperatures, annual solar radiation, potential for evapotranspiration, and longest dry season average in all of Europe. This results in extremely variable rainfall, comparable globally only with very arid and desert areas. The annual mean rainfall is about 400-600 mm per year, while monthly river flows vary between 20-600 m³/sec depending on dam operations. In wet years, this can reach as much as 1500 m³/sec.

Portugal's water quality and quantity is dependent upon upstream water usage in Spain. Major cities include Ciudad Real near the headwaters, with a population of about 74,000, Badajoz on Spain's western border, with a

population of about 150,000, and Évora in eastern Portugal, with a population of about 167,000. An important trend is the prominence of dam construction throughout the Guadiana River Basin. There are a total of 1,824 dams built along the river, of which 86 are large dams that retain about 150% of the annual runoff.

In Portugal, all of the Guadiana watershed planning is done by the National Water Institute, the Instituto da Água (INAG), while two regional authorities, the Direcção Regional de Ambiente e Ordenamento do Território (DRAOT) Alentejo and DRAOT Algarve, are responsible for licensing and monitoring. In Spain, the River Basin Authority, the Confederación Hidrográfica, has all of the management power. However, it competes with regional authorities that control domestic water use, wastewater, and agricultural development. In November 1998, the two countries adopted a new agreement, the "Convention on Co-operation for the Protection and Sustainable Use of the Waters of the Spanish-Portuguese River Basins". This treaty-of-sorts set limits for certain sections of shared rivers in normal precipitation years (Timmerman and Doze, 2005). It represents a first bilateral step away from governing strictly for hydroelectric power, and moves towards better water management practices

Economically, the region is dependent upon agriculture and industrial manufacturing. While the region supports an array of leather, metal, mining, wood, and machine manufacturing, most of the water usage is in agriculture. Both the Spanish and Portuguese have valuable fruit and vegetable exports, as well as vibrant meat and olive industries dependent on the river. Irrigated crops have higher productivity than rainfed crops in both dry and wet years. This provides additional incentive for farmers to pull water from the river, even with significant rainfall.

Water Scarcity Impacts

Environmental Impacts

Tablas de Daimiel National Park in Spain consists of 2,000 hectares of protected wetlands along the easternmost part of the river. This usually vibrant ecological community has been severely affected in recent years by agricultural withdrawals. In 2009, overuse of the river became so great that the aquifer that feeds the wetlands fell 20 m below them, and only about 1% of the park's surface remained submerged. The dried organic matter left behind mixed with oxygen in the soil and sparked underground fires in the hot summer heat.

In addition to water scarcity problems, aggressive agricultural and industrial use has resulted in significant runoff pollution. Likewise, the presence of dams not only limits flow regimes, but provides more opportunity for eutrophication, siltation, and increased salinization of the water. The lack of nutrient passage can also hurt downstream fish populations and changes in sedimentation can destroy local anchovy habitats

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