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CLIMATE-PROOF PLANNING

SOLUTION FOR PREVENTING THE IMMENSE COST OF SUBSIDENCE DAMAGE TO DWELLINGS AND INFRASTRUCTURE

Stress test

As part of the DPRA, municipal authorities are assessing the current extent of climate resilience and adaptation in their areas. This is focused on the following topics: heat stress, waterlogging, drought and flooding. Fugro's research mostly concerns the latter three topics.
The vulnerability of an area can be assessed using a stress test. It is important to take the future climate into account in public realm planning. This often requires only limited changes to be made to projects currently in the planning pipeline.

Climate-proof urban areas

At Fugro, we believe that climate-proof planning necessitates consideration of the ground and water management in all project designs. Climate-proof planning of urban areas means balancing spatial planning with the local topography, i.e. where can we build, and where not? And also: how can we deal with a shortage or excess of water?

When studying a climate-proof planning proposal, Fugro assesses whether the proposed solution is compatible with the soil and water management practices in the area. If not, then we investigate whether there are options to adapt the area. If this is not possible either, then we suggest that spatial planning choices may need to be made. Fugro can provide support at all stages of this process, enabling clients to make well-founded decisions about climate-proof spatial planning.
Active groundwater level management is a good example of this. Fugro is currently undertaking research on this topic, in association with Deltares (an independent institute for applied research in the field of water and subsurface) and Wareco (a specialist in soil, water and foundations).

Large-scale active groundwater level management
Urban areas on weak ground can be affected by groundwater levels which are too high or too low. For example, an excessively low groundwater level in a city can lead to immense damage resulting from subsidence and rotting of wooden piles – with the potential to cost tens of billions of euros between now and 2050, according to some estimates. Climate change will further increase these costs unless effective measures are taken. But an excessively high groundwater table can also cause problems, such as damage to roads and houses and other flooding-related issues. Active groundwater level management can solve multiple problems at once.

Drainage and infiltration

Active groundwater level management is based on a drainage and infiltration pipe in connection with surface water. If there is too much groundwater, it is discharged to the surface water. During dry periods, the same pipe is used to recharge the groundwater with surface water. This system has already been implemented on a small scale. Eight case studies in several cities have now demonstrated that active groundwater level management can be used on a larger scale. The design is based on factors such as the soil structure, density of the urban area, hydrology, how water reaches the area, and the intended effects.

Short payback period

In many cases, the costs of installing and maintaining the system have been found to be less than the cost of the avoided damage. In areas potentially affected by ground settlement due to a low water table, the municipal authorities can often recoup the costs of the system thanks to less damage to municipal assets. For example, active groundwater level management to reduce ground settlement extends the lifespan of infrastructure in the area.

The payback period will be even shorter if the installation of the drainage system is combined with sewer installation or replacement. Furthermore, if the avoided damage to foundations of private property is factored in, the costs of active groundwater level management are always easily offset by the savings. ●

The Delta Plan on Spatial Adaptation (Deltabeslissing Ruimtelijke Adaptatie or 'DRA') is a collective plan, drawn up by municipalities, district water boards, provinces and the central government, to render the Netherlands climate-proof and water-resilient. The Delta Plan expedites and intensifies the efforts to tackle waterlogging, heat stress, drought and the impact of urban flooding.
More information: https://ruimtelijkeadaptatie.nl/english/policy-programmes/delta-plan-sa/

Figure 1 – Construction site.

Figure 2 – Foundation.

SUMMARY

The Delta Plan on Spatial Adaptation (DRA) aims to make the Netherlands climate-proof and water-resilient. Spatial adaptation means changing the public realm so that it can cope with the effects of climate change. As part of the DRA Programme (DPRA), Fugro was commissioned to contribute to a study on active groundwater level management.

In the 21st century, the Netherlands will be faced with four climate-related trends: it will get hotter, it will get drier (in summer), it will get wetter (in winter), and the sea level will rise. The effects and impact of this will be different for each sector. So far, over a hundred climate-related effects have been identified, from the rotting of wooden piles through to roads flooding.

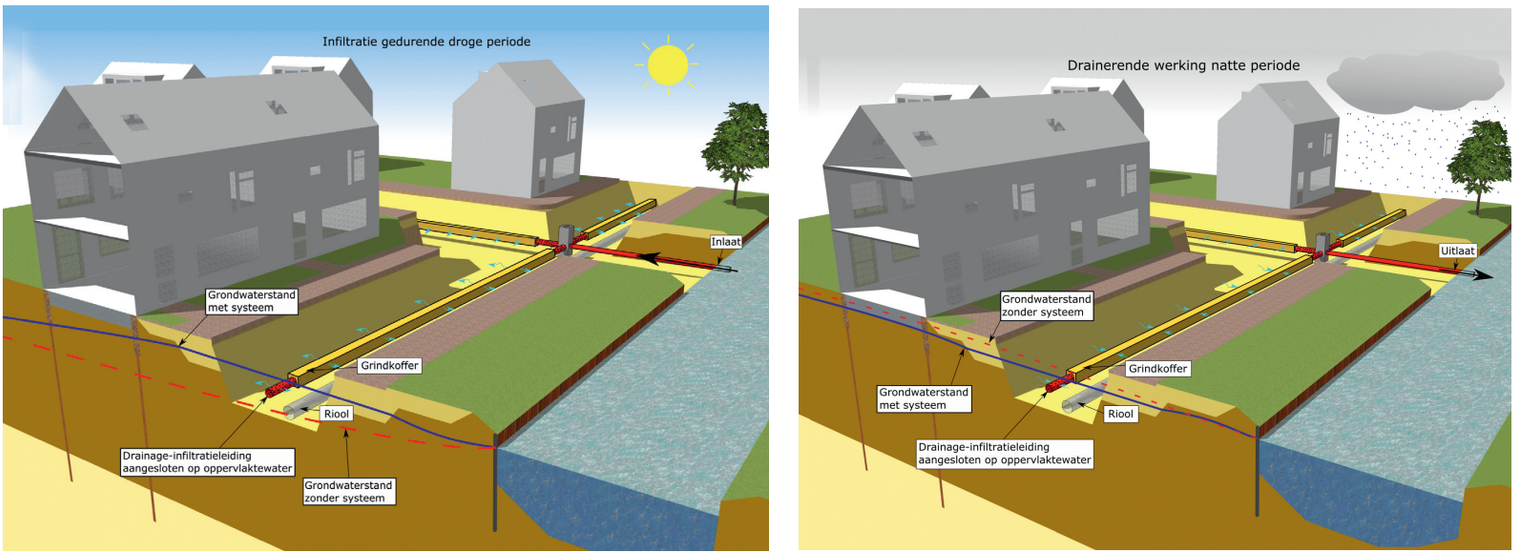

Figure 3 – In dry periods, the surface water flows through a network of drainage and infiltration pipes which allows the water to enter the soil. This maintains the groundwater at the required level. The system works the other way round during wet periods: excess rainwater flows through the pipes to the surface water. As a result, the groundwater level does not rise excessively.
Source: Rapport: Grootschalig actief grondwaterpeilbeheer in bebouwd gebied, mei 2017, Auteurs: Wareco, Deltares, Fugro.