

## **Adaptation measures for securing good quality and quantity in Finnish groundwater resources**

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A nationwide Finnish program to monitor and evaluate the changes in groundwater levels has been functioning since the 1970's. Groundwater quality has been monitored and assessed in a parallel program since the early 90's. This priceless monitoring data has been used to characterize the mean seasonal groundwater level variation patterns in Finland into four different hydrogeological regimes. The mean annual variations during the past decades under natural conditions have been used to model the effects of climate change, which is an essential mean for further developing adaptation measures to ensure adequacy of groundwater as a water resource, as groundwater reservoirs or artificial groundwater provide 66 percent of the national water supply when only the largest cities use surface water. Five million Finns have access to the water distribution network and the daily use is in average 130 liters/person.

Even though Finland has in worldwide comparison abundant water resources compared to the population density, the supply and demand of naturally occurring groundwater does not meet in the long run when projected with the population growth projections in the near decades. Other key impact factors that can jeopardize the quality and availability of groundwater resources due to climate change are more frequent and severe weather conditions: storms, heavy rainfall, flooding, and droughts. Precautionary adaptation measures for water supply facilities include risk assessment, preparedness plans for water supply facilities, the planning of flood control and conservation of groundwater basins. In a larger scale, national challenges in preserving good quality and quantity of groundwater have been recognized with the help of monitoring results and include: agricultural loads as well as forestry loads, domestic wastewater in areas outside sewerage networks, harmful impacts of hydrological engineering and water-level regulation, and containing the effects of soil and bedrock specific characteristics. Different measures have been applied and are being further developed to diminish these effects.