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Decision Support System for Water Rights Licencing in Alluvial Aquifers

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ABSTRACT

Groundwater is one of the Slovenia's most important natural resources. It plays an important role in public water supply and provides about 97% of drinking water. In the Second Slovenian River Basin Management Plan for the period 2016-2021, the ratio of groundwater abstraction (2010-2013) to the mean long term available groundwater (1981-2010) is 3%. From an overall national perspective, the groundwater resources are abundant. But locally, the availability of ground water varies widely. Groundwater abstraction is highest in alluvial aquifers, reaching as high as 26% of available groundwater. The largest pressure on groundwater quantity is in shallow aquifers, located in alluvial plains along main Slovenian rivers, where big Slovenian cities lie and there is a lot of arable land as well. Here, the drinking water abstraction is accompanied with other water uses, mainly with irrigation and industrial use of groundwater. Responsible and sustainable groundwater management is therefore crucial and means co-ordination of interests and rights of those that abstract groundwater already and those who will abstract groundwater in the future. In Slovenia, the granting of water rights (water permits and concessions) is responsibility of Ministry of the Environment and Spatial Planning and Slovenian Water Agency. To help those decision makers in groundwater rights licensing, a complex decision support system, based on modelled groundwater quantities, has been set up. For now, the system is operational for six shallow alluvial aquifers with significant abstraction pressures. The system links the results of numerical groundwater flow models with the water permits and concessions databases and help groundwater managers to quantify groundwater reserves for a given aquifer and provide information about quantity of groundwater for water rights licensing. The quantities of already granted/or to be granted groundwater have to be ensured in any time for several years during the validity of the water rights, therefore the modelled quantity of groundwater represent hydrological situation in the aquifer that ensure sustainable use of groundwater resource. The system enables that the water quantity data from water permits and concessions in conjunction with the results of numerical groundwater modelling are used in the managing process of granting water rights to users in terms of their long-term access to groundwater (sufficient quantity of groundwater) and in relation to the water rights of other users (co-impact of groundwater pumping). Also, groundwater access must be managed in such a way that it does not cause unacceptable local impacts (pumping must not lower the water level for more than 2/3 of water body in the medium-low hydrological conditions).

The goal of the expert decision support system is to provide control mechanisms in order to verify the granting of water rights for the sustainable use of groundwater resources, to prevent overexploitation of groundwater and degradation of groundwater dependent ecosystems and to ensure that the groundwater is available for future generations.