

Groundwater (recharge) in Urban Areas

Context and objectives

Groundwater recharge rates in urban areas remain poorly understood. Recent research has shown that a correlation between groundwater recharge rates and the extent of the urban area exist. Although it is commonly stated, that groundwater recharge is reduced with urbanization; the reverse seems to be the more common condition. Transformation of natural landscapes into impervious areas leads to the reduction of evapotranspiration and water main leakages can further contribute to an increase in recharge rates. This however, does not guaranty that increasing water availability is present because at the same time increasing water extraction exceed or buffer the surplus of groundwater recharge

Thus, the objective of this study is to analyzing the impact of urbanization on groundwater availability and recharge rates. This work will strongly contribute to the growing body of knowledge related to the interrelationship between urban areas and groundwater and their sustainable use.

Methodology

In a first step the student will carry out a very detailed literature review about the relationship between urbanization and groundwater recharge and quantity. In a second step, the student who addresses this proposal will determine groundwater recharge rates under different degrees of urbanization for different cities in Switzerland based on an already existing workflow using a water balance approach. The student will use readily available data.

He/she will be responsible for collecting data and applying the workflow. He/she will be responsible for carrying out the water balance calculations, sensitivity and uncertainty analyses and to interpret the results. Moreover, the student will optimize the existing workflow. These calculations will allow us to determine the critical calculation steps at the local, regional as well as countrywide level. The results will be an important aspect to understand the impact of urbanization on groundwater quantity.

Supervision and collaboration

For the thesis work, it would be beneficial to have several meetings at Eawag, the Swiss Federal Institute of Aquatic Science and Technology in Dübendorf, the main working place of Mario Schirmer and Christian Moeck. It can also be arranged that all the work is performed at Eawag.

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