Fact and figures about global freshwater reserves

- ✓ 98% of our non-frozen freshwater reserves consist of groundwater.
- ✓ Roughly 20% of our food is grown using groundwater. 40% of that water is not replenished.
- ✓ The quality of groundwater is often better than surface water.
- ✓ Globally, groundwater reservoirs supply 35% of the water consumed by humans.
  In California, that figure is already 60%: on average, every inhabitant uses more than 400 litres of water a day and that water comes from deep below the ground!
- ✓ In 2030, over 70% of the world's population will be living in cities. Cities in deltaic areas in particular will feel the impact of the over-exploitation of groundwater reserves. This is also where we see the highest risk of the salinisation of groundwater reservoirs.
- ✓ The largest groundwater reservoirs in the world are being depleted at an alarming rate: a NASA study has shown that 13 of the 37 are almost exhausted. These are reservoirs in the United States and the Middle East. The level is falling faster than it is being replenished in 21 reservoirs.
- ✓ The most seriously affected groundwater reservoirs are located in the coolest and most densely-populated areas of the world: Northwest India, Pakistan and Northern Africa. Water shortages can result in instability and migration to areas where water can be found.
- ✓ Freshwater scarcity results in major investment risks for global industrial players such as oil refineries, beer brewers and food producers. Their business operations use excessive quantities of groundwater.
- ✓ During dry periods, we are drilling ever deeper for groundwater as a source of drinking water, for industrial use and for irrigation. That is the easy option, particularly at the local level, and it is relatively cheap because no major infrastructure investments are needed.
- ✓ The excessive extraction of groundwater from the subsurface is not without consequences. Precisely in densely-populated deltaic areas, it attracts salt groundwater, making drinking water wells unusable. We do not yet have the technology required to use either less water or poorer-quality water at reasonable cost.
- ✓ Extracting groundwater causes land subsidence, exacerbates flood risks and damages infrastructure.
- ✓ Land subsidence and the salinisation of groundwater reserves often go hand in hand: land subsidence results in land being located below sea level, and sea water flows landwards through the subsurface, or via land surface being infiltrated later.
- ✓ Groundwater reservoirs have often taken thousands of years to build up but they are not replenished as quickly under natural conditions. In addition, less rain is anticipated and rain evaporates faster because of climate change. Precisely in regions where groundwater reserves are not adequately replenished, there are also no rivers or lakes and so groundwater is the main source of water. As a result, the available reserves of fresh groundwater are dropping dramatically at rates of several metres annually.

- ✓ Groundwater studies (such as New Delta by Deltares and Utrecht University) are being conducted by using powerful computers to run state-of-the-art models showing salt transport in the subsurface. They are combined with the available data such as ground levels, simulated river discharges, subsurface properties, seabed depths in the shallow areas offshore deltas, and projections of population growth.

- ✓ A new weapon in the Delta research arsenal looking at salinisation is that we can now use our understanding of how specific areas have developed geographically over thousands of years to predict a sound estimate of groundwater reserves.

- ✓ Salt groundwater is often found much further landwards than one might expect given the present coastline; this is a result of changing sea levels, sometimes in the distant past.

Deltares, August 2015