

Indicator Fact Sheet

(WQ03b) Saltwater intrusion

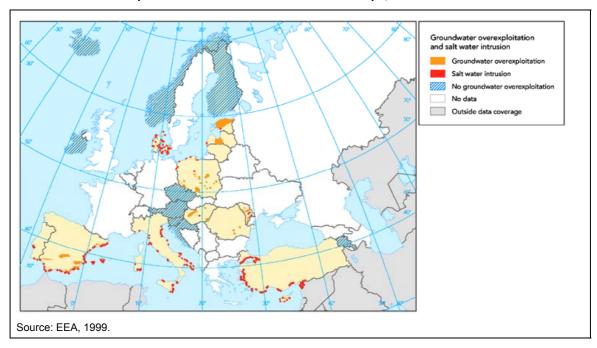
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Key message

• Saltwater intrusion as a result of groundwater over-exploitation is a major concern in many aquifers throughout Europe.

Groundwater over-exploitation and saltwater intrusion in Europe, late 1990s





Results and assessment

Policy relevance:

The Water Framework Directive aims to ensure a balance between abstraction and recharge of groundwater quantity and a chemical composition of the groundwater body not exhibiting the effects of saline intrusion, with the aim of achieving good groundwater status by 2015. Furthermore, for achieving good quantitative status of a groundwater body "alterations to flow direction resulting from level changes may occur temporarily, or continuously in a spatially limited area, but such reversals do not cause saltwater or other intrusion, and do not indicate a sustained and clearly identified anthropogenically induced trend in flow direction likely to result in such intrusions".

Policy context:

The indicator aims to indicate sustainable use of groundwater in coastal areas and whether abstraction and recharge of groundwater quantity are in balance or not.

The 6th Environmental Action Programme aims to ensure that the rates of abstraction from our water resources are sustainable over the long term and to promote sustainable water use based on a long-term protection of available water resources.

Environmental context:

Groundwater over-exploitation occurs when groundwater abstraction exceeds recharge and leads to a lowering of the groundwater table. The rapid expansion in groundwater abstraction over the past 30–40 years has supported new agricultural and socio-economic development in regions where alternative surface water resources are insufficient, uncertain or too costly (EC, 2000). Over-abstraction leads to groundwater depletion, loss of habitats and deteriorating water quality. It is a significant problem in many European countries. One of its impacts is the intrusion of saltwater into aquifers.

Once saltwater intrudes into a groundwater body its recovery is nearly impossible even in the longer term. Hence freshwater demand has to be met by abstractions from other groundwater or surface water bodies, often over long distances, transferring and increasing the water stress to distant areas. Alternatively in many regions the freshwater demand is met by a desalination of saltwater. Common to both solutions is that they are very costly.

Assessment:

In ten of 12 countries where over-exploitation was reported to exist, saltwater intrusion is the consequence. Large areas of the Mediterranean coastline in Italy, Spain and Turkey have been reported to be affected by saltwater intrusion. The main cause is groundwater over-abstraction for public water supply.

More than 100 areas (10 countries) have been reported to be affected by marine saltwater intrusion. In 16 areas (3 countries) saltwater intrusion is caused by the rise of highly mineralised water from deeper aquifers.

The main cause of saltwater intrusion is groundwater over-abstraction for public water supply followed by agricultural water demand. Irrigation is the main cause of groundwater over-exploitation in agricultural areas, some examples are the Greek Argolid plain of eastern Peloponnesos, where it is common to find boreholes 400 m deep contaminated by salt water intrusion.

Presented information on saltwater intrusion in groundwater was mainly collected for the preparation of the EEA (2000) report. As there is limited information available in State of Environment reports, this report represents currently the source of best available information for a European-wide overview. The temporal development can not be assessed at this stage due to a lack of historical information.



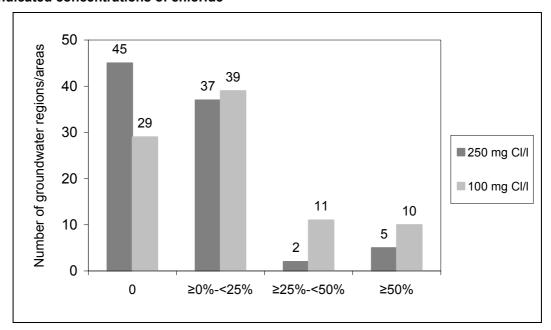
Subindicator 1

Chloride in groundwater

Key message

• Chloride is a significant problem in some groundwater areas in Europe. Most of these areas are located near the coast, and saltwater intrusion is probably the main cause of the high chloride content.

Number of groundwater bodies where a certain percentage of sampling sites exceeds indicated concentrations of chloride



Note: Number of groundwater regions/areas where a chloride level of 100 and 250 mg/l is exceeded at none, 0-25, 25-50 and ≥50 % of the sampling sites for which information is available.

Source: EEA, 1999.

Assessment for the sub-indicator

In six regions/areas out of the 89 for which information was obtained, the drinking water guideline value of 25 mg Cl/l (80/778/EEC) was not exceeded. The percentage of sampling sites within a region/area showing chloride values of more than 250 mg Cl/l varied between 0 % and 100 %. In 44 of the 89 regions, at least one sampling site exceeded the annual mean concentration of 250 mg Cl/l. In seven regions, the level of 250 mg Cl/l was exceeded at a quarter or more of the investigated sampling sites, and in five regions this value was exceeded in at least half of the wells.

7 countries provided information on chloride problem areas where at least a quarter of the sampling sites exceed an annual mean value of 250 mg Cl/l. In four countries (Austria, France, Hungary and Lithuania), there are no problem areas, Latvia reported one zone, Denmark five, and Romania six 'hot spots'.

References

EEA (1999): Groundwater quality and quantity in Europe. Environmental assessment report No 3. European Environment Agency. Copenhagen.

Data

ArcGIS file: 16_Saltwater_Intrusion_map.zip

Spreadsheet file

Subindicator: saltwater-intrusion_sub1.xls

Meta data

Technical information

- 1. Data source: EEA (2000).
- 2. Description of data: Location of saltwater intrusion. Number of regions where a chloride level of 100 and 250 mg/l is exceeded at none, 0-25, 25-50 and ≥50 % of the sampling sites for which information is available.
- 3. Geographical coverage: EEA
- 4. Temporal coverage: Main indicator: ~ 1996
- 5. *Methodology and frequency of data collection:* Unique data collection for the EEA (2000) report. Saltwater intrusion will be included into the EUROWATERNET guidelines and the regular data collection of EUROWATERNET.
- 6. *Methodology of data manipulation, including making 'early estimates':* Aggregated data on GW-body/area/region level have been aggregated on European level.

Quality information

- 7. Strength and weakness (at data level): strength: Mapping of location of saltwater intrusion gives an overview of the extent of the problem. Furthermore, for most of the problem areas the name of the area, the size and the main cause of groundwater-overexploitation are available.
- 8. Reliability, accuracy, robustness, uncertainty (at data level): reliable data
- 9. Overall scoring (give 1 to 3 points: 1=no major problems, 3=major reservations):

Relevancy: 1 Accuracy: 1

Comparability over time: 3
Comparability over space: 1

Further work required

Saltwater intrusion will be implemented in the EUROWATERNET Guidelines and into the regular data collection procedure.

Countries should validate and improve the completeness of the information provided.

Countries should be motivated to provide data in order to close geographical data gaps.