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30/31

Project-Reports:

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LifE project: Long-term initiatives for Flood-risk Environments – Water Management as the Basis for Urban Planning

Development pressure, energy and climate change are at the forefront of public consciousness and in recent government policy. The LifE (Long-term Initiatives for Flood-risk Environments) Project funded by Defra (Department for Environment, Food and Rural Affairs) in the UK addresses these issues, providing guidance on new sustainable development as well as presenting solutions to combat the most visible effects of climate change: rising water levels and increased flood risk. The research presents a shift in thinking by permitting water into sites in a controlled manner, to 'make space for water' and to position blue infrastructure at the heart of spatial planning. The intention is to create synergies with natural cycles, more adaptable and intuitive landscapes, improving awareness of flood risk and helping to maintain continuity of daily life before and after flooding. The LifE approach promotes innovative architectural and landscape solutions where it is not possible to locate development in areas of lower flood risk, so that the means of managing flood risk become an asset to the community.

Robert Barker, project leader of the LifE project, Baca Architects, London (UK)

New buildings will need to reduce their impact on the environment, if they are to form part of the solution and not the problem. Yet the next generation of buildings will also need to cope with and adapt to a changing climate. These simultaneous requirements create new conditions and opportunities for architecture and urban planning, from the design of floating and amphibious homes to the way new and existing towns are planned.

The LifE project addresses the need for new homes, increased risk of flooding and heightened environmental standards simultaneously by integrating the three approaches holistically and is outlined below:

Summary

Regensburg: the river as a planning basis in the middle of the city. – The river landscape, formed by the estuary of the rivers Regen and Danube, has been situated in the centre of the city of Regensburg for just under 100 years. It therefore provides an important basic condition for urban planning decisions. Four aspects within this subject – danger of flooding, islands within the river, UNESCO World Heritage Site, harbour – will be presented by examples based on three current planning objectives: flood protection, inner-city development, orientation towards the river. Since the 1980s, use and design concepts have been developed and partly controversially discussed in order to gear the bankside old town areas and islands towards the River Danube in terms of design and to use their very attractive location on the river.

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1. *Living with Water*
   Adapting to increased flood frequency and severity, likely to happen with climate change.
2. *Making Space for Water*
   Working with natural processes to provide room for the river and sea to expand in times of flood and reduce reliance on defences, where possible.
3. *Zero Carbon*
   Providing all energy needs from renewable resources on-site, such as wind, tidal and solar power.

To test the LifE approach, three desktop masterplans were developed as case studies. The sites were chosen from those submitted by local governments, varied in character, flood-risk and renewable energy potential but were all of a sufficient scale to consider a range of design and engineering options. On each site, conceptual proposals for large-scale masterplans of between 1000 and 2000 new homes were developed. Each site included areas near a river, at risk of flooding and within a different part of the river catchment.

- *Hackbridge* within the upper catchment of the River Wandle;
- *Peterborough* within the middle catchment of the River Nene;
- *Littlehampton* within the lower catchment of the River Arun.

In *Hackbridge* (site 1) an area of land at the heart of the development was ascribed multiple functions. The 'village/blue green' would provide a flexible informal recreation area that would provide current and future flood storage potential and space for an array of boreholes for ground source heat pumps. This area would create a focus for the development, increase the sale value of properties and improve access to the river for the wider neighbourhood.

In *Peterborough* (site 2) 'rain and stream corridors' were introduced between buildings to create areas for rainwater attenuation and to create drainage and flood paths away from homes. The corridor widths were designed to allow generous daylight into taller buildings and provide separation from small wind turbines located at the centre. Soft landscaping was integrated throughout the masterplan to create a high quality environment and reduce air temperature in and around buildings, mitigating urban heat island effect.

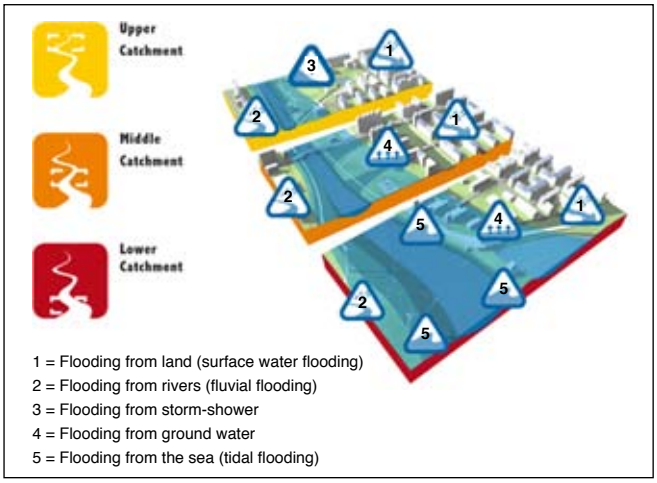
In *Littlehampton* (site 3) a large area of land to the rear of the development site was designed for controlled flooding, to reduce water levels in the river and reduce the strain on existing defences. This inland lagoon would provide water recreation adjacent to the development and habitat for wildlife in intertidal regions (mudflats and slat marsh) beyond. Twelve tidal turbines would generate energy for five hours during each successive ebb tide. The lagoons would be an attractive backdrop to the development and unique regional attraction.

Conclusions

The LifE approach demonstrated that it is possible to develop in flood risk areas providing the nature of the risk is known and appropriate management solutions are developed. Understanding the location of a particular site within the context of an entire river catchment is key to producing an effective blue infrastructure and to reconcile the competing spatial demands of development and energy. Coherent land assembly is important to enable blue infrastructure to be integrated into master planning at an appropriate scale. Consideration of the wider context, particularly understanding the location within the river catchment is essential to identifying the best solutions. The river catchment can be divided into three regions, the upper, middle and lower catchment (see figure).

Within the *upper catchment* the river is typically narrow, un-navigable and responds quickly to rainfall, with river levels rising and falling swiftly. The primary guiding principle developed from the Hackbridge case study was to 'Let rain slow'. Green infrastructure such as rain gardens, permeable paving and swales may help to slow the passage of water into the river system.

Within the *middle catchment*, rivers are more likely to have been engineered for navigation or industry. These areas are often only affected by big floods, where volumes are generally too large to consider storing on site, as was the case in Peterbrough. The primary guiding principles developed were 'Let rivers flow' where floodwater would be allowed to pass through the site to avoid flooding up and downstream and to aid drainage of the site. Green and blue infrastructure such as stream and river corridors may be used to channel the water away from developments.



Within the *lower catchment* of the river, or estuary, land is typically low-lying and susceptible to many types of flooding as well as sea level rise. The primary guiding principle developed from the Littlehampton case study was to channel tidal waters away from the development 'Let tides go'. Land use planning to create designated blue/green areas that would flood in preference to development, combined with intelligent spatial planning and structural resilience of building may help to manage and reduce risk.

Areas of land set aside for flooding provided a good opportunity to locate renewable energy technologies and prioritise the most efficient options. However, the cost of making developments zero carbon still represented an overall increase of 30-40% on all study sites.

On all three sites, the cost of 'making space for water' was actually found to be marginally cheaper than providing flood defences and represented a very small percentage of total development costs. However, the cost of providing flood resilience to buildings increased costs by 2 to 11% depending on the location. The cost of integrating SUDS was found to be competitive with conventional drainage. Communication of flood risk issues is an important aspect of bringing any development forward. Tools such as the LifE Handbook and the LifE Project Report have a part to play in this process. ■

Publications

- www.lifeproject.info
- Baca Architects, with BRE et al. (2009). The LifE Project: Long-term Initiatives for Flood-risk environments, IHS BRE Press, ISBN 978-1-84806-101-9.
- Baca Architects, with BRE et al. (2009). The LifE Handbook, IHS BRE Press, ISBN 978-1-84806-088-3.
- http://www.defra.gov.uk/Environ/Fcd/adaptationandresilience/sd7/sld2318.htm

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