MAPPING OF RAINWATER HARVESTING POTENTIAL, A CASE STUDY OF SZEGED, HUNGARY

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Abstract

In urban environment, rainwater harvesting is a good solution to make the water management sustainable. The rainwater harvesting potential of a whole city gives information to the urban planners about the building possibilities of real collecting systems. In our work, with the help of hydrological modeling we create urban micro-watersheds, which based on the roof of buildings. Our expected results can give a comprehensive picture of rainwater harvesting possibilities in urban areas.

Introduction

In the 21st century one of the most urgent problem is the climate change and its impacts on the whole environmental system. The problem with the effect caused by climate change is the uncertainty. The weather extremes will occur more and more often, and the preparation for their impacts is one of the biggest challenges of the environmental planning. In the urban systems – where the impacts affect many citizens – the changes will also cause serious problems. The artificial pavements and the sewer system alter the hydrological system in urban areas. In addition to these changes in urban areas there are less green surfaces and vegetation cover. Based on these, the hydrological system changed in the cities and the urban planning system needs to be prepared different problems, than natural areas [3]. The first main problem is the occasional too much available water. Heavy rainfalls can cause flooding in cities owing to the impervious pavement, the undersized sewer system and sometimes the obsolete drainage method. The other side of the problems is too less available water in cities [1]. During the long drought period – which is climatic characteristic of the southern part of the Great Hungarian Plain – in the cities the urban vegetation needs irrigation and usually the source of this is potable water, which is not a sustainable solution in long term. Rainwater harvesting can help to reduce the volume of drinking water usage [4].

Study area, methods

The aim of our research is to examine the processes on urban micro-watershed (roofs). The information about these processes (runoff and evaporation on roofs) contribute to create a rainwater harvesting potential map based on a building database. The rainwater harvesting potential map can provide information about the volume of the potentially collectable rainwater. In this study we use the EPA SWMM model, which is one of the widespread storm water management model [2]. The base of the modeling is a building data base, which contains approxametly 15 000 building polygons (Figure 1.). Each polygon represents an urban micro-watershed. Owing to the database it is possible to separate the slope/pitched roof and flat roofs which also allowed us to determine which roofs have the potential to be used as a green roofs to further facilitate efficient rainwater harvesting. Among the geoinformatics database, the model need some meteorological data like daily temperature, windspeed and hourly precipitation.
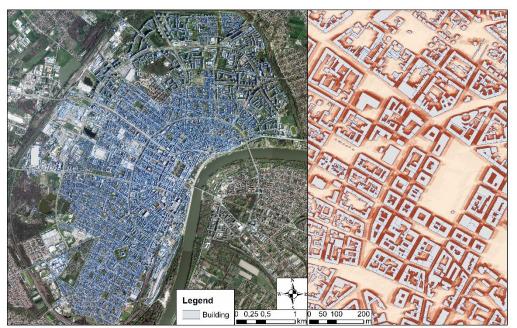
Figure 1. Spatial extent of the building database

Expected results, conclusions

With the help of the modeling processes we can examine both city- and district scale result about the rainwater harvesting possibilities within Szeged. We can also delineate which roofs suitable for to build real rainwater harvesting systems. Based on the whole year meteorological data the result can give information about the seasonal distribution of the collected rainwater and which volume of these water can be used in drought periods. Our results could contribute to the local decision-making processes and give usable data for urban planners to make into greater account the potential of rainwater storage.

Acknowledgements

References

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