

## Measuring quantity of groundwater within aquifers

The changes to the quantity of groundwater within aquifers is important information for many countries that rely heavily on groundwater availability. For the purposes of Indicator 6.6.1 monitoring the changes to groundwater levels gives a good indication of changes to the water stored in an aquifer. Furthermore, only significant groundwater aquifers, that can be seen as individual freshwater ecosystems will be included in the reporting.

**Location of Monitoring:** Measuring the level of groundwater within an aquifer is done through the use of boreholes. One of the challenges in setting up monitoring is choosing the location of boreholes which will adequately represent the total groundwater situation for an aquifer. The number of boreholes that need to be monitored cannot be prescribed because the distribution of groundwater can be variable depending on the location and characteristics of aquifers. It is recommended that sufficient boreholes to characterise the area should be monitored, with the capacity of the country being a factor in deciding how many would best represent the area. It is highly recommended that data should be taken from observation boreholes / monitoring boreholes (these are boreholes which are not equipped with pumps). Data from used (pumped) boreholes should be avoided. In case a pumped borehole needs to be used for measurements, then it is crucial to allow for a sufficiently long recovery period in which the borehole is not used so that the groundwater level in the borehole can stabilise prior to any measurement.

**Frequency of Monitoring:** Groundwater levels change as a result of changes in groundwater recharge (affected by climate conditions, and land use) and by anthropogenic removals from the system (groundwater abstraction). Seasonal and wet/dry cycle influences need to be understood and hence monthly monitoring is optimal, but collection at least twice per year, in the wet and dry seasons, is necessary.

### Criteria for Indicator 6.6.1 Data

Groundwater quantity data provided to the custodian agency(s) will be quality checked to ensure data integrity. Collection of groundwater level data generates statistics that are a proxy to the quantity of groundwater in an aquifer over time. In order to examine this change over time, percentage change in groundwater level will be generated and validated between the custodian agency(s) and the country. Calculating percentage change at a national level requires the establishment of a common reference period for all basins, which can either be based on historical groundwater level data (preferred) or modelled data if available. In cases where these are unavailable, a more recent period can be adopted to represent the 'baseline' or reference period.