Characteristics of Water Use across 124 Urban Centers in the USA: What did we learn?

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Abstract:
In planning for projections of urban population growth, this study has compiled the current and historical water use data, from 124 urban areas across the USA. The water use data collected were categorized into residential, and commercial, industrial and institutional (CII) end use types. Using exploratory statistical methods, the city wide water use data was clustered based on different parameters such as population density, climate zone, land use pattern, income per capita, GDP, etc., to understand the spatial variation of water use trends. Time series analysis fostered the understanding of temporal variation in water use trends leading to a discussion on non-stationarity and non-linearity of urban water systems in the USA. In confirming to various studies in the past on urban water use, this work reinforces our current understanding that average water use per capita decreases with increase in population density, and also increases from wetter to drier climatic zones, on a continental scale. From the end water use studies, it is seen that water use data is an effective indicator of the level of industrialization in an area which is tied closely with the level of population density. Thus high levels of urbanization goes hand in hand with high levels of industrialization and an increasing demand for fresh water withdrawals. The ultimate goal of this work is to assess the potentials of distributed water systems in mitigating stress on urban water demands, and to pave way for the advancement of sustainability in urban water resources planning and management.