

The floating city as an ecosystem

Floating construction: several municipalities in the Netherlands are working with it on a small scale. TU Delft alumnus Rutger de Graaf of the YesDelft company DeltaSync would like to speed things up with his Blue Revolution.

His floating pavilion for meetings and events has been bobbing around in Rotterdam's Rijnhaven for five years now. Closer to home, five water villas have been floating in the Delft Harnaschpolder since last year, as part of an innovative project initiated by the City of Delft and DeltaSync. Residents purchased water lots and worked with their own architects to develop floating homes. One of these residents, Olaf Janssen, even developed a new floating system based on composites. A true world first! Similar projects are gradually popping up throughout the Netherlands. Some are on a larger scale. One obvious example is the IJburg in Amsterdam, with around 100 homes. Others are smaller, as in Lelystad and Woerden, with ten homes at the most. Last October, Dordrecht offered five water lots for sale on a 'first come, first served' basis. Interested parties waited in line in campers for weeks.

Just last month, the Aqua Dock was officially opened in the Dokhaven in Rotterdam. The Aqua Dock is an RDM Campus project intended to be a test environment for floating construction. There will be a floating road and companies will be able to lease water lots for testing their innovations. It was there that De Graaf presented the Community of Practice for Floating Construction – a cooperative partnership between education, industry and government – and he hopes to open a new, floating office for DeltaSync there in 2016. The fact that floating construction is possible and that people like it are obviously reason enough to do it. In De Graaf's opinion, however, there are even more important reasons: worldwide problems including deforestation, urbanisation and the growing need for food,

biofuels and other raw materials. He estimates that the space shortage in 2050 will amount to approximately 22 million square metres: equivalent to the total land surface area of North America.

Shortage of land

He explains how urbanisation has increased the need for biofuels and food, even as the amount of desert has increased. 'In theory, we could use the remaining bit of nature to resolve the major shortage of land that this has created. This is exactly what is happening now: in Indonesia, tropical rainforests are being cleared away on a large scale to make room for palm oil plantations. In Brazil and Argentina, they are being cleared to grow the soya beans that we feed to our pigs'.

Could floating construction be an alternative for converting nature into agricultural acreage? Only in part, according to De Graaf. Although the amount of agricultural land could be maintained by expanding cities on water, these expansions will require additional food.

'In addition to resolving the shortage of land, floating construction could be used to create ecosystems that filter nutrients out of the water'

With DeltaSync, De Graaf has developed what he describes as a total solution: Blue Revolution. According to this vision, most coastal cities should be able



The floating pavilion in the Rotterdam Rijnhaven.

to expand on water, in combination with floating food and biofuel production. ‘You could make livestock feed from seaweed. Biofuels could be produced from algae on the water. One square metre of algae could produce much more biofuel than a sugar cane plant, for example. Algae need CO₂, of which we have a surplus. They also need nutrients that are present in waste water released by coastal cities’.

Wouldn't large-scale construction on water be harmful to nature? In order to investigate this, DeltaSync collaborated with a large number of partners to develop an underwater drone to take measurements beneath all floating construction projects in the Netherlands. Students from TU Delft and various institutes of higher education also took part. The drone took images and measured oxygen content, temperature, nutrients and other substances. De Graaf was unable to demonstrate any significant effects on water quality.

Ecosystem

However, he did observe the emergence of interesting ecological systems beneath the floating pavilion and in Lelystad. Lots of fish were swimming there and seaweed and mussels were attached to the seabed. ‘In addition to resolving the shortage of land, floating construction could thus be used to create ecosystems that filter nutrients out of the water. Then we would have

a floating city that could serve as a water-purification and ecological system. The floating cities could use waste from land to complete cycles. Symbiosis between cities on land and water.

De Graaf also sees his Blue Revolution as a way of reducing flood risk, since floating cities would be able to protect cities on land against waves. ‘Researchers are working with 3D-printed coral reefs that could protect floating cities from waves’.

The technology already exists – algae cultivation, artificial reefs, floating technology, composites – though fragmented. De Graaf would like to connect these fields. He is already collaborating with the American Seasteading Institute, which also regards floating cities as an experimental space for self-government.

In the Netherlands, nothing as large as the floating pavilion has been realised in the past five years. De Graaf attributes this to the crisis and to delays caused by consensus-seeking. ‘A floating city requires political leadership, vision and courage. I would like to present innovative projects here in the Netherlands that could subsequently be exported all around the world. Twenty years from now, we can't still be showing the Delta Works to foreign delegations’. <<