



Barrierer og drivkræfter for implementering af blågrønne løsninger i svenske kommuner

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Urban wetland



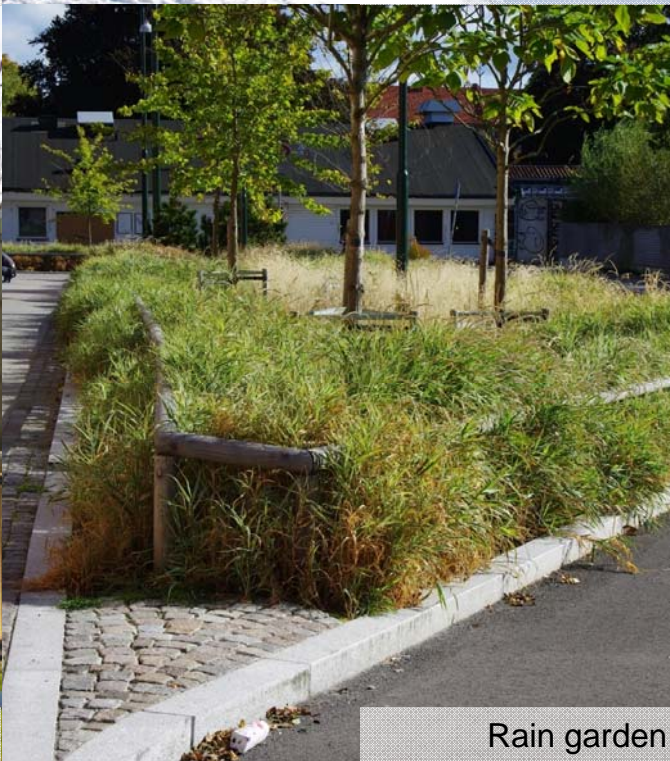
Swale



Green roof



Floodable land



Rain garden



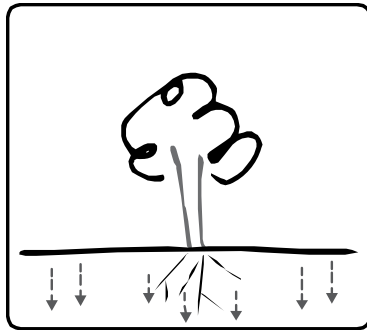
Pond

Research questions

- What role do **blue-green infrastructure (BGI)** have in the **urban environment** in relation to hydrology?
- Can BGI **reduce flood risk**?
- How can **wide-spread implementation** of BGI be done?



Hydrological processes of blue-green infrastructure (BGI)

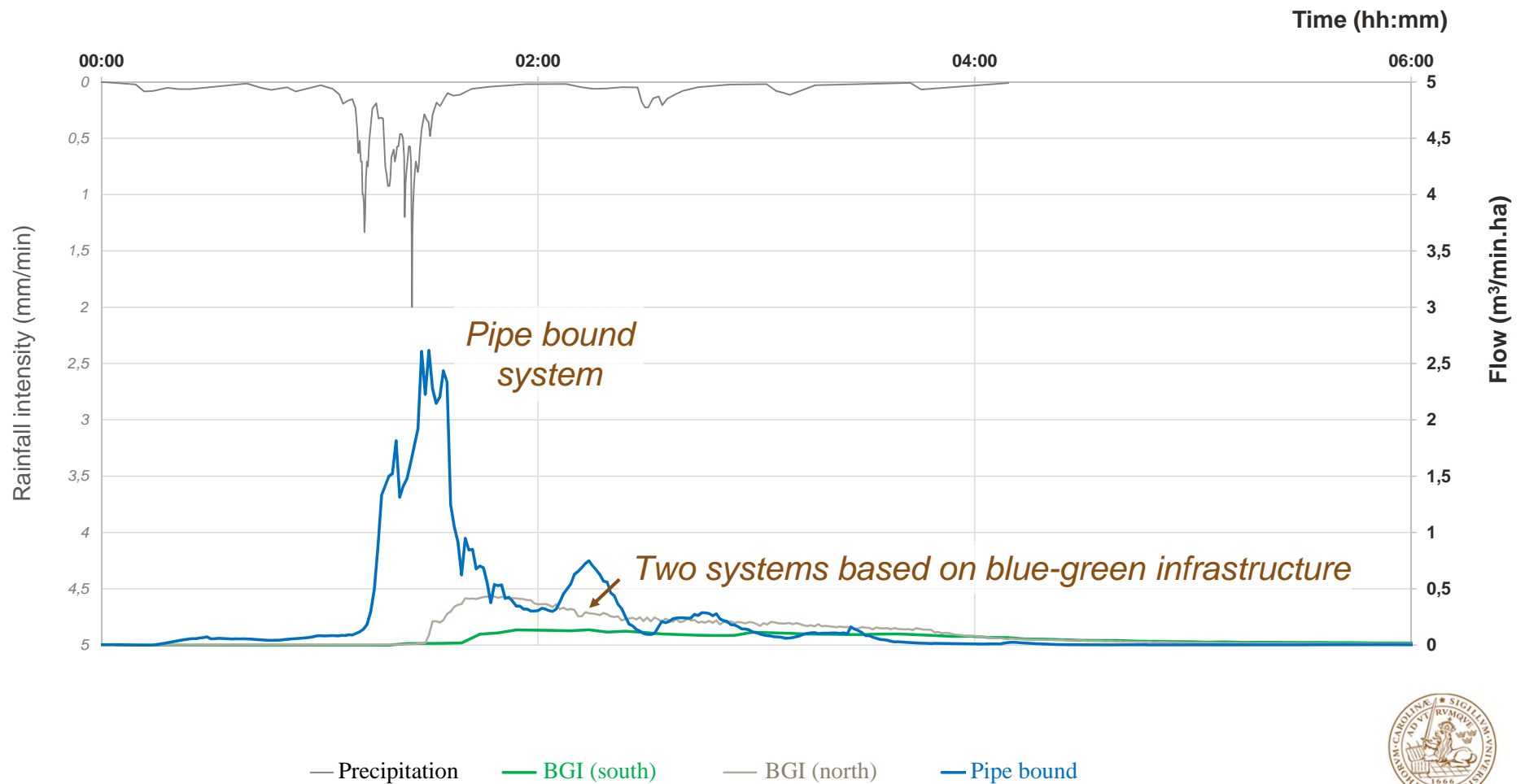


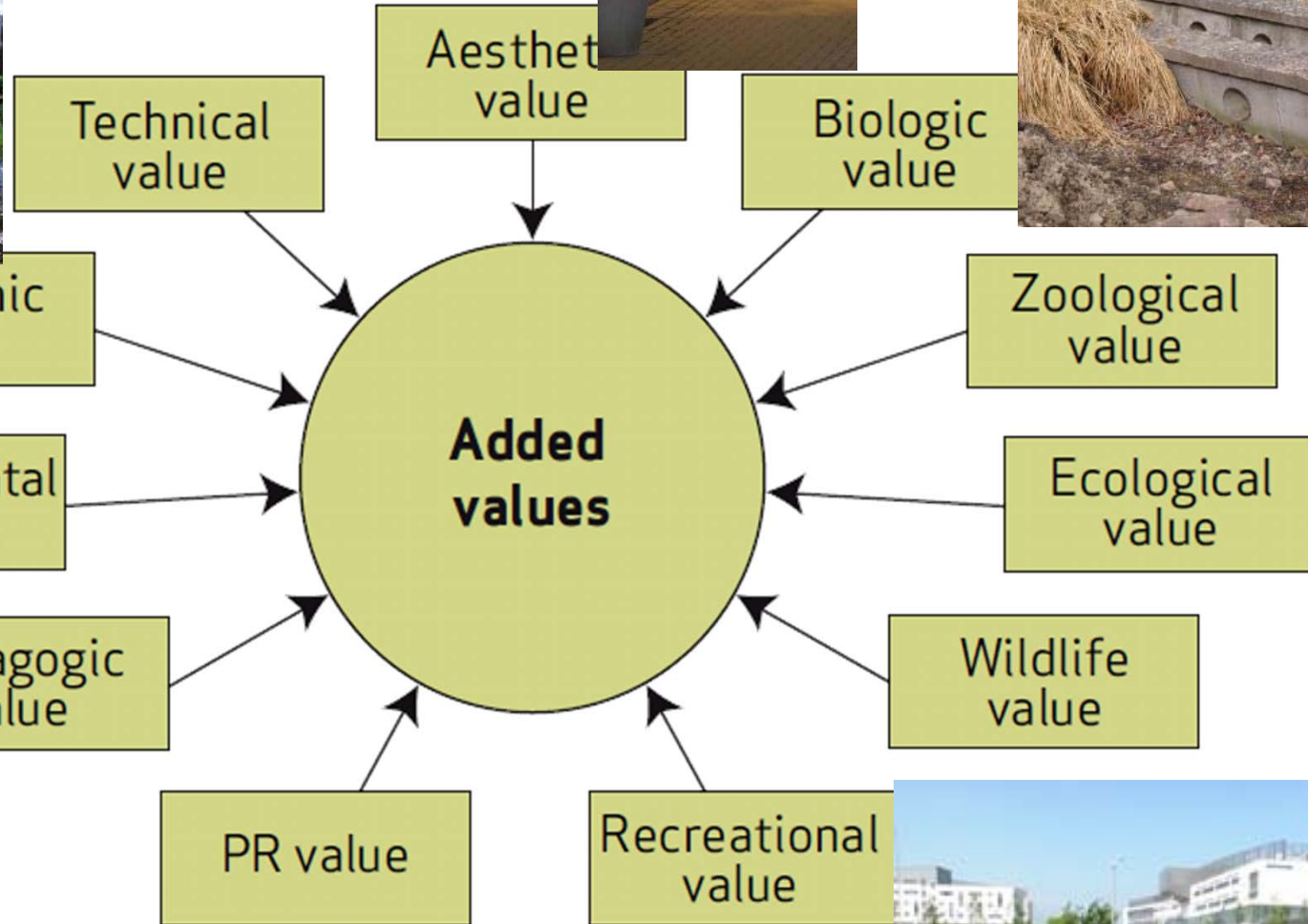
Infiltration

Permeable paving, soak-
aways, trees, swales,
bioswales, wetlands,
rain gardens

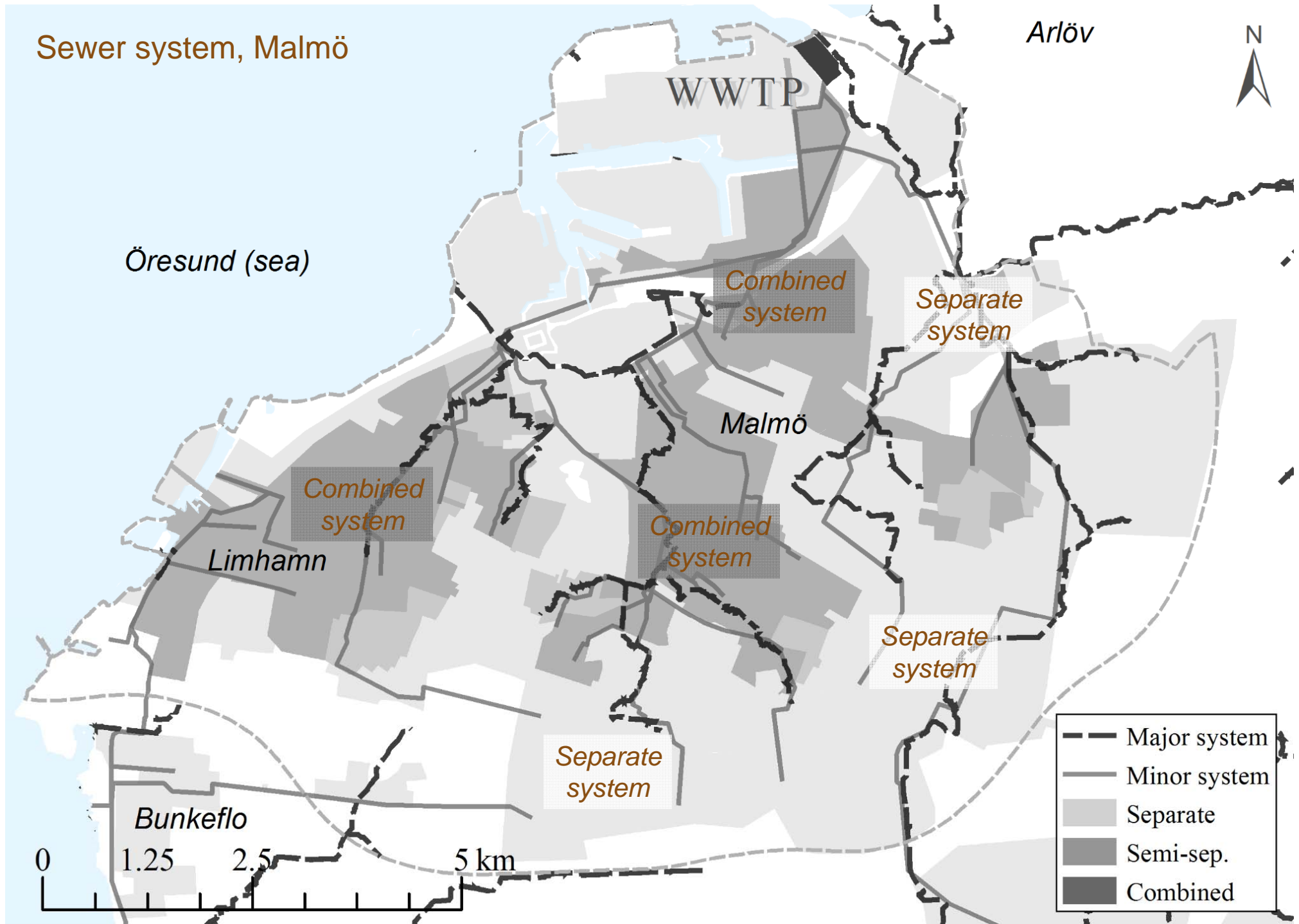


Observed hydrographs – pipe bound system and BGI





Sewer system, Malmö



Arlöv



Öresund (sea)

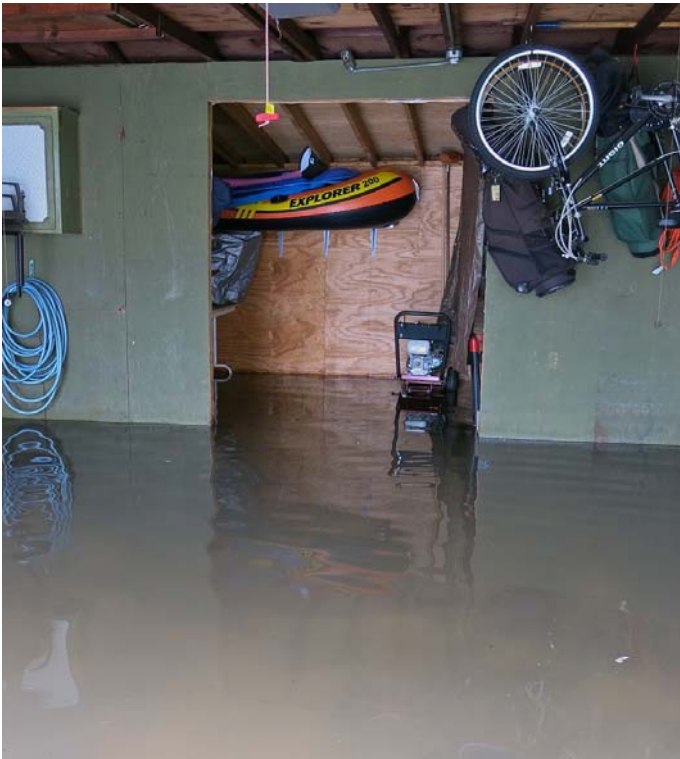
Malmö

Limhamn

Bunkeflo

0 1.25 2.5 5 km

- Major system
- Minor system
- Separate
- Semi-sep.
- Combined



Pluvial flooding
(flooding caused by
intense rainfall)



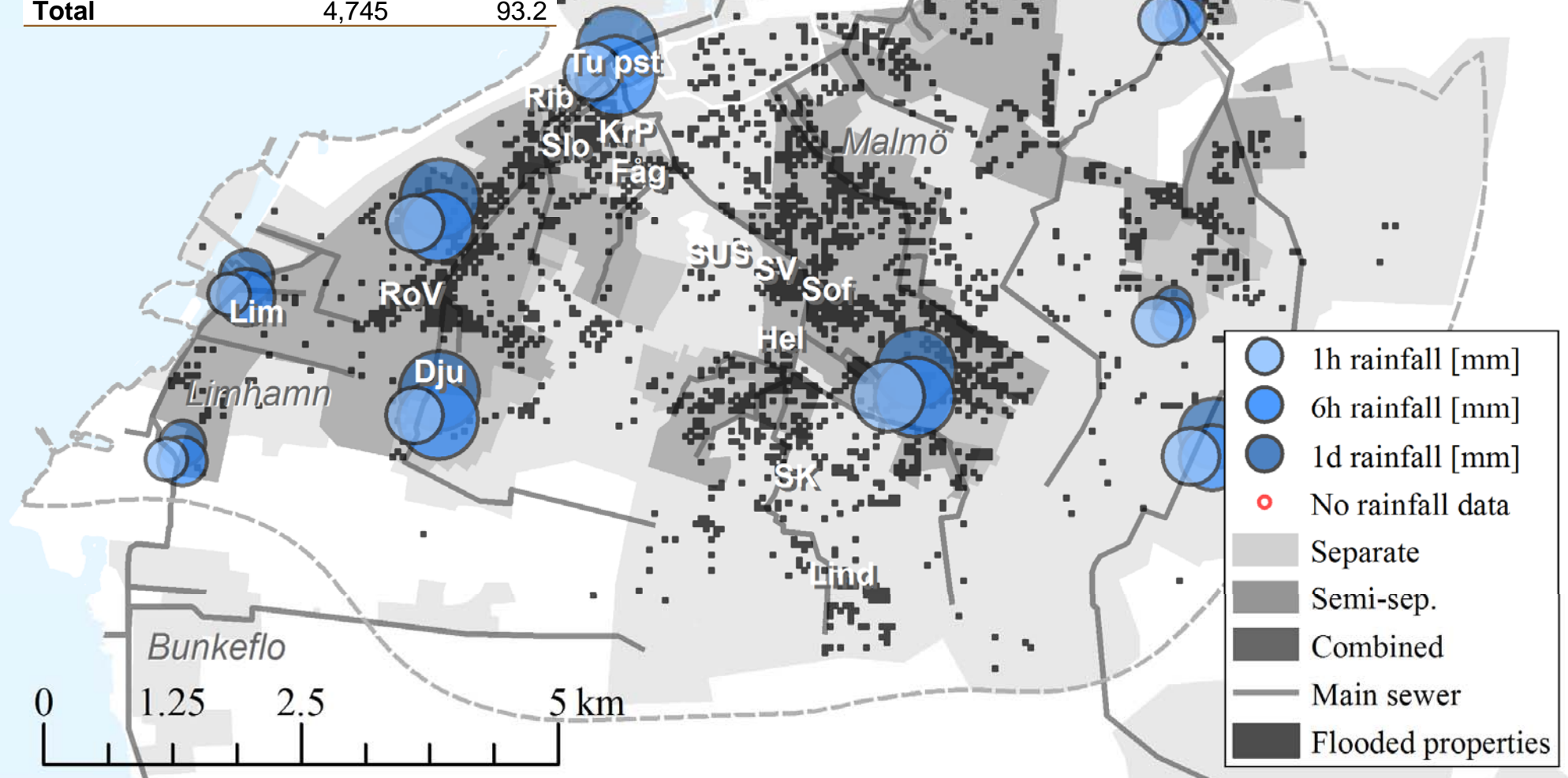
Flood claims, 2014 event

WWTP Arlöv



Reference: Sørensen, J., & Mobini, S. (2017) Pluvial, urban flood mechanisms and characteristics – Assessment based on insurance claims. *Journal of Hydrology*, 555: 51–67.

Pipe system	2014-08-31	Flood claims per 100 hectares
Separate	1,056 (22%)	36.8
Semi-separate	574 (12%)	184.4
Combined	3,112 (66%)	165.6
Total	4,745	93.2



- 1h rainfall [mm]
- 6h rainfall [mm]
- 1d rainfall [mm]
- No rainfall data
- Separate
- Semi-sep.
- Combined
- Main sewer
- Flooded properties

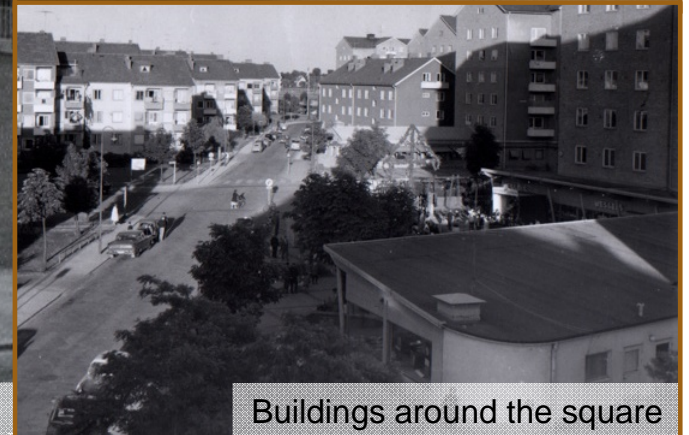
Reference: Sörensen, J., & Emilsson, T. (2019) Evaluating Flood Risk Reduction by Urban Blue-Green Infrastructure Using Insurance Data. *Journal of Water Resources Planning and Management*, 145(2).

Blue-green infrastructure & flooding (Augustenborg)





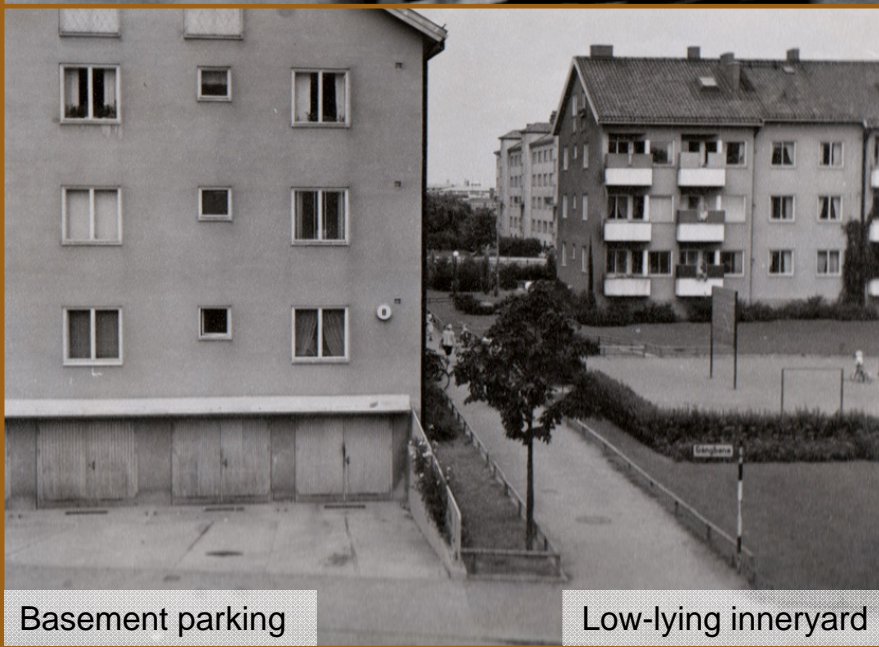
The square



Buildings around the square

Augustenborg: residential area,
constructed 1948–1952
3–6 storeys apartment blocks
3,000 people living in the area

Low-lying inneryard



Basement parking

Low-lying inneryard



Augustenborg kindergarten in 1952 – modern area
(photo shows when the queen visited)



The square

Blue-green infrastructure in Augustenborg

- **Infiltration** on green roofs, lawns, parking, etc.
- **Flow detention** in ponds and areas for temp. flooding
- **Slow transport** in swales, ditches, canal, etc.

Augustenborg, Malmö





Urban wetland



Swale

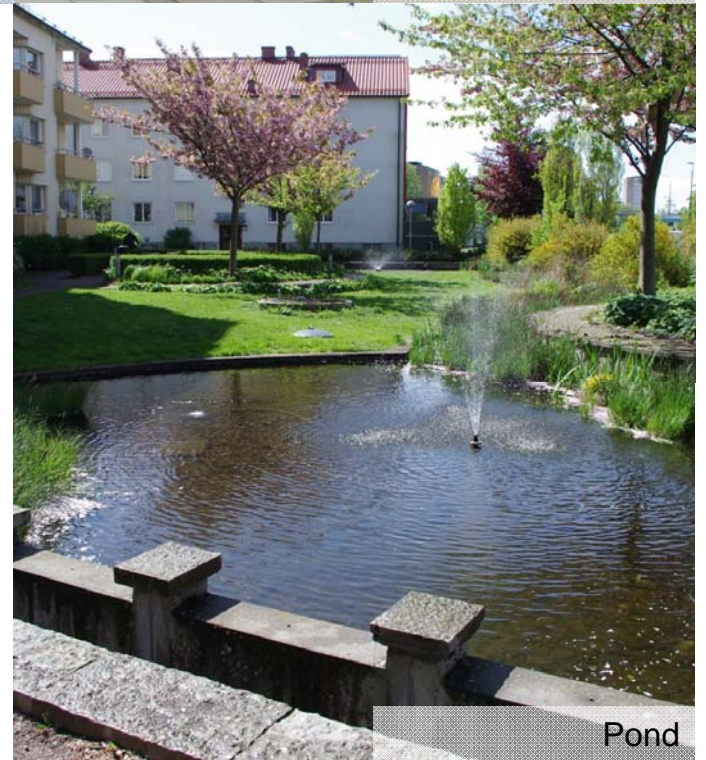


Green roof

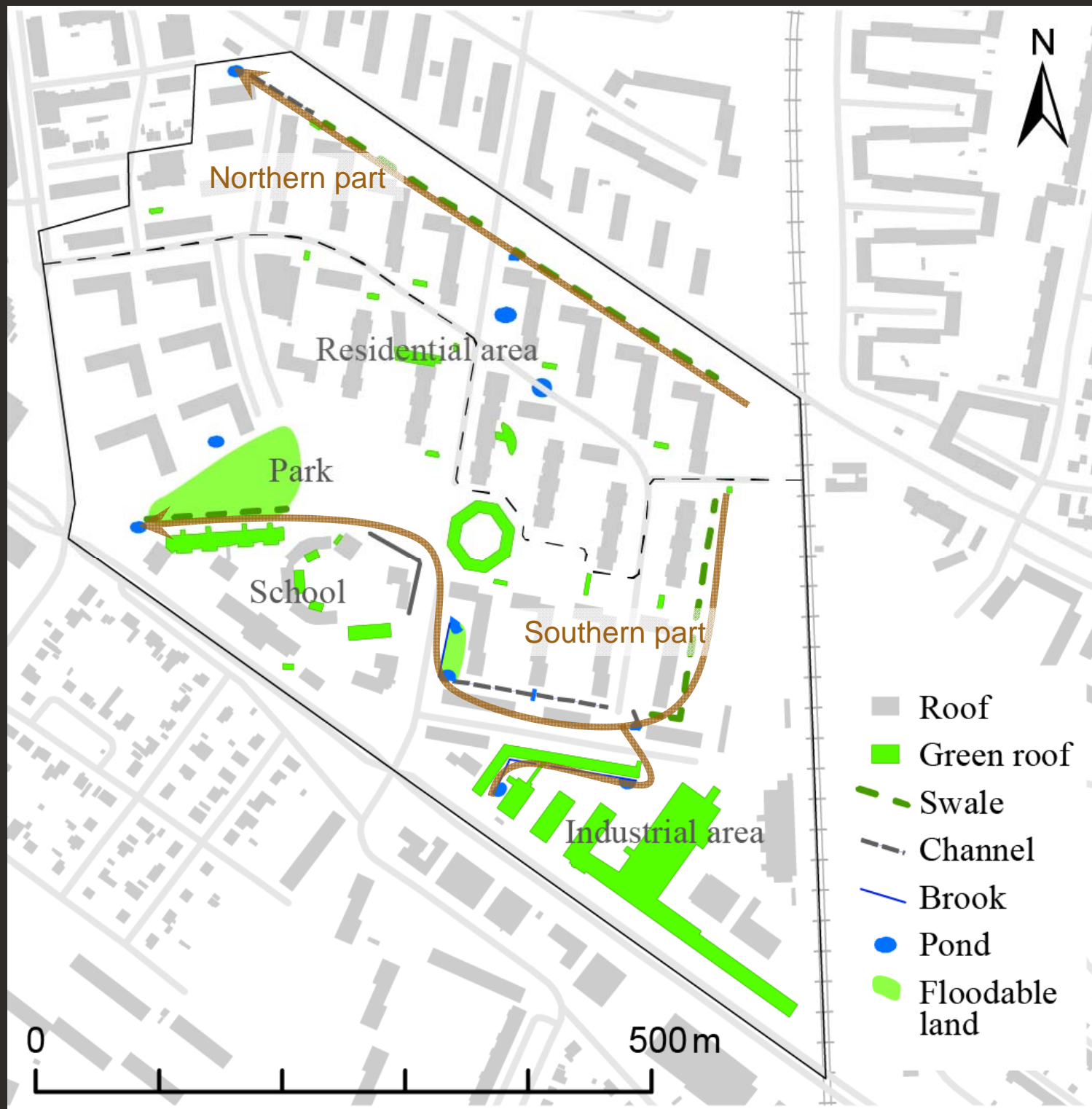


Floodable land

Examples of blue-green infrastructure in Augustenborg

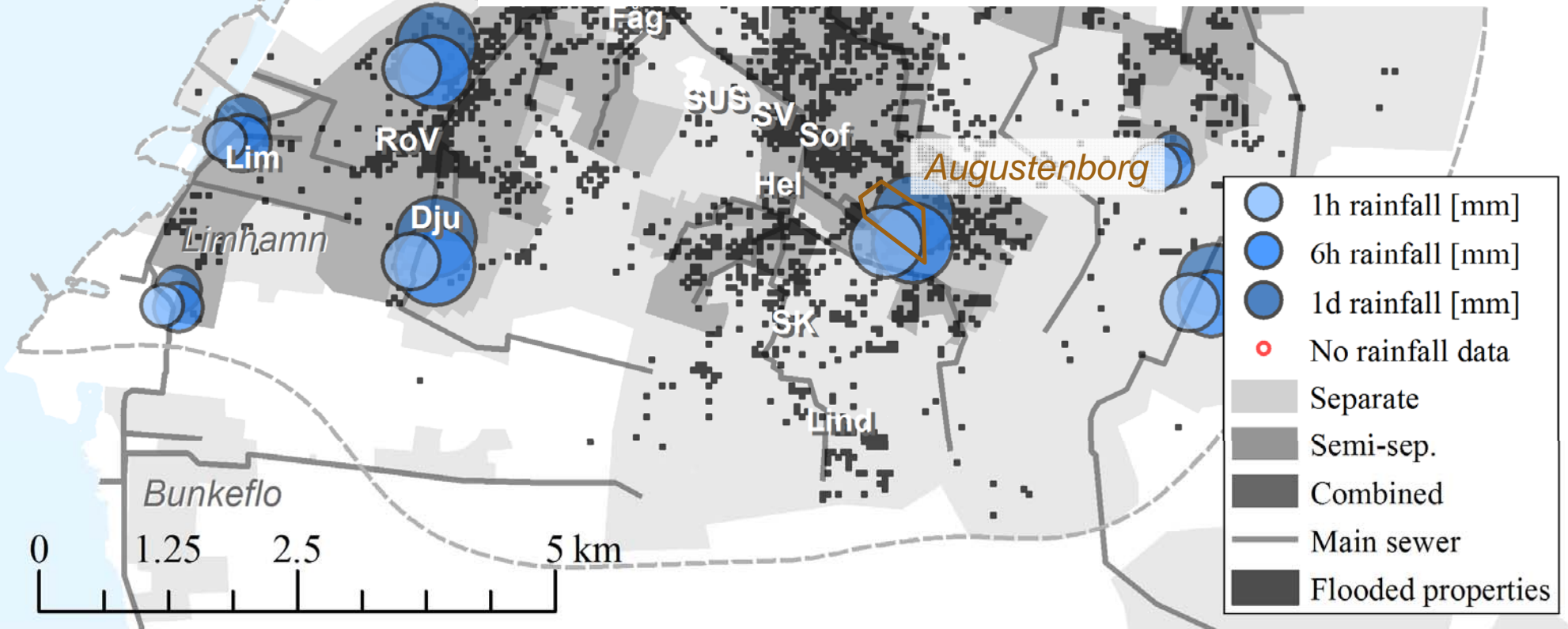
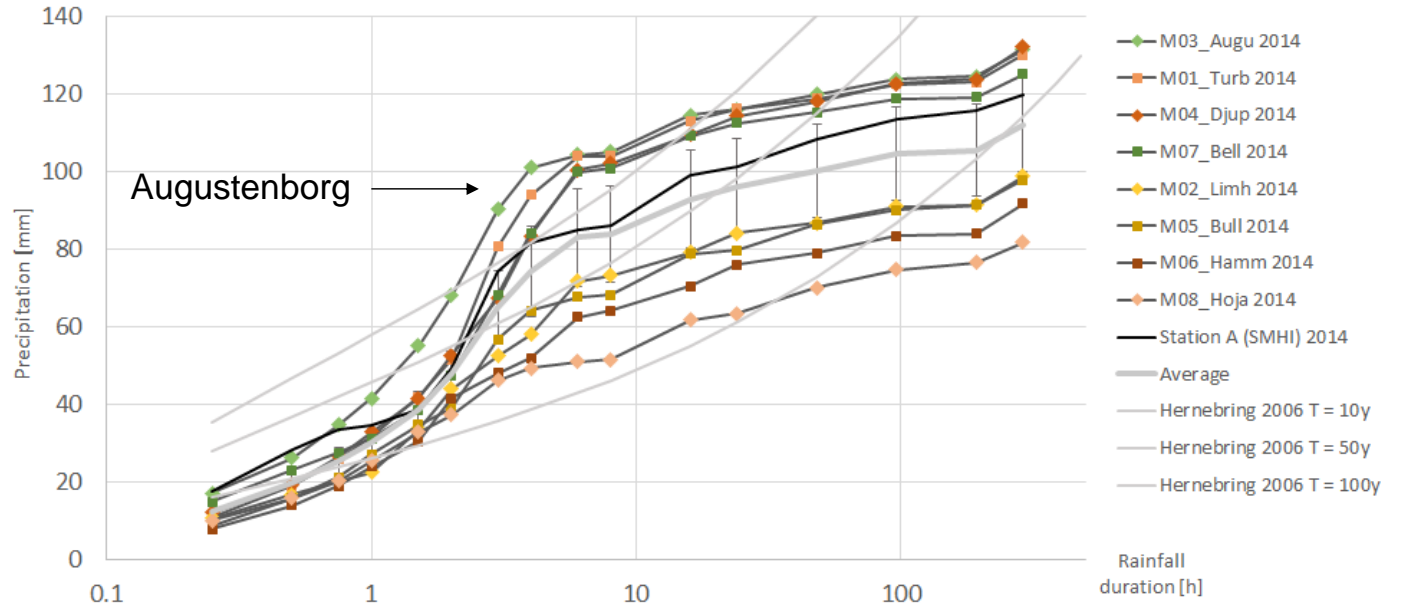


Pond

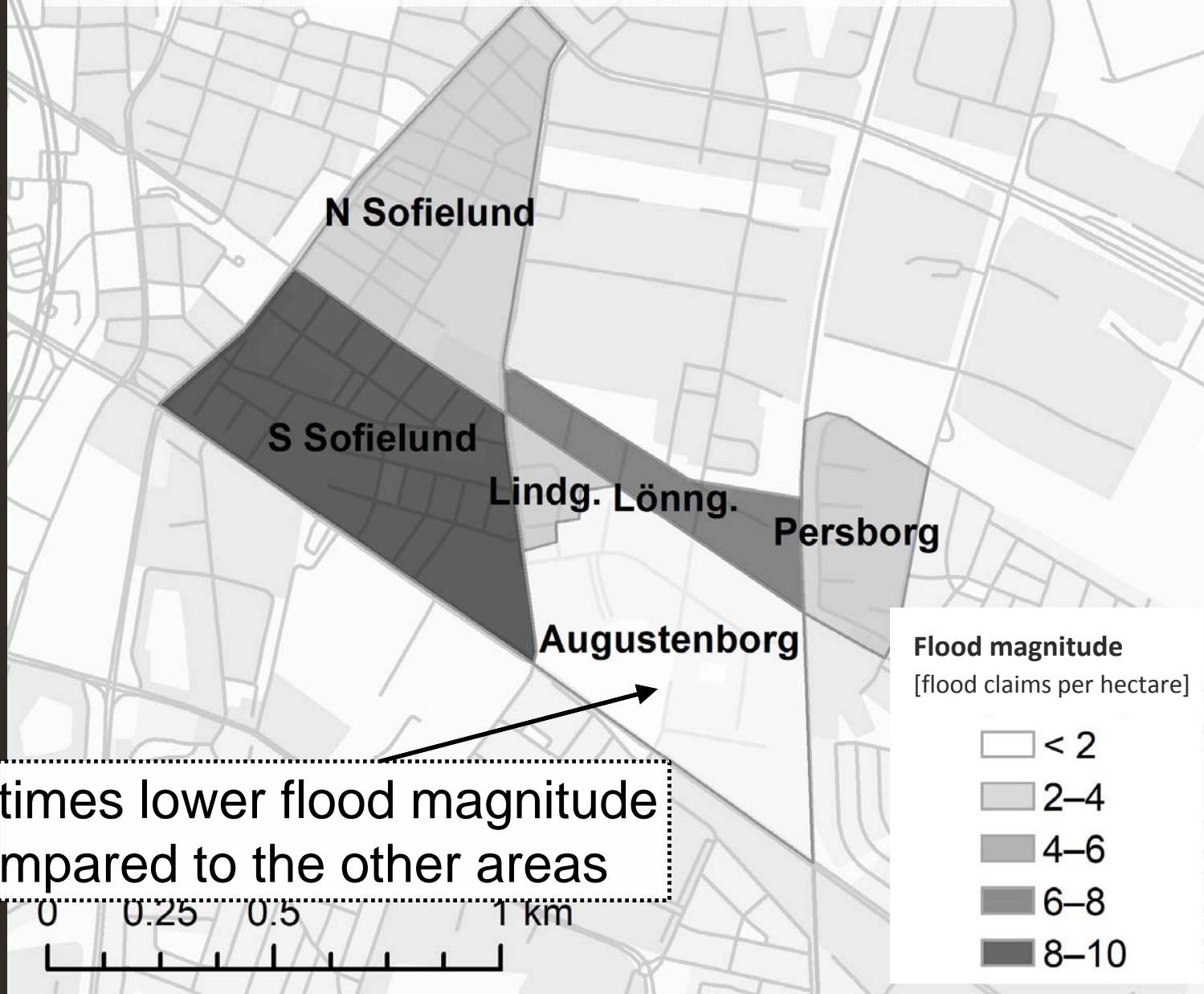


Flood claims, 2014 event

Öresund (sea)



Flood claims from
Länsförsäkringar Skåne (insurance company)
VA Syd (water utility company)





Basements disconnected from the stormwater system

The lawn can be flooded up to this level (without causing any problems)

Augustenborg – ponds + floodable land





Photos: Henrik Thorén (all pictures)



31st of August 2014, Augustenborg



Reference: Wihlborg, M, J Sörensen, and J Alkan Olsson. 2019. "Assessment of Barriers and Drivers for Implementation of Blue-Green Solutions in Swedish Municipalities." *Journal of Environmental Management* 233 (November 2018): 706–18.

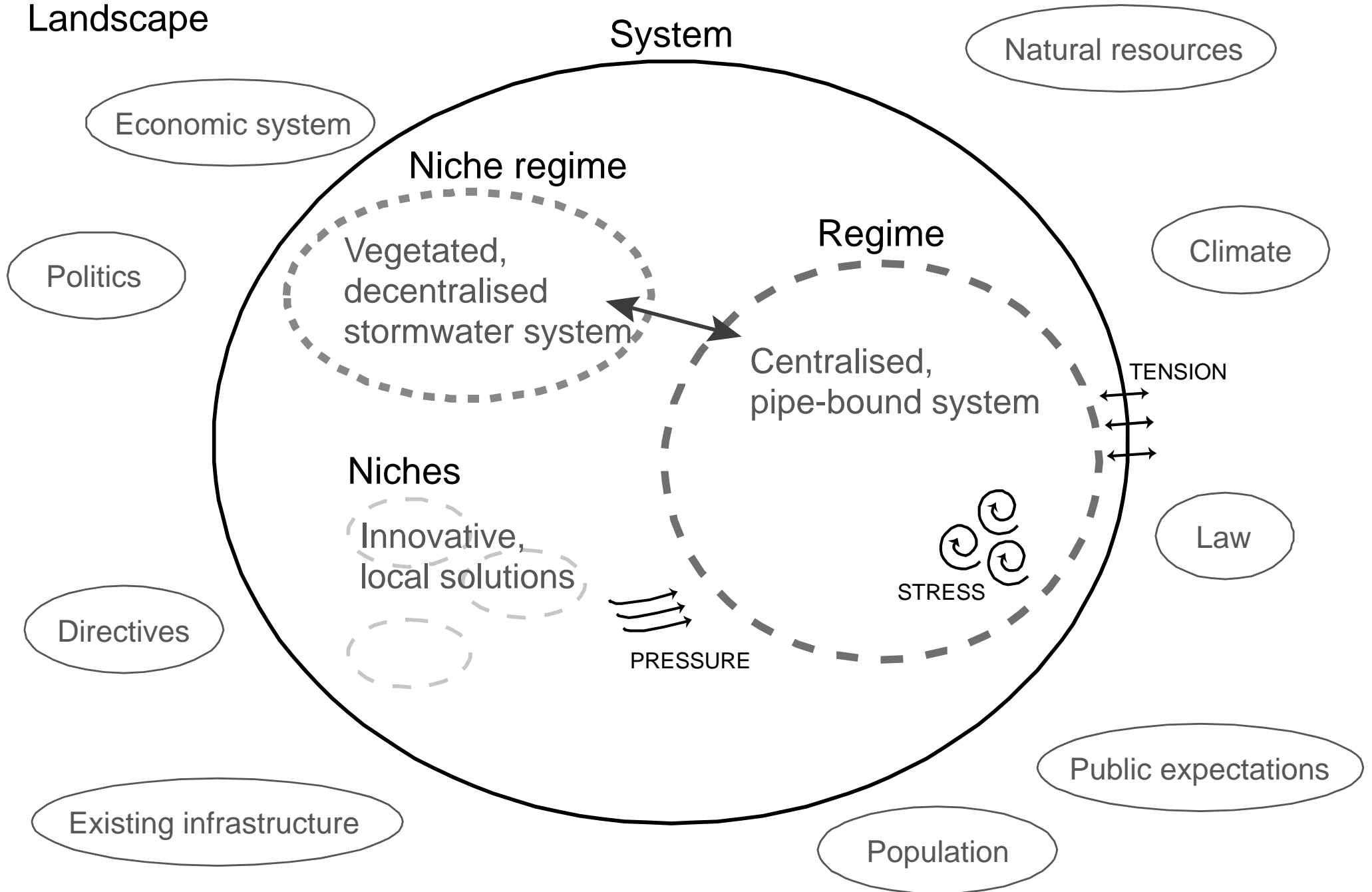
Widespread implementation of blue-green infrastructure?



Interview study

1	Helsingborg	Green	Environmental strategist
2	Helsingborg	Green	Head of department, environmental strategy
3	Helsingborg	Planning	Water planner
4	Helsingborg	Planning	Landscape architect
5	Helsingborg	Planning	Physical planner (zoning)
6	Helsingborg	Planning	Plan co-ordinator (zoning)
7	Helsingborg	Planning	Landscape engineer
8	Helsingborg	Planning	Head of department, building permits
9	Malmö	Planning	Community planner
10	Malmö	Planning	Landscape architect
11	Malmö	Green	Project leader (leads projects and development)
12	Malmö	Green	Project leader (leads projects and responds to referrals)
13	Malmö	Planning	Building permits, architect
14	Malmö	Planning	Head of department, planning
15	Malmö	Planning	Physical planner
16	Malmö	Planning	Environmental strategist
17	Malmö	Planning	Environmental administrator
18	NSVA	Blue	Civil engineer
19	NSVA	Blue	Civil engineer
20	VA SYD	Blue	Head of department, new construction and exploration

The multilevel perspective



Drivers

<ul style="list-style-type: none">• Ecosystem services	<i>Very strong among the interviewed practionairs (in southern Sweden)</i>	20 (of 20)
<ul style="list-style-type: none">• Climate change		16
<ul style="list-style-type: none">• Economy		7
<ul style="list-style-type: none">• Politics of urban densification		7
<ul style="list-style-type: none">• Knowledge of new municipal employees		3



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Barriers

- **Economy** 18 (of 20)
- **Lack of knowledge** 17
- **Roles and responsibilities** 16
- **Legislation** 16
- **Municipal organization** 13
- **Urban densification and housing shortage** 10
- **Political interests** 9
- **Time and workload** 8



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Many
barriers!

This is
complex

Both
bottom-up
and top-down
needed

Conclusions



Thanks.

