

# Science for Environment Policy

## Groundwater extraction for agriculture increases salt levels in Spanish coastal wetland

**Around 20% of all species** found in a Spanish coastal wetland could be affected by increasingly salty water as seawater intrudes into the groundwater system as a result of groundwater being withdrawn to irrigate crops. This is the conclusion of a recent study which used a Life Cycle Impact Assessment approach to characterise the ecological damage in the wetland as a result of changes in groundwater consumption.

**Seawater can flow** into groundwater sources in coastal areas when excessive amounts of groundwater are extracted for irrigation. This increases the salinity of the groundwater and can negatively affect species living in groundwater-fed wetlands. Changes in agricultural practices in south-east Spain over recent decades have resulted in an extension of the field area under irrigation and more crops being grown in greenhouses, which are irrigated with water pumped from groundwater sources.

This semi-arid region also contains coastal wetlands and this study focused on the Nueva Lagoon in a wetland close to the Mediterranean Sea. The wetland is recognised as being of international importance under the Ramsar Convention<sup>1</sup>, which means that it must be used wisely to protect its ecology. The site is of national botanical importance and supports a number of bird species, some of which are endangered.

The Nueva Lagoon is replenished mainly by groundwater, but suffers from seawater infiltration. An increase in irrigation in the surrounding area has reduced the amount of natural and irrigated water that is returned to the groundwater, and allowed seawater to intrude and raise the salinity of the groundwater feeding the lagoon.

In this study, partly conducted under the EU LC-IMPACT project<sup>2</sup>, the researchers used a Life Cycle Impact Assessment approach to develop a Characterisation Factor for the Nueva Lagoon to model the potential impact of increasingly saline groundwater on coastal wetlands species as a result of water withdrawals for irrigation. The researchers explored the impact of increased salinity on 18 species of plants, fish, algae and one crustacean found in the wetland. The potential impact to the health of the wetlands was estimated by the change in the proportion of freshwater species affected by a change in salinity.

The results suggest that, between 2003 and 2008, overall salinity in the Nueva Lagoon increased from 4.5 grams of salts per litre of water ( $\text{g.l}^{-1}$ ) to 7.5  $\text{g.l}^{-1}$ . This potentially affects around 20% of all the species found in the wetland. Of the 18 species included in this study, the fish species *Micropterus salmoides* (a type of bass) and *Cyprinus carpio* (the common carp) found in the lagoon are likely to be especially affected by raised salt concentrations, whereas *Mugil cephalus* (a type of mullet) is likely to be less sensitive.

In addition, the researchers considered the impact on freshwater species of the consumption of water by one tonne of crops typically produced in the area. Producing a tonne of melons was found to have the greatest impact and growing a tonne of cucumbers had the lowest impact on freshwater species as a result of water use.



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1. See: [www.ramsar.org](http://www.ramsar.org)

2. LC-IMPACT - Development and application of environmental Life Cycle Impact assessment Methods for improved sustainability Characterisation of Technologies is supported by the European Commission under the Seventh Framework Programme. See: [www.lc-impact.eu](http://www.lc-impact.eu)