Term Project Proposal Update

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Objective

Application of 3D Buildings in Measurement of Rainwater Harvesting Potential in Cities, a Case Study in downtown Corpus Christi, TX

Background

Limited supply of water resources has become a more and more critical issue in urban development. During last year's drought, the worst one in Texas's recorded history, nearly 100 km^3 of water is lost. Thus alternative source of water supply is needed to ensure community development and economic growth. In this case, we will look into Corpus Christi downtown to measure the potential of rainwater harvesting in this urban area.

Method

This project will use feature database of downtown Corpus Christi where features are commercial buildings. By first measuring the area of roof footprint of these buildings, the project will calculate the volume of rainwater captured by these buildings and their potential of serving toilet flushing use, one of the most common water usage in commercial buildings. The way to estimate toilet water usage is by approximate average calculation. Office area of each building is estimated as relative height of the building divide by average height of one floor(4.5m), and then multiply with area of roof footprint. By giving 20 m^2 of office area to each person, we could get the number of people working in each building. Then, we would give a ratio of 25 people per toilet and the toilet would be used with a frequency of 6L per flush, 8 flushes per hour and 10 hours per day. Based on these, we could calculate the water use for toilets. Rainfall data is collected based on The Texas Manual on Rainwater Harvesting by Texas Water Development Board and monthly water balance method will be used to determine the feasibility of each building's rainwater harvesting potential.

Current Data&Results

Current Data:
- Feature data of 273 buildings in downtown Corpus Christi with roof area and relative height
- Annual & Monthly precipitation data of Corpus Christi

Current Results:
- Toilet water use for each building is calculated already.

Next Steps

- Toilet water use for some tall buildings will be recalculated as roof areas with given relative height only occupy a fraction of the total roof areas, making the approximate estimation of office areas, people, toilet numbers, toilet water use unreasonable.
- Monthly water balance will be calculated to measure the cistern volume of each building and the feasibility of rainwater harvesting will be discussed.