North West Cambridge Integrated Water Management Strategy, University of Cambridge with Innovate UK, Cambridge, UK

North West Cambridge is a new greenfield development consisting of 3,000 new homes and a 100,000m^2 research and office space on the edge of Cambridge, UK. Since 2008, AECOM coordinated with the University of Cambridge to bring forward this ground-breaking development from concept design to achieving planning permission and post planning consents. Growth in this part of the UK is likely to put pressure on scarce water resources with potential impacts on wider ecosystems. When it does rain, the increase in impermeable surfaces associated with new development on what was a greenfield site increased the rate of run-off which increases the risk of downstream flooding an urban pollution. Climate change, including longer periods of drought in the summer and stronger, more unpredictable storms in the winter is likely to exacerbate these challenges.

RISK	ACTION	IMPACT	OUTPUT
Approaches to urban water management have become disconnected from the natural water cycle High concentrations of demand draw in water resource from miles around, whilst high volumes of waste water are discharged back into the environment downstream. Storm water frequently adds to waste water management challenges as urban areas increase runoff that is channeled quickly into combined systems. These systems are increasingly constrained and overwhelmed resulting is sewer flooding. North West Cambridge faces all these water management challenges. The site is in a water scarce area and will put pressure on water resources. New development is also likely to increase urban run-off and the potential of downstream flood risk. Climate change exacerbates these risks.	AECOM in partnership with the University of Cambridge secured a research grant from the UK Government's Innovate UK programme to look at approaches to developing a more connected urban water cycle. Central to the research was the development of a mass water balance. This time series analysis of all of the different potable and non-potable water demands as well as all the potential sources of water (including storm water, grey water from showers/baths and black water from toilets) helped to identify opportunities to provide more localized water cycle management. By making better use of waste water on site, potable water demands and pressure on water resources can be reduced whilst removing this water from waste networks can reduce pressure.	The study provided the evidence for developing a site-wide rain water harvesting network. All rainwater that falls on the site is channeled into a series of green swales that line the streets and follow the natural hydrology of the site to help clean the storm water. The water is then channeled into a series of retention ponds where it is stored for reuse. A non-potable water network draws water from the retention ponds and following further treatment is distributed to all homes to flush toilets and for irrigation. This means that potable water demand has been reduced to 80lpd from a baseline of around 125lpd. The area around the retention ponds is designed to flood in extreme rainfall events providing additional protection from downstream flooding.	The study, and in particular the mass water balance allowed for a better appreciation the opportunities to reconnect the water cycle by making better use of waste water to reduce exposure to risk from flooding and water scarcity that will be exacerbated by climate change. This initial study led to the development of the storm water management strategy and non-potable water network. These area now being constructed.

Lessons Learned

There are two key lessons learnt from the opportunity to undertake a mass water balance for North West Cambridge: 1. Developing a more integrated approach to urban water management can help to reconnect the water cycle, reducing potable water demand as well as reducing flood risk and pressure on waste water networks. 2. Developing a site-wide approach delivered the economies of scale required to make non-potable supply viable.

BUSINESS CASE

A strategic, site wide approach to rain water collection and harvesting, as well as non-potable water distribution was estimated to cost around 40% less than meeting the same potable water reduction measures through on-plot approaches. The network non-potable supply approach offers a potential income stream as water can be sold back to consumers, currently at 90% of the potable water equivalent.

Delivering surface water management using green infrastructure also delivers a other benefits including reducing the cost of water treatment, creating an attractive space, carbon sequestration, air quality improvements and biodiversity. Demonstrating these benefits helps to navigate the development through planning permission.

REPLICATION OPPORTUNITIES

Although the final solution may take a different form, the principle of using a mass water balance to help provide the evidence for a more integrated water cycle management on any new urban development. Different scales and land use mixes of development are likely to generate different water demands and non-potable water arising which may lead to different technological approaches. The benefits are also likely to be location specific depending on the availability of water supply, flood risk and water quality.

How does the project support the implementation of the Sendai Framework targets?

1	*Reduce disaster mortality by 2030*		The approach to water management provides increased resilience in a way that is beneficial for future communities in providing a high quality public realm and alternative water supplies whilst reducing the economic and infrastructure costs associated with reducing in water availability and flooding.
2	*Reduce number of affected people by 2030*	X	
3	*Reduce economic loss by 2030*	X	
4	*Reduce infrastructure damage and disruption of services by 2030*	X	
5	*Increase countries with DRR national/ local strategies by 2020*		
6	*Enhance international cooperation to developing countries*		
7	*Increase the availability of and access to EWS* and DR information to people by 2030*		

How does the project contribute to the ARISE Themes?

1	*Disaster Risk Management Strategies*	X	The water balance approach provides a framework for appraising the potential for developing a more integrated approach to urban water management. It provided a comprehensive cost benefit analysis that is building the evidence around investment metrics for reducing urban risks and improving resilience.
2	*Investment metrics*	X	
3	*Benchmarking and Standards*		
4	*Education and Training*		
5	*Legal and Regulatory*		
6	*Urban Risk Reduction and Resilience*	X	
7	*Insurance*		

For More Information

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