

ARE OUR BUILDINGS FIT FOR THE FUTURE?



STRUCTURAL ENGINEERING FOR THE FUTURE

CAROLINE FIELD, HEAD OF RISK & RESILIENCE, BUROHAPPOLD ENGINEERING

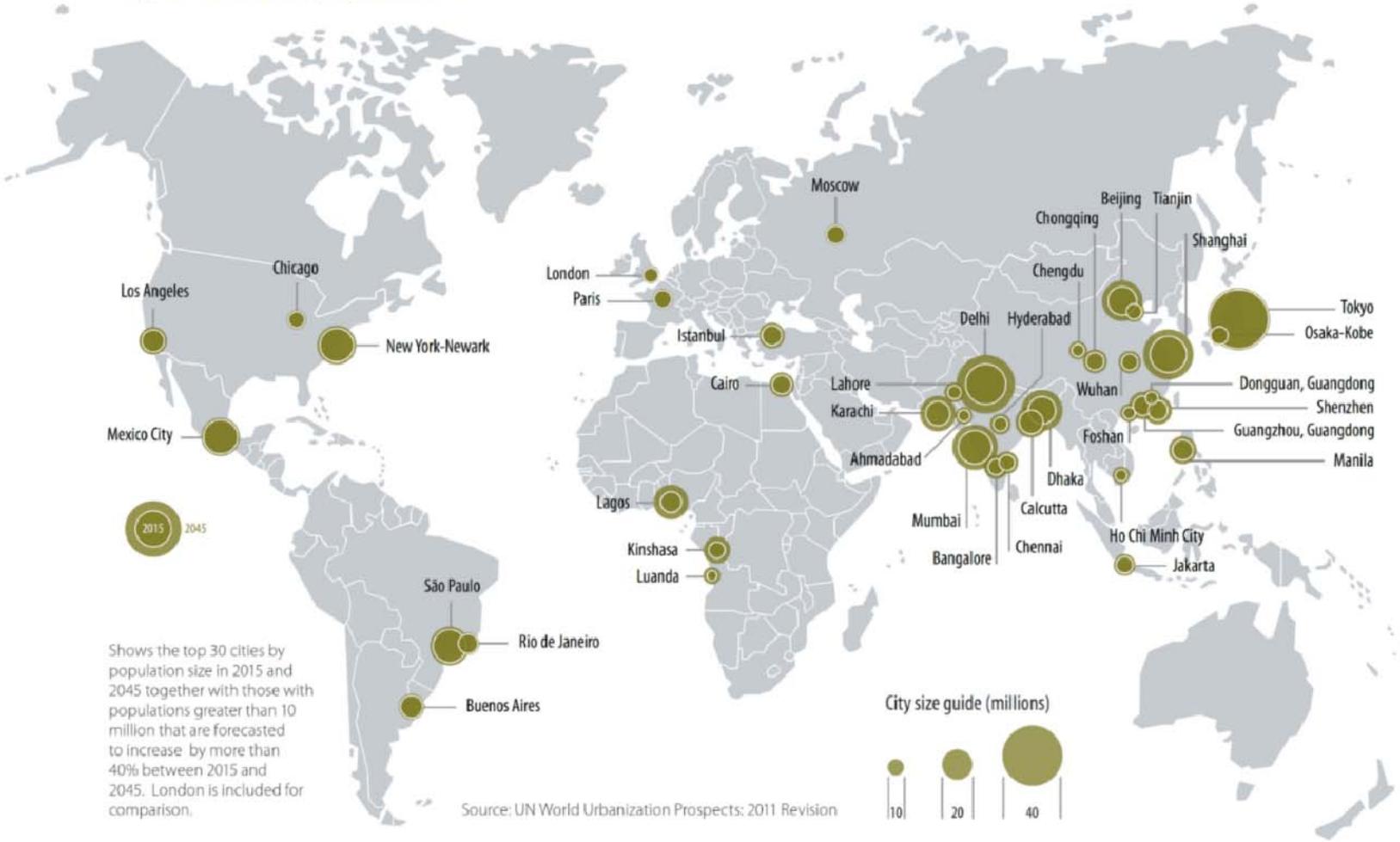
GEOPOLITICS



**BUROHAPPOLD
ENGINEERING**

URBANISATION

Major centres of population



CLIMATE CHANGE

Water Stress



Air Pollution



Environment



Heat Stress



Sea Level Rise

NATURAL HAZARDS

BUROHAPPOLD
ENGINEERING

COPYRIGHT © 1976-2017 BUROHAPPOLD ENGINEERING. ALL RIGHTS RESERVED

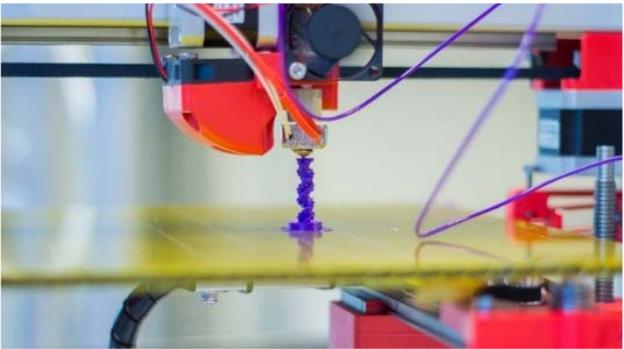
Thames valley, 2014



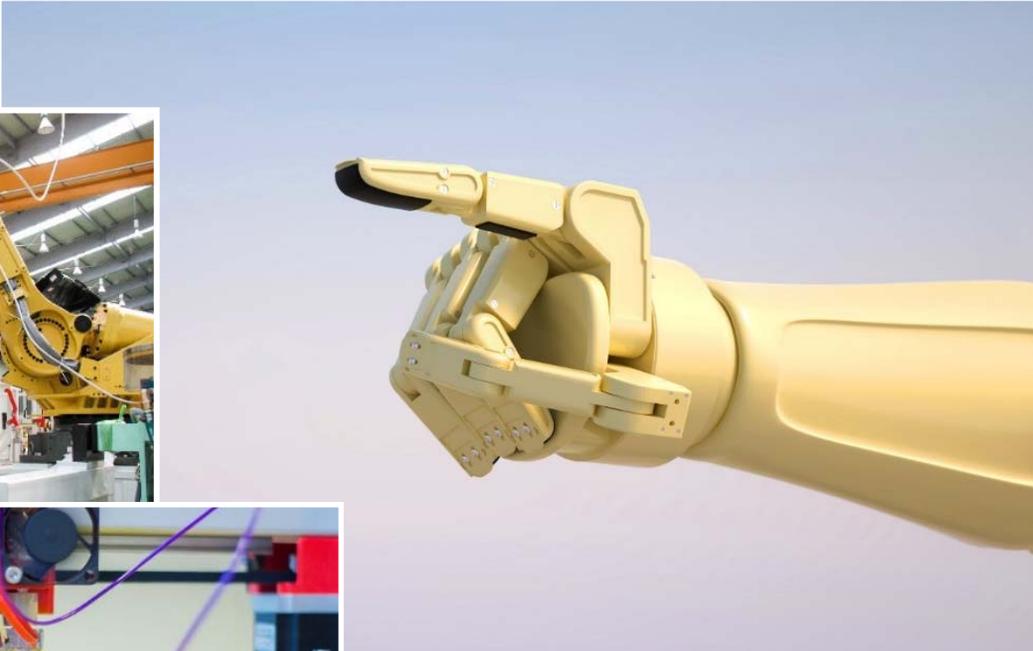
TECHNOLOGY

Artificial Intelligence

Automation

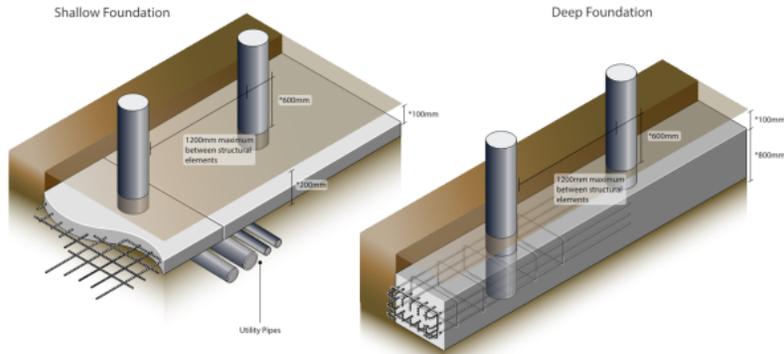


3D Printing

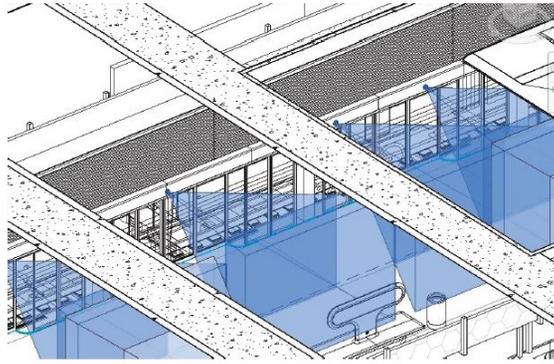
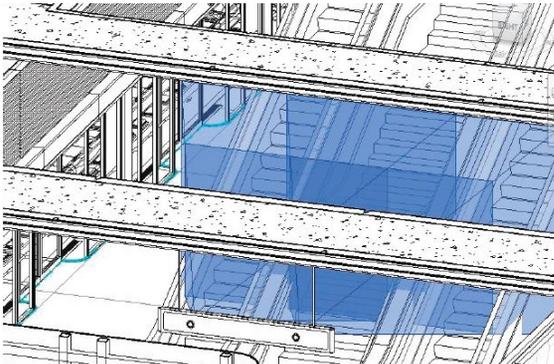


BUILDING INFORMATION MODELING

Jeddah Metro - IWA-14 Security Bollards



* Indicative Dimensions



Properties

_BHE_SecurityDevices_CameraStatic12
Internal Wall Surface

Security Devices (1) Edit Type

Constraints

Length	5980.000 mm
REV STATUS NO	1
REV STATUS REPORT	Uncontrolled Insertion
Review Approval	
Offset	0.000 mm
Work Plane	Level : Level 0

Graphics

INFRARED

LASER

Electrical - Loads

Dimensions

DFOV	0.000 mm
DISTANCE	5980.000 mm
FAR LIMIT	5980.000 mm
FOCUS HEIGHT	2300.000 mm
FOCUS WIDTH	2624.159 mm
HFOV	6303.784 mm
HORIZONTAL ANGLE	55.5849378°
Mounting Horizontal Angle	110.0000000°
Mounting Horizontal Offset	0.000 mm
Mounting Offset	0.000 mm
Mounting Vertical Offset	0.000 mm
NEAR LIMIT	111.100 mm
OFFSET	3000.000 mm
VERTICAL ANGLE	38.3830452°
VFOV	4736.809 mm

Identity Data

Phasing

General

IT HUB

NETWORK SWITCH REFERENCE

OPERATIONAL REQUIREMENT

Electrical - Circuiting

Electrical Data

Data

MEGAPIXELS	1.800000
MICROPHONE	<input type="checkbox"/>
PIXELS PER FACE WIDTH	24.366318
PPM	203.053 mm
RESOLUTION	0.922 mm
RESOLUTION HEIGHT	720.000 mm
RESOLUTION WIDTH	1280.000 mm
ROTAKIN	400.000000
ROTAKIN EQUIVALENT	56.403514
WEATHER PROOF	<input type="checkbox"/>

Visibility

[Properties help](#) Apply

LARGE SCALE 3D PRINTING (AIBUILD)



AUTOMATION & AI



WHAT IS THE FUTURE ROLE OF ENGINEERS?

- SOCIETAL
- PEOPLE FOCUSED
- CONSULTATIVE
- EXPERIENCE
- INNOVATORS

A close-up photograph of a lizard's head, showing its eye and the intricate patterns of its scales in shades of green, blue, and yellow. The lizard is looking towards the right of the frame.

OUR DEFINITION OF RESILIENCE

“The **will** and **ability** to **anticipate**, endure, adapt and thrive within a disruptive and changing environment”

FILTER SHOCKS

Select the shocks/stresses that will be used in this report. Active shocks/stresses are shown in colour. The others are in grey.



LAND MOVEMENT, EARTHQUAKE,
LANDSLIP & SUBSIDENCE

RESILIENCE REPORT i

HEEL



PROJECT LIST ☰

SELECT ○

DEMAND ○

DIAGNOSE ○

CAPACITY ○

REPORT ●

LOGOUT ☒

We have created a simple but powerful approach, backed by a set of tools that makes resilience quantifiable, comparable and crucially manageable.

FILTER SHOCKS

PRINT

BUROHAPPOLD
ENGINEERING

UNDERSTANDING THE RISKS, UNCERTAINTIES & TRENDS

Health



Infrastructure



Societal Hazards



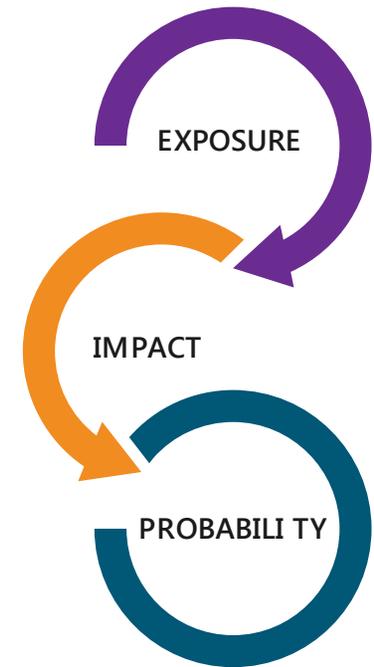
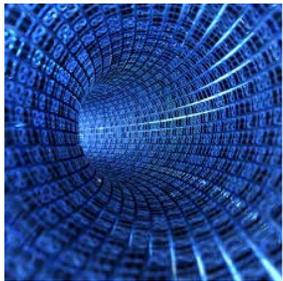
Natural



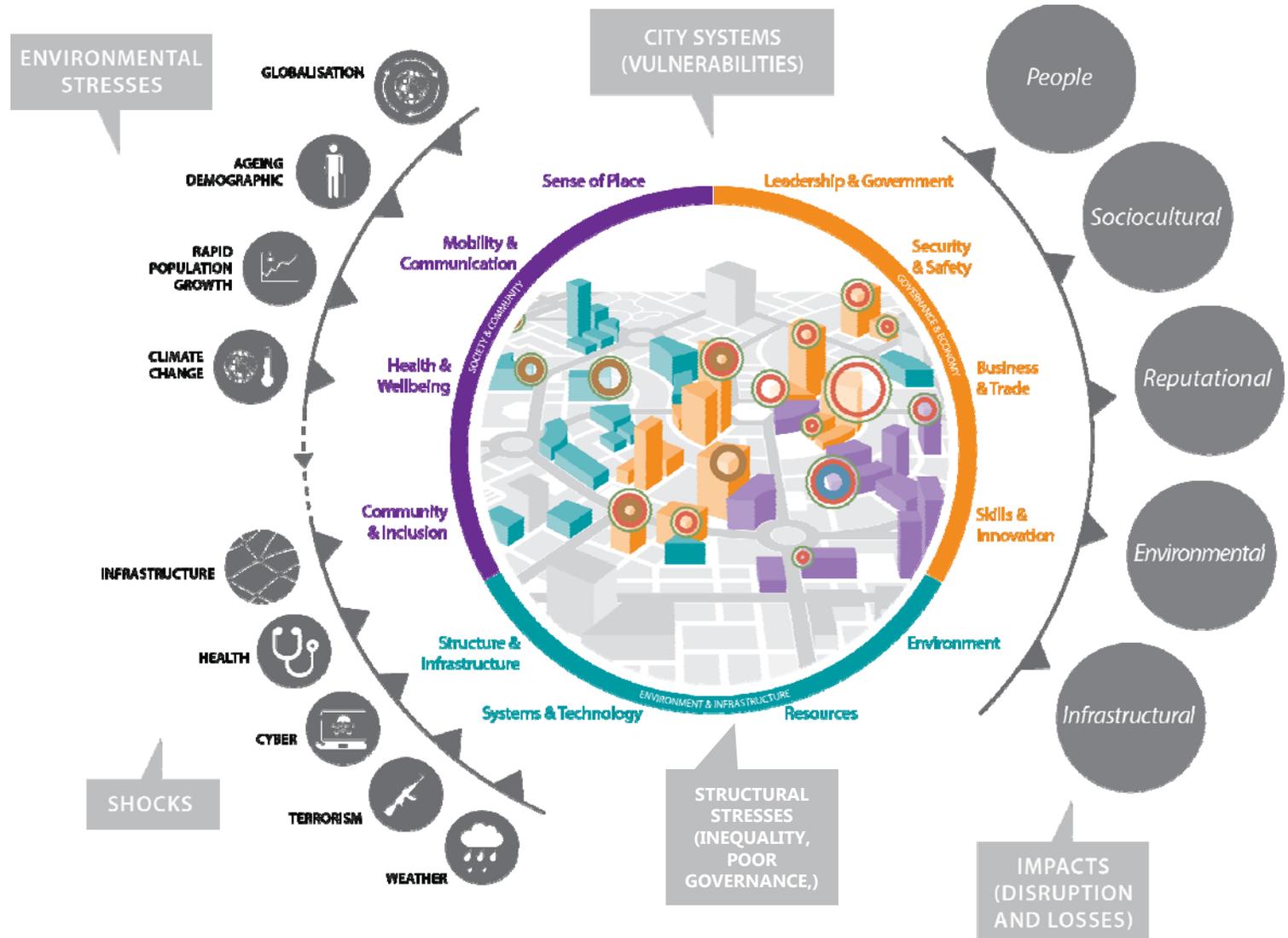
Security



Technological



RESILIENCE DEMAND



RESILIENCE CAPACITY



PREPARATION



AWARENESS



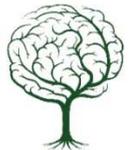
RESPONSE



RECOVERY



LEARNING & ADAPTATION



HEALTH



PROTECTION



ROBUSTNESS

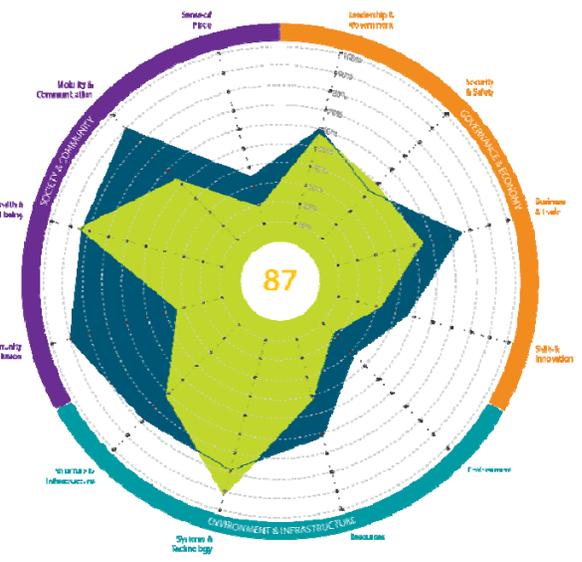
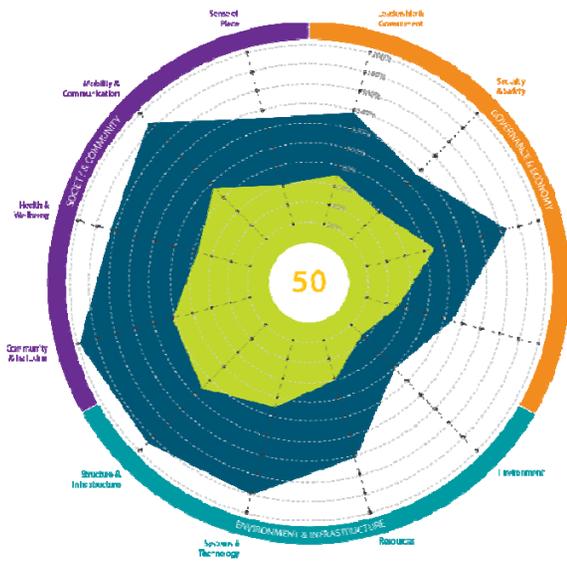


DIVERSIFY



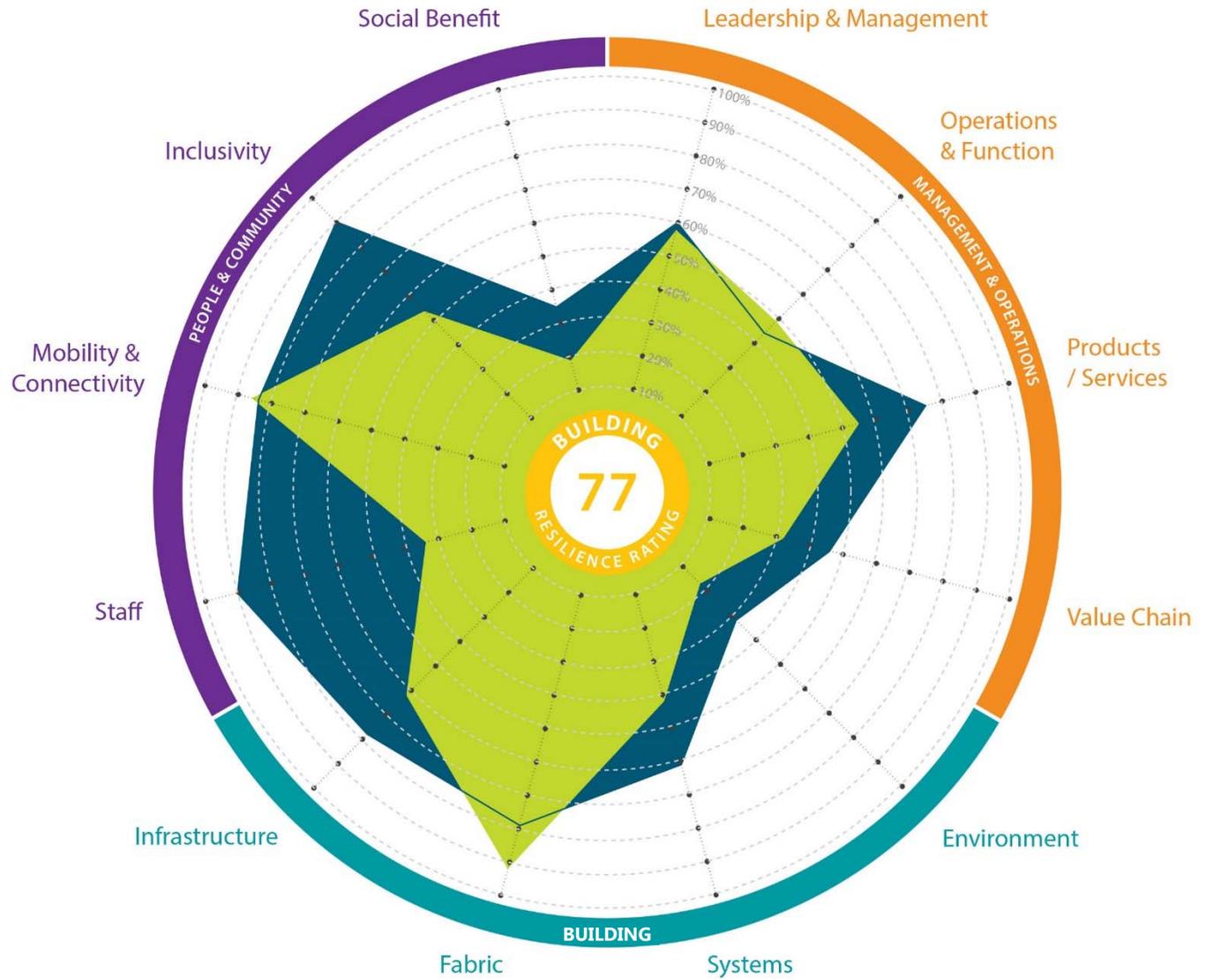
FAIL SAFES

CITY RESILIENCE



**BUROHAPPOLD
ENGINEERING**

BUILDING RESILIENCE



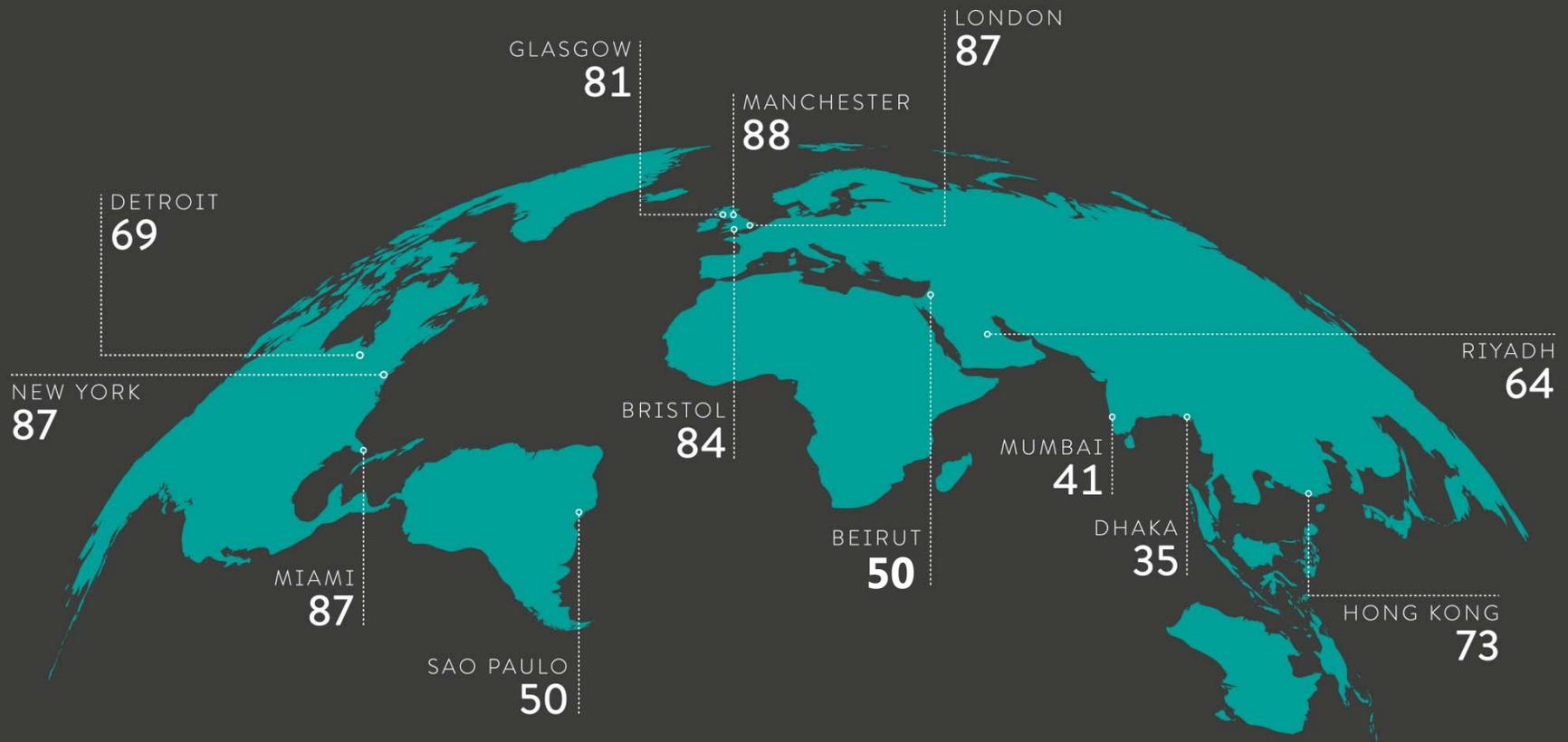
BUROHAPPOLD
ENGINEERING

HOW DO WE NEED TO ADAPT?

- EMBRACE TECHNOLOGY
- EDUCATION
- STRESS TESTING
 - WHAT IF SCENARIOS
 - RISK BASED
 - UNDERSTANDING UNCERTAINTY
 - CONSIDER SHOCKS, STRESSES AND FUTURE TRENDS
 - PERFORMANCE BASED
 - FAIL-SAFE DESIGN
 - CONSIDER WIDER SOCIETAL & ECONOMIC EFFECTS OF FAILURE



BUROHAPPOLD
ENGINEERING



Thank You!

risk&resilience@burohappold.com