Differences between the ancient Greek civilization with the earlier Mesopotamian and Egyptian civilizations are not confined to cultural or mental issues, but also extend to infrastructure conditions related to water and wastewater. While Mesopotamia and Egypt relied on the exploitation of water of large rivers (i.e., Tigris, Euphrates, and Nile), developments in Greece have been characterized by limited and often inadequate natural water resources. Greeks and especially Minoans, paradoxically, avoided the establishment of their palaces and major cities close to the existing small rivers and lakes. Although the reasons are not well understood, it can be hypothesized that the protection from floods and water-related diseases (e.g. malaria), as well as a more convenient life style in a dry climate and better adaptation to the environment, were among the reasons. Water scarcity due to the dry climate and the distance from major water bodies led Greeks to the development of advanced hydraulic systems for the collection and transport of water and for the collection and dispose the wastewater as well as sustainable management practices (Koutsoyiannis et al., 2008).

The history of water supply and wastewater engineering on Crete dates back more than ca. 4,500 years. From the early Minoan period (ca. 3200-2300 B.C.) issues related to water supply were considered of great importance and were accordingly developed. Archaeological and other evidence indicate that during the Bronze Age advanced water management and sanitary techniques were practiced in several settlements in Crete (Angelakis and Koutsoyiannis, 2003). The emergence of the palaces reveals a remarkable development of water management in the urban context. Moreover, during the Middle Minoan and the beginning of the Late Minoan periods (ca. 2000-1500 B.C.) a “cultural explosion” occurred on the island. A striking indication of this is manifested, inter alia, in the advanced water management techniques practiced in Crete at that time. These included various scientific fields of water resources, such as wells and ground-water hydrology, aqueducts, domestic water supply according to local condition in terms of climate and geomorphology. Additionally, the constructions and use of sanitary and purgatory facilities, even the recreational uses of water, signify attitudes of life and taste (Lyrintzis and Angelakis, 2006). Numerous very advanced and wonderful water and wastewater systems, including aqueducts, cisterns, filtering systems, rainfall-harvesting systems, terracotta pipes for water supply, fountains, baths, sewers, and toilets were practiced in several Minoan palaces and other settlements (Angelakis et al., 2005).

These systems were so advanced that can be compared with the modern systems, which were established only in the second half of the 19th century in European and American cities. Thus, Crete became the cradle of one of the most important civilizations of mankind and the first major civilization in Europe (Angelakis and Koutsoyiannis, 2003). Later, during
the Hellenistic and Roman periods, significant developments were done by Cretans in hydraulics, such as in the construction and operation of aqueducts, cisterns, wells, harbors, water supply systems, baths, toilets, sewerage and drainage systems. Further improvements were achieved by Cretans during the Byzantine and Venetian periods, when a further development of hydro-technologies was achieved.

With a few exceptions, the basis for present day progress in water transfer is clearly not a recent development, but an extension and refinement of the past. It should be noticed that hydraulic technologies in ancient Greece were not limited to urban water and wastewater systems. Different techniques were applied to assure water supply: (a) management of spring runoff water and (b) transportation and storage of water, according to local conditions. While the Knossos palace was depending on springs, in the palace of Phaistos the water supply was depending on a surface runoff system, while at the Zakros palace a groundwater system was used (Koutsoyiannis and Angelakis, 2003). Despite this diversity, common construction mastery was applied. The progress in urban water supply was even more admirable, as witnessed by several aqueducts, cisterns, wells, and other water facilities discovered, including the famous Minoan aqueducts of Knossos and Tylissos, the cisterns of Zakros, Archanes, Pyrgos and Tylissos, the wells of Paleokastro, Zakros, and Itanos (e.g. Koutsoyiannis et al., 2008). These advanced Minoan technologies were expanded to the Greek mainland in later periods of the Greek civilization, i.e. in Mycenaean, Archaic, Classical, Hellenistic and Roman.

It can be suggested that a group of people living in prehistoric Crete were aware of the principles of technologies relevant to water. This is suggestive of the existence of master craftsmen responsible for constructing and maintaining the water supply system of a community. They were concerned with the solution of some water related problems and were able to provide palaces and settlements with efficient, even sophisticated water supply systems. To accomplish their goals, this group of craftsmen obviously possessed at least a rudimentary understanding of some basic principles, such as flow and friction, of what we call today water and environmental engineering (Angelakis and Spyridakis, 1996).

In light of these historical and archaeological evidences, it turns out that the progress of present day in urban water and wastewater technologies as well as in comfortable and hygienic living is not as significant in terms of evolution as we tend to believe (Koutsoyiannis and Angelakis, 2003). Many civilizations, which were great centers of power and culture, were built on locations that could not support the populations that developed. Now we find ourselves in similar situations in many places around the world. How do we balance the mega water projects with the methods of traditional knowledge? Koutsoyiannis et al. (2008) explored the legacies and lessons on urban water management learned from the ancient Greeks. They summarized the lessons learned as follows: (a) The meaning of sustainability in modern times should be re-evaluated in light of ancient public works and management practices. Technological developments based on sound engineering principles can have extended life span. (b) Security, with respect to water, is of critical importance in the sustainability of a population. And (c) in water-short areas, development of an effective water resources management program is essential. In addition, when we define ancient civilizations, in addition to cultural, recreational and in-family practices, we
should also consider all technological achievements and especially water resources
technologies, as manifested by the relevant remnants.

The use of traditional knowledge does not directly apply techniques of the past but
instead, try “to understand the logic of this model of knowledge” (Laureano, 2007).
Traditional knowledge allowed ancient societies to keep ecosystems in balance, carry out
outstanding technical, artistic, and architectural work that has been universally admired.
The use of traditional knowledge has been able to renew and adapt itself. Traditional
knowledge incorporates innovation in a dynamic fashion, subject to the test of a long term,
achieving local and environmental sustainability. Minoans are considered pioneers in
developing the basic water and wastewater technologies in urban environment, in a
sustainable way. Later other ancient civilizations (i.e. Egyptians, Phoenicians, Greeks,
Romans, Mayans, and Incas) lived in harmony with nature and environment.

More on this will be presented and discussed during the 3rd IWA International
Symposium on Water and Wastewater Technologies in Ancient Civilizations, Istanbul,

References
Angelakis, A.N. and Spyridakis, S. V., 1996. The status of water resources in Minoan times:
A preliminary study. In: Diachronic Climatic Impacts on Water Resources with Emphasis
on Mediterranean Region (A.N. Angelakis and A.S. Issar, Eds.), Ch. 8: 161-191,
Springer-Verlag, Heidelberg, Germany.
Ancient Greek Times. The Encyclopedia of Water Sciences, Marcel Dekker Inc. (B.A.
Stewart and T. Howell, Eds.), Madison Ave., New York, N.Y., USA, p. 999-1008.
Water management in Ancient Greece: Legacies and Lessons. ASCE, Journal of Water
Resources Planning & Management, 134 (1): 45-54.
Koutsoyiannis, D. and Angelakis. A. N., 2003. Hydrologic and Hydraulic Sciences and
Technologies in Ancient Greek Times. The Encyclopedia of Water Sciences, Marcel
Dekker Inc. (B.A. Stewart and T. Howell, Eds.), Madison Ave., New York, N.Y., USA,
p. 415-418.
Laureano P., 2007. Ancient water techniques for proper management of Mediterranean
Water and Wastewater Technologies in Ancient Civilizations (A. N. Angelakis and D.
Koutsoyannis, Eds.), Iraklio, Greece, p. 163-174.