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SKINT WATER SERIES

SUSTAINABLE URBAN WATER PLANNING ACROSS BOUNDARIES

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SOLAR CITY, HEERHUGOWAARD, THE NETHERLANDS

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INTRODUCTION

Solar City is a 118 ha new urban area with about 1,400 houses southwest of the municipality of Heerhugowaard. Solar City is the world's largest carbon neutral community. The energy-efficient houses use solar and wind power.

In the early 1990s the Fourth White Paper on Spatial Planning identified the area of the municipalities of Heerhugowaard, Alkmaar and Langedijk in the province Noord-Holland as a future urban development area. Besides the large housing task there were tasks for recreation, water storage and aquatic biodiversity as well. On top of that, the province and the three municipalities had high ambitions for CO₂ reduction.

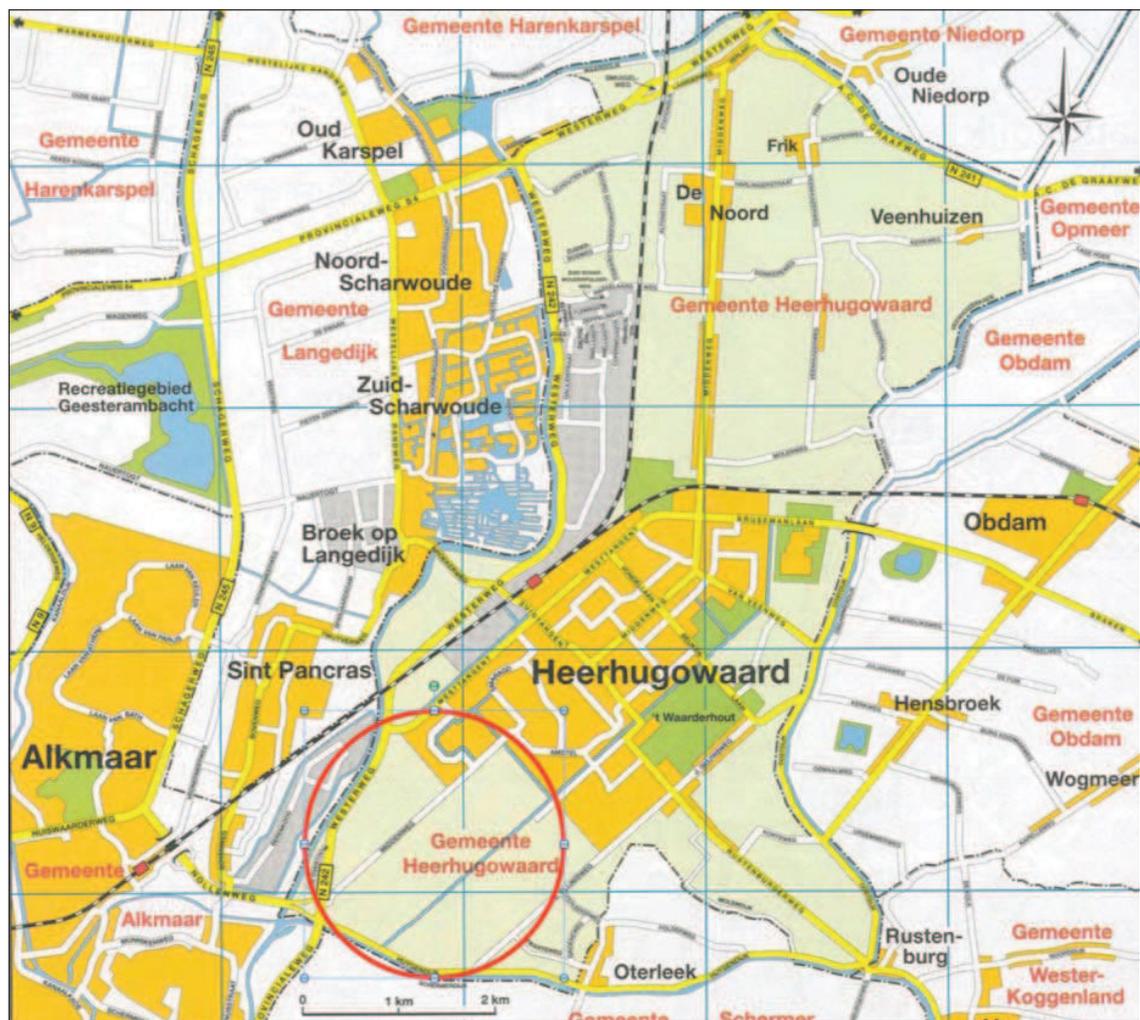


FIGURE 1. LOCATION OF SOLAR CITY

In a shared spatial planning vision the three municipalities combined housing, energy neutrality, water storage, aquatic biodiversity, nature and recreation in the ambitious plans for Solar City in Heerhugowaard – all at the lowest part of the polder of Heerhugowaard, which dates from 1630. The planning of the project lasted from 1992 to 2006. Ever since, residents have been moving into their new homes.



FIGURE 2. ARTIST'S IMPRESSION OF SOLAR CITY

MAIN STAKEHOLDERS AND THEIR INVOLVEMENT

A development like Solar City requires many different fields of knowledge as well as the skills to integrate and to harmonise all these fields. The municipality of Heerhugowaard is the project manager of the development plan for Solar City. Throughout the planning period Heerhugowaard cooperated closely with the Water Board of Hoogheemraadschap Hollands Noorderkwartier. Heerhugowaard invited Hollands Noorderkwartier as the municipality wanted to use the expertise of the water managers to make a so-called waterproof spatial plan.

This initiative of Heerhugowaard to cooperate with the water board was taken long before the water board's involvement could be enforced by legislation, the so-called Water Assessment as we know it nowadays in the Netherlands.

As a water manager, Hoogheemraadschap Hollands Noorderkwartier was responsible for the flood risk management, the water quality and the aquatic ecology of the area. This led to a water system with hardly any water supply or discharge of excess rainwater, and a naturally purified water system in the Luna Park. After completion of the project Hollands Noorderkwartier will continue to manage the water in Solar City and Luna Park.



FIGURE 3. ARTIST'S IMPRESSION OF LUNA PARK

The province Noord-Holland helped in dividing and combining the large national housing task with the other national and regional tasks, especially in the field of renewable energy. This led to cooperation between public bodies.

Ashok Bhalotra, the world-renowned urban developer from Kuiper Compagnons, was the first to introduce the sketches for a city largely based on photovoltaic energy. The energy utility company NUON is the owner of most of the photovoltaic systems. Urban planning consultancies, energy consultancies, architects, landscapers, etc. created new plans, new views and new solutions. The recreation authority manages the Luna Park. The main stakeholders, their roles and interests, are summarised in Table 1.

Stakeholder	Role				Interest										
	Decision-maker	Advisor	Developers	Long term ownership	Regulators and interest groups						Planning bodies				Others
					Wild life	Heritage	Environment	Water quality	Water quantity	Local communities	Strategy planners	Development control	Building control	Road/Transport	Subsidies
Heerhugowaard	x		x	x		x	x	x		x	x	x	x	x	
Hollands Noorderkwartier		x						x	x						
Province of Noord-Holland	x					x	x	x					x	x	
Dutch Government	x													x	
European Union														x	
Kuiper Compagnons		x					x		x		x				
PWN water company		x					x	x	x						
Nuon Energy		x	x				x								
Recreation authority Noord-Holland					x		x	x							
Housing association Woonwaard				x									x		
Private project developers			x										x		
Real estate developers				x									x		
Property owners				x						x					

TABLE 1. MOST IMPORTANT STAKEHOLDERS LINKED TO SOLAR CITY DEVELOPMENT

MAIN PROBLEMS RELATED TO THE INTEGRATION OF LAND AND WATER MANAGEMENT

Until 1630 the current polder of Heerhugowaard used to be a lake. This lake was part of the water storage in Noord-Holland. Since the reclamation started in 1600 the percentage of surface water in Noord-Holland decreased from 50% to only 8% nowadays. Urbanisation caused further surface run off to the remaining water system.

More specifically, the area to be built for Solar City was in the lowest part of the polder. Solving water management problems at the lowest part of a polder will cause severe water management problems elsewhere in the polder.

Besides the flooding problems there are also serious water quality problems. Birds discovered the lakes around Solar City from the start. The bacteria in their excrements sometimes cause problems for swimmers. Unfortunately, the better the weather conditions are for swimming, the more likely it is that poor water conditions occur.

Another water quality problem is caused by sport fishermen when evicting fish. Sport fishermen evict fish, which is hardly ever ecologically sound as they usually want to catch the heavyweights. These heavyweights like carp dig the sediment, causing turbid water and free nutrients resulting in algae. A downward spiral is created as the declining water quality decreases the numbers of ecologically sound fish like pike, since hunting is more difficult in turbid water.



FIGURE 4. RECREATIONAL ACTIVITIES IN WINTERTIME

The communication on the principles of Solar City generally went well. However, communication on an important issue, the use of the water system, was not as smooth. It was agreed with the municipality of Heerhugowaard that the water quality would be sufficient for recreation purposes but not for swimming. However, the municipality created a small beach and talked about swimming water in the newspapers. The water quality does not always meet the requirements for swimming, especially during warmer periods. This sometimes leads to resentment as citizens counted on swimming possibilities.

More than once, the above-mentioned water management solutions were threatened by financial limitations.



FIGURE 5. LAND RECLAMATION MAP „HEER-HUYGHEN-WAERT“

WATER MANAGEMENT SOLUTIONS

To preserve Solar City from flooding a lot of surface water was dug: over 30% of the project's area consists of surface water. Furthermore, a lot of flexibility in the water level is allowed. During summer the water level can drop to 0.40 metres below the average level. In winter the water level might rise up to 0.30 metres above average. This permitted level fluctuation of 0.70 metres enables the water system to be more or less self-sufficient. Only in very dry periods is a small water supply needed, and in very wet periods water is discharged by an automated weir. These results are really exceptional for a polder more than 3 metres below sea level, given the Dutch climate.



FIGURE 6. RECREATIONAL ACTIVITIES IN SUMMER TIME

Initially a flexible water level seemed to be impossible because of the existing buildings. Eventually, it was decided to raise small dikes around the historical farms in the surrounding area to protect them from high water levels. The newly built houses have no crawl space underneath to enable the water level to fluctuate.

A reasonable water quality is achieved by using the natural purifying water system in Luna Park. Here the water is circulated through a wetland area. This rids the water of most of its nutrients. However, the required water quality for swimming can hardly be met, especially not when the weather conditions for swimming persist.

From design to blueprint, there was always a tension between functionality, safety, experience, construction costs and maintenance costs of the water system. In the end, an acceptable balance between the water management requirements and the financial means was found.



FIGURE 7. LIVING CLOSE TO THE WATERFRONT



FIGURE 8. OVERVIEW OF LUNA PARK, A COMBINED WATER TREATMENT AND RECREATIONAL AREA

DIFFICULTIES AND HOW THEY WERE OVERCOME

The instability of the Dutch subsidy policy and the bureaucratic procedures caused numerous problems. The realisation of the project was heavily dependent on a Dutch national subsidy programme, as photovoltaic systems could not otherwise compete with conventional or other renewable energy systems. The termination of this subsidy programme required innovative financing schemes.

The rigidity of the European Commission with regards to the time frame and planning of the project also caused major concerns. The time frame was too narrow for a project of this scale. This was solved by holding an official opening of Solar City when only two thirds of the project had been realised.

The project developer was very demanding; he wanted to avoid future claims on uncertain and unproven construction methods. Furthermore, many of the architects had no experience with, and hardly any knowledge about photovoltaic systems. But in the end, all the purely technical problems in the design and in the realisation of the project were solved.

KEY SUCCESS FACTORS

As in most such ambitious projects, success relied on the enthusiasm of individuals working in public bodies. They are the ones that need to convince the decision-makers. Here they were able to do so because they believed in the principles of the project, they trusted their colleagues from the other public bodies and they cooperated whenever possible.



SUSTAINABILITY ASSESSMENT

Many areas of the Netherlands lie below sea level. This means that all the excess rain water needs to be pumped out to sea. This is mainly true during the winter; in summer fresh water from the rivers supplies the regional water systems. The flexible water system in Solar City leads to less fuel consumption at the pumping stations.



FIGURE 9. HOUSING IN SOLAR CITY: ALL THE ROOFS HAVE SOLAR PANELS

DISCUSSION AND CONCLUSIONS

Solar City is a sustainable neighbourhood. It is designed to be climate proof, as solar and wind power generate the needed electricity for almost 1,400 households. The neighbourhood and its surroundings have an excellent water quality and aquatic biodiversity, promoting water-related recreation and nature. To achieve a good aquatic environment, rainwater is retained and circulated through an integrated purification labyrinth. The water banks and aquatic plants purify the water in a natural way.

A positive side effect of this flexible water system is that more local water is available in the area. This is interesting from an ecological point of view. Thanks to the natural purifying water system in Luna Park, the water quality is also much higher than could be expected with a traditional water system.

The photovoltaic systems, together with the power of the three windmills, supply enough energy for Solar City and its residents to be fully carbon neutral.