Ancient Water Supply and Management Systems
in the Western Mediterranean

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Ancient Water Supply and Management Systems in the Western Mediterranean

Construction and Operation

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Contents

Introduction. Water Management in Roman Times: Continuity and Variability in Archaeological Studies.....**4**
María del Mar Castro García

Water Usage at *Mirobriga* (Castelo Velho de Santiago do Cacém, Portugal). An Overview of the Structures of Water Supply and Distribution.....**7**
Catarina Felício

Water Management in *Calduba* (Sierra Aznar, Arcos de la Frontera, Cádiz): A Terraced System for the Recreation of a *Locus Amoenus*?.....**29**
Isabel Rondán-Sevilla, José Antonio Calvillo Ardila and Lázaro G. Lagóstena Barrios

***Erogationes* in the San Lázaro Aqueduct, Mérida? The 'House of the Amphitheatre' Example**.....**44**
Macarena Bustamante-Álvarez, Elena H. Sánchez López and Ana M. Bejarano Osorio

Monumental Fountains with Staircases at the End of the Iron Age in Southern Gaul.....**56**
Sandrine Agusta-Boularot, Marc Bouiron, Grégory *Vacassy and Ghislain Vincent*

Water Management in a Roman Settlement at the Foot of the Alps: The Waterworks of *Augusta Taurinorum*.....**74**
Davide Gangale Risoleo and Stefania Ratto

Water and the City of Veii: A Link between Mythology, Religion, Archaeology, and History.....**100**
Ugo Fusco

The Underground Structures of the Theatre in Ostia: A Preliminary Study on the Sewerage System.....**121**
Katerina Gottardo

The Villa Under the Lakes. Water Management of Nero's Villa in Subiaco, Rome.....**153**
Fabiana Tozzi

Late Antique Transformations in Water Provision, Management and Distribution in the Thermal Bath Archaeological Park of *Baiae* (Bacoli, Naples).....**169**
Gioconda Di Luca

Analysing the Water Supply to Roman Artisanal and Commercial Facilities: Pompeii as a Case Study.....**179**
Elena H. Sánchez López

Rainwater Collection and Storage in the Pompeian House: Slaves at Work.....**191**
Gemma Jansen

***Abellinum* and its Water Distribution System: New Evidence for a Wider Comprehension of the Hydraulic Infrastructures**.....**203**
Marina Covolan and Daniela Musmeci

'Domesticating Water': Some Conclusions on Water Infrastructure in the Ancient World.....**217**
Jesús Acero Pérez

Introduction

Water Management in Roman Times: Continuity and Variability in Archaeological Studies[1]

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Humans need water, and therefore effective management and strategic planning for its use and control are required. In ancient times, hydraulic structures were developed to collect water, or to divert its flow, from various sources, including groundwater, rainwater, and surface water. While aqueducts, notably during Roman times, significantly increased the quality and quantity of the water supply, traditional water collection methods - such as wells, cisterns, reservoirs, and drainage channels - continued to be used. These methods served either as complementary systems or for storing surplus water to prevent shortages. Hydraulic structures designed for collecting water were effective because of the construction of devices that distributed water, facilitated its use, and managed drainage These structures formed the 'water cycle', which can be observed in urban, rural, artisan, and cultural contexts. The variety of sources of water and construction techniques reflects a sophisticated understanding of hydrology and technical adaptability, which enabled efficient water management in many communities across the Mediterranean.

Water management has been a topic of scholarly interest for many decades, and examining the material evidence available on this issue is a relevant and contemporary field of research. The regional and local elements s of Roman water management, as expressed through physical artefacts, were influenced not only by the enduring cultural traditions from pre-Roman times in various regions of the Empire but also by the unique climatic and geographical characteristics of different areas. These factors highlight the diversity of the environments and landscapes within the extensive political and administrative structure of the Empire.

Case studies that examine the specific aspects of water management in the territories of the Roman Empire play an important role Publishing collections of data to identify similarities and differences in water management is also important, as it provides a deeper understanding of the continuities, transformations, adaptations, and unique features involved in this field during Roman times (as noted by Klingborg 2022 in the introduction to his work). These efforts to organise information help to clarify the complex nature of a phenomenon that intertwined technical, social, cultural, and environmental factors within the context of Antiquity.

The spread of technical and construction advances in Roman water management across the Empire, along with how experts adapted to various cultural and environmental contexts and the legal and administrative frameworks associated with water management, makes this period a crucial lens for

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understanding the relationship between societies and water resources (Hermon 2008). The author of this volume has holistically examined this comprehensive approach to water management by considering the construction techniques, administrative processes, and social, symbolic, sacred, and ritualistic aspects that established a new way for communities to interact with water.

Incorporating new methodologies, such as spatial, physicochemical, geophysical analyses and digitalization, offers innovative ways to explore how societies interacted with water and the material manifestations employed for its management. The tools offered by these new methodologies enable more precise case studies to be produced and enhance understanding of the complex Roman water collection, distribution, and drainage systems. Additionally, studying these systems provides insights into the symbolic significance of their use.

This monograph offers an updated overview of various case studies on different regions of the western Mediterranean. It examines several themes that illustrate the relationship between the Romans and water, emphasising the tangible aspects of this interaction from an integrated management perspective. The study employs diverse methodological approaches, including archaeology, history, religion, and geography.

The first part of this volume focuses on case studies from Hispania. It reconstructs the water cycle in *Mirobriga* by analysing the material remains available, and it considers public and private perspectives, as well as the topographic layout designed for efficient water distribution. Hydraulic constructions should not be analysed in isolation; they must be understood within their geographical contexts. Technologies such as LIDAR have enabled precise mapping of infrastructures, notably in *Calduba*, which was renowned for its robust hydraulic structures. These new methodologies enhance the understanding of the functionality and symbolism of Roman water collection and distribution systems. This system is an example of practical utility and the aesthetic of this type of structure, reflecting the power and mastery that Rome exercised over nature. A significant, though sometimes challenging to verify, element is the existence of *erogationes*, or the distribution of public water for private use in urban systems, as documented in the works of Frontinus and Vitruvius. This practice has been evidenced in *Augusta Emerita*, thanks to a recent discovery in what is known as the 'House of the Amphitheater'.

Moving into *Gallia Narbonensis*, the southern region of Gaul, remarkable examples of the cultural persistence of hydraulic systems, such as staircase fountains can be found. In Cisalpine Gaul, the study of *Augusta Taurinorum* reveals the complexity of its water supply system through the reconstruction of its water cycle based on the limited remains that have been preserved. While traditional water collection methods continued to be used, the construction of an aqueduct led to the introduction of the advanced technique of an inverted siphon.

On the Italian peninsula, particularly in *Latium*, the use of water and the hydrogeological characteristics of the territory significantly influenced the cultural identity of civic communities, as shown by the study of the city of *Veii*. Urban planning was crucial in water management, incorporating supply, drainage, and sewage systems. For example, the theatre of Ostia featured a complex drainage network integrated into the city's sanitation system to ensure public health.

The imperial villa of Nero at *Subiaco*, located in a mountainous area, is a great example of sustainable water planning with a circular water system designed to adapt to its environment while maximising efficiency. In this context, water was both functional and part of a show of imperial strength, symbolising power and luxury. Likewise, the dynamic nature of water management systems, which adapted to changes in the use of space and the requirements for this usage, is demonstrated in examples such as the luxury villas of *Baiae* and the city of *Abellinum*. Material evidence indicates the evolution of complex water redistribution systems in these locations.

Despite extensive research, Pompeii continues to provide new insights into urban water management. Data management systems and spatial analysis have analysed the various uses of water in artisanal, productive, and commercial contexts. On a domestic level, cisterns located beneath the *impluvia* of the *Domus* offer a glimpse into everyday interactions with water. They demonstrate how access to and maintenance of water were integral to daily life and could be adapted to seasonal needs, highlighting the importance of this resource in Roman households.

As mentioned earlier, the study of water management in Antiquity remains academically relevant and significant. This relevance is evident in the Sustainable Development Goals, particularly Goal 6: 'Clean Water and Sanitation', which emphasizes efficient and universal resource management. Ensuring water quality and adequate sanitation remains a significant challenge for Agenda 2030.

Archaeology and history can play a crucial role in addressing this challenge by raising awareness about the effectiveness of sustainable water systems based on past experiences. This awareness can promote a shift in how water resources are managed at all levels, from individuals to communities. Therefore, these disciplines must actively contribute to fostering a new water culture that is more respectful of the environment, similar to the practices of ancient societies.

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