Dresden Nexus Conference

Urban Water Resilience through innovation

Dr Mark Fletcher
Global Water Leader

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More than half the world is now urban

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Population Growth eg London

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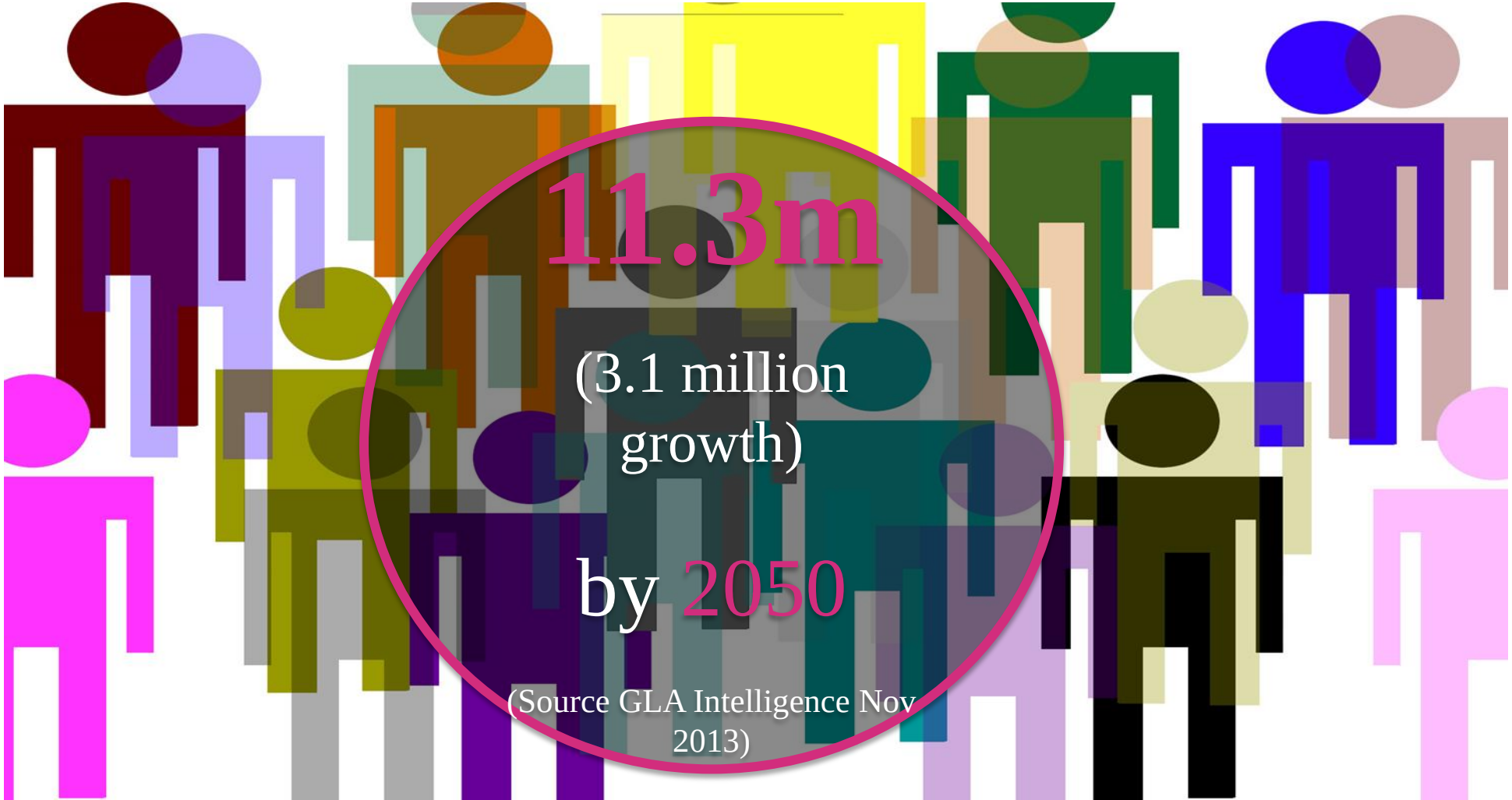

World Economic Forum
Global Risk Report 2017

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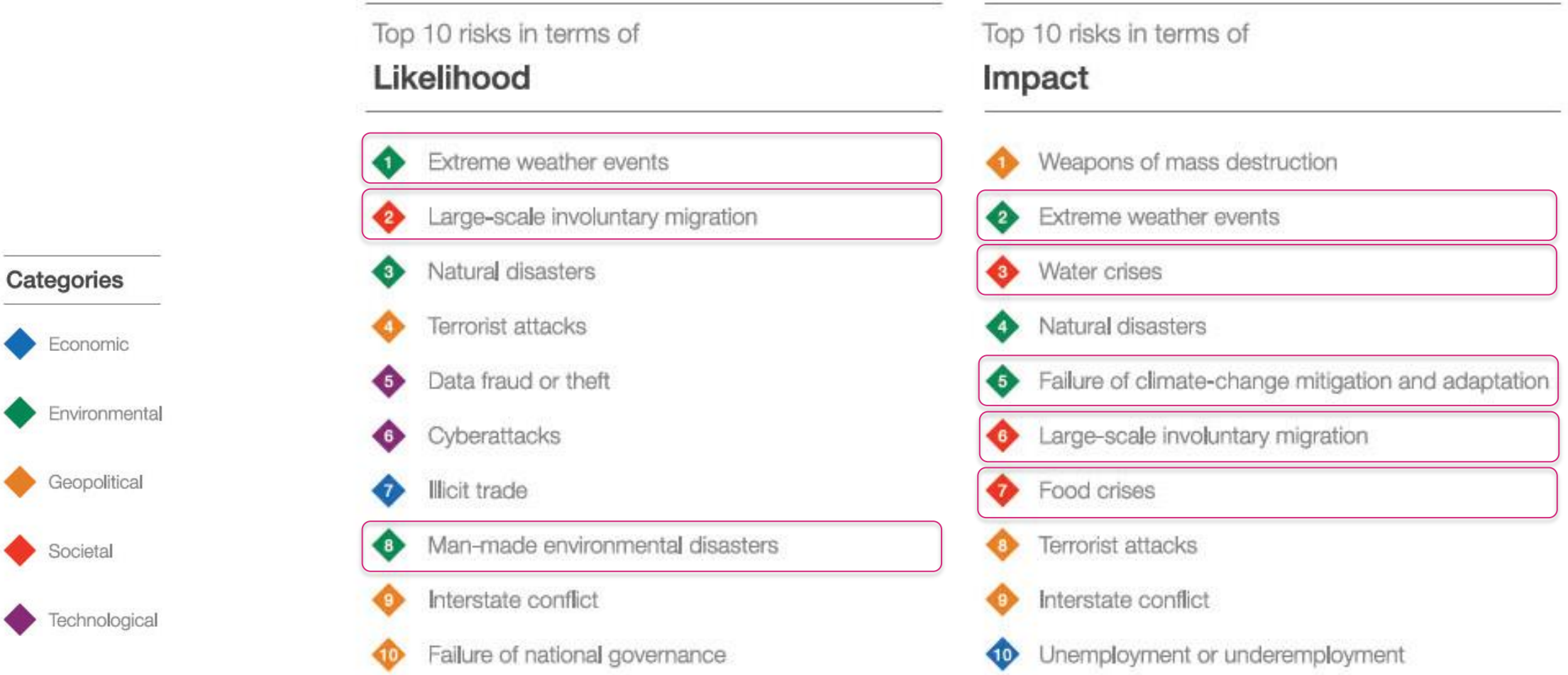

Climate Change water-related hazards

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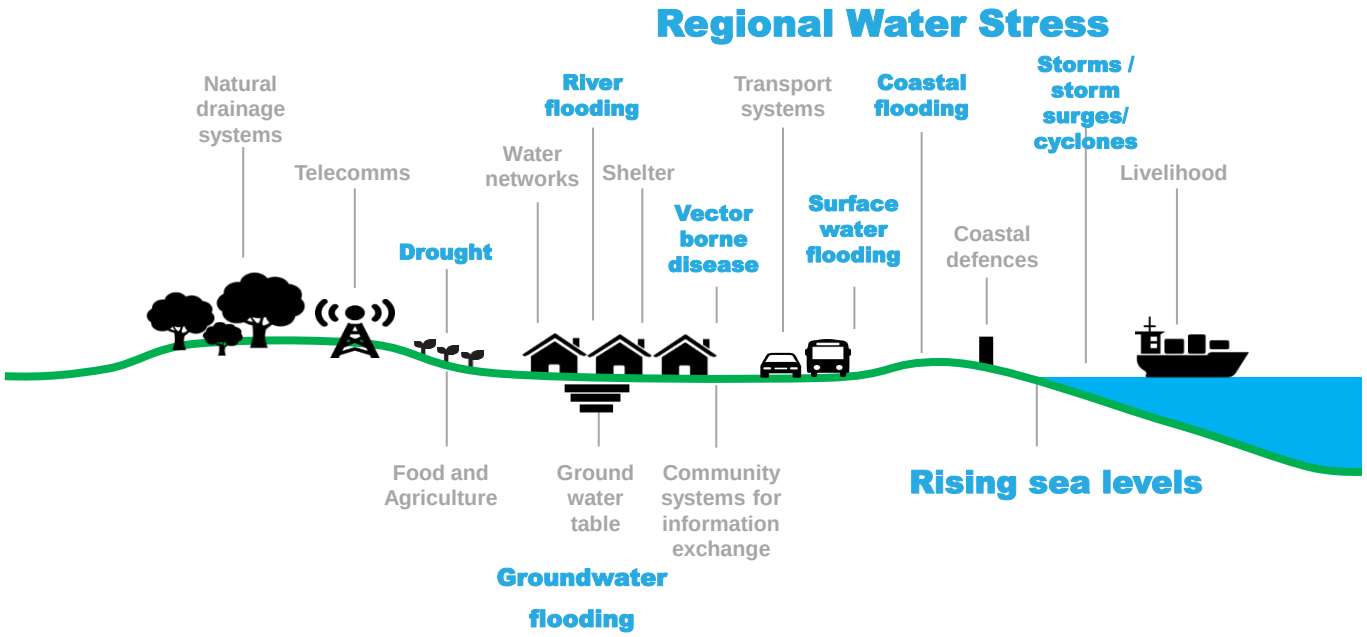

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Shock Change eg Storm
Incremental Change eg Sea Level Rise

Recovery (as you were) and Adaptation (or transformation)

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New York

5 feet sea level rise

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New York

12 feet sea level rise

ARUP

New York

25 feet sea level rise

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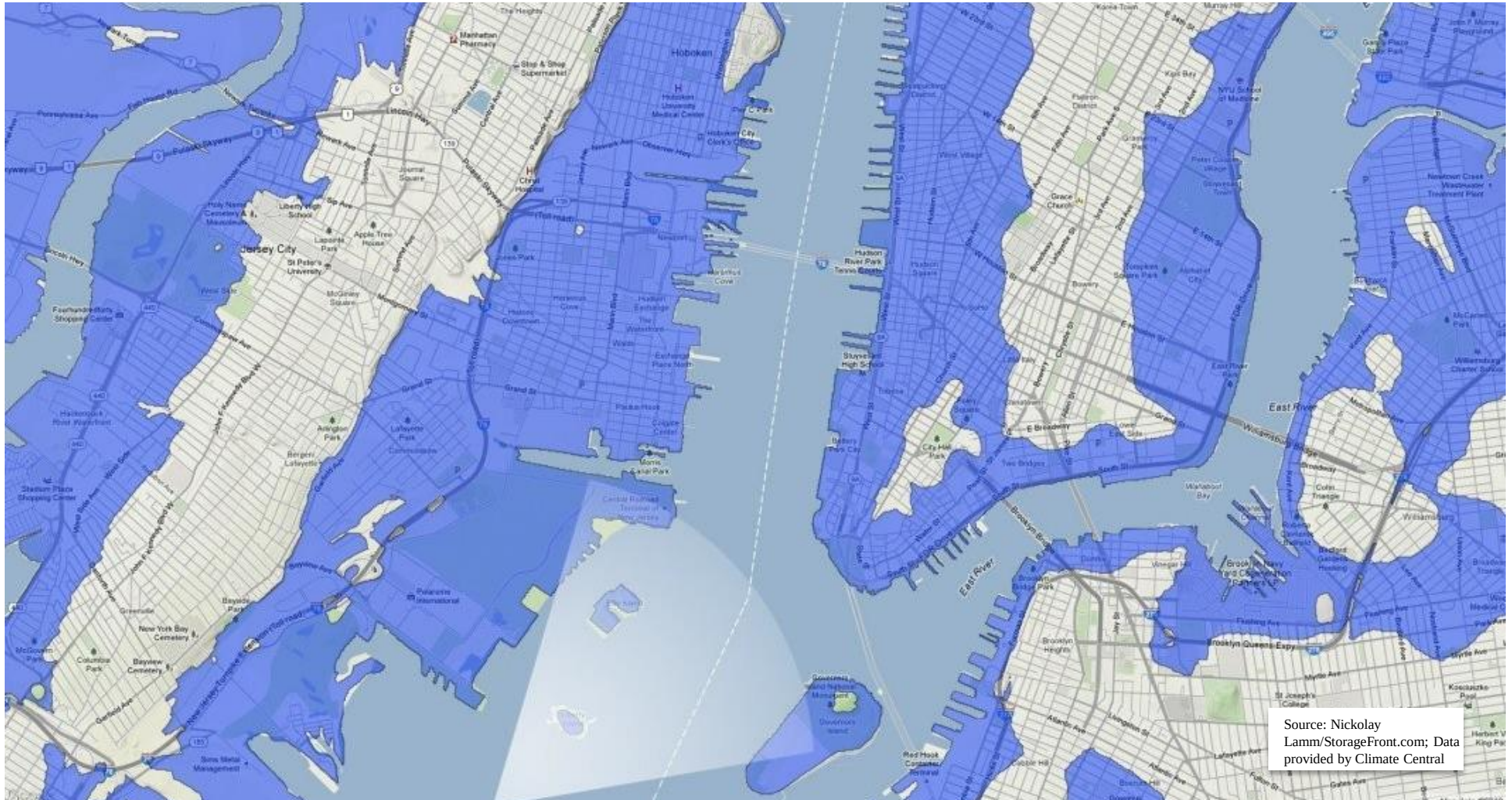

Source: Nickolay Lamm/StorageFront.com; Data provided by Climate Central

Design with Water
Green and Blue Thinking

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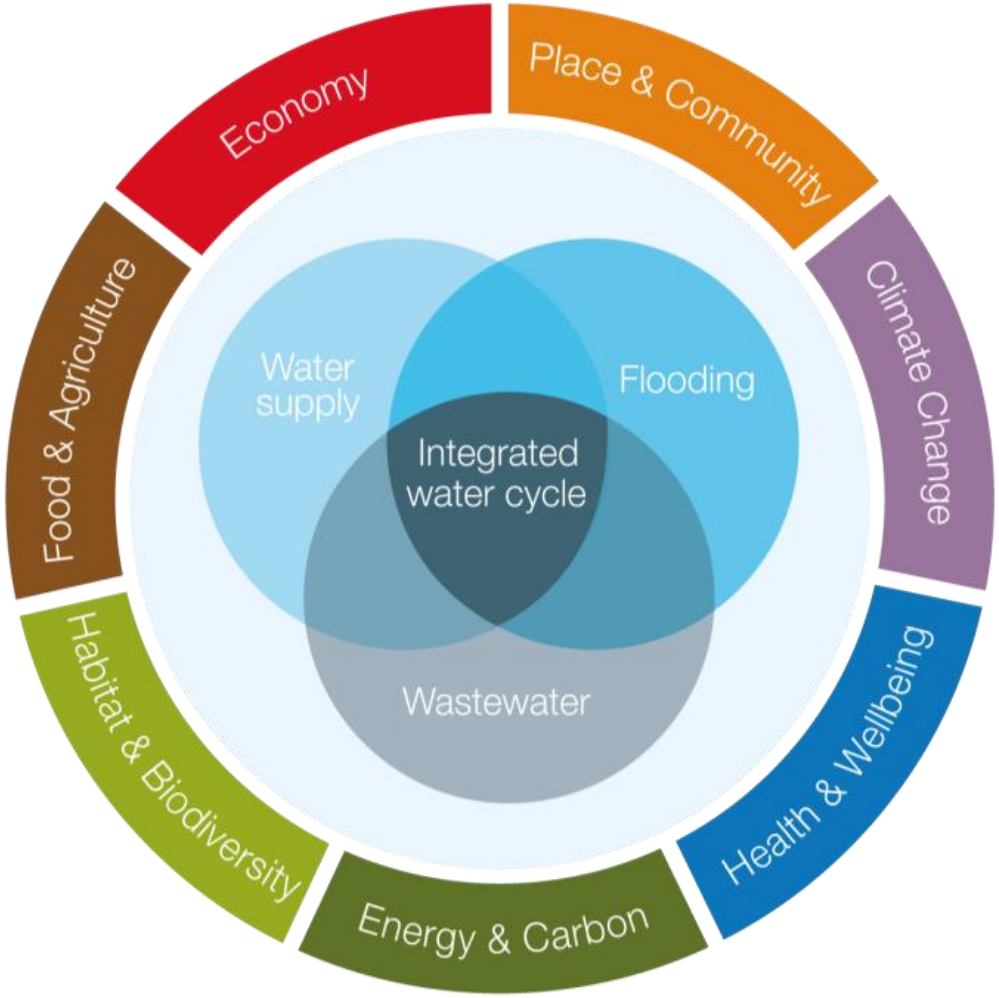

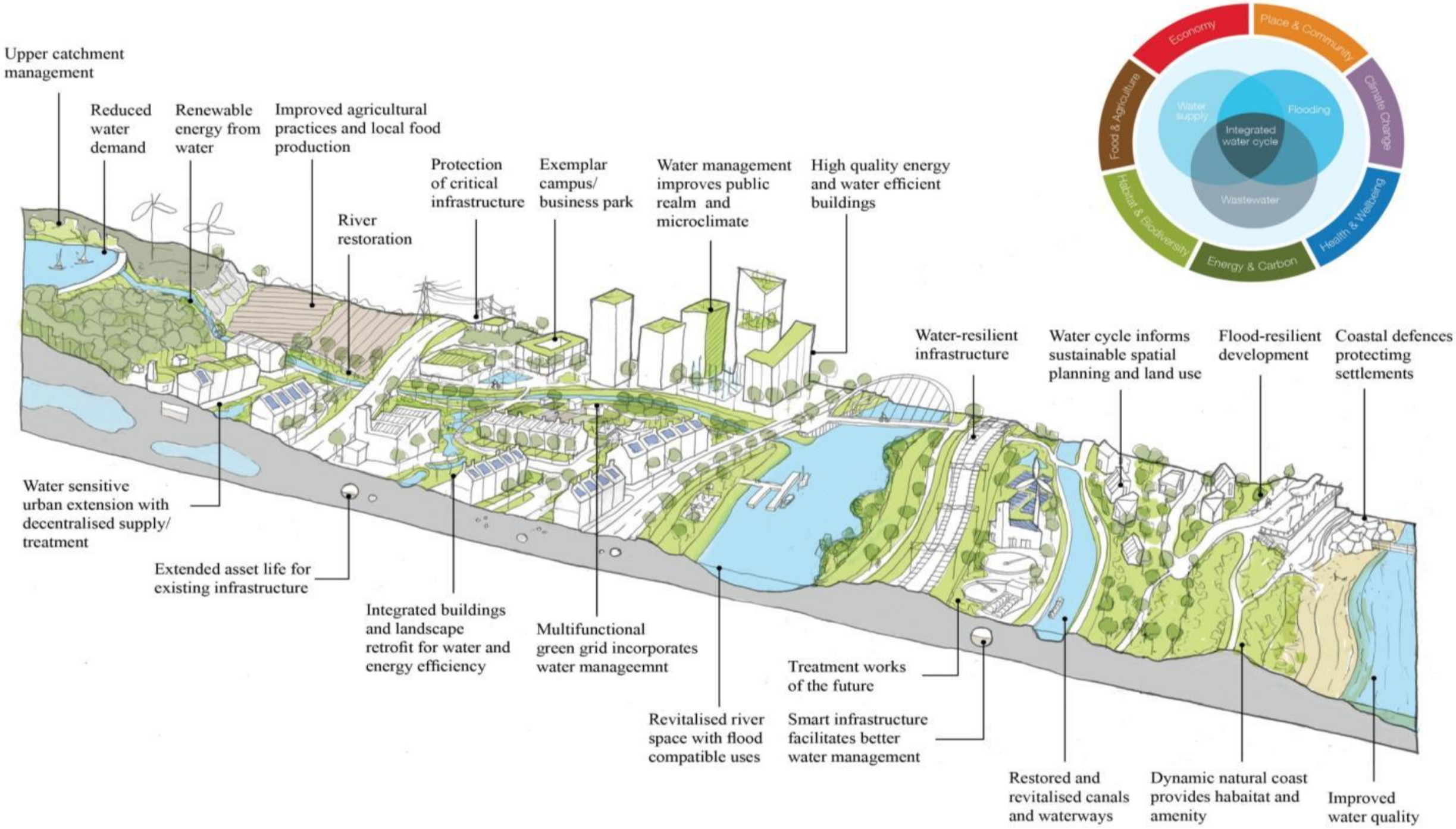
Upper catchment management
Reduced water demand
Renewable energy from water
Improved agricultural practices and local food production
River restoration
Protection of critical infrastructure
Exemplar campus/ business park
Water management improves public realm and microclimate
High quality energy and water efficient buildings
Water-resilient infrastructure
Water cycle informs sustainable spatial planning and land use
Flood-resilient development
Coastal defences protectimg settlements
Water sensitive urban extension with decentralised supply/ treatment
Extended asset life for existing infrastructure
Integrated buildings and landscape retrofit for water and energy efficiency
Multifunctional green grid incorporates water manageemnt
Revitalised river space with flood compatible uses
Treatment works of the future
Smart infrastructure facilitates better water management
Restored and revitalised canals and waterways
Dynamic natural coast provides habaitat and amenity
Improved water quality
Economy
Place & Community
Climate Change
Health & Wellbeing
Energy & Carbon
Habitat & Biodiversity
Food & Agriculture
Water supply
Flooding
Integrated water cycle
Wastewater

‘Green’ Thinking

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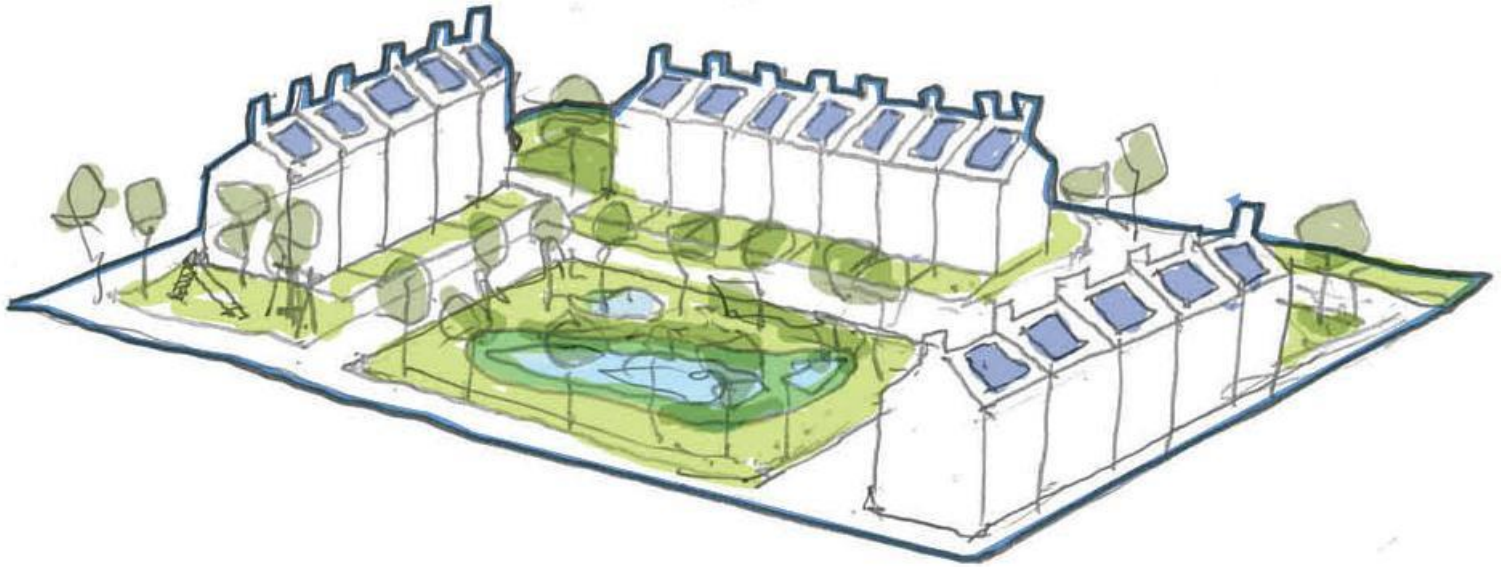
- ☺ Work with the water cycle
- ☺ Use green and blue space – create, expand, adapt
- ☺ Capture, store and release…. and treat
- ☺ Design places using vegetation
- ☺ Natural/semi-natural: bush, tree, copse, wood, forest, meadow, wetland
- ☺ Man-made: green roof, planter, flowerbed, park, field, footpath, hedgerow

Examples:
ABC Water Singapore
Sponge Cities China
Green Infrastructure New York and Philadelphia



‘Blue’ Thinking

ARUP

- ☺ Work with the water cycle
- ☺ Use green and blue space – create, expand, adapt
- ☺ Capture, store and release…. and continuity
- ☺ Design places using water
- ☺ Natural/semi-natural: puddles, pools, ponds, lakes, streams and rivers
- ☺ Man-made: Taps, toilets, reservoirs, canals, swales, fountains, ditches and drains

Welsh Water
Resilience Innovation

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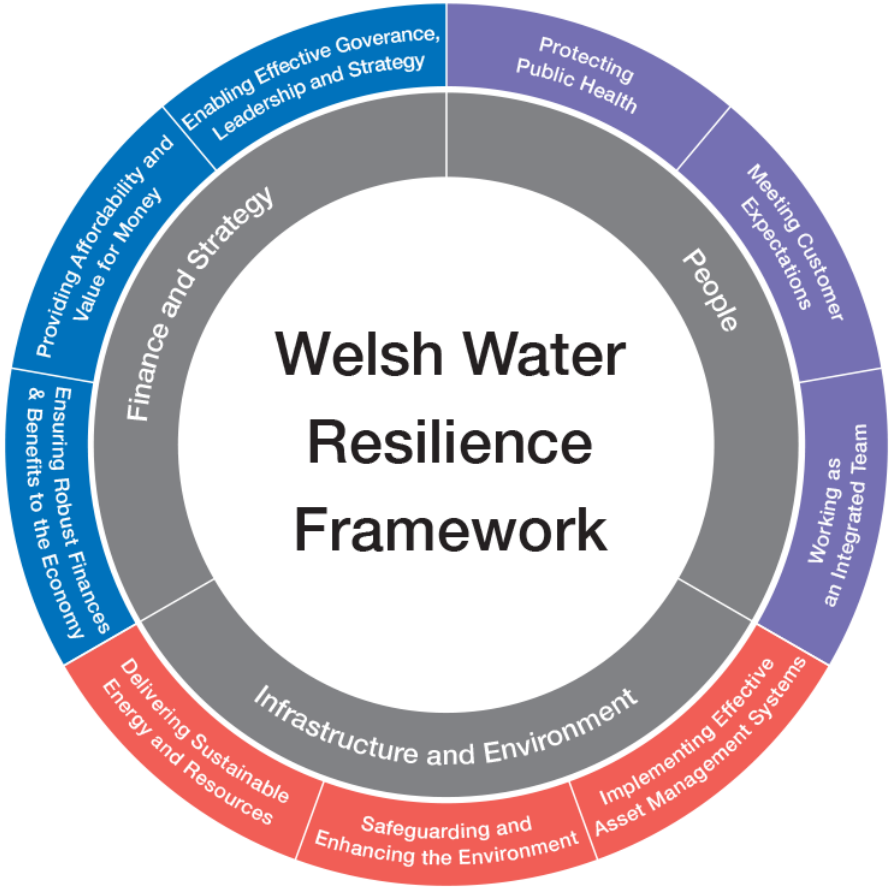

Sustainable ie develop from a triple-bottom line :

Social/people
Environment/infrastructure
Finance/strategy

Maturity Framework UK and Global best practice *eg City Resilience Index by Arup for Rockefeller Foundation*

Qualitative and quantitative indicators

Bespoke to DCWW, helps to inform vision for 2050 and develop a resilient business

Centred on Design with Water ie water cycle

Policy & legislative context for Wales and UK

Incorporates known shocks, stresses and risks

Welsh Water
Good Practice Review

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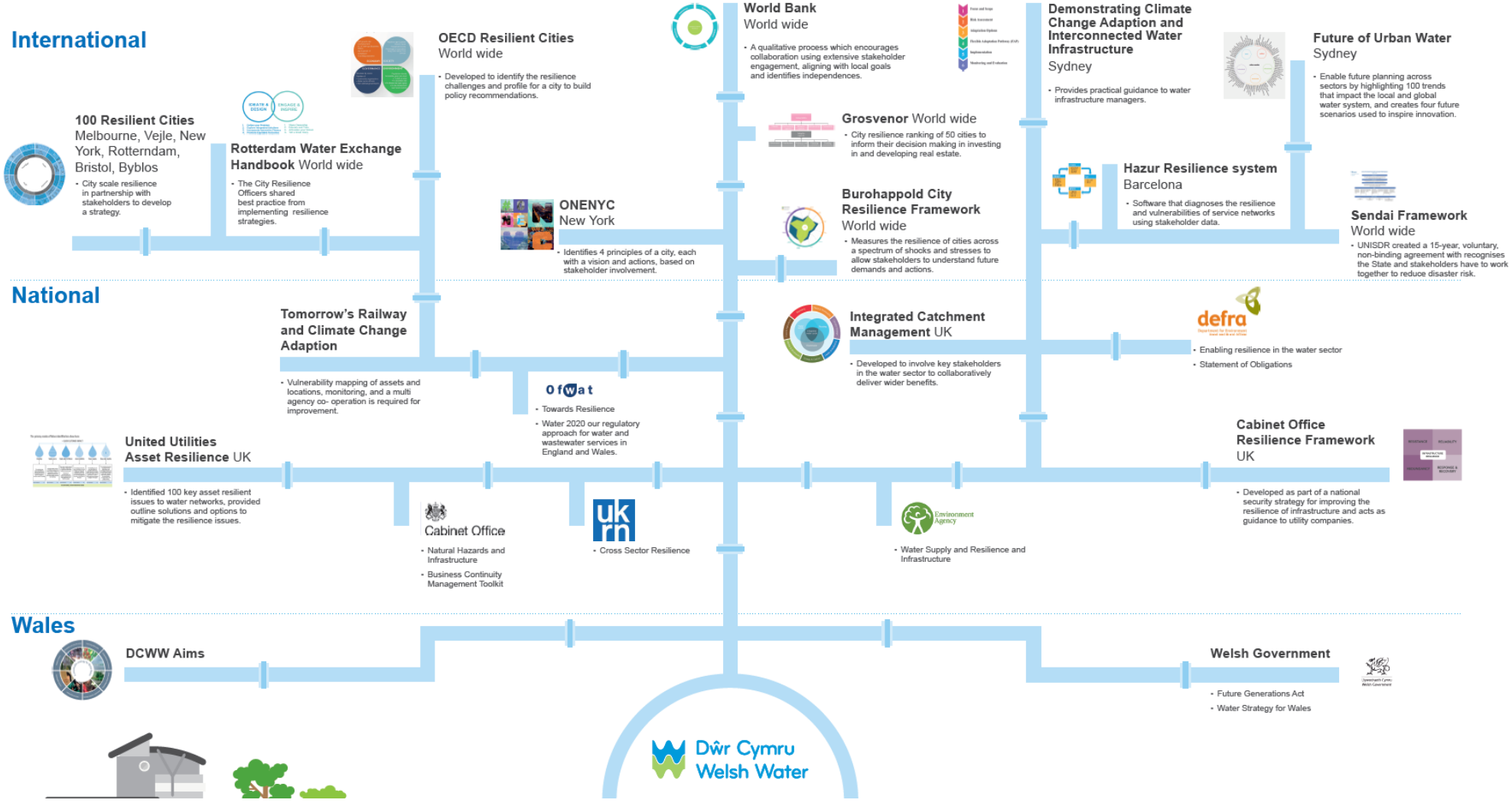

Welsh Water
Resilience Innovation

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Framework Process

Resilience Qualities

Adaptive | Long term | Robust | Redundant | Inclusive | Integrated | Resourceful | Reflective | Innovative

Welsh Water
Resilience Lens

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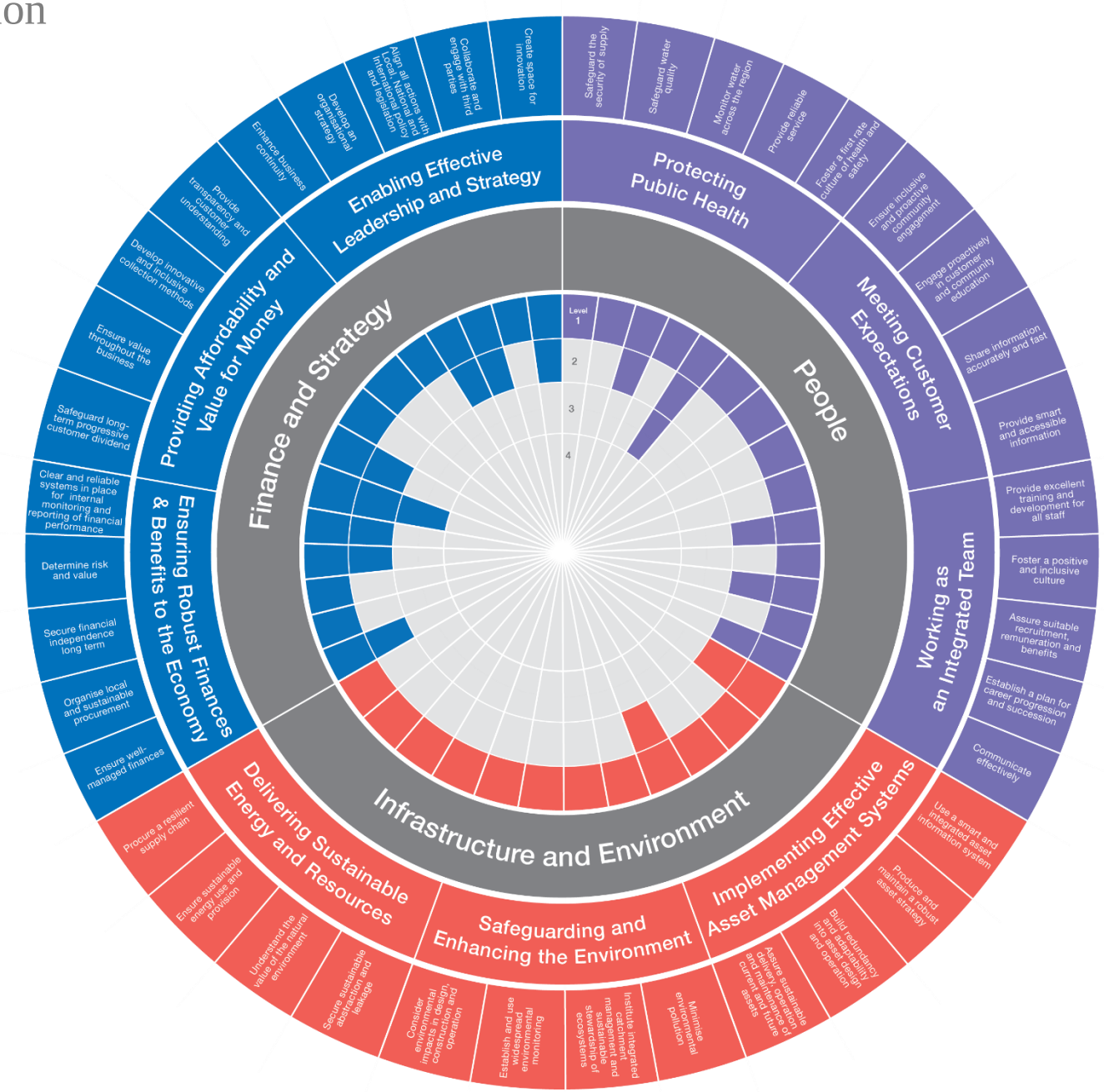
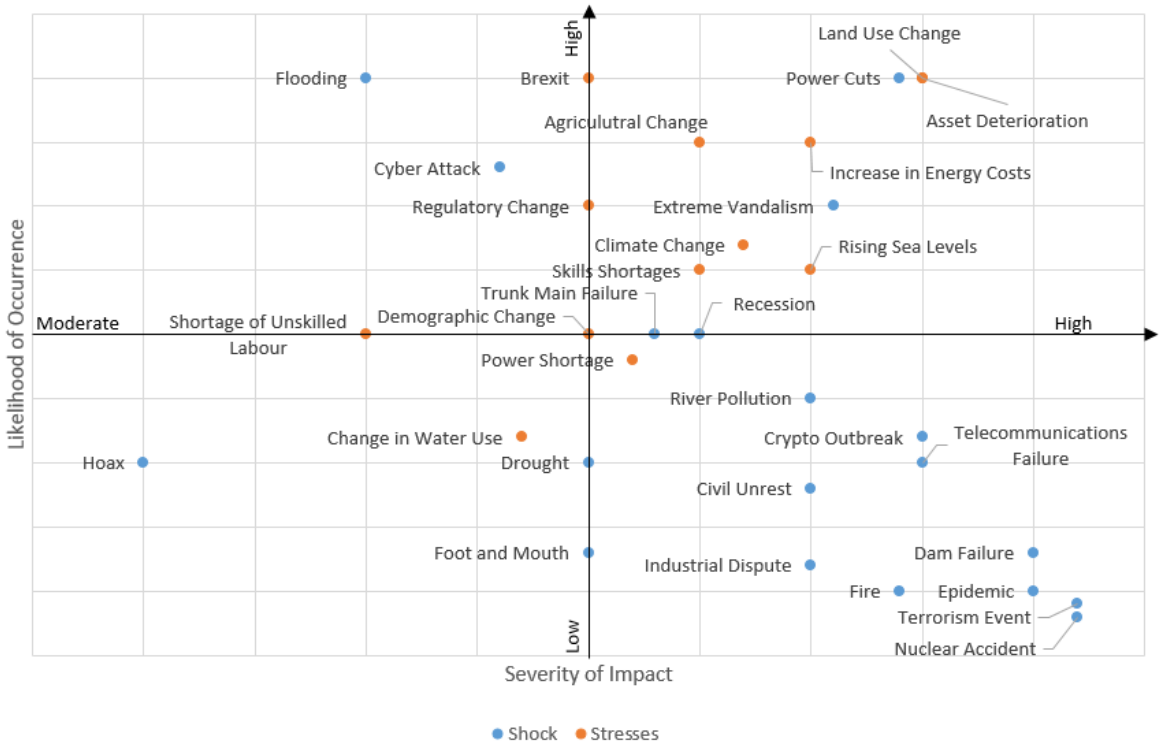


Welsh Water
Shocks and Stresses

ARUP

‘Resilience is the ability to cope with, and recover from, disruption, and anticipate trends and variability in order to maintain services for people and protect the natural environment, now and in the future.’

Shocks	Disruptive events, which impact the ability to provide a high quality service.
Stresses	Chronic conditions which weaken the function of the organisation or system long-term. Stresses are also often felt as shocks when they reach a tipping point.



Learning from Events

Shocks & Stresses

Theme	Shocks
Climate	Flood Storms Drought Heat Wave
Security Related Incidents	Fire (Third Party) Terrorism / Hoax Cyber Attack / Data Fraud Vandalism False Positive Alarm Poisoning (Third Party) Water Contamination
Economic Change	Brexit Recession Fraud
Asset Related Incidents	Infrastructure Failure Fire / Explosion Operational Deaths / Drownings Poisoning Pollution Infectious Diseases Natural Disasters Nuclear Incident
Supply Chain	Third Party Service Failure Civil Unrest Supply Chain Failure Staff Strikes Industrial Disputes Power Outage Severe Energy Price Change Comms Outage

Abbeystead, Lancashire
1984
Methane Explosion

Camelford, Cornwall
1988
Aluminium sulphate poisoning

Fukushima, Japan
2011
Earthquake & Tsunami

Learning from Events

Shocks & Stresses

Theme	Stresses
Climate	Changing Rainfall Patterns Regional Water Stress Sea Level Rise / Coastal Erosion Resource Scarcity
Legislative Change	Water Act Water Quality Regulations Abstraction Licenses Change Change in Land Use Sentencing Council Guidelines
Economic Change	Unmanageable Inflation Increased Cost of Borrowing Macro Industry Change
Customers	Demographic Change / Economic Development Trend of Urbanism / Urban Creep Population Change Migration Increased Water Demand Per Capita Willingness to pay
Supply Chain	Skills Shortages Employment Costs Energy Costs Comms Costs

Western USA Regional Water Stress
2010-15
Lake Mead Intake

Thames 2100 Strategy
2016
Sea Level Rise Accelerating

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Bosco Verticale, Milan, Italy
2011-2015
World's largest Vertical Forest

New York City Green Infrastructure

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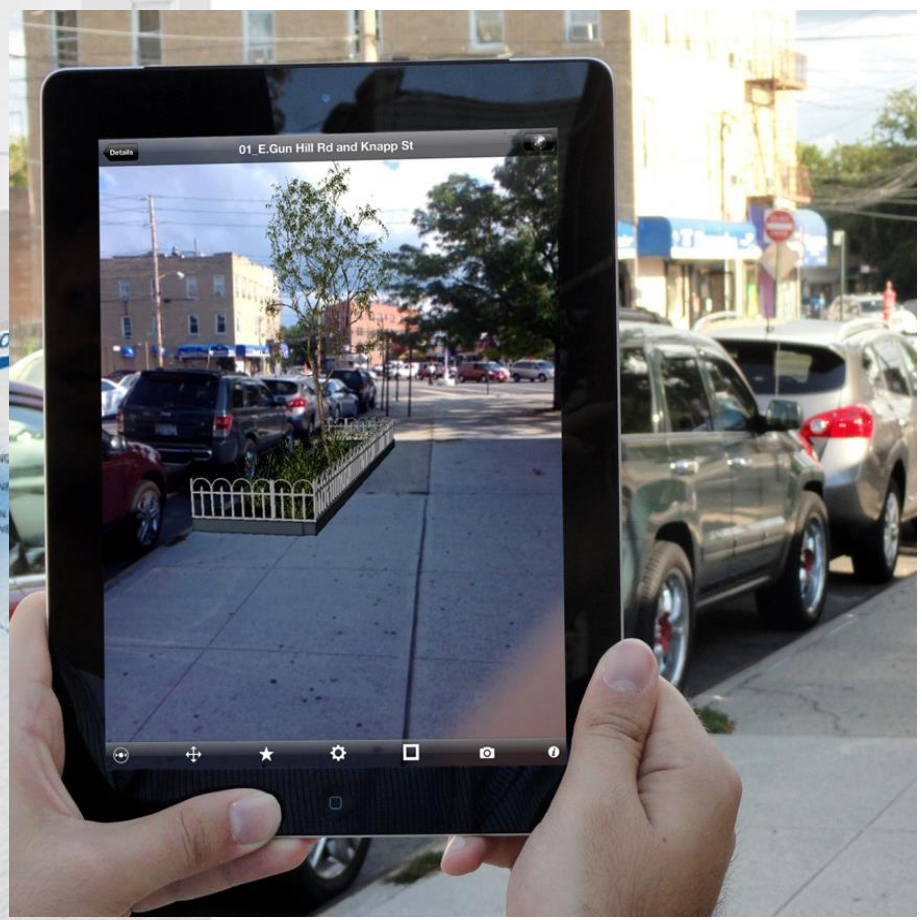

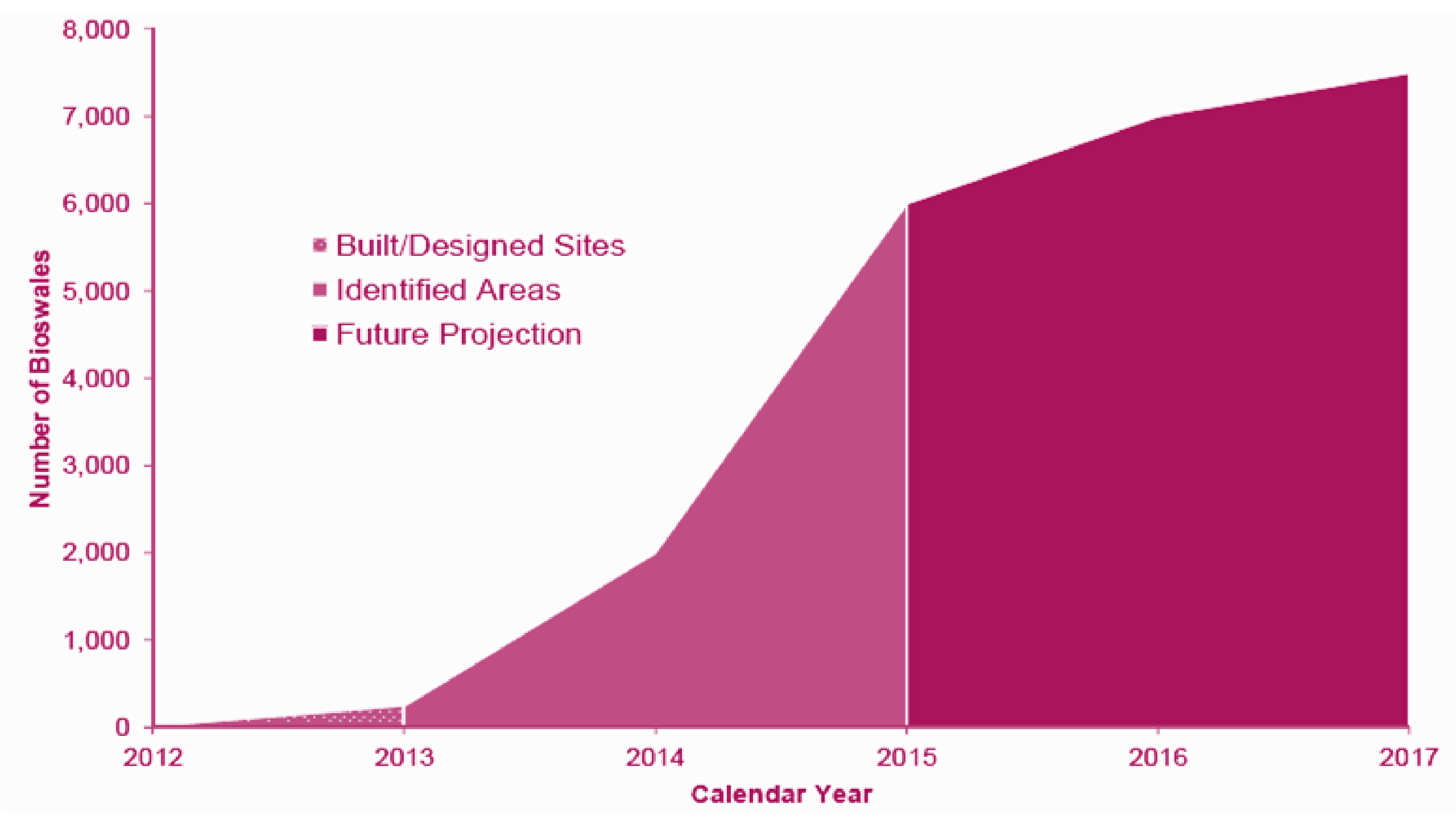
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Number of Bioswales
Built/Designed Sites
Identified Areas
Future Projection
2012
2013
2014
2015
2016
2017
Calendar Year

Red Rock Houses
NYCHA Recovery & Resiliency Program

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Red Rock Houses
NYCHA Recovery & Resiliency Program

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