



CLAIRO CONFERENCE: LIVABLE AND CLIMATE RESILIENT EUROPEAN CITIES

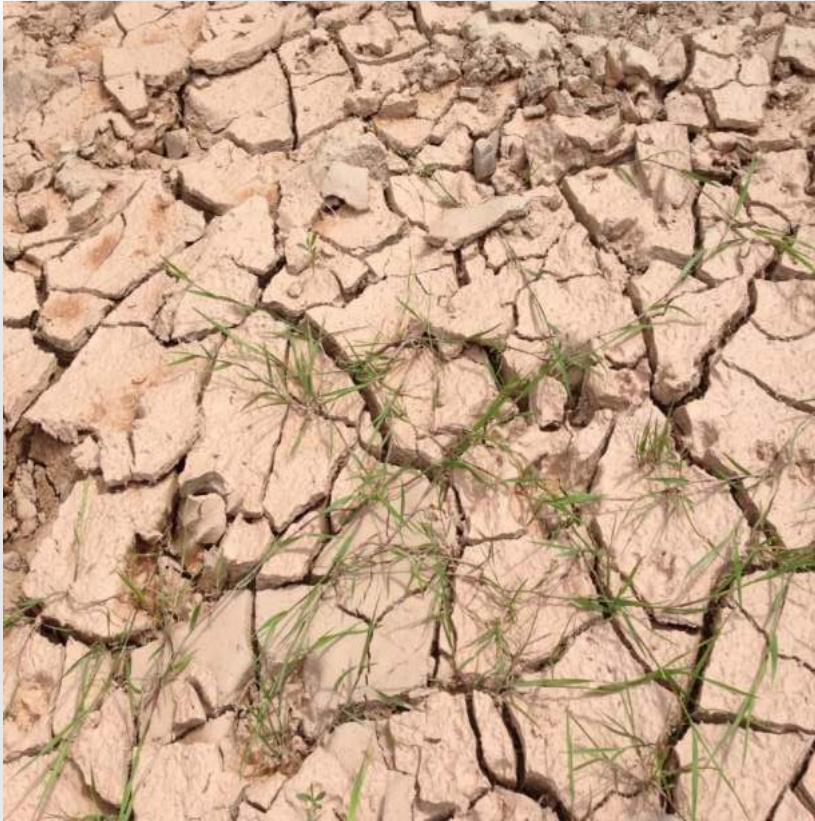
Nature-based solutions: attractive options to tackle climate change impacts

Birgit Georgi

22 March 2022



CLIMATE CHANGE IMPACTS



CLIMATE CHANGE ADAPTATION MEASURES



soft



grey

CLIMATE CHANGE ADAPTATION MEASURES



soft

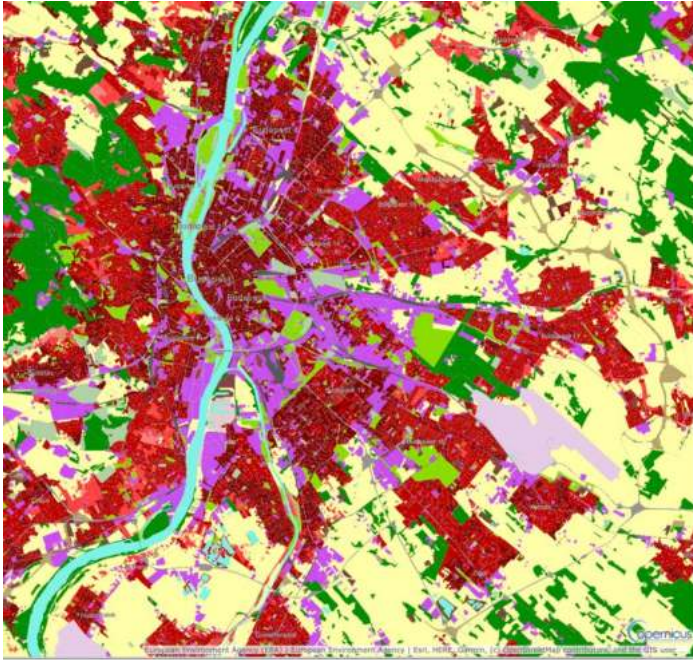


grey



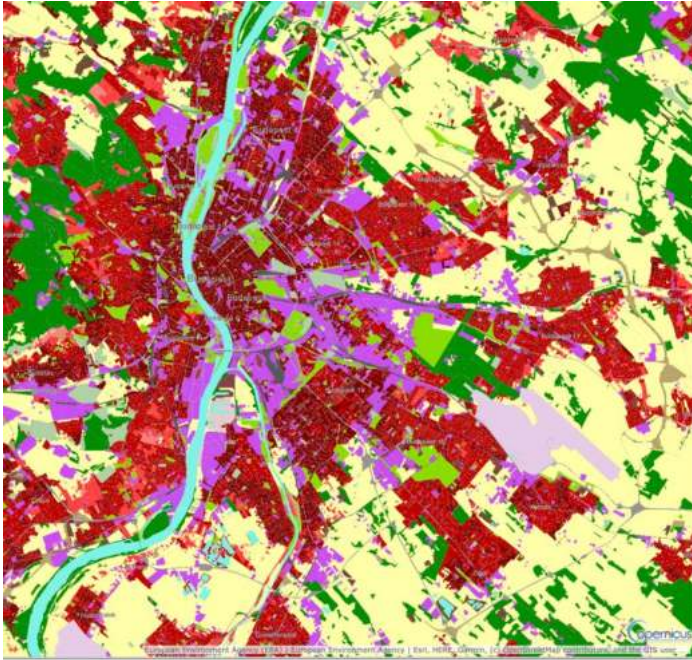
green / blue

GREENSPACE AND TEMPERATURE

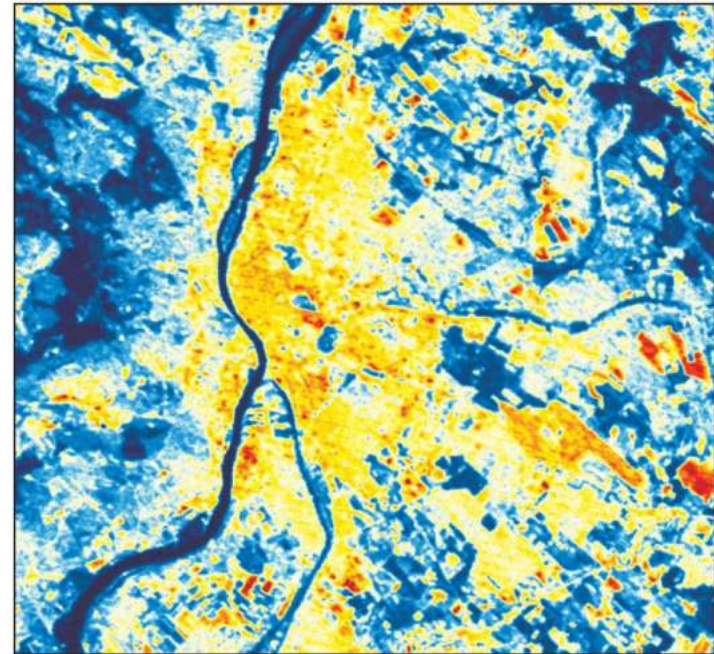


Urban land use in Budapest
Urban Atlas 2006

GREENSPACE AND TEMPERATURE



Urban land use in Budapest
Urban Atlas 2006



Surface temperature of Budapest, 1 August 2005, 9:30 CET

Temperature (°C)

≤ 15	16	19	22	25	28	31	34	35	36	37	40	43	≥ 45
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Urban Heat island effect

BENEFITS FOR TACKLING HEAT

- Reduce the heat storage capacity of urban surfaces,
- Reduce air temperature,
- By shading and increased evapotranspiration
- Can support ventilation and bringing cool air into the city



MODELLING IN SALZBURG SUGGESTS THAT ...

doubling the reflectivity of
sealed surfaces (roofs, walls and
pavements)

+

reducing sealed surfaces by 30 %

+

greening 50 % of roof surfaces

+

increasing the number of trees
by 50 %

+

replacing bare soil with grass



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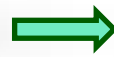
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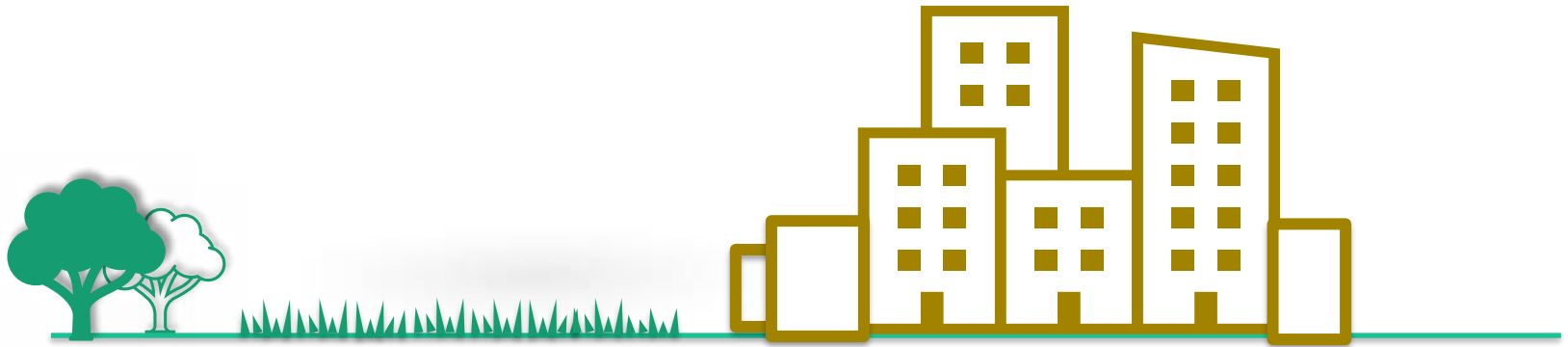


same number of hot days in 2050
as in 1981-2010,

with a chance that the denser
urban areas of the city could be
**even cooler than in the historical
period**

URBAN HEAT ISLAND

Day



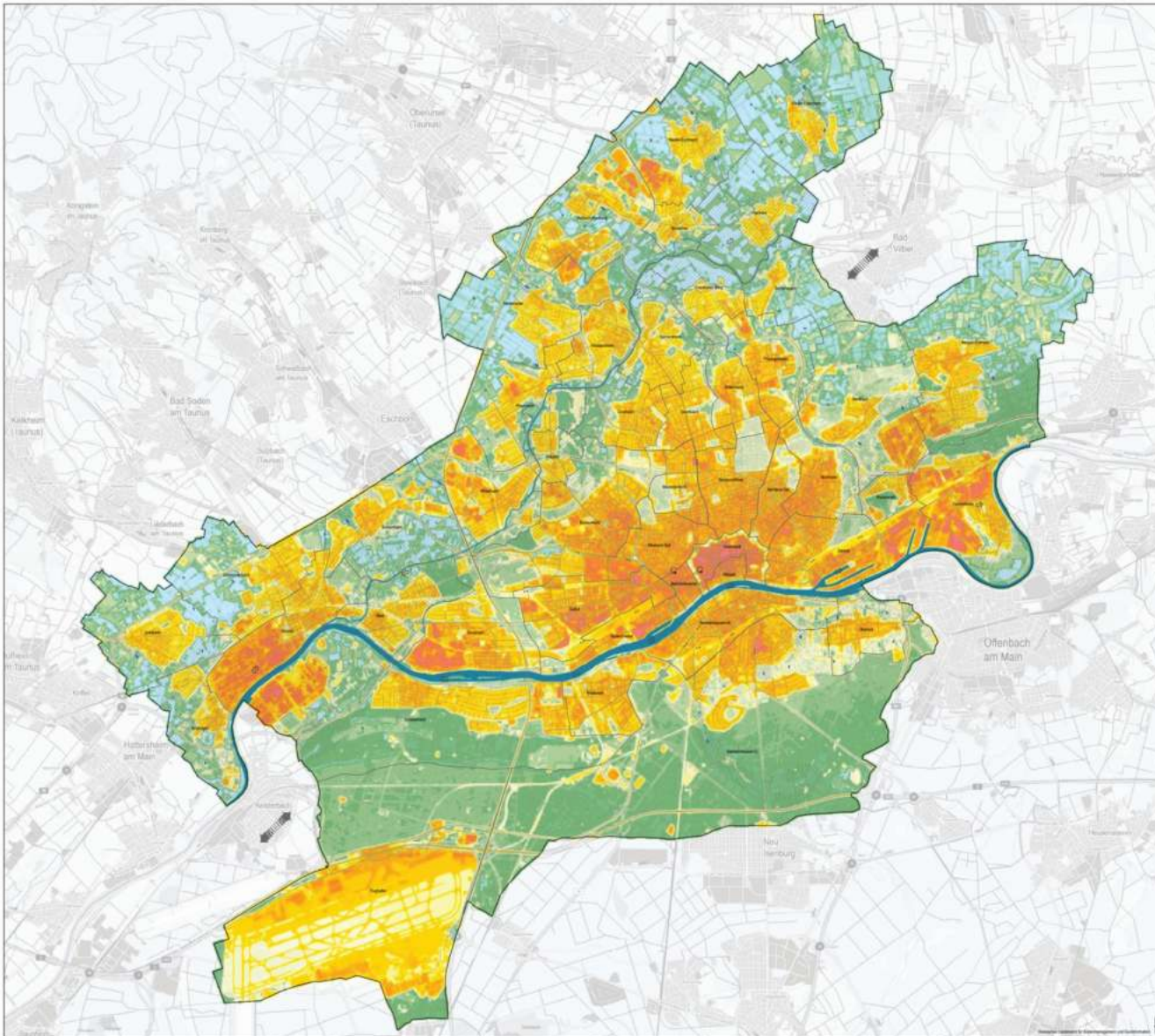
Temperature

URBAN HEAT ISLAND AND THE CHIMNEY EFFECT

Night



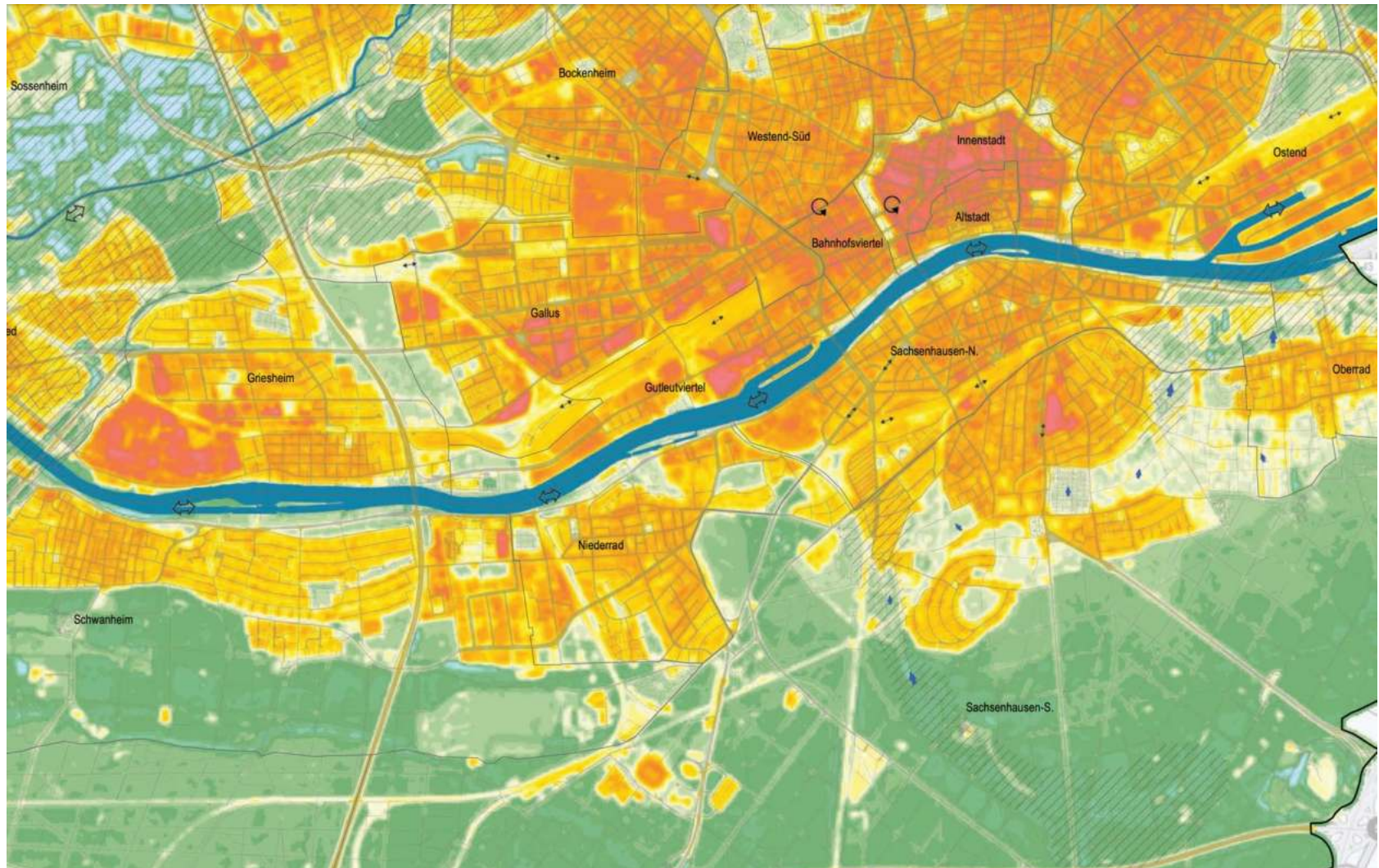
KLIMAPLANATLAS
Frankfurt am Main
Klimafunktionskarte 2016



Thermische Komponente:		
Farbe	Name	Beschreibung
Gefährlich	Fluss- und Aufschmelzgefahr	Überhitzung mit 100° Gefährlichkeit: Flussgefahr , also mit sehr gefährlichen Temperaturen in Verbindung mit sehr gefährlichen Temperaturen und entsprechenden Gefahren
	Flussformierungsgefahr	Überhitzung mit 100° Gefährlichkeit: Wärme fließende Stoffe, können mit sehr hohen Temperaturen und sehr hohen Temperaturen in Verbindung mit sehr hohen Temperaturen
	Wack- und Übergangsgefahr	Überhitzung mit 100° Gefährlichkeit: Klein fließende Stoffe, können mit sehr hohen Temperaturen und sehr hohen Temperaturen in Verbindung mit sehr hohen Temperaturen
	Übergangsgefahr	Überhitzung mit 100° Gefährlichkeit: Übergangs , fließende Stoffe, können mit sehr hohen Temperaturen und sehr hohen Temperaturen in Verbindung mit sehr hohen Temperaturen
	Wackende Überhitzung	Überhitzung mit 100° Gefährlichkeit: Wackende , fließende Stoffe, können mit sehr hohen Temperaturen und sehr hohen Temperaturen in Verbindung mit sehr hohen Temperaturen
	Starke Überhitzung	Überhitzung mit 100° Gefährlichkeit: Starke , fließende Stoffe, können mit sehr hohen Temperaturen und sehr hohen Temperaturen in Verbindung mit sehr hohen Temperaturen

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FRESH AIR FOR FRANKFURT AM MAIN



FRESH AIR FOR FRANKFURT AM MAIN



Image: Birgit Georgi



Image: Birgit Georgi

NATURE-BASED SOLUTIONS – WHAT IS IT?



Image: Birgit Georgi

Green and blue space, trees



Image: Bundesanstalt für Wasserbau

Bioengineering



Image: Nourhan Hisham

SuDS



Image: Birgit Georgi

Working with nature /mimicking nature

DIFFERENT EFFECTIVITY OF NBS ON HEAT

Reduction in Temperature in °C; IGNITION project's evidence base

	Indoor air	Exterior wall/ surface	Ambient exterior air
Living wall	4.8	1.0 - 3.0	0.5 - 4.1
Green facade	1.7 - 4.0	0.4- 7.1	1.0 - 3.0
Green roof extensive	2.0 - 4.0	2.0 - 20	0.5 - 1.5
Green roof intensive	0.3 - 4.0	7.0 - 22.0	Average 1.0, max. 4.2
Trees		10.0 –12.0	0.9 - 5.2 (globe temperature: 3.8 - 15.0)
Urban green space			Daytime: 0.5 – 7.0 Nighttime: 1.2

BREDA CITY CENTRE, NL



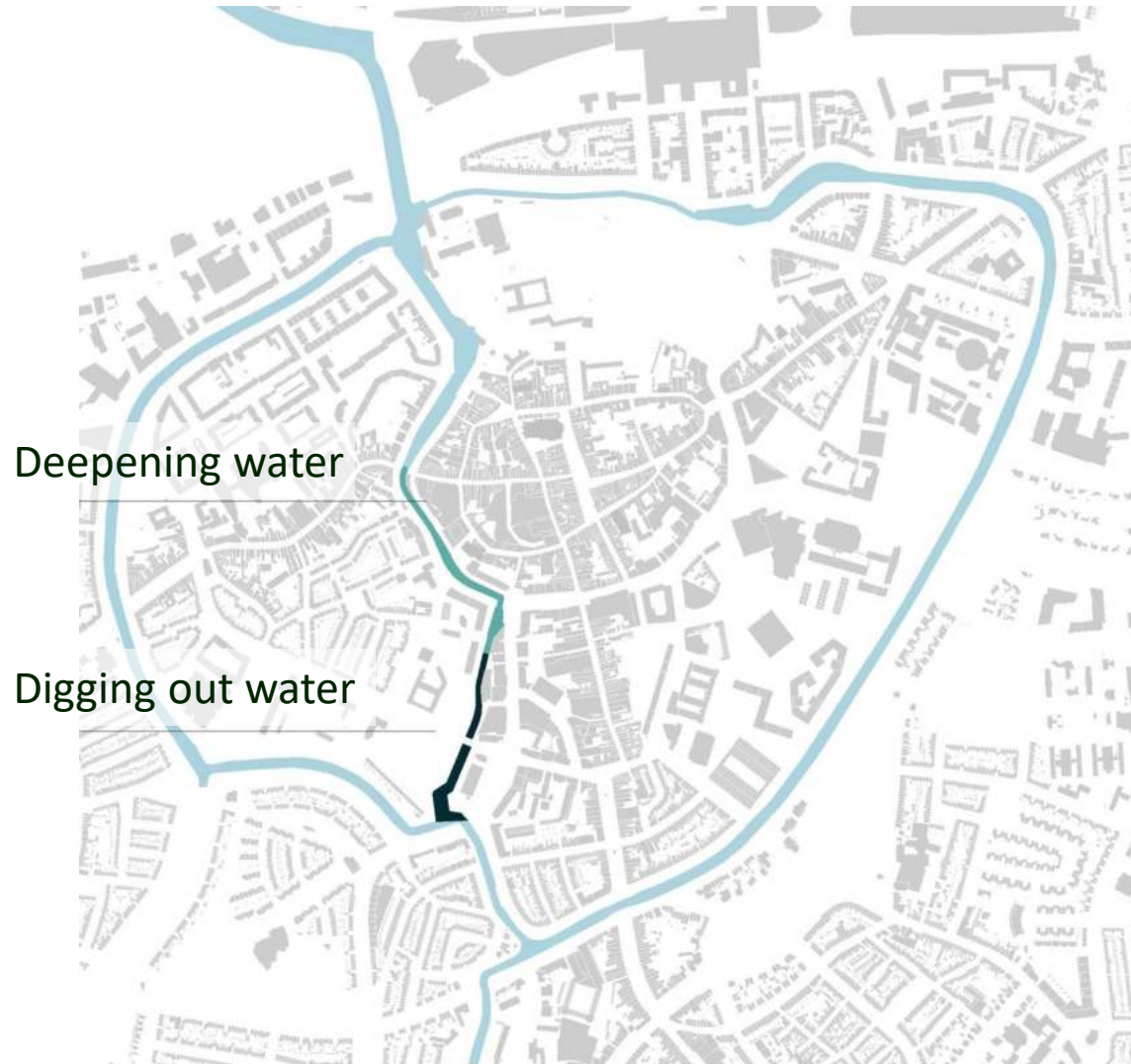
1941



1950s/60s

Image: Municipality of Breda

GreenQuays PROJECT BREDA, NL



GreenQuays BREDA

Nature-inclusive Quays



Image: Municipality of Breda

GreenQuays BREDA

Nature-inclusive Quays



Image: Municipality of Breda

VEGETATION AT SMALL-SCALE TEST SITE

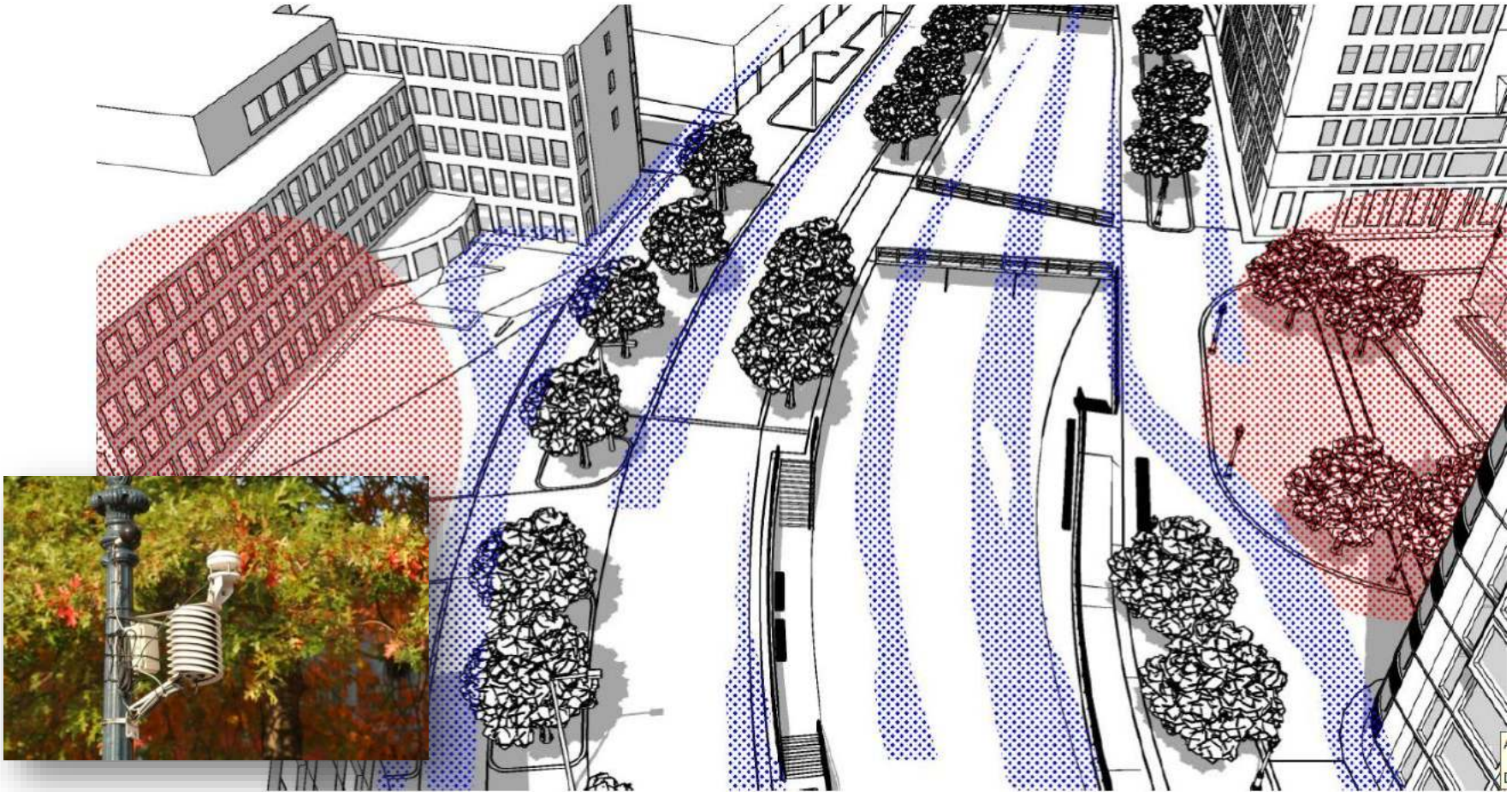


Nature-inclusive Quays



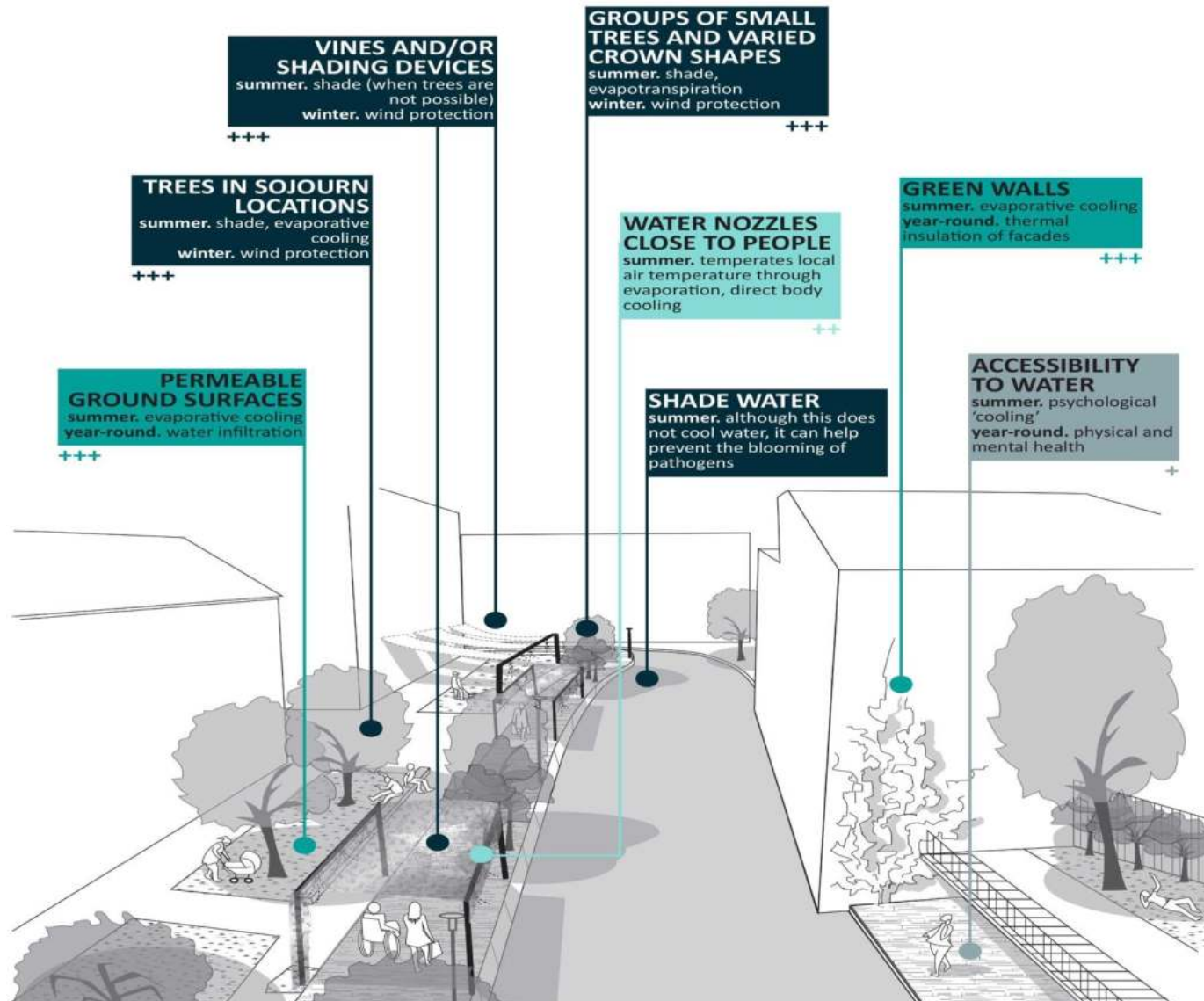
Images: Erwin van Herwijnen

CLIMATE RESPONSIVE DESIGN – GreenQuays

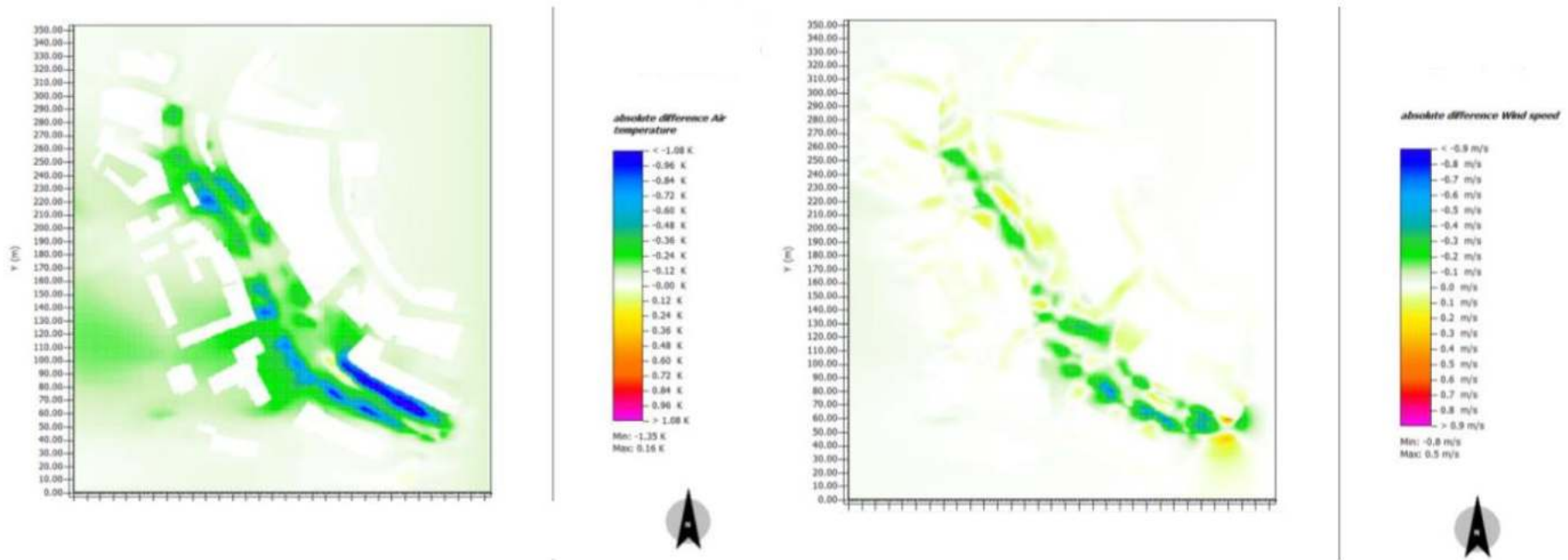


Example of the wind analyses made for the *Nieuwe Mark* project. The blue patches indicate wind flow and the red patches indicate likely wind blockage areas.

CLIMATE RESPONSIVE DESIGN GreenQuays



CLIMATE RESPONSIVE DESIGN – GreenQuays



Difference in modelled air temperature (left) and wind speed (right) between final design and existing situation of the Nieuwe Mark area at 11 am l.t. for 1 July 2015.

NOW



Image: Municipality of Breda

AND AFTER



Image: Municipality of Breda

NO SPACE FOR TREES?



Image: Birgit Georgi

GREEN WALLS AND ROOFS



TACKLING PLUVIAL FLOODING

Simple things ...



Image: Birgit Georgi

TACKLING PLUVIAL FLOODING

Simple things ...



TACKLING PLUVIAL FLOODING AND DROUGHT

Simple things ...



STORING STORMWATER IN BACKYARDS

Malmö Augustenburg



Image: Birgit Georgi

CLIMATE RESPONSIVE DESIGN - WATER

Manchester, West Gorton – GrowGreen project



Image: Birgit Georgi

CLIMATE RESPONSIVE DESIGN – WEST GORTON



CLIMATE RESPONSIVE DESIGN – WEST GORTON



Image: Birgit Georgi

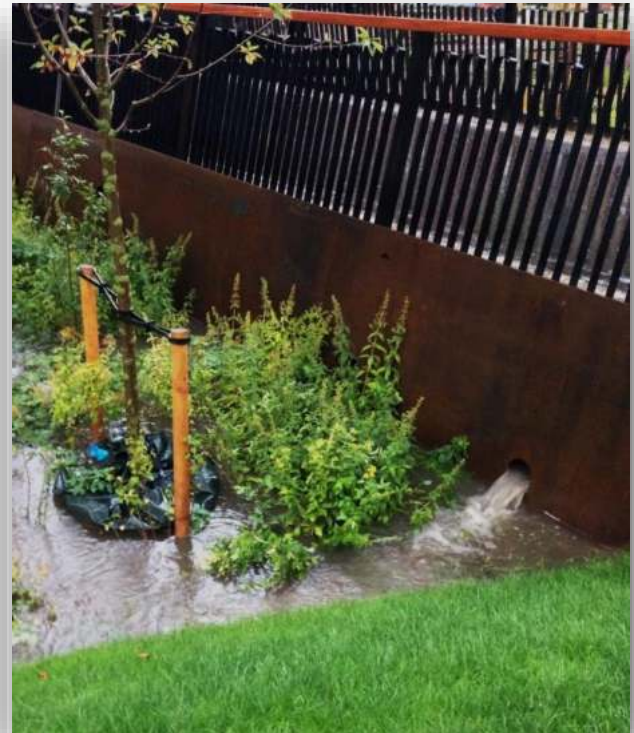
CLIMATE RESPONSIVE DESIGN – WEST GORTON



Image: Birgit Georgi

CLOUDBURST PLAN – COPENHAGEN

i.a., Green areas designed to store temporarily water in Copenhagen, St. Kjelds plads



Images: EVM Landskab

COMBINING DIFFERENT NBS

IGNITION Living Lab at the Campus in Salford, Greater Manchester



Image: Nourhan Heysham

2019

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IGNITION Living Lab at the Campus in Salford, Greater Manchester



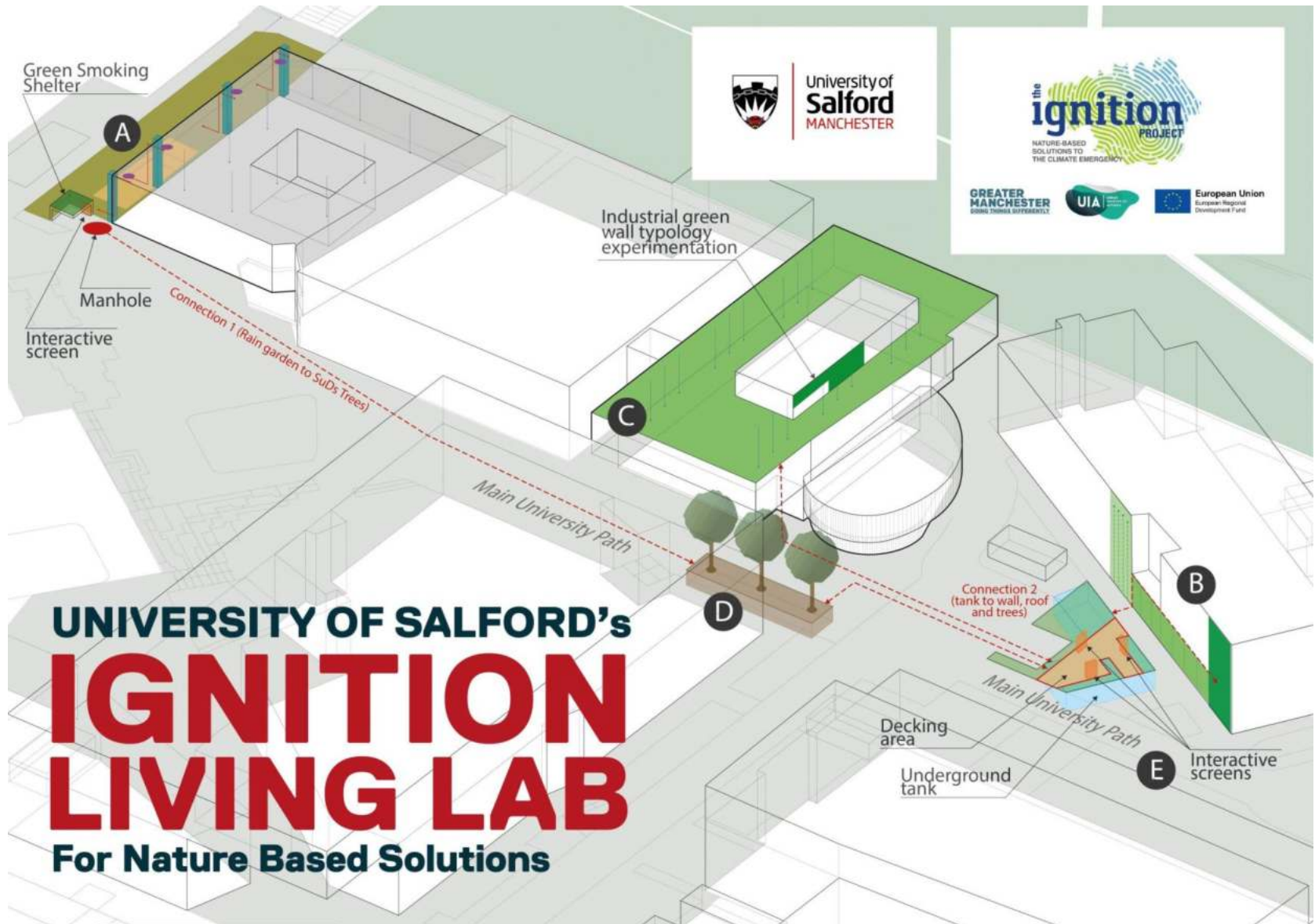
Image: Birgit Georgi

2021

PREFABRICATED GREEN WALL



LEARNING FROM COMBINING DIFFERENT NBS



RAINGARDEN



Image: IGNITION project

UNDERNEATH



Image: Nourhan Heysham

ABOVE GROUND



Images: Birgit Georgi

SUDS TREES



Image: Nourhan Heysham

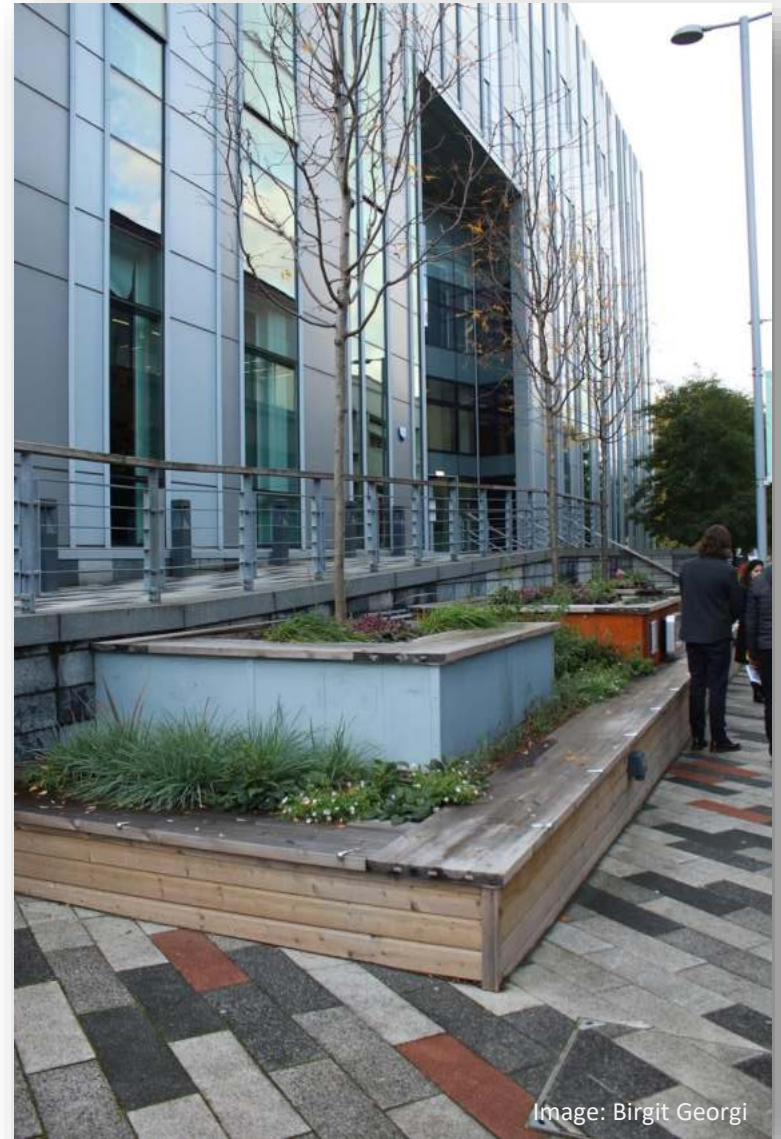


Image: Birgit Georgi

NBS THEMSELVES ARE **THREATENED**

by heat and drought



Image: Birgit Georgi

Use species adapted to new climate conditions

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Use rainwater

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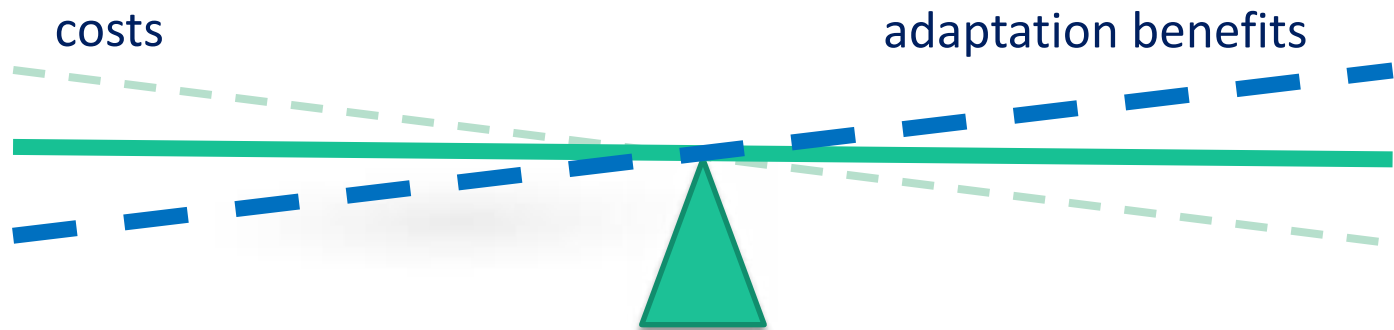
Use rainwater



Image: Nourhan Heysham

Use greywater recycling, smart irrigation and SuDS

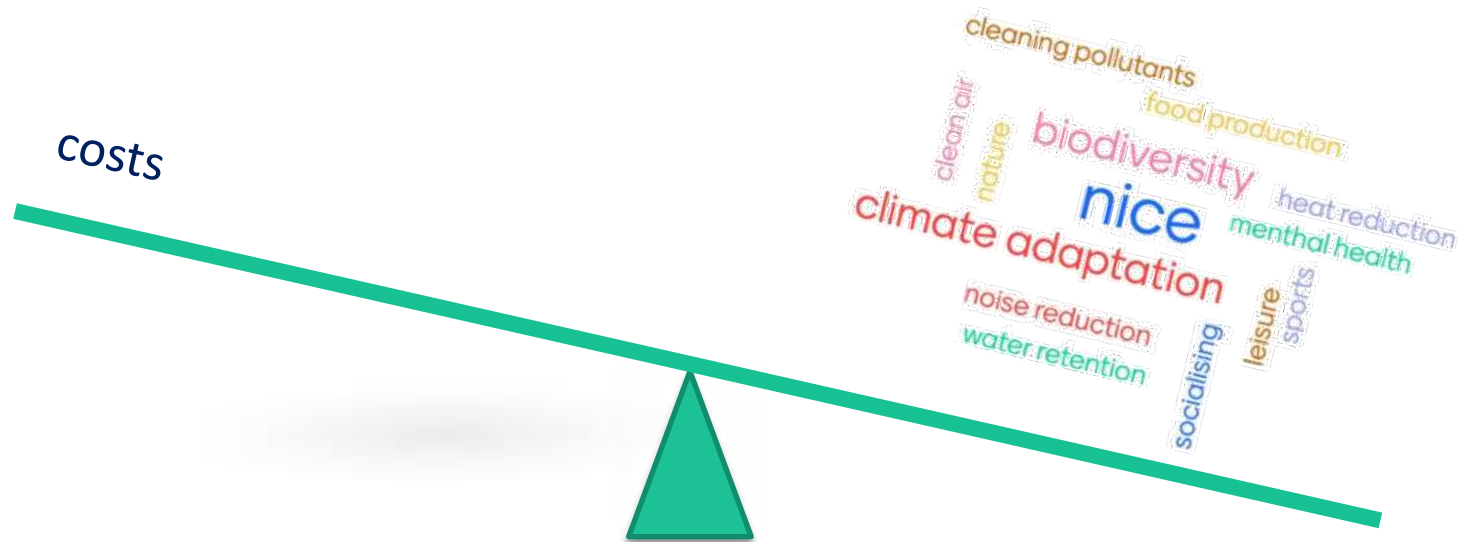
NBS = CHEAPER SOLUTIONS?



NATURE-BASED SOLUTIONS MANY BENEFITS



NBS = CHEAPER SOLUTIONS?



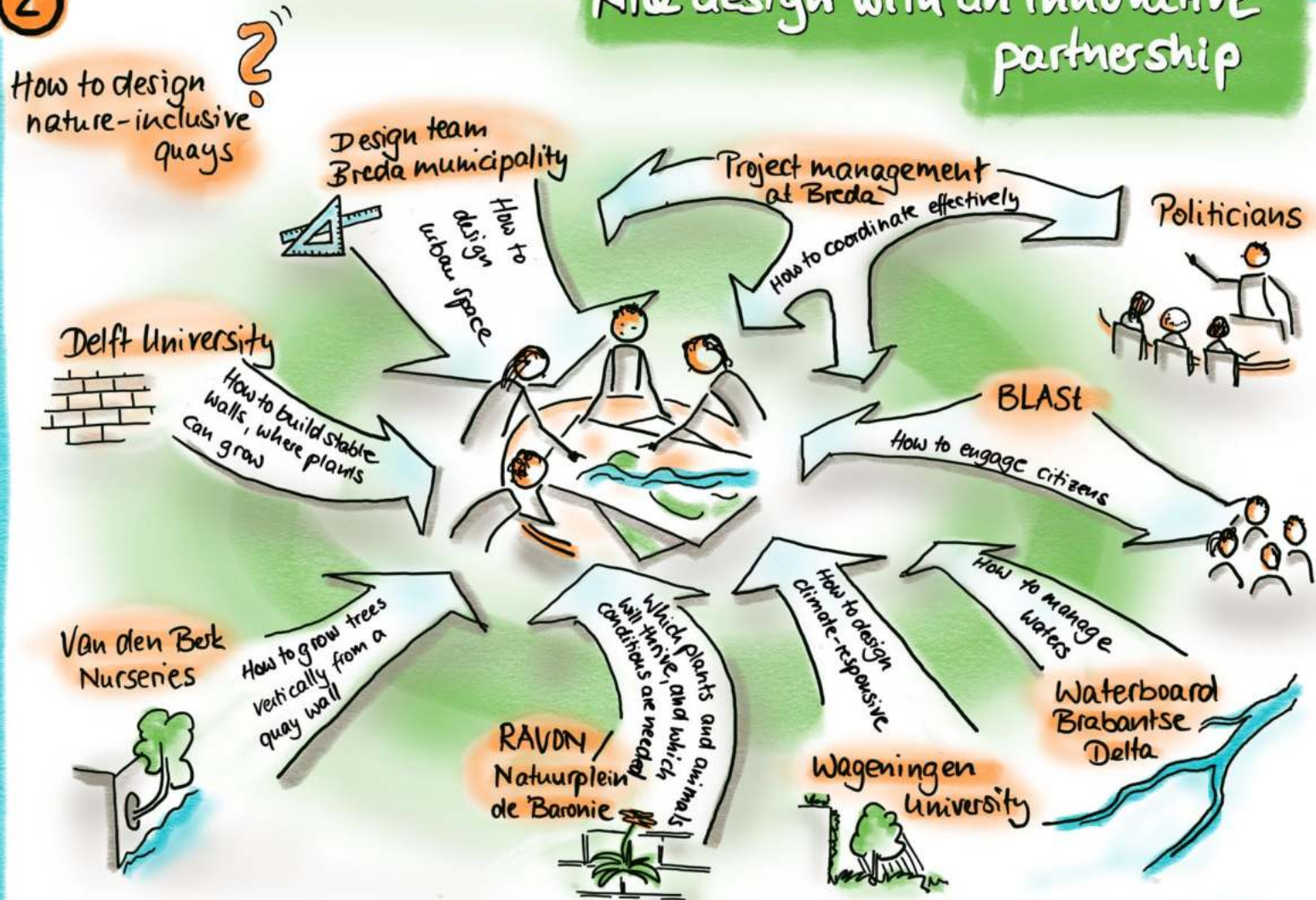
But multiple benefits do not come by themselves...

INTEGRATE!

GreenQuays

2

NIQ design with an innovative partnership



CO-CREATE!



Image: Birgit Georgi



Image: Ton Dassen

Image: GreenQuays

EMBRACE!

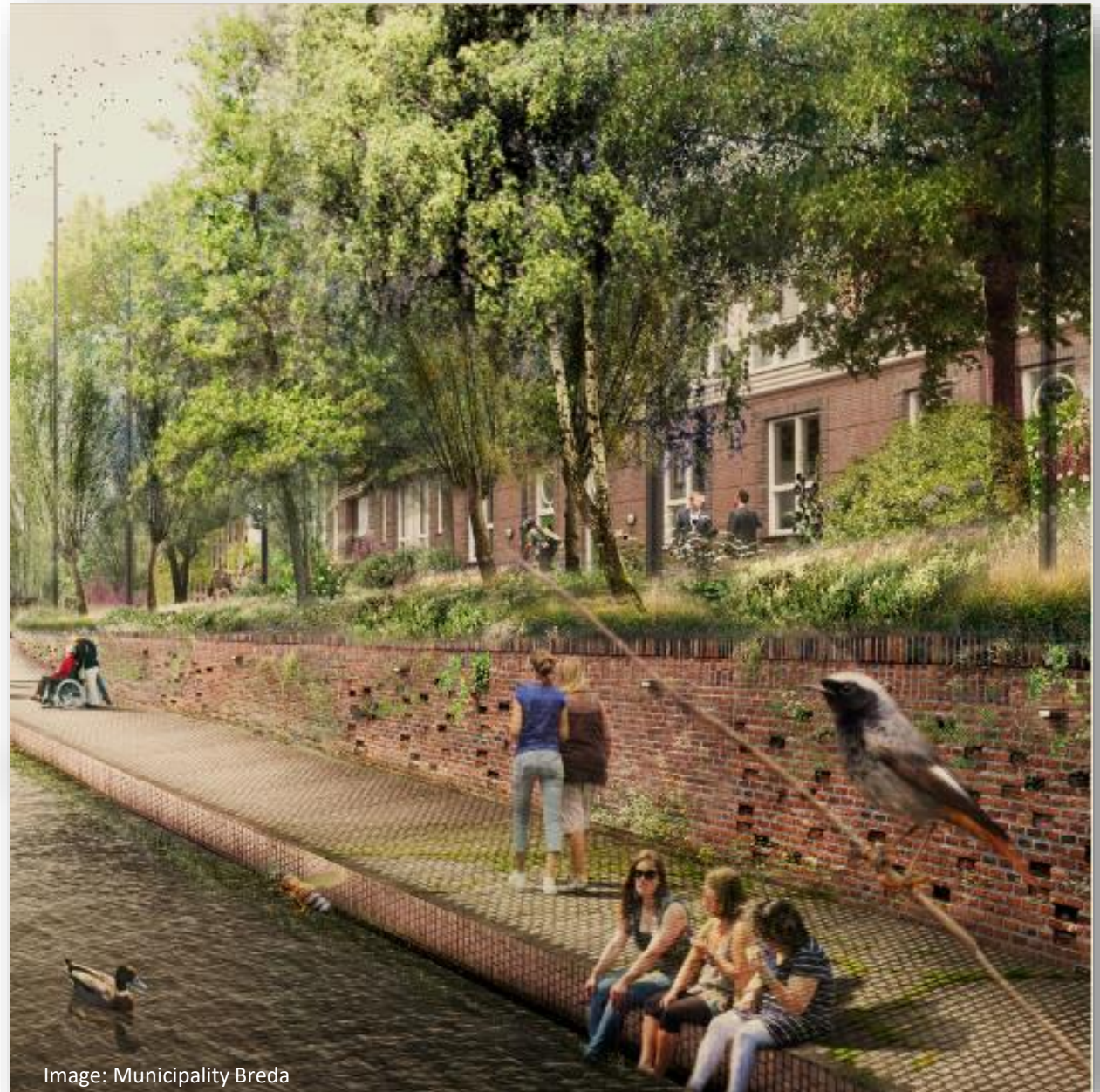


Image: Municipality Breda

Thanks you!

www.BirgitGeorgi.eu/



SOME RESOURCES

Urban adaptation in Europe: How cities and towns respond to climate change 2020

<https://www.eea.europa.eu/publications/urban-adaptation-in-europe>

See also the EEA reports on urban adaptation of 2016 and 2012

Nature-based solutions in Europe: Policy, knowledge and practice for climate change adaptation and disaster risk reduction

<https://www.eea.europa.eu/publications/nature-based-solutions-in-europe>

IGNITION project Greater Manchester (UIA): Evidence base of NBS

<http://www.ignitiongm.com/>

<https://www.uia-initiative.eu/en/uia-cities/greater-manchester>

<https://hub.salford.ac.uk/ignition-living-lab/living-lab/>

GreenQuays project Breda (UIA)

<https://www.greenquays.nl/>

<https://www.uia-initiative.eu/en/uia-cities/breda-call4>

Copenhagen Cloudburst plan <https://climate-adapt.eea.europa.eu/metadata/case-studies/the-economics-of-managing-heavy-rains-and-stormwater-in-copenhagen-2013-the-cloudburst-management-plan>