Geophysical Research Abstracts
Vol. 17, EGU2015-5157, 2015
EGU General Assembly 2015

Water footprint of hydro power in Norway

Kolbjørn Engeland (1), Lena Tallaksen (2), Tor Haakon Bakken (3), and Ånund Killingtveit (4)

(1) NVE, Oslo, Norway (koe@nve.no), (2) UiO, Oslo, Norway (l.m.tallaksen@geo.uio.no), (3) NTNU, Trondheim, Norway (Tor.Haakon.Bakken@sintef.no), (4) NTNU, Trondheim, Norway (anund.killingtveit@ntnu.no)

The IPCC Special Report on Renewable Energy (IPCC, 2012) assesses the potential for renewable energy sources to replace fossil-based fuels and benchmarks the technologies with respect to a set of criteria, including their water footprint measured as m3/MWh. While most of the renewable technologies show a typical range of 1-5 m3/MWh, the very sparse data on hydropower range from a minimum of 0.04 to a maximum of 209 m3/MWh. More recent studies on water footprint from hydropower indicate that the water consumption rates could go even far beyond the numbers published by IPCC (2012). The methodological approach behind these numbers are, however, criticized as it appears over-simplistic and several issues need to be defined and clarified in order to present the 'true picture' of the water footprint of hydropower. Despite this, the rather high numbers for hydropower may imply a reputational risk for the sector and also be a direct investment risk in new projects if hydropower is considered a "large-scale water consumer". Estimation of water footprint has two important components (i) definition of water footprint (including system boundaries), and (ii) estimation of evaporation, which is assumed to constitute the main water loss from hydropower. Here we will mainly address the second topic and have chosen to use a water footprint definition based on net evapotranspiration from reservoirs. Thus, we need estimates of evapotranspiration from the land surface prior to inundation and the evaporation from the reservoir after it has been filled up. The primary objective of the study is to estimate water footprint of hydropower in Norway and in particular to answer the following questions: (i) How does different environmental variables influence water footprint estimation in Norway?, and in particular (ii) What is the total/specific water footprint from Norwegian hydropower production? To answer these questions we tested how environmental variables like climate and vegetation characteristics influence the estimated net evaporation and water footprint estimates by systematically varying their values. The water footprint was estimated for a subset of hydropower complex for which GIS data sets with land use prior to construction of reservoirs were available. The presentation will focus on the differences in evaporation from reservoirs and evapotranspiration from various land surfaces.