



## **Simulation of the effects of change in land use on urban runoff in the Middle Eastern City Rammallah**

**A. Fritz** (1), J. Lange (1), Ch. Leibundgut (1), S. Husary (2), M. Ghanem (2), T. Grodek (3), J. Lekach (3)

(1) Institute of Hydrology, University of Freiburg, Germany (alexander.fritz@hydrology.uni-freiburg.de), (2) Palestinian Hydrology Group, Ramallah -West Bank, (3) The Hebrew University of Jerusalem, Israel

By contrast with most Middle European or North American cities which have a dendritic stormwater-drainage-system the Middle Eastern City of Ramallah owns a rudimentary system. Only 40 % of the investigated urban catchment (1.6 km<sup>2</sup>) is connected to the stormwater drainage system which consists of a main pipe of about 1 km length (main drainage line) interrupted by open areas. These open areas cause as well retention of the stormwater runoff as a reduction of the peak flow. Due to this rudimentary stormwater-drainage-system most of the runoff moves on the road network to the catchment outlet. Compared to dendritic drainage systems the discharge reduces, since the road network as well collects stormwater from roads, buildings and open areas as loses stormwater to the surrounding open areas of the roads. The investigated urban catchment is disaggregated into five nested sub catchments (0.1 km<sup>2</sup> to 0.9 km<sup>2</sup>) each equipped with a separate runoff gauging station. Three different types of land use are distinguished: roads (12.3 %), roofs (14.9 %) and undeveloped areas (72.8 %). With the hydrological GIS-based rainfall-runoff-model ZIN it is possible to simulate the effects of different land use scenarios on the discharge of the investigated catchment:

- Intensive use and extension of the cistern capacity of the buildings within the catchment
- Increased sealing of the city surface on account of an increased building and road density

- Changes in usage of runoff from roofs i.e. stormwater will be directed to the road network and not dumped in the surrounding garden
- Road network without losses of stormwater to the surrounding area to simulate the effect of a possible future development of a dendritic drainage system
- Effects of retention measures in the catchment
- Effects of building development inside the open areas of the main drainage line