Modelling of Water Tank

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Everywhere in the world people, face problems related to water. In some places massive amounts of precipitation produce, disastrous floods while other regions gets so little rain that it can be difficult to obtain enough drinking water. In Denmark, we do not experience problems with getting drinking water because we have fair amounts of precipitations throughout the year. In the northern parts of Algeria, the average annual rainfall is almost the same as in Denmark, but the rain is more unevenly distributed with a dry period in the summer and a rainy winter. In this project, the effect of a rainwater storage tank is investigated with emphasis on the tank's behavior in the Danish and North Algerian climate. The tank collects water from the roof of the house, which then is used in the house for toilet flushing, and thereby replaces water of drinking water quality. The investigation of the behavior of the tank is done by making a rather simple water balance model in both MATLAB and Excel. Data used in the models is daily precipitation data from the European Climate and Dataset database for the last 30 years. Variables in the model are the roof area and tank volume ratio, the daily water usage in the household and the precipitation patterns. The outputs are the amount of water in the tank every day, the amount water overflowed from the tank, and the amount of water supplied to the tank in case of draught. The results are displayed in graphs showing the impact from the tank/roof ratio and water consumption on overflow and additional water supplied in both countries. From the results, it is clear that persons wanting to implement a rainwater tank should take the water consumption of the house into account, because inadequately sized tanks lead to a higher amount of either overflow or added water than necessary, thus reducing the costs and the environmental benefits. It is evident that the roof area/tank volume ratio is more important in Algiers in order to reduce the drinking water usage and prevent overflow from the tank, meaning that it pays off to invest in a bigger tank. In Copenhagen, the influence from the tank/roof ratio is less important and mostly makes a difference for houses with very high water consumption. This means that in the Copenhagen area it would be more of a waste to invest in a very large tank than in Algiers, where added volume to the tank results in reduced overflow and drinking water consumption. The reduction in drinking water consumption is bigger in Copenhagen than in Algiers due to the mere evenly distributed rain. The rain distribution is also the reason why the overflow in Copenhagen is generally higher than in Algiers. It is concluded that the tank can help both countries saving drinking water, but is less efficient as a solution to prevent floods, because the uncertainty of the amount of water in the tank makes it a very unreliable solution.