Source: Universidad de Granada

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Seawater Intrusion Is The First Cause Of Contamination Of Coastal Aquifers

Science Daily — Seawater intrusion is often the consequence of freshwater aquifers overexploitation. This is a very common and serious phenomenon all over the Mediterranean basin, as well as in other areas with similar weather conditions and population.

In Spain, the most severely affected areas by seawater intrusion are the Mediterranean and South-Atlantic coastlines. Given that Spain is located on a peninsula, seawater intrusion is currently one of the main causes of groundwater pollution. In fact, "about 60% of Spanish coastal aquifers are contaminated by seawater intrusion, a generalised phenomenon in 20% of cases", points out Prof. José Benavente Herrera, a researcher from the Water

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Institute of the University of Granada, Spain, and senior lecturer at the department of Geodynamics.

According to Prof. Benavente, "freshwater contaminated by a 5% of seawater can no longer be used for common purposes, such as human use, agriculture or farming. That is the reason why salinisation of coastal aquifers – mainly a consequence of an uncontrolled or deficient management – is such a serious phenomenon". In Southern Spain, "seawater intrusion is contaminating some of the most important aquifer systems in economic terms", both on the Mediterranean and the Atlantic coastlines. In the world, the most affected areas include Mexico, the North of the Pacific and Atlantic coastlines, Chile, Peru and Australia.

Solutions: prevention and control

A good knowledge of aquifers (subsoil) enables scientists to determine the 'critical discharge', i.e. the extent to what aquifers can support water catchments without seawater intrusion taking place. Experts in hydrogeology acknowledge that such is a complex question, but they can currently give advice on prevention and control of situations caused by human activity.

Prof. Benavente states that solutions to prevent salinisation should start by studying every aquifer individually. Therefore, reducing freshwater pumping should be followed by other measures, such as analysing the aquifer's situation before building reservoirs upstream, as this will account for a serious minimisation of its natural recharge and, possibly, for salinisation if the return flow is not guaranteed. In fact, "ironic as it may be, building up an artificial reservoir could render useless the natural groundwater reservoir downstream."

Also, says Benavente, in very localised seawater intrusion areas, reducing pumping or extracting water from either smaller or greater depths become indispensable measures. According to Benavente, artificial recharge of aquifers is another efficient measure to prevent salinisation, as it stops seawater intrusion and increases freshwater levels. In this sense, for instance, clean water obtained from urban sewage purification can be used for irrigation of crops and golf fields as well as to create a hydraulic barrier against seawater intrusion.

Some regions in the world – including Spain – are already implementing these measures. Prof. Benavente highlights Los Angeles, USA, and river Llobregat delta, Spain, where sewage water injection as mentioned above has proven to be useful to solve salinisation problems.

Quick summary

- About 60 per cent of coastal aquifers are contaminated by seawater intrusion, a generalised phenomenon in 20 per cent of cases.

- Experts have found viable solutions implying not so much investment, but rather an 'intelligent' management of water resources.

- Scientists from France, Italy, Morocco, the Palestinian Authority, Spain, Switzerland and Tunisia have taken part in an international project to address sustainable water management in Mediterranean coastal aquifers.

Note: This story has been adapted from a news release issued by Universidad de Granada.

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