

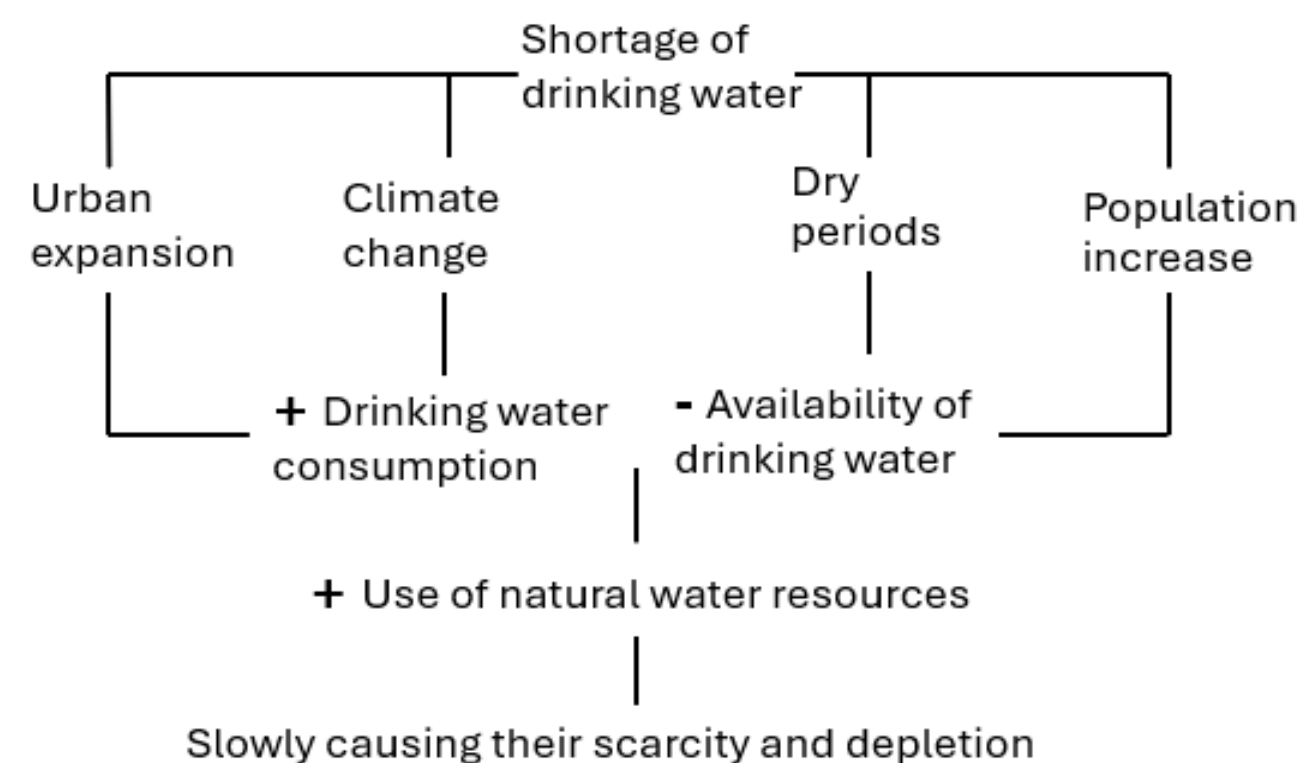
## Storage and use of rainwater in urban areas: Gambelas university courtyard

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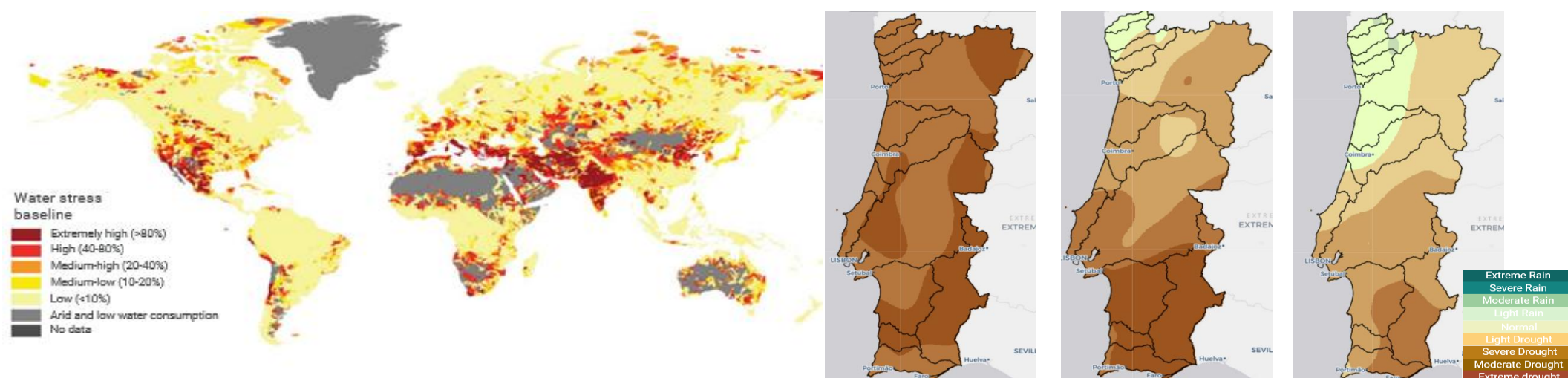
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### INTRODUCTION & AIM

The scarcity of drinking water is a current global problem, resulting from the continuous increase in consumption and the progressive reduction in supply. This imbalance leads to the overexploitation of natural water resources, contributing to their scarcity and risk of depletion.



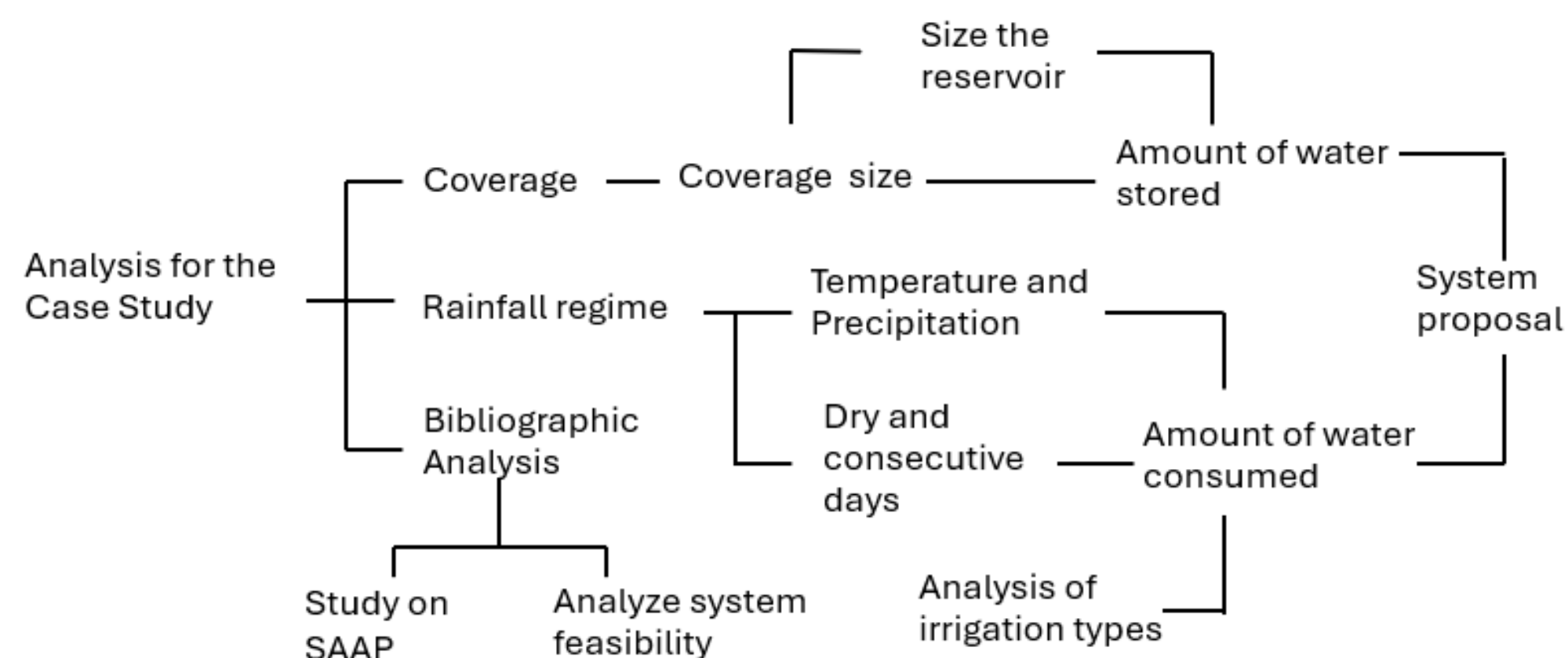
Drought is a factor that aggravates the water crisis in regions already affected by water scarcity, while at the same time increasing water stress in areas that do not yet face this problem.



Illustrative map of the level of water stress in the world (UNESCO WWAP), Drought Index of 2022, 2023 and 2024 (<https://www.ipma.pt/pt/index.html>)

### METHOD

One solution gaining increasing recognition is rainwater harvesting. To implement this approach, we decided to analyze the various characteristics of the chosen study area, building 1 of the University of Gambelas.



This method can be carried out through the Rainwater Harvesting System, carried out when precipitation falls on a collection surface, such as the roof of a building, and is then redirected to a storage structure, and can be installed in the following three different ways: direct, indirect and gravity systems.

#### Direct system

The precipitation is sent directly to the places where it will be used through the use of a pump.

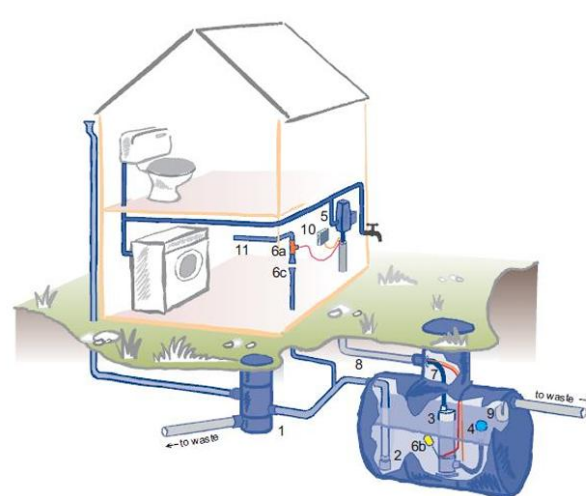
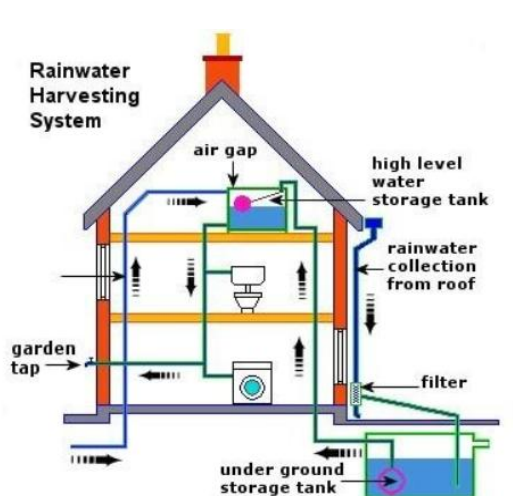


Diagram of the direct precipitation storage and utilization system (Rodrigues, 2010), Diagram of the indirect precipitation storage and utilization system (Waterways Environment, 2014), Diagram of the gravity precipitation storage and utilization system (Sousa, 2015).

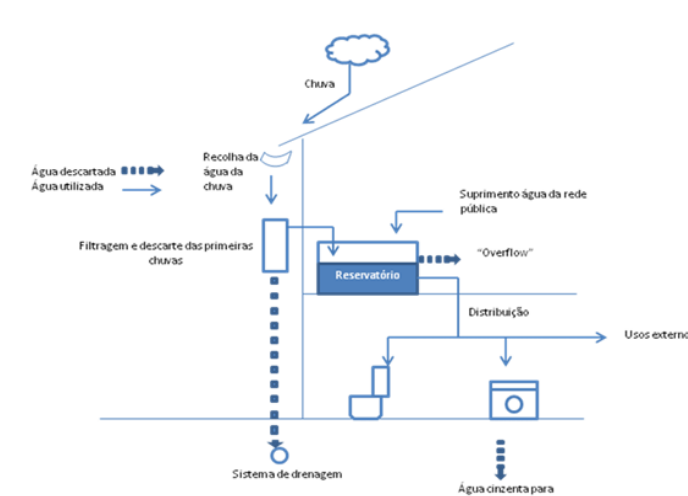
#### Indirect system

The precipitation is stored in a reservoir, where it is pumped to reach an elevated tank, being distributed from there by the action of gravity.



#### Gravitational system

The precipitation is sent to a reservoir and then distributed by gravity, without the need for a pump.



### RESULTS & DISCUSSION

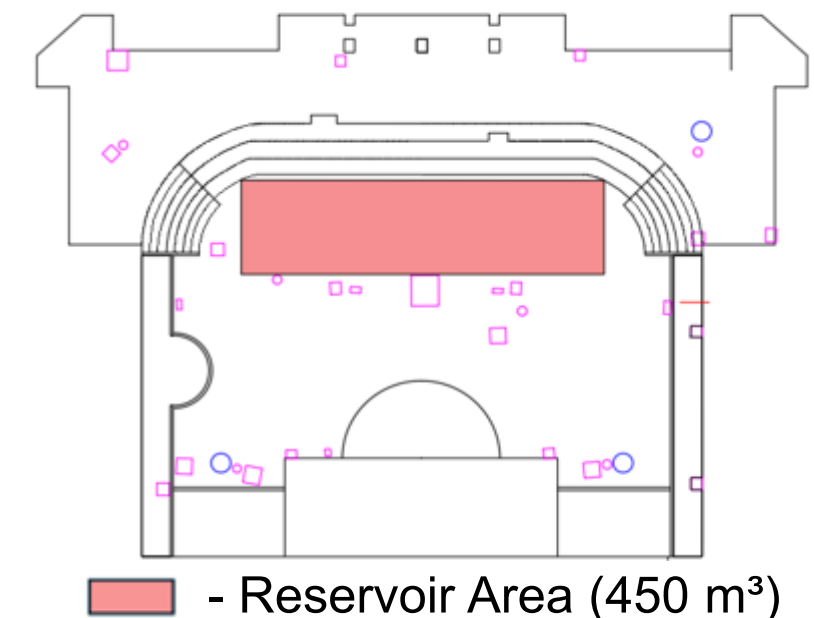
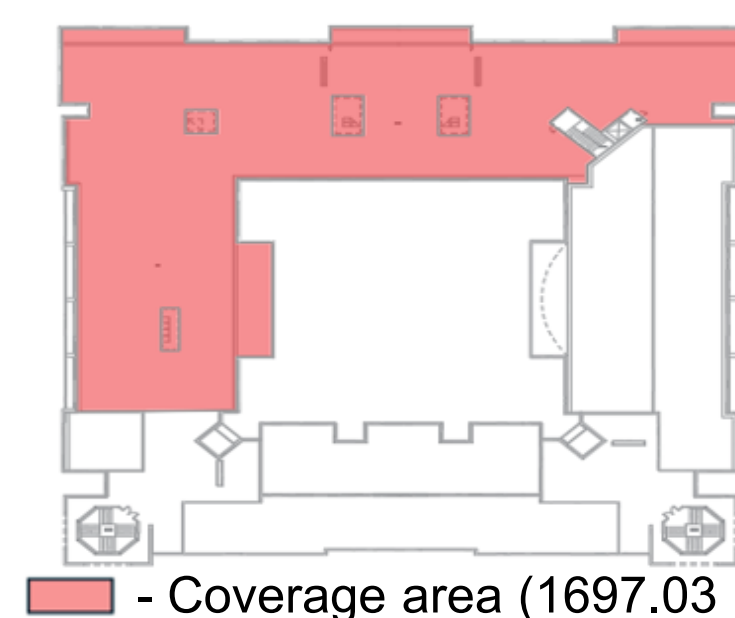
From this analysis it is found that:

- The study area has a mediterranean climate, with lower average rainfall and a higher average number of dry days between June and August.

- Catchment area: 1697.03 m<sup>2</sup>.

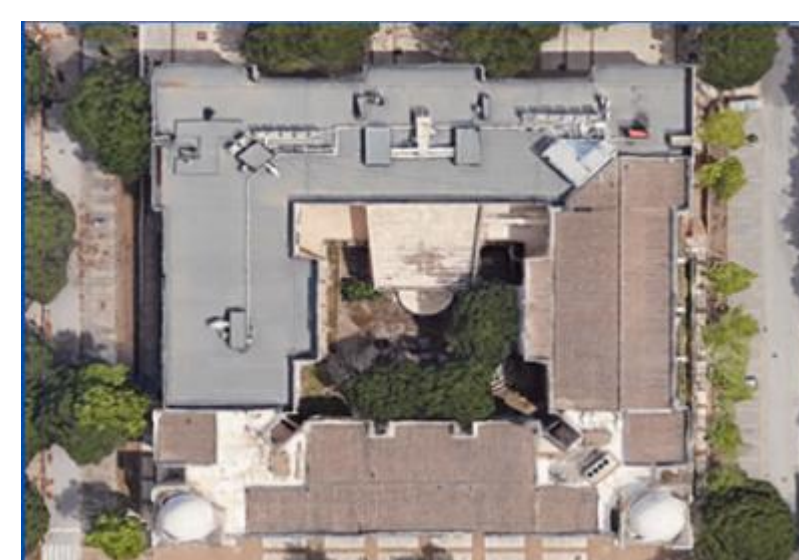
- Retention of 624 m<sup>3</sup> of rainwater, used only from October to April.

- Annual consumption of green spaces: 441.36 m<sup>3</sup>.

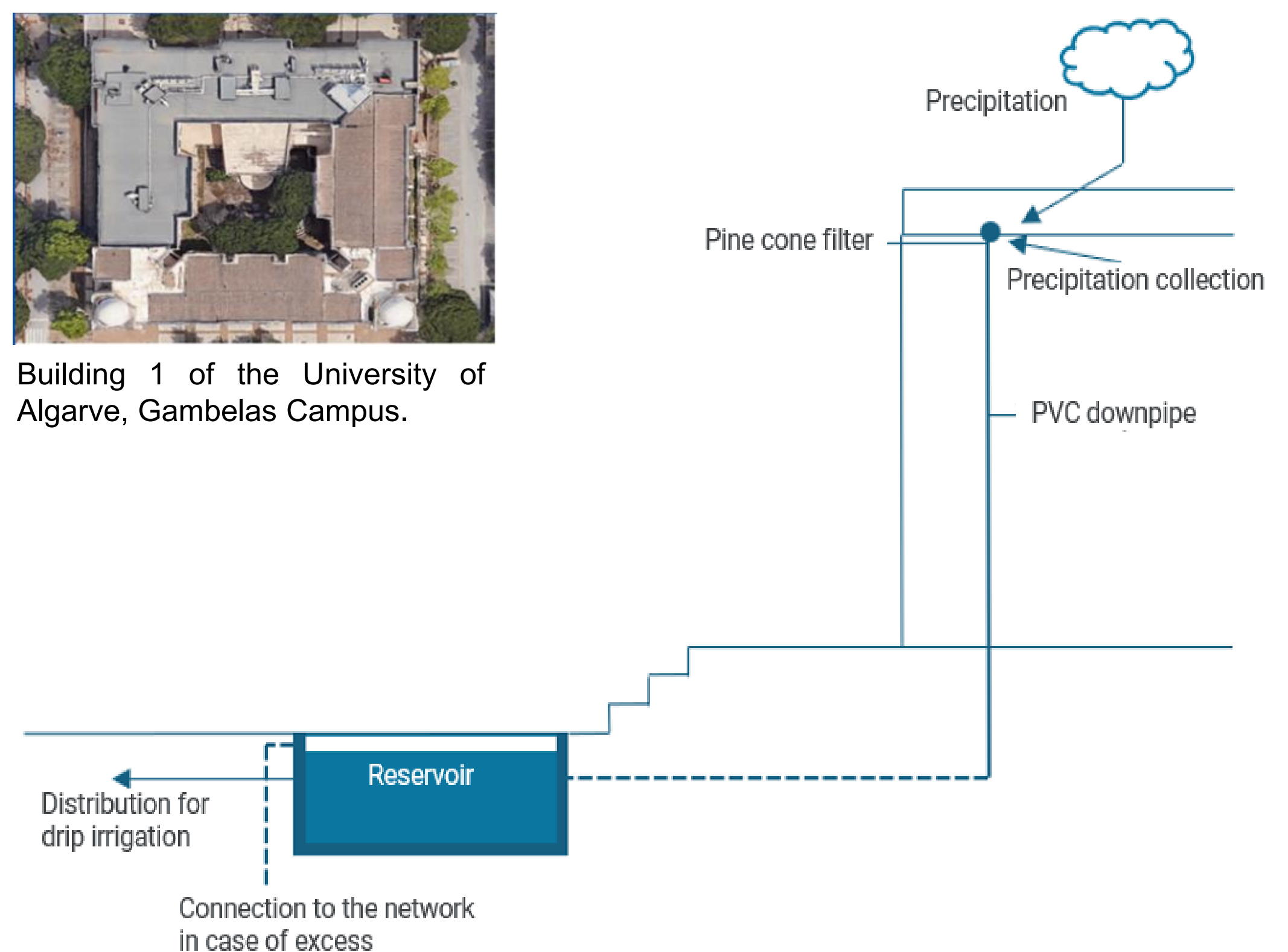


To improve water resource management at the University of Algarve and reduce drinking water consumption, a rainwater harvesting system was proposed for irrigating the green spaces of building 1 in Gambelas.

The project includes adapting the roof collection system, installing external PVC downpipes, an underground reservoir with flushing, distribution via PVC pipes with filters, and the application of drip irrigation with HDPE hoses.



Building 1 of the University of Algarve, Gambelas Campus.



### CONCLUSION

It is therefore concluded that the value of water possibly stored in the determined period of time, reaching 624 m<sup>3</sup>, would be capable of ensuring the irrigation of the selected green spaces, due to the estimated consumption reaching 441.36 m<sup>3</sup>. In addition, through the study and comparison of the examples, it was proven that the application of a SAAP at the university would be an effective and sustainable option, having significant positive impacts when introduced in the analyzed case studies.

### FUTURE WORK / REFERENCES

In future work, it would be interesting to develop a set of Rainwater Harvesting Systems spread throughout the university buildings, so that it would be possible to extend this practice to the neighborhood scale or to create a pilot system that encompasses the green spaces of the city of Faro, thus contributing to a more significant reduction in the demand for drinking water.