Editorial: Probing the past and facing the future

Most of human history has been spent in the hunting and gathering of food. The very settlements of humankind were established in temperate areas with sufficient water supply. In the long history of humankind the basic, most powerful, propelling force that shaped his action was the need to secure food and water. Air was beyond his control. This is shown practically in all excavations of prehistoric human habitations. They all had one thing in common; all were located near sources of a spring, river, lake or stream. During the Neolithic age (ca. 5700–3200 BC), the first successful efforts to control the water flow (such as dams and irrigation systems) were driven due to food needs and were implemented in Mesopotamia and Egypt.

The first successful effort for water supply and wastewater management was undertaken during the Neolithic Age in El Kowm (or Al Kawm), located between the Euphrates River and the city of Palmyra in modern day Syria. This location was one of the first places where the domestic infrastructure for water and wastewater was built. The early Mesopotamian cities at the end of the fourth millennium BC to the beginning of the third millennium BC had networks of wastewater and stormwater drainage. Some of these cities included Habuba Kabira, Mari, Eshnunna, and Ugarit. Wastewater disposal facilities such as drainage facilities were available in the Late Urak Period (ca. 3500–3200 BC) at Habuba Kabira. Minoan Crete, Greece and Mohenjo-Daro in modern day Pakistan in the Indus Valley are the earliest examples of water supply and sanitation that have developed in an impressive way since the Bronze Age (ca. 3200–1100 BC). During that era water supply and wastewater management were practiced in several Minoan settlements, such as the four great palaces of Knossos, Phaestos, Mallia, and Zakros. In Knosos, which was the largest palace, there were advanced water supply systems based on a closed pressurized network, bathing rooms, lavatories, and a drainage and sewerage system, with one lavatory having a flushing channel dug into the floor, fed by an outside reservoir. The ancient Egyptians followed water supply and sanitation practices according to their social status.

China has a long history of urban water supply, drainage, river management, irrigation, and wastewater management: the earliest event of water governance dates back to around 2000 BC. The earliest event of water governance recorded in Chinese documents as well as in popular folklore was the story of Da Yu Governance of Water. He led the Yellow River governance successfully and as a result he became the first emperor of the Xia Dynasty of China (ca. 2000 BC), when early China was formed. According to Chinese ancestors, vicinity to a river was a strong criterion for the selection of the site for the establishment of cities, such as Xi’an, Beijing, and Nanjing. As a result, water supply, wastewater and stormwater management was an integral part of the cities’ services.

Around 400 BC, the Greeks recognized the importance of water for public health consequently organizing baths, toilets, and sewerage and drainage systems. The Etruscans were masters of hydraulics: the Romans, following their lessons, became masters in water and wastewater engineering constructing, in particular, the sewerage system of Rome developed around its main sewer (still preserved): the Cloaca Maxima (first developed around 600 BC). During the Middle Ages, epidemics raged through the majority of European cities, but the medieval world was more conscious of sanitation than the other Renaissance civilizations. During the Byzantine period, the combination of several variables, such as the partial continuation of ancient traditions and practices, the barbaric raids and their results, the social reformation due to the Christianity, etc., had a great influence on the development of water supply, lavatory, and wastewater technologies. Water supply and sanitary installations such as toilets were incorporated in most Ottoman religious and secular buildings, such as mosques, madrese, türbe, hospitals, hammams, and baths. In the 19th century there were diffuse outbreaks of cholera. Going

doi: 10.2166/ws.2013.151
against the mainstream view (‘miasma theory’), in 1854 the British physician John Snow demonstrated that cholera epidemics were waterborne rather than airborne. The water closet gained tremendous popularity due to its ability to immediately remove human waste from the house, thus making cesspools no longer necessary. The 20th century saw the development of water disinfection and wastewater treatment processes, with one of the main emphases and advances being the activate sludge process.

That rapid technological progress in the last century created a disdain for past achievements. Past technologies, especially in water and wastewater sectors, were regarded to be far behind the present ones; significant major advances achieved in the 20th century. At the same time, it gathered a great deal of unresolved problems, related to management principles, such as the decentralization of the processes, the durability of water and wastewater projects, the cost effectiveness, and the sustainability and especially protection from floods and droughts. In the developing world, such problems were intensified to an unprecedented degree. Moreover, new problems have arisen such as the contamination of surface and groundwater. Naturally, intensification of unresolved problems led societies to revisit the past and to reinvestigate successful past achievements. To their surprise, those who attempted this retrospective, based on archaeological, historical, and technical evidence, were impressed by two things: the similarity of principles with present ones and the advanced level of management of both water and wastewater. Thus, today it is well documented that most of the technological principles related to water and wastewater are not achievements of the present-day, but date back to 3,000–4,000 years ago.

With the increasing worldwide awareness of the importance of water resources management in ancient civilizations, the responsibility for organizing the 3rd IWA International Symposium on Water and Wastewater in Ancient Civilizations was undertaken by the IWA Specialist Group (SG) the end of May 2009 during the 2nd IWA International Symposium which was held in Bari, Italy. The Symposium was organized by the IWA SG on Water and Wastewater in Ancient Civilizations in collaboration with the Istanbul Technical University, the International Water History Association (IWHA) and other national and international agencies, in Istanbul, Turkey, from 22 to 24 March 2012. The aims of the Symposium were:

- Methods, practices, and techniques of water and wastewater resources management in ancient civilizations.
- Groundwater resources, cisterns, qanats (kareez) and wells in ancient civilizations.
- Urban water use in ancient civilizations.
- Urban wastewater and storm water management technologies in ancient civilizations.
- The evolution of water and wastewater technologies through the millennia.
- Old influence in modern water and wastewater technologies.
- The socio-economic role of water in ancient civilizations.

The Symposium aimed at bringing together a wide body of knowledge from the newly emerged and expanding field of water and wastewater management technologies in ancient civilizations. It was an international one, with 350 scientists and professionals from 18 countries. The geographical coverage was wide beyond expectations, including four out of five continents with the prominence of the Mediterranean region and particularly Turkey and Greece. Simultaneously, it was an interdisciplinary Conference, with representatives of several scientific and technological disciplines and with the additional participation of the industry, with a dominance of Water and Wastewater Sciences and Archaeology but also including Life Sciences, Environmental Sciences, Health Sciences, Biology, Physics, Geosciences, Economics, Law and even Tourism.

From the submitted papers, 87 were selected and included in the 905-page proceedings. This number of papers was impressive, particularly, because most of the contributions do not originate from formal and funded research projects. Some authors were motivated by personal interest (even as hobbies) and made their contributions in parallel to their many duties and under the stress of their heavy workload. Apart from the number of papers and the quantity of information gathered and processed, several other aspects impressed. The timeframe of the conference themes extended from prehistoric to medieval and contemporary times; a few papers examined modern themes trying to trace old influences. Twenty-one papers were
selected following the journal’s rigorous peer review process and are included in this issue. The following general conclusions were drawn in the final session of the Symposium, in attempt to summarize the state of the art in the field and the Symposium contributions:

- Ancient hydraulic structures constitute a valuable historical, cultural and environmental heritage.
- The history of water science and technology is currently in its infancy.
- History teaches that water management is important for the sustaining of civilizations.
- History also teaches that many civilizations all over the world have developed magnificent technologies and management practices.
- There is a lot to learn from ancient water and wastewater technologies and practices.
- Technologies coming from the past will certainly furnish ‘new’ and sustainable solutions for facing the future global environmental crisis.
- The current conference has been a further successful step beyond the previous conferences.
- The continuation of these conferences will certainly suggest improved solutions for current and future problems.
- Finally, during an IWA SG Meeting hold at the Conference in Istanbul the organization of our next Symposium in Peru in March 2015 was decided.

Last but not least, special thanks are due to all authors, the Organizing and the Programme Committees, and all local organizers for their devoted contributions.

**Guest Editors**

**Andreas N. Angelakis**  
National Foundation for Agricultural Research (N.AG.RE.F), Institute of Iraklion, 713 07 Iraklion, Greece  
Zheng Xiao Yun  
Yunnan Academy of Social Sciences, Kunming city 650034, Yunnan Academy of Social Sciences Building, Yunnan Province, China