



The history of Sustainable Drainage

Susanne Charlesworth (1), Luis Angel Sañudo-Fontaneda (2), and Larry W. Mays (3)

(1) Coventry University, Centre for Agroecology, Water and Resilience, Centre for Agroecology, Water and Resilience, United Kingdom (s.charlesworth@coventry.ac.uk), (2) Department of Construction and Manufacturing Engineering, University of Oviedo, Polytechnic School of Mieres, Calle Gonzalo Gutiérrez Quirós s/n, 33600, Mieres (Asturias), Spain, (3) School of Sustainable Engineering and the Built Environment, Arizona State University, College Avenue Commons, 660 S. College Avenue, Tempe, Arizona 85281, USA

Sustainable surface water management is not just a modern innovation, there is evidence from antiquity that it was in use fairly extensively. Cultural and citizen knowledge were closely related to the design and planning of these early drainage systems, supplying the basis of what would become modern water management engineering. Water management was highly influenced by religious beliefs as well as geopolitical, socio-economic and climatic challenges faced by different ancient civilisations. Water-sensitive approaches were used in many cities providing water for consumption, cleaning and washing, and to enhance agricultural production in order to improve food security. Catchments were designed with long-term drainage schemes, which managed water from relatively small areas up to transnational empires that functioned efficiently for extended periods of time. Sustainable water management helped to maintain the balance of power and directly influenced the development and prosperity of entire civilisations either in time of peace or war.

The early Babylonians and Mesopotamians had surface water drainage systems, relying mainly in hard infrastructure, for example, the Minoans (3200–1100 BC) used terracotta pipes to convey stormwater out of their settlements. However, similar techniques to Sustainable Drainage Systems or SuDS were well-known and efficiently carried out as long ago as the Early Bronze Age such as rain water harvesting, water storage in cisterns and ponds and slow conveyance. Constructed wetlands, infiltration and non-structural approaches were also used in antiquity. In fact, previous research has compared Inca drainage techniques at Machu Picchu with that of Low Impact Development since infiltrating pavements, meandering swales and water harvesting were all used. Non-structural approaches include a “superintendent of fountains” in Athens to ensure the equitable distribution of water in the city as well as individual citizens having the responsibility of maintaining the city’s stormwater cisterns.

Agricultural practices were at the very heart of water resource management in antiquity and required the control of water to enable efficient crop production through the design of irrigation systems under challenging environments. Climatic conditions played a decisive role in either limiting water resource availability or in exceeding requirements. Water management was important in supporting both political and social development under changing climates; this could be compared with current climate change predictions, providing clues of how modern society could face this challenge. The principles of Water Sensitive Cities can thus be applied to the water management schemes designed by a number of ancient civilisations through the application of SuDS.