Rough Guide to Sustainability

4th Edition

A Design Primer

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Flood risk and amphibious architecture

Global warming and the consequent increase in the frequency of flooding have resulted in architects being involved in design strategies to enable buildings and water to coexist. Alleviating flood risk occurs at three main levels: urban design, building design and construction. The first has led to whole neighbourhoods being conceived as floating mini cities; the second involves design approaches which allow buildings to accommodate periodic inundation; and the third is concerned mainly with water penetration and buoyancy technologies.

Four main types of flood risk occur: tidal and storm surge (coastal), pluvial (rain flooding), fluvial (river), ground water, burst sewer or infrastructure collapse (surface water flooding).[4] As pressure increases to preserve agricultural land, the need to build on marshlands, flood plains and coastal regions grows.

Flood risk architecture is most advanced in Holland due to its sea-level location and the enterprise of its people who have long colonised land rescued from the North Sea. Dutch architects and planners have developed approaches to both water-based urbanism and building design which have been copied elsewhere. More recently, China has developed eco-cities which occupy flood risk areas exploiting in the process the benefits of ecological approaches to hydrology and urban design developed first in the Netherlands. With global warming and increases in storm frequency coupled with world population growth, amphibious architecture will feature more prominently in the future.

Of the main strategies commonly adopted, the first involves exclusion of flood risk by constructing sea walls, river banks and local bunds. Under this approach detention ponds are created to catch excess water which increasingly are designed to support biodiversity or provide amenity areas. This is largely an engineering and landscape architecture approach and dovetails into SUDS. Without this approach there are detrimental ecological consequences because excessive use of physical barriers denies rivers and flood water from naturally over-spilling onto marginal lands that act as sponges. Eventually the problem is moved elsewhere. 'Soft engineering' involves using permeable surfaces, green roofs and rainwater harvesting and making space for water catchment in the development process.

Fig. 5.5
The Citadel, a floating apartment building of 60 units at the new offshore city of Westland, The Netherlands, designed by Waterstudio Architects.
Source: Architect: Koen Olthuis – Waterstudio.NL; Developer ONWIBNG GO

The second approach is more design led. Here buildings have raised ground floors with living spaces mainly upstairs. Houses are designed to accommodate flooding and to dry out readily using passive solar for space heating with roof windows for ventilation. Concrete is used in wet areas, with timber above. Buildings are designed for ready escape using pontoons or boats in some circumstances. A good example is the Turnaround House designed as a prototype by Ben Adams Architects.

The third approach is more radical. It involves designing buildings so that they can float or rise telescopically on stilts. Such buildings are partly amphibious and designed to absorb storm surges. They have rounded corners and are built as groups so that they can share protection just as mangrove swamps do. Examples designed by Waterstudio and other Dutch architects highlight the creative possibilities of amphibious buildings.