FLOAT ON: A NEW APPROACH TO FLOOD MANAGEMENT?

Frank Bourke looks at the international concept of floating buildings employed in countries such as Holland and the US, and suggests such buildings could form an innovative part of a flood management strategy for Irish urban centres

Bartels consulting engineers have been working with water and water-related issues for over 90 years. This is not surprising when you realise 10 of their offices are based in Holland. The remainder of their 350 employees are based in Germany, Poland, Bulgaria, Turkey, Ghana and Ireland.

Going Dutch

One of Bartels offices located in Leeuwarden (Northern Holland), specialises in civil infrastructure and building in, on and under water. In Holland, dealing with water is not a recent problem. You can trace its history back over 900 years to 1100 AD. The Waterschappen (water authorities) were the first Dutch democratic form of government. Today, there are approximately 27 independent authorities on water management in Holland. They have their own tax system and elections. The board of each authority is made up of farmers, industry owners and residents and professionals.

Water management authorities are just new names for activities that have long been a part of life in the history of the Netherlands.

The flooding challenges facing all countries, not just Holland, are constantly changing. This is due to climate, increased development with large impermeable areas, reduced flood plains, rising sea levels, and aging flood defences. Each country is preparing and adapting to these new challenges, i.e. in Britain, the upgrade of the Thames Barrage and the construction of the Severn Barrage are methods of control being adopted to counteract rising sea levels, along with the policies of allowing coastal erosion in remote areas and concentrating funding in higher density urban centres. This solution would have relevance in countries such as Ireland. However in Holland, which is the most densely populated country in Europe, this approach would be unworkable.

In order to balance the issue of living space and water storage space, the concept of floating structures was conceived. These structures co-exist with water, instead of working against a force of nature that is increasingly gaining strength. The floating structures can be introduced into all aspects of construction, i.e. buildings, roads and services.

Floating construction: the applications

The idea of floating construction is not new; examples of man-made islands and raised buildings on stilts have been around for thousands of years. Historically, the 'crannog' is a famous Irish example of such buildings. While modern day equivalents would serve a different purpose, their fundamental structural elements are similar.

Introducing this concept today would create interesting advantages when preparing for climate change. The accompanying images show a number of projects in Holland and the US. One project near Amsterdam, currently under construction, involves both floating buildings and structures situated on reclaimed land.

The provision of temporary housing is an option being employed by many urban areas. Temporary accommodation is particularly suited to medical facilities, which would have the capability of being moved on, relatively conveniently, when no longer needed.

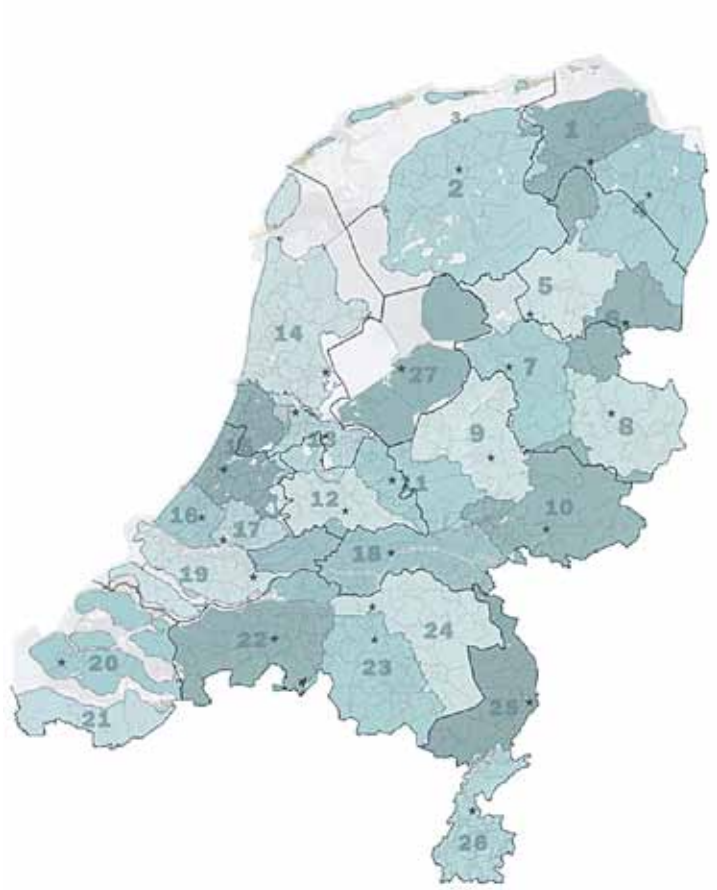
Another idea involves adapting this process by prefabricating

Floating houses and marina.

Floating houses built near the water's edge.

Studio with modern design.

Floating studio.



Map showing the 'Waterschappen', the Dutch water authorities.

a structure in a dry dock and transporting it over water to a prepared, permanent site. Prefabricated construction illustrates the possibilities presented by this type of construction. Holland is known for its horticulture and agriculture; much of this activity involves green houses, which are mainly located in low-lying areas. During river flooding in 1995, many greenhouses were destroyed. Since then a number have been rebuilt as floating structures, considerably reducing their susceptibility to damage during floods. Of course, all of the aforementioned floating concepts must provide access for vehicular and pedestrian traffic. Currently, there are examples of floating roads and related services in the US, which cater for traffic using anchored, floating platforms. If one structure can be built and serviced using this method, why not many structures to complete a self-contained, sustainable community? This type of construction allows enhanced flexibility and could make shorter time frames for urban planning a reality. Cities could become much more efficient.

Floating construction: the structure

Having looked at the application of this type of construction, let us now examine the actual structure. The basic concept employed in creating a floating building takes a number of forms. The two most common are: a polystyrene insert with waterproofed concrete surround; or a buoyant watertight concrete box, which can also be used as a basement and operating room for services. By employing either of these methods, the submerged section gives buoyancy to the structure. The required buoyancy is directly related to the overall weight of the structure, allowing it to sit in the water at a predetermined

level while facilitating easy access at all times. Stability of the structure is vital and is provided using rigid steel piles and steel fixings which allow for vertical movement, or flexible ties secured using anchor blocks. Of the two structural options listed above, the concrete box design gives greater dynamic stability due to its weight. The movement allowed in each anchoring option is precisely calculated to facilitate vertical movement of the building during extreme high and low water levels. The water levels are based on historical data and future forecasts allowing for climate change.

Utility provision

A vital element of this type of construction involves the provision of utilities with sufficient flexibility to cater for the changes in water level. The components used in the laying of pipe work to supply water and remove foul water must ensure no contamination or leakage. To facilitate the removal of foul water, a pressurised system is required.

The potable water used must be supplied from an isolated source, positioned above flood level. This is the most effective method of eliminating contamination at source. The supply of potable water for drinking, and the removal of sewage, are both vital services not just for floating structures, but for all areas prone to flooding. For example, when frequent flooding occurs in Bangladesh, a considerable number of deaths are not due directly to the floods, but to water-borne diseases. In developing countries this issue of water-borne diseases will provide difficult challenges, especially in those countries that have not prioritised implementing flood defence systems.

In this situation, providing emergency facilities is essential.

The construction of a number of floating structures, which provide temporary accommodation and medical facilities would certainly save lives, for instance, I would suggest that the provision of a number of these structures in New Orleans would have provided the residents with temporary safe accommodation, medical help, food supplies, and additional time for evacuation teams to save lives.

In Ireland, observers have predicted that there is a risk of serious flooding in a number of our larger urban centres. In spite of these predictions, the defences in place offer only minimum protection. If sufficient flood defences are not to be invested in, and the repatriation of residents is not an option, then other options must be investigated. The provision of a number of floating facilities could provide at least part of a strategic, emergency solution. Φ

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