



GREENPRINT FOR CITIES

mainstreaming green infrastructure
in urban environments

*die planungsstrategie grüne infratraktur
im städtischen bereich etablieren*

WORLD GREEN INFRASTRUCTURE CONFERENCE | DESIGNING WITH NATURE
TOM ARMOUR | 20 -22.06.2017 | WGIC 2017 BERLIN

ARUP

1 Creating a strong business case
Einen stabilen und nachhaltigen Anwendungsbereich entwickeln

2 Mainstream green infrastructure
Die Planungsstrategie Grüne Infrastruktur etablieren

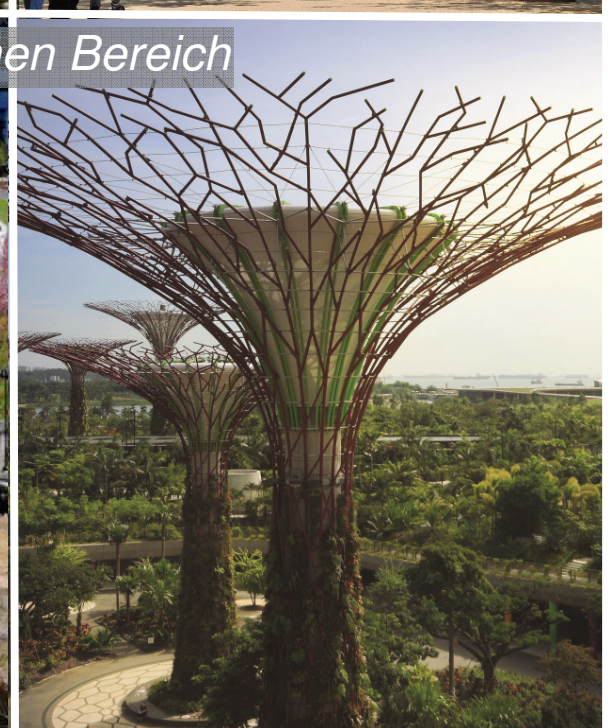
CENTRAL PARK, NEW YORK

From aesthetic to functional...





High performance infrastructure in urban areas



Hochleistungsinfrastruktur Grün im städtischen Bereich



Social, environmental, economic benefits

the benefits of green infrastructure

environmental benefits

Improved visual amenity

Enhanced microclimate

Improved air quality

Reduced flood risk

Better water/ soil quality

Water storage and reuse

Improved biodiversity

Reducing ambient noise

economic benefits

Increased property prices

Increased land values

Faster property sales

Encouraging inward investment

Reducing building energy costs

Faster planning permission

Improving areas for tourism

Lowering healthcare costs

social benefits

Encouraging physical activity

Improving childhood development

Improved mental health

Faster hospital recovery rates

Lowering stress

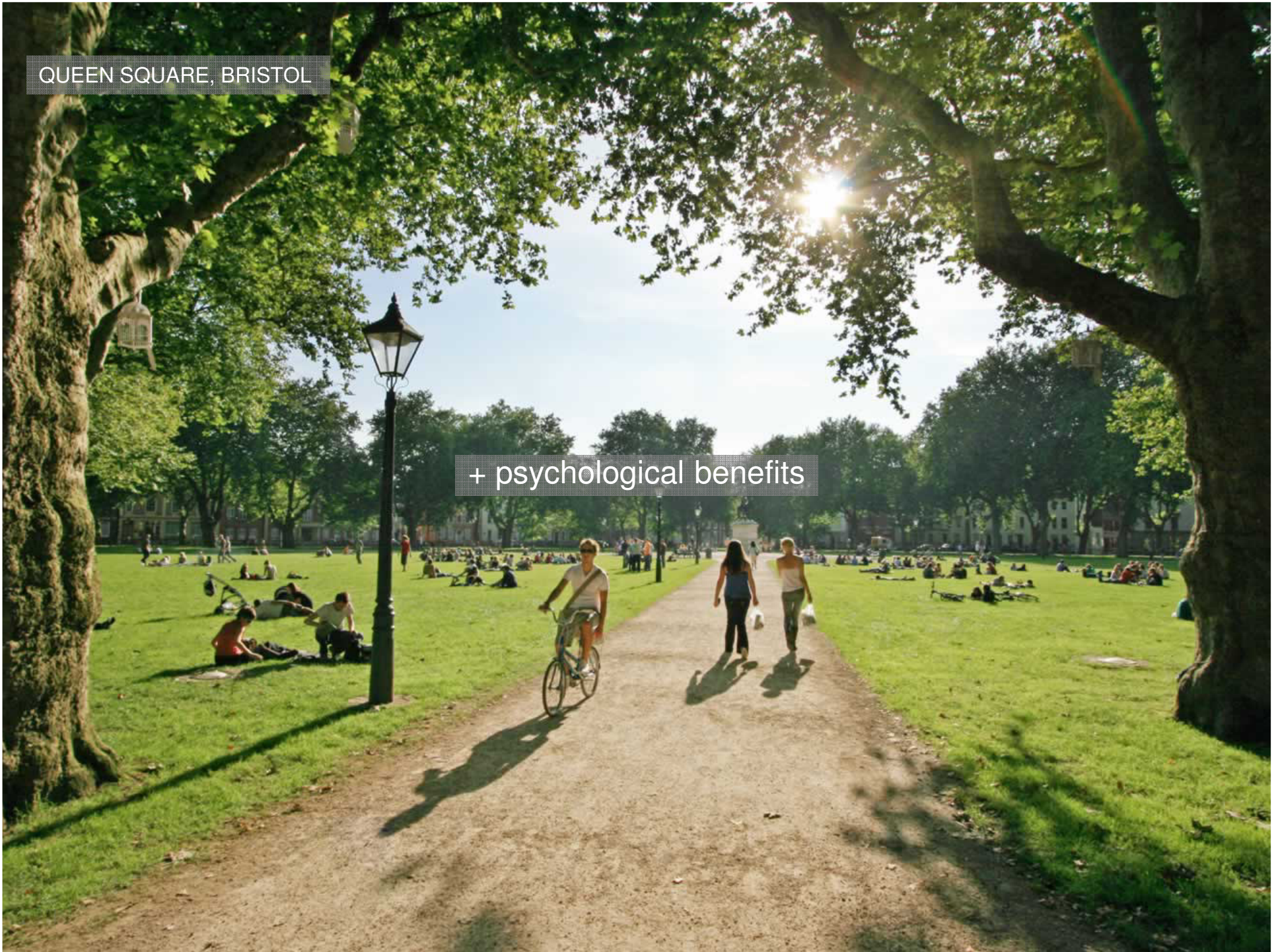
Improved workplace productivity

Increasing social cohesion

Reducing crime

QUEEN SQUARE, BRISTOL

+ psychological benefits



QUEEN ELIZABETH OLYMPIC PARK, LONDON

+ climate change resilient



BANGKOK 2011

© SHUTTERCOCK

Climate change is costing the world more than \$1.2 trillion annually

CLIMATE CHANGE VULNERABILITY MONITOR (2015) - DARA GROUP AND CLIMATE VULNERABLE FORUM

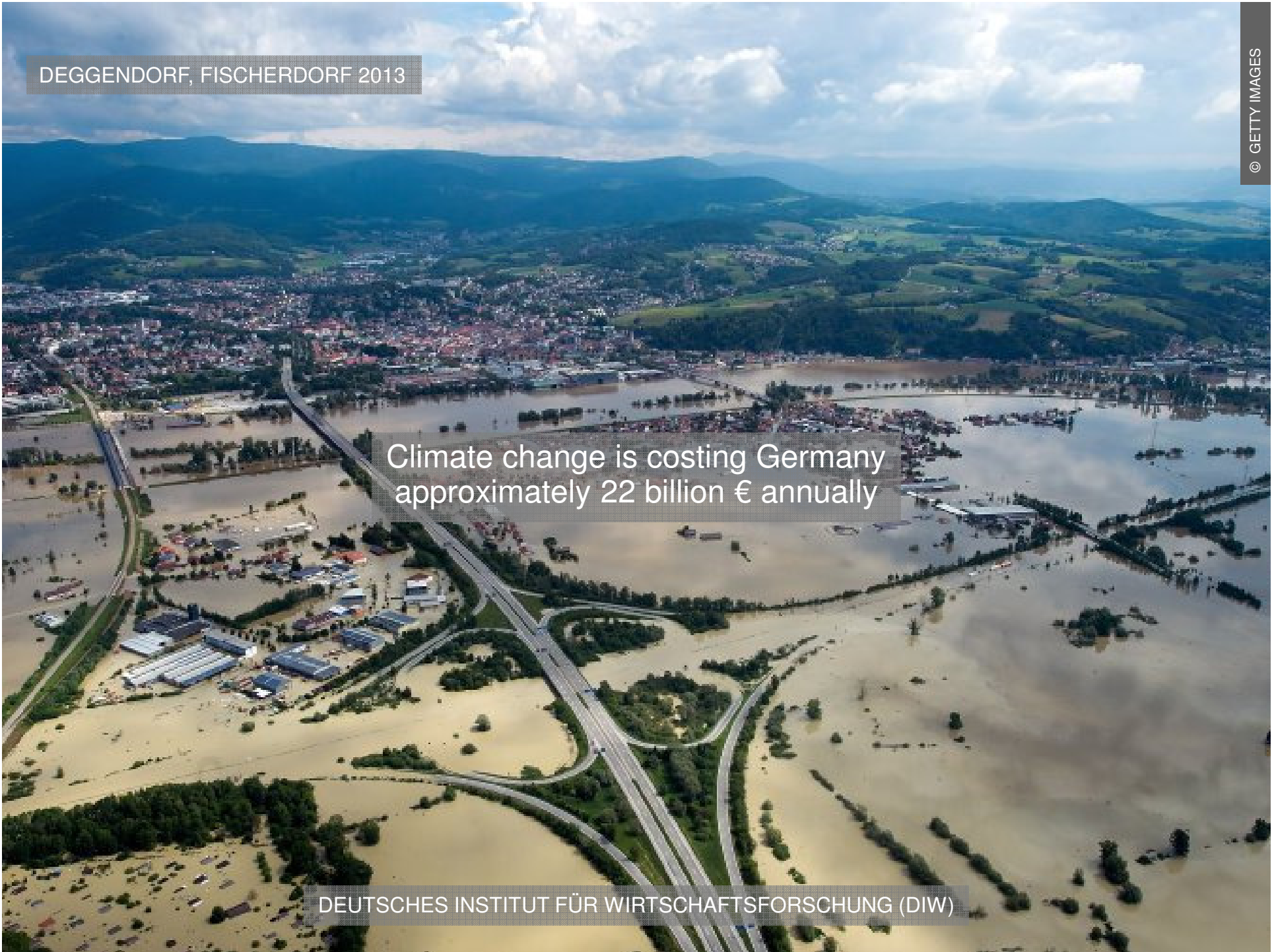


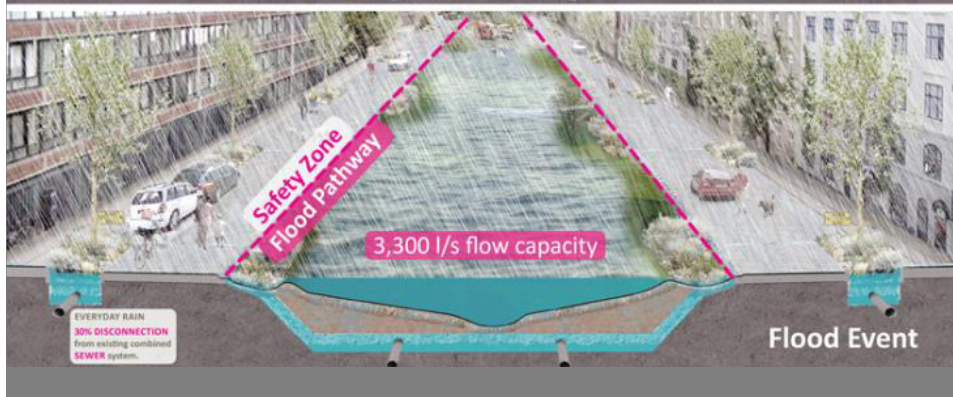
DEGGENDORF, FISCHERDORF 2013

© GETTY IMAGES

Climate change is costing Germany
approximately 22 billion € annually

DEUTSCHES INSTITUT FÜR WIRTSCHAFTSFORSCHUNG (DIW)





green infrastructure is often cheaper
than traditional solutions

Copenhagen 'Cloudburst project'

£610m

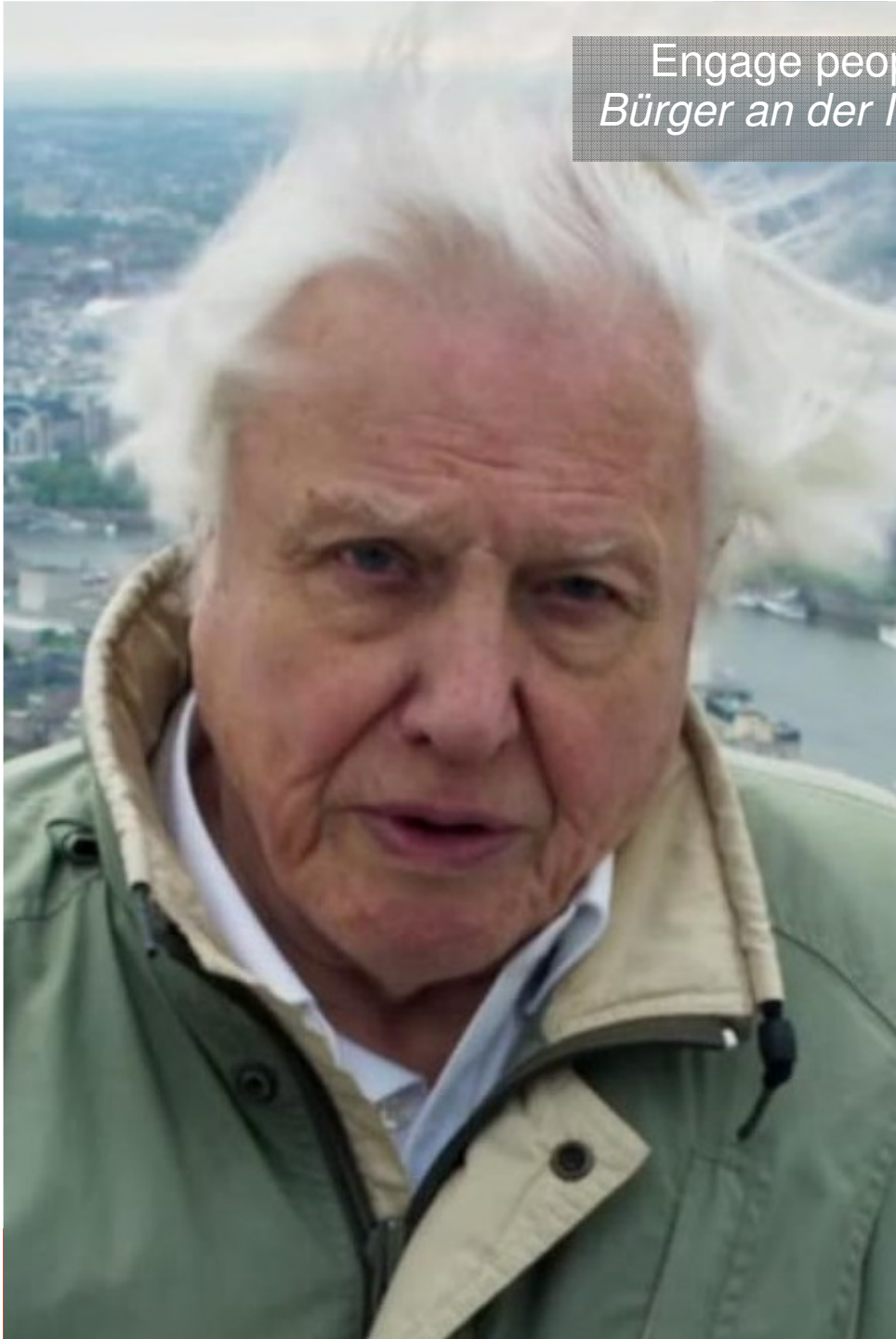
Cost of rectifying a single flood
event in 2011

£410m

Cost of implementing a
sustainable drainage project

SOURCE: LONDON INFRASTRUCTURE PLAN 2015 | LANDSCAPE
INSTITUTE POSITION PAPER ON GREEN INFRASTRUCTURE (2012)

Engage people in our quest
Bürger an der Initiative beteiligen



Mainstream green infrastructure
Die Planungsstrategie Grüne Infrastruktur etablieren

analyse the resource

Number of trees = 8,421,000

Canopy cover = 21% of area

Air pollution removal = 2240 tonnes / year (£126m)

Storm alleviation = 3,414,000 m³ (£2.8m)

Carbon storage = 2,367,000 tonnes (£147m)

Carbon sequestration = 77,200 tonnes/year

Building energy reduction = £260,000/ year

Structural value (cost of replacement) = £6.12bn

Asset Value (CAVAT) = £43.3bn

VALUING LONDON'S URBAN FOREST

Results of the London
i-Tree Eco Project





Green infrastructure

We can enhance and expand the All London Green Grid, so that by 2050 we will have a network of green infrastructure providing flood protection, shade, biodiversity, space for cycling, walking and recreation, and a more attractive environment.

THE ALL LONDON GREEN GRID
FRAMEWORK PLAN

- Strategic corridors
- Strategic links
- ▨ Metropolitan park opportunities
- ▨ Regional park opportunities
- Regional parks
- Metropolitan parks
- District parks
- Local parks & open spaces
- Other/private spaces
- Strategic walking routes
- Strategic cycling routes

Source: Greater London Authority

By 2050, across the city we will need:

An additional 1.5 million homes



A 20% increase in energy supply capacity

10% more green cover in central London and town centres



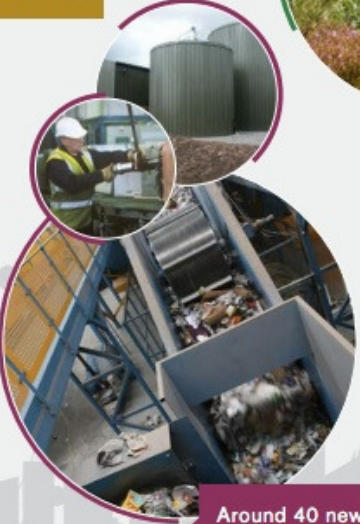
A 70% increase in public transport capacity



High speed digital connectivity



Over 600 more schools and colleges



Around 40 new waste facilities

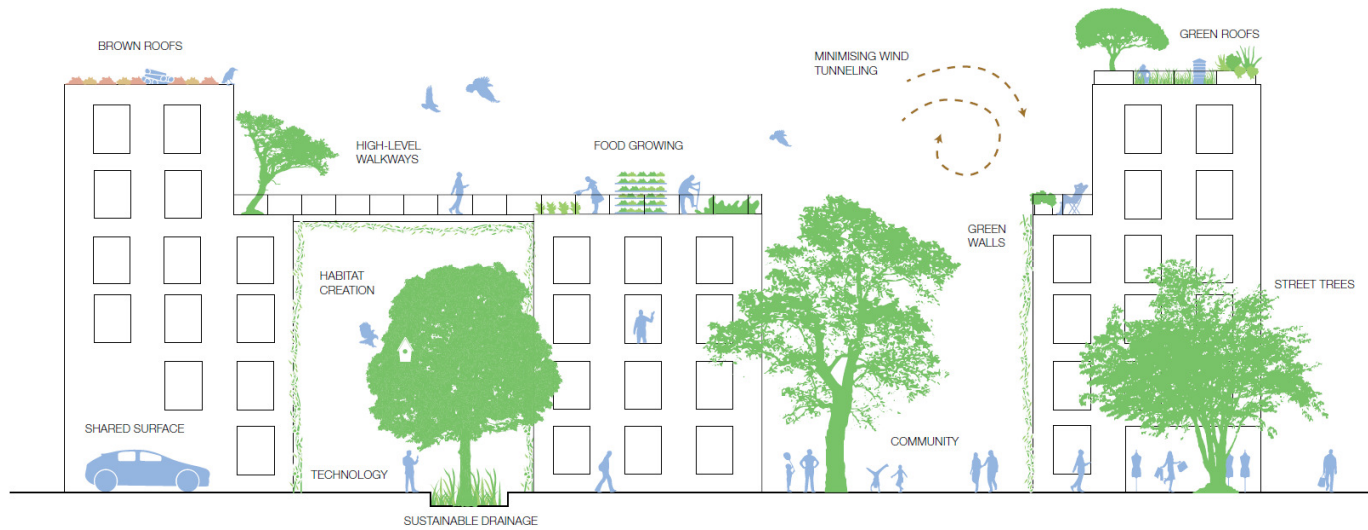
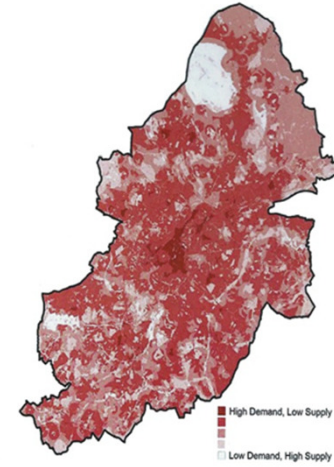


An extra 9000ha of accessible green space



Thames Tideway Tunnel (sewer)

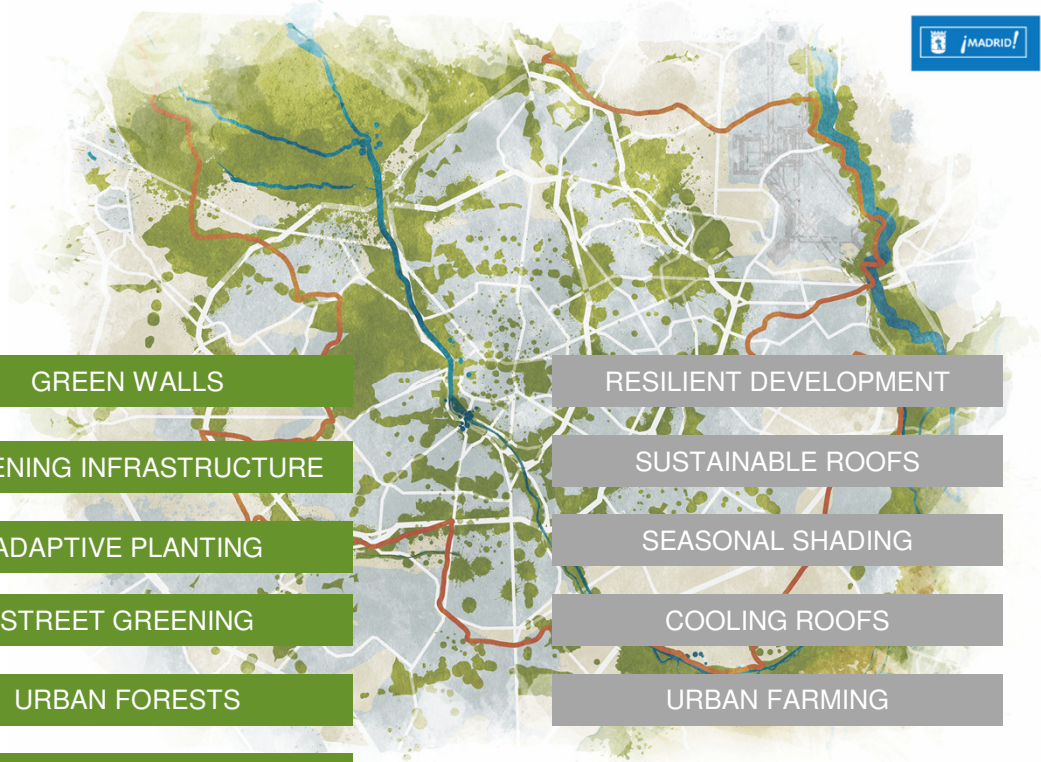
weave it in at all scales



VAUBAN, FREIBURG GERMANY



madrid + natural



- SUSTAINABLE DRAINAGE
- PERMEABLE SURFACES
- MICROCLIMATES w WATER
- TEMP FLOODABLE AREAS
- RIVER+STREAM RESTORATION

- GREEN WALLS
- GREENING INFRASTRUCTURE
- ADAPTIVE PLANTING
- STREET GREENING
- URBAN FORESTS
- PLANTING DERELICT LAND

- RESILIENT DEVELOPMENT
- SUSTAINABLE ROOFS
- SEASONAL SHADING
- COOLING ROOFS
- URBAN FARMING



temporary can become permanent



temporary can become permanent



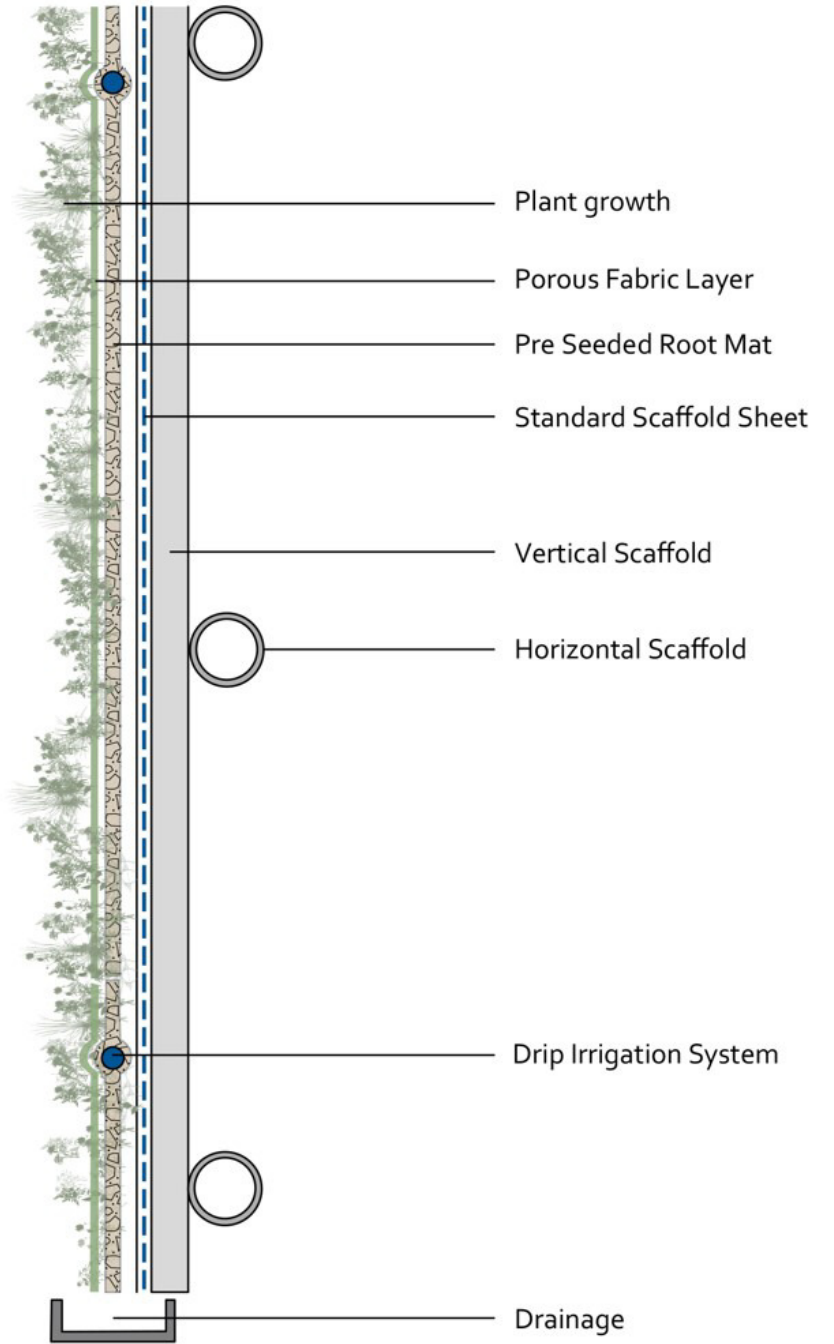
temporary can make a significant impact



the living wall

1-2
3-4





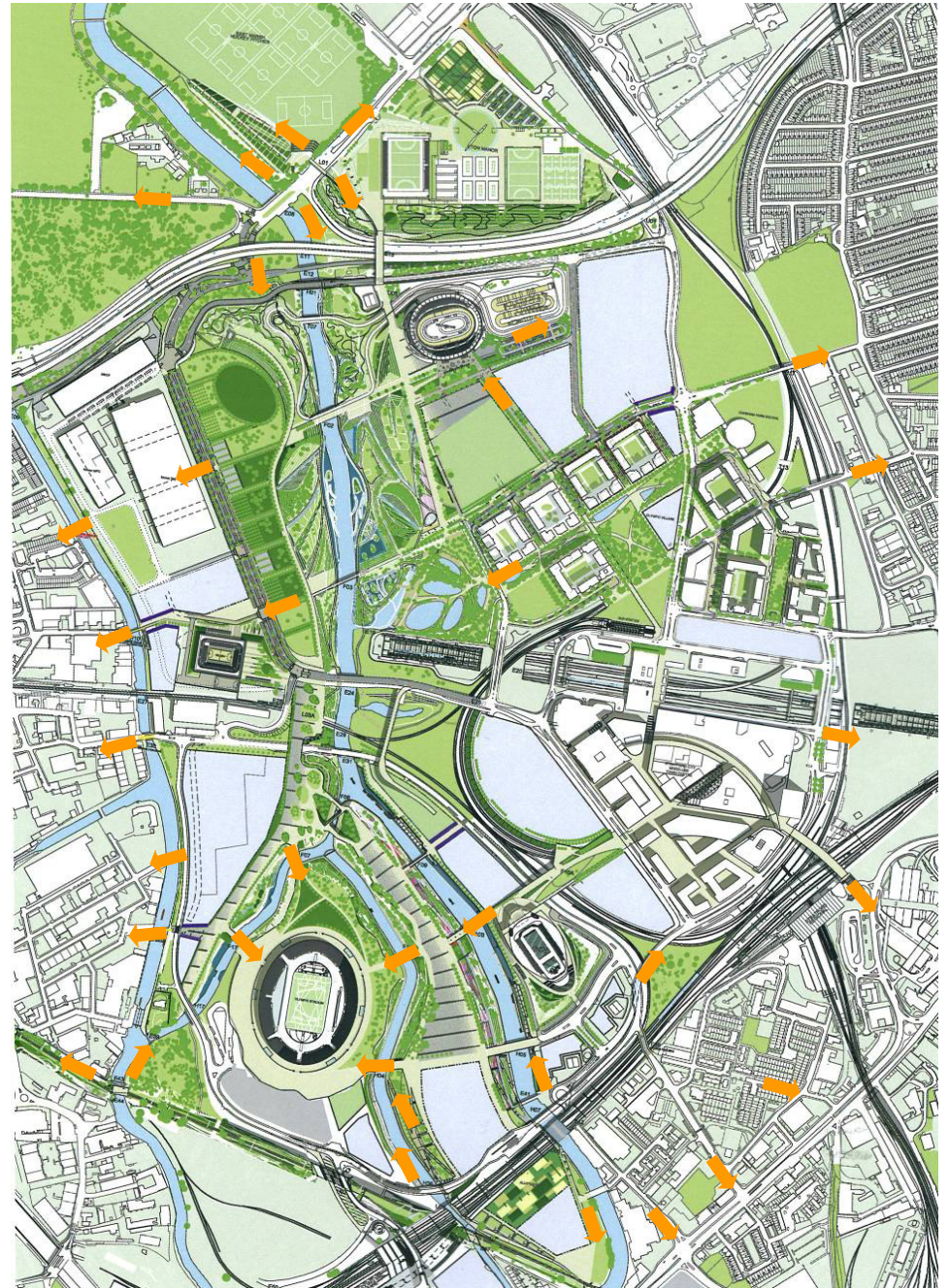
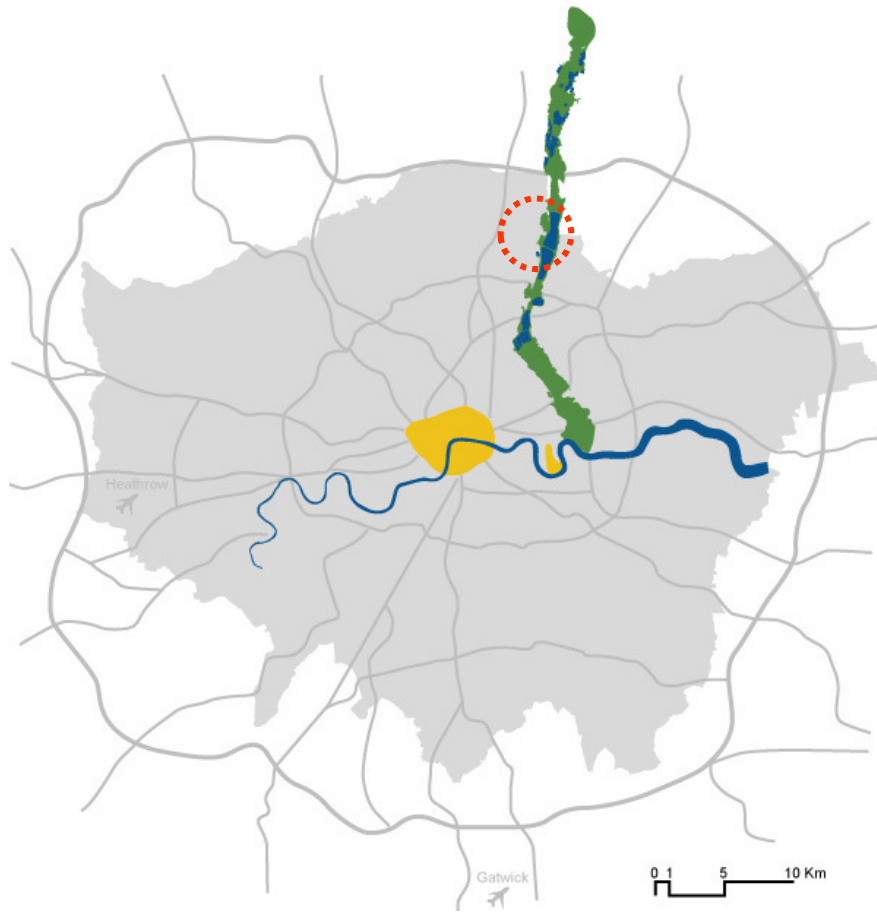
CHELSEA FLOWER SHOW 2017
RHS Greening Grey Britain Garden
Nigel Dunnett
Arup Living Wall







Opportunities of infrastructure and regeneration projects



London 2012 – Queen Elizabeth Olympic Park





Madrid Rio Project

Are we using all the space?



all built components can contribute



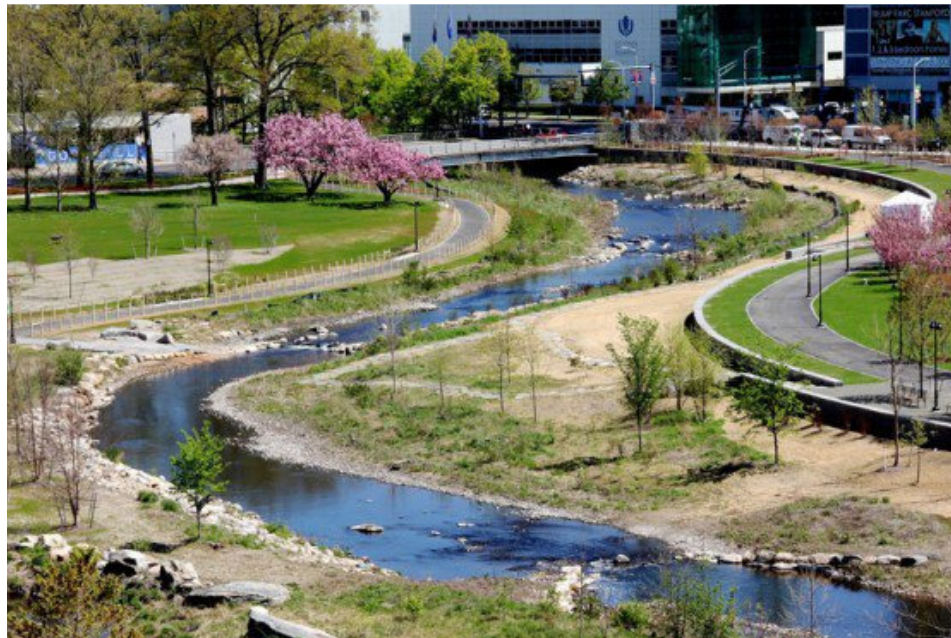






think grey to green

think grey to green



BIOTOP PARK QUNLI, HAERBIN CHINA

+ scale of response

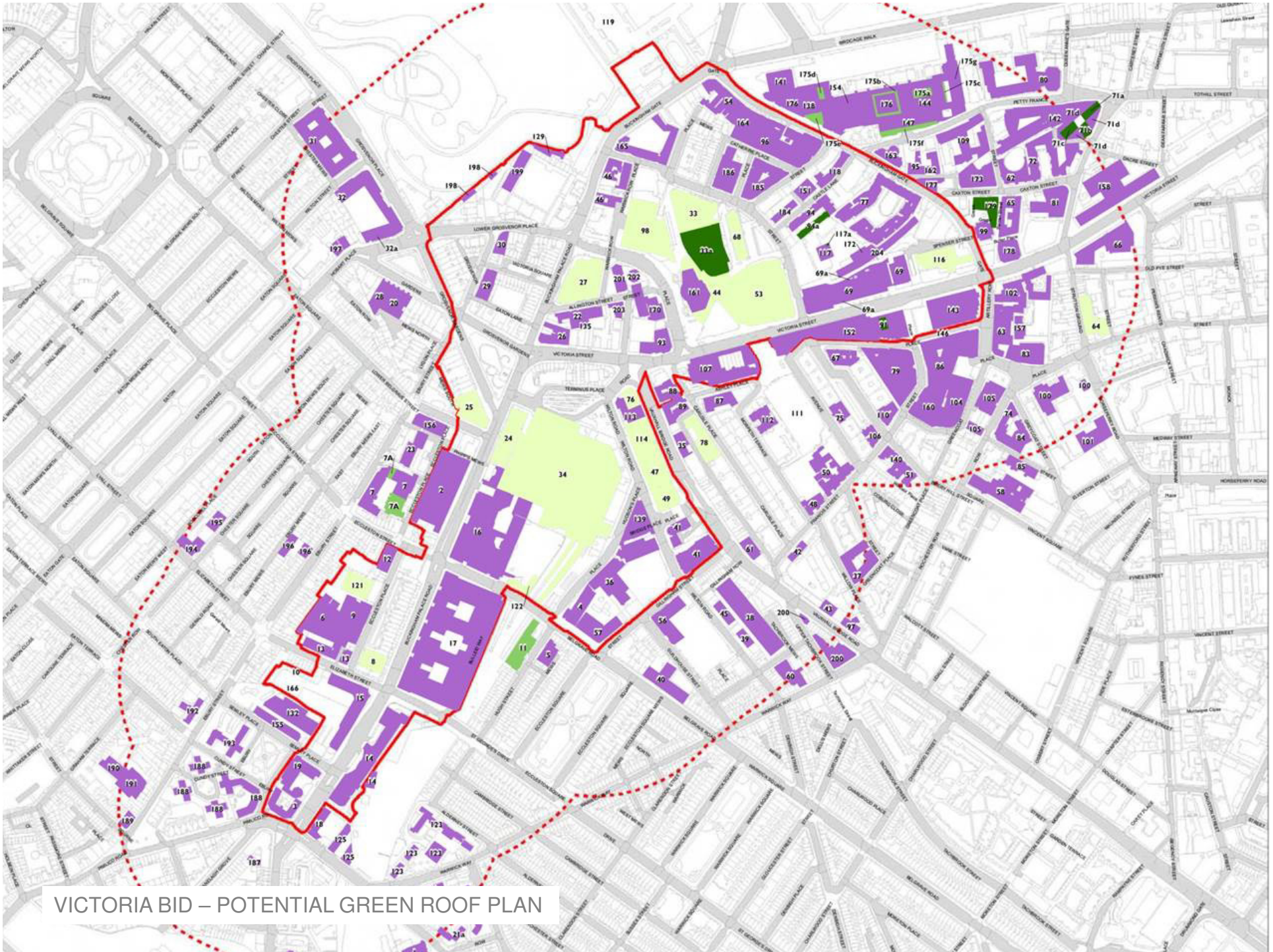




utilise derelict land







VICTORIA BID – POTENTIAL GREEN ROOF PLAN



thank you