

Autonomic and climatic impacts on the Dutch coastal groundwater system.

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Half of the Netherlands is located below sea level and still land subsidence is taking place. As saline groundwater is found within a couple of meters below ground surface, salinization of the freshwater resources is taking place. Above mentioned process together with anthropogenic activities like groundwater exploitation and differentiated water level management is called the autonomic process. As a consequence, salt seepage affects the quality of surface water and reduces the freshwater volume necessary for drinking, environmental, industrial and agricultural purposes. Apart from this autonomic process, the Dutch delta will be jeopardized by climate change due to two effects: sea level rise and a combination of changing precipitation and evapotranspiration.

Calculations with a regional density dependent 3D model for the coastal province of Zuid-Holland show increasing piezometric heads for all implemented climate scenarios due to sea level rise. This will, however, only happen at areas less than 10-20 km from the coastline or large rivers. Up to 5 km from the coast, the piezometric heads will increase with more than 50% of the sea level rise. In the inland areas, land subsidence causes decreasing piezometric heads.

Salinization of the groundwater system will take place in most parts of the Dutch delta. Around the islands of Zuid-Holland, the main cause for salinization is sea level rise. The autonomic process on the other hand dominates the salinization of the polders. Due to increasing piezometric heads and salinization, the salt seepage will increase up to 20% for inland polders and up to 75% for coastal polders. The effects of the changes in recharge and evapotranspiration are small in general and depend on the climate scenario and area.

Adaptive and mitigative activities like land reclamation offshore and desalination of saline groundwater show some positive effects on the chloride concentrations of the groundwater. Nevertheless, this cannot reverse the ongoing salinization of the Dutch delta.

