

SLURRY WALLS, INFILTRATION WELLS AND BRACKISH WATER

Combating salinity

Climate change, salinization and freshwater scarcity are significant threats to Delta areas around the world. A variety of concepts are being developed and pilot projects implemented to deal with water shortages. “Do not ignore the fact that this is happening,” says Professor Gerard Galloway, a researcher at the University of Maryland, USA. “You have to be ahead of the game.”

MICHEL VERSCHOOR

Bangladeshi village people collect drinking water from a pond at Perikhali, Bagerhat, Bangladesh. Thousands of people from 50 villages collect drinking water from this pond as the rest of the ponds are full of saline water. In the southern part of the country salinity is increasing daily due to climate change, and drinking water is becoming scarce.



Southern California: a Trench Remixing and Deep wall (TRD) machine digs a trench and uses a mix of in-place soils and additives to create a barrier wall. This will then be tested for its effectiveness in preventing salt water intrusion.



California

Addressing salinization for the benefit of future generations

Salinization is not a new problem in coastal regions around the world. "In California it is a challenge that we have faced for over half a century", says Professor Gerard Galloway. "California is a relatively arid region where we have been pumping groundwater for irrigation and municipal use. Extracting the water has lowered the water table, resulting in intrusion of salt water from the ocean. Policy makers have been taking steps to deal with the problem for over 60 years." The initial measures adopted were to inject fresh water along the coastline to prevent intrusion of salt water. The fresh water was taken from the state's interior and was transported by pipelines to the coastal regions, countering the pressure

from the ocean onto the groundwater. There was a problem, though: "We were using fresh water, and fresh water is now scarcer than ever. Over time Californians started to recycle water. Nowadays we are looking at the use of impervious slurry walls, with which we fill up very narrow trenches. That keeps salt and brackish water out."

Impervious slurry walls

The problem of salinization in California will become even more severe in the years ahead, according to Galloway. "The challenge is to plan for the future. We have to carefully evaluate the consequences of sea-level rise, future alternatives and scenarios,

and then take the best steps possible. Political support is essential. Local and regional governments should not ignore the fact that this is happening; they should be prepared for it by planning adequately, and then take the proper steps in an intelligent programme and in a reasonable time frame." According to Galloway there is no one solution: "California can start protecting its fresh water with slurry walls, or by bringing more water in from other areas. At the same time some of the losses could be compensated for by reducing demand. We need multiple approaches and have to be ahead of the game. We cannot wait till it is there but need to start addressing these problems now".



In the middle of a salt water flood, fresh water is pumped up deep from under protective clay strata.

Bangladesh

Responding to impending sea-level rise and increased flooding

Countries respond in different ways to salinization. In some, such as Bangladesh, salinization has always been part of the natural cycle, so farmers and others have learned to live with it. But now that droughts are more intense and last longer, and saltwater intrusion has become irreversible, the resilience of one of the world's most densely populated and poorest countries has come to an end. The coastline of Bangladesh in the Bay of Bengal is 575 kilometres long, and most of the 156 million inhabitants live in the delta of the Ganges and Brahmaputra Rivers. Their waters flow into the delta from opposite directions. While the land is very fertile thanks to the sediment deposits, it is also very vulnerable to flooding. Tornados and storm surges hit the country almost every year. Nearly half of the population lives below the poverty line and has very little ability to bounce back.

Dr Kazi Matin Ahmed works with Dhaka University's Department of Geology: "Ten

million Bangladeshis have limited access to fresh water. They depend on groundwater, but in coastal regions it is becoming more saline as sea water penetrates inland more often." In contrast to prosperous nations like the US, Bangladesh has minimal research funds available. "We do not know what the impact of climate change will be and urgently need our own data to prepare for the future", says Ahmed. "If the predictions are right, we are facing sea-level rise and more frequent storms. If the Himalayas do not deposit enough sediment in our delta, land formation will not be strong enough. Current long-term forecasts suggest that our rivers will receive less meltwater from the Himalayan glaciers, and a rising sea level will make our water brackish and saline. With the help of international funds we are looking for innovative solutions. Without this aid we can hardly manage the challenge ourselves, since adapting to climate change is unaffordable. We are an innovative and optimistic people,

though, and I am sure we will survive."

Infiltrating wells

Dr Koos Groen, a Dutch senior hydrologist with Acacia Water, is involved in an innovative project in Bangladesh. "North of the Khulna district, fresh water is only available during the monsoon season", says Groen. "We have started to infiltrate wells with monsoon water, so there's also fresh water in the dry season. If salt water floods the land, people with drinking water wells also suffer. UNICEF is funding small-scale pumps, which we use to pump fresh water into aquifers under deep clay strata, where salt water does not penetrate, so they can extract it when needed. We have five pilot projects running at the moment. UNICEF is considering using the technology on a wider scale. It's not just useful in the tropics, by the way. It might even provide a solution in Holland, for the market gardeners in the west, whose crops are suffering from saline seepage."

The Netherlands

Adapting to brackish water

Water managers in delta regions can choose between two strategies to combat salinization and freshwater scarcity: use technical measures, or accept them in part, while trying to find a new balance with nature. Dutch policy makers are taking the best from both approaches. According to Alphons van Winden, a consultant at Bureau Stroming, the Netherlands is adopting a more open attitude towards sea water. Van Winden: "This is inevitable as the prospect of rising sea levels looms ever larger. As the sea comes further inland at high tide, it becomes increasingly difficult to discharge water during rainy periods." Local authorities and water boards are generally worried about salt water, rivers flooding and drinking water shortages in times of drought. Van Winden thinks the

coastal region of the Netherlands will just have to get used to the new situation: "We need to learn to deal with subtle transitions between fresh and salt water. In the near future we will see the sea gradually flowing in and the rivers pushed back. At the moment saltwater-freshwater transitions are quite abrupt due to storm surge barriers, but the more we let nature take over, the more subtle these will become." As far as drinking and irrigation water supplies are concerned, Van Winden states that there is in fact no water shortage in Holland. "The problem is that we do not store enough and that we distribute our water inefficiently." Dutch visionaries foresee the future development of a sufficient number of freshwater buffers inland and new agricultural activity in marshland areas,

with salt-tolerant crops like salicornia and perennial goosefoot. ■

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'Koudekerkse Inlaat' in the Dutch province Zeeland in September with red glasswort and edible sea aster.

