Salinisation

Welcome to the salinisation wiki of Deltares!

The impact of salinisation is becoming a bigger problem in various parts around the world. Given climate change, droughts, sea level rise and anthropogenic impacts such as rising demand for fresh water, dams and dredging, long-term effects must be considered in current and future interventions in the system. Deltares is using its system knowledge and models to contribute to monitoring, forecasting, scenario analysis, policy studies, effect analyses, testing innovations and implementing solutions. A partner to tackle salt intrusion in an integrated and future-resilient way.

As a knowledge institute, it is important to be at the forefront of knowledge and tool development, and of developing adaptive strategies for a sustainable (fresh) water supply, both in a national and an international setting. We have therefore formed **Team Salinisation**. Within Team Salinisation, we aim to combine the strengths of the different units and programs within Deltares towards scientific and societal impact by working on an **integrated approach for saltwater management** and building a **community of salt experts** . This wiki serves as a portfolio for all salinisation projects within Deltares.

News

💡 08 Apr 2024 Course at IHE Delft on processes and modelling of salt water intrusion; link to exercises and lectures sheets download from here

💡 12 Jan 2024 New paper: Verkaik, J., Sutanudjaja, E. H., Oude Essink, G. H. P., Lin, H. X., & Bierkens, M. F. P. (2024). GLOBGM v1.0: a parallel implementation of a 30 arcsec PCR-GLOBWB-MODFLOW global-scale groundwater model. Geoscientific Model Development, 17(275–300). https://doi.org/10.5194/gmd-17-275-2024

💡 10 Jan 2024 New paper: Zamrsky, D., Oude Essink, G. H. P., & Bierkens, M. F. P. (2024). Global impact of sea level rise on coastal fresh groundwater resources. *Earth's Future*, *12*(1). https://doi.org/10.1029/2023EF003581

💡 10 Apr 2023 Delsman, J.R., Mulder, T., Verastegui, B.R., Bootsma, H., Zitman, P., Huizer, S., Oude Essink, G.H.P., 2023. Reproducible construction of a high-resolution national variable-density groundwater salinity model for the Netherlands. Environ. Model. Softw. 105683. https://doi.org/10.1016/j.envsoft.2023.105683

💡 12 Apr 2023 Seibert, S.L., Greskowiak, J., Bungenstock, F., Freund, H., Karle, M., Meyer, R., Oude Essink, G.H.P., Van Engelen, J., Massmann, G., 2023. Paleo-hydrogeological modeling to understand present-day groundwater salinities in a low-lying coastal groundwater system (Northwestern Germany). Water Resour. Res. https://doi. org/10.1029/2022WR033151

💡 24 Apr 2023 - 25 Apr 2023EGU 2023, Vienna: Deltares has multiple contributions to the EGU session on saltwater intrusion and submarine groundwater discharge

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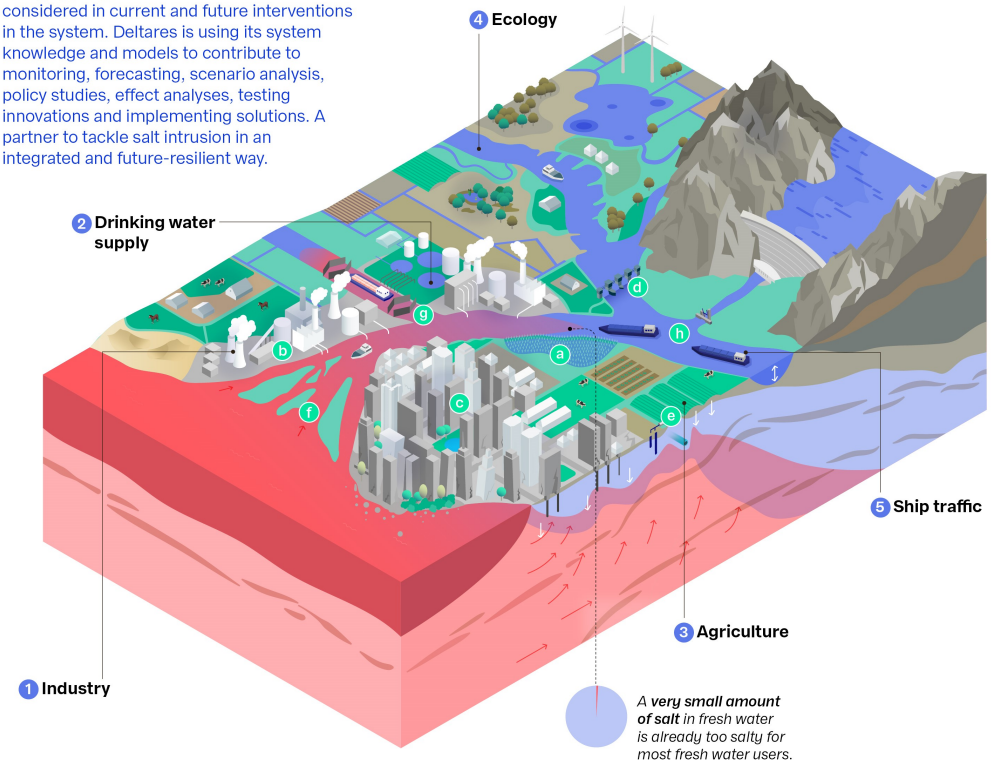
Legend

- *Functions*
- *Solutions for salinisation*
- *Salt water*
- *Fresh water*
- *Brackish water*



FACTS AND FIGURES

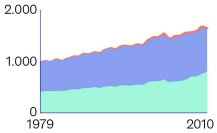
Drinking-water sources

Consumption

groundwater · surface water · desalinisation

50% 50%

Data shows a **growing trend** in water consumption:



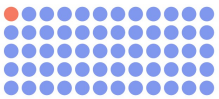
Pressures on the coast

Population density is significantly higher in coastal areas

One third *of the world population lives in coastal areas (<70km), being 2.65 billion*

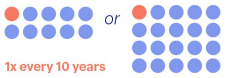
Lower river discharges

Now



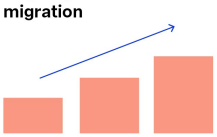
1x every 60 years

In the future due to climate change



1x every 10 years *or* 1x every 20 years

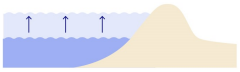
Ongoing trend of coastal migration



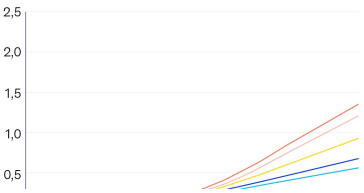
This is associated with global demographic changes. Most of the world megacities are also situated at the coast.

Salinisation of groundwater takes place all over the world, not only in coastal areas

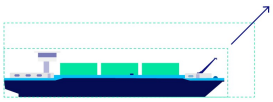
Sea level rise



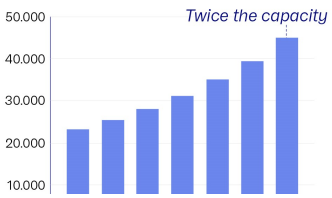
Projected sea level rise, in meters



More and larger ships



Fleet capacity, prognose , in TEU

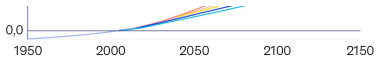


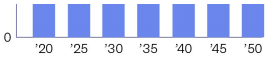
Costs of salinisation of agricultural land

Europe
500 million euros *a year*

World
22,5 billion euros *a year*

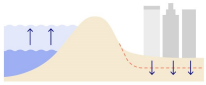
Salinisation increases due to



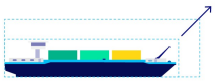


sea level rise and lower river discharges.

Drivers

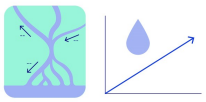


Sea level rise and land subsidence



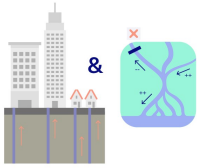
Larger ships (channel deepening and construc-tion of large sea locks)

Sand mining (channel deepening)



Lower river discharges and more water demand

Sealing subsurface and shortage of fresh water



Overextraction and water mismanagement practices

Storms, hurricanes, typhoons and cyclones

Long-term effects

Unwanted changes in ecology

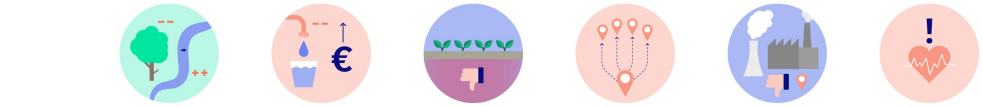
Less and more expensive drinking water

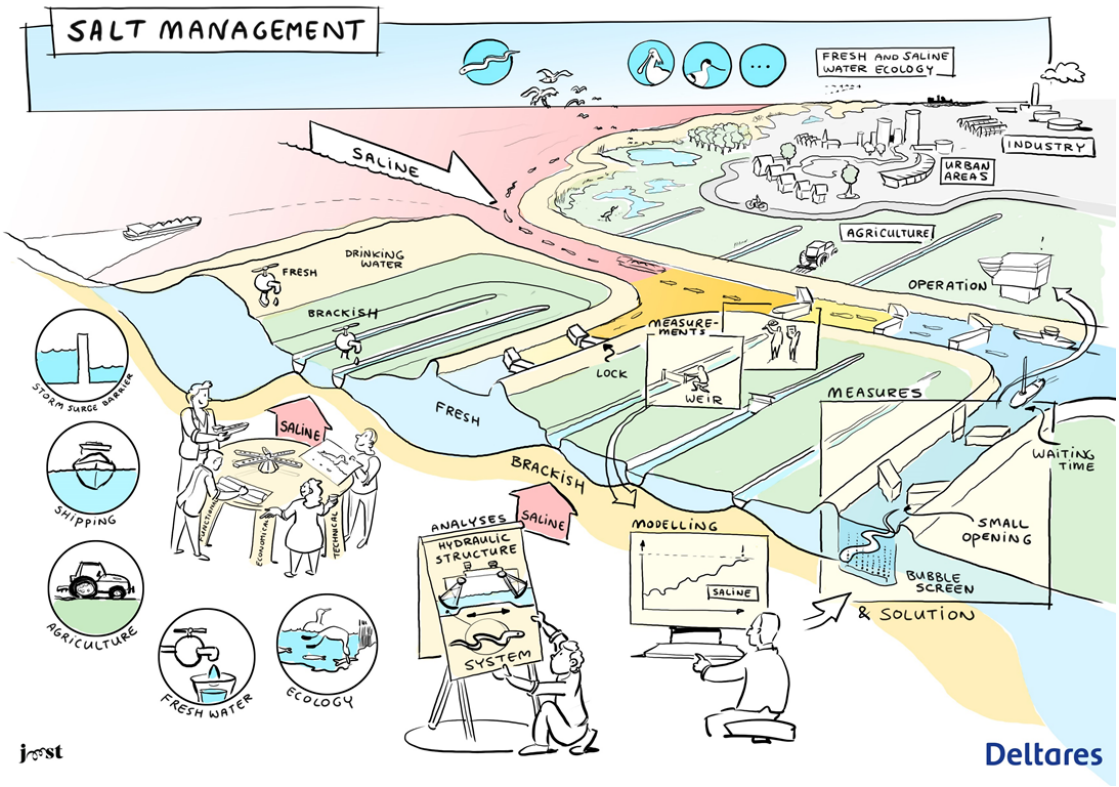
Unsuitability for certain crops

Migration

Unsuitability for industry

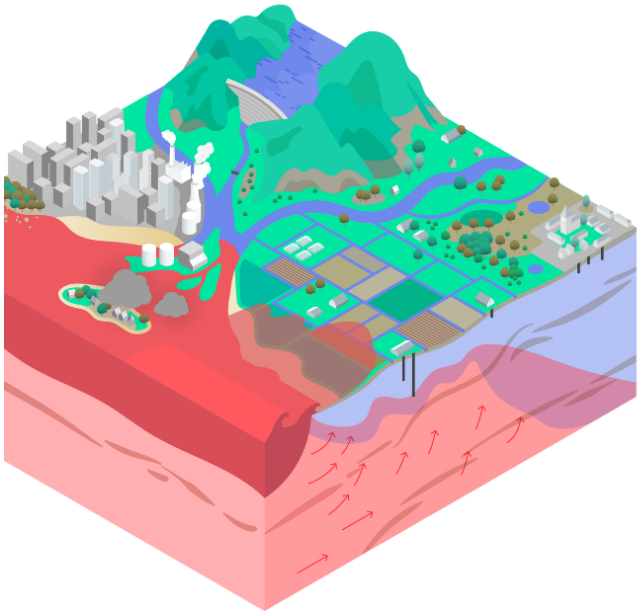
Health effects





Salinisation

the slow disaster



A natural enemy is threatening our freshwater resources: salt. Accelerated by sea level rise, more frequent occurring hazards like storm surges or hurricanes, and by our own overextraction of fresh groundwater, this destroyer is slowly moving inland and from deeper parts of the groundwater systems. From there, it will increase salt damage to crops and threaten our drinking water sources.

In this infographic we show the past, present, and two possible futures for the delta under saline threat. One future is obvious: if we don’t act, most benefits of living in a delta will be lost to us.