

**CAN** Climate Adaptive Neighbourhoods

**Life** Long-term Initiatives for Flood-risk Environments

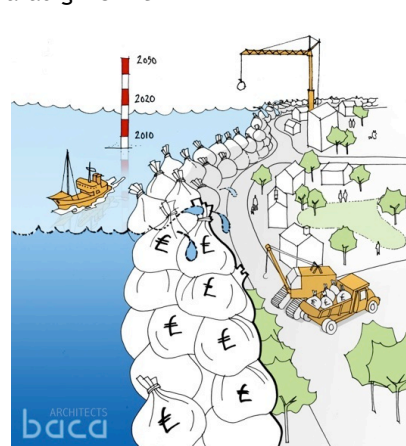
**Robert Barker**  
**Baca Architects**

**Awards**  
 Technology Strategy Board - Design for future Climate 2012  
 World Architecture Best Young Practices - Top 21, 2012  
 Green Dot Award (US) - Bronze Winner 2010  
 Evening Standard New Homes - Highly Commended 2010  
 International Urban Landscape Award (IULA) - Bronze Winner 2010  
 RIBA presidents research (UK) awarded - Winner 2009  
 International Design Awards - Finalist 2009  
 DEFRA Innovation fund for the LIFE Project - 2007  
 RIBA Sustainable Living by Design - Winner 2006  
 Evening Standard New Homes - Commendation 2010  
 Docklands Barges - Winner 2009  
 Nijmegen - Awarded contract 2009



**Climate change requires Paradigm Shift**

- Rising temperatures
- Rising sea levels
- Increased storms
- Need for more robust planning

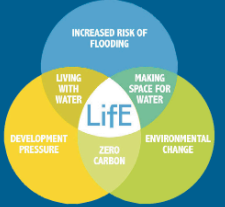



Robert Barker > Baca Architects > [www.baca.uk.com](http://www.baca.uk.com) > [rbarker@baca.uk.com](mailto:rbarker@baca.uk.com)

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The **Life** Project

Long-term Initiatives for Flood-risk Environments adopts an integrated approach to adaptable, zero carbon, flood resilient development.

**defra** Innovation Fund The LIFE Project

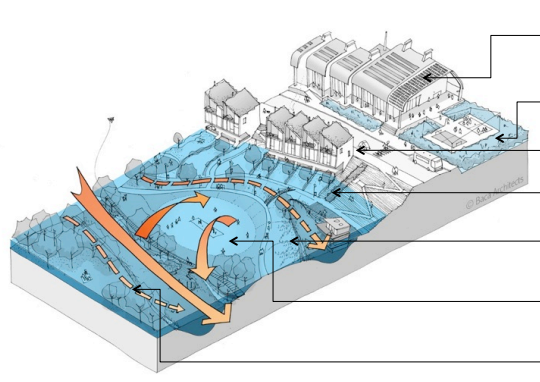
**RIBA** RIBA President's Award for Professional Practice Research 2009

**IULA** International Urban Design Award 2009, Bronze Medal

**HCA** Sustainability Framework Consultant 2010

**Life > Non-defensive flood risk management**

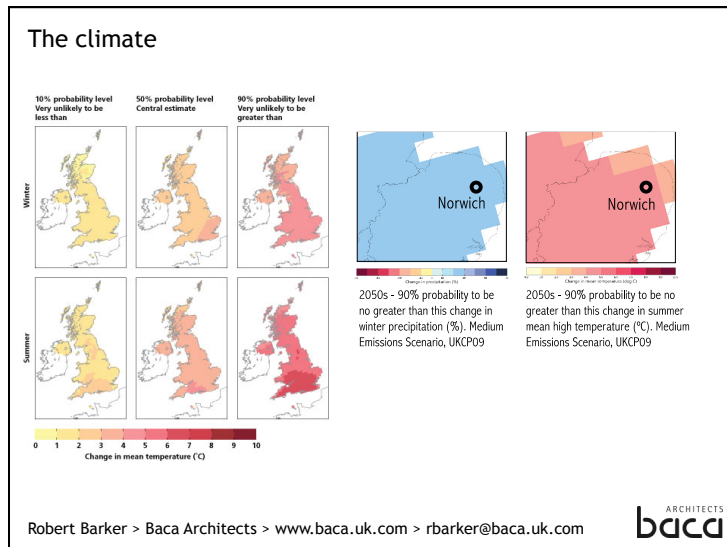
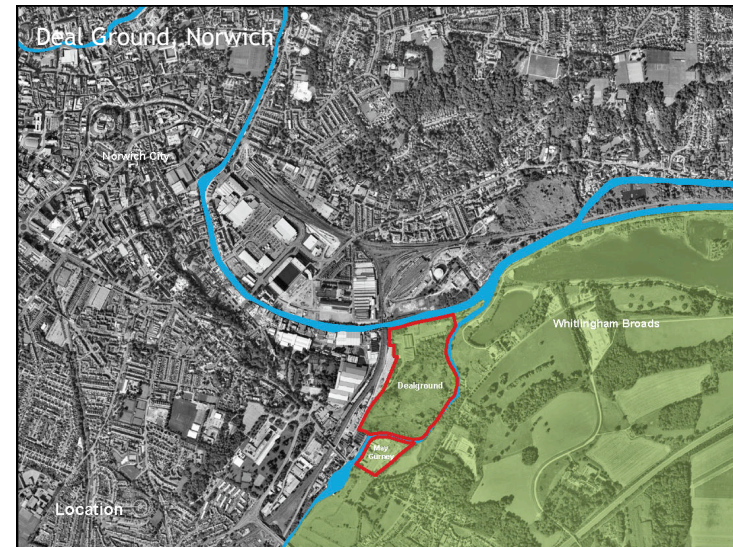
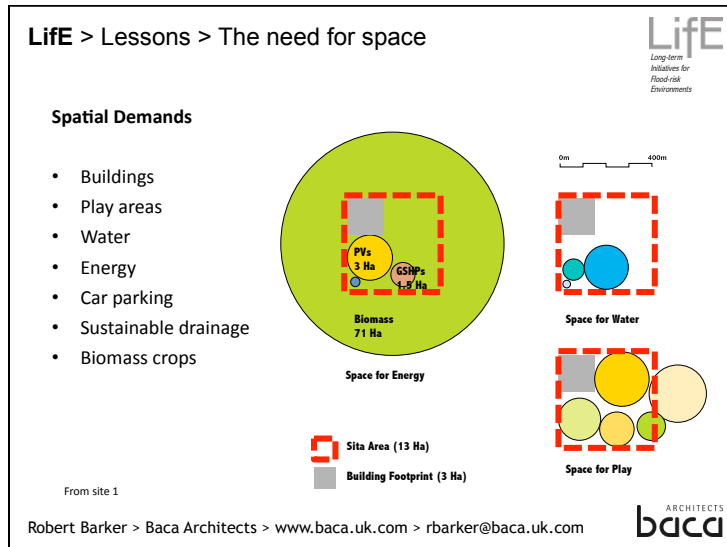
*Long-term Initiatives for Flood-risk Environments*



- 'Safe Havens'  
Resilient Schools and community buildings provide safe spots to gather and centres for renewable energy
- 'Rain Gardens'  
Communal gardens collect and store rainwater away from rivers
- 'Green Roofs'  
Green roofs can slow down the flow of rainwater, easing flooding
- 'Flood Gardens/Safe Houses'  
Flood water can pass through the garden without affecting the houses
- 'Canal Paths'  
Planted pathways are designed to channel flood water away from homes
- Village Blue  
Small ponds are designed to expand during a flood. The rest of the time they can be used for boating, fishing and swimming
- Village Green  
Play areas are designed to flood when a really big flood occurs

Robert Barker > Baca Architects > [www.baca.uk.com](http://www.baca.uk.com) > [rbarker@baca.uk.com](mailto:rbarker@baca.uk.com)

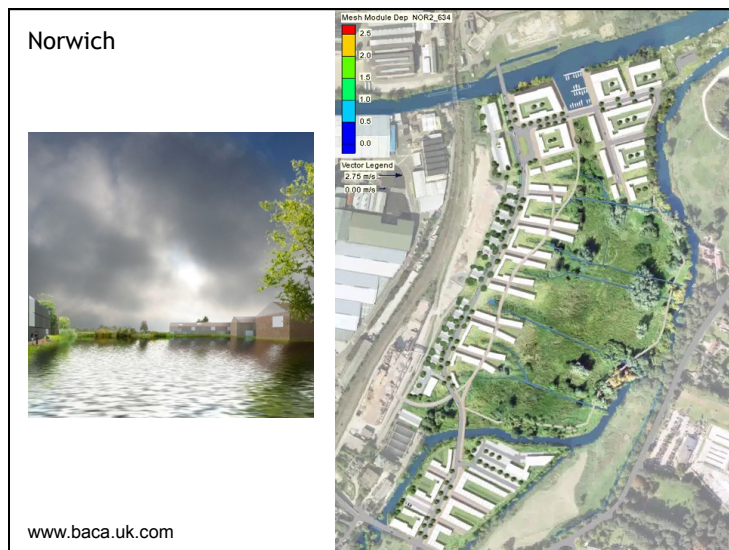
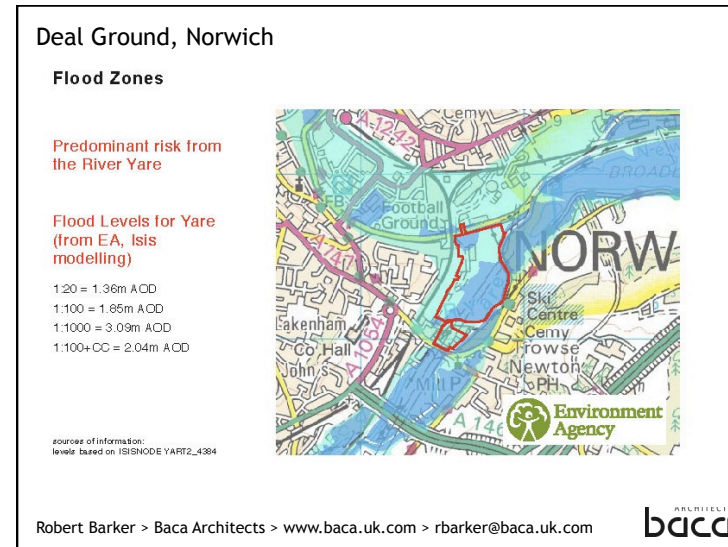
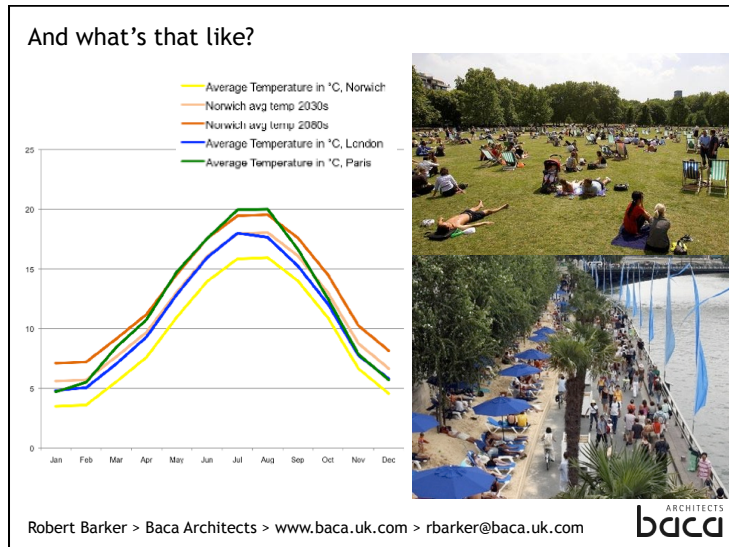
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### What's the weather like?

2080	Min	Avg	Max		
	-8.0	33.4	-4.7	38.4	Temperature min, max (°C)
	0.1	1.0	6.8		Number of heat wave days
	565.2	622.5	674.3		Mean annual precipitation (mm)
	4.4	4.5	4.5		Wind speed (m/s)
	2.6	2.8	3.2		Sunshine (Daily solar radiation)
	-15%	+25%	+75%		River flows (% change)
	-10%	+24%	+85%		Wettest day in winter (% change)

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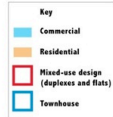
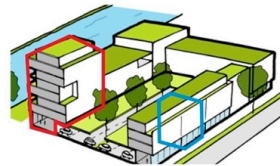


## Climate Adaptive Neighbourhoods

### Appendix 1: Typical Plans

#### Characteristics of the development

- Duplexes with apartments above
- Or townhouses
- All units at ground floor must have an upper level as safe refuge
- Bedrooms to ground floor is to be prohibited due to risk of flooding
- Courtyard parking (Landscaped) with podium deck as refuge
- Rainwater storage to courtyard



#### LAYOUT

##### Key Rooms:

- Kitchen at high level
- Living spaces above GF
- Bedrooms above max flood level

##### Services:

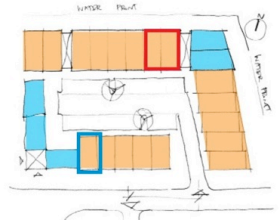
- Electric at high level
- Drainage
- Main services and emergency backup

##### Daylighting:

- Solar Gain (Cooling)
- Reduce need for artificial lighting

##### Safety during flood scenarios

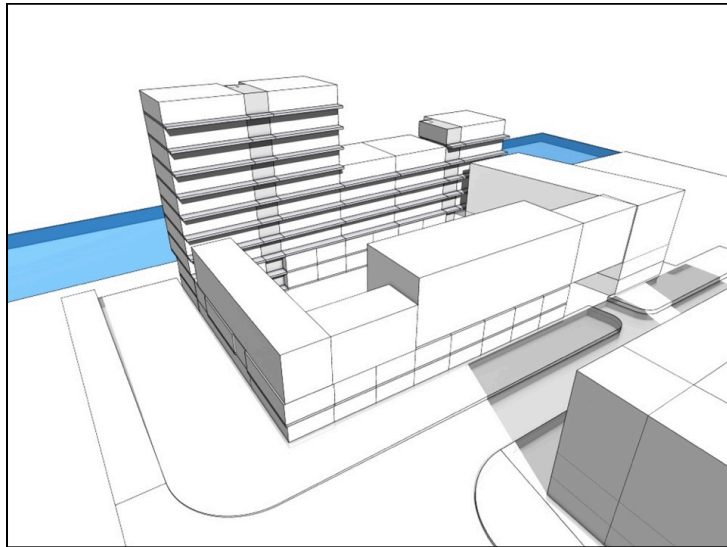
- Early warning system
- Refuge



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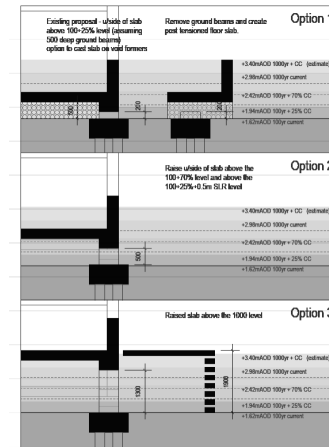
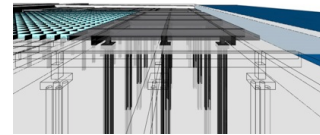


ADAPTATION STRATEGY	SUDS (swallowing options from JRA)			Resilience and convergence			Resilience and debris		
	Op 1	Op 2	Op 3	Op 1	Op 2	Op 3	Op 1	Op 2	Op 3
<b>ADAPTATION STRATEGY</b>	Op 1	Op 2	Op 3	Op 1	Op 2	Op 3	Op 1	Op 2	Op 3
<b>Op 1</b>	Op 1	Op 2	Op 3	Op 1	Op 2	Op 3	Op 1	Op 2	Op 3
<b>Op 2</b>	Op 1	Op 2	Op 3	Op 1	Op 2	Op 3	Op 1	Op 2	Op 3
<b>Op 3</b>	Op 1	Op 2	Op 3	Op 1	Op 2	Op 3	Op 1	Op 2	Op 3



### Resilience and Conveyance > BUILDING

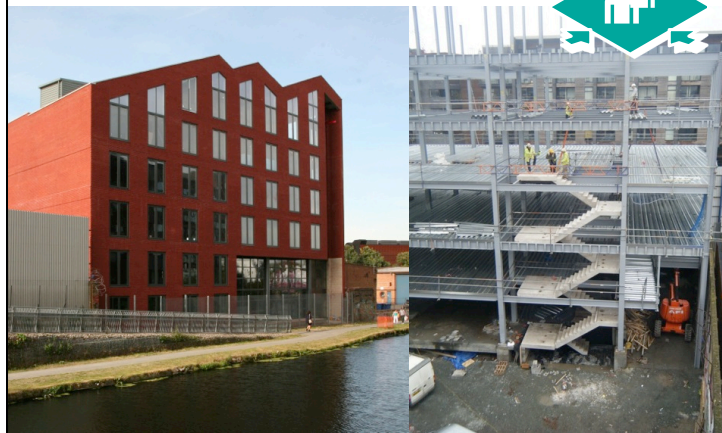
1. Floors above 100+20% CC+0.3m. Flow paths beneath building/ courtyards. Risk level is exceeded.
2. Floors above 100+20% CC+0.3m. Create flow paths between buildings by removing 10% of grd flr units.
3. Raise all floor levels (apx 0.6m) to above 100+70% CC+0.3m flood level and create flows beneath slab.



Robert Barker > Baca Architects > [www.baca.uk.com](http://www.baca.uk.com) > [rbarker@baca.uk.com](mailto:rbarker@baca.uk.com)



### SAFE HAVEN > White Post Quay



Robert Barker > Baca Architects > [www.baca.uk.com](http://www.baca.uk.com) > [rbarker@baca.uk.com](mailto:rbarker@baca.uk.com)



### Rainwater Harvesting > BUILDING

#### Options

1. Communal system located below ground in the courtyard (need for pipes, pumps, treatment etc)
2. Communal system located at high level (New York style+need for pipes, pumps, treatment etc)
3. Individual RW systems located on terraces or within flats (space take on flats)



Stage 2, Interim Report - Appendix 6 - A6.5  
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### Plant selection > SITE

- 1. Trees and planting on the streets
- 2. Trees and planting in the courtyard
- 3. Planting to individual terraces



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### Resilient materials, WALLS > CONSTRUCTION DETAILS

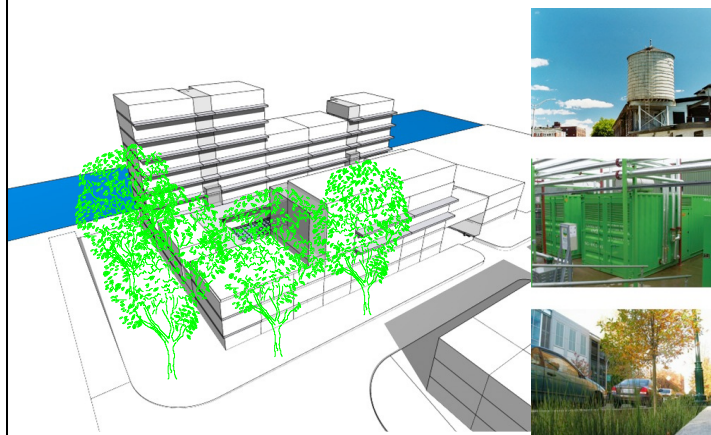
- 1. Brick and block, cavity masonry wall construction
- 2. Timber frame and insulated timber infill. Brick, timber, render or metal panel finish
- 3. Steel or concrete frame with steel stud infill and render/ single brick skin (mass house builder approach)



Robert Barker > Baca Architects > [www.baca.uk.com](http://www.baca.uk.com) > [rbarker@baca.uk.com](mailto:rbarker@baca.uk.com)



### Bringing the design together



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### And how the building is constructed

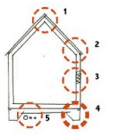


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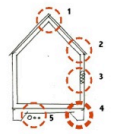
**Sub-structure > foundations**



There are a number of sub-structure options that were considered for the residential properties. The type of foundations is most likely to be determined by the prevailing soil conditions. Due to the mix of alluvium, sand and silt on the site and the depth of bedrock pile (not identified) friction pile foundations would be the most logical option. This is often likely to be the case on brownfield sites near rivers.

Option	Cost implication		
	Current	2050	2080
Friction piles and ground beams	Green	Green	Green
End bearing piles	Red	Red	Red
Micro piles and ground beams	Orange	Orange	Orange
Concrete raft	Red	Red	Red
Strip / trench	Orange	Orange	Orange
Pad foundations	Orange	Orange	Orange

**Sub-structure > slab**



There are a number of sub-structure options that were considered for the residential properties. The type of foundations is most likely to be determined by the prevailing soil conditions. Due to the mix of alluvium, sand and silt on the site and the depth of bedrock pile (not identified) friction pile foundations would be the most logical option. This is often likely to be the case on brownfield sites near rivers.

Option	Cost implication		
	Current	2050	2080
In-situ concrete slab with insulation	Green	Green	Green
Precast concrete slab with insulation	Green	Green	Green
Beam and block with insulation	Green	Green	Green
Precast steel and concrete	Green	Green	Green
Timber joists and boarding	Green	Green	Green
Precast hollow core concrete slabs	Green	Green	Green

Robert Barker > Baca Architects > [www.baca.uk.com](http://www.baca.uk.com) > [rbarker@baca.uk.com](mailto:rbarker@baca.uk.com) **ARCHITECTS baca**



**Designing For Water**

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