

**Spatio-Temporal Mapping of Water Consumption at Public Institutions:
Case of United Arab Emirates (UAE) University**

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Large portion of human activities take place within buildings. Therefore, if energy and water consumption are minimized in buildings this will help in reducing climate change. UAE demarcated water in its vision 2021 as one of the areas that need more researches. This is because water is one of the basic human needs and the country spends millions of dollars every year in desalinating and transporting water to various cities and villages across UAE. Therefore, efforts could be done at individual and institutional level to optimize water usage and consequently save money and environment.

In this study, indoor water consumption at UAE university, as one of the biggest public institute in Al Ain is assessed for the period 2016-2017. The study will fill a gap in literature about water consumption at public institutes in arid environment. It utilizes Geographic Information System (GIS) to answer where water is highly consumed within the university (hot spots), when (time), who consume it, why (causes), and how to minimize consumption. It assembles diverse data reside at various departments to gain a better knowledge about the broad patterns of water consumption in the university campus. The assumption made here is that water consumption is directly proportional to population density (students/faculty/staff) and less during winter. The highest water consumption is found at the College of Information Technology (CIT) and this is due to its size and heterogeneity of its activities (lectures, workshops, conferences, book distribution, restaurants). The relationship between water consumption and number of students is modeled using least square. The coefficient of determination (R^2) is found ranged between 0.13 and 0.47. These values indicate low correlation between water consumption and number of students. This may be due to the centralized usage of buildings and movement of students between buildings during lectures.

Temporal variation showed sharp decrease during July of 2016 and 2017 irrespective of the building type/size and this is associated with summer holidays. The hypothesis of activity-driven consumption showed that the highest water consumption (67.8%) is found at residential buildings (hostels). This is due to many reasons such as longer stay time at the hostels and use of water for showering, flushing, ablution, and washing machines. The library showed consistent low water consumption. It is very interesting to deduce the library usage while investigating water consumption, but it is a lesson that water consumption could be used as a proxy to reveal number of users at buildings. The water consumption at UAEU is benchmarked with the university of Bordeaux in France and other public institutes in Al Ain. On average the water costs the university annually around two million dirhams (AED 2,030,429 = EUR 474,399 = USD 553,250). The result from this study identified sites with the highest water consumption and this could be used to adapt water conservation techniques and campaigns at these sites.

Keywords: Water consumption, public institutes, UAE University, GIS, public awareness