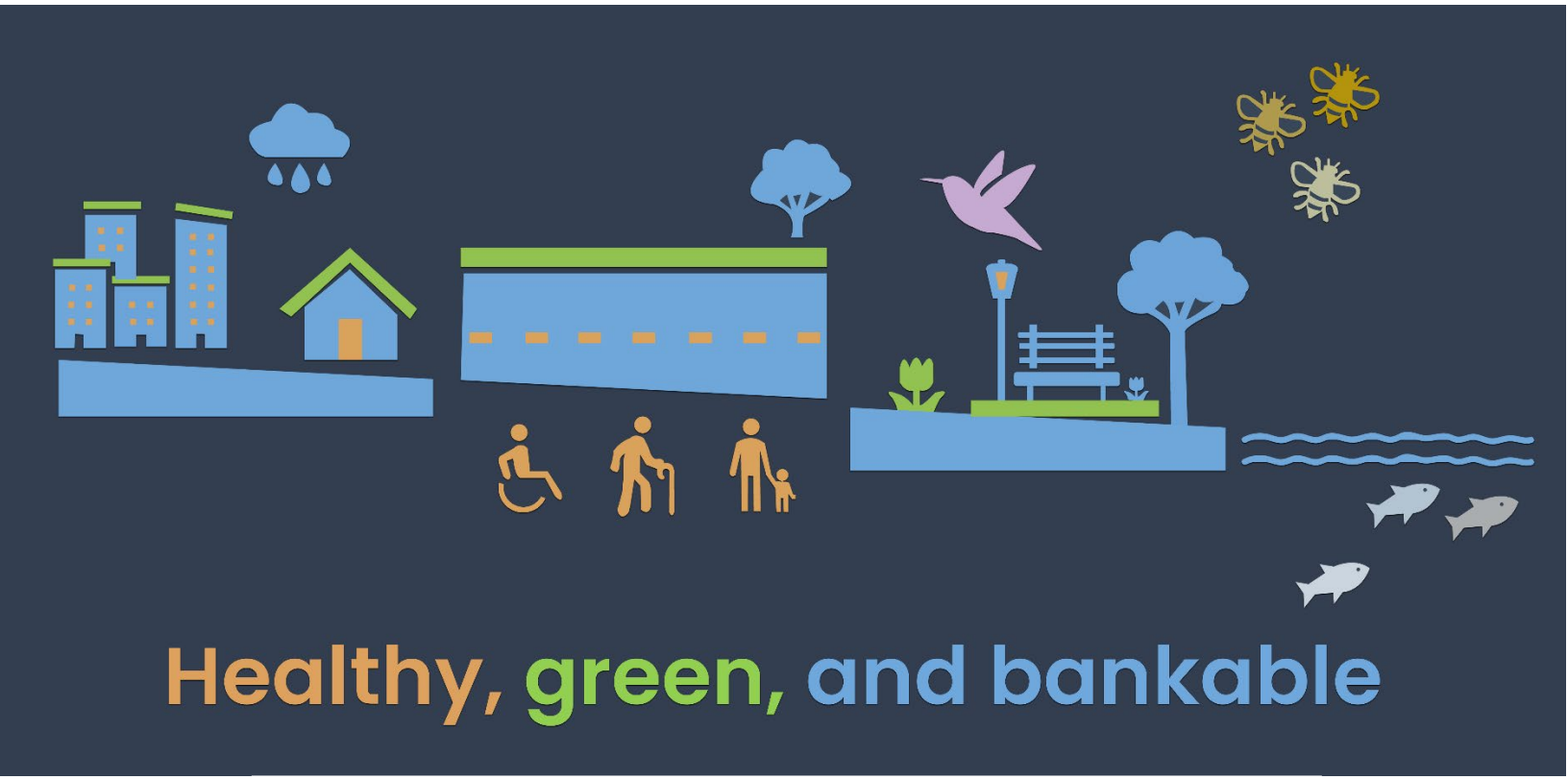
Building Health Lab

September 2023

UrbanCare

Putting People First in Green Planning

Guidance for Evidence-based Planning and Design



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Contents

1. Introduction

© 2023 Building Health Lab. "UrbanCare Workshop space at the Stadtwerkstatt Berlin Senate"

Building Health Lab is a scientific Think & Do Tank applying health strategies and actions to reach sustainable urban developments. We envision a future where city decision-makers lead the way in developing evidence-based projects to benefit people and the planet and significantly enhance performance, reduce time, and optimize costs.

Our mission at BHL is to empower spatial planners and designers with urban health tools that translate scientific research into practical, intuitive solutions. We aim to provide the knowledge and insights they need to confidently create positive and context-specific impacts.

Building Health Lab exists to bridge the gap between academic expertise and real-world practice. Our primary goal is to attend the need for integrating departmental planning efforts and fill the knowledge gap in the process.

This document introduces our UrbanCare service, to showcase how we assist municipalities in structuring cases to access the sustainable debt market and attract businesses that champion social and environmental causes. UrbanCare is our vehicle for supporting sustainable urban development, aligning seamlessly with the most rigorous scientific frameworks and guidelines.

2. Why UrbanCare

Healthy urban planning is a complex and dynamic endeavor that demands a transformative shift in perspective. It calls for adopting systems thinking and implementing coordinated management to strike a harmonious balance between urban development, public health, and environmental preservation.

Impacts on Pedestrian Health

The very fabric of our cities directly deters the health and well-being of their residents, particularly pedestrians. In many urban areas, streetscapes prioritize vehicular traffic over the needs of pedestrians, leading to numerous problems, such as decreased physical activity, traffic-related accidents, stress, and various urban-associated diseases. Vulnerable groups, including children, women, older adults, and people with disabilities, are most at risk of countless physical obstacles and environmental threats, such as heat and pollution, when navigating the urban environment.

Environmental Sustainability

Urban environments, especially streets, are mostly sealed surfaces that significantly affect natural cycles and the planet's health. They can negatively impact ecosystem services such as clean air and water, healthy soil, and overall biodiversity. An unhealthy urban ecosystem affects the local population and climate, contributing to regional and global environmental challenges.

Challenges in Municipal Planning

In today's urban landscape, municipalities face this myriad of health and climate challenges. Their solutions are often hindered by:

- Working in silos: Data, systems, and processes from traffic, mobility, environment, health, and other departments or teams frequently operate independently, resulting in data duplication, inefficient processes, and outdated information. This translates to reduced productivity, heightened risks, and overall inefficiency.
- Correlating useless data: Highly aggregated or contextually deficient data conceals crucial differences among subgroup categories, undermining the effectiveness of analyses and subsequent actions.
- Poor decision-making: The absence of high-quality and context-rich data and insights from diverse stakeholders hinders effective decision-making, resulting in missed opportunities and costly errors.

The Role of Evidence-Based Strategies

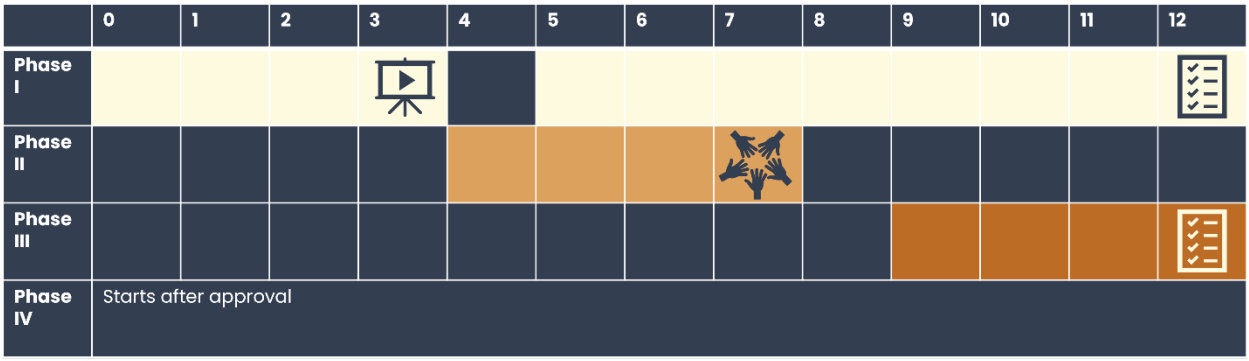
Against this backdrop, evidence-based urban health and green strategies have never been more critical for urban planning. Municipalities must look beyond short-term gains and apply well-informed holistic measures to ensure a sustainable health of their citizens and cities.

Prioritizing Urban Health and Green Initiatives

Addressing the shortage of public space or its lack of continuity for vulnerable groups requires prioritizing urban health and green initiatives at the street level of neighborhoods. A systematic assessment and replication of safe, comfortable, conveniently close, and aesthetically pleasing active travel pathways to various destinations are the first steps in confronting these challenges and towards building a healthy and climate-resilient city.

3. UrbanCare Phases

UrbanCare is a framework to manage streetscape and other urban public space projects from concept to completion. Its project cycle is a four-phase process adjustable to fit the specific needs of an urban site.



Phase 1: Capacity-building

This two-step phase invites municipalities to Building Health Lab in Berlin for five days of input on sustainable urban development and implementation strategies. Site visits, technical presentations, and dialogues allow comparative analyses to identify and define the visiting Municipal project's problems, goals, scope, stakeholders, and requirements. The second step is to draft three documents that shape the project idea and make short presentations to a highly qualified jury from academia, industry, and the financial sector.

Phase II: Development

Once the project idea is defined, the development phase begins. It involves a series of workshops to outline and structure the project idea into an urban project case to envision the key features, impacts, and challenges. With an evidence-based approach, the first step is to collect and process ecological data about the site using mixed methods. The second step uses intuitive infographics of the site's data, human-centered planning principles, and compelling climate design interventions to guide the Municipal participants in problem-solving and decision-making workshops.

Phase III: Submission

In this phase, first we carefully search for a sustainable investor to match the project and thoroughly study its specific guidelines and requirements for project submissions. Then, prepare a comprehensive proposal that outlines the project's sustainability goals, budget, timeline, and expected environmental and social impacts. Finally, submit the proposal through the entity's designated application process, ensuring it aligns with their sustainability criteria and goals.

Phase IV: Closure

Once the project proposal is approved, the implementation starts. Our project team will ensure the execution aligns with the proposed timeline and sustainability objectives. Regular progress reports and evaluations track the project's success and compliance with health and environmental impact targets. The project closes with a scientific publication with our partner Cities & Health Journal from Routledge Publisher.

The project cycle phases are not always linear. It may be necessary to revisit the Development Phase if significant changes to the project scope or requirements are needed.

Phase I: Capacity-building

© 2023 Building Health Lab. " UrbanCare initiation phase in Berlin with Brazilian Municipalities"

UrbanCare Dialogues is a five-day urban incubator in Berlin for municipality managers to formulate investment-ready projects for health using nature-based solutions. The program invites local government representatives to meet with urban health, climate, and financial access advisors for five days.
Day 1 introduces Berlin, its urban development participatory processes, achievements, and challenges. The following three dialogue days are to draft three documents that shape the project idea under the topics Healthy, Green, and Bankable. After each dialogue, guided site visits showcase the rights and wrongs in planning. The closing day is to make short presentations before a diverse jury of highly qualified representatives from academia, industry, and the financial sector.

The Dialogues create an environment for Gov and urban advisors to align goals, strengthen operations, focus resources, and establish agreement around intended results and outcomes.
The main outputs are three draft documents with insights from the technical site visits, academic inputs, and industry demonstrations. The drafts are uploaded to each municipality's web-based working space to continue with BHL's guided development until its submission before a financial agency or investor.

Several learning outcomes describe the collaboration across all participants.

- Gov renews knowledge for project proposals by taking practical advice from evidence-based planning and design approaches increasing cost efficiency.
- Planning experts and researchers gain greater insight into technical and financial obstacles that local governments undergo in developing and implementing projects.
- Organizations reach consensus on offering customized programs, frameworks, and resources to set up sound and realizable project proposals for each municipality. Furthermore, harness shared know-how to establish a transdisciplinary exchange of tools, methods, and communication channels useful for other municipal governments.

Workshop Preparation

UrbanCare 360° pedestrian journey (2021). buildinghealth.eu/urbancare-data-journey-in-a-berliner-neighborhood/

The Workshop Preparation step has two parts: Diagnostics and UrbanCare APPs, both instrumental in shaping a holistic and informed approach to sustainable urban planning. Through these parts, we create the foundation for evidence-based strategies that address the unique challenges of each municipality.

Preparation Part 1, Diagnostics

Our diagnostics studies urban ecosystem of specific sites to understand relations between the physical environment and possible impacts on travel behavior and health.

In most cities, neighborhood level data is needed to inform mobility and climate plans. At BHL, we do desk and field research needed for pedestrian plans and public space design, focusing on the benefits for slower-paced groups and strengthening climate resilience.

We identify and map neighborhood priority destinations located at most 1 km away from tram stops.
A diverse mix of commercial and cultural attractions are found as well, numerous elderly homes, medical offices, schools, and playgrounds.

A demographic study helps estimate the gait speed of the slower groups, including children, the elderly, and people with disabilities. Knowing the location of priority destinations and the gait speed of slower groups, we understand how wide streets can impact the daily life of most residents.

Creating pedestrian loops

Sidewalks and other walkways (lines) connecting the priority destinations render "Pedestrian Loops" or possible continuous walkways within neighborhoods ideal for people to do daily errands, go to work, school, or play comfortably and safe from street threats.

Along the loops we upload data from four field surveys: spatial inequity, urban heat, surface runoff, and biotope loss.

Simplified surface runoff and biotope loss calculations to easily grasp.
UrbanCare 360° pedestrian journey, Runoff (2021).

Preparation Part 2, APPs

Immersive Data Journeys invites all stakeholders to understand their neighborhood environmental situation and participate in rating daily life urban scenes from a pedestrian perspective. The app comprehends:

- 360° photo pedestrian environment exploration to assess spatial inequity,
- Local climate infographics on urban heat, stormwater runoff, and biotope loss,
- Participatory surveys on urban scenes affecting quality of life and health.

Click & explore a 360° journey demo.

Our data-driven processes help communities:

- Collect and analyze neighborhood scale data,
- Initiate petitions and organize campaigns.
- Co-create streetscapes using the evidence.

Visit our neighborhood case Bötzowviertel in Berlin.

"UrbanCare Berlin: A Practical Framework to Gather Evidence and Develop Regenerative Landscapes for Pedestrian Health." BuildingHealth.eu. (2021). buildinghealth.eu/a-healthy-neighborhood-in-berlin/

Workshop Conduction

UrbanCare Workshop Gothenburg with Göran Lindahl (Chalmers) and Alvaro Valera Sosa (BHL)

The Workshop Conduction step marks a crucial phase in the UrbanCare framework, where municipalities move from data collection and preparation to collaborative action. Here, our goal is to facilitate dynamic, transdisciplinary workshops that empower municipal representatives to identify challenges, craft solutions, and chart a path towards a sustainable urban transformation. Through a series of four sessions, we guide participants in envisioning a healthier and more resilient urban landscape.

The Workshop conduction phase has five goals:

- Learn about streetscapes that restore ecosystem services such as clean air, water, and soil, to improve pedestrian health.
- Understand and describe everyday obstacles slower groups such as children and the elderly face in a neighborhood street network.
- Determine environmental threats and risks for pedestrian health mainly of slower groups in reaching priority destinations.
- Apply streetscape strategies that increase walkability and biodiversity by reducing stormwater runoff and urban heat.
- Coordinate actions that develop and manage a healthy green pedestrian plan. The four sessions have one main objective each.

Session 1: Gap Finder

In the starting session, participants split into groups. Each group works on a site with eight urban scenes. Participants take a persona chip of slower groups (such as children, older adults, and people with different disability types) and pedestrian challenge cards (street level situations such as entrances to priority locations, resting places, street crossings, and stops and stations).
The task is to shortly describe in survey sheets how the urban scenes hinder the active mobility of slower groups.
The objective is: Identify mobility obstacles and barriers to vulnerable groups.

"Persona chips" and "Pedestrian Challenge Cards" are used to simulate these obstacles.
© 2022 Building Health Lab. "UrbanCare Curitiba Workshop, Gap Finder Session"

Session 2: Diagnostics

"Street Eco-Cards" describe physical environmental factors that degrade the urban ecosystem. "Pedestrian Disease Cards" define how our health is affected by these environmental factors. In session two, Participants are encouraged to make card combinations, place them in the urban scenes that challenge slower groups the most, and vote for the most critical ones.
The objective is: Review pedestrian needs and street-level ecosystem data to prioritize the most pressing issues.

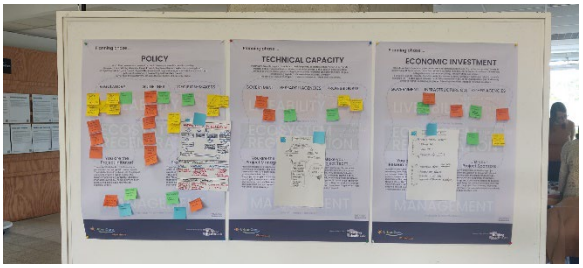
© 2022 Building Health Lab. "UrbanCare Curitiba Workshop, Diagnostics Session"

Participants use "Street Eco-Cards" and "Pedestrian Disease Cards" to assess environmental factors and their impact on health.
© 2021 Building Health Lab. "UrbanCare Sahlgrenska Workshop, Diagnostics Session"

Session 3: Planning

Discuss how this session involves planning for the development of healthy green streets based on the needs identified in Session 2.

Session 3 starts with the urban scenes selected from session 2. Participants are encouraged to write down posts explaining the resources and management positions needed to plan the development of healthy green streets.
The posts are pinned into three planning posters: Policy, Technical Capacity, and Economic Investment.
The objective is: Define strategies, technical teams, schedule, and an investment scheme.



Participants fill in planning posters for Policy, Technical Capacity, and Economic Investment.

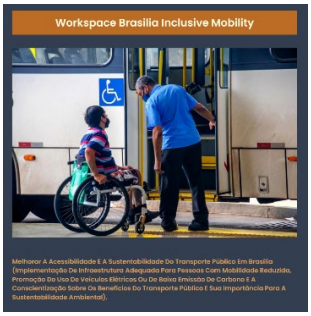
Session 4: Design

The last session is to communicate urban issues and possible solutions in a short presentation.
Participants create two streetscape sketches in ten minutes. The first is on pedestrian and street level climate issues. The second is on comprehensive streetscape solutions considering conclusions pinned in session 3.
The objective is: Present a vision to execute the pedestrian plan that maximizes benefits.

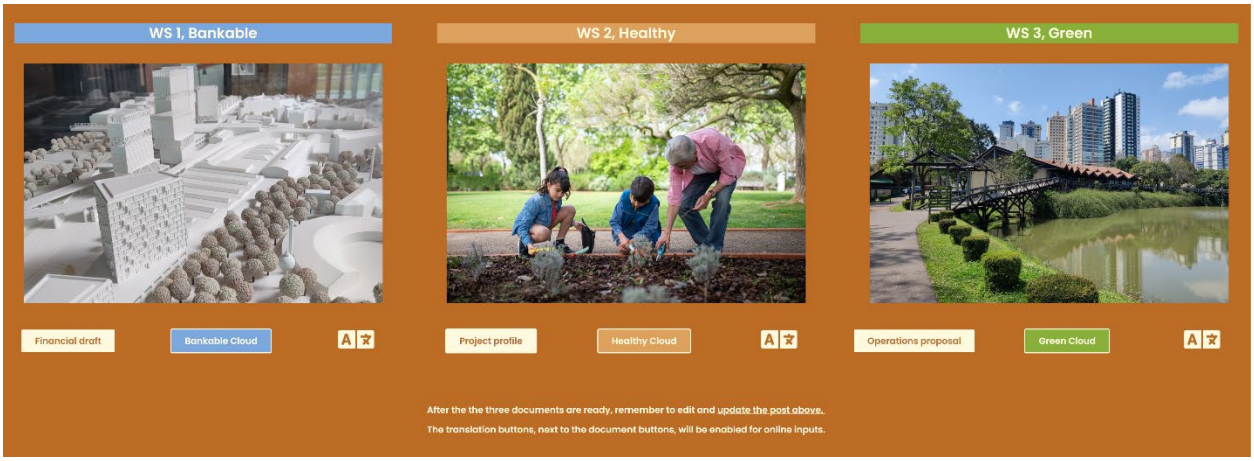
Participants create streetscape sketches that incorporate planning strategies from Session 3.

Phase III: Submission

The Submission Phase bridges meticulous planning and real-world execution in the UrbanCare framework. The focus is on translating the comprehensive urban development plan into actionable proposals that resonate with sustainability-focused investors and align with their specific guidelines. The phase kickstarts in the Dialogues (Phase 1, Initiation) with a dedicated web-based workspace for each municipality. The workspace has all the presentations, inputs, and resources from the dialogues. It includes the three project documents (project profile, operations proposal, and financial strategy) enriched during phase 2, Development. The process ensures the urban project's sustainability goals, budget, timeline, and expected environmental and social impacts clearly articulate.



Once the proposal is ready, it undergoes a rigorous assessment to meet the criteria of the chosen financial entity or investor, marking a critical step in securing the project's implementation. This phase ensures that the visionary urban plans crafted in previous steps turn into tangible projects ready to have positive impacts on urban health and sustainability.



Phase IV: Closure

The Closure Phase is the culmination of the UrbanCare framework, where the seeds of sustainable urban transformation planted during the earlier phases come to fruition. In this phase, the focus shifts to the practical execution of the approved project proposal, with a dedicated project team overseeing the alignment of every detail with the proposed timeline and sustainability objectives. Continuous monitoring and reporting ensure the project remains on course, achieving its intended health and environmental impact targets.

As the project reaches its successful conclusion, a final milestone is the publication of a scientific urban case in partnership with the esteemed Cities & Health Journal from Routledge Publisher, disseminating knowledge and insights gained from the project to replicate the lessons learned to other municipalities.

Click to visit the City know-how platform from Routledge, Cities & Health and Building Health Lab.

4. Achieving Municipal Goals

The UrbanCare workshop is a pivotal platform for municipalities, facilitating the collection and processing of data and information instrumental in crafting a pedestrian climate-friendly plan. This unique plan allows inter-departmental coordination and technical integrations to align municipal health, climate and financial goals beyond the project's objectives.

Health municipal goal: Improve outdoor environmental health.
Project objectives:

- Elevate active travel in the discussion, promoting a pedestrian first approach and public transport usage for a healthier and sustainable city.
- Precisely delineate the requisites of a pedestrian climate-friendly plan, emphasizing the needs of slower-paced groups.
- Systematically tackle street-level obstacles faced by vulnerable groups by applying principles of equity and inclusion.
- Identify and mitigate urban environmental hazards that adversely affect public health.

Climate municipal goal: Restore ecosystem services.
Project objectives:

- Identify and assess threats to the environment, formulating effective mitigation strategies.
- Leverage evidence-based approaches for mitigating the identified threats.
- Spearhead the development of nature-based solutions (N-bS) with the aim of restoring ecosystem services.
- Define the N-bS project operations involved in ensuring on-time delivery, adherence to budget, and meeting the required quality standards.

Economic municipal goal: Ensure financial readiness.
Project objectives:

- Explore and identify a range of funding sources, including public-private partnerships, grants, and innovative financing models, to ensure a robust financial foundation for the project.
- Investigate sustainable financing options aligned with the project's sustainability goals, including mechanisms for continued financial support beyond the initial phase.
- Apply transparent budgeting practices, clarifying how financial resources will be allocated throughout the project's lifecycle to foster confidence among financial stakeholders.
- Engage with local communities and relevant stakeholders to garner support and financial contributions when applicable, fostering a sense of ownership and financial responsibility for the project.
- Ensure a compelling case that resonates with development financial agencies and sustainability investors, such as cost-benefit and cost-effectiveness analyses, risk mitigation strategies, and monitoring and reporting.

The UrbanCare workshop empowers municipalities to harmonize their health, climate, and financial aspirations, ensuring the urban development plan is sustainable and aligned with their core objectives.

5. Why work with Building Health Lab?

Partnering with Building Health Lab presents several compelling reasons:

1. **Expertise in Sustainable Urban Development**: With our academic partners and industry collaborators, we bring a wealth of knowledge and expertise on sustainable urban development to address complex urban challenges.
2. **Urban Health Systems Approach**: Our focus on urban health aligns perfectly with the health and well-being of urban populations. Our comprehensive approach takes in the interconnectedness of health, environmental sustainability, and economic viability.
3. **Scientific Rigor**: Our foundation is built upon scientific research, ensuring that every urban development project we undertake is deeply rooted in evidence-based methodologies. BHL's commitment to scientific rigor results in well-informed, data-driven solutions that stand up to scrutiny.
4. **Practical Application**: While our work is grounded in scientific research, we go beyond theory to apply these findings in practical, real-world contexts. Our Think & Do Tank approach bridges the gap between academic knowledge and on-the-ground implementation, making scientific insights accessible and actionable.
5. **Transdisciplinary Solutions**: We involve transdisciplinary collaboration in our projects critical for tackling multifaceted urban challenges. Our ability to bring together experts from diverse fields ensures that our projects are well-rounded and includes a range of perspectives.
6. **Science Communication Tools for Citizen Science and Community Participation**: We emphasize the importance of citizen science and community involvement, providing tools and strategies for effective science communication. With intuitive applications, communities actively engage in urban development projects, fostering a sense of ownership and participation.
7. **Alignment with Sustainable Development Goals (SDGs)**: Our work aligns directly with numerous SDGs, particularly those related to health, climate action, sustainable cities, and partnerships. Collaborating with us allows you to make significant progress toward meeting your SDG commitments.
8. **Innovative Tools and Methodologies**: We utilize innovative tools and methodologies that can enhance the effectiveness and efficiency of urban development projects. Our UrbanCare framework, for instance, streamlines the entire process, from concept to execution, ensuring that projects are well-planned and have a higher likelihood of success.
9. **Capacity to Mobilize Funding**: Our experience exploring various funding sources, including public-private partnerships and innovative financing models, can help secure the financial backing required for ambitious urban projects.
10. **Partnerships and Networks**: We have a vast network of partners and collaborators in academia, industry, and the financial sector. This network fosters valuable connections and collaborations, enhancing the impact of projects.

In summary, partnering with Building Health Lab offers a combination of expertise, innovative approaches, and a commitment to holistic urban health that aligns perfectly with your goals. Our transdisciplinary approach makes us a valuable partner in pursuing healthier, more sustainable, and resilient urban environments.

Academic partners in Europe

Oceanic Climate: CVA Chalmers University of technology
Continental Climate: Urban Management program, TU-Berlin
Inter-Mediterranean climate: Abita, University of Florence
Mediterranean climate: University of Cyprus

Academic partners out of Europe

Federal University of Paraná (BZ)
University of Mexico (MX)
Pune College of Architecture for Women University (IN)

Globally, we collaborate with climate and health advocacy groups such as the Architects Declare, the Global Health Hub, and the International Society for Urban Health.

Organization

UrbanCare Research and Development:
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Institutional partners:
Chalmers University of Technology | Göran Lindahl, Prof.
Technische Universität Berlin | Jacob van Rijs, Prof.
University of Cyprus | Nadia Charalambous, Prof.
University of Florence | Rosa Romano, Prof.
Universidade Federal do Paraná | Alessandra Bianchi, Prof.
Dr. Bhanuben Nanavati College of Architecture | Sujata Karve, Prof.

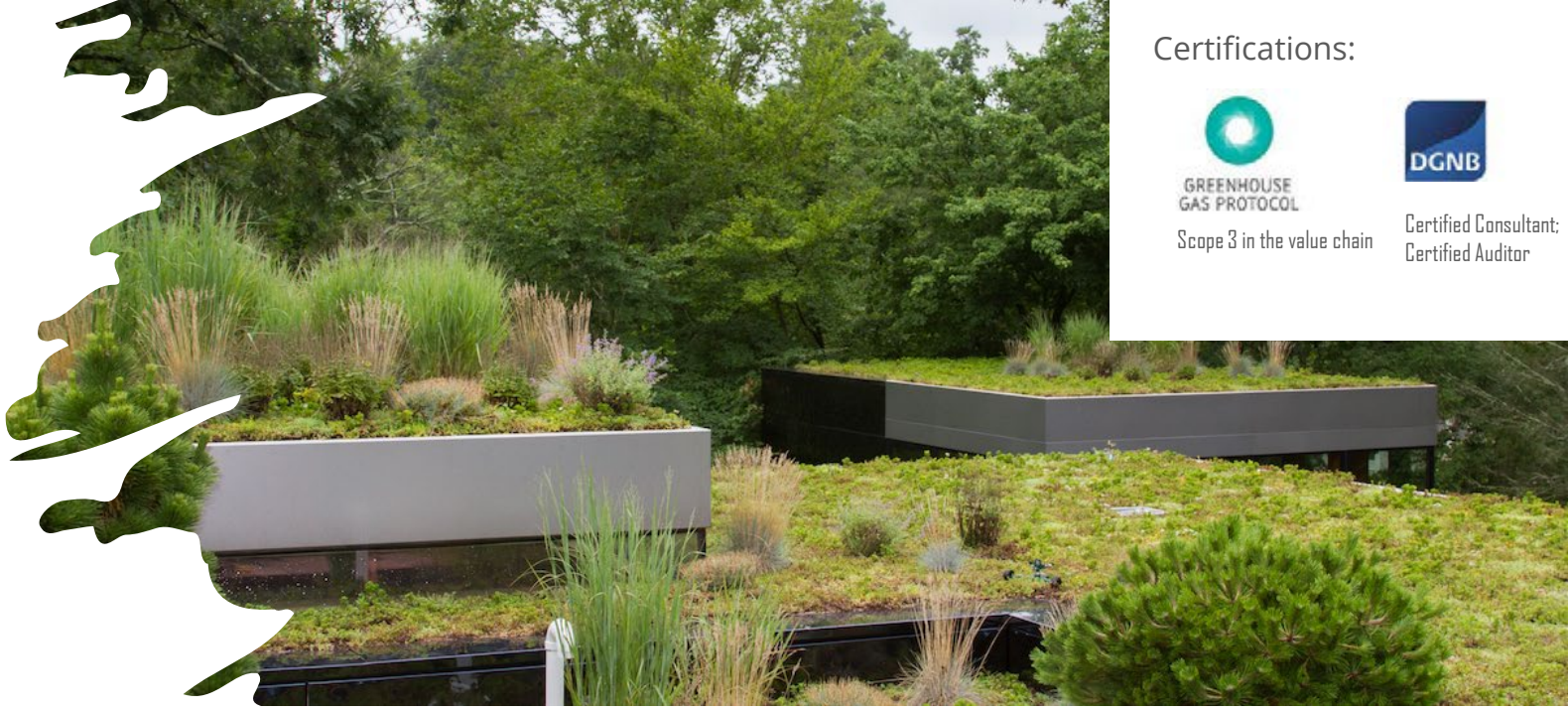
ANCB The Aedes Metropolitan Laboratory | Miriam Mlecek, Manager
Cities & Health Journal | Marcus Grant, Editor in Chief

Building Health Lab Team:
Anna Au
Sonia Medina
Catalina Corral
Vera Sale
Gunnar Leinemann

At BHL, we are committed to forging collaborative partnerships with academia and industry to facilitate the exchange of knowledge and drive the advancement of #UrbanCare and #PedestrianHealth, benefitting municipalities.

Let's connect and make a positive impact together. Reach out to us at: info@buildinghealth.eu

iimpcoll
innovate impact Collaboration



Certifications:

GREENHOUSE GAS PROTOCOL
Scope 3 in the value chain

DGNB
Certified Consultant;
Certified Auditor

Green Infrastructure – possibilities & limitations

Dr. Anna Zakrisson

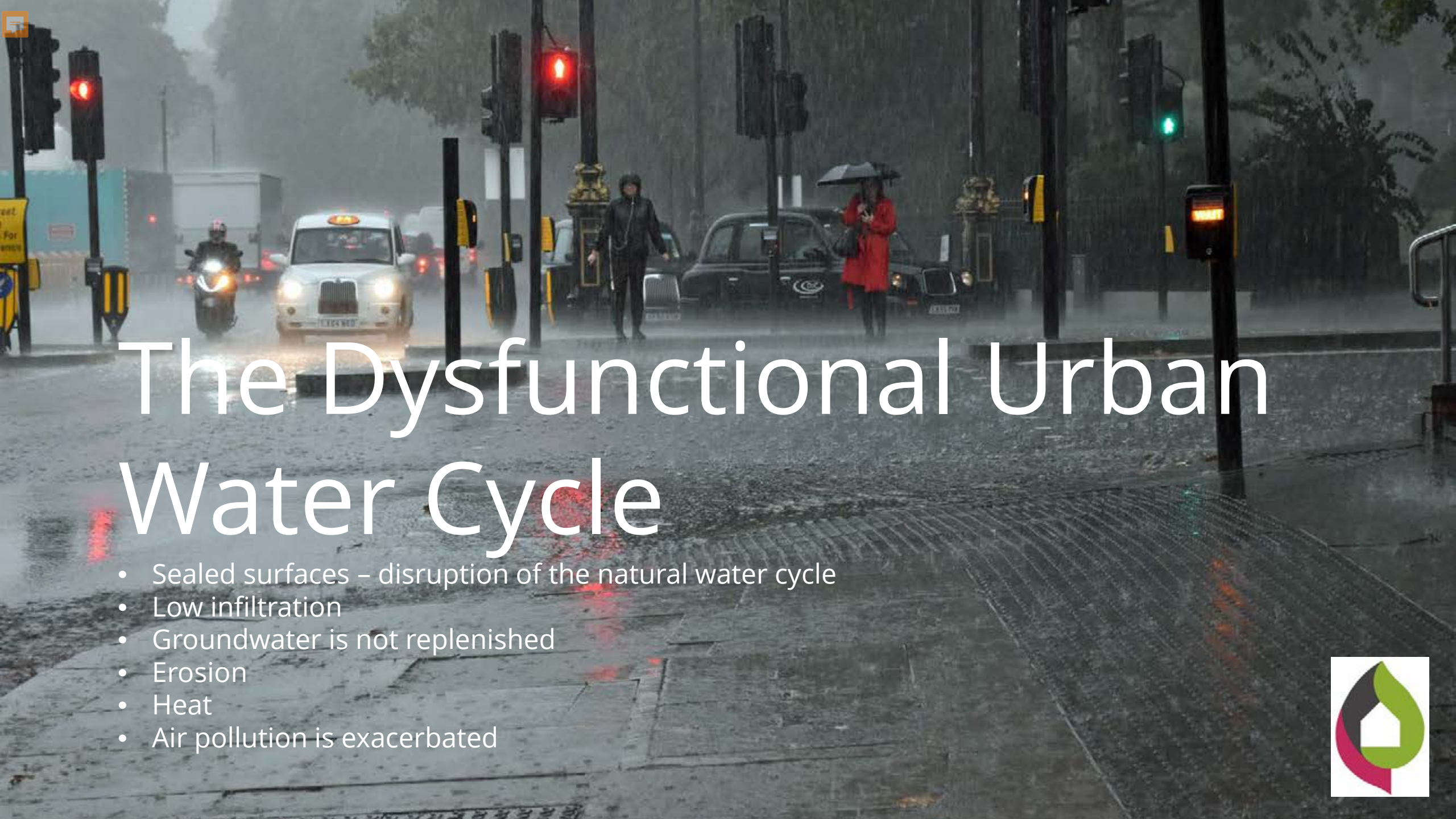
UNIVERSITY OF CAMBRIDGE

MAX PLANCK GESELLSCHAFT

Stockholm University

Leibniz-Gemeinschaft


We Have a
Problem!



The Dysfunctional Urban Water Cycle

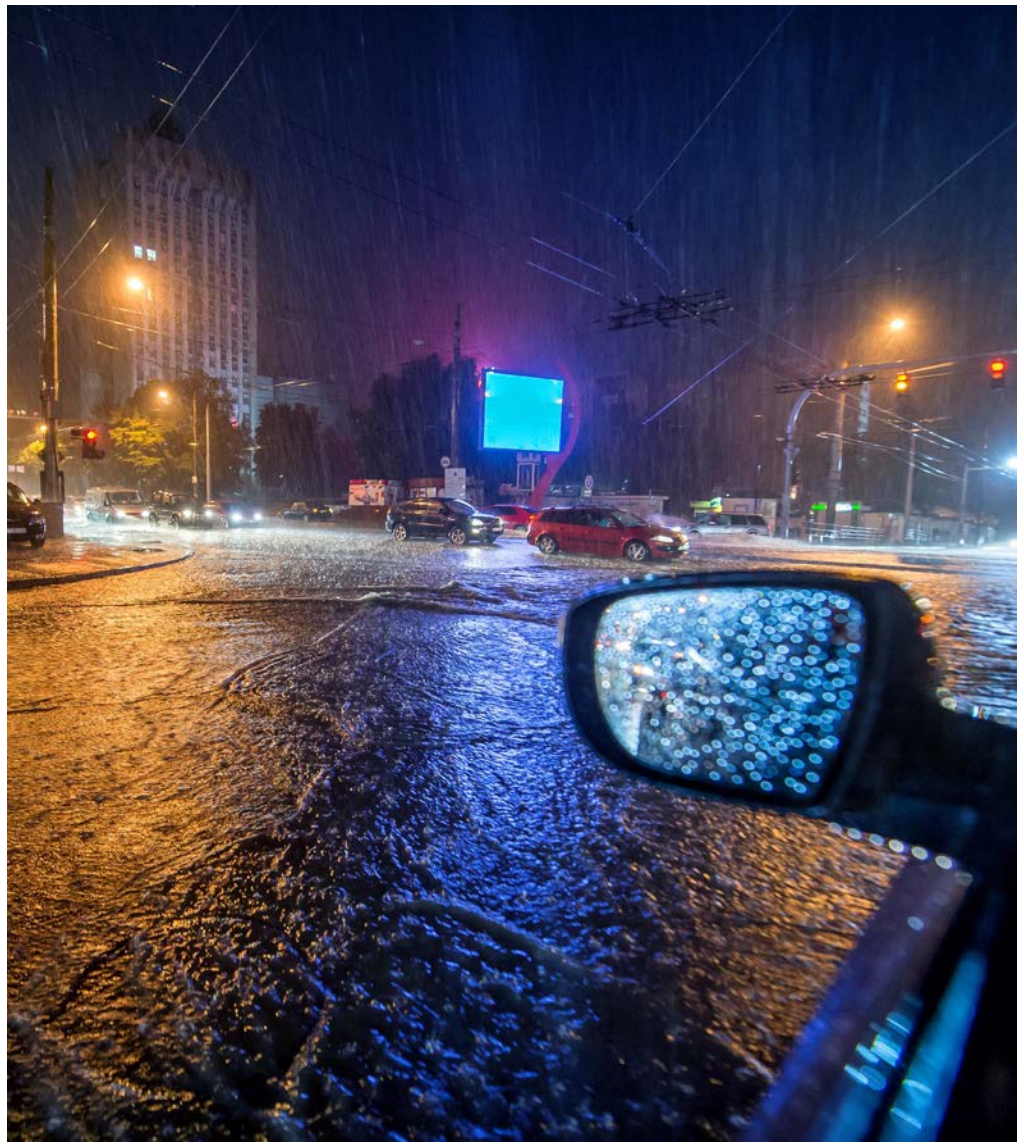
- Sealed surfaces – disruption of the natural water cycle
- Low infiltration
- Groundwater is not replenished
- Erosion
- Heat
- Air pollution is exacerbated


Retention -
Evapotranspiration
The Natural
Water Cycle
Detention – Slowing Down

Sealing & Runoff

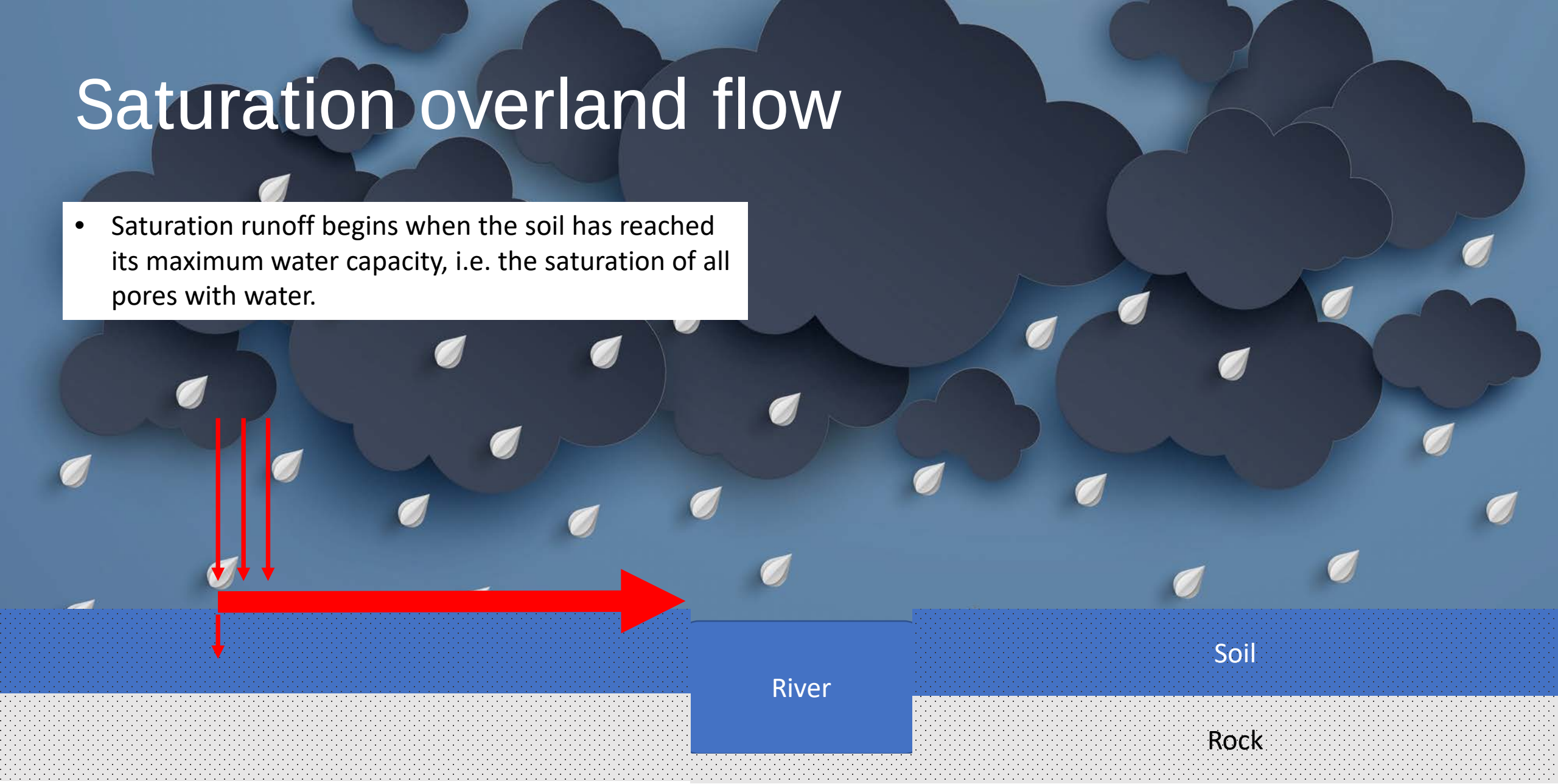
Sealing and flooding

- Surface runoff - when precipitation or snowmelt water ceases to infiltrate the soil and drain at the surface of the terrain.
- Often the trigger floods
- It is a trigger and transport medium for water erosion.
- A few types of surface runoff:
  - Saturation discharge/saturated overland flow
  - Horton runoff generation

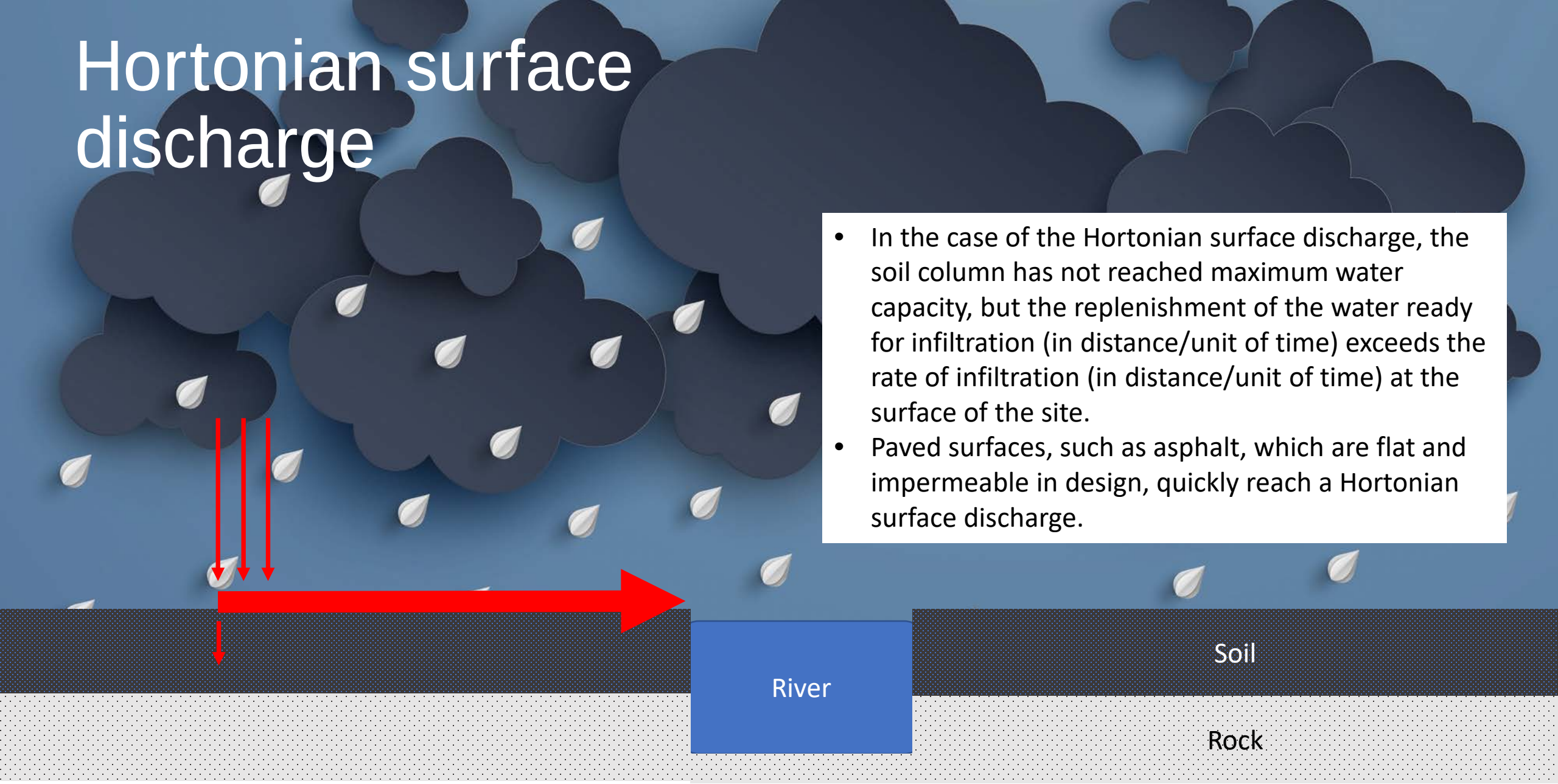


Saturation overland flow

- Saturation runoff begins when the soil has reached its maximum water capacity, i.e. the saturation of all pores with water.



Hortonian surface discharge



- In the case of the Hortonian surface discharge, the soil column has not reached maximum water capacity, but the replenishment of the water ready for infiltration (in distance/unit of time) exceeds the rate of infiltration (in distance/unit of time) at the surface of the site.
- Paved surfaces, such as asphalt, which are flat and impermeable in design, quickly reach a Hortonian surface discharge.

Urban Heat Islands (UHIs)

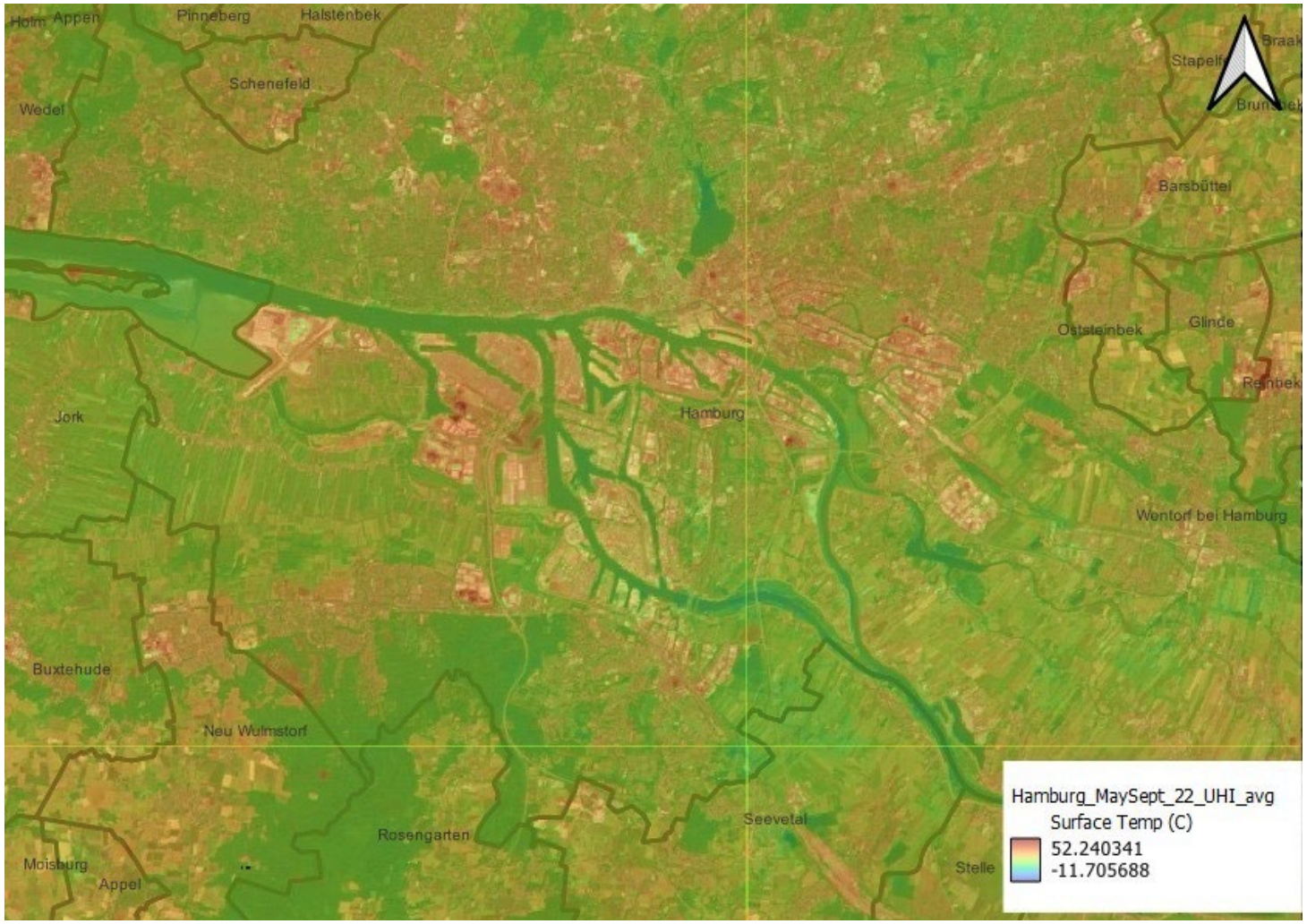
Why are UHIs problematic?

- In the three summers of 2018 to 2020, more than 19,000 people died in Germany due to the heat (RKI)
- It is hard to find reliable data on death numbers in the most vulnerable countries
- We need to restore natural cooling!

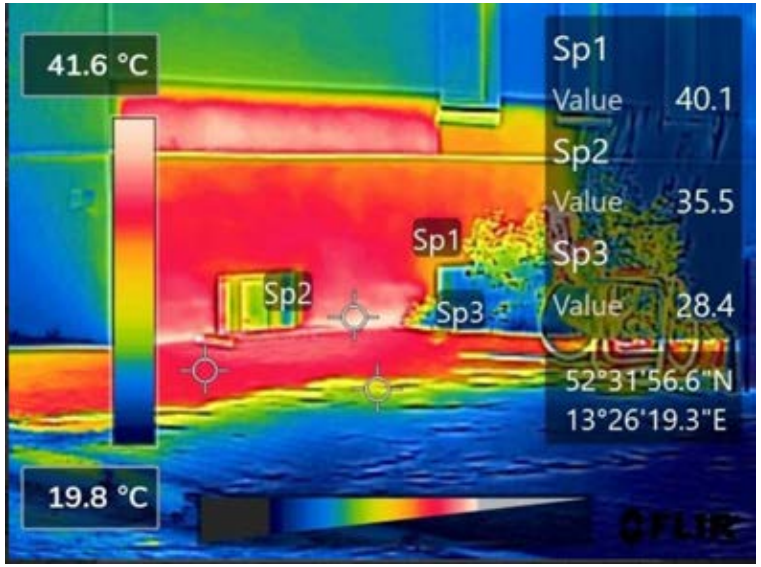
The power of green!

- Average surface temperature
- Water and green areas are easy to see (cooler due to the evapotranspiration process)

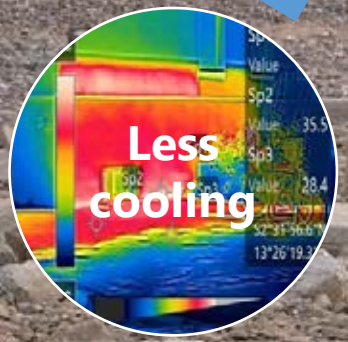
May-Sept 2022 derived from Landsat 9



Urban Health Lab: https://buildinghealth.eu/urbancare-data-journey-in-a-berliner-neighborhood/



Droughts & Floods are twins!



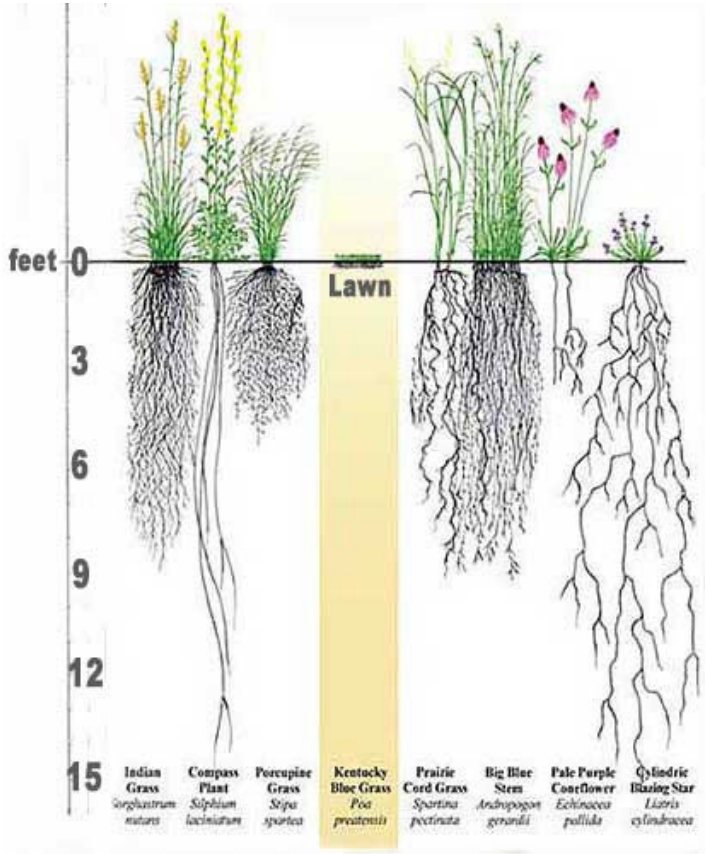
Sealed surfaces

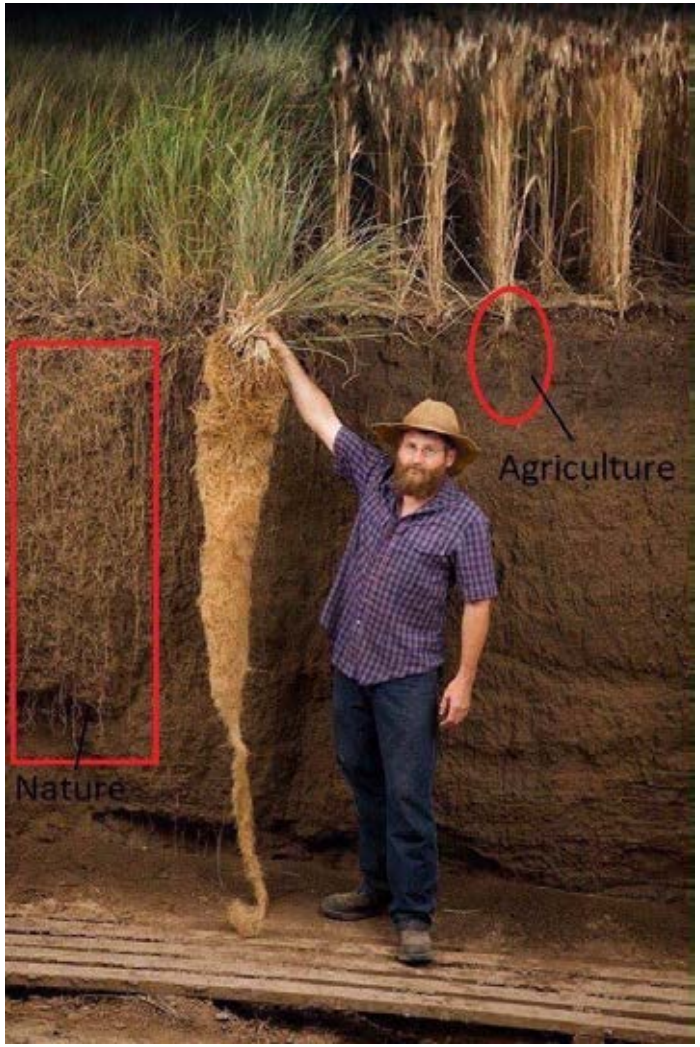
Sealed surfaces

- About 44 percent of settlement and traffic areas in Germany are currently sealed
- ... built-up, concreted, asphalted, paved or otherwise paved

Sealing of the soil often leads to a total loss of natural soil functions

- Prevention of exchange between soil air and atmosphere
- Change in soil temperature and water balance and thus change in the microclimate
- No groundwater recharge, significantly higher surface runoff of rainwater
- Lack of filter performance – risk of increased pollutant accumulation of neighboring soils and/or receiving waters
- loss of vegetation area and plant sites
- Isolation of soil organisms and killing of fungi and bacteria that are difficult to regenerate.



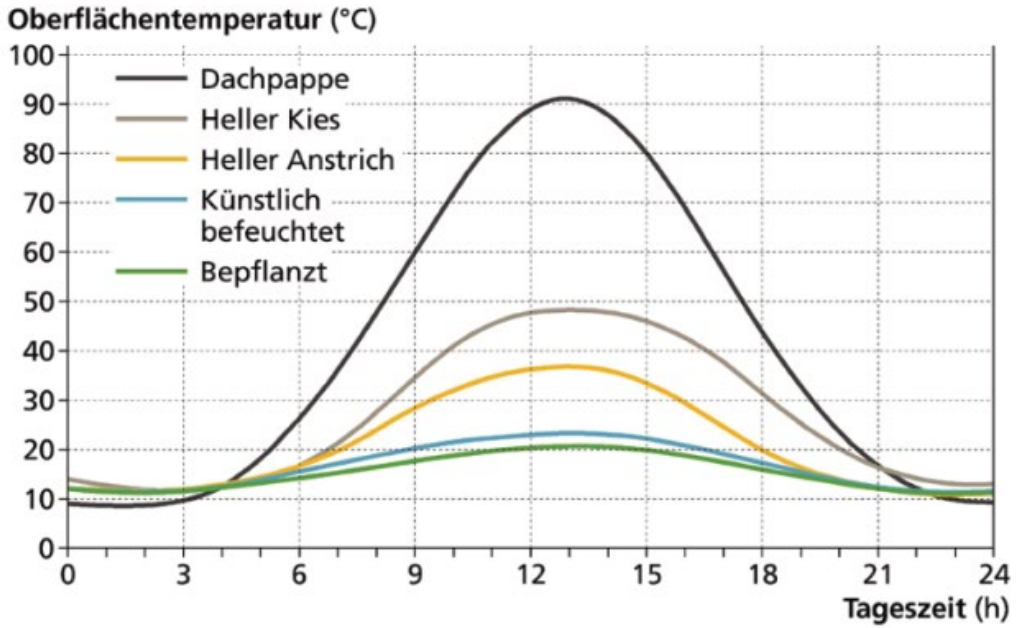


What does native species have to do with flooding protection?

- https://wisconsinpollinators.com/Articles/PlantRootSystems.aspx

Green infrastructure can be useful – provided the configuration is climate appropriate…

- Annual runoff volume reductions by up to 60% through Retention (data based on green roofs)
- Detention-type green roofs can replace tanks and cisterns as stormwater tools
- Cooling
- Increased urban biodiversity
- Pollution capture
- Improved mental health
- Re-establishment of the natural water cycle



The Sponge City Concept

How can you prevent sealing? – The SPONGE CITY

- SuDS – Sustainable Drainage Systems, e.g. to dampen water-damaging discharge peaks (hydraulic stress) from urban drainage.
- Green Infrastructure (GI)

- GI Environmental Benefits (EU Commission)
  - Provision of clean water
  - Absorption of pollutants from air and water
  - Flood protection
  - Reduction of heat islands
  - Improved pollination
  - Protection against soil erosion
  - Retention and absorption of rainwater
  - Improved pest control
  - Improvement of soil quality
  - Less land consumption and soil sealing
  - Protection against natural disasters (such as storms, forest fires, landslides)

The Sponge City Concept - It Started in China

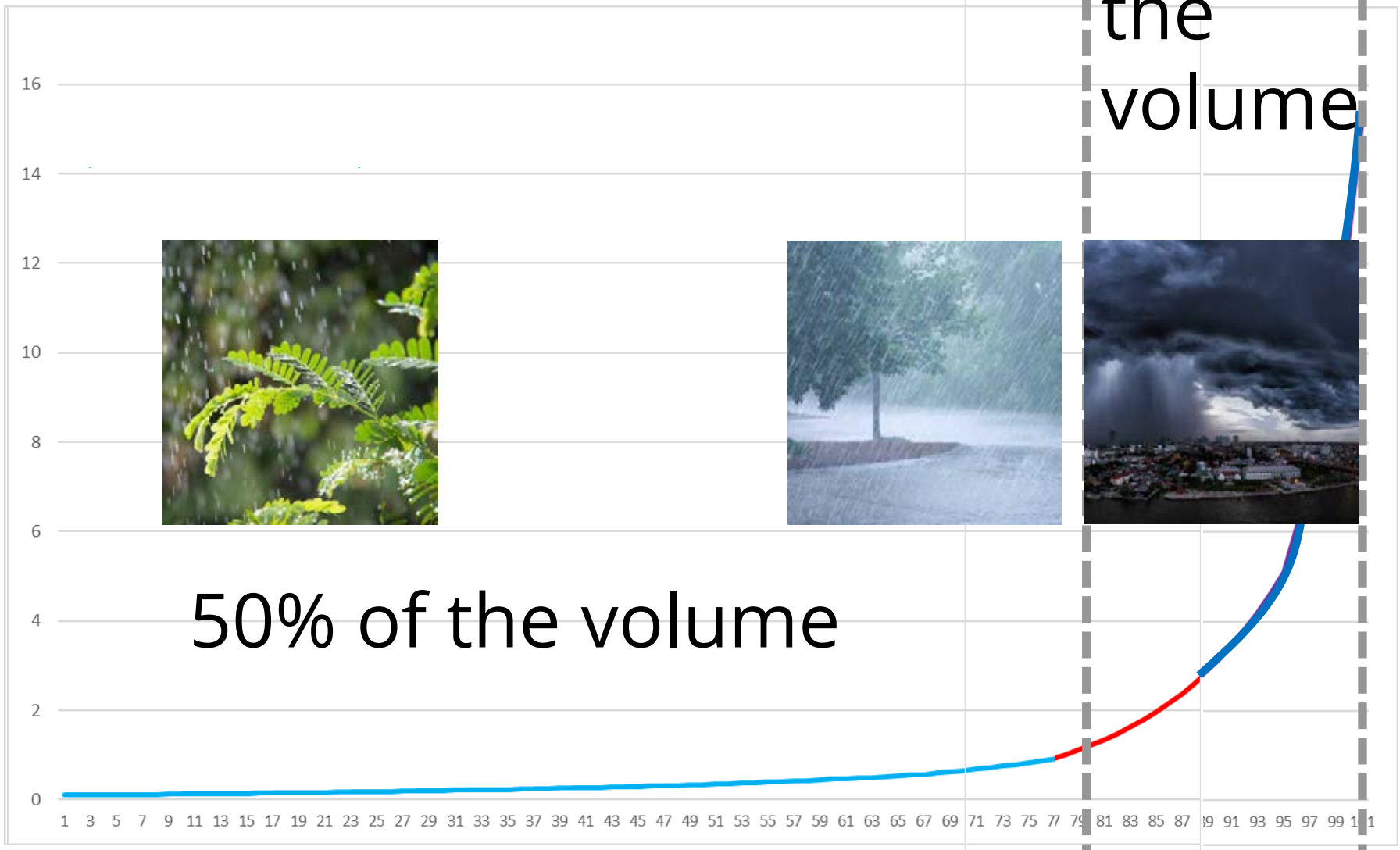
- In China, where the central government adopted Yu Konjian's ideas in 2013, the concept has been successfully tested in 30 municipalities, and the country now plans to adapt 80% of urban areas accordingly by 2030.
- "It's not about preventing flooding," says Scott Hawken, head of the landscape architecture and urban planning program at the University of Adelaide in Australia. "It's about using water intelligently and letting it seep away so that flooding is less dangerous.

Retention vs. Detention



Different types of storms

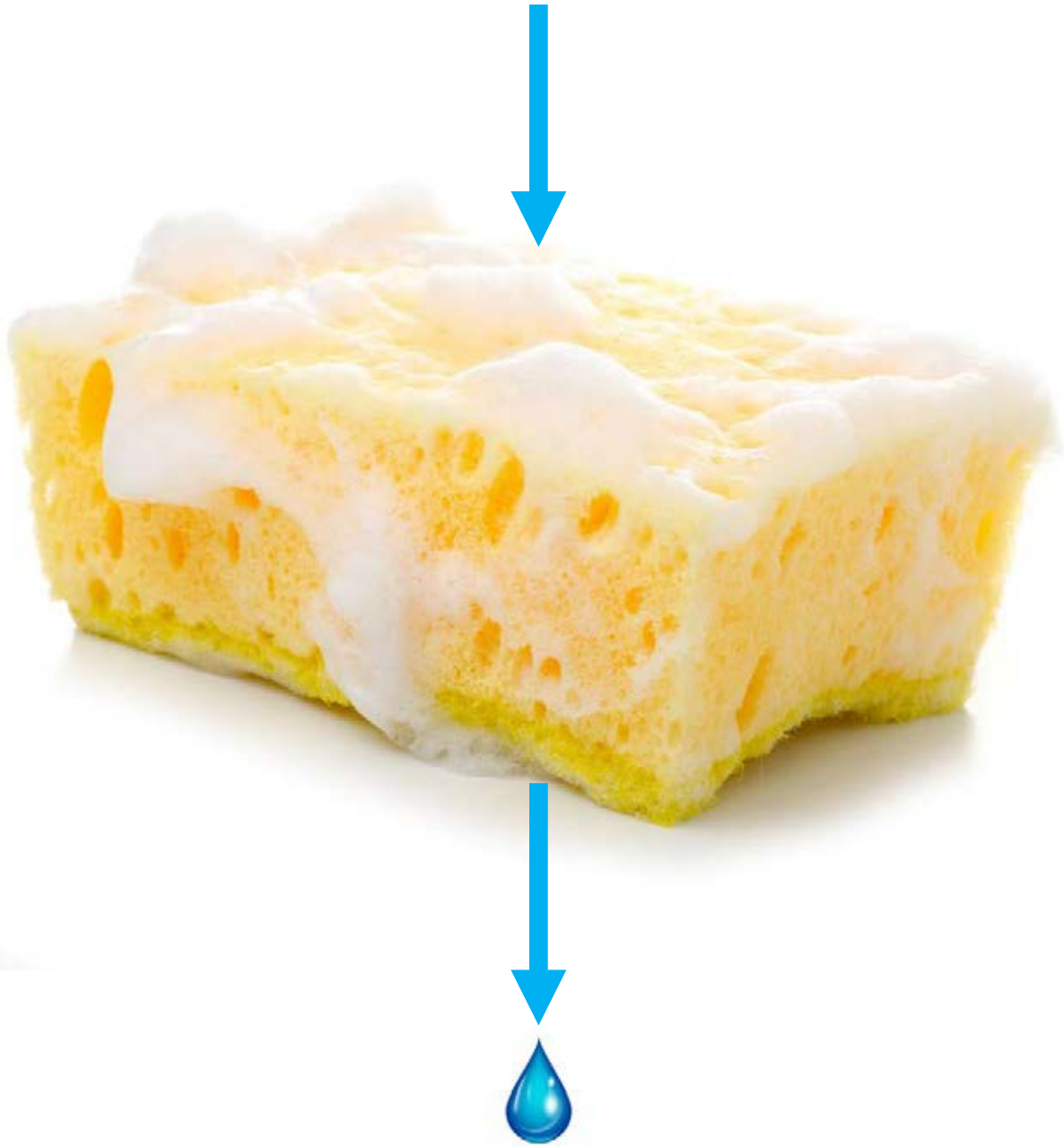
Storm size

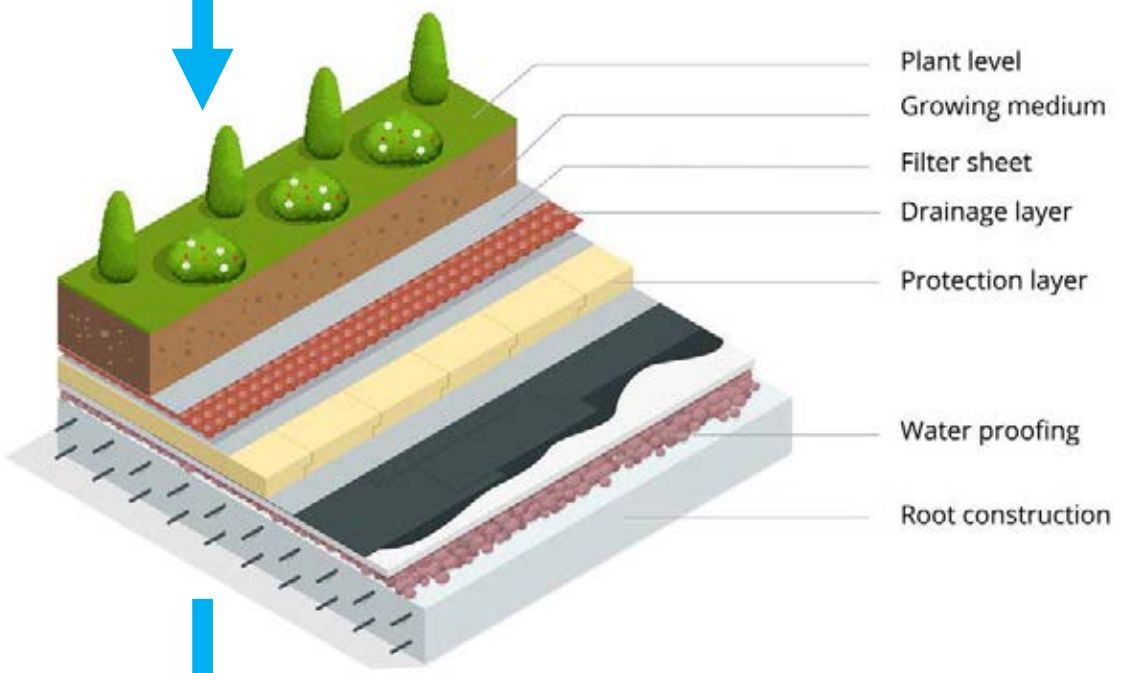


Statistical storms events in a year

Retention vs. Detention

Traditional Green Roof



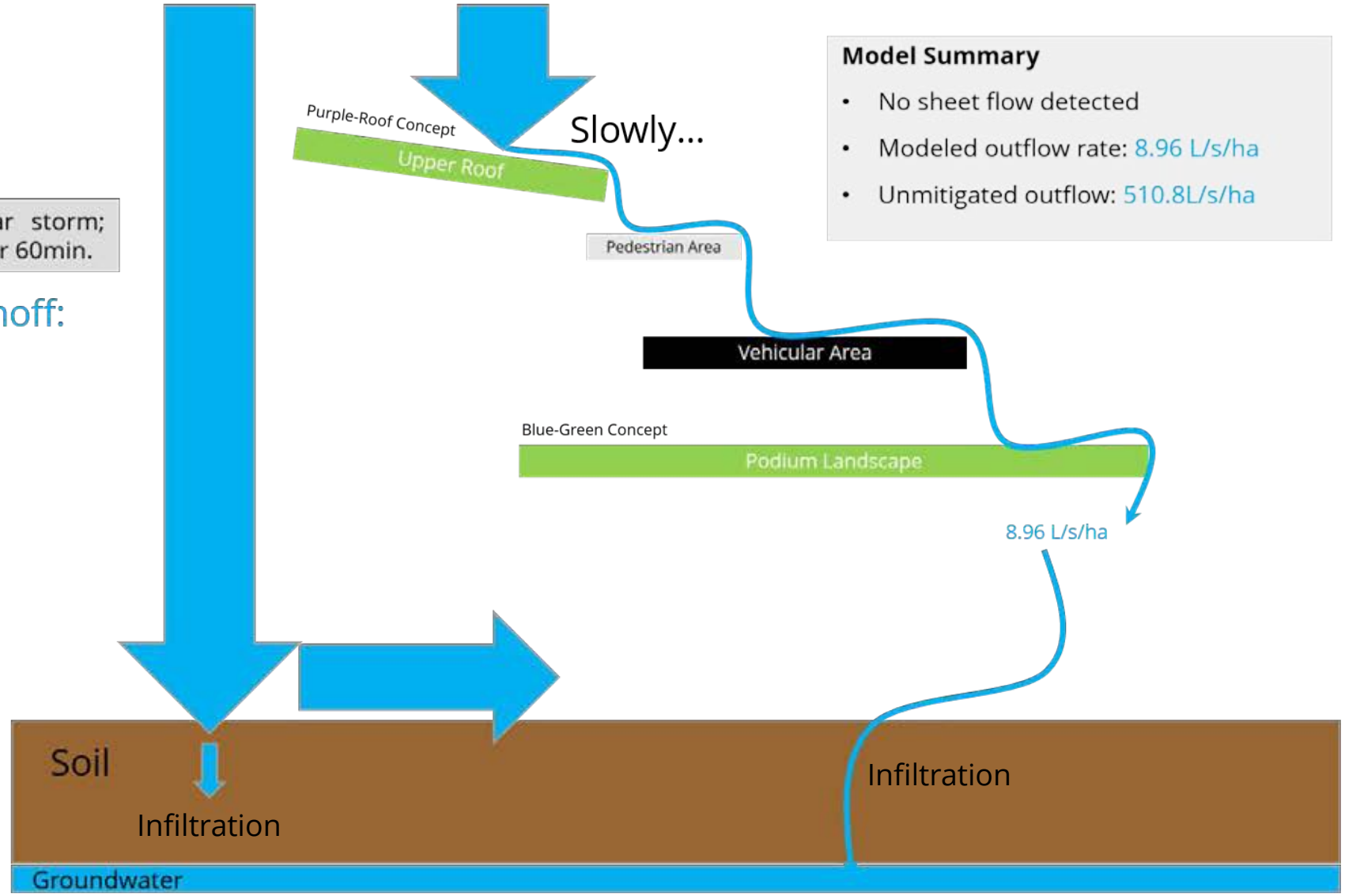


CONNECT THE SOLUTIONS! THINK ECOSYSTEM!

Detention modeling: Berlin

Design storm: 100-year storm; Euler Type II; 55mm over 60min.

Unmitigated runoff: 510.8 L/s/ha



Model Summary

- No sheet flow detected
- Modeled outflow rate: 8.96 L/s/ha
- Unmitigated outflow: 510.8L/s/ha

Based on data and modeling from Green Roof Diagnostics

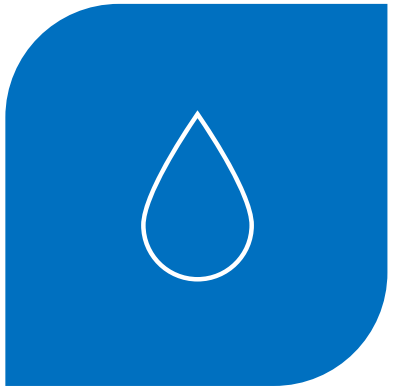
Different Types of Roof Detention

All are excellent. They cover different parts of the market.

BLUE-GREEN ROOFS

+ Excellent detention
+ High retention through detained water
+ Rainwater harvesting

- High load
- Requires a flat deck
- You store a pool of water on the roof (insurance)



BLUE ROOFS

+ Excellent detention

- Little retention as **no plants**
- High load
- Requires a flat deck

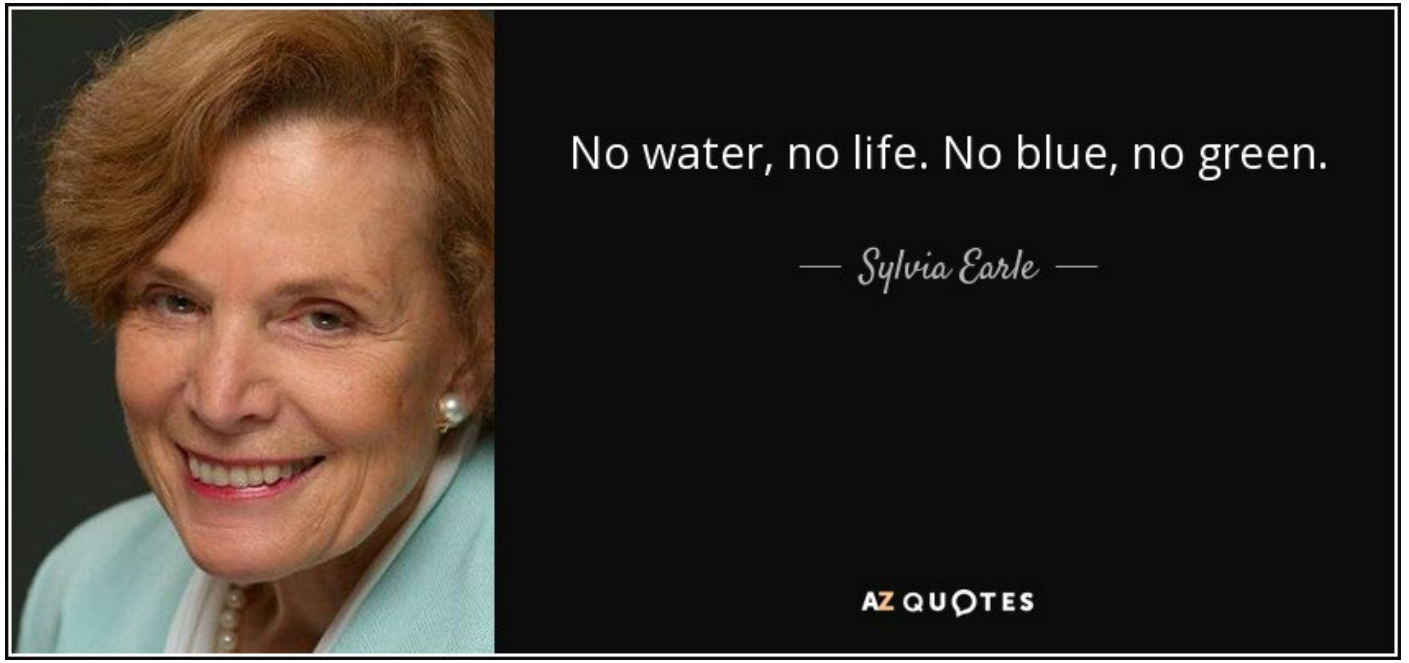
PURPLE-ROOF CONCEPT

+ Good detention
+ High retention
+ Lightweight
+ Can be installed on sloped roofs

- Rainwater harvesting is separate

Conclusion

- Green infrastructure implementation for stormwater purposes is not a green luxury
- The cost of inaction is higher than cost of action
- …and there are clear business cases for green roofs in many areas
- Stormwater management is divided into retention (“holding”) and detention (“delay”)



Thank you!

Contact me!

Dr. Anna Zakrisson

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iimpcoll
innovate impact Collaboration

Specialities

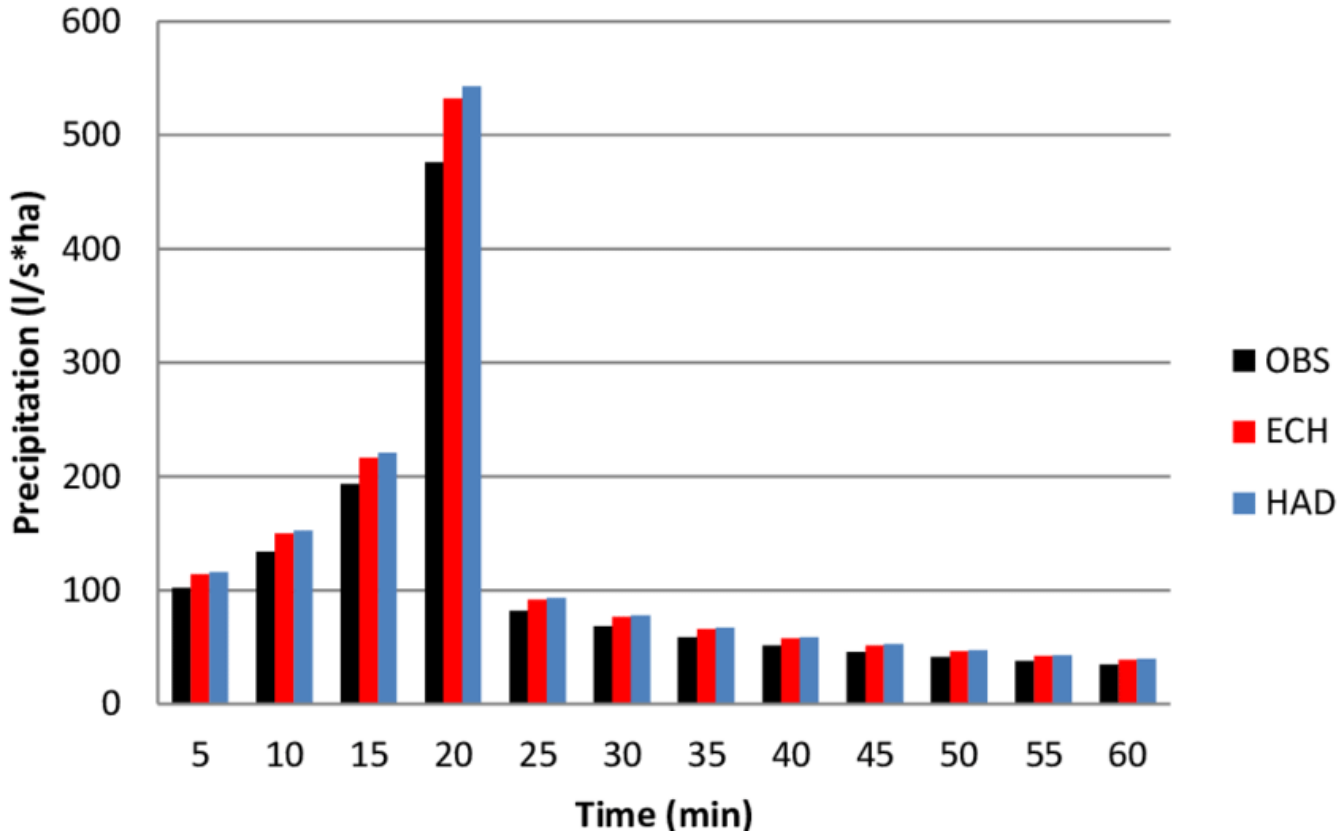
- ESG reporting
- Scope 3 in the value chain
- DGNB consultant & auditor (next week)
- Green infrastructure specialist

Stormwater Management – the Rules of the Game

- The project must be able to withstand a 100-year storm event (design storm)
- Often gray, outdated infrastructure is added such as concrete cisterns
- The project runoff rates cannot exceed the MAXIMUM ALLOWABLE flowrates set by the city.
- Maximum allowable flowrates are often 1-10L/s/Ha

The Design Storm (Bemessungs-niederschlag)

- Euler Type II, R8, R10, Type I, Type II…
- 20, 50, 100, 200-year storms



Olsson, Jonas, et al. "Downscaling of short-term precipitation from regional climate models for sustainable urban planning." *Sustainability* 4.5 (2012): 866-887.

Sizing of stormwater solutions in Germany

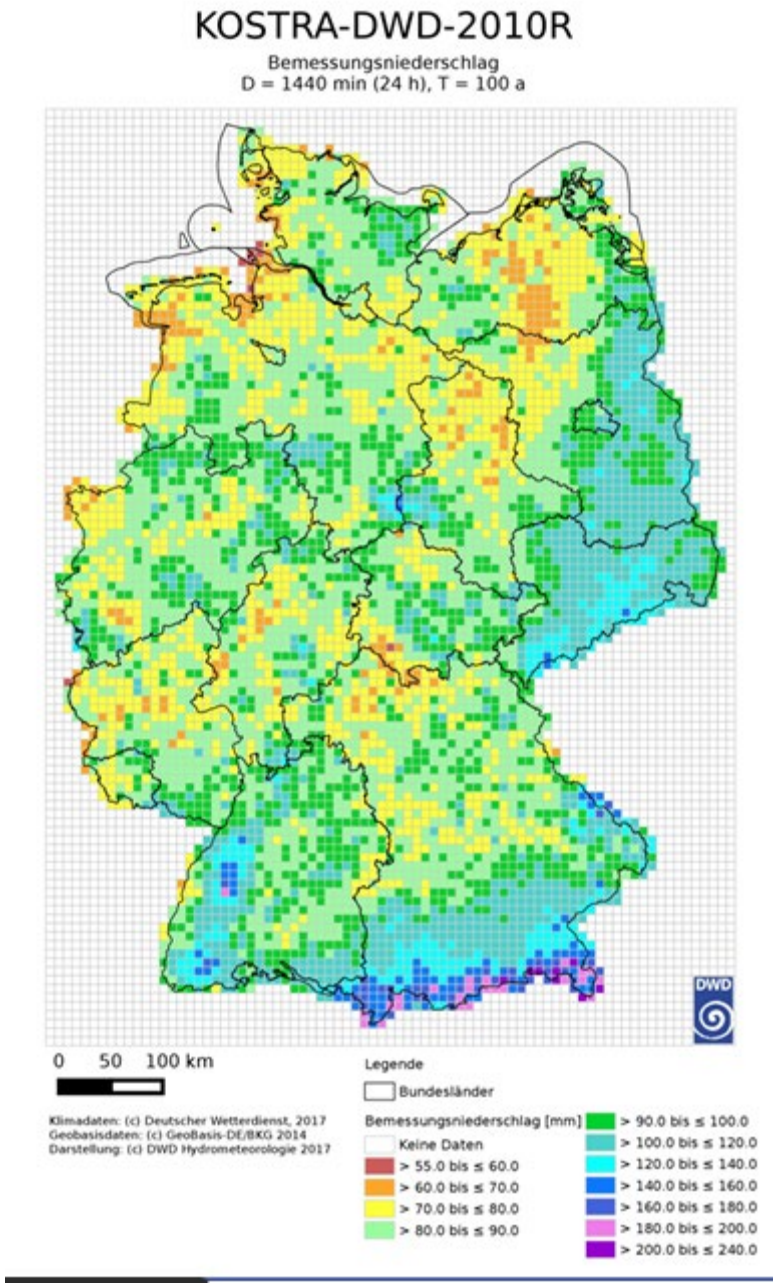
Lexikon der Geowissenschaften

- Design precipitation:
  1) "precipitation height and precipitation distribution assumed for a given catchment area for the determination of the design flood".
- 2) "Precipitation level of a particular precipitation event on which water management and structural planning is based".
- Design precipitation varies from region to region
- Design precipitation is an extreme statistical analysis of precipitation time series with a high temporal resolution and describes theoretical precipitation events as a function of duration D and return time T.

Bemessungs - Niederschlagshöhen (mm)
in Abhängigkeit von Wiederkehrzeit und Dauer

Dauer-stufe	Wiederkehrzeit in a								
	0,5	1	2	5	10	20	30	50	100
5 min	3,5	5,0	6,6	8,6	10,1	11,6	12,5	13,6	15,1
6 min	4,0	5,7	7,4	9,7	11,4	13,1	14,1	15,4	17,1
7 min	4,4	6,3	8,1	10,6	12,5	14,4	15,5	16,9	18,8
8 min	4,7	6,7	8,8	11,4	13,5	15,5	16,7	18,2	20,2
9 min	5,0	7,2	9,3	12,2	14,3	16,5	17,7	19,3	21,5
10 min	5,3	7,5	9,8	12,8	15,1	17,3	18,7	20,3	22,6
11 min	5,5	7,9	10,3	13,4	15,8	18,1	19,5	21,3	23,6
12 min	5,7	8,2	10,7	13,9	16,4	18,9	20,3	22,1	24,6
13 min	5,9	8,5	11,0	14,4	17,0	19,5	21,0	22,9	25,5
14 min	6,1	8,8	11,4	14,9	17,5	20,1	21,7	23,6	26,3
15 min	6,3	9,0	11,7	15,3	18,0	20,7	22,3	24,3	27,0
16 min	6,5	9,2	12,0	15,7	18,5	21,2	22,9	24,9	27,7
17 min	6,6	9,5	12,3	16,1	18,9	21,7	23,4	25,5	28,4
18 min	6,8	9,7	12,6	16,4	19,3	22,2	23,9	26,1	29,0
19 min	6,9	9,9	12,8	16,7	19,7	22,7	24,4	26,6	29,6
20 min	7,0	10,0	13,1	17,1	20,1	23,1	24,9	27,1	30,1
21 min	7,1	10,2	13,3	17,4	20,4	23,5	25,3	27,6	30,6
22 min	7,3	10,4	13,5	17,6	20,8	23,9	25,7	28,0	31,1
23 min	7,4	10,5	13,7	17,9	21,1	24,3	26,1	28,5	31,6
24 min	7,5	10,7	13,9	18,2	21,4	24,6	26,5	28,9	32,1
25 min	7,6	10,8	14,1	18,4	21,7	24,9	26,9	29,3	32,5
26 min	7,7	11,0	14,3	18,7	22,0	25,3	27,2	29,6	33,0
27 min	7,8	11,1	14,5	18,9	22,2	25,6	27,5	30,0	33,4
28 min	7,9	11,3	14,6	19,1	22,5	25,9	27,9	30,4	33,8
29 min	8,0	11,4	14,8	19,3	22,8	26,2	28,2	30,7	34,1
30 min	8,0	11,5	15,0	19,5	23,0	26,5	28,5	31,0	34,5
35 min	8,4	12,1	15,7	20,5	24,1	27,7	29,9	32,5	36,2
40 min	8,8	12,5	16,3	21,3	25,1	28,8	31,1	33,8	37,6
45 min	9,1	13,0	16,9	22,0	25,9	29,8	32,1	35,0	38,9
50 min	9,3	13,3	17,4	22,7	26,7	30,7	33,1	36,0	40,0
55 min	9,6	13,7	17,8	23,3	27,4	31,5	33,9	36,9	41,1
60 min	9,8	14,0	18,2	23,8	28,0	32,2	34,7	37,8	42,0

Bemessungsregen Regenreihen der Freien und Hansestadt Hamburg



KOSTRA-DWD Koordinierte Starkniederschlags Regionalisierungs-Auswertung

- ~5400 Rasterfelder von je rund 67 km^2
- 9 Wiederkehrintervalle zwischen 1 und 100a
- 18 Dauerstufen zwischen 5 min und 72 h
- Praxisrelevanten Extremwerte des Niederschlags (PEN) wird für größere Wiederkehrzeiten als 100a

Planning mistakes can have massive ecological & economic consequences....

Video link: https://www.youtube.com/watch?v=eJOcmnXhWpY

Kotchakorn Voraakhom

https://www.linkedin.com/in/kotch-voraakhom/

TED-talk:
https://www.ted.com/talks/kotchakorn_voraakhom_how_to_transform_sinking_cities_into_landscapes_that_fight_floods?language=en

- How the sponge city principle saved Bangkok!

Hochschule Hof
University of Applied Sciences

Chulalongkorn University Centenary Park, or CU Centenary Park

- During the rainy season, the park collects and stores water, which is then used for irrigation in the dry season.
- 11 hectares in the center of Chulalongkorn University
- Accommodates outdoor gatherings, an amphitheater, a recreation lawn, playgrounds, and a small museum.
- 4000m3 water retention capacity
- The museum has Thailand's largest green roof with 5 220m2. The grasses absorb large amounts of water during the rainy season from July to October and are hardy enough to survive the hot season from March to June.