THE HINDSIGHT OF BENEFITS:
LEARNING TO MAKE THE BROADER CASE FOR
FLOOD RESILIENT PLACES

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What I will be covering today:

• Regenerating the past
• The Present: a blue green approach – from Copenhagen to Calderdale
• The Future: the internet of resilient places?
• Final thoughts

“A learning city is a place that is continually expanding its capacity to create its future.”

Adapted from Peter Senge, The Art and Practice of the Learning Organization 1990
RAMBOLL: DECADES OF SUSTAINABLE INNOVATION

1945
Ramboll was founded

1955
Broadcast towers - rebuilding Europe after the war led to Telecoms infrastructure today

1967
The Great Belt Link - the world’s longest suspension bridge

1971
Special investigations of post-tensioned concrete bridges began enabling significant extension of asset life

1984
Started working on Copenhagen’s district heating system, one of the largest in the world

2009
Laser aided modelling LAM to enable building information models (BIM) to be developed directly from point clouds

2006
Queen’s Award for Enterprise: Innovation, for Multi-disciplinary engineering skills and solutions

2002
Queen’s Award for Enterprise: Innovation, for Archtec bridge arch strengthening

1990
Pioneered failure mode effect analysis (FMEA) leading to engineering simulation and 3D computational design

2014
Cities Lab created to help our clients develop innovative blue-green infrastructure solutions

2016
Web-hosted wireless instruments used for remote monitoring of movement in structures

2017
Dynamic masterplanning tools launched to facilitate client early option analysis and time-compression in design

2017
World’s largest low-carbon cross-laminated timber building completed
- Dalston Works, London
REGENERATING THE PAST
LONDON’S LOST & MODIFIED RIVERS

• Just 3km south west of here is Chelsea Creek (200m long)

• Counter’s Creek actually used to run for 8km from Kensal Green to Chelsea

• ‘Bridge of the Sandy Ford’ crossed it, aka ‘Stamford Bridge’, home of The Blues

• In the nineteenth-century the Creek was converted into a canal, then a railway (Shepherd’s Bush to Imperial Wharf)

• One of more than 20 wholly or partially “Lost Rivers of London” (e.g. the River Fleet, the River Tyburn, the River Effra)

Photo: CBD architects
HARNESSING REGENERATION

- **1990s**: encroachment impact recognised i.e. the cumulative effect on flood capacity & ecology of replacing tidal defence river walls in front

- **1997**: **New design approaches** introduced e.g. Greenwich Peninsula (Millennium Dome/O2 Arena)

- **2008-2016**: more than 17.5km of river across London have been restored to a more natural setting, beating the old London Plan target (Environment Agency)

Source: Riverbank Design Guidance for the Tidal Thames, EA 1997
THE PRESENT: BLUE-GREEN, COPENHAGEN TO CALDERDALE
Copenhagen experience – lessons that can be learnt:

Copenhagen hit twice by cloudburst events in two consecutive years – both in summer:

• 14 August 2010, **25mm rain in one hour**
  – Average rain in August: 62 mm
  – Return period: 20 years

The city and government was still trying to figure out what to do when:

• 2 July 2011, **150 mm in one day**, most fell **within two hours**
  – Average rain in July: 70 mm
  – Return period >1,000 years

• Population of metropolitan area: 2,000,000

• Estimated total losses from flood damage in 2011: approximately **1.5 billion Euros**
CLIMATE ADAPTATION PLANS AND “CLOUDBURST” MASTERPLANS PUT INTO ACTION

CO-FINANCING

- Economic advantages for both municipality and utility companies
- Economic partnership causes innovation in chosen solutions
- Increased understanding between engineers and landscape designers
CLOUDBURST MASTERPLAN DEVELOPMENT

✓ To reflect the city’s planning aspirations of becoming more “liveable”

✓ Stormwater retention higher in the catchment if possible

✓ Focus on blue-green flexible solutions

✓ Flood Management Plan ...... but also addresses mobility, recreation, safety, water quality and biodiversity for wider community benefit

✓ Multi-functional streets, parks and plazas
CALDERDALE, WEST YORKSHIRE: FLOOD MANAGEMENT & BGI FOR WIDER BENEFITS

- Review of Calder Valley’s long term potential for combining flood attenuation and water management with Tourism, Recreation and Placemaking

- Identify areas with the most potential for natural flood management (NFM)

- Compendium of possible blue and green infrastructure (BGI) solutions

- Focus in on the deployment of approaches in a settlement (Sowerby Bridge)

Outputs:

- Report and associated toolkit providing details on NFM/BGI intervention opportunities and benefits for implementation within Calderdale – to aid in decision making

- High level opportunities and constraints mapping.
The toolkit provides a range of potential flood management interventions at various scales.

It encompasses more ‘conventional’ approaches for flood management, for example SuDS, in addition to broader interventions that take a ‘blue-green’ approach, such as Green Streets and Detention Areas.

Provides examples of **synergy benefits** and case studies.
Example: Conveyance Streets and Detention Areas

- Conveyance streets can be used to channel runoff during peak rainfall events as managed overland flood flow routes.

- Channels and swales can be established on road edges so water runs in urban flow paths or green strips.

Opportunities for Calderdale

- For example, the Old Cawsey Site within Sowerby Bridge has potential to become a detention area.

- Conveyance streets could also present opportunities to align with expanded biking paths throughout the valley including the National Cycle Network Routes (66/68) and the proposed Ryburn Greenway project.
EXAMPLE: COPENHAGEN CLOUDBURST DENSE URBAN CONVEYANCE STREET - WET
Runoff directed to planted areas and conveyed at surface in controlled manner, low point along centre of street
EXAMPLE: CLOUDBURST DENSE URBAN CONVEYANCE STREET - FLOOD
Street remains useable on foot at edges, but also stores and conveys flood water centrally
BRIDGING VISION (CALDERDALE) AND REALITY (COPENHAGEN)

VISION

• Blue-Green feature along the square to store and convey storm water

• Central green belt to be larger, more lively and inviting

• Possibilities for cafés and restaurants to have outdoor space and service

• As few underground pipes as possible until outlet
KEY OBSERVATIONS

- Landscape-based (blue-green) storm water management has the potential to upgrade the urban public spaces
- Interdisciplinary design process needs to be adjusted with regard to the multi-faceted goals
- Focus on the combined solution from the earliest design phases
- Ensure sufficiently thorough data collection
**Challenge**
Outline concepts and levels for riverine flood protection and storm surge to be integrated into an existing vision and implementation plan.

**Smart inputs**
Resilience study using Ramboll Cost Benefit Analysis tool to understand the likely flood protection requirements in combination with co-benefits.

**Benefit justification & realisation**
Tool showed effectiveness of co-benefit solution vs do minimum and do nothing scenarios using benefit to cost ratios 1.11/0.83/0.40.
THE FUTURE: THE INTERNET OF RESILIENT PLACES?
ADAPTING TO A CHANGING CLIMATE IN THE FUTURE

“It is going to get wetter and hotter and windier. Our kites will blow away. We will have to put suncream on every day – and that is just wasting your own time on the beach!”

My six year old daughter
A **metropolitan area network** (MAN) is a large computer network covering urban districts or entire cities.

A MAN usually combines local area networks by using high-capacity backbone technology (ie fiber-optical links), and can be combined with wireless technologies, ie wide area networks, through wi-fi, radio-frequency identification and other wireless technologies.
SOCIETY

PEOPLE

ORGANISATIONS

CITY WIDE DIGITAL INFRA-STRUCTURE

"SMART CITIES"

Environment

Water

Smart grid

Traffic

Free Wi-Fi for tourists

Security

Vulnerable citizens

Asset Tracking

Innovation and growth
REVOLUTION OR EVOLUTION
SMART ROME WILL NOT BE REWIRED IN A DAY

The cusp of a revolution in the internet of things (IoT)

- 2016 to 2017 growth in IoT connections for smart cities; 41% energy/utilities (source: Verizon)
- 75bn IoT devices by 2025; 15bn in 2015 (source: Statista)

But UK cities, towns and villages are a rich tapestry with ageing buildings and infrastructure
REVOLUTION AND EVOLUTION
INNOVATIONS FOR CLIMATE RESILIENCE

Some opportunities for big disruptive changes, but in established cities with finite budgets incremental innovation is more likely:

1. Analytics/AI to make better use of the existing data used to operate the city
   - Real time flood modelling?

2. Digitalised design
   - Integrating Geographic Information Systems & BIM?

3. The next generation of sensors and control technologies (IoT)
   - Self maintaining SUDS & blue green infrastructure?
   - Adaptive (robotic) flood defence systems?
Using smart technologies and big data to create cleaner, greener cities

Use the options below to search our database of international case studies
FINAL THOUGHTS
KEY POINTS

1. **Harness the right tools** to tailor the approach to design, engagement, and economics

2. **Be ready to learn** through monitoring, evaluation and collaboration

3. **Benefit realisation is key.** Additional benefits are great but be clear about the main problems/challenges to be solved & make the objectives measurable

4. Imagine and invent the **Internet of Resilient Places**

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THANK YOU

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