

HEAT, DROUGHT AND FLOODING PRESENT NEW CHALLENGES FOR THE BUILDING INDUSTRY

# Required: climate-proof buildings

The building industry is expected to take the consequences of climate change into account. It has already developed energy-efficient houses and offices, but how does one cope with higher temperatures, drought and flooding? A vanguard of architects and developers is showing the way.

JACO BOER

Climate change is presenting construction companies and project developers with a new challenge. How to build houses and offices which not only use less energy and water, but are also climate proof? According to the IPCC, we will be more often faced with hot dry periods as well as spells of high precipitation in the coming decades. As a result, architects will have to design buildings and neighbourhoods that take into consideration extra high temperatures, and periods of drought and flooding.

“The building sector has already come up with several solutions for making buildings more energy and water-efficient. But there is still too little attention paid to climate adaptation”, says Andy van den Dobbelsteen, professor of Climate Design and Sustainability at Delft University of Technology. The problem of higher temperatures in particular is an aspect that is not getting enough attention, in his view. But actually there are already simple ways of making buildings cooler and more comfortable without having to use energy-devouring air-conditioners. “The traditional architecture of Mediterranean countries demonstrates this.”



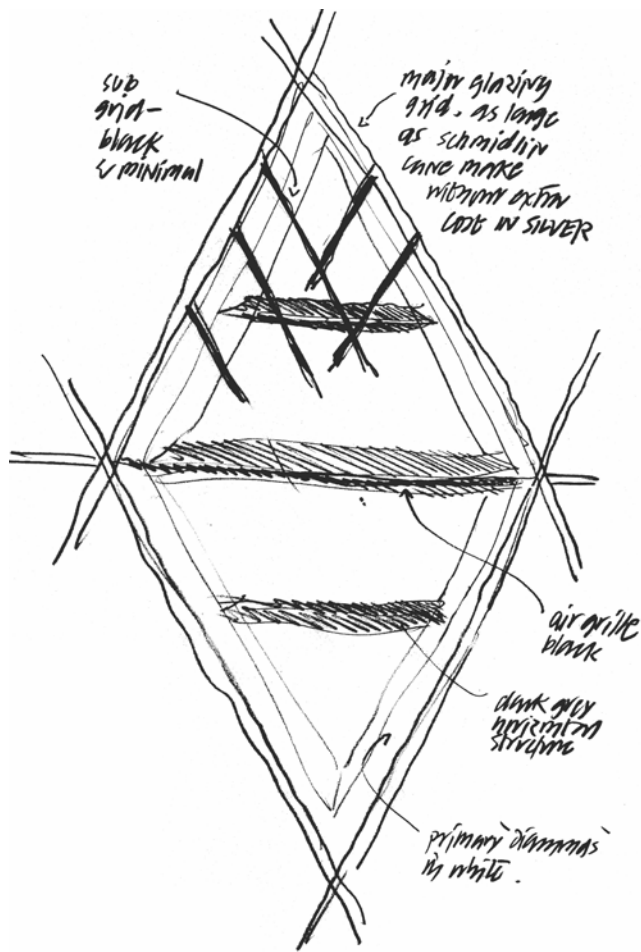
HH / DOROTHEA SCHMID

## ◀ Water plazas and green façades

It seems paradoxical but, apart from having to take water shortages into account, builders will also have to consider the risk of flooding. Delta cities, in particular, are vulnerable. Rivers no longer just discharge more water but are also affected by rising sea levels. More and heavier rain showers are expected. Because of this a number of cities, in cooperation with architects, are actively involved in the search for smart options for water storage which do not take up too much space. For example, in Rotterdam, a new public parking garage has been opened with beneath it a reservoir with a 10-million-litre capacity. De Urbanisten, a recently established urban development office, has designed a multi-functional ‘water plaza’, which combines water storage with a children’s playground area in rainy periods. Construction should begin next year.

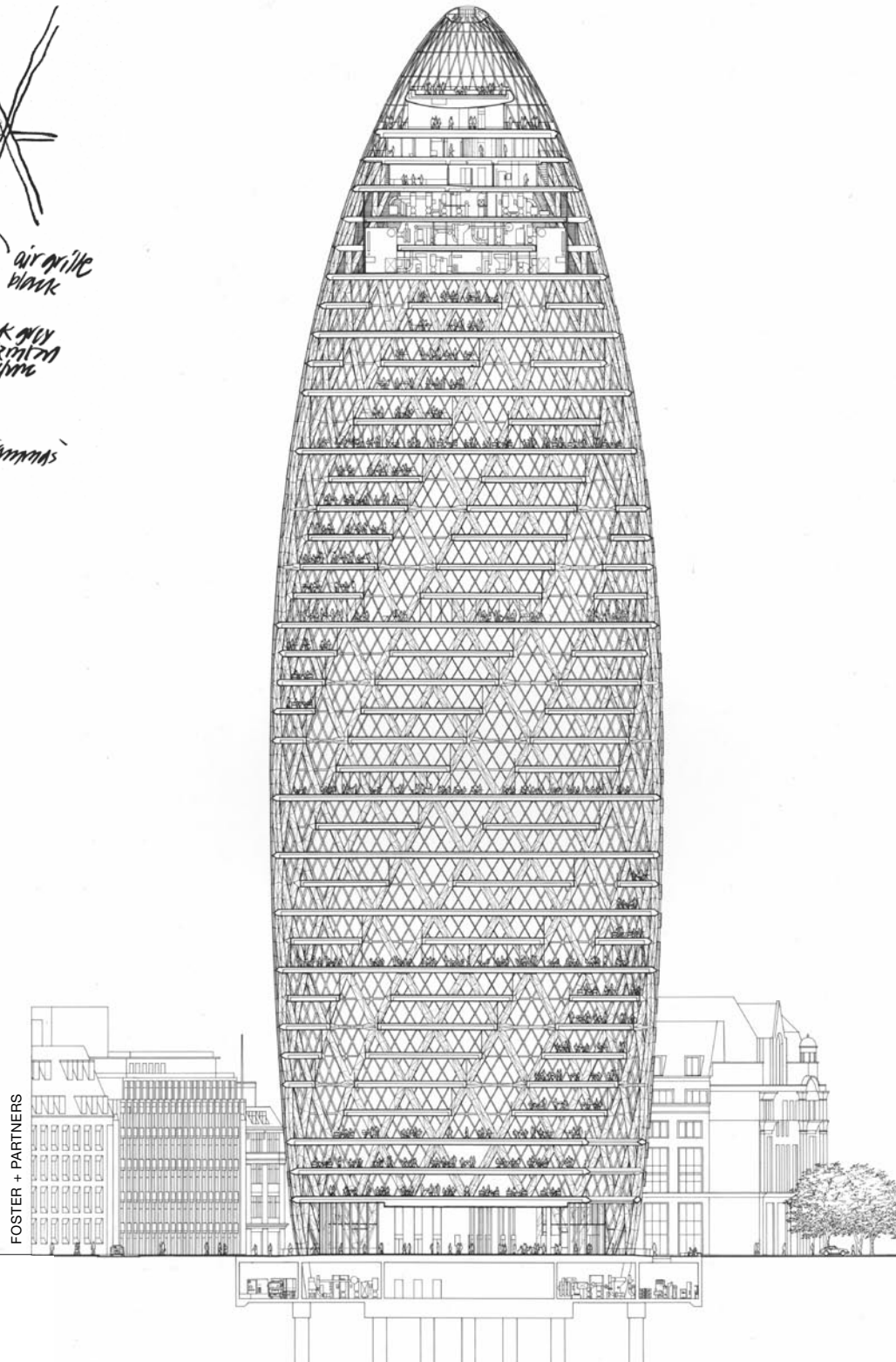
By planting greenery on facades and roofs, and in gardens, excess rainwater can be retained for a longer period, which prevents flooding of drains. In Berne, the Swiss capital, houses in the district of Halen were already bedecked with plants and linked together by overhanging plants 30 years ago. In the meantime, all over the world, ‘greened’ buildings can be found, spectacular highlights being the Musée du Quai Branly in Paris and the ‘drive through’ roof-top showroom of Subaru in Singapore.

There are already simple ways to construct cooler and more comfortable buildings

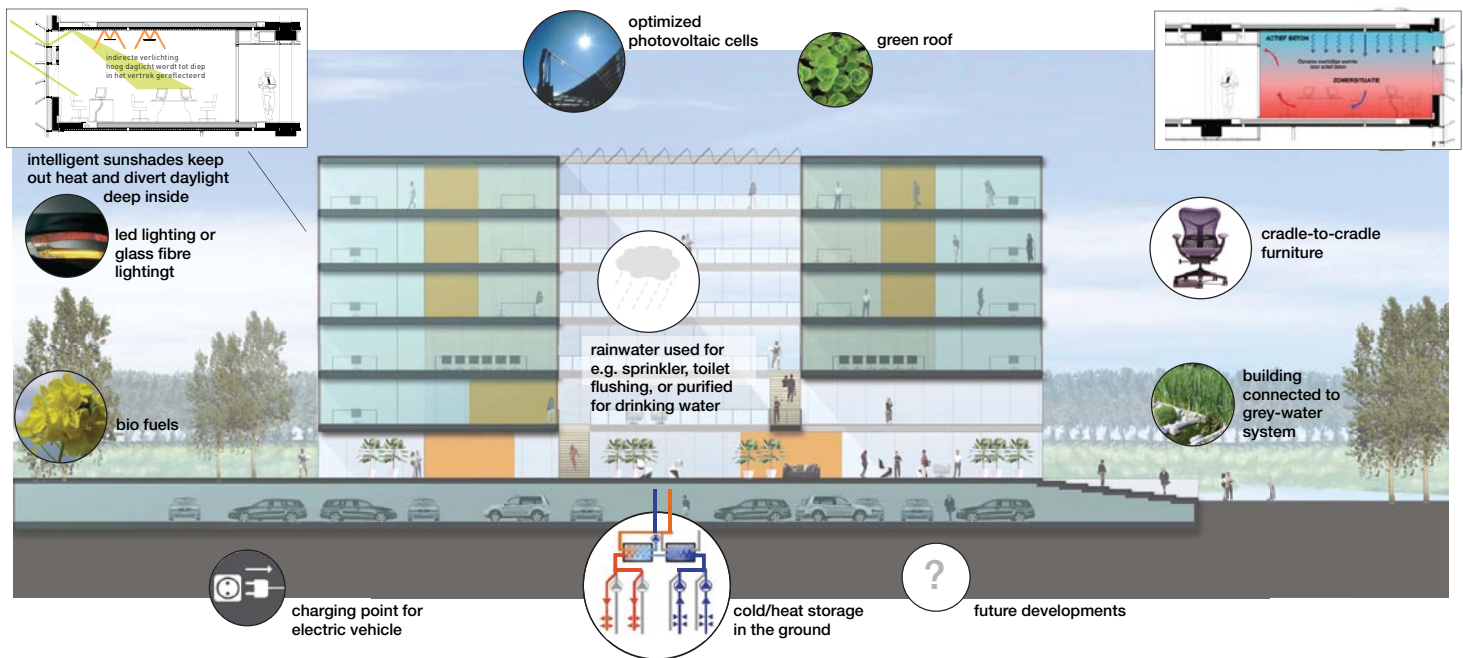


### Natural ventilation ►

The urbanization of AlmaVerde on the Portuguese Algarve is an example of how the British architect, Jes Mainwaring, was inspired by old Moorish principles of design. The houses were fitted with sloping (cooler) roofs, white reflecting façades and particular attention was paid to the insulation of windows, exterior walls and roofs. In addition, an ingenious system of underground PVC pipes through which air is blown allows the villas to be cooled in a natural way in summer. Internationally renowned Norman Foster has also experimented with natural cooling and ventilation systems in recent years. He designed a spiral-shaped tower for the offices of SwissRe in London in which warm air climbs upward through a hollow glass frontage, providing passive cooling in summer and passive heating in winter. In Madrid, a few years later, he built a skyscraper in which the two supporting columns were situated in such a way that the workspaces were shielded from direct sunlight. This method resulted in substantial savings on cooling costs.







## ▲ Dealing with drought

Cities are not only facing higher temperatures; drought is becoming an increasing problem too. Fortunately, more and more builders are installing water-saving taps and showers in offices and homes as a matter of course. Grey-water systems, whereby rainwater is recycled for flushing toilets, and for sprinkling gardens and flower boxes, are becoming more popular. These systems were mainly installed in dwellings in the past few decades. But recently, in Japan, a double waterworks system was installed in an indoor stadium with a seating capacity of 50,000. Rainwater was channelled from the roof to a reservoir with a storage capacity of 3 million litres, located under the stands. Close to Amsterdam, the innovative developer OVG is building a new climate-neutral head office for TNT, the international mail company, which will also be fitted with a grey-water system.

Prof Andy van den Dobbelsteen  
 Climate Design and Sustainability  
 Delft University of Technology  
 T. +31 152783563  
 a.a.j.f.vandendobbelsteen@tudelft.nl

## ▼ Water-resistant buildings

If the worst happens and a city is flooded, the important thing is to keep the damage to a minimum. By raising the height of door thresholds and banning crawl spaces, builders can avoid a lot of trouble. It also helps us to point out to residents that they should not lay parquet on ground floors. One step further is to lift up the home and let it float. Only then will you be completely immune from fluctuations in water levels. Developers all over the world are experimenting with ways of constructing floating villas. In Canada they have even laid a highway on water and, in the Netherlands, a nursery is growing tomatoes in a floating greenhouse. Developers could gain further inspiration from the floating villages in many Asian countries. Who will be the first to build a modern version of the Vietnamese sampan?



DURA VERMEER

# Climate Change Adaptation

Region

## Minimizing Probability

- improved dikes
- new Delta plan
- cool recreational opportunities



## Minimizing Consequences

- compartmentalization between dikes
- flood risk maps
- early warning system
- evacuation plan



## Stimulating Recovery

- priority for recovery from societal disorder
- emergency shelters



City

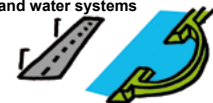
- de-hardened and greener surfaces
- public green and water zones
- room for innovative water storage
- avoid vulnerable functions in vulnerable areas



- alleviated public infrastructure
- adapted traffic management during evacuations
- heat stress plan



- priority for recovery of public space
- accommodation of heat stress victims
- water nuisance fund
- backup energy and water systems



District

- buildings integrated into dykes
- integrally heightened areas
- collective green gardens
- rain-water infiltration systems, wadis



- safe havens
- green walks
- elevated sidewalks



- passive water drains



Building

- green frontages
- permanent cooling options
- buildings on mounds



- wet proof ground floors
- dry proof ground floors
- sun blinds
- self-reliance



- availability of pumps
- wet proof decorations



## Rotterdam Sustainability Guide

An excerpt from the Rotterdam Sustainability Guide. Planners use it to incorporate sustainability in their design process. The guide is intended to stimulate creativity, provide practical solutions and create a common framework. The left-hand column

shows a traditional resistance approach. The middle and right-hand columns of the adaptation scheme provide examples of measures that increase resilience and innovative solutions generated in a case study.

Wim de Jager  
City of Rotterdam  
T. +31 104893331  
wfj.dejager@gw.rotterdam.nl