WET 'N' DRY

Words Ali Watkinson

'WATER, WATER, EVERYWHERE, NOR ANY DROP TO DRINK', WROTE COLERIDGE IN *THE RIME OF THE ANCIENT MARINER*, NEATLY PRESAGING THE PAINFUL PREDICAMENT FACING THE WORLD TODAY AS CLIMATE CHANGE BRINGS TOO MUCH WATER TO LOW-LYING, COASTAL AREAS, AND TOO LITTLE TO INCREASINGLY ARID DRYLAND REGIONS. *SUBLIME* COMPARES TWO HOMES DESIGNED TO WITHSTAND DROUGHT OR FLOOD

The irony for the planet, just as it was for the Ancient Mariner, could not be more acute. While of course absolutely vital to human life, water is absolutely key to how we have become accustomed to live our lives. The daily drinking requirement may be a mere three to four litres, but include water for sanitation and the total consumption in the developed world rises to 40 litres per person per day; add in water for bathing and it reaches 250 litres per person. It's no wonder commentators are predicting we won't be going to war over oil in years to come, we'll be going to war over water.

Architects the whole world over are addressing – and becoming inspired by – these issues. With extreme droughts expected to cover as much as 10 per cent of the planet by 2050 (up from 2 per cent today) reducing water use is crucial. In the desert city of Phoenix, Arizona, US architect Matthew Trzebiatowski of Blank Studio (www.blankspaces.net) has built a house for himself named Xeros, after the Greek word for 'dry'.

Situated within a 1950s neighbourhood where, Trzebiatowski says, 'the urban grid of Phoenix is overtaken by the organic land forms of the North Phoenix Mountain Preserve', the house is in fact a two-storey design studio 'that descends down into the earth' topped with a single-storey residence accessed by an external staircase.

For Trzebiatowski, location is 'the most important factor in considering a design approach for a project' and naming the house Xeros is, he explains, 'a reminder that all design solutions should be a direct response to the environment in which the project exists.

'Xeros,' he continues, 'exhibits several environmentally responsible decisions: the form turns an opaque face towards the intense western afternoon sun while the more exposed faces to the south and east are shielded by an external layer of woven metal shade mesh.

'THE LONG, NARROW LOT PRECIPITATED A VERY TALL FORM [30 foot at its apogee] with a petite footprint that allows the maximum amount of site to be retained for vegetation. Low-water use, native vegetation is positioned around the residence to add to the shading effect of the screen. And the site itself was "recycled" in that new life was injected into a neglected plot in a neglected Phoenix neighbourhood.'

The overriding characteristics of the location in Phoenix are low rainfall – on average just eight inches of rainfall per year ('the region has been in a drought for a decade', says Trzebiatowski) – combined with flash flooding which directed Trzebiatowski to keep the site pervious 'to allow rainwater to percolate rather than flow freely and cause erosion'.

'Creating a city like Phoenix, in this desert location, is a very perverse exercise in human ingenuity,' says Trzebiatowski. 'People are lured here by a low cost of living and housing developments with lush grass lawns as far as the eye can see. It then takes water conservation mandates and incentives from local government to get these people to stop watering those lawns and to transform them into "xeriscape" [landscaping method employing drought-resistant plants].'

He believes it's an out-of-sight, out-of-mind mentality. 'Much of the city's water comes from a river that is located two states away – we don't have bodies of water that let us gauge how low the levels have gotten. If we did, perhaps intellectually we could make the connection between those low levels and our use and adjust accordingly.'

ESTABLISHED SUSTAINABLE BUILDING SOLUTIONS also have to be adapted as the man-made environment throws up new challenges. 'The average night-time temperatures in Phoenix,' Trzebiatowski explains, 'have increased greatly over the last 15 to 20 years due, in large part, to the mass of the roads, paving and buildings which absorb heat during the day and re-radiate it during the evening. This means "massive" construction – concrete, block, stone, earth – is no longer a viable solution to building in this place.'

Xeros was consequently constructed with a lightweight frame that is well insulated to contain the interior conditioned air. The primary building material is exposed steel and this has been allowed to weather naturally, melding with the parched colors of the surrounding hills.

Although the building envelope is, visually and technically, a reaction to the arid conditions, Trzebiatowski has not forsworn the opportunity to employ water aesthetically, using it to guide visitors down to the studio. 'It is a low-tech solution,' he explains, 'turning on a hose bib that fills a stainless-steel trough that, in turn, fills a shallow reflecting pool at the terminus of the path in the studio's forecourt. This pool has an overflow connection that waters the plantings downstream. There are no pumps or filters – it works by gravity alone.'

Internally Trzebiatowski specified water-efficient fixtures although, as he readily admits, 'the aesthetics drove the decision-making ... My wife and I have always been efficient with our use of resources no matter what they are. There is much that can be done in terms of efficiently using water resources – recycling grey water, low water-use fixtures etc. – but by not doing certain things – not having a swimming pool, not having lawns and plants that require more water than nature provides – we make an impact as well.'

Even so, Xeros is a very luxurious house. 'The challenge was twofold,' Trzebiatowski explains – 'to make an environmentally responsible building that's beautiful and forward-thinking, and to show that architecture, so influenced by aesthetically minded solutions, can be responsible to the environment.'

IT IS NOT ONLY RISING SEA LEVELS (which threaten many of the world's major cities) that will cause catastrophic flooding in years to come – 'extreme' rainfall and glacier-melting, in the Himalayas, for example, is predicted to bring increased flooding, too. The Netherlands – where 50 per cent of the country lies only one metre above sea level and 27 per cent is actually below sea-level – is built on 3,500 polders, or parcels of land reclaimed from the sea, protected by a complex network of dykes, canals and water pumps. Architect Koen Olthuis of Waterstudio.NL (www.waterstudio.nl) speaks of a shift towards living with water rather than fighting against it in the face of climate change.

'We've been fighting in the Netherlands against water for hundreds of years. If we stopped pumping water daily, the water level would rise within 48 hours. The system we made with dykes and windmills to pump out the water has been very safe but changes in sea level – the Government is forecasting the sea will rise up to six metres by 2100 – rising rivers [much of the Netherlands is essentially a delta for the Rhine and other rivers] and higher rainfall caused by climate change mean it is going to be more difficult to get all the water pumped out, 24 hours day.' The upshot being, 'we need to give land back to the sea,' he concludes simply.

WORKING WITH THE WATER TRANSLATES INTO BUILDING FLOATING or amphibious houses that rely on patented 'floating foundations' – a hollow box structure that sits underneath the waterline. Like a large boat the floating house is stable because of its weight. 'Floating foundations are rather like cellars,' explains Olthuis. 'We use two systems for the boxes. One is concrete with walls 20 to 25 centimetres thick. The other method uses foam with a concrete shell around it, which being lighter is more suitable for big floating houses. This box is like a ship; it is fixed to the land with cables or gliding piles. When the water level rises the box – the foundations – moves up and when the water level goes down it sinks back.'

The floating house approach is not so revolutionary in a country with 80,000 houseboats. 'The Dutch have built houseboats for more than fifty years,' relates Olthuis, 'so techniques have been developed over that time to bring the same public utilities into a floating house as one on land. Gas, water and electricity enter the house via flexible tubes, while sewage is first put through a cutting system and then pressured out of the house again through a flexible tube.'

This page and opposite The dark reflective and transparent materials used throughout Waterstudio's project in Aalsmeer make great play with the watery location – every ripple is amplified. A statement glass staircase leads to the underwater story housing the 20-seat cinema and lounge.

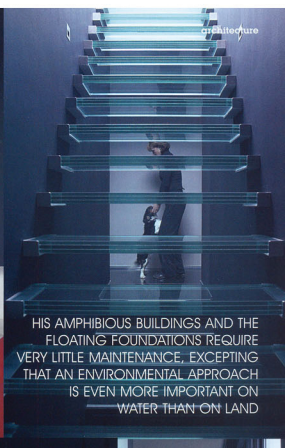
SURPRISINGLY, HE STATES THAT HIS AMPHIBIOUS BUILDINGS and the floating foundations require very little maintenance, excepting that 'an environmental approach is even more important on water than on land. Everything you do has an effect on the water quality. If you don't use the right materials, say – and any pollution doesn't stay on your spot, it goes to the floating houses all around.'

One of Waterstudio.NL's earliest projects was in Aalsmeer, an area badly damaged by the North Sea Flood of 1953 which killed over 1,800 people (prompting the Delta Works project, the world's largest flood protection scheme, which was completed in 1997).

'The clients bought a piece of land next to a lake and got permission to put a floating house there,' says Olthuis. 'The local council only gave permission to build up to four metres above the waterline, but the clients wanted a two-storey house, so we made a storey below water – with a lounge, 20-seat cinema and technical rooms. In other floating projects we've worked on people sleep under the water, or half under the water, but this client is a little bit afraid of the water so he sleeps above.'

The two-bedroomed house, which measures six by 25 metres (giving 300 square metres of living space, plus roof terrace), was built in a factory and floated through to its final destination just like a boat. From the outside it is completely black in order to reduce its impact, with mirrored glazing providing further privacy, while the inside is fitted out with black and/or reflective (and humidity-resistant) materials to emphasise the reflections from the water. 'If you are in the living room and open up the windows you feel as though the water is flowing inside,' says Olthuis. A glass staircase leading to the lower storey continues the watery, reflective theme.

His ingenious approach is now being employed in the Netherlands for floating apartments, floating gardens, floating roads – floating communities in fact – 'and even floating tower blocks 100 metres high with foundations six to eight metres below the water', as well as further afield in places like London, Dubai and New Orleans, where an estimated 300,000 homes were destroyed after the tidal surge generated by Hurricane Katrina breached every one of the city's levees. ■



HIS AMPHIBIOUS BUILDINGS AND THE FLOATING FOUNDATIONS REQUIRE VERY LITTLE MAINTENANCE, EXCEPTING THAT AN ENVIRONMENTAL APPROACH IS EVEN MORE IMPORTANT ON WATER THAN ON LAND