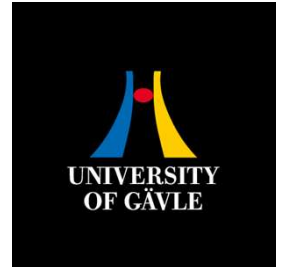


Addressing nature based solutions: A focus on northern Environments

Chris de Rijke



Contents



Introduction

- My background
- PhD project
 - Aims and objectives

Theory

- Nature based solutions
- Blue-green infrastructures
- Systematic literature review

Results

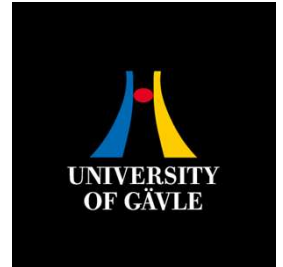
- Mapping nature-based solutions
- Specific solutions
 - Usable in northern environments?

Conclusion

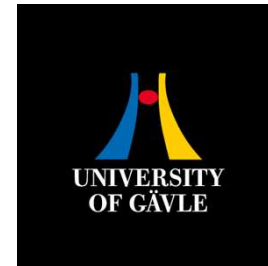
- Climate adaptation
- Climate mitigation
- Urban development



My background



- Education:
 - Earth Sciences and Economics Bsc. & Msc. from VU University Amsterdam
 - Geomatics Msc. from University of Gävle
- Current employment:
 - Teacher in geospatial information science at University of Gävle
 - PhD student at University of Gävle

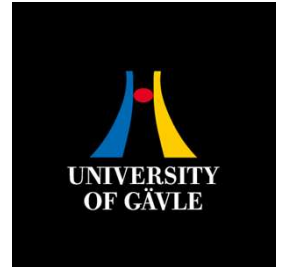


Introduction

- Climate change
- Urbanization
- Higher latitude regions
- Green transition
- Climate change mitigation
- Nature based solutions
- (Blue-)Green infrastructures



PhD project: Aims and objectives



- *How can climate change in northern regions of Sweden impact the resilience of urban and rural environments?*
- (Re)design towards a sustainable society
- Two aims:
 - Framework for evaluating urban and rural development for environmental, economic and social sustainability
 - Determining how to plan to sustain developmental needs, growth and resilience in urban and rural regions

Nature-based solutions

- Protect, manage and restore ecosystems
- Address societal challenges
- Human well-being and biodiversity benefits
- Complement other measures
- Involve natural areas or conservation measures
- Solution types:
 - Improve existing ecosystems
 - Restore ecosystems
 - Create new ecosystems

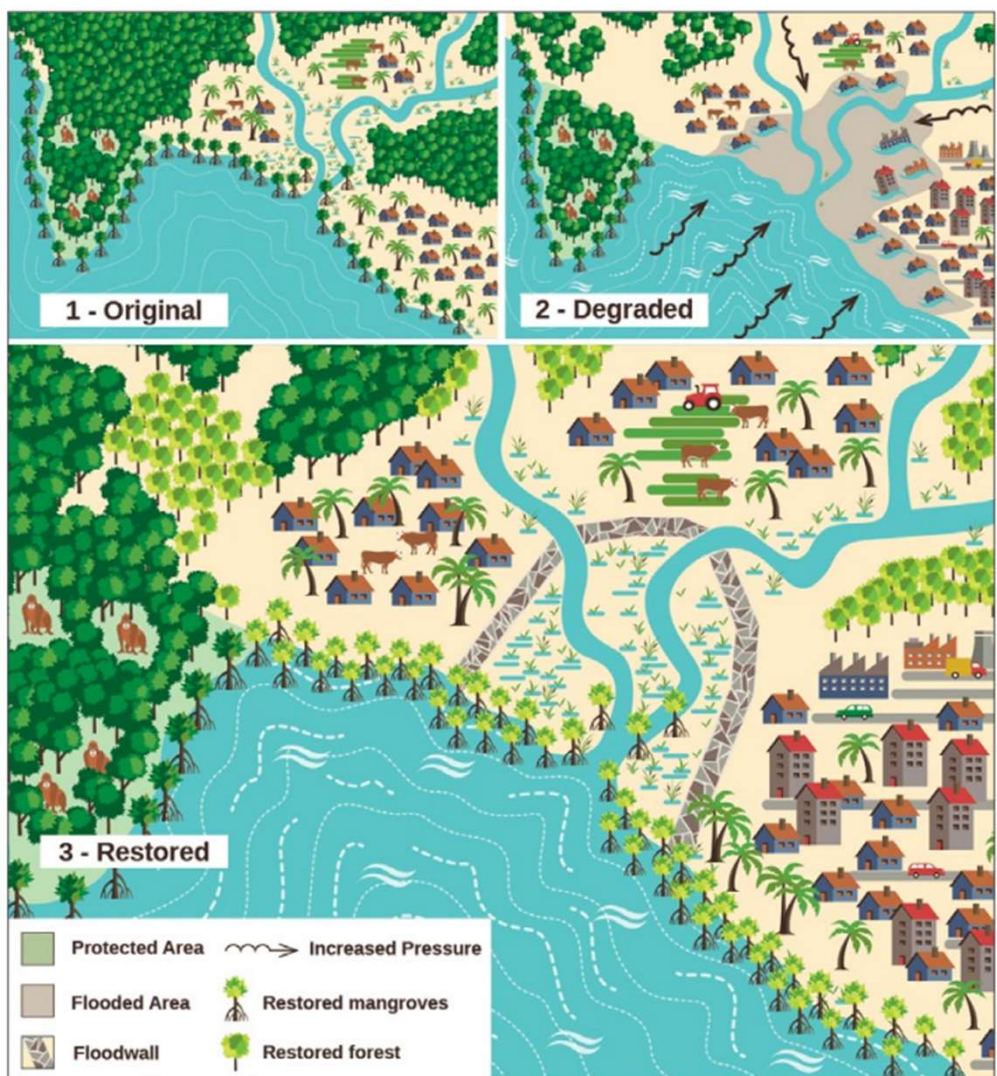
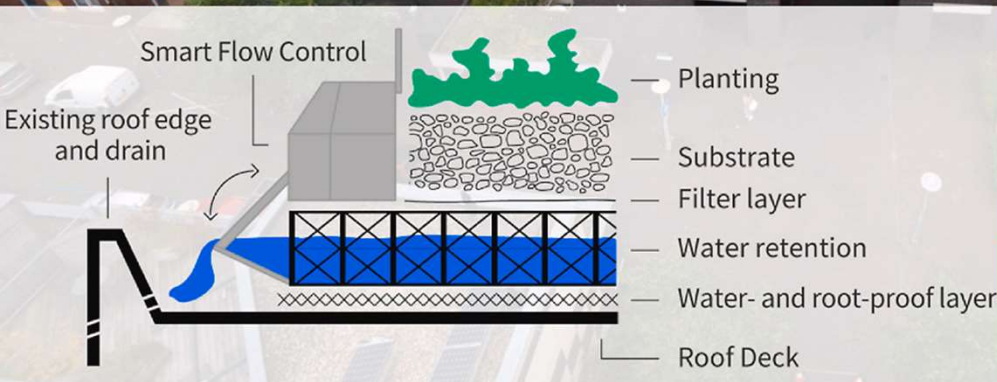


Figure 4. Hypothetical scenario of Nature-based Solutions being used in conjunction with infrastructure development and protected area conservation

Cohen-Shacham, E., Walters, G., Janzen, C., & Maginnis, S. (2016). Nature-based solutions to address global societal challenges. *IUCN: Gland, Switzerland*, 97, 2016–2036.

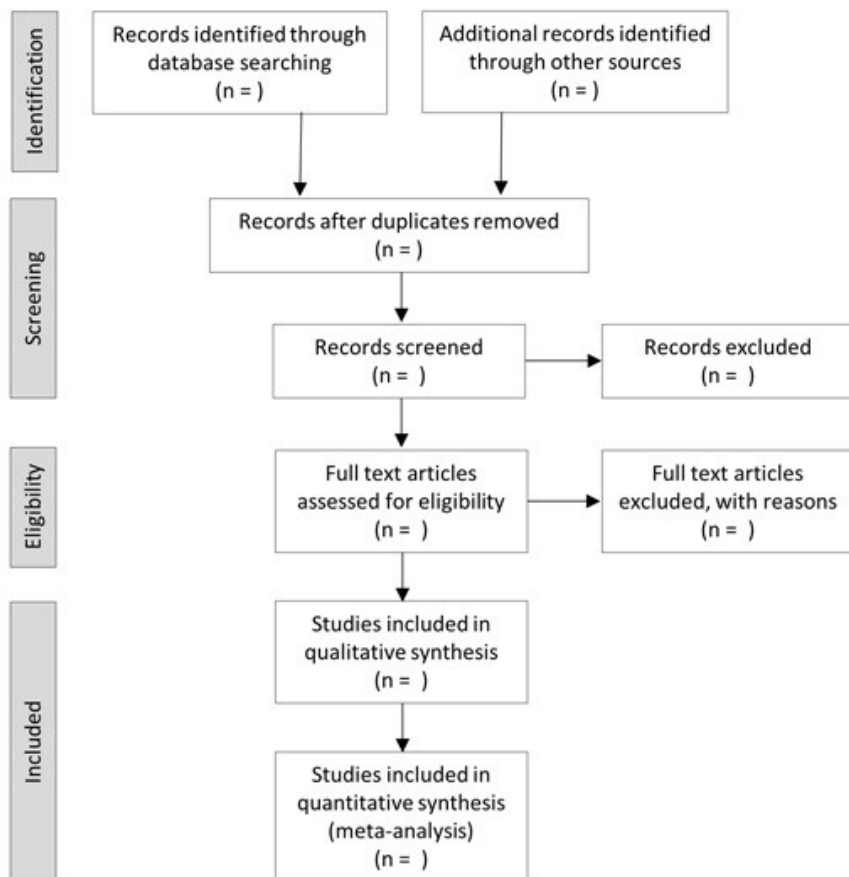
Blue-green infrastructure

- Implementing natural infrastructure
- Adapt and mitigate climate changes
- Blue: Infrastructure related to water
- Green: Nature based infrastructure
- (White): Snow based implementations
- Urban heat island effect reduction
- Storm/flood water management



Busker, T., de Moel, H., Haer, T., Schmeits, M., van den Hurk, B., Myers, K., Cirkel, D. G., & Aerts, J. (2022). Blue-green roofs with forecast-based operation to reduce the impact of weather extremes. *Journal of Environmental Management*, 301, 113750.

The PRISMA Flow Diagram

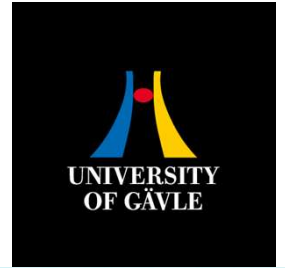


From: Moher D, Liberati A, Tetzlaff J, Altman DG, The Prisma Group. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLOS Medicine. 2009;6(7):e1000097.

Mapping nature based solutions

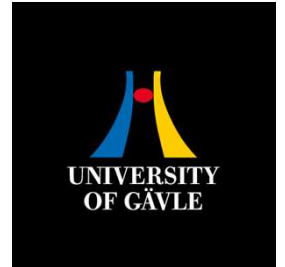
- Systematic review
 - Nature based solutions is new
 - Recent papers
 - English
 - Therefore South America and Africa might be less represented
 - Actual implementations are mapped
 - 748 papers related to NBS
 - 78 relevant for mapping
 - 24 are included in the results currently

Current results





Nature-based solution?



Yes?

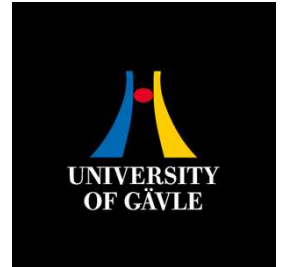
No?

Pocket park in Katowice, Poland

Maja Ostrowska-Lindner/WKATOWICACH.eu. Plac na Glanc w Bogucicach



Nature-based solution?



Yes?

No?

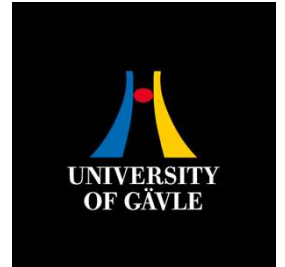
Grönklitt, Geopark Siljan in Dalarna

Visit Dalarna

(<https://www.visitdalarna.se/en/do/attractions/gronklitt>)



Nature-based solution?



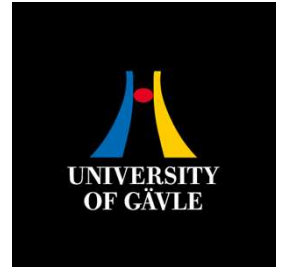
Yes?

No?

Agricultural land in Wognum, Netherlands



Nature-based solution?



Yes?

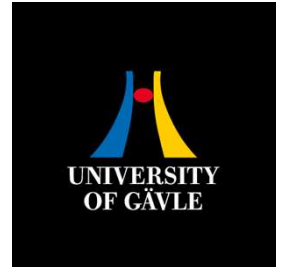
No?

Kipos³, Urban agriculture in Thessaloniki, Greece

Chrysoula Athanasiou,
<https://www.facebook.com/cityasaresource/>



Nature-based solution?



Yes?

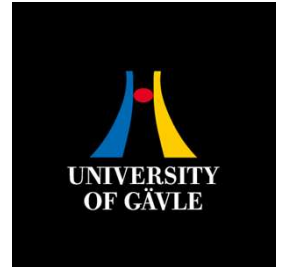
No?

Sint Andries, Linear Park in Antwerp, Belgium

AG Vespa, <https://www.agvespa.be/projecten/sint-andries-en-zuid#over>



Nature-based solution?



Yes?

No?

Leftover agricultural land in The Hague, Netherlands

Specific solutions

- Constructed wetland
- Urban agriculture
- Bioremediation ponds
- Pocket park
- Linear park
- Green waterfront
- Green roofs
- Bioswells
- Raingardens
- Nature-based playground



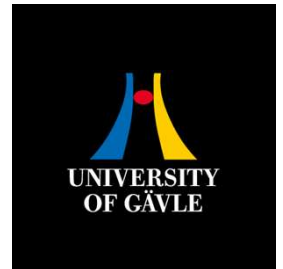
Augustenborg, Malmö
By jorchr - Self-photographed, CC BY-SA 3.0,
<https://commons.wikimedia.org/w/index.php?curid=1206982>

What is solved by NBS?

- Restoration of ecosystems
- Social capital through community supporting
- Environmental education
- Green jobs
- Soil restoration
- Recreation
- Water retention
- Flood protection
- Food
- Sense of place
- Thermal comfort



Dakkackers Roofgarden, Rotterdam
NRC, 2021. Het is de hoogste tijd voor meer dakkackers in de steden.
<https://www.nrc.nl/nieuws/2021/10/28/het-is-de-hoogste-tijd-voor-meer-dakkackers-in-de-steden-a4063308>

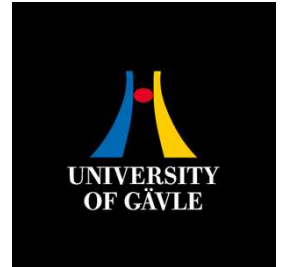


Conclusion

- Systematic review preliminary
 - Hypothesis seems confirmed
 - Few solutions adapted to northern latitudes
- Climate adaptation
 - Northern latitudes more affected
 - Blue-green-white infrastructures
- Climate mitigation
 - Restoration of ecosystems
- Urban development
 - Increased mining activity
 - Influx of population
 - Moving settlements



Thank you!



Questions?

Comments?