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Landscape stability and water management around the ancient city Jerash, Jordan

Genevieve Holdridge, Ian Simpson, Achim Lichtenberger, Rubina Raja, and Søren Kristiansen
Institut for Geoscience, Aarhus, Denmark

Reduced vulnerability to environmental fluctuations by increasing food and water security increases the resilience of a human society. In the Middle East, there is much archaeological evidence of steady developments and abrupt disasters in cities that have occurred over the millennia, while paleoenvironmental and landscape studies have provided much needed insight into the changes of a city′s surroundings. However, more in-depth urban archaeological studies of soils and sediments on-site, and the interaction of processes on- and off-site are needed to provide new information on human impact and adaptation through time in this region.
The present city of Jerash is the location of one of the major Roman urban centers of the Syrian Decapolis. The city was continuously occupied from the Hellenistic period (2nd century BC) to the Umayyad period in the 8th century AD. The city is located along the Wadi Dayr, which feeds into the Zarqa River, and the area is affected by the tectonic activity of the Dead Sea Rift zone. Since the Roman period, various structures were built to manage surface water including rock-cut and plastered channels, water reservoirs and cisterns. Also, during the city's long occupation, slopes were managed by constructing terraces on- and off-site.
We have examined the urban and extra-urban fluvial record along the Wadi Dayr in order to better understand urban adaptation and environmental impact of on- and off-site water and land management. By engaging an interdisciplinary approach that incorporates archaeological, paleoclimatic, and geomorphological information, our objective is to discern natural and anthropogenic influences on land and water management.
In order to explore human adaptation and impact, we have examined both on- and off-site urban stratigraphy, and are currently analyzing sediments and soils at both landscape and intra-site scales. Profiles in key locations of the wadi offer insight into slope stability (upstream), site land use (midstream) and overall impacts on the wadi system (downstream). Analyses include soil geochemistry, micromorphology and physical properties. We have also applied both relative and absolute dating techniques (i.e. optically stimulated luminescence (OSL) and radiocarbon dating) to constrain short-term events, and to better understand long-term change. Paleoclimatic proxies including stalagmites and sea cores from the eastern Mediterranean are used as a source for regional paleoclimatic trends.

We will present early results from this interdisciplinary approach, which offer insight into how on- and off-site land and water use of an ancient city reflect adaptation over centuries of occupational history. In addition, these early results provide much needed information on the beneficial and adverse impacts this adaptation had on the surrounding landscape and local dryland fluvial system.