

“Net Zero” Water System for Mehran University of Engineering and Technology

Team: Imran Chaudhry, Rubayat Jamal, Ahmed Rafique, Khawar Riaz

The scarcity of potable water is a serious issue worldwide. Changes in climate pose an increasing risk of drought and drawdown of aquifers in many countries, and the world’s poorest regions are least able to respond. As there is a population increase, pressure on water treatment plants is not able to cope with the growing demand. The idea of rainwater harvesting, aggressive conservation, and water recycling is becoming more and more popular every day. “Water neutral” or “Net Zero” Water System is used to describe a building, development, and neighborhood whose “water footprint”—the amount of water it consumes— is no greater than the water it conserves. In most water neutral projects, baseline water use is established, then compared to water availability; the difference between those two numbers is the amount of water that has to be saved, first through on-site conservation and then through off-site projects such as plumbing retrofits, turf removal, and water reuse. Most water neutral projects in the United States are in California, where a combination of environmental regulation and extreme drought has made it necessary to take extreme measures. Given the similar size, similar climate variability, and regular occurrence of drought, Mehran University Campus, located in Jamshoro, Sindh, is a good place to look for potential solutions to water management, leading to Net Zero water system, in Pakistan.

In this project, the scope of work is limited to achieve net zero water system for only one building at the MUET campus, i.e., Jatoi Hostel Building. The first step was to estimate water budget for that building. Water budget shows the actual water usage and its usage pattern inside the building. Through this, we can identify target areas for achieving net zero water in our hostel facility. For our project, four core target areas are recognized. First is water conservation, here the idea of water conservation is to make and persuade people to be responsible for their water use and promote water-saving culture in the occupants of the building. This will be done by organizing water conservation workshops in the University, which will be made mandatory for all resident students. In addition to that, metered connections for the building will be proposed as a management and policy decision. The second target area is implementing water reuse policy, and the proposed strategy to address this area is on-site water treatment plant. For this, we have designed a separated water treatment system for the gray and black water. Since the amount of blackwater generated is significantly less than greywater, separate treatment of these two is our proposed financial arrangement. The underlying ideology is all the water generated in the toilet faucet, bath, dishwashing, and laundry doesn’t require advanced purification as required for drinking water quality. And they only need primary step purification for making them reusable for the above-said purpose. The black water, after the primary step purification, can also be used in the toilet flush and urinals. The third area of focus is rainwater harvesting. Despite getting little annual precipitation, our site can be used for storing rainwater temporarily and using it for indoor or outdoor demand. A small cistern of 3,000 gallons is designed and will be constructed on site for storage purposes. Lastly, emphasizes is on changing the appliances in the hostel to make it more water conserve. Replacing the old appliances with new and more water efficient ones will be an effective step towards achieving net zero water at our hostel facility.

There is an appreciable amount of progress being done in all the target areas. We have completed Water Budget Calculation for the building, layout plans of the building are finalized, feasibility analysis of rainwater harvesting and tank sizing is done. Also, we have identified the separation of greywater and black water pipelines to ensure further more energy efficient treatment and pure water supply.