
Groundwater management and protection in Estonia

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Natural background

Hydrogeologically Estonian area is a typical artesian basin with 5 main aquifers divided into a greater or lesser extent by impervious beds: Devonian (D) in Southern Estonia and Silur-Ordovician (S-O), Ordovician-Cambrian (O-C) and Cambrian-Vendian (C-V) in Central and Northern Estonia. The uppermost aquifer is the Quaternarian, that feeds the deeper aquifers by 62 m³/s. Available resource of groundwater is 1.5 million m³ per day.

The total amount of groundwater is about 2000 km³, being fed on precipitation about 70 mm (3.2 km³) annually. The most intensive infiltration areas are uplands, which form only 16% of Estonian territory, at the same time when 40% of infiltration takes place there.

The groundwater till the depth of 200 m is of HCO₃-Ca-Mg type with a mineralization of 0.3-0.4 g/l. On the coastal areas occurs the ground water of HCO₃-Cl-Na-Ca or even SO₄-Cl-Na-Mg types with a mineralization of up to 3 g/l. The salinity of ground water increases downwards. In the Southern Estonia the salinity of Cambrian and Vendian groundwater is 2-17 g/l (at a depth of 410-780 m), containing relatively high bromine concentration.

Groundwater use

Groundwater forms 15-20% of the total water abstraction (1487 million m³ in 2000) of Estonia. The major amount of groundwater is abstracted from about 20,000 bored wells from which only halves are deeper than 20 metres. Most widely used aquifer is the Ordovician one. Water is pumped out from oil-shale mines in Northeast Estonia and it formed about 198 million m³ (78%) from the whole groundwater extraction (255 million m³) in 2000.

The drinking water supply in Estonia is based on groundwater – 65% of the inhabitants; in all rural settlements and most of towns. Only 2 cities (Tallinn and Narva) are using surface water as a source of drinking water. However, it forms about 35% from the population of Estonia.

The most common problem in water supply is the aggressivity of groundwater – studies of the water in bored wells indicate that almost 90% of groundwater in use needs stabilisation.

Estonian groundwater is the high concentration of iron, being averagely 0.5-1.3 mg/l in different aquifers. The problems with a high fluorine concentration are observed in O-C and O aquifers in Western Estonia. Groundwater resources in these regions are confirmed on condition that Fe removal takes place before consumption, the fluorine concentration has been reduced with mixing the groundwater of different aquifers. In some places chloride ions in deep bored wells exceed the norm.

The human impact to groundwater resources has been resulted in heightened concentration of nitrates in uppermost aquifers. The natural NO₃ concentration in Estonian groundwater should be 1-3 mg/l, but in reality about a half of Estonian territory has the NO₃ concentration in the uppermost aquifer at least 10-30 mg/l. The most affected is the S-O aquifer, but also Quaternary and Devonian groundwater in South Estonia has shown the NO₃ concentration over the standard.

Besides, the ground water quality is threatened by pesticides use, past pollution, amortization of sewerage etc. In the North-East Estonia (the area of oil-shale mines) the serious problem is the SO₄ contamination. Due to the excavation works the water table is lowered and oxidation of pyrite causes the increase of SO₄ concentration in ground water up to 500 mg/l (naturally 20 mg/l).

Groundwater management

The water management in Estonia bases on the water permits to a great extent. With respect to groundwater, the water permits are required for abstraction (if >5 m³/d), recharging or diverting of groundwater, lowering of groundwater level, using water in a manner that alters the physical or

chemical properties of water or biological properties of the water body, mining of natural resources, other activities which alter the natural condition of the water body or the ground and surface water regime.

Water permits are issued by county environmental departments (regional level) of the Ministry of the Environment, who are also responsible for checking the surveillance of quantitative groundwater resource. In case of limited water resource the priority is given to water supply for inhabitants, health care, care and educational establishments and the food industry. Water permit is issued for 5 years as maximum, authorizing water intake quantities, the surveillance monitoring, data supply to the issuer of a permit etc.

Prior to constructing a groundwater intake with a productivity of more than 500 m³ per day, hydrogeological investigations shall be performed to determine the groundwater resources. The groundwater cadastre is established in order to follow the status and use of water resources. The quality of confirmed groundwater consumption resources is generally in accordance with present requirements of drinking water standard, except concerning concentration of iron and fluorine.

The extent of a sanitary protection zone of a water intake is 50 m from a bore-well, except if the abstraction is less than 10 m³ a day for the needs of one immovable. A sanitary protection zone may extend up to 200 m from the groundwater abstraction point if the abstraction is more than 500 m³ per day. Economic activities are prohibited inside the sanitary protection zones of 50 m, activities are restricted on the sanitary protection zones with a width more than 50 m.

In order to protect groundwater and surface water, nitrate sensitive areas are designated in areas of agricultural production. according to the criteria of EU Nitrates directive (91/676/EEC). Special water protection measures are applied there, e.g. limited use of fertilizers and sewage sludge, number of cattle per hectare etc.