



# URBAN REGENERATION AND OPTIMAL WDM

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## Overview

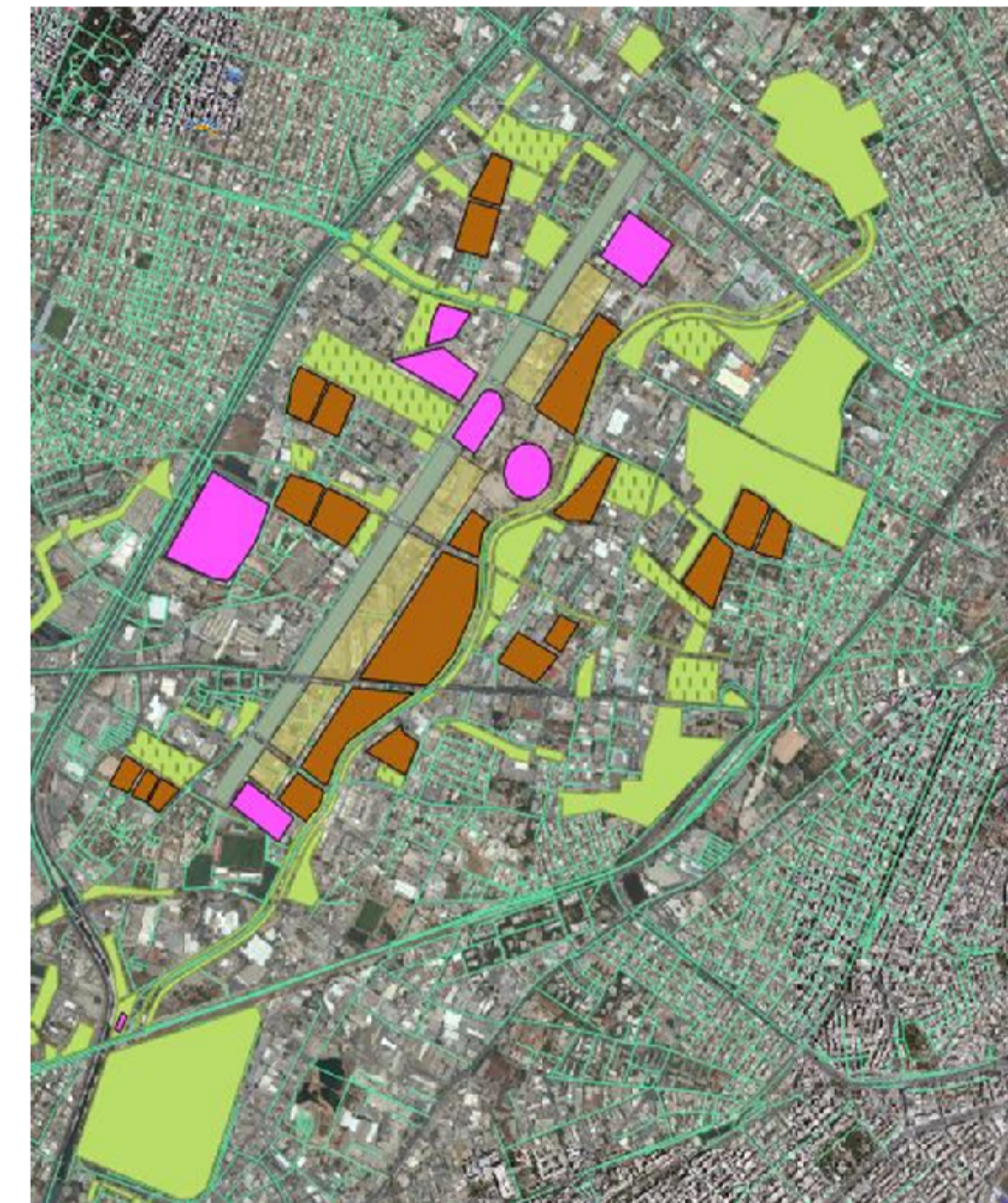
### Abstract

In this study, three alternative regeneration scenarios of Elaiwnas Athens, were assessed with UWOT. UWOT was used to 'scan' the water networks of the three scenarios (assuming conventional water network) to identify the most intense water consumers. Afterwards, a local rainwater harvesting scheme was introduced in the networks of the major water consumers to reduce the water demand on-the-spot. Then, UWOT along with an optimization algorithm were used to properly dimension this rainwater harvesting scheme. The results of the optimization indicated that the runoff volume could be considerably reduced, which will further improve the ecological footprint of the planned regeneration.

### Related Work

1. Enveco (2011) Master Plan: Eleonas Metropolitan Region Of Athens, Greece.
2. Rozos, E., and Makropoulos, C. (2013). Source To Tap Urban Water Cycle Modelling. Journal of Environmental Modelling and Software, DOI:10.1016/j.envsoft.2012.11.015.
3. Rozos, E., Makropoulos C., and Maksimovic C. (2013) Rethinking urban areas: an example of an integrated blue-green approach, Water Science and Technology: Water Supply, 13 (6), 1534–1542, doi:10.2166/ws.2013.140.

### Elaiwnas regeneration scenarios

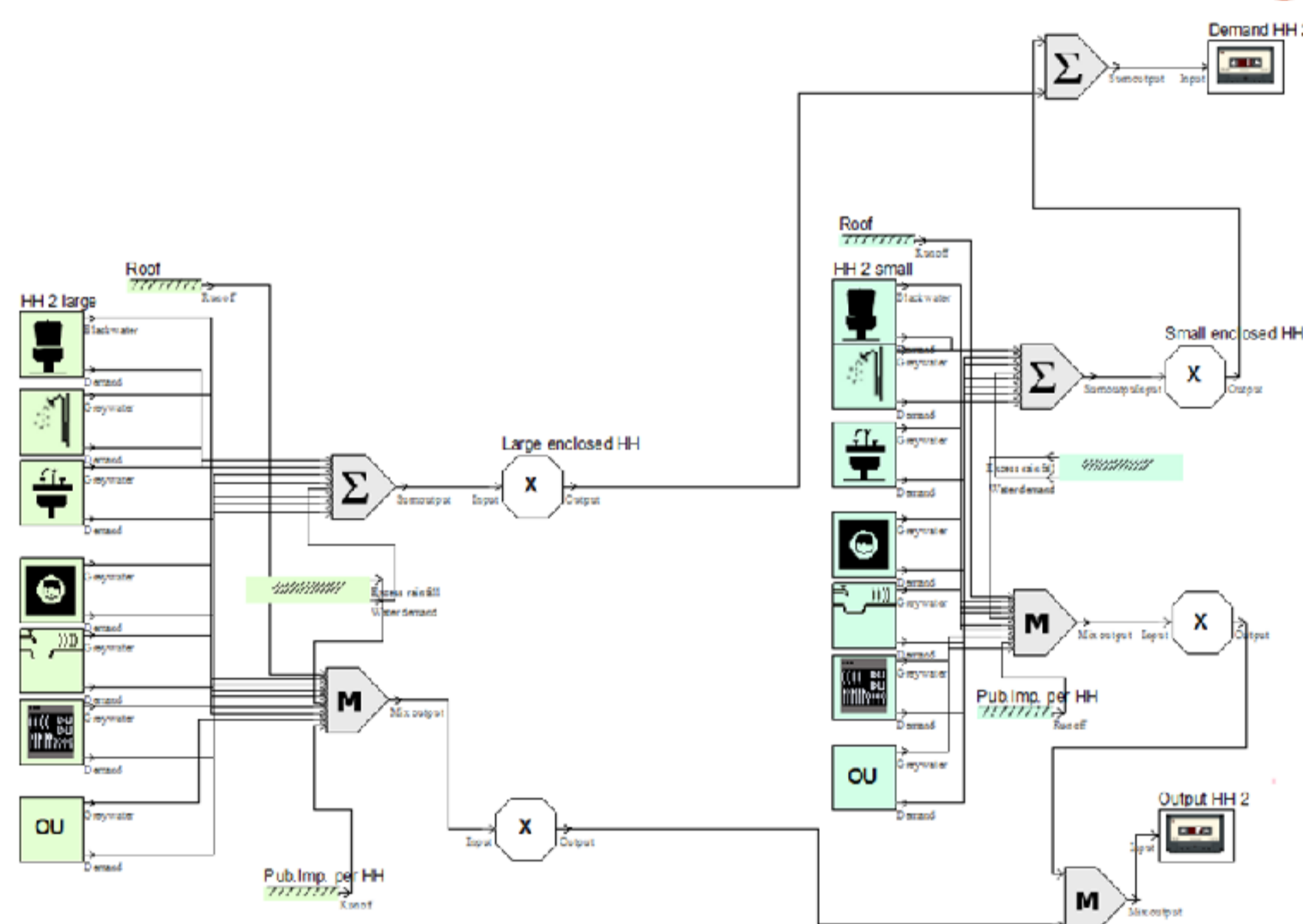


Public buildings    Multi-storey build.    Apartments    Olive groves  
Green areas

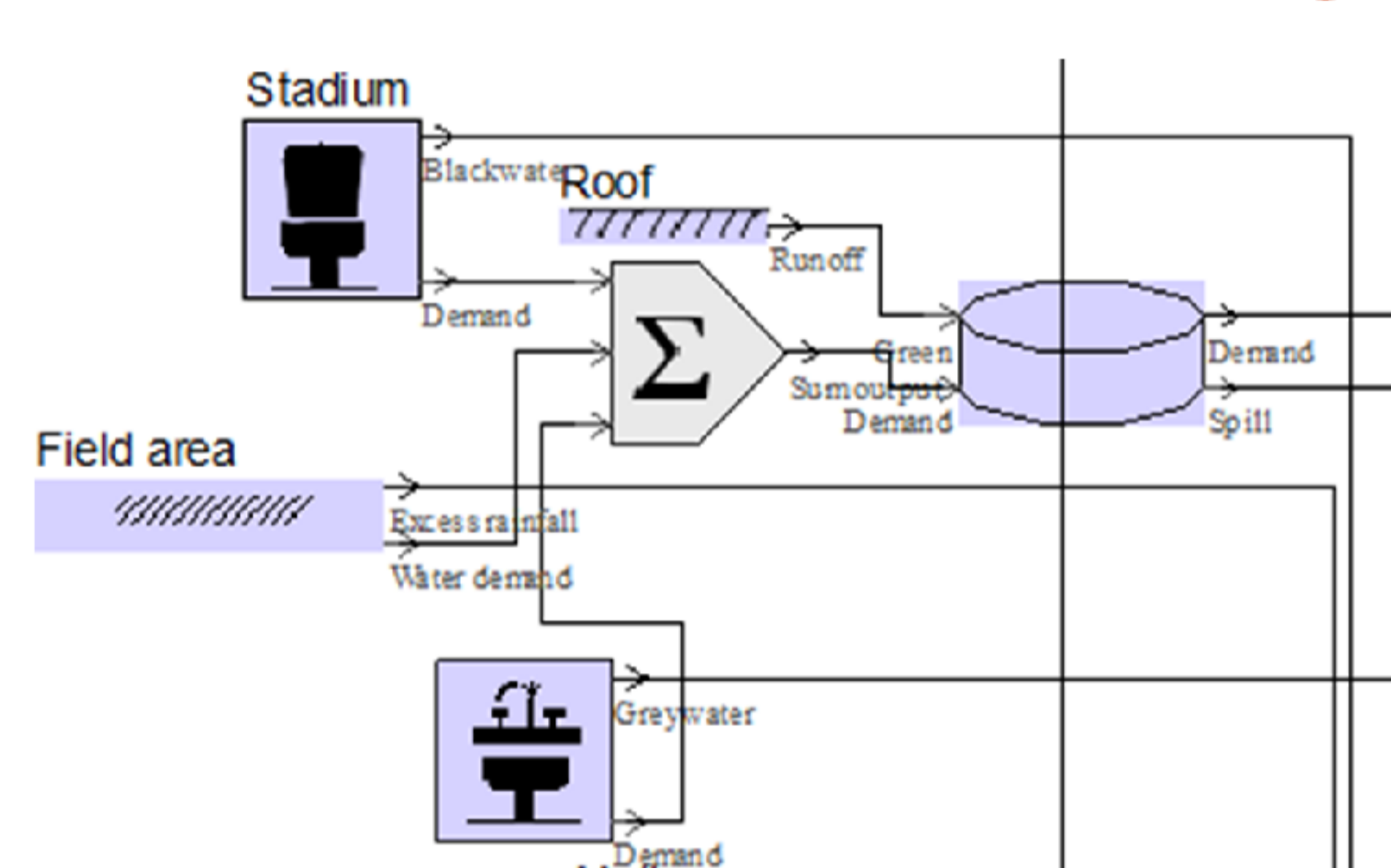
- **Scenario 1**, the area will become a green zone for the surrounding urban fabric.
- **Scenario 2**, the area will include new households, transportation services and extended green areas.
- **Scenario 3**, the area will become the new central business district of Athens.

## Model setup

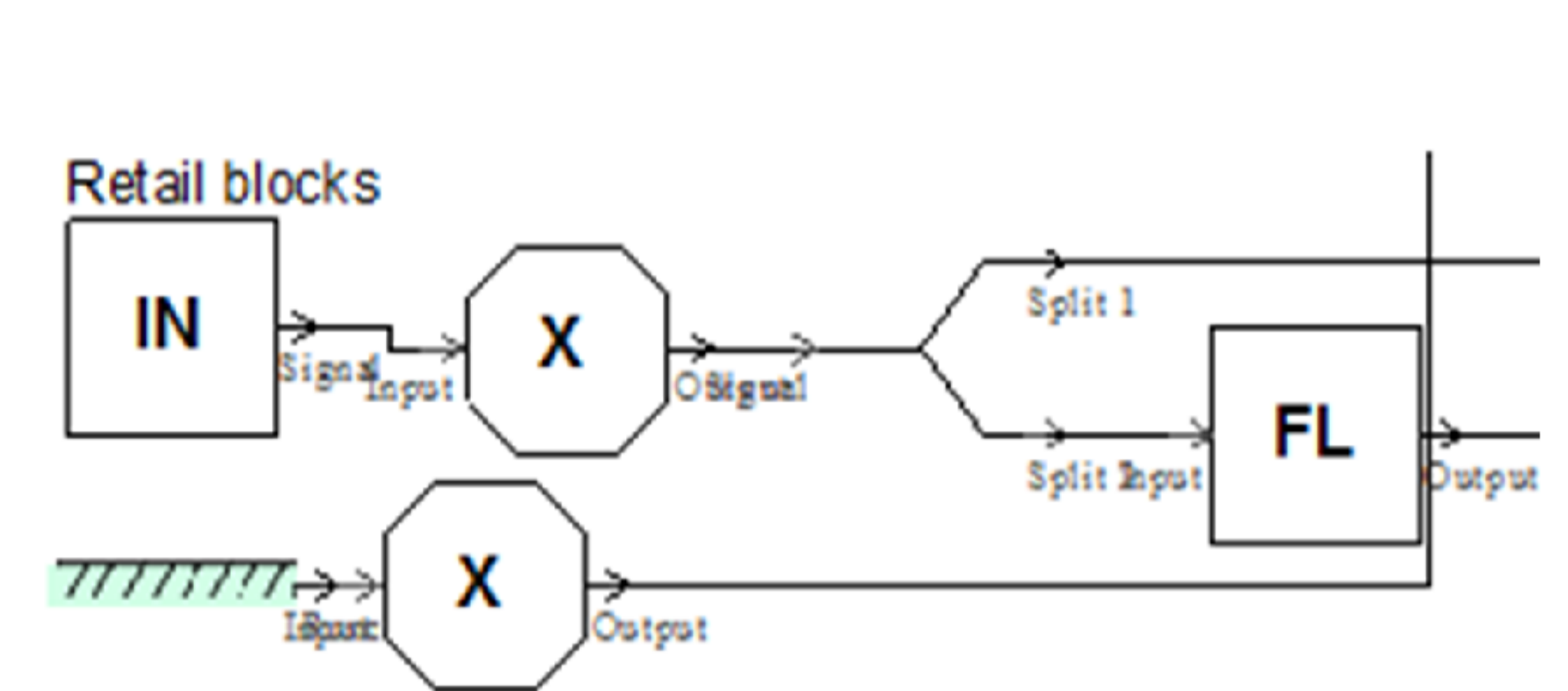
### Households – low level modelling



### Stadium – low level modelling

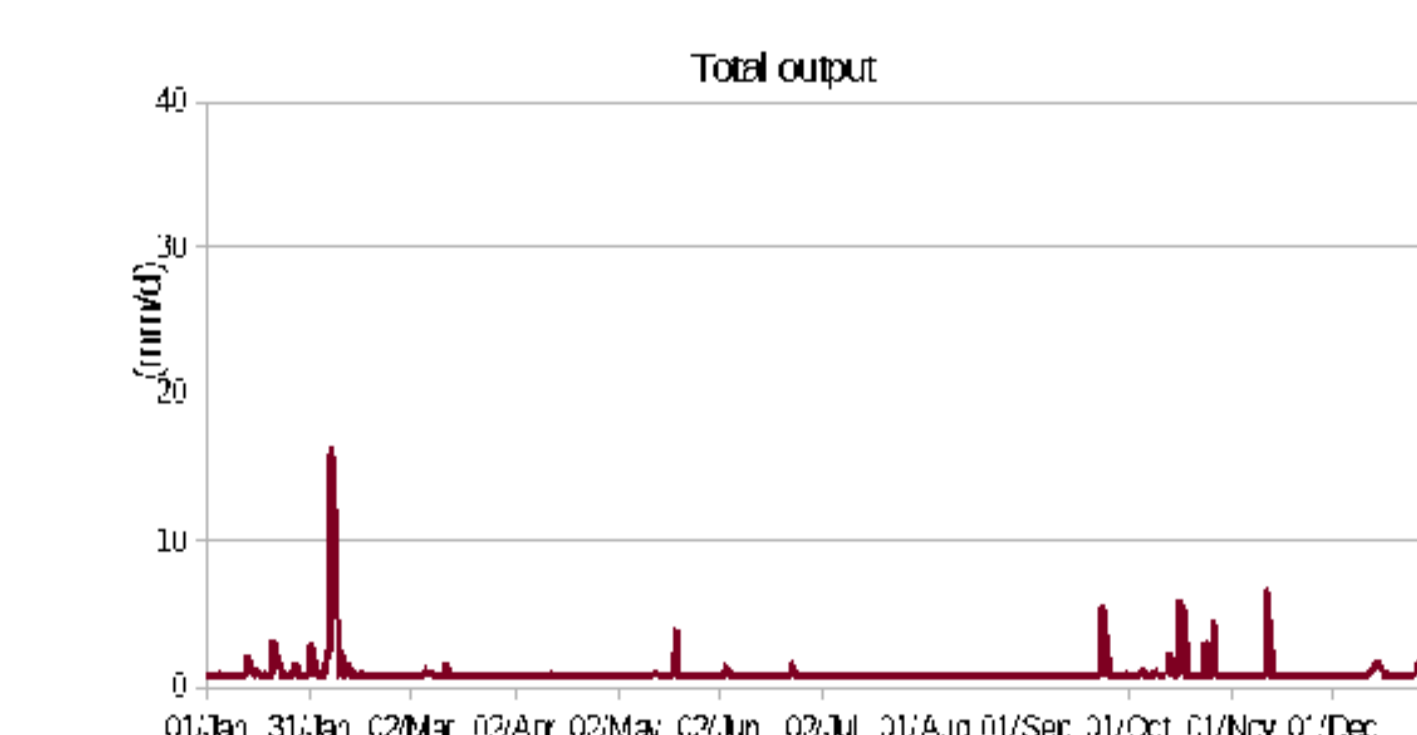
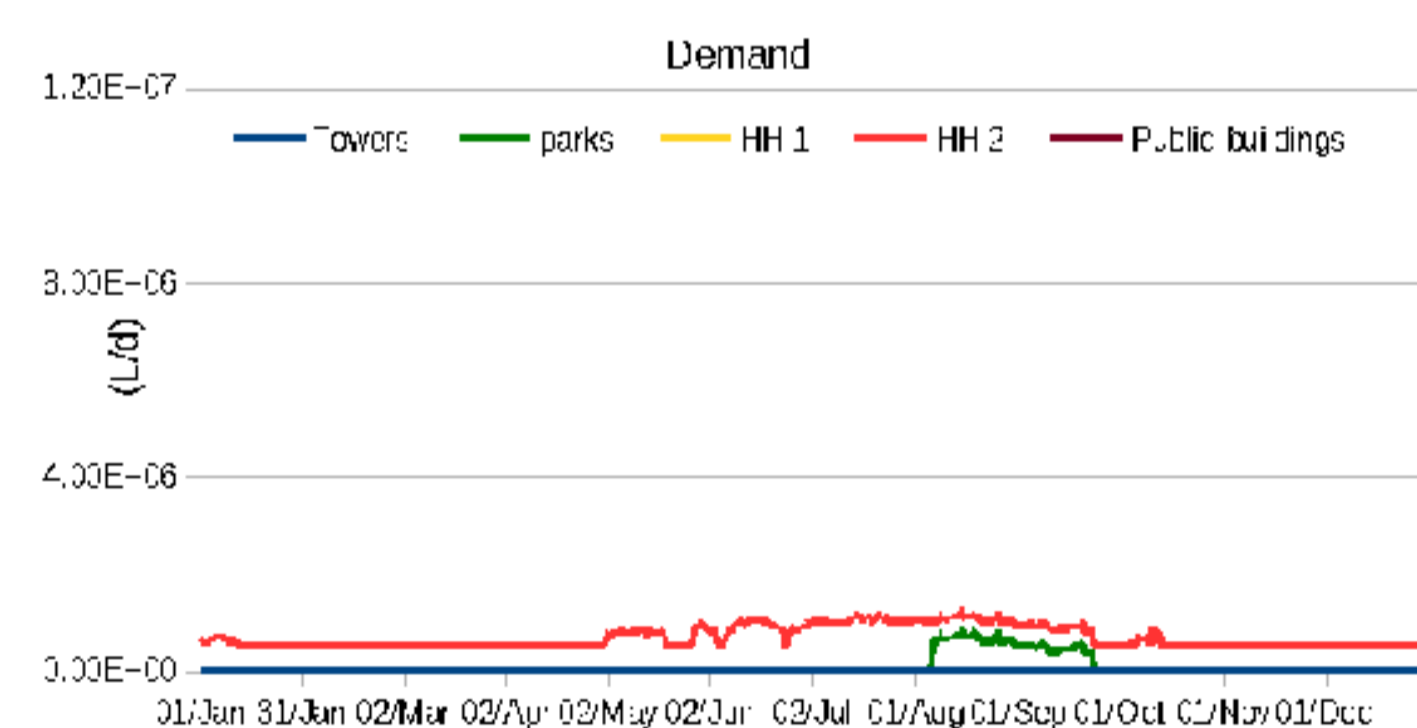


### Retail – empirical modelling

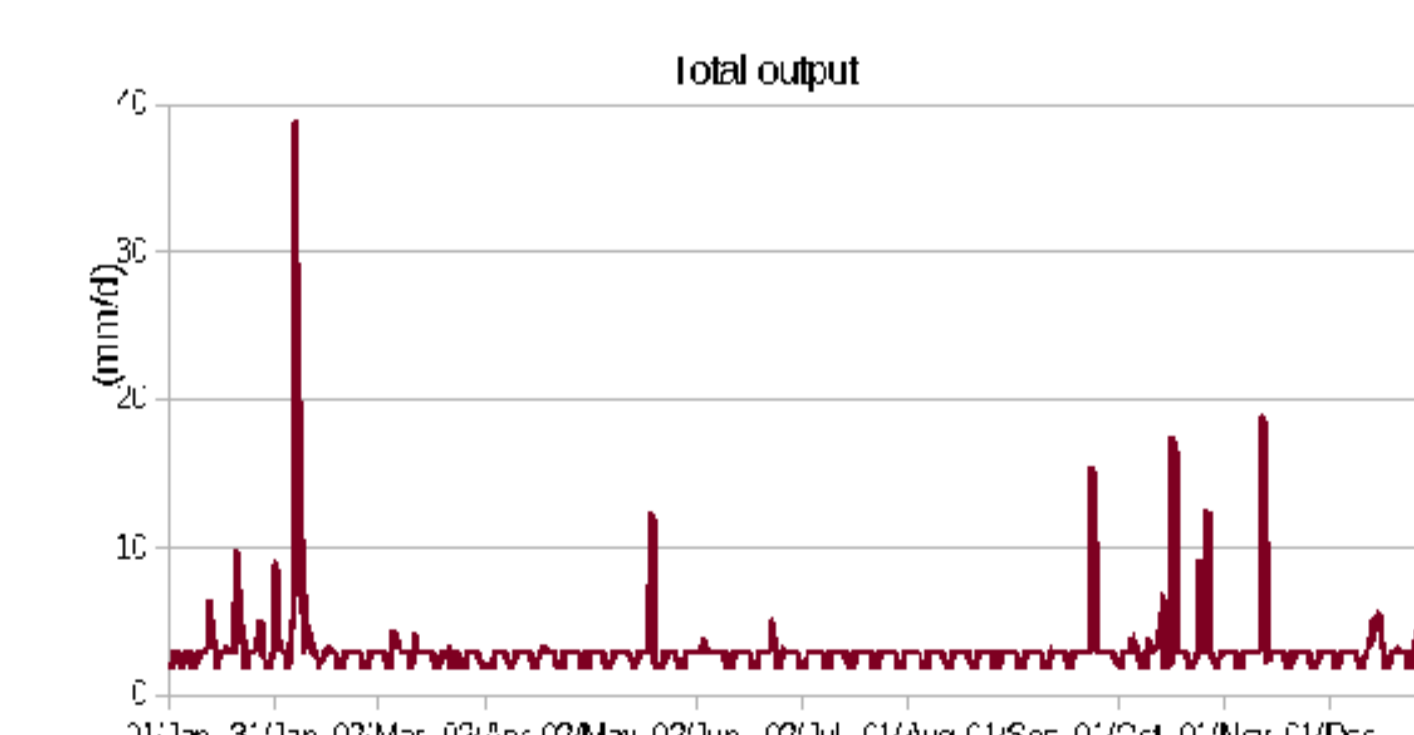
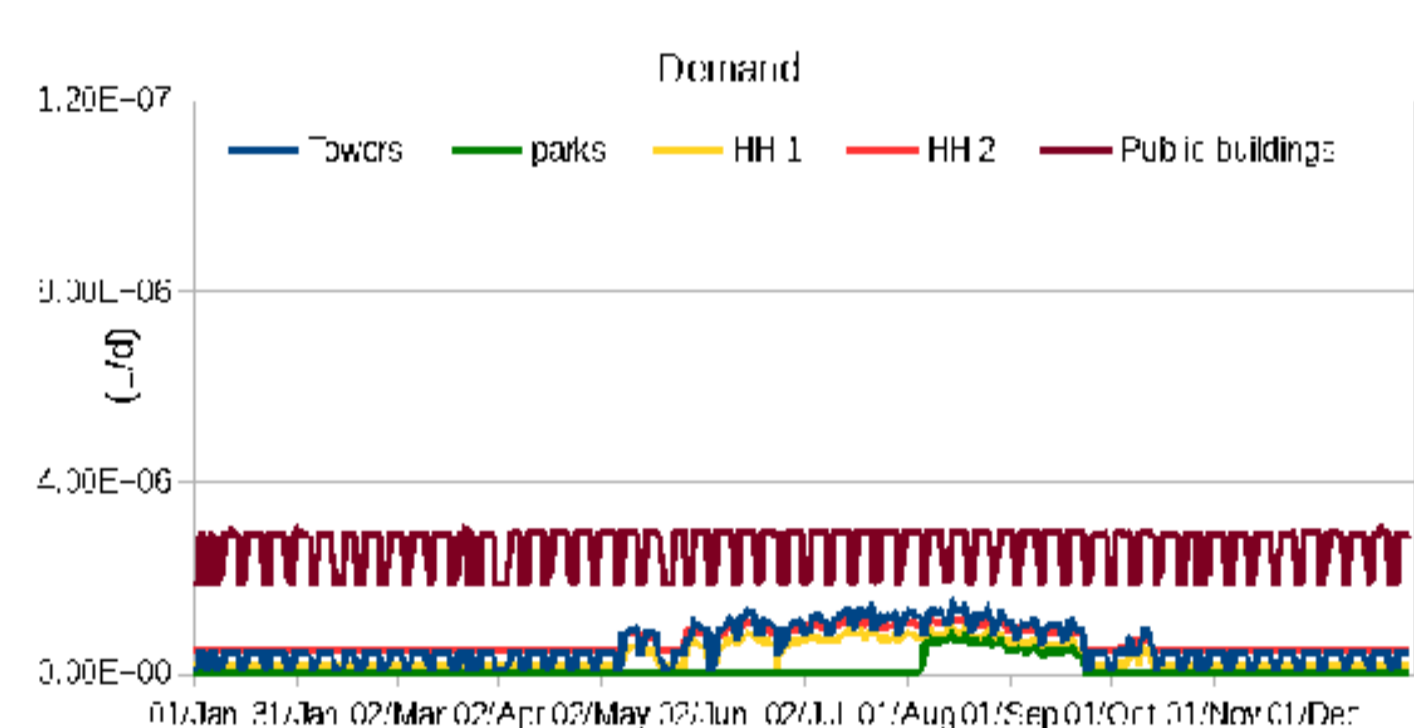


## Results

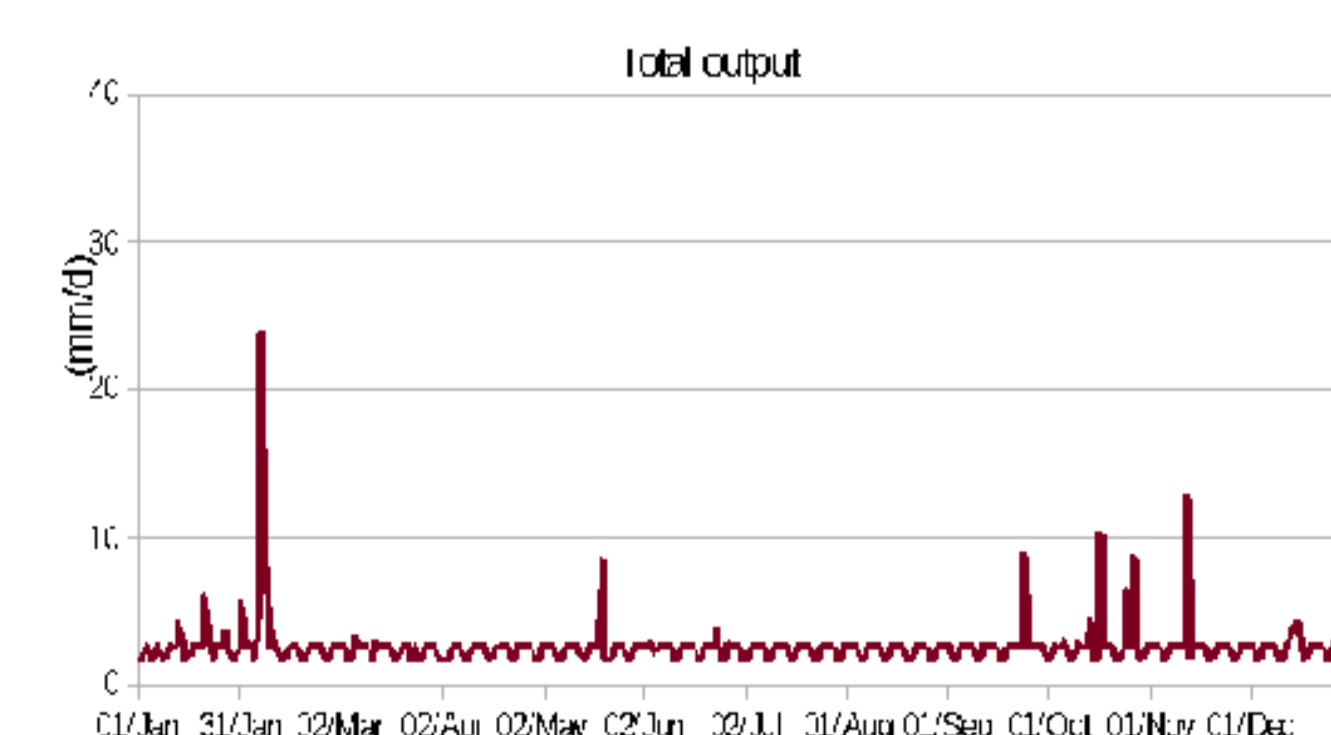
### Scenario 1



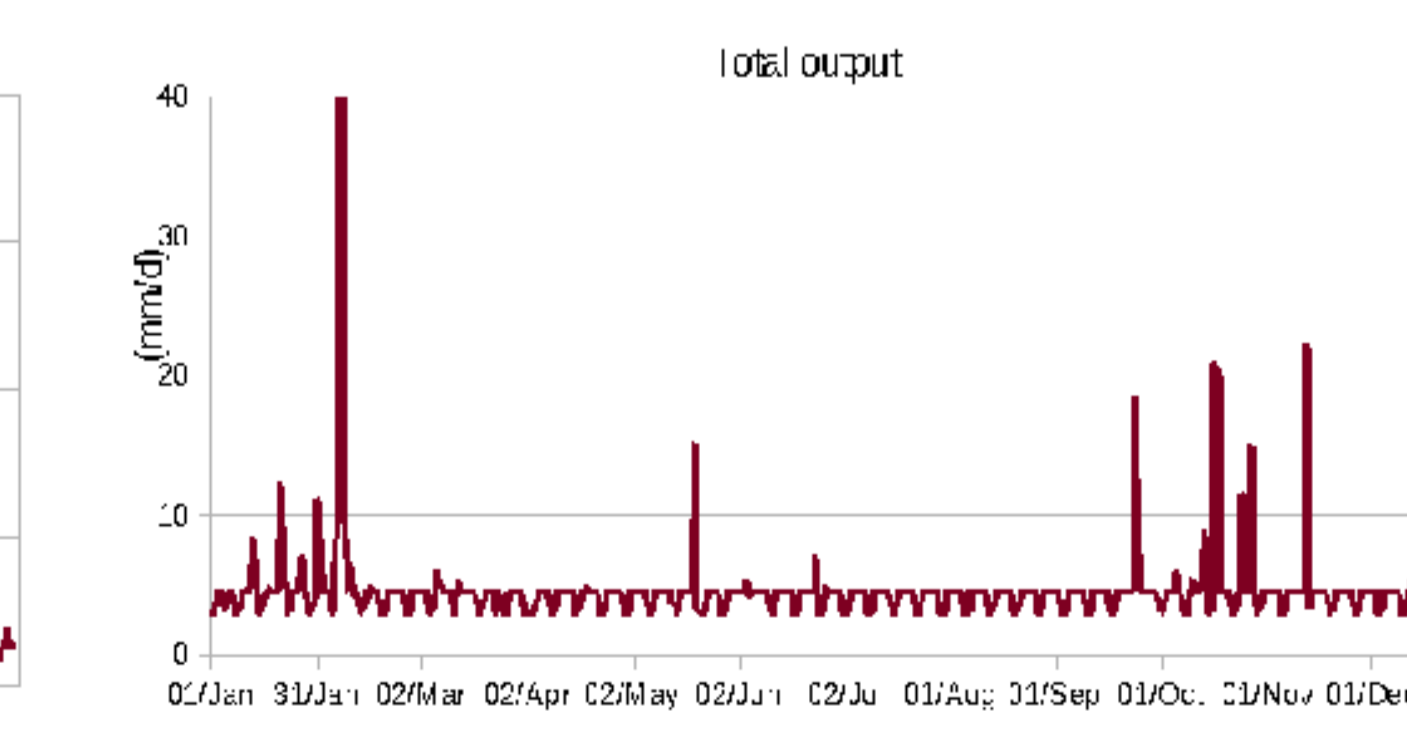
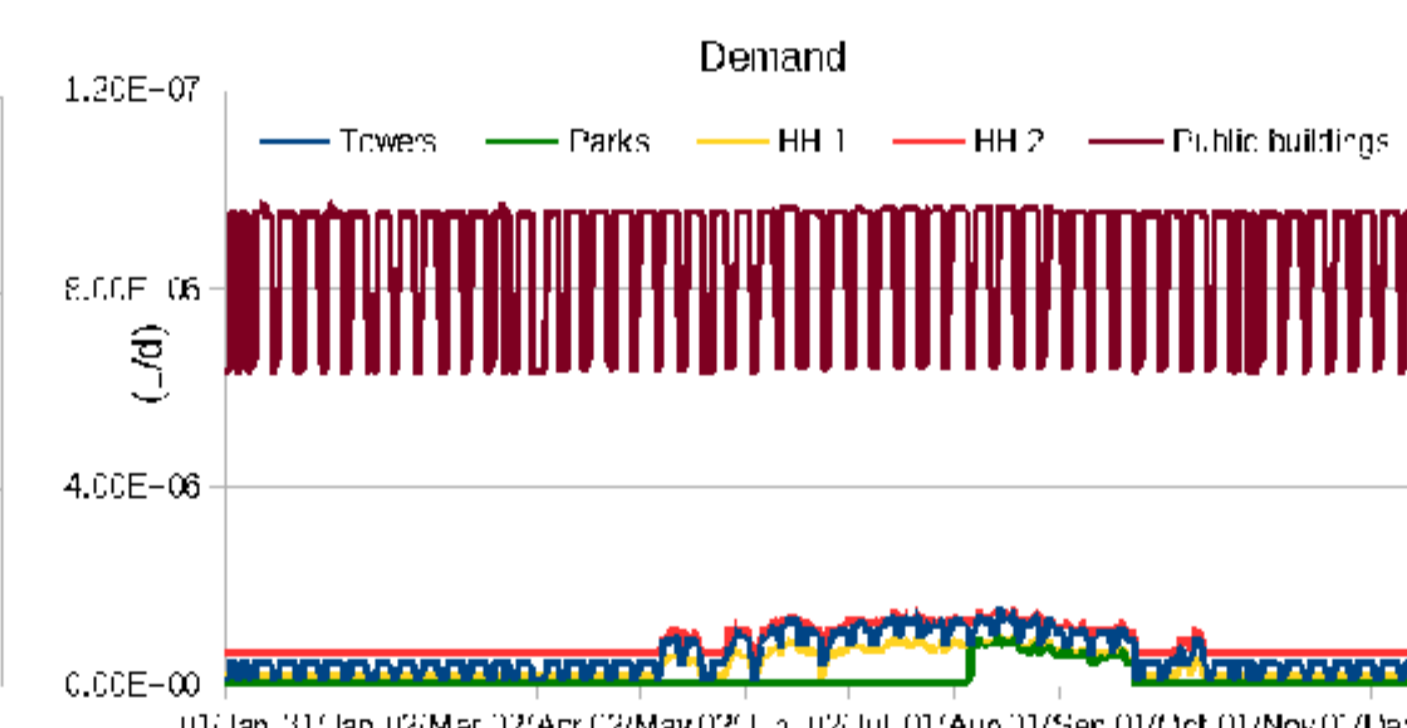
### Scenario 2-BUA



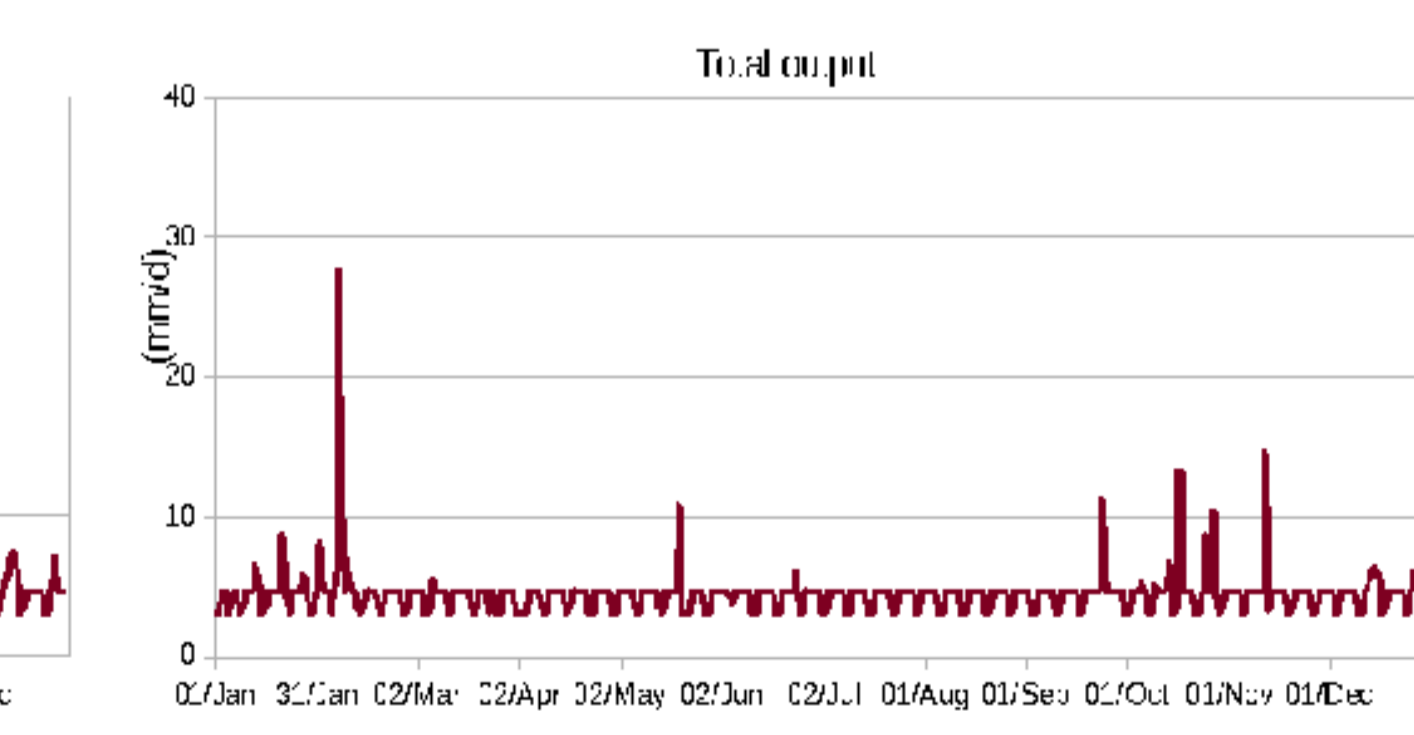
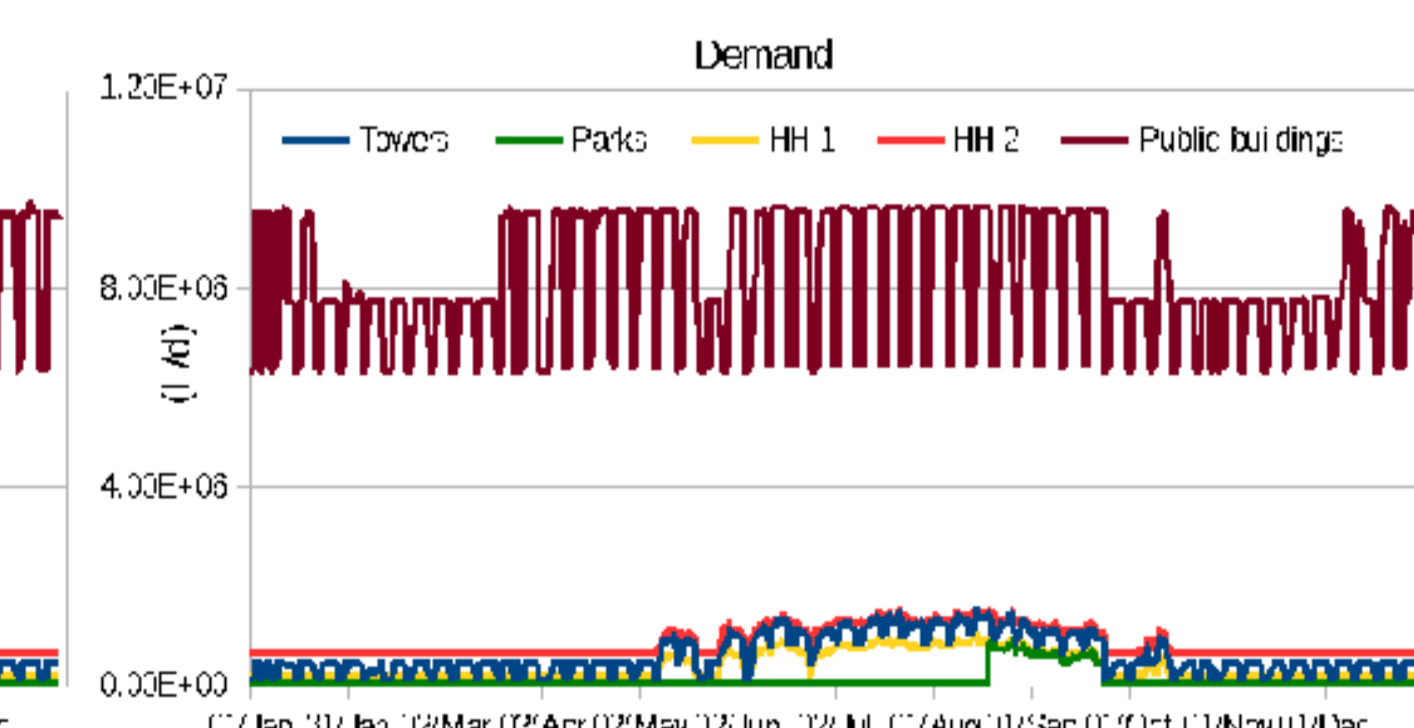
### Scenario 2-RWH



### Scenario 3-BUA



### Scenario 3-RWH



## Discussion

Three alternative regeneration scenarios of Eleonas, Athens, Greece were modelled using UWOT. Regarding Scenarios 2 and 3, rainwater harvesting schemes were investigated. The parameters of these schemes were optimized using optimization algorithms from MATLAB Optimization Toolbox.

According to the simulation results, the largest consumer is the public buildings with a significant day-to-day variation because some of them (e.g. the Administration Building) do not consume water during bank holidays. The other consumers exhibit a remarkable seasonal variation in consumption due to increased irrigation needs during the dry season.

## Conclusions and Future Research

Demand and runoff volume increase following the urban density (Scenario 1 the lowest, Scenario 3 the highest). The runoff per unit area of Scenarios 2 and 3 is almost triple of that of Scenario 1. However, after incorporating the rainwater harvesting schemes, the runoff volume is reduced by almost 40%. Regarding the water demand, the rainwater collection scheme does not offer a significant reduction, achieving only about 5% in both Scenarios 2 and 3. Grey water recycling scheme is not suitable for this case since there is no sufficient production of grey water.

### ACKNOWLEDGMENT

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