

Livable Cities Thriving with Water: *Artful, Technically Innovative, Integrated*

Herbert Dreiseitl

*Director, Liveable Cities Lab
Ramboll*



WHY DESIGN MATTERS; ARTFUL, TECHNICALLY INNOVATIVE, INTEGRATED STRATEGIES THAT WORK

Climate Adaptation Forum, Boston Jun. 08.2018

Herbert Dreiseitl, Liveable Cities Lab / Ramboll; www.ramboll.com/LCL



HOW CAN WE BRING BLUE-GREEN INTO GRAY CITIES ?!



Soon 2/3 of mankind will live in Cities

This creates increasing pressure on Nature and the Environment

Green disappears and Blue is displaced to Underground

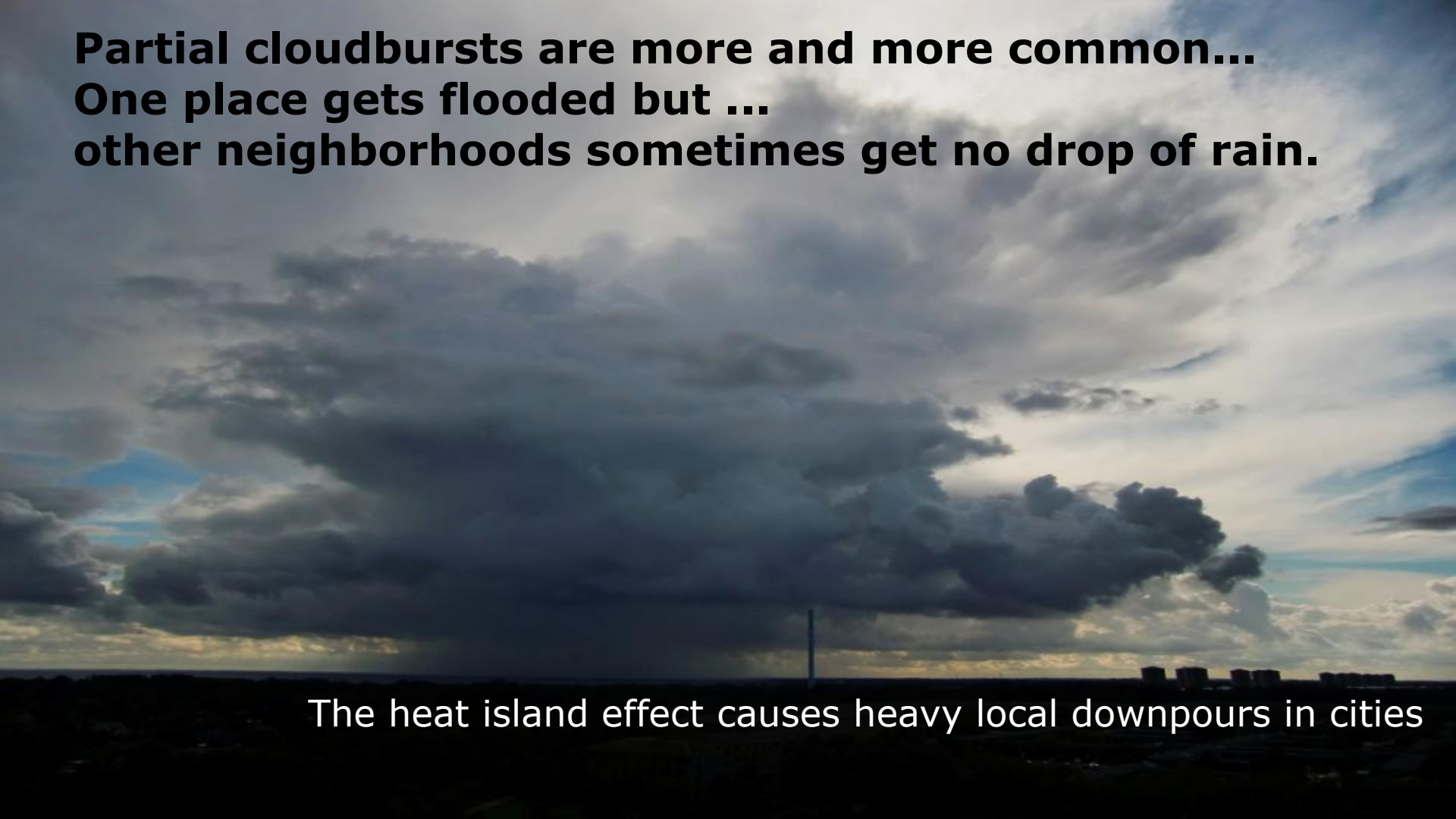


We turn the city's backside to water

The Current Challenges

1. Climate change
2. Growing cities with increasing areas of hard surfaces
3. Limited capacities of drainage facilities, economic limits for upgrading
4. Decreasing open space for green areas and open water

**Partial cloudbursts are more and more common...
One place gets flooded but ...
other neighborhoods sometimes get no drop of rain.**

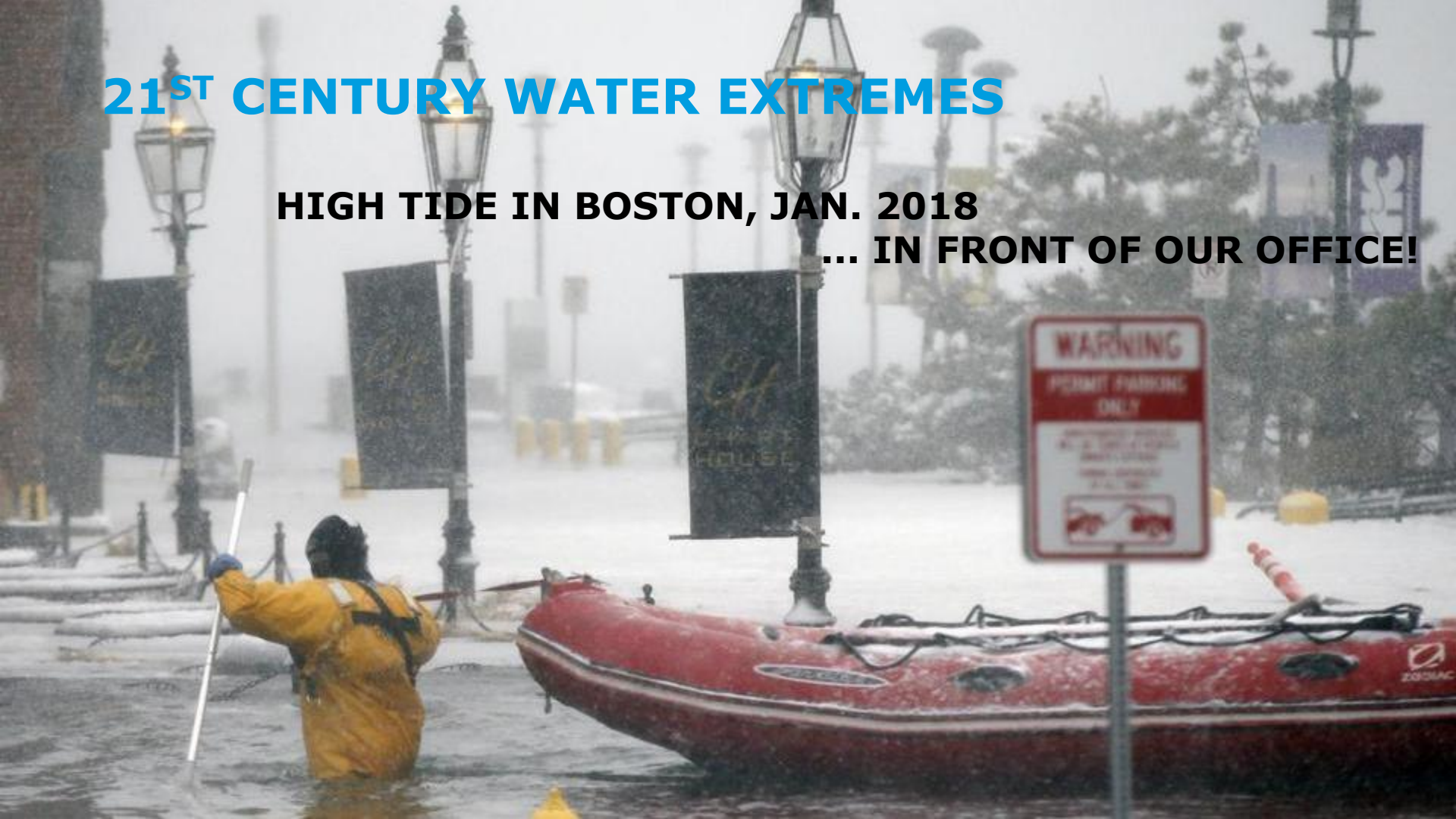


The heat island effect causes heavy local downpours in cities

21ST CENTURY WATER EXTREMES

HIGH TIDE IN BOSTON, JAN. 2018

... IN FRONT OF OUR OFFICE!



21ST CENTURY WATER EXTREMES

A woman with dark hair tied back, wearing a colorful halter top and a black backpack, is leaning back and looking upwards, cooling off under a row of large industrial fans. The fans are white with metal grilles. In the foreground, the back of a woman's head with reddish-brown hair is visible. The background is blurred, showing other people and a blue structure.

TOO LITTLE

Heatwaves, Draught
North America 2017



HIGHLIGHTS

Summer 2017

LATE
T-STORMS

FIRE
THREAT

MONSOON
T-STORMS

DRY

DRY
HOT

T-STORMS
SUPPRESS HEAT

T-STORMS

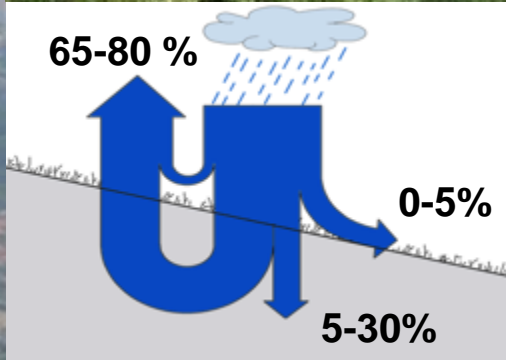
HOT

Flooding, hurricanes,
droughts, wildfires:

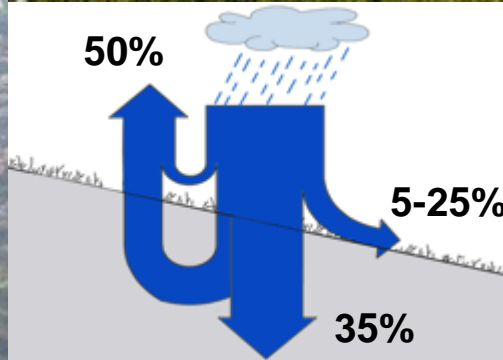
- Damage of \$306 Bio
 - 3rd hottest year in the US history
- > CITIZENS SUFFER

REPAIRING THE URBAN WATERBALANCE

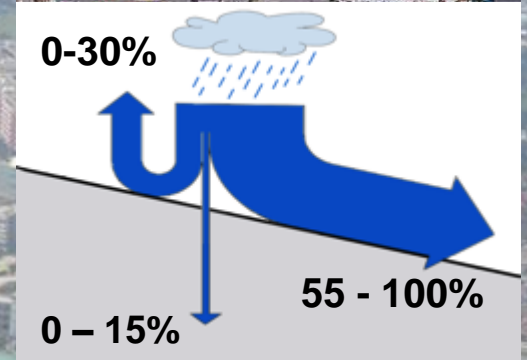
Nature



Agriculture



Urban Area



How to get to a Water Sensitive City

INTEGRATION OF STORMWATER MANAGEMENT

EXAMPLE of HAMBURG, GERMANY | RISA Program

STATUS:



(Grafik: Atelier Dreiseitl)

END OF PIPE SOLUTION
ELIMINATION OF WATER

GOAL:



(Grafik: Atelier Dreiseitl)

INTEGRATIVE SOLUTION
WATER AS A TREASURE

RESILIENCE AND MULTIFUNCTIONAL

DRY

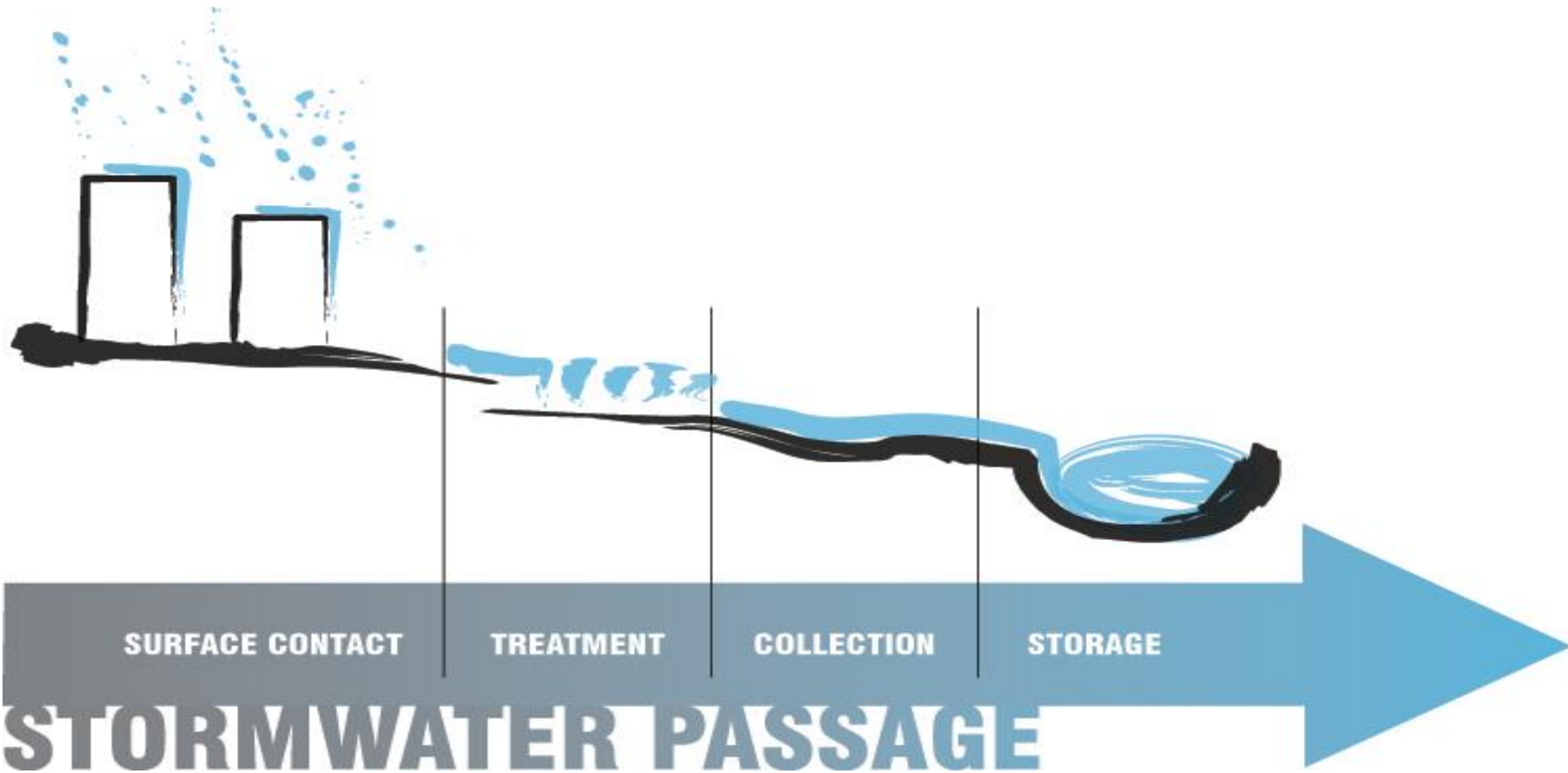


WET

DRY

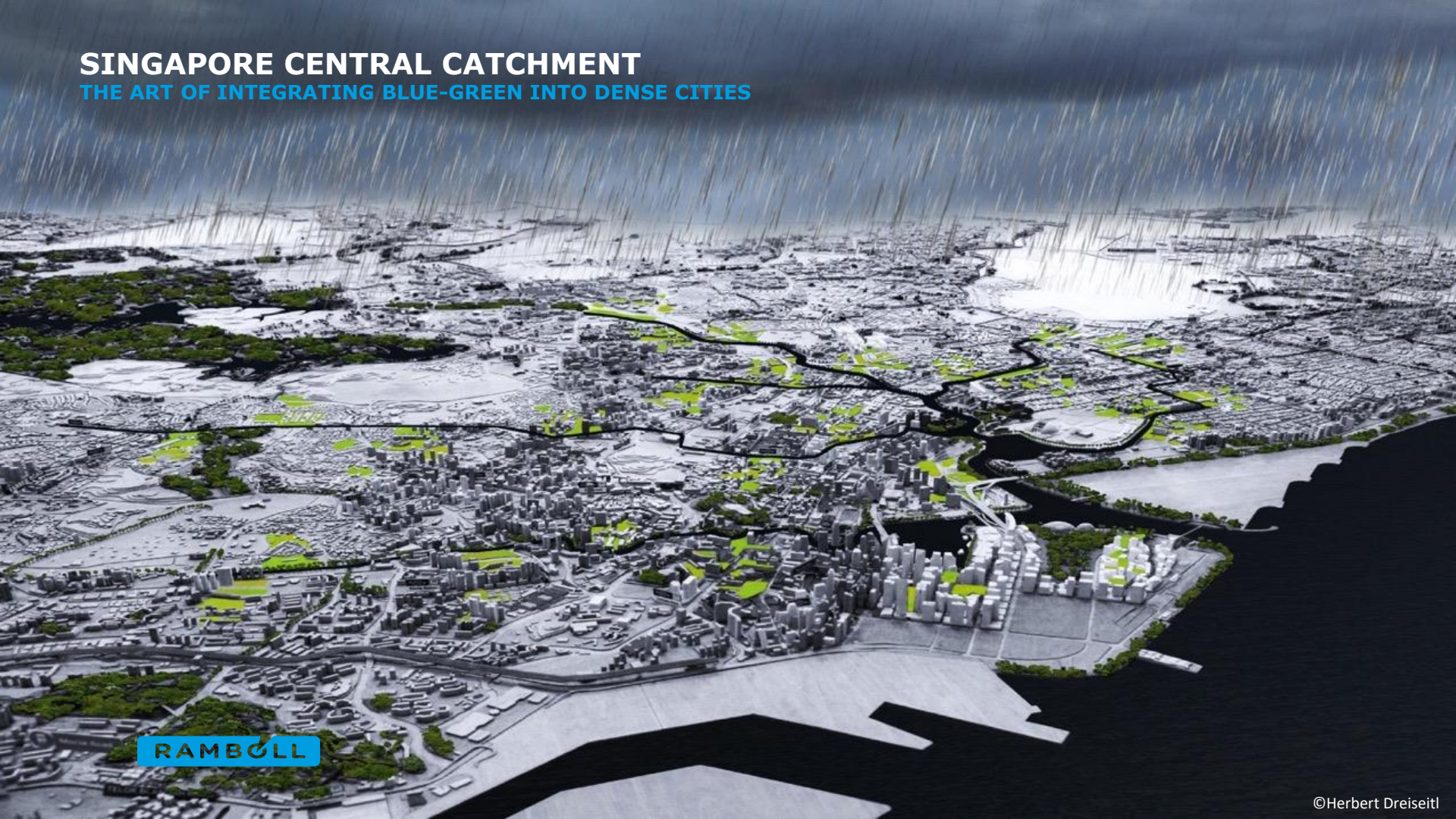


WET



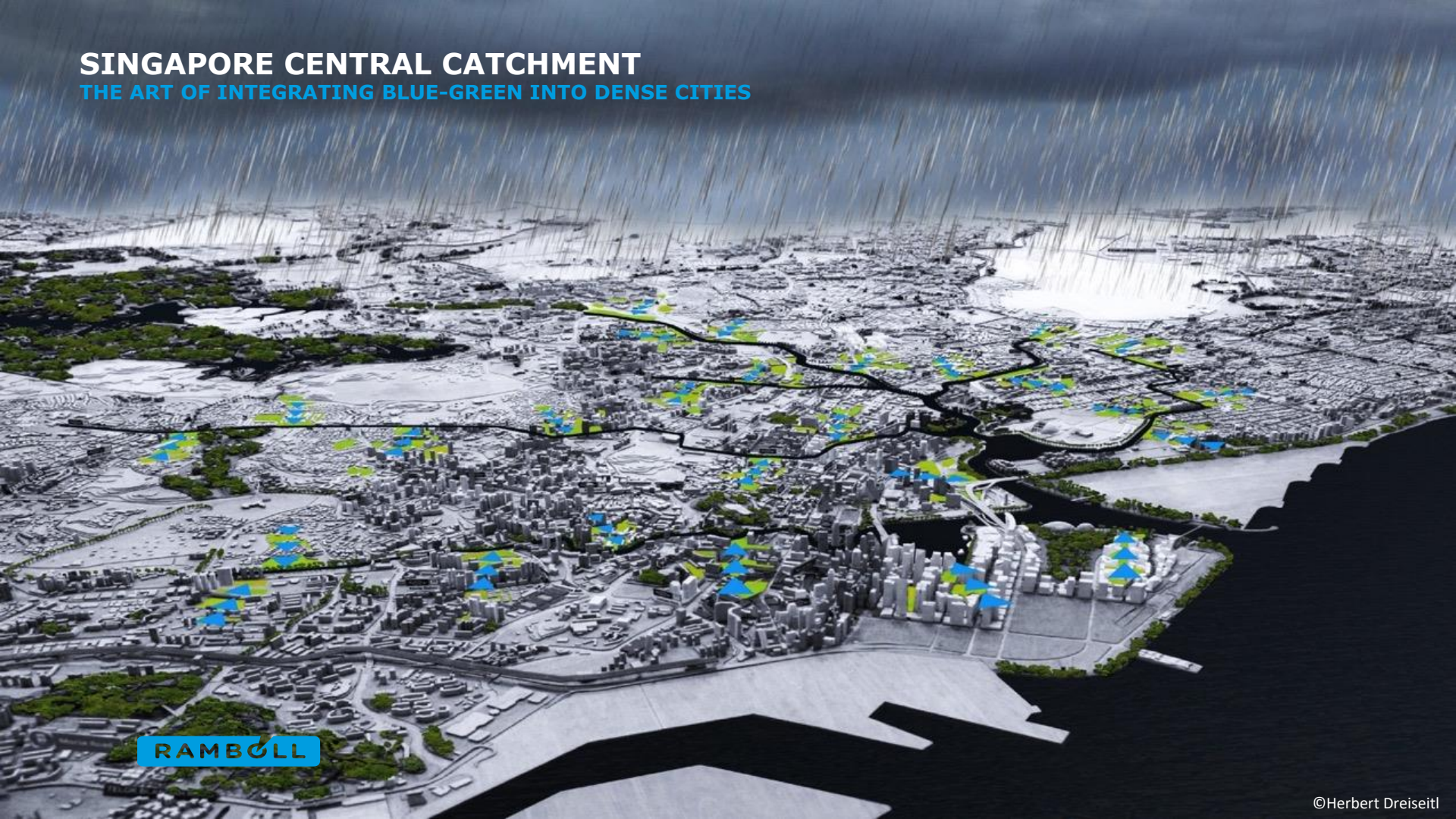
SINGAPORE CENTRAL CATCHMENT

THE ART OF INTEGRATING BLUE-GREEN INTO DENSE CITIES



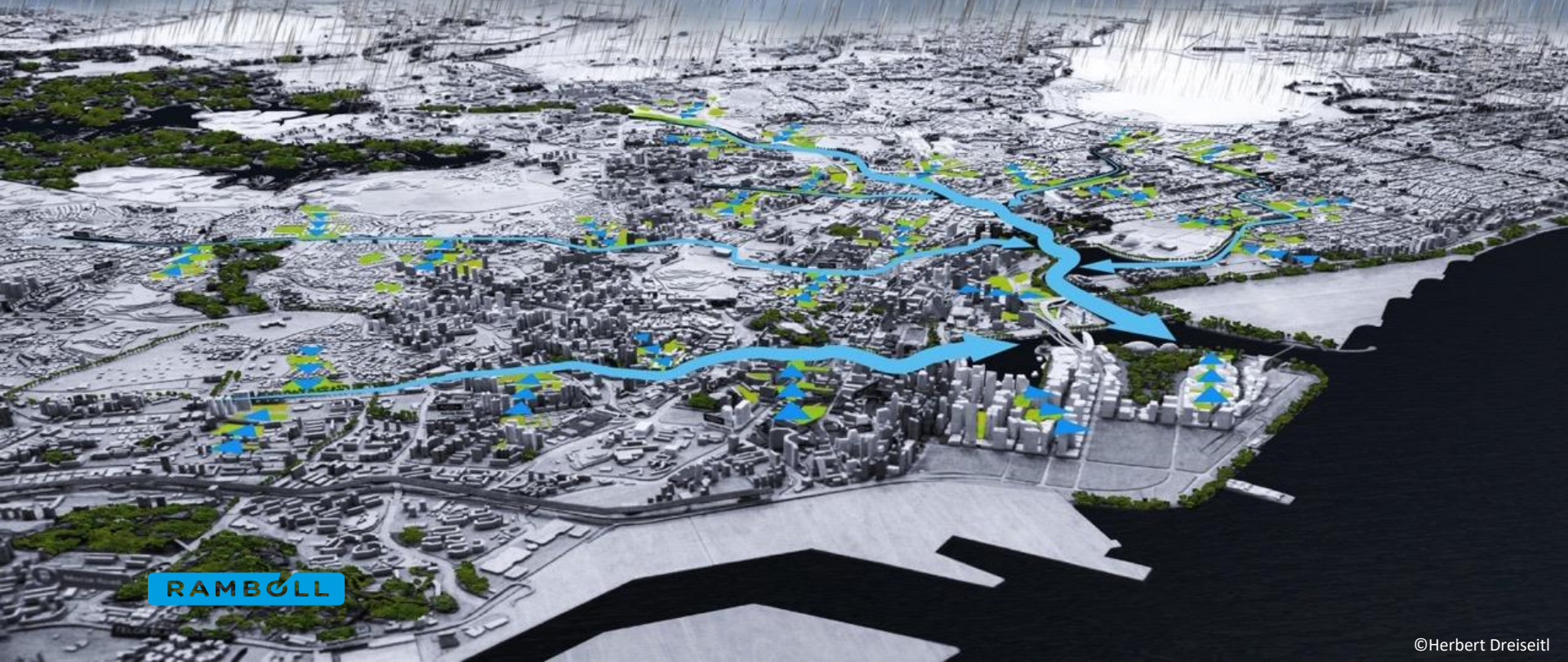
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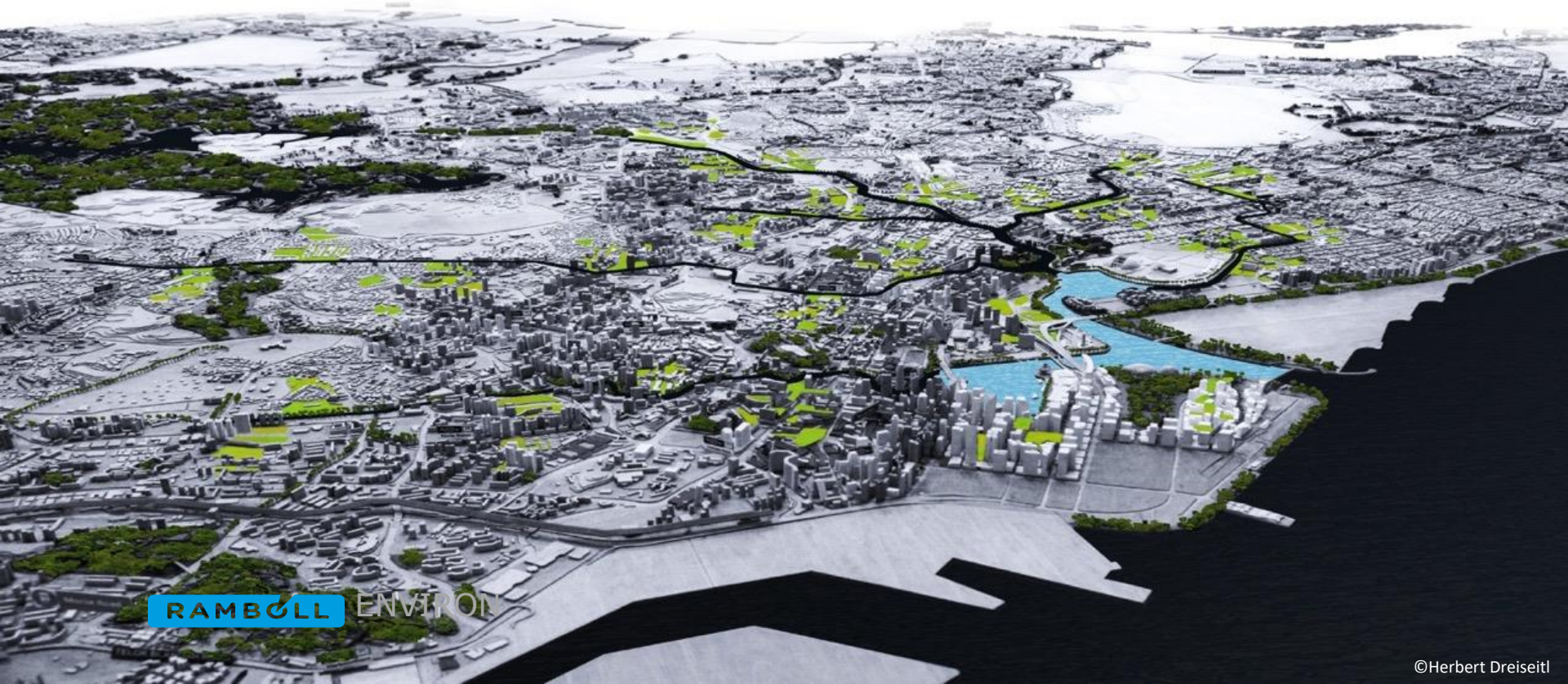
SINGAPORE CENTRAL CATCHMENT

THE ART OF INTEGRATING BLUE-GREEN INTO DENSE CITIES



SINGAPORE CENTRAL CATCHMENT

THE ART OF INTEGRATING BLUE-GREEN INTO DENSE CITIES







2008

Before



2013

After (View from bridge 5)





KALLANG RIVER Bishan-Ang Mo Kio Park

Rain Event 4th May 2011

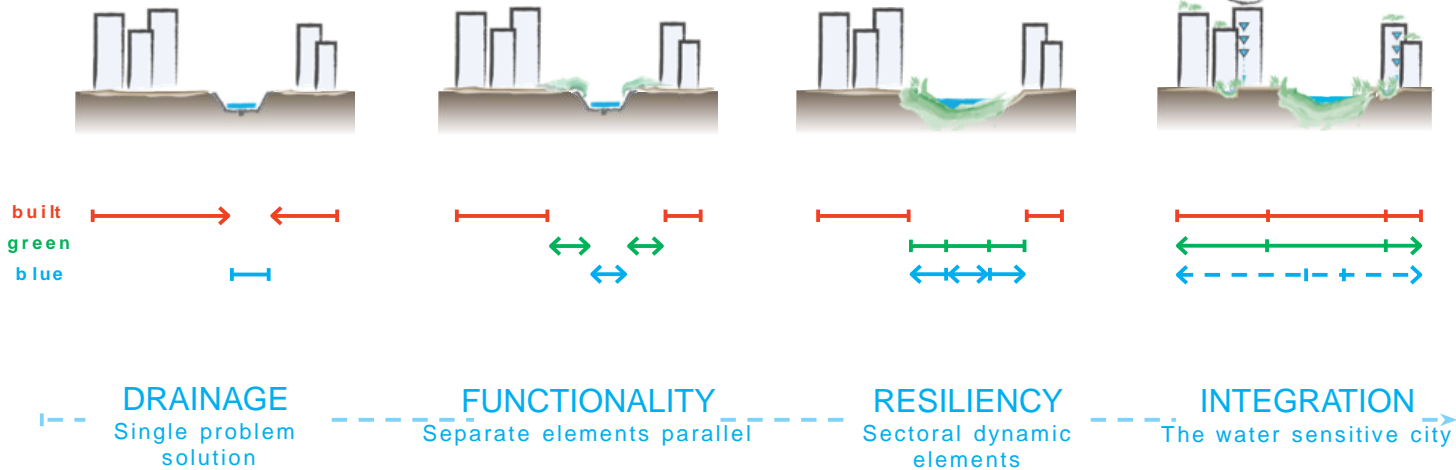




KALLANG RIVER



BLUE\GREEN\RED FROM SEGMENTED TO SEAMLESS INTEGRATION



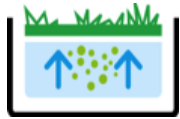
BRINGING NATURE TO DOWNTOWN SINGAPORE



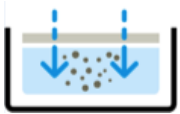
Image: Dreiseitl

BLUE-GREEN INFRASTRUCTURE TOOLKIT

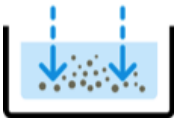
QUALITY CONTROL



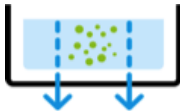
Biological
Absorption



Filtration



Sedimentation



Infiltration



Recycle



QUANTITY CONTROL

Evaporation



Conveyance



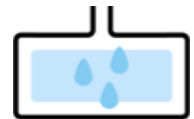
Detention



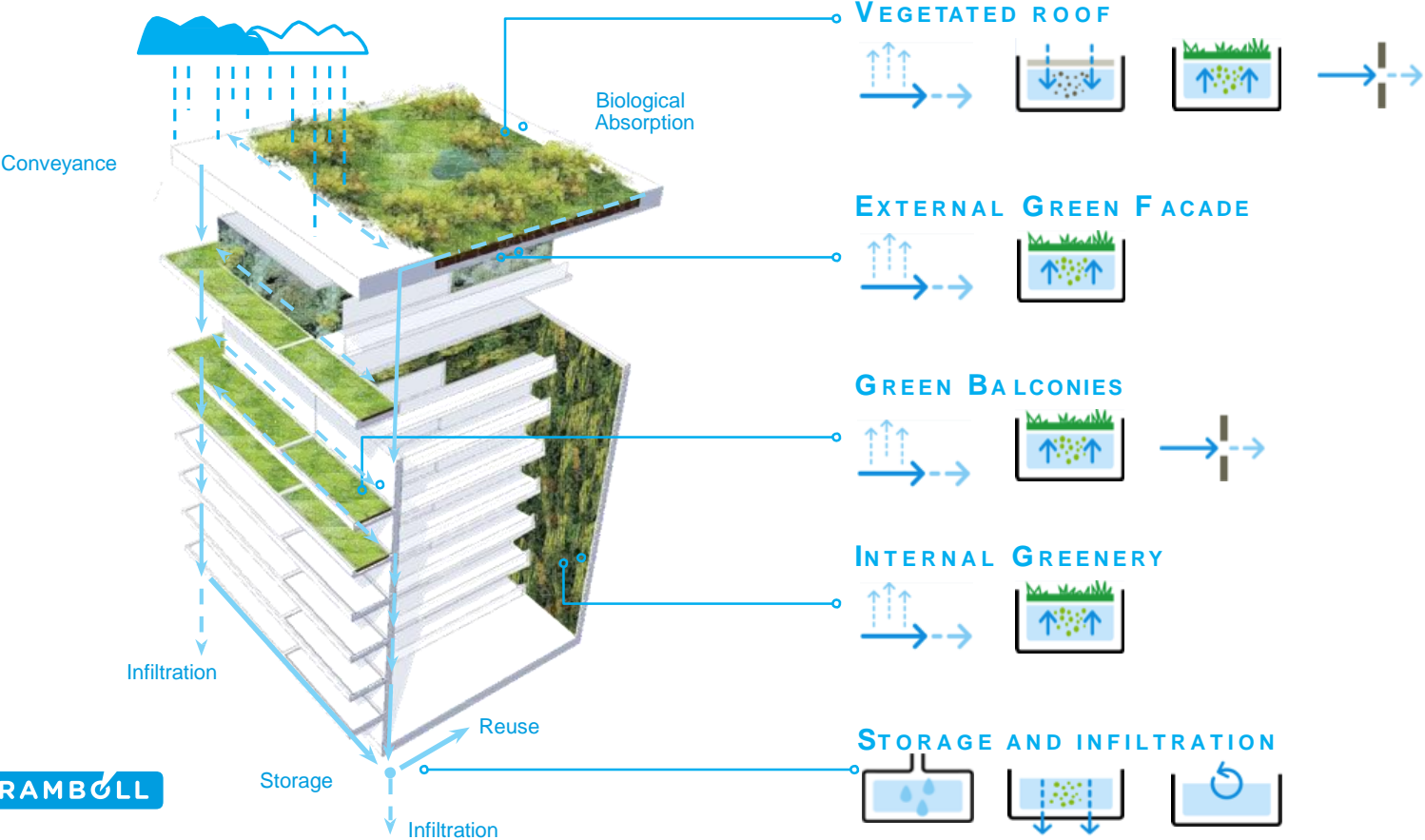
Retention



Storage



BGI – BUILDING SCALE



POTSDAMER PLATZ, BERLIN



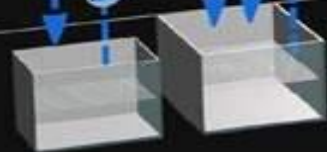
Berlin Potsdamer Platz Rainwater management



Rainwater collection

Urban bodies of water

max.
Wsp
min.



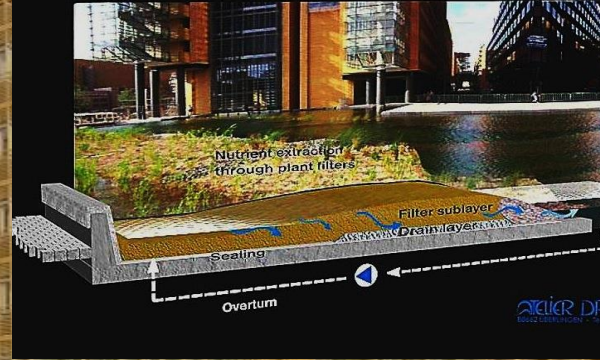
Storage

Booster cistern

Retention

Overflow





Collected Rainwater and Cleansing Biotope on top of Garage and Tunnel

POTSDAMER PLATZ

Berlin, Germany

70%

carbon emission
reduction

20,000

cubic meters of
potable water
saved

13,500

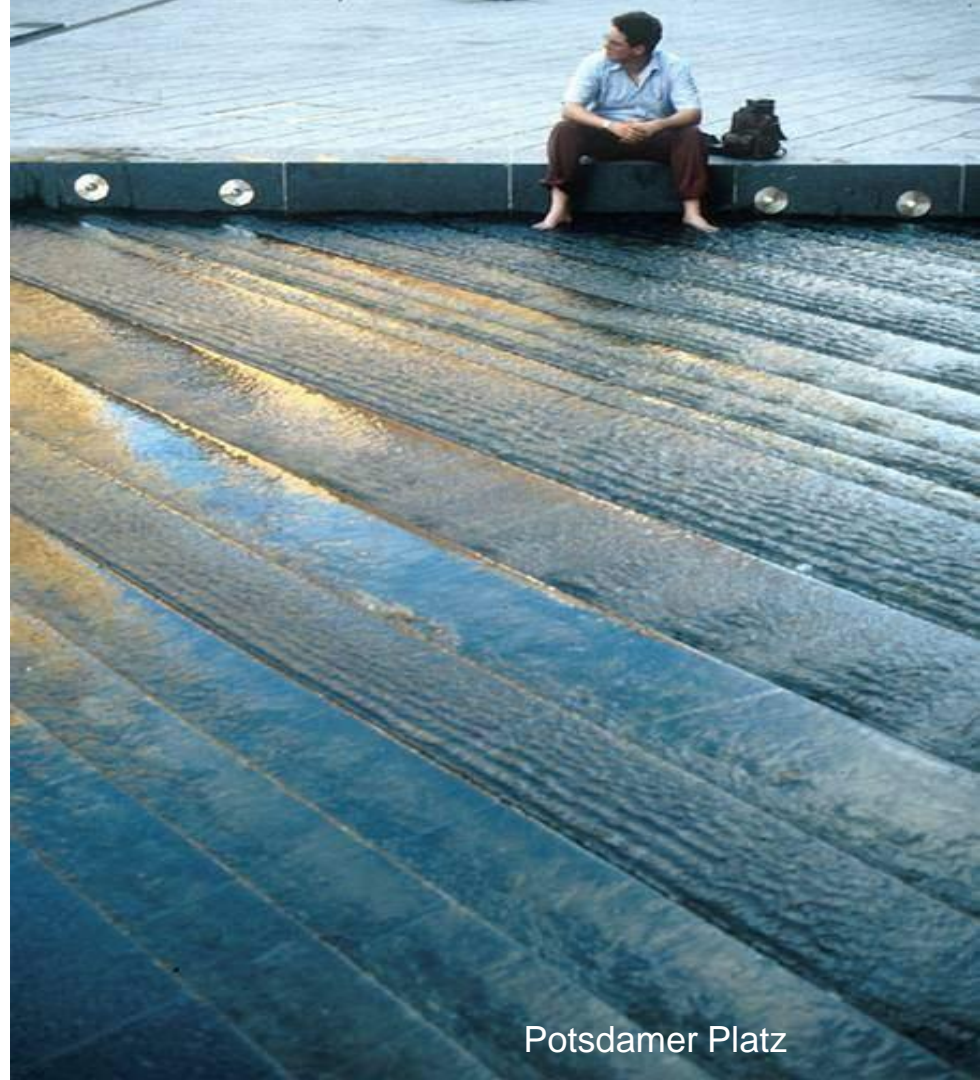
cubic meters
combined
stormwater
storage

50%

primary energy
saved compared to
air-conditioned
systems



Architect: Renzo Piano Building Workshop
Waterdesign: Ramboll Studio Dreiseidel



Potsdamer Platz

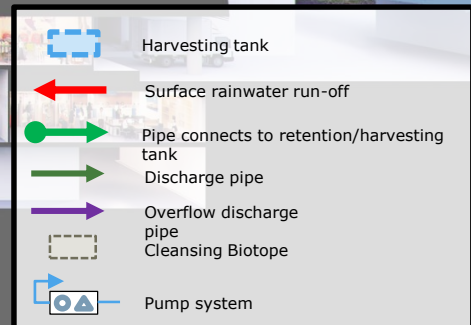
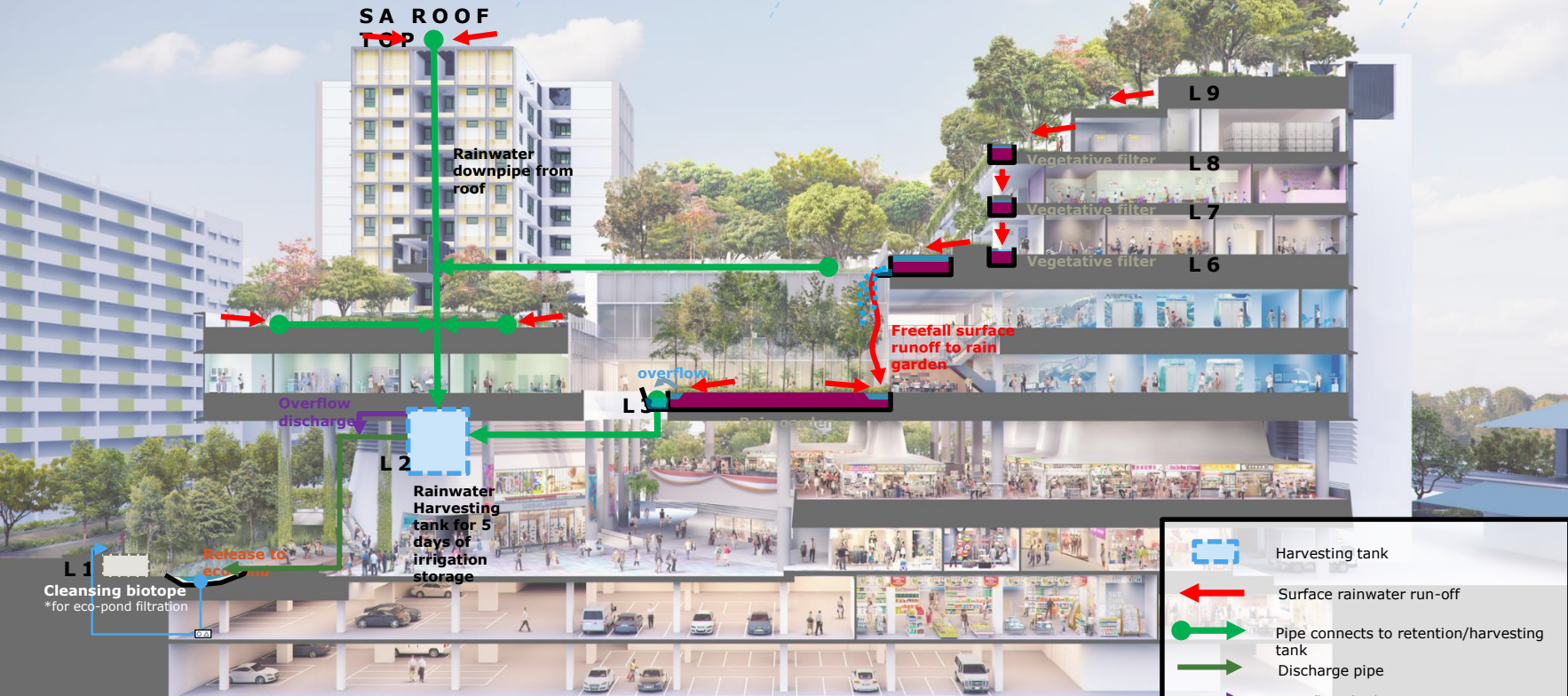
SINGAPORE – MULTIFUNCTIONAL BUILDING BLOCK

An aerial architectural rendering of a modern residential building complex in Singapore. The central focus is a large, U-shaped building with a facade of colorful, multi-colored panels in shades of red, blue, and grey. This building is surrounded by a lush green courtyard with various trees and a winding path. To the left, there is a large, blue-roofed structure, possibly a community center or a school. The surrounding area is filled with other modern high-rise buildings, some with white facades and others with more colorful accents. A road with a red bus and several cars is visible in the foreground, along with a pedestrian walkway and a small park area. The overall scene is bright and clear, suggesting a sunny day.

WOHA Architects, Singapore
Ramboll Studio Dreiseitl

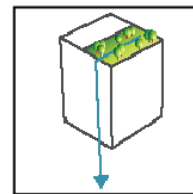
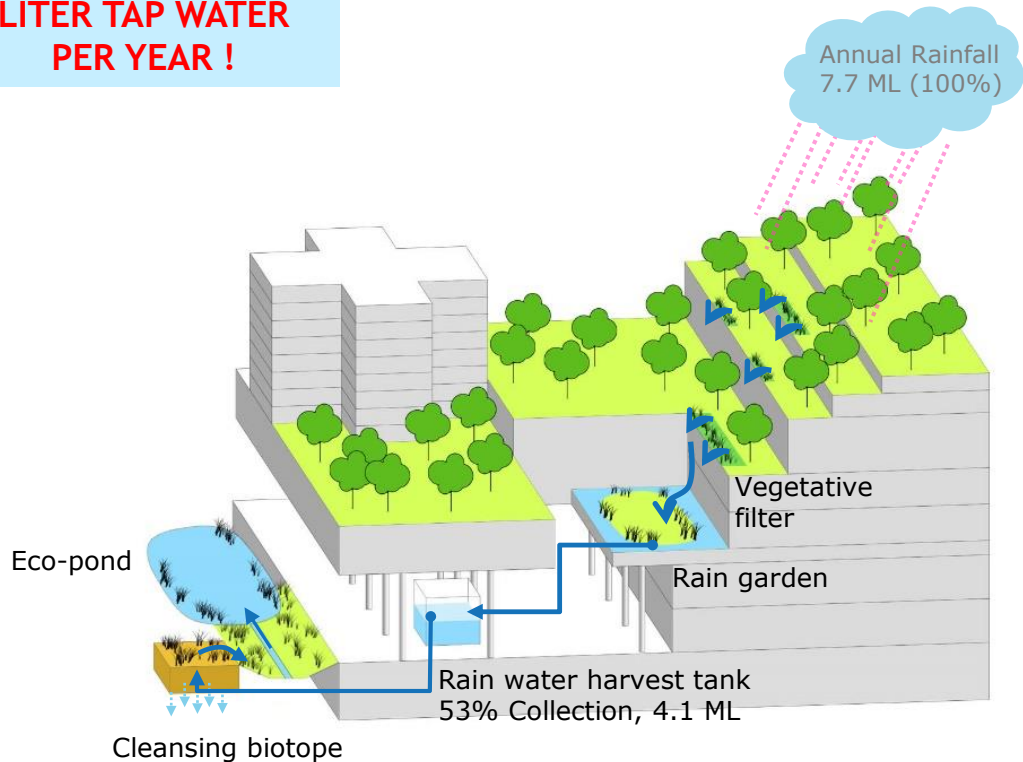


VERTICAL ABC WATERS DESIGN INTEGRATION



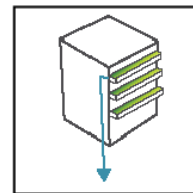
HOLISTIC VERTICAL STORMWATER MANAGEMENT

**SAVE 4.1 MILLION
LITER TAP WATER
PER YEAR !**



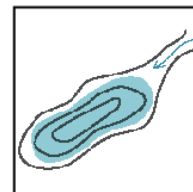
Green Roof

50% of total roof surface area
Intensive green roof construction
Equipped with downsprout
connection towards surface and
underground detention units.



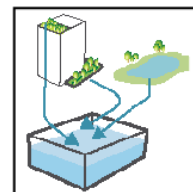
Vegetative Filter

Serves as vertical conveyance
elements along the building
facade
Provides additional surface
area for WSUD tools and
Increase aesthetic value of the



Rain Garden

A total of 295 m² is required, and
up to 7 basin units, each 42.1 m²
can be sited.
Provides treatment for 1 in 3
months storm event.
Interconnected with vegetated
swales to induce overflow



Harvesting Tank

Receives infiltrated water from
bioretention units.
Provides additional storage volume
when surface detention overflows
Can be discharged in a controlled
way.



COPENHAGEN Cloudburst Project



**BEFORE:
Extensive Flooding**

**02 July 2011: > 150mm
RAIN fell in 2 HOURS.**

**GASVÆRKSVEJ
Copenhagen**

ECONOMIC MODELS - RISK BASED MANAGEMENT

SOCIO ECONOMIC AND CBA

Cost of direct damages from

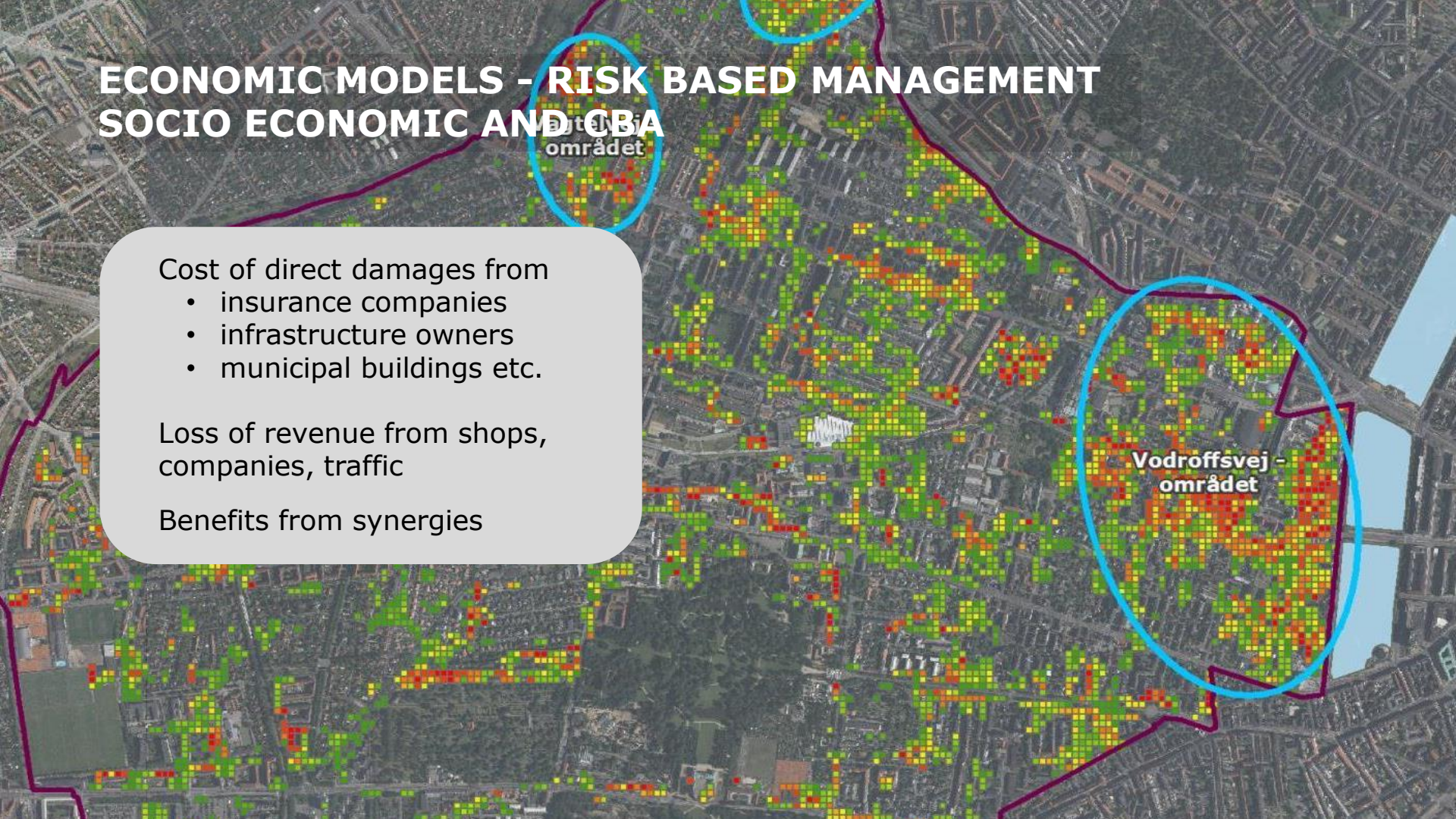
- insurance companies
- infrastructure owners
- municipal buildings etc.

Loss of revenue from shops,
companies, traffic

Benefits from synergies

Drottning
området

Vodroffsvej -
området



WHAT ARE WE ASSESSING AND HOW?

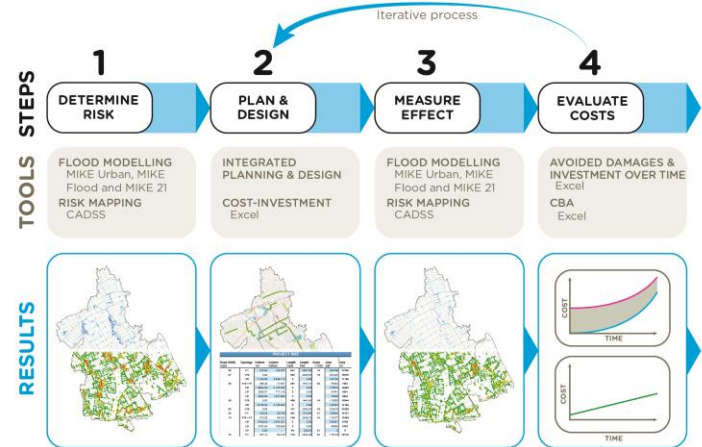
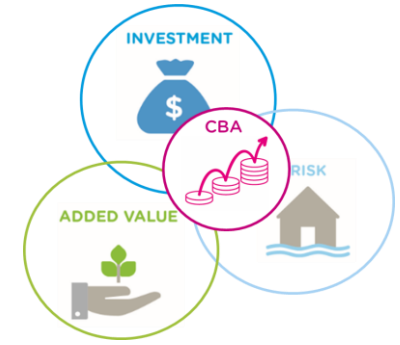
The exposed city

City functions are paralyzed and general attractiveness decreases

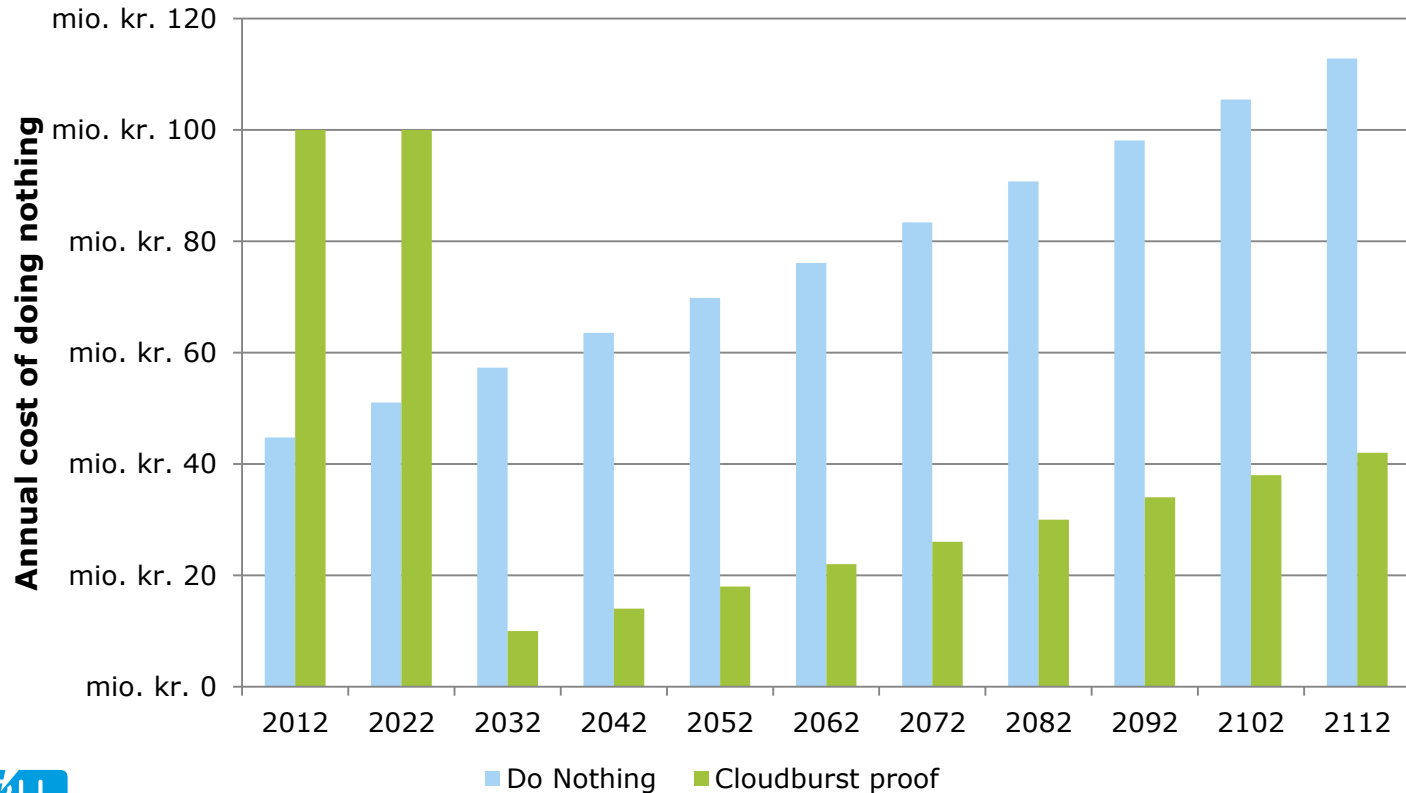


The climate adapted city

A resilient and connected city



THE ANNUAL COST OF DOING NOTHING VS FLOOD MANAGEMENT



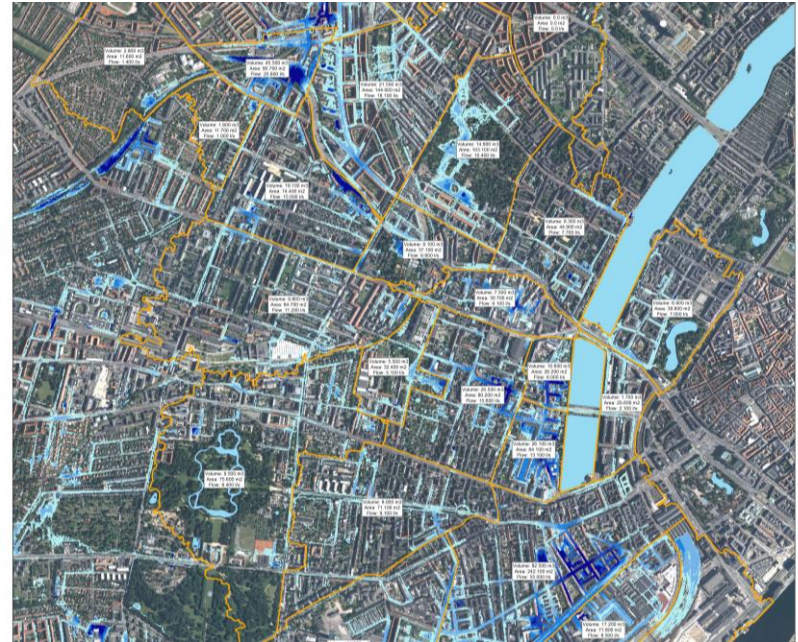
STRATEGY, TARGETS AND SERVICE LEVELS

Service levels

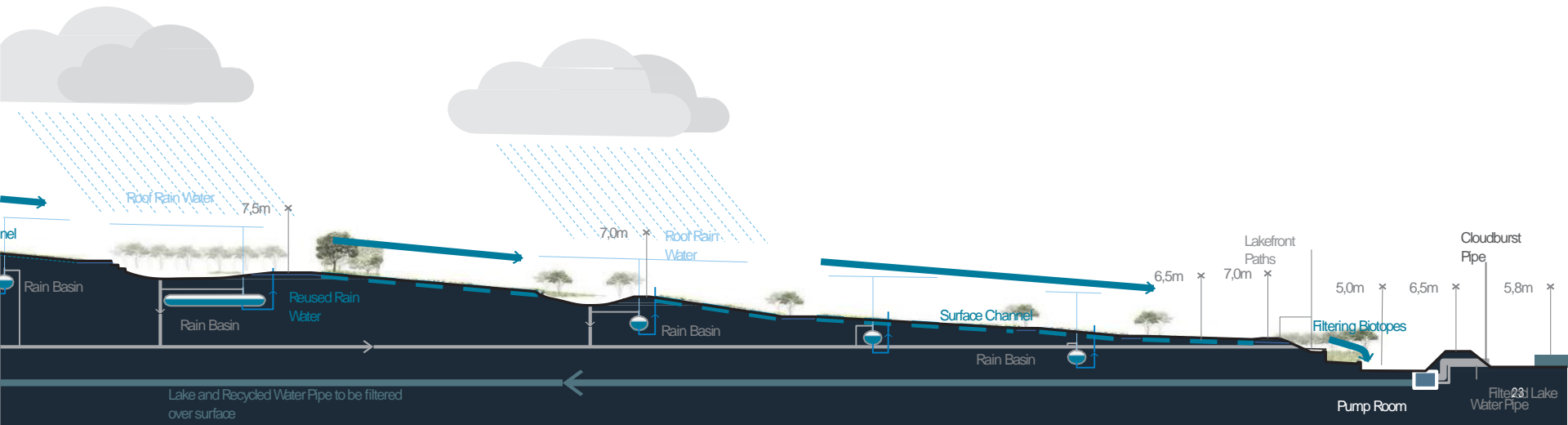
- Flooding accepted with return period of 10 year
- During a 100 year extreme event (present day precipitation +40 %) water levels of up to 10 cm are accepted

Strategy and targets, technical

- 30 % of impervious areas detached and rainwater is harvested or infiltrated
- Retention upstream and discharge downstream
- Reduced urban heat island effect by 30 % more green spaces







COST-BENEFIT ANALYSIS

Ramboll is increasingly selling the risk-based resiliency planning approach **to:**

1. Build the business case

(Copenhagen, NYC, Singapore, Gothenburg, etc.)



2. Prioritize options or plans

(Copenhagen, Buzzard Point)



3. Define optimum safety level

(Kildeskovsrenden, Buzzard Point)



KØBENHAVNS KOMMUNE



City of Gothenburg



FREDERIKSBERG
KOMMUNE

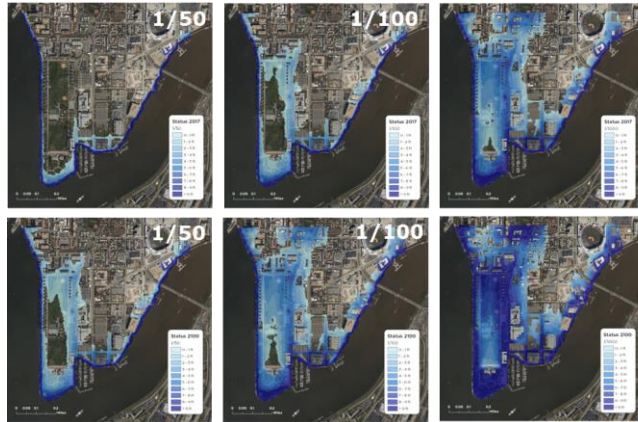


*** DEPARTMENT
OF ENERGY &
ENVIRONMENT
GOVERNMENT OF THE DISTRICT OF COLUMBIA

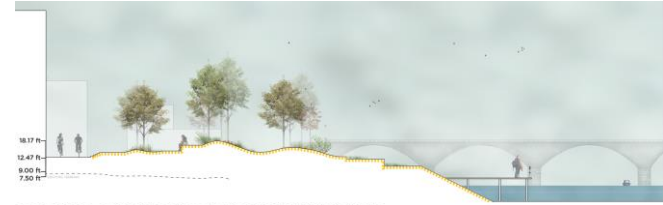
EXAMPLE – WASHINGTON D.C.

Buzzard Point (US)

Developing a conceptual plan for living shoreline protection along the Anacostia and building business cases for levels of protection



Fluvial and tidal storm surge events today & future

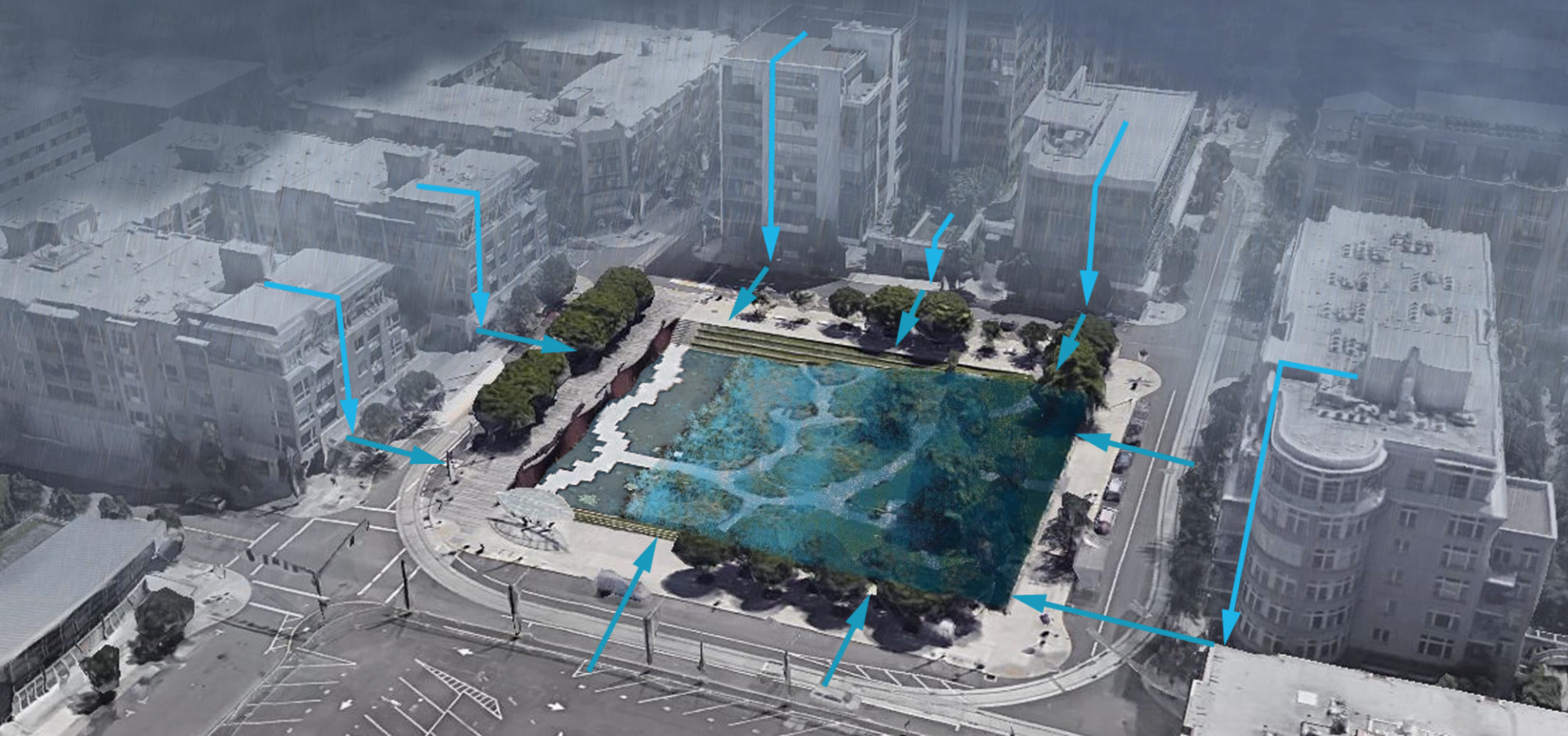


TANNER SPRINGS PARK PORTLAND

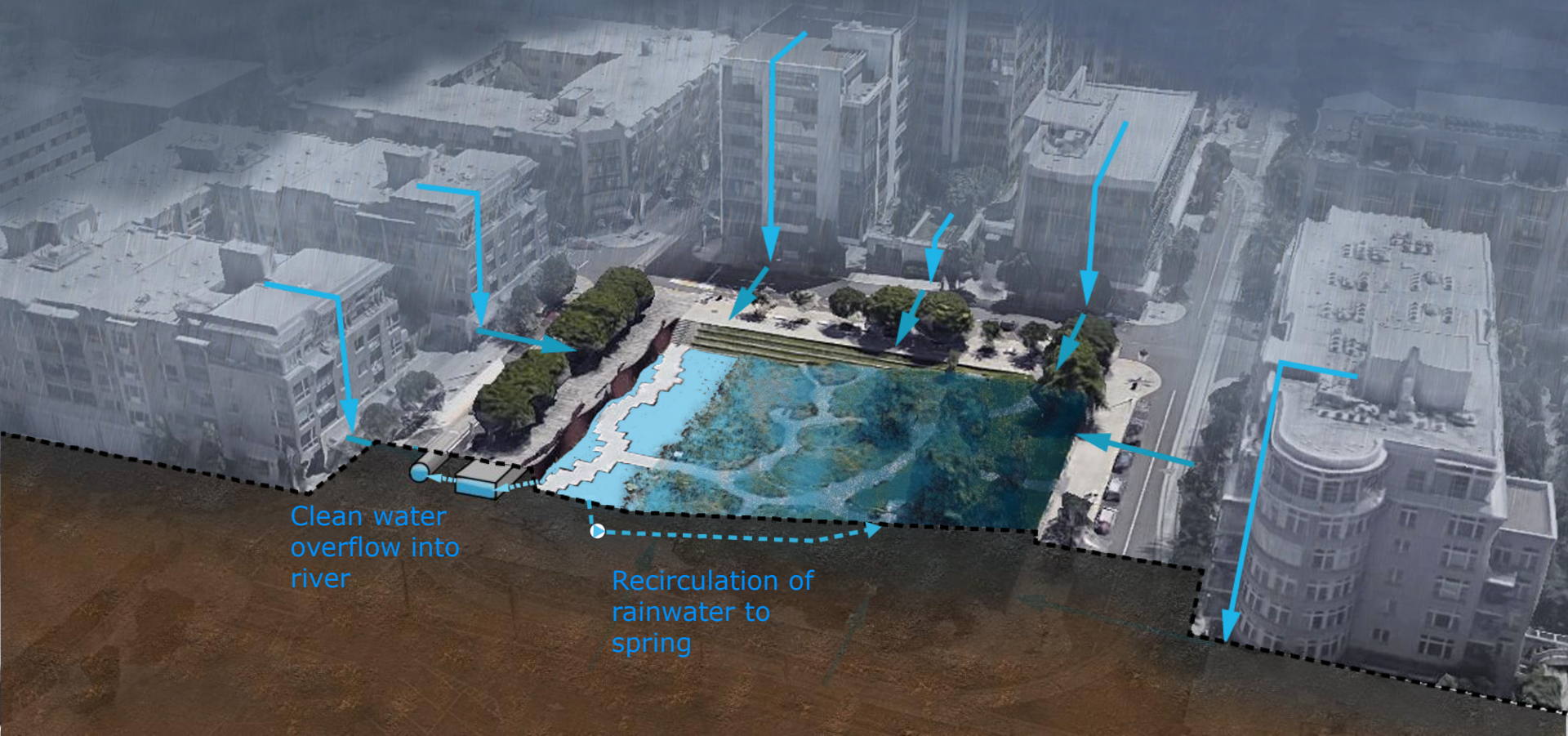


Ramboll Studio Dreiseitl, Prime
Greenworks, Landscape Architect
Art Work, Herbert Dreiseitl

RAINWATER COLLECTION SYSTEM



RAINWATER RECIRCULATION SYSTEM AND OVERFLOW



Clean water
overflow into
river

Recirculation of
rainwater to
spring



WORKSHOP WITH PUBLIC & STAKEHOLDER INVOLVEMENT
Tanner Springs Park under leadership of Herbert Dreiseitl



DESIGN CREATES VALUE

artful, technically innovative, integrated strategies that work



Herbert Dreiseitl, Liveable Cities Lab / Ramboll

www.ramboll.com/LCL herbert.dreiseitl@ramboll.com