

Sensor technology

Rinke van Veen | Beleidsmedewerker Water en Natuur
provincie Drenthe

Cooperation

Eugène de Geus | Directeur DySI



For the province of Drenthe, the development of sensor technology was an important aspect of WaterSense. 'Over the past few years, the project produced a lot of publicity', explains Rinke van Veen. He is policy employee for water and nature. 'The participating companies were also in the picture. Another interest is that we, as province, can already take account of climate change which may involve longer periods of drought. An area like the fens is particularly sensitive to that. That is why we find a system that supports water management important.' At European level there was also ample attention for WaterSense. Regions in southern Europe are already faced with prolonged periods of drought. A system that is focused on water savings can provide a solution.

'In our presentations we often quote WaterSense as a sample project', explains Van Veen. 'Not only due to the intelligent use of water, but because of the alliances that are forged between the companies. For example between Dacom and Hydrologic. We are looking for cross-border cooperation with similar projects in Germany. They also grow starch potatoes on a large scale and the knowledge we acquired with WaterSense is gratefully received.' The fact that Dacom and Hydrologic found each other in terms of cooperation is indeed an important added value of WaterSense, according to Maarten Spijker of Hydrologic. 'We have come to know each other as specialised firms and realised that we can enhance and strengthen each other. Reason enough to continue the cooperation.'



DySI from Assen provided the data processing for WaterSense. 'We are specialised in treating and analysing large amounts of data', says Director Eugène de Geus. 'In that sense our role was mainly a facilitating one.

To us WaterSense was an interesting project to gain experience of the water sector. During the project, we realised that the amount of data used by the water sector is relatively small, which makes our added value relatively limited. As a result we will no longer focus on the water sector at the moment. However, the project did lead to an interesting collaboration with Dacom. It became apparent that Dacom did not use part of the information that was produced by the soil-humidity sensor.

Together with Dacom we will look at how we can use that information to increase the reliability of the advice.' As a sidetrack, DySI investigated the reliability of the 10-day weather forecasts. 'That was relatively simple for us', De Geus explains. 'We had detailed forecasts and knew what the weather had been. It proved that the 10-day forecasts for temperature and precipitation are not particularly accurate. That does not benefit the reliability of the advice.' On balance, De Geus is positive about the results of the project. 'Innovative projects always contain a certain element of inherent risk. To us this was an opportunity to explore the possibilities of a new sector and it produced an interesting alliance partner.'



Participants WaterSense

- Waterleidingmaatschappij Drenthe
- Provincie Drenthe
- Waterschap Hunze en Aa's
- Dacom
- DySI
- Hydrologic
- Praktijkonderzoek Plant en Omgeving - Wageningen UR
- Met medewerking van Waterlaboratorium Noord, - TTI Wetsus

POST watersense



WaterSense POST | 2012 www.projectwatersense.nl

WaterSense completed after four years

When should a potato grower irrigate or fertilise? What is the basis for the Water Board deciding to retain more water in an area or to pump it out? The WaterSense project was intended to answer these types of questions by using sensor technology. The project started in 2008 and was completed in 2012. It was carried out in the catchment area of the Hunze in the Drenthe fens.



The most important objective of the project was to develop a decision support system that supports water management by using sensor technology. This is about the amount of water and the quality of the water. This is important to agriculture, Water Boards, water companies, knowledge institutes, the province of Drenthe and participating SMEs. Through WaterSense they had the opportunity to gain experience of innovative applications of sensor technology in the water sector.

DSS

The central purpose of WaterSense was the decision support system (DSS). We have succeeded in developing a proof of principle, or rather a pilot model for quantity. This DSS provides the users with information and advice about measures such as irrigating, adjusting water levels

or setting weirs and pumping stations. The DSS is to support Water Boards and farmers with day-to-day management, during extreme situations and with strategic choices. The DSS uses many different data in forecast models. In function of the weather forecast and the actual humidity, these models forecast what will happen with the amount of water in an area. The farmers and water managers can take measures in time to prevent unwanted situations. The system is also able to calculate the effects of measures. Sensors also provide data for the DSS. DACOM's sensors measure the amount of humidity in various agricultural plots at different depths in the soil. The weather forecasts come from Meteo Consult. Data on the water level and the ground-water level are also used. The DSS takes account of the properties of the soil in the different plots.

WaterSense Post informs you about the use of sensors in conjunction with a decision support system for agriculture and the water chain. WaterSense Post is a publication of the WaterSense Project.

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SAMENWERKINGSVERBAND NOORD-NEDERLAND
DIT PROJECT WORDT MEDEGEFINANCIERD DOOR
HET EUROPEES FONDS VOOR REGIONALE ONTWIKKELING
EN DOOR HET MINISTERIE VAN EZ, PIJLEN IN DE DELTA



Innovation

Martha Buitenkamp | Anantis

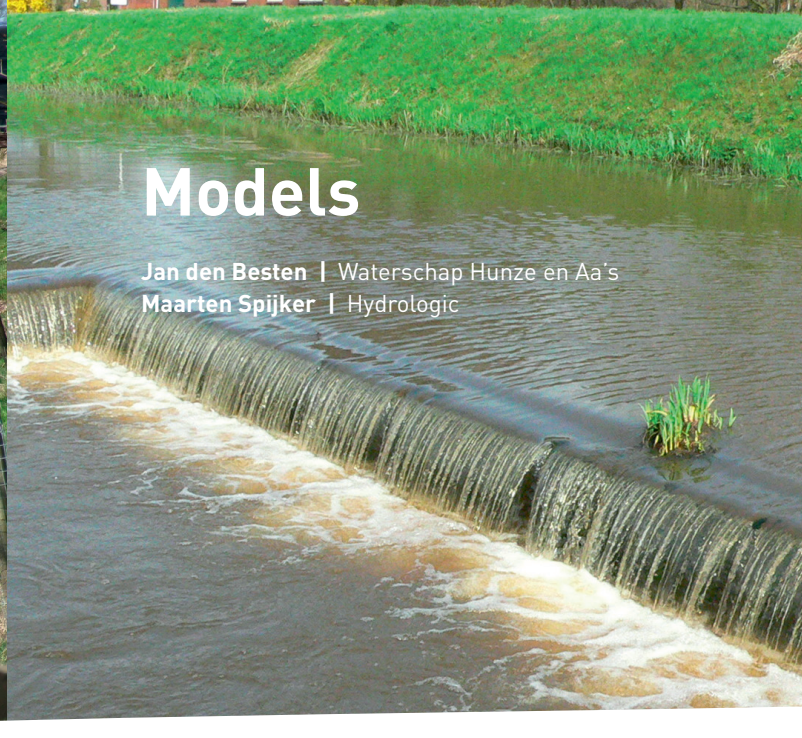


Water management



Models

Jan den Besten | Waterschap Hunze en Aa's
Maarten Spijker | Hydrologie



Water quality

Norbert Veldkamp | WMD



Sensors

Louis Nannes | Dacom



Agriculture

Janjo de Haan | Kennisinstituut Praktijkonderzoek Plant en Omgeving



Project leader Martha Buitenkamp of Anantis is proud of what has been achieved in four years. That the enthusiasm was maintained together with the partners to keep working on the original objective. 'The added value of this project was in the cooperation between the parties', she explains. 'The different angles are the reason for new developments. Innovation takes time and is a process of three steps forward and two steps back. It is wonderful that resources were made available for this project by SNN, Drenthe Water Supply Company (WMD) and the province of Drenthe. The cooperation between the parties will continue after the project. Companies and knowledge institutes in particular have come together and will use the results of WaterSense and take new steps.'

For water managers, the DSS is useful because it combines different data. The additional information about ground water and surface water seems particularly useful for water-level management. At the end of WaterSense, the DSS is not yet ready for use; it is proving to be complex to build such an integrated system. Quite a few things are still required to make it sufficiently accurate for practical use. WaterSense has demonstrated that a true integrated model is complicated and possibly not necessary to answer many day-to-day water issues. It is likely that a modular DSS will be sufficient to meet the needs, whilst it is an adequate approximation of the reality. A modular system is easier to produce and easier to adjust to the needs.

Another result of WaterSense is that the application of sensor technology with soil-humidity sensors produces a lot of information about the behaviour of water in the soil. This information helps to improve the hydrological models, which is important for the prediction of the available amount of fresh water. Sensor data have demonstrated that the amount of humidity in the soil is often underestimated.



For hydrologist Jan den Besten of the Hunze en Aa's Water Board, the benefit of the project is largely in the farmers' increased awareness of the need to deal efficiently with water. 'On the internet they could track how much water there was in the soil on a day-by-day basis. Seeing and experiencing this every day increases awareness. The outcomes of WaterSense are limited for the Water Board in terms of water management. Although a prototype has been developed, we cannot take any decisions yet on the basis of the DSS. The groundwater model is too complex for that. The next step is to study whether remote sensing is a promising option, as the information would be more general and cover an area.'



Maarten Spijker believes that WaterSense has brought precision agriculture and water management closer. 'That is the trend we observe nationally and internationally. Growers would like to have information per square metre to enable them to use raw materials as efficiently and effectively as possible.'



'The advice model for agriculture and water management is a positive result', says Norbert Veldkamp, Manager of the Environment sector of the Drenthe Water Supply Company (WMD). 'The insights we obtained can be applied in our groundwater protection areas. As a drinking water company it is in our interest to prevent substances from leaching out. For example, at the moment we regularly need to remove 1,2 dichloropropane from the ground water. That is a residual product of the soil disinfectant DD that was used up to the 1980s. If the advice model brings clean agriculture closer, we will have less chance of contaminations leaching out.'

Quality

WaterSense did not produce a DSS for quality that can tell a farmer whether he needs to add fertiliser or some more plant-protection product. This is largely because there is still a lack of knowledge of the behaviour of plant-protection products and nitrate in the soil. It is difficult to capture in models. Sensors that can measure water quality in shallow soil where the roots grow, and that can measure this online and real time actually don't exist. For Dacom this was reason to develop a prototype nitrate sensor. To optimise fertilisation it is important to know how nitrate behaves in the soil.

'The nitrate sensor is interesting for agriculture and the Water Boards', argues Louis Nannes of Dacom. 'It is one of the most important minerals for a crop and it plays a major role in any contamination of ground water and surface water. A farmer would like to know whether he needs to add extra fertiliser or not. Water Boards monitor the quality of surface water. If they have information about the amount of nitrate in the soil, they can take measures at an early stage if the water quality is under pressure. Dacom developed the nitrate sensor by adapting existing technology for use in the soil. The main benefit of participating in a project like WaterSense is that you receive immediate feedback and you can meet the demands of the users. The same applies to the sensors that measure the humidity in the soil. WaterSense enabled us to discover that we need to simplify the sensors. The users simply want to know whether there is enough moisture in the soil and whether to irrigate and how much on the basis of simple advice. That's enough.'



For the approximately 50 potato growers who participated in WaterSense, the information from the DSS proved useful for business operations. Sharing information with colleagues was also experienced as beneficial. The information about the humidity of the soil helps them to take decisions about irrigation, fertilisation and plant protection. The system contains a large amount of information, and it is not easy to make optimum use of all of it. That still needs to be improved. Janjo de Haan works for knowledge institute Praktijkonderzoek Plant en Omgeving, which is part of Wageningen UR (University and Research centre). He was particularly involved with tests concerning irrigation and fertilising potatoes at the experimental farm 't Kompas in Valthermond.

He is satisfied with the outcomes of WaterSense. 'I was a little sceptical at first', he explains. 'Because it was a highly ambitious project. One of the most important results of the project is that we managed to bring a large amount of data together and use it to support decisions. That allows agriculture to take better substantiated decisions.' That irrigation did not lead to a higher yield in all cases is easy to explain, according to De Haan. 'During the project we did not face truly dry summers. To investigate the effect of irrigation properly, you need to have comparisons over a longer period of time.' De Haan was surprised by the enthusiasm that was shown by the participating businesses. Amongst the farmers there was a large amount of interest in working with a soil-humidity sensor. They are interested in a follow-up and are prepared to invest in that.'

Innovation

For the Northern Netherlands, sensor technology is one of the economic drivers. There are various attempts to make this technology suitable for commercial applications. That does not always produce a specific product. Sometimes, the outcome of the innovation is in new insights or alliances.