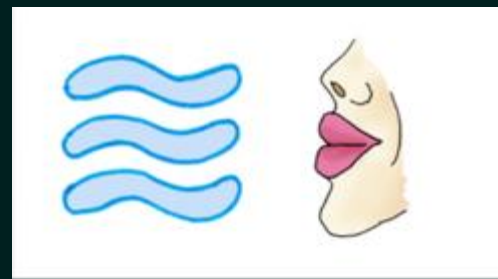
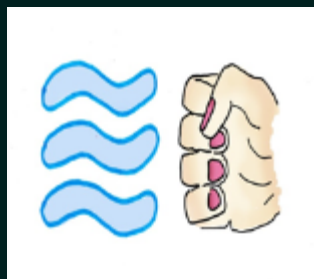


Conference Options to adapt the Dutch rivers to climate change
Nijmegen, 30th January 2014

European Rivers embraced

Evening program: foreign perspectives



Great Britain



Welcome to Britain - shame about
the weather



Stiff upper lip



What we learned from the Dutch



Who is to blame?

- God?
- Climate change?
- Gay marriage (seriously)
- No, it's the Dutch!



400 years of use and counting



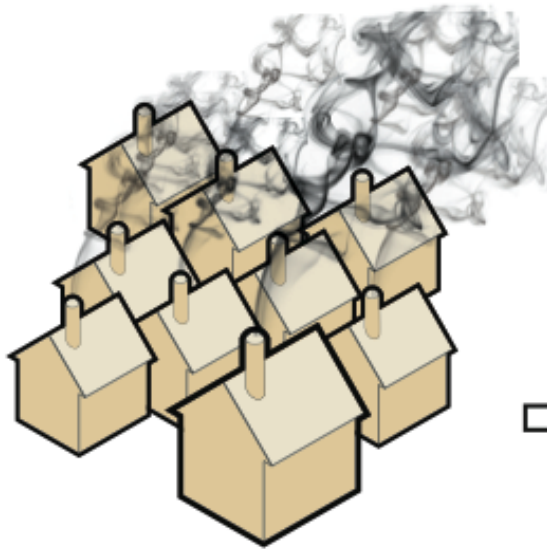


What the British are Doing

Making Space for Water

ORAS HS GR, Nijmegen, 30th January 2014

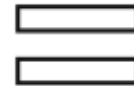
What we need



new homes increase
CO² emissions further



CO² increases
global warming



more intense rainfall
more flooding

Where shall we put them?

- Not here!



Where shall we put them?

- Not here!



Where shall we put them?

- Definitely not here!



Where shall we put them?

- Okay, maybe here?



Where shall we put them?

- Or here?



The Life Project

ARCHITECTS
baca

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

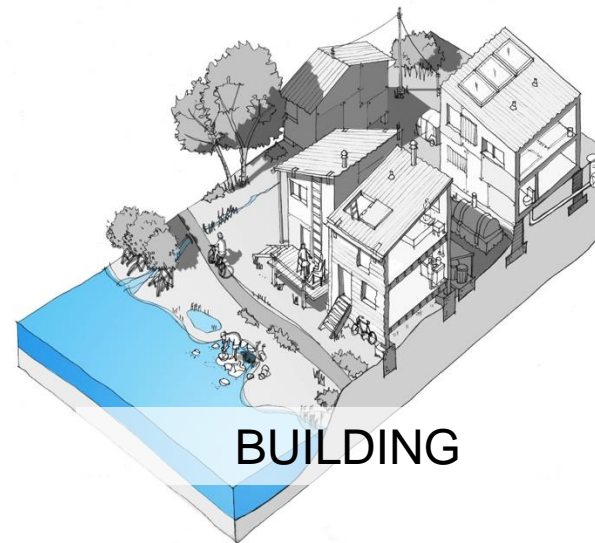
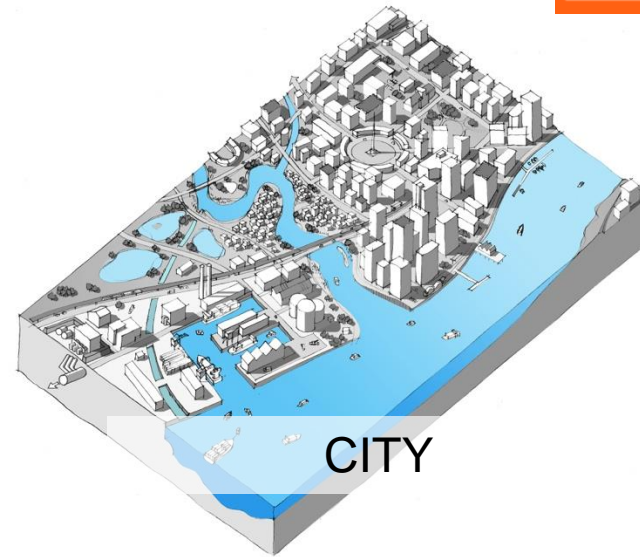
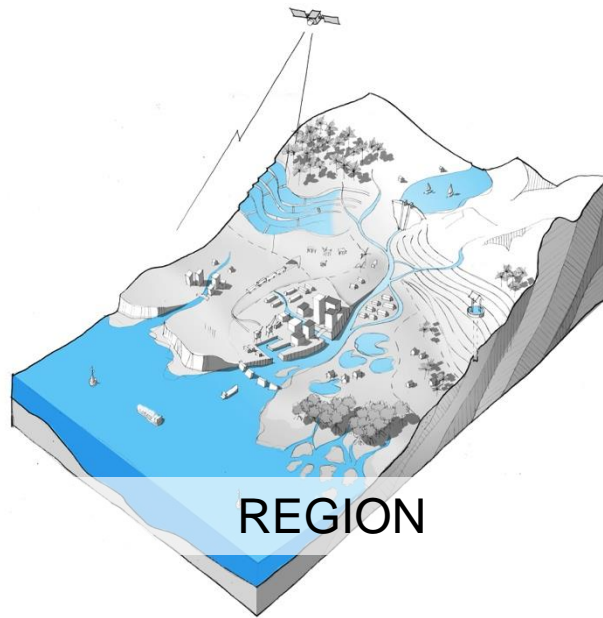
IULA²⁰⁰⁹

International Urban Design Award 2009,
Bronze Medal



Homes &
Communities
Agency

HCA Sustainability Framework
Consultant 2010



Flood risk and development p

PPS 25

Flood Risk Vulnerability classification (see Table D2)		Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone (see Table D.1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	✗	Exception Test required	✓
	Zone 3b 'Functional Floodplain'	Exception Test required	✓	✗	✗	✗

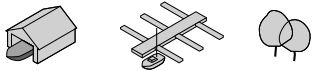
Key:

✓ Development is appropriate

✗ Development should not be permitted

Water Compatible Uses

boat yards, marinas and open space...



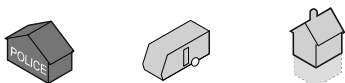
More Vulnerable Uses

houses, hospitals, schools...



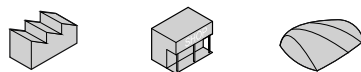
Highly Vulnerable Uses

emergency services, caravans, basements...



Less Vulnerable Uses

offices, retail, commercial or civic buildings...



Environment Agency Flood Zones



□ Flood Zone 1

□ Flood Zone 2

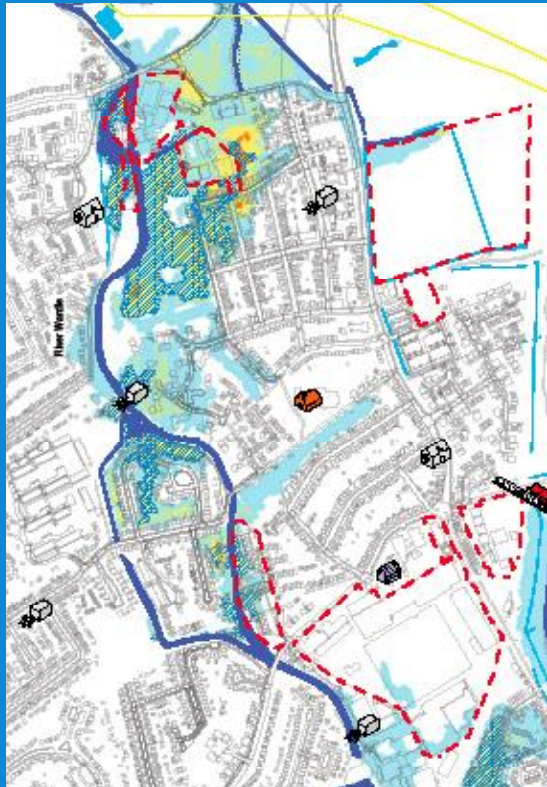
□ Flood Zone 3

— Main River

Flood risk mapping

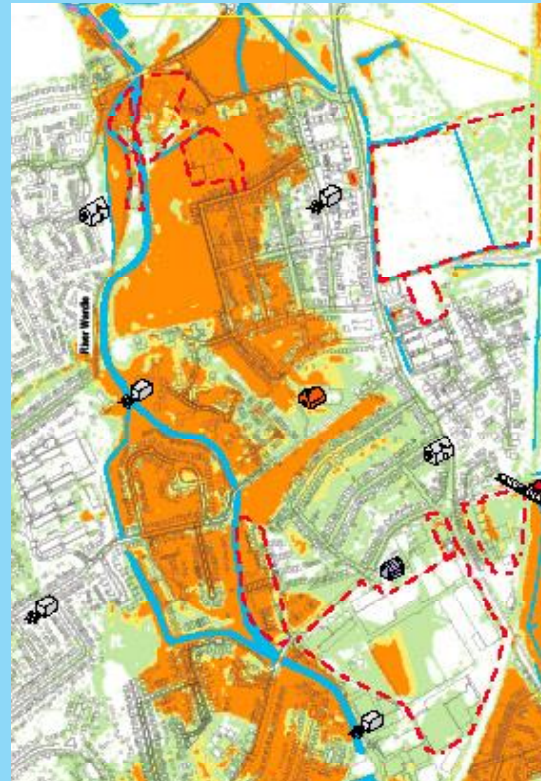
Fluvial Flood Vulnerability

(from the river)


















Pluvial Flood Vulnerability





(from the land)



- The EA produce maps of flooding from the river (fluvial)
- LBS produce detailed maps of the flood hazard (depth+velocity) from river flooding with climate change
- LBS also produce a range of maps for current and future surface water flooding (pluvial)
- **The toolkit combines this info into just two maps**

Toolkit on Blue Infrastructure

		Flood Zones			Flood Hazard with Climate change		
		1	2	3a	Low	Mod.	Sign.
LAND USE ALLOCATION							
	SOFT PLAY Natural dedicated area for recreation activity including sensory gardens, local equipped area for play and playing fields.						
	INDUSTRY AND BUSINESS B1 - Business, B2 - General Industry, B8 - Storage and Distribution. ^c						
	MIXED USE Employment located at ground floor with residential located above. ^c			ET			
	C3 - RESIDENTIAL Dwellings, small businesses at home. (Does not include households consisting of more than six residents not in a family or households where care is provided for the residents).			ET			
SURFACE WATER MANAGEMENT							
	GREEN ROOF / WALL A plant roof or wall to a building that helps to control runoff slowing the flow down to the ground, store rainwater and filter out pollutants. ^a						
	SWALE Shallow channels that are designed to convey, infiltrate, store and treat run off rainwater. They run parallel to hard surfaces, allowing runoff to trickle down side slopes and then transported to another SUDS component or watercourse. Can be used in permeable or impermeable ground conditions. ^a						
TRANSPORT & ACCESS							
	PRIMARY ACCESS FOR VEHICLES¹ Essential road infrastructure designed to allow safe access and egress for emergency and residents vehicles for a 1 in 100 year flood event. Generally highest volume of traffic.						
	SECONDARY ACCESS - SIDE ROADS Support infrastructure to primary roads with lower volume of traffic. Secondary roads could be designed for flood inundation or as a flood pathway.						
	FOOTPATH & CYCLEWAYS Attractive and practicable public routes promoting sustainable movement and a viable alternative to use.						
RESOURCES (ENERGY & WATER)							
	BIO-MASS/COMBINED HEAT AND POWER (CHP) Small powerstations that provide Combined Heat and Power from burning fuel such as wood chip. Tri-Gen powerstations can also provide cooling. ²						
	SOLAR ELECTRIC Solar photovoltaic cells (PVs) convert the sun's energy into electricity. Typically located on south facing roofs or as exterior wall cladding systems. ³						
CONSTRUCTION							
	APPROACH - DRY PROOF - Water Exclusion Strategy For flood depths up to 0.3m, resistance measures used to keep water out. The strategy is for short term floods as prolonged flooding will increase the potential for water penetration. Low permeability materials are used that are easy to clean and dry out. The finished floor level should be 0.3m above the predicted flood level due to freeboard. ^{a,2,3}						
	APPROACH - WETPROOF - Water Entry Strategy For flood depths above 0.3m, consider resilience measures to allow water in to avoid structural damage. Measures are taken to reduce damages, deformation, and facilitate drainage, drying and cleaning. ^{a,2}						
	LAND RAISING Remove building from flood hazard. Land is raised to create high ground, without adversely affecting flood management. Design should compensate for loss of flood storage. ^a						
	ELE VATED Remove building from flood hazard conventional approach raised level difficult access poor urban realm. Would address flood compensation issues. The void beneath the building should be protected for flood storage whilst maintaining flood flows. ^a						

		Flood Zones			Flood Hazard with Climate change		
		1	2	3a	Low	Mod.	Sign.
LAND USE ALLOCATION							
	SOFT PLAY Natural dedicated area for recreation activity including sensory gardens, local equipped area for play and playing fields.						
	INDUSTRY AND BUSINESS B1 - Business, B2 - General Industry, B8 - Storage and Distribution. ^c						
	MIXED USE Employment located at ground floor with residential located above. ^c			ET			
	C3 - RESIDENTIAL Dwellings, small businesses at home. (Does not include households consisting of more than six residents not in a family or households where care is provided for the residents).			ET			

Toolkit on Blue Infrastructure Planning for Life





What can you learn from the British?

Learn to live with flooding

Learn to love water

Deal Ground, Norwich

Norwich City

Whitlingham Broads

Dealground

May
Gurney

Baca Architects (UK)
Atelier PRO (NL)

Location



Deal Ground, Norwich

Flood Zones

Predominant risk from
the River Yare

Flood Levels for Yare
(from EA, Isis
modelling)

1:20 = 1.36m AOD

1:100 = 1.85m AOD

1:1000 = 3.09m AOD

1:100+CC = 2.04m AOD

sources of information:
levels based on ISISNODE YART2_4384



Norwich





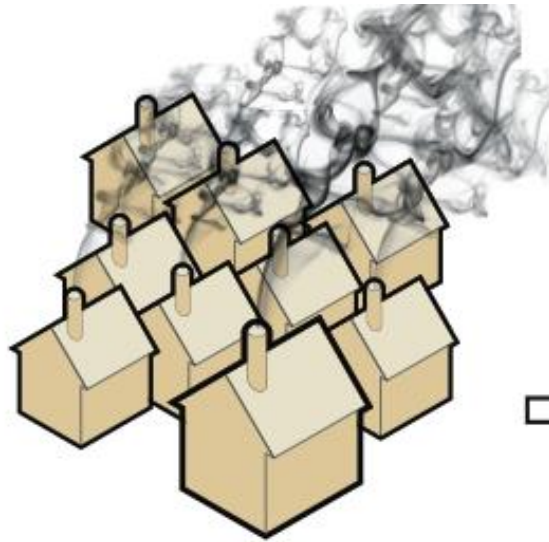
Deal Ground, Norwich





central swale

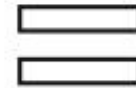
Maybe we can't stop this...



new homes increase
CO² emissions further

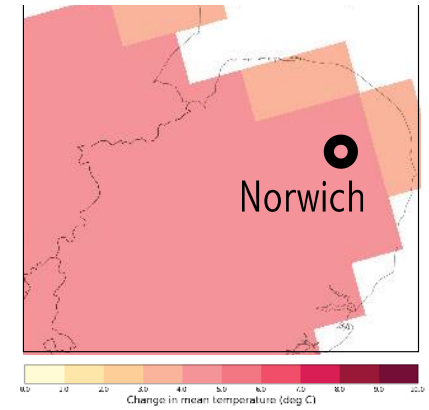
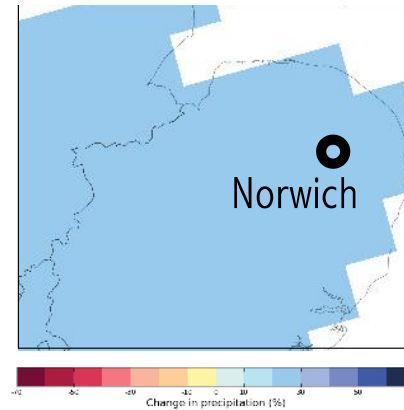
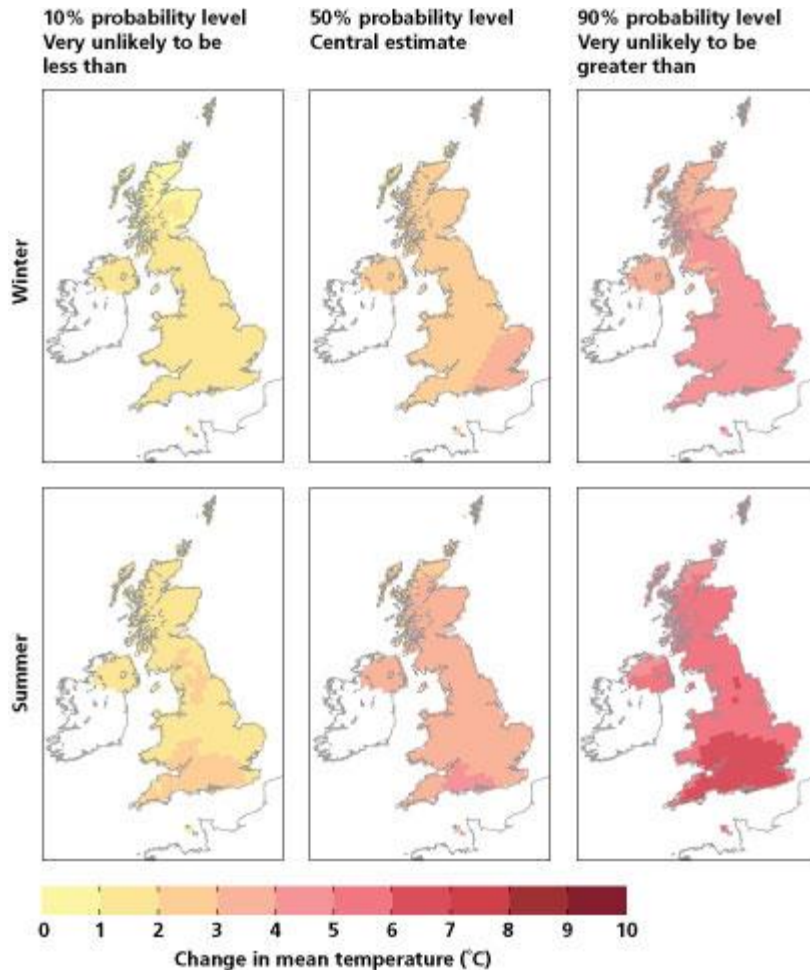


CO² increases
global warming










more intense rainfall
more flooding

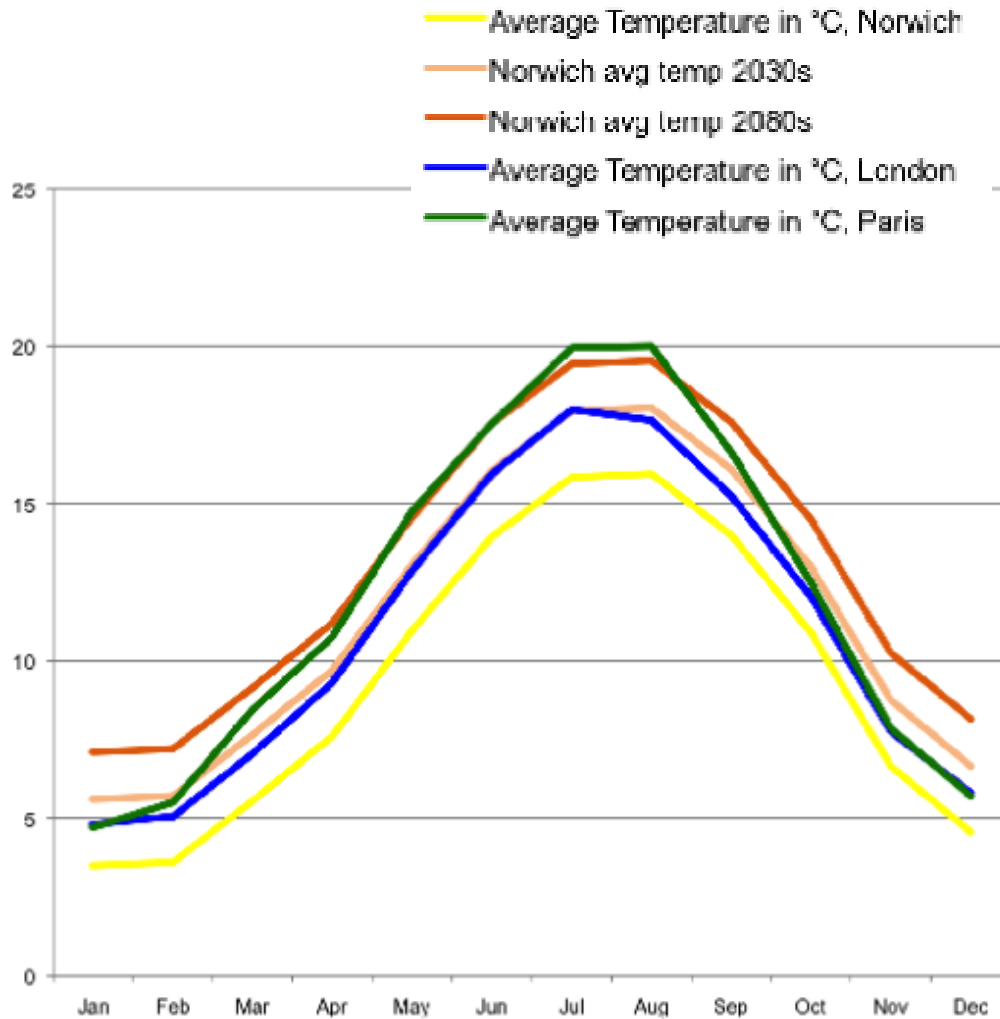
...but maybe we can adapt?



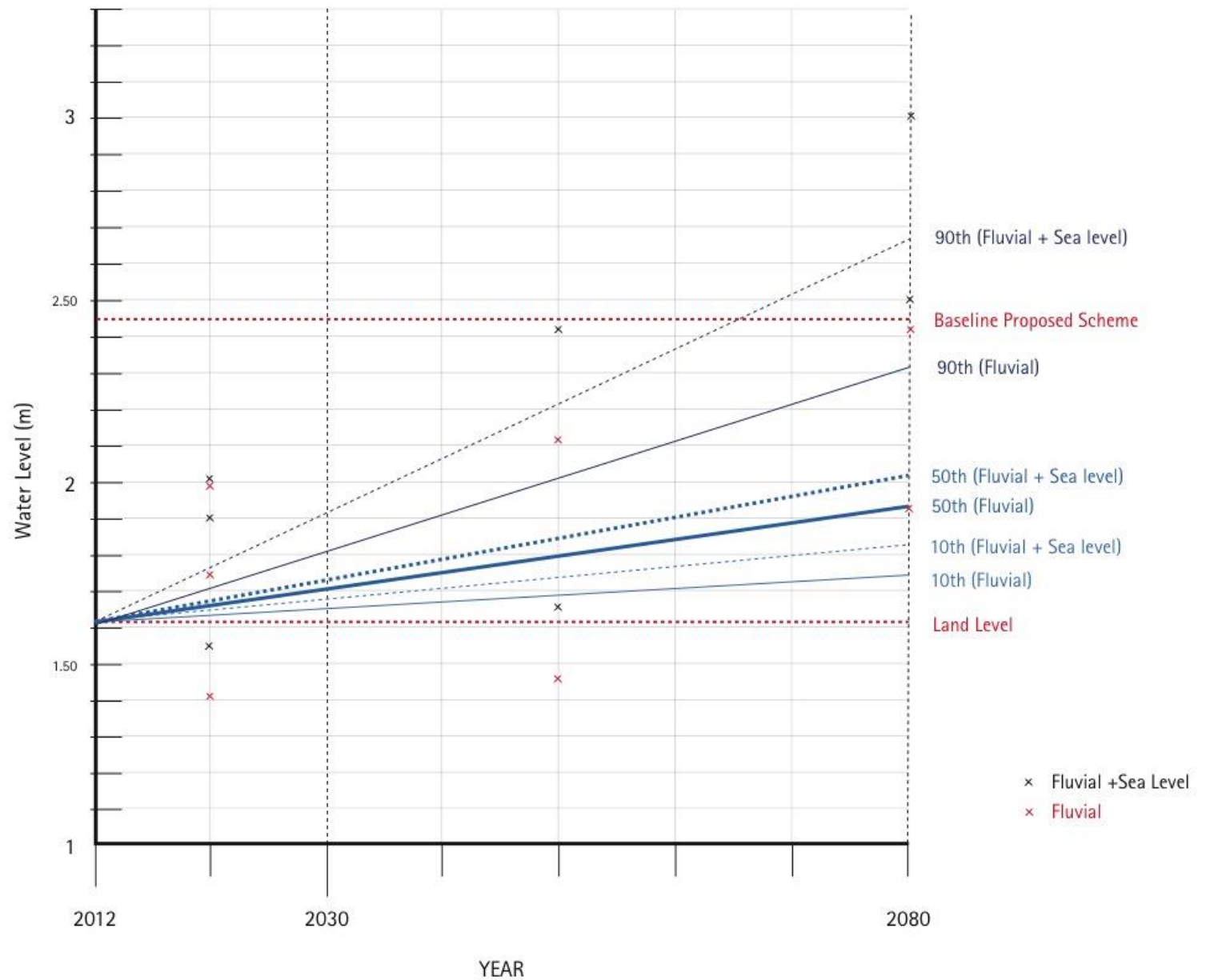
What's the weather like?

2080	Min	Avg	Max	
	-8.0 33.4	-6.4 35.6	-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)

And what's that like?



Predicted Peak Water Levels For 1 in 100 Year Event



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:

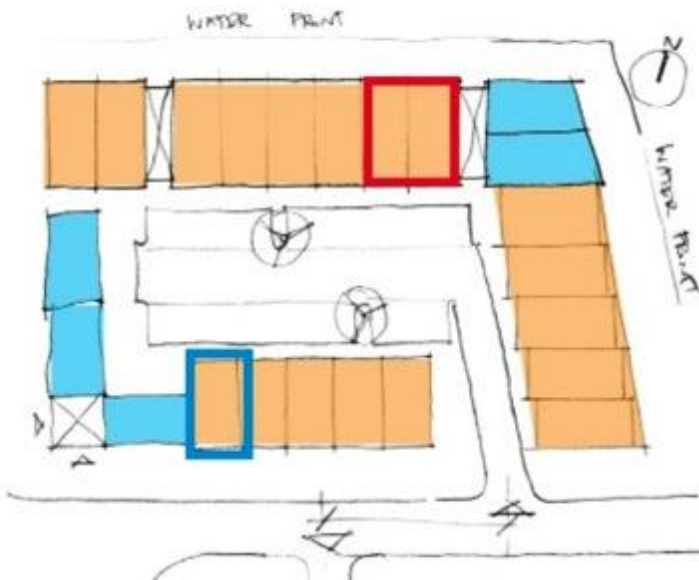
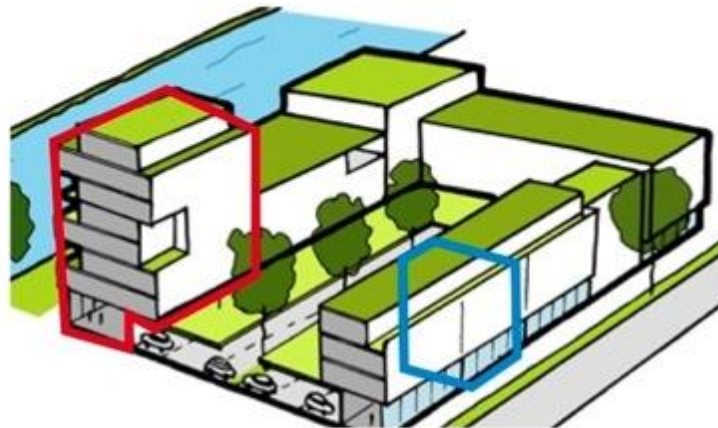
- Electrics at high level
- Drainage
- Main services and emergency backup

Daylighting:

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

Safety during flood scenarios

- Early warning system
- Refuge



Rainwater Harvesting > BUILDING

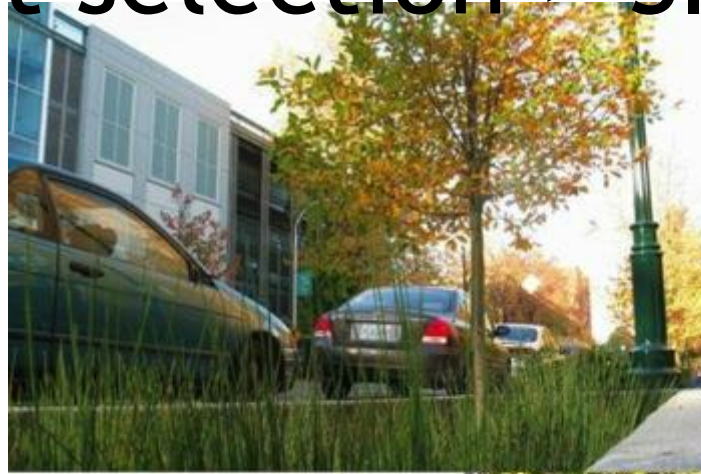
Options

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)



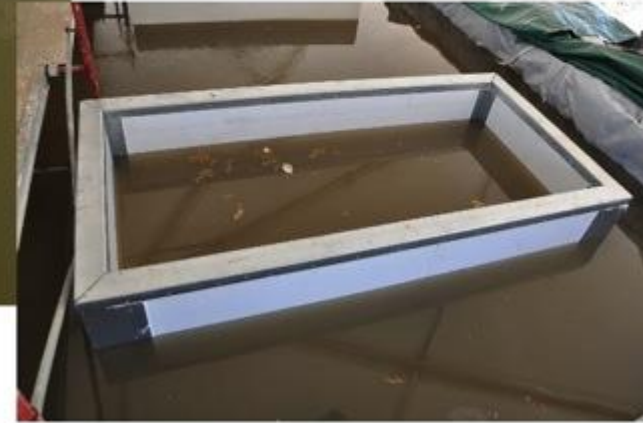
Plant selection > SITE

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



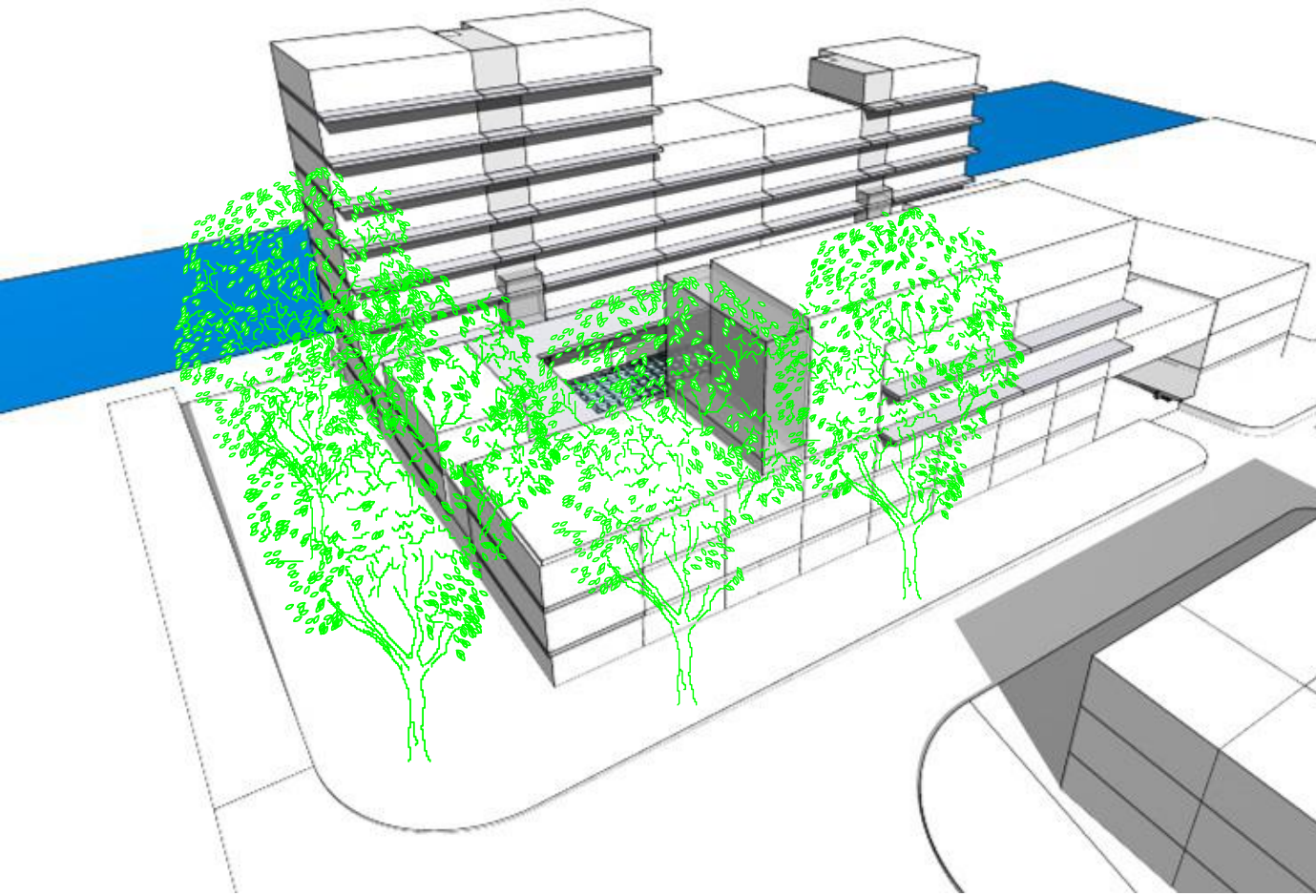
Resilient materials, WALLS > CONSTRUCTION DETAILS

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)



source:
<http://gccds.org/>
Gulf Coast
Community Design
Studio

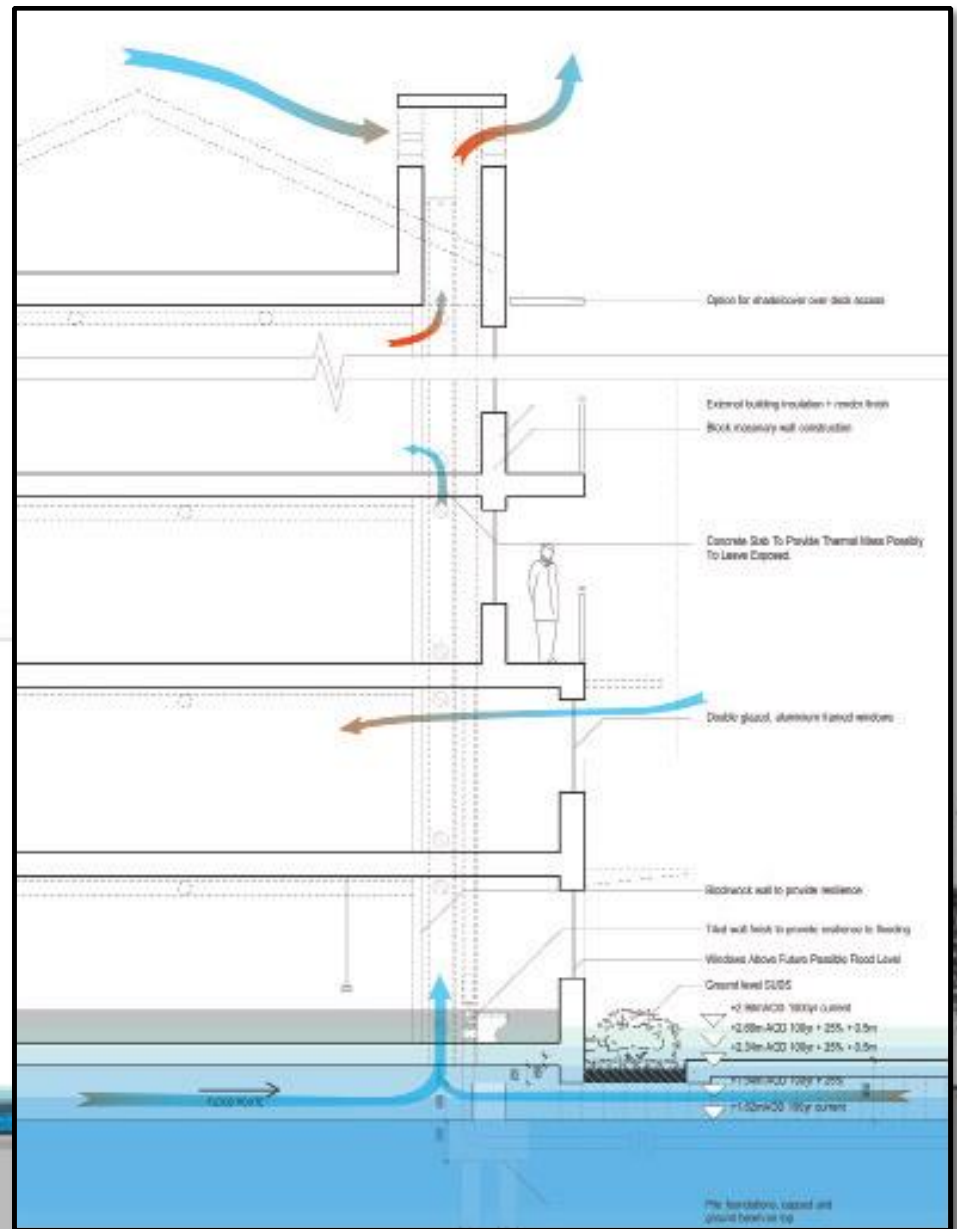
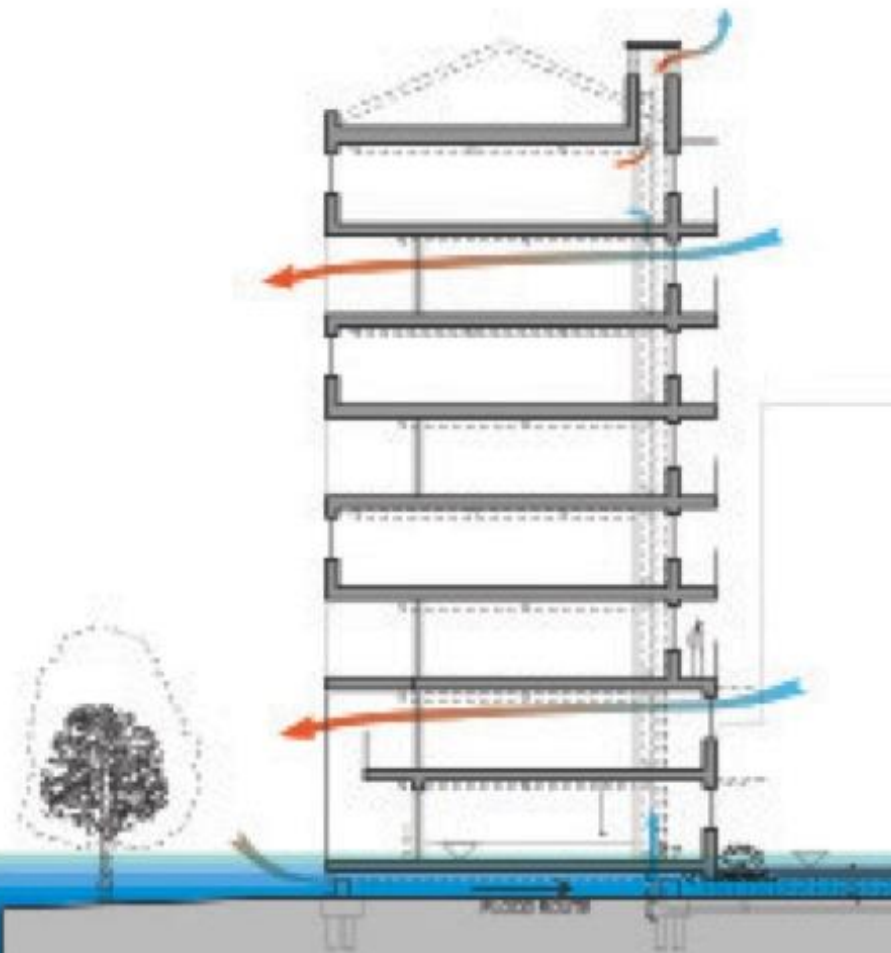
Bringing the design together



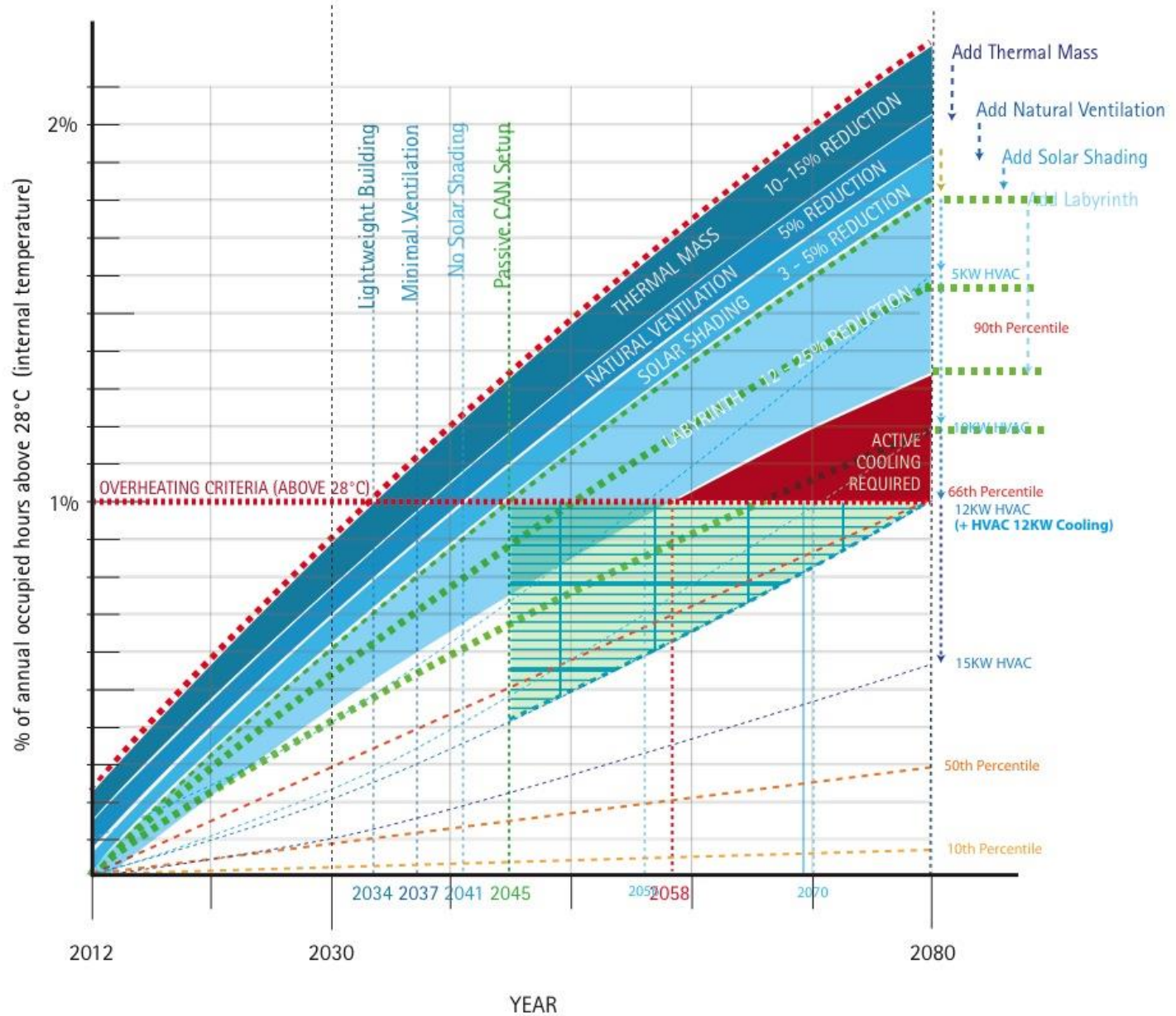
And how the building is constructed

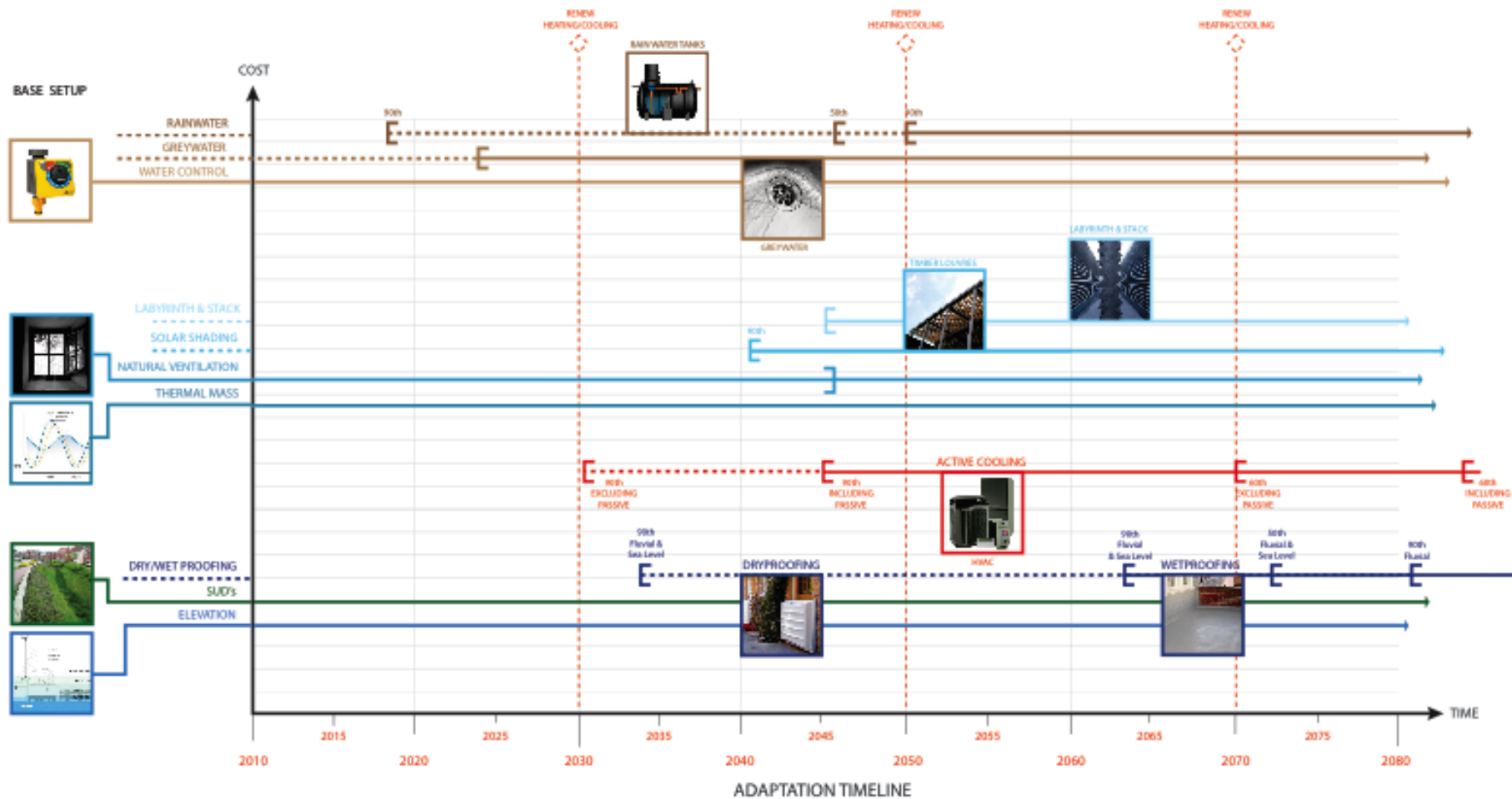


Integrated Section



Incremental Effects Of Cooling Strategies On Base Scheme For 90th Percentile Future Climate





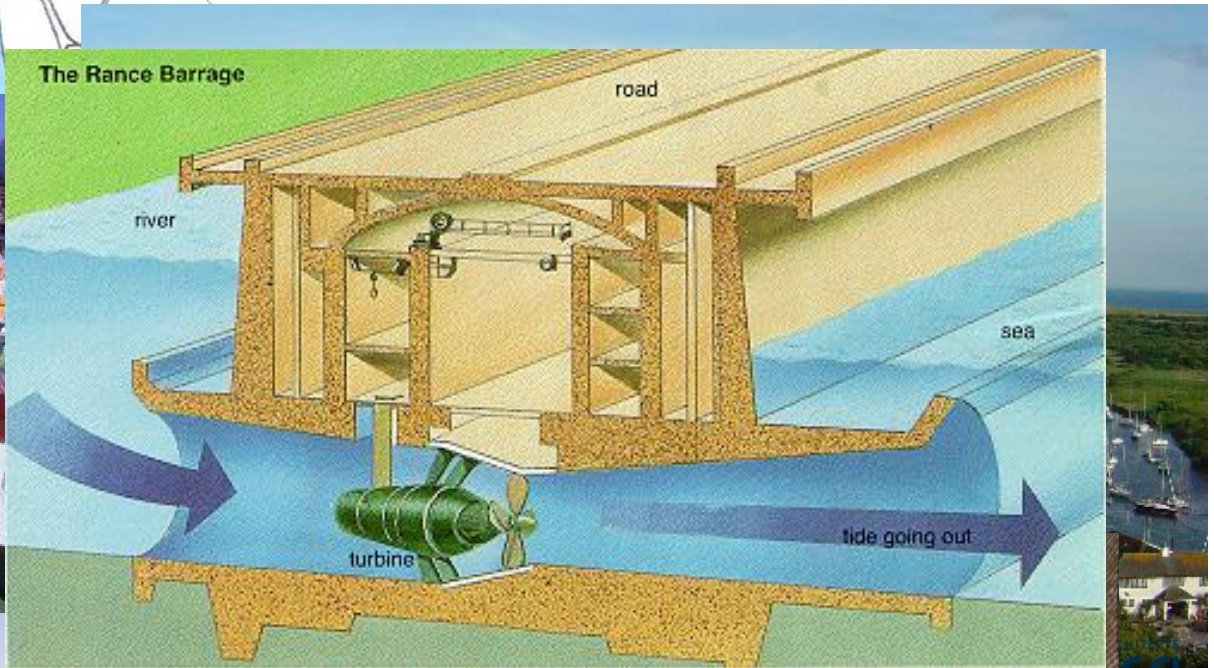


We HAVE options

Let us not keep using the same one?

Concept Plan - Coastal Destination

Littlehampton > West Bank

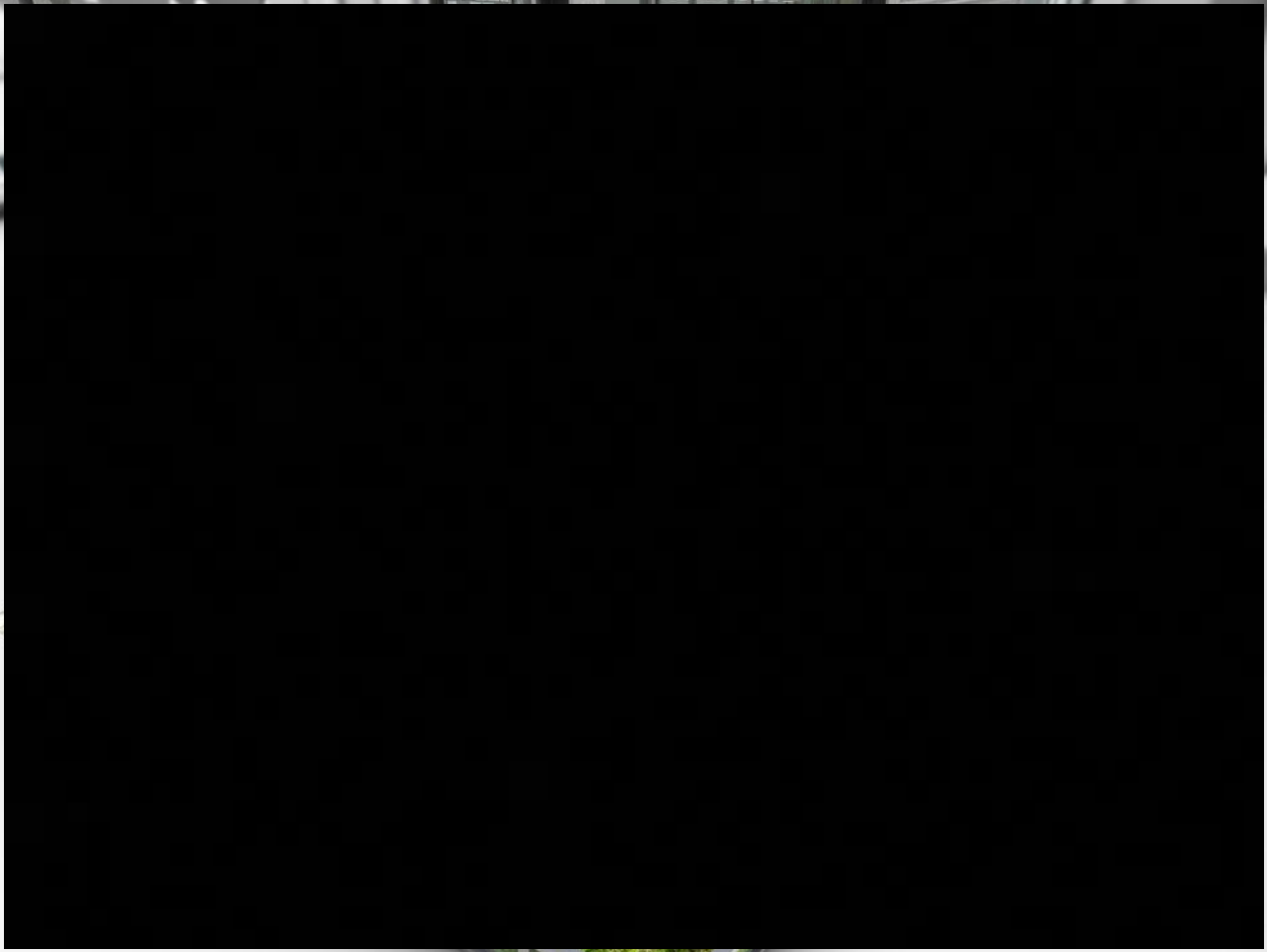




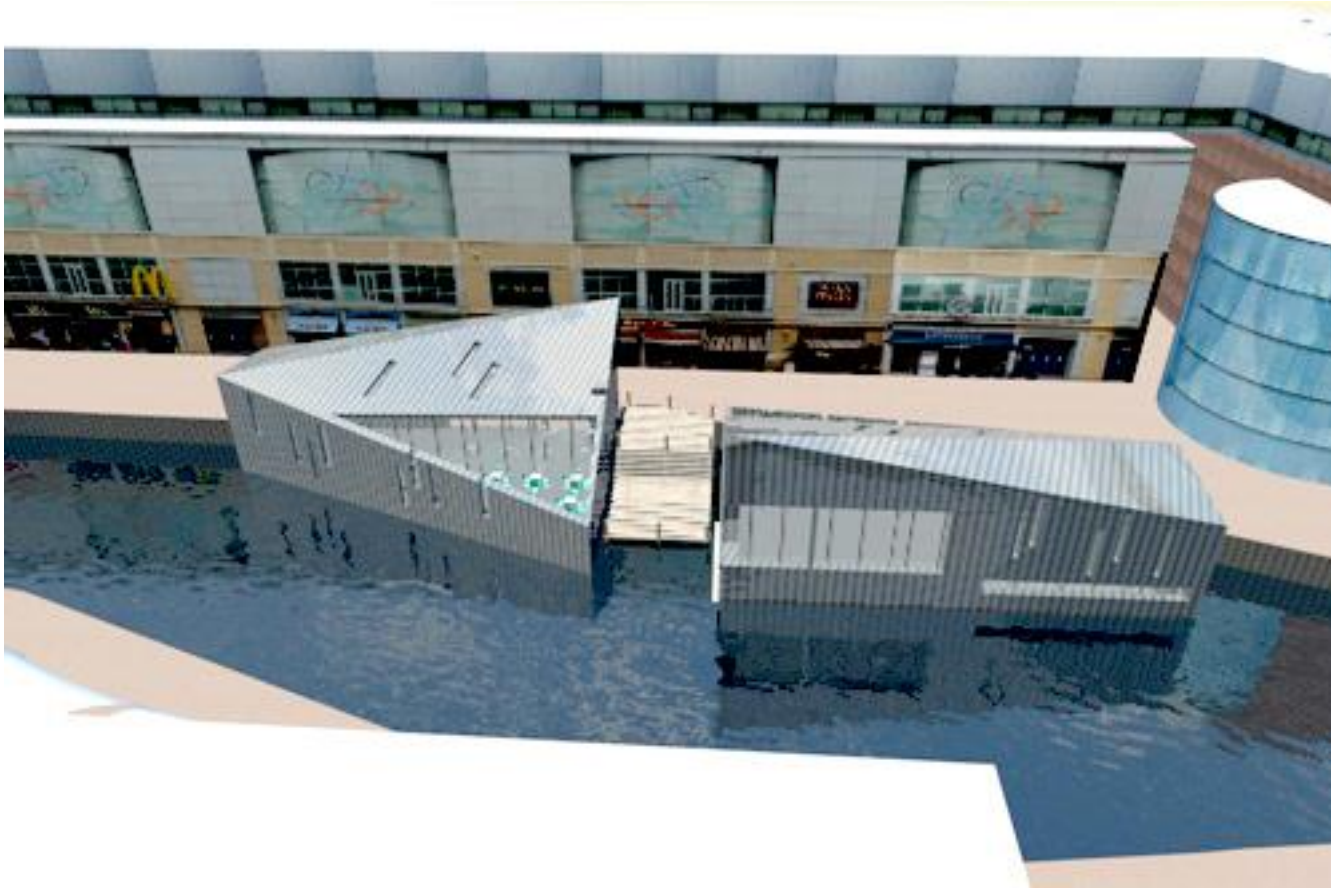
Elevated



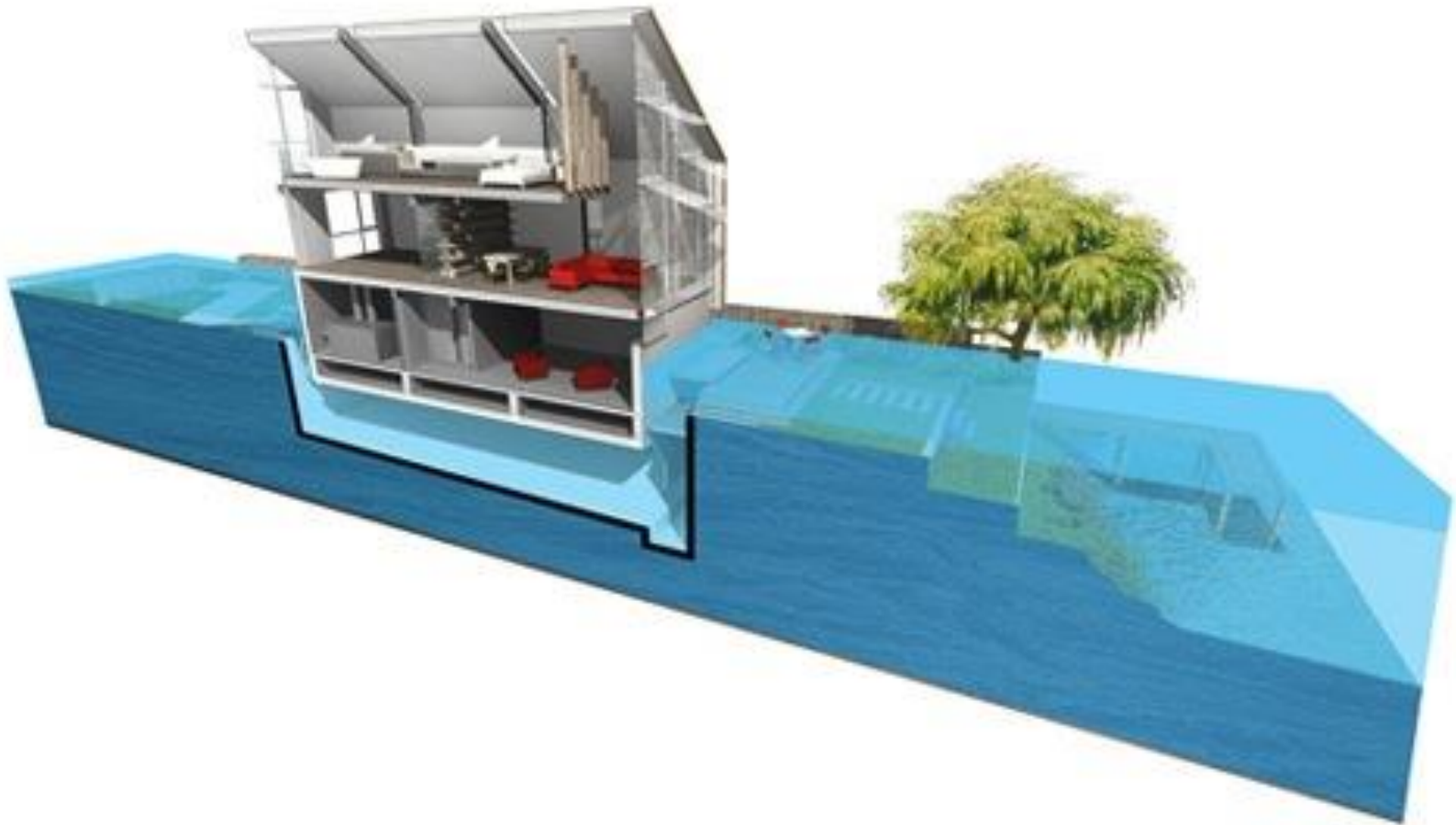
Or resilient



Or floating

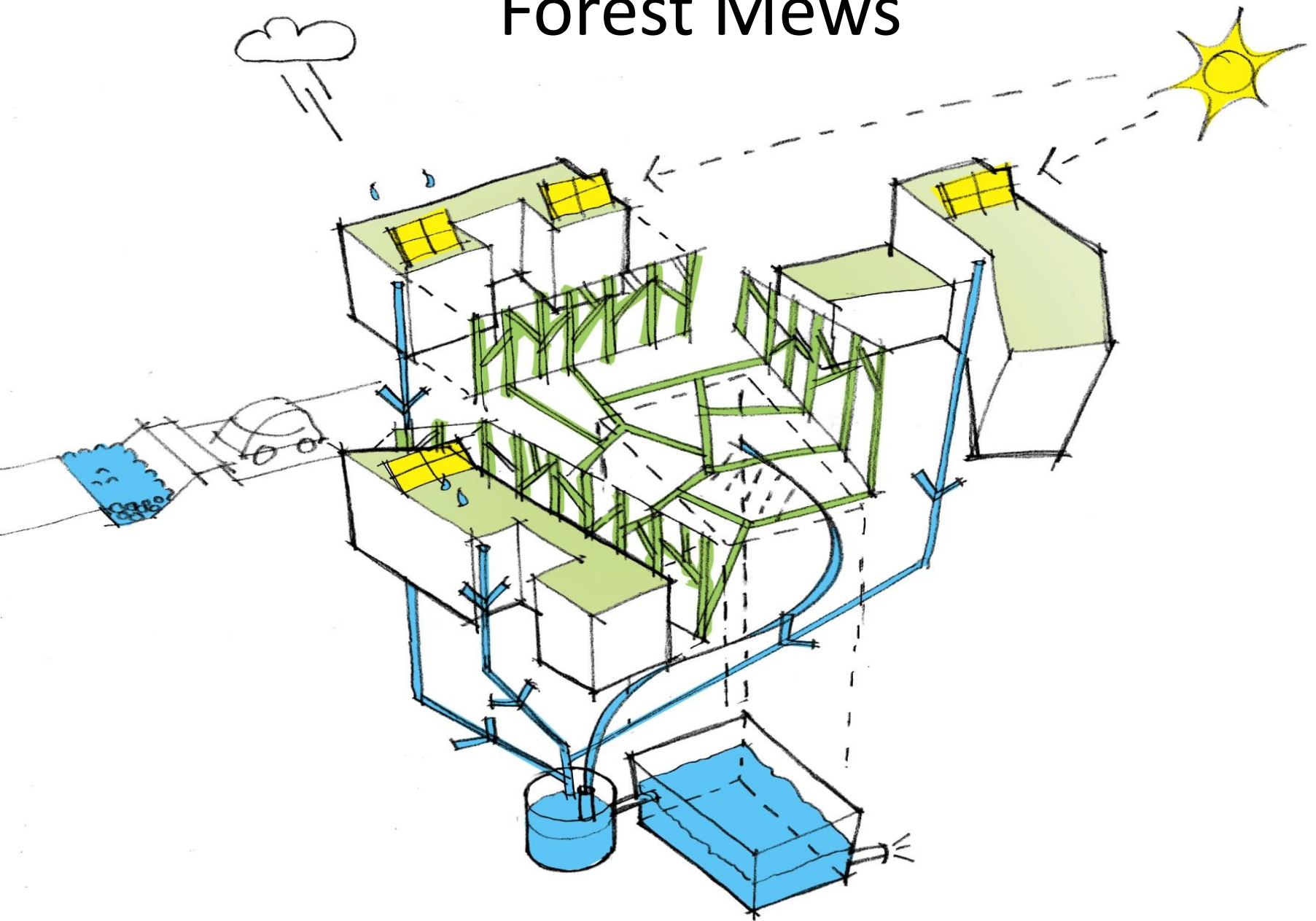


Or this...The Amphibious House





Forest Mews





Thanks for your attention!

You can find more information on:

.....

**Robert Barker, Stephen Ndzerem or Peter
Heiland
www.baca.uk.com**