Trends in streamflow in the hydropower-producing Nordic countries and implications for water resource management

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Abstract Norway, Sweden, Iceland and Finland are especially sensitive to long-term variations in streamflow, as much of their electricity production is based on hydropower. A data set of 138 streamflow records was analysed to detect spatial and temporal changes in streamflow, and to consider the potential impacts for water resource management. Changes in annual and seasonal streamflow, floods and droughts for three periods: 1920–2005, 1941–2005 and 1961–2000 were considered. The Mann-Kendall trend test was used for trend detection, and streamflow records were pre-whitened prior to its application. Trends are discussed in terms of their magnitude, direction and field significance. The stations and periods analysed affected the patterns found, but overall increased annual flows provide support for increased hydropower production, assuming that this trend will continue. Increased winter and spring flows and earlier spring floods are also dominant. The trend in summer flow depends on the period analysed, but more severe summer droughts were identified in southern and eastern Norway in all periods. If trends towards increased winter and spring runoff continue in the future, the need for storage of late summer and autumn runoff for use in hydropower production for winter periods will be reduced.

Key words streamflow trends; hydropower production; water resources management; flood; drought; temporal autocorrelation; field significance