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# Thermal use of groundwater: International legislation and ecological considerations

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Groundwater fulfills various functions for nature, animals and humans. Certainly, groundwater has highest relevance as freshwater resource. Another increasingly important issue – especially considering rising oil and gas prices - is the use of aquifers as renewable energy reservoirs. In view of these two somehow conflictive uses it seems important to define legal regulations and management strategies where exploitation and protection of aquifers is balanced.

Thermal use of groundwater with e.g. ground source heat pump (GSHP) systems results in temperature anomalies (cold or heat plumes) in the subsurface. The extension of these temperture plumes has to be known in order to interpret their influence on adjacent geothermal installations. Beside this technological constraint, there exists an ecological one: man made thermal anomalies may have undesirable effects on the groundwater ecosystem. To promote geothermal energy as an economically attractive, sustainable and environmentally friendly energy source, such constraints have to be integrated in regulations, planning and maintenance (Hähnlein et al. 2008a,b).

The objective of this study is to review the current legal status of the thermal use of groundwater and to present first results how the ecosystem is influenced.
• Legal viewpoint: The international legal situation on thermal groundwater use is very heterogeneous. Nationally and internationally there is no consistent legal situation. Minimum distances between GSHP and temperature limits for heating and cooling the groundwater vary strongly. Until now there are no scientifically based thresholds. And it is also legally unexplained which temperature changes are detrimental. This is due to the fact that there are no ecological and economical parameters established for sustainable groundwater use.
• Ecological viewpoint: First results show that temperature changes that arise with the thermal use of groundwater can noticeably influence the composition of biocoenoses. For a profound quantification and interpretation of an ecologically sustainable thermal use of groundwater more data from lab experiments and in situ surveys are needed.

We can conclude that for sustainable use of groundwater legally-binding minimum distances between adjacent installations are crucial. However, they have to be based on geological arguments. Also relative temperature limits for cooling and heating of groundwater to avoid negative changes in the groundwater ecosystem should be defined. Overall, there is a need for a legal framework, ideally developed nationally and internationally, which thoroughly addresses legal, technical, ecological and economical aspects.

References:
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