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Run-Off

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Definition

Run-off, also used as runoff or surface runoff, is the term used to refer that part of precipitation in the water cycle that moves on the ground surface downslope or downstream away from the location where it first accumulated as rain or snow. Surface water run-off is part of the water cycle that also includes evaporation, infiltration, and storage (USGS, 2016). Run-off is estimated from rainfall based on an empirical approach that is known as the rational method (Goyen et al., 2014)

$$q = C A p \quad (1)$$

where q is the peak unit discharge in m^3/s from a drainage basin at a point of interest, C is a dimensionless coefficient that represents the amount of run-off as a decimal fraction of precipitation, A is the drainage basin area in m^2 above the point of interest, and p is representative rainfall intensity in mm/hr for a meaningful duration and a desired return period. The duration for the rainfall intensity may be the time of concentration (the time required for water to flow from the most distant point in the drainage basin to the outlet defined as the point of interest). The unit discharge for several

precipitation return periods (2 y, 5 y, 10 y, 25 y, 50 y, 100 y, 200 y) would be of interest for flood routing and flood hazard studies.

$$Q = C A P \quad (2)$$

where Q is total discharge volume in m^3 for a duration of interest, often one year, and P is total precipitation that falls during the period of interest. Thus, P might be the annual precipitation averaged to represent the drainage basin area. The total discharge would be of interest for water resources information.

The value of the C coefficient depends on the ground conditions in the drainage basin (vegetation, bare soil, exposed bedrock, urbanized pavement, and rooftops) that tends to vary with time and may be seasonal. The value of C also depends on the duration of the precipitation; C in a particular drainage basin would be lower for a rainfall event associated with a 2-year return period than for a 50-year rainfall event.

References

- Goyen, A, Phillips, BC, Pathiraja, S (2014) Project 13: urban rational method review. Australian rainfall & runoff report P13/S3/001, Engineers Australia. http://www.arr.org.au/wp-content/uploads/2013/Projects/ARR_Project_13_Stage3_report_DRAFT.pdf. Accessed May 2016
- USGS (2016) The water cycle. U.S. Geological Survey webpage. <http://water.usgs.gov/edu/watercycle.html>. Accessed May 2016