NINA URBAG UAB Universitat Autònoma de Barcelona

Research project: integrated assessment of Oslo's green roofs

How can green roofs improve resilience, equity and provision of ecosystem services in cities without creating negative socio-ecological impacts?

Friday, November 5th / 9:30h - 10:30h

Agenda

1	Introduction to the research project
2	Case study: Integrated assessent of green roofs
3	Criteria for assessment
4	Scenarios for green roofs development
5	Expected results

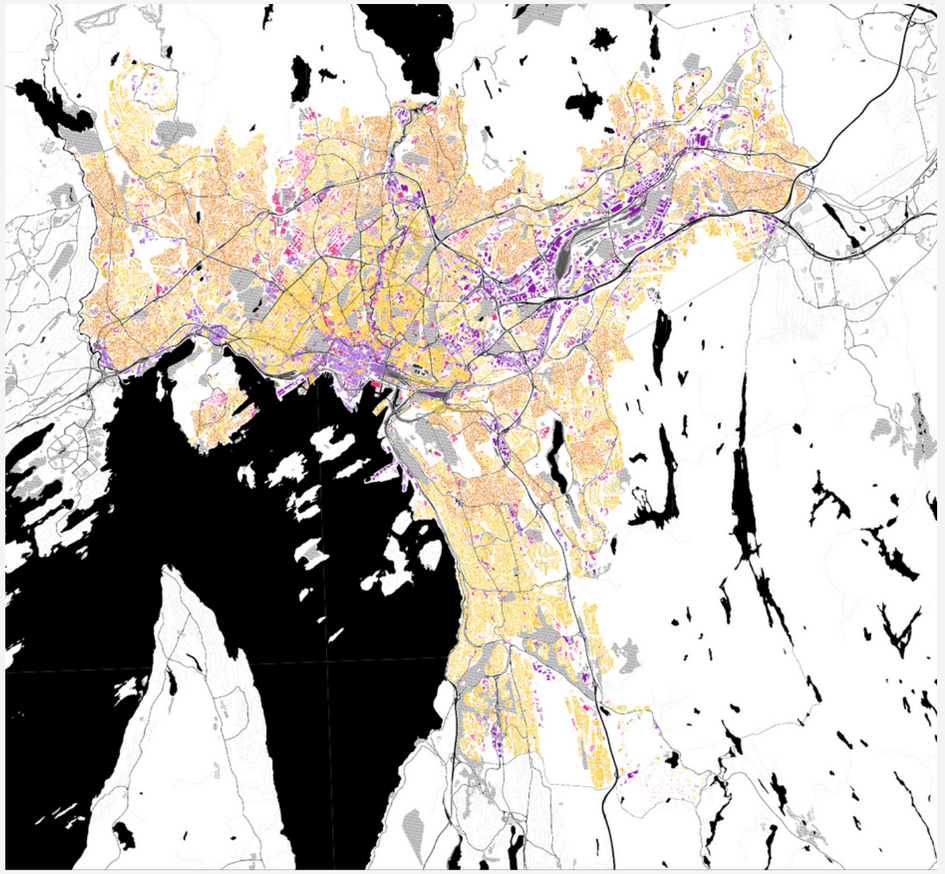
nature-based solutions

How can **nature-based solutions** improve resilience, equity and provision of ecosystem services in cities without creating negative socio-ecological impacts?

Objective: to develop a tool for the integrated evaluation of Nature-based solutions in urban evironments

What will be evaluated?

Green roofs



How it will be evaluated?

Dimensions

Socio-ecological urban risks

Who needs green roofs in the city?
Where are most needed?

How it will be evaluated?

Dimensions

Socio-ecological urban risks

Who needs green roofs in the city?
Where are most needed?

Benefits of green roofs

What can green roofs offer for the city?

How it will be evaluated?

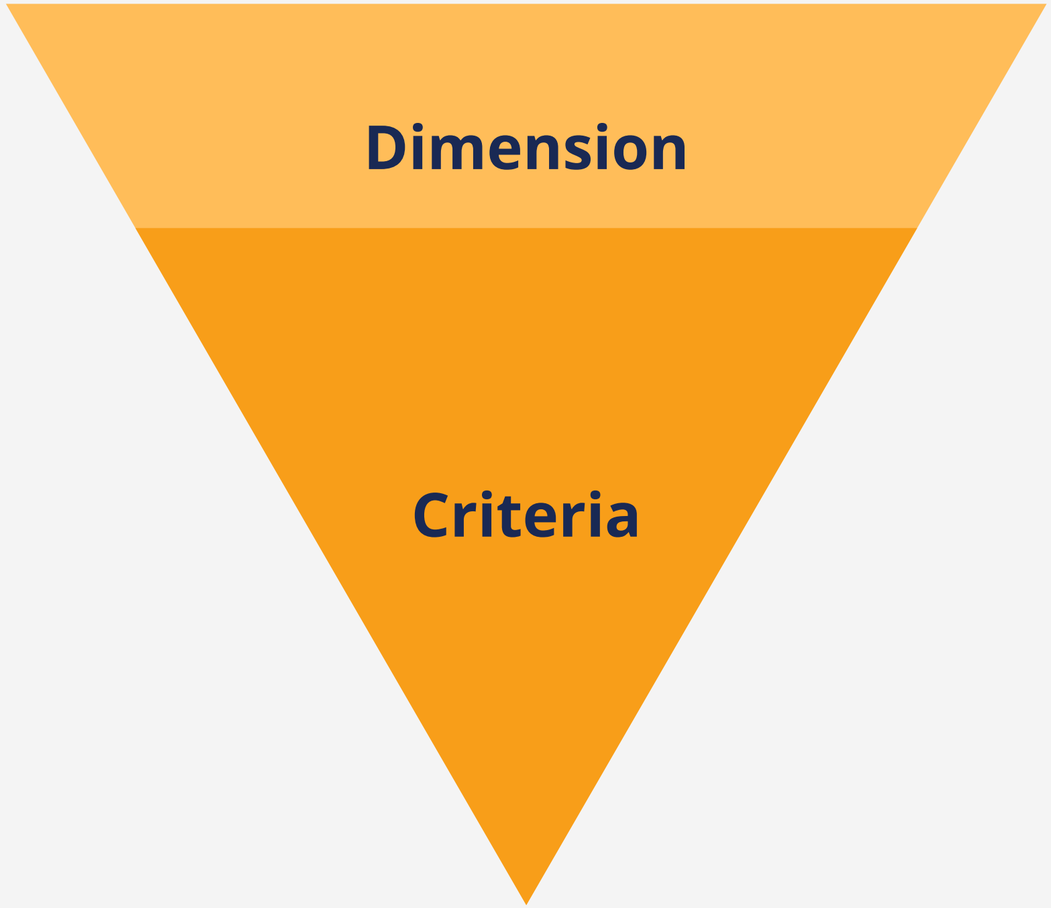
Dimensions

Socio-ecological urban risks
Who needs green roofs in the city?
Where are most needed?

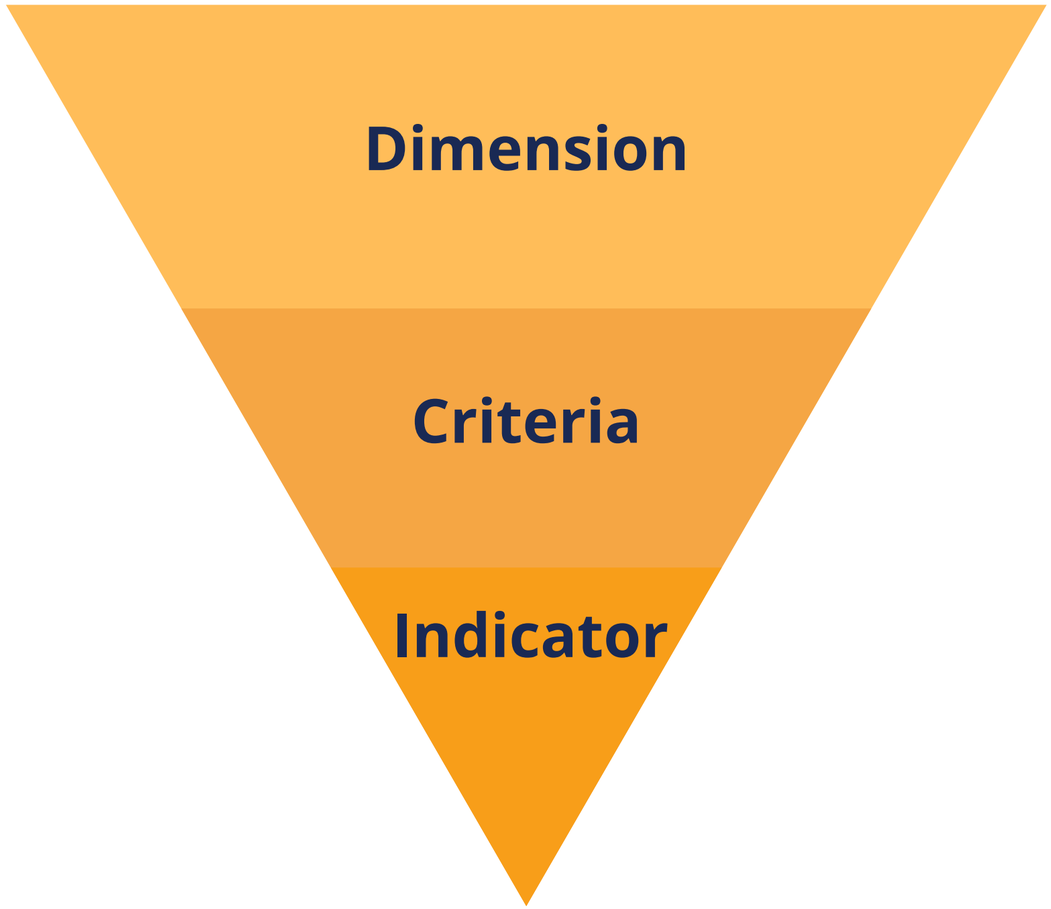
Benefits of green roofs
What can green roofs offer in the city?

Obstacles of green roofs
Which are the costs associated to green roofs?
Which are the negative environmental impacts?

Evaluation Structure



Evaluation Structure



e.g.,

Socio-ecological urban risks

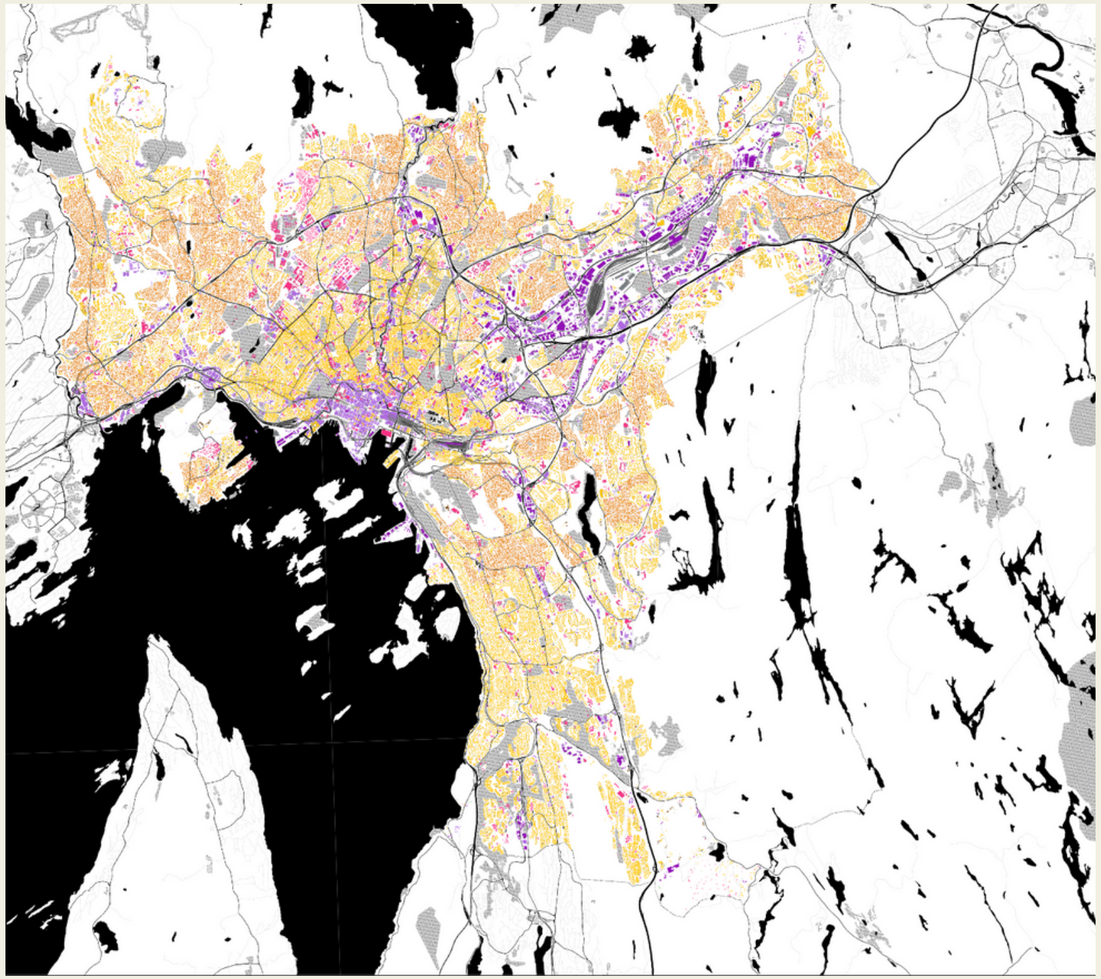
Lack of habitat for biodiversity

Pre-selected criteria

DIMENSIONS	SOCIO-ECOLOGICAL URBAN RISKS	BENEFITS OF GREEN ROOFS	OBSTACLES OF GREEN ROOFS
CRITERIA	• Flood and runoff risks • Air pollution exposure • Heat risks • Lack of habitat for biodiversity • Risk of social segregation / Social divide • Lack of opportunities for cultural and recreational experiences • Neighbourhood degradation • Lack of opportunities for the involvement with natural environments	• Runoff and flood mitigation • Air pollution reduction • Thermal regulation • Provision of habitat for biodiveristy • Provision of environments for social cohesion / integration • Provision of environments for cultural and recreational experiences • Landscape aesthetics • Provision of environments for biosphere reconnection, environmental education and stewardship • Reduction of energy use • Reduction of greenhouse gases	• Costs of implementation • Costs of maintenance • Water depletion • Greenhouse gas emissions • Air Pollution • Soil Pollution • Water pollution • Energy use

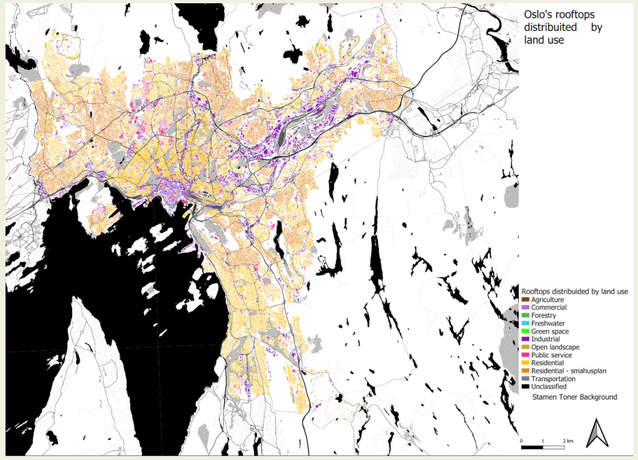
Context for the evaluation

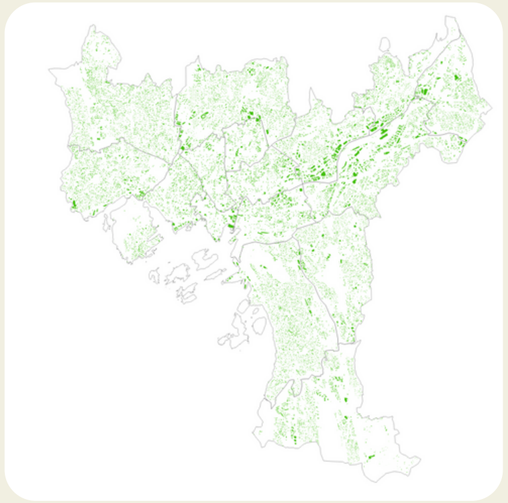
Increase in green roofs until 2030

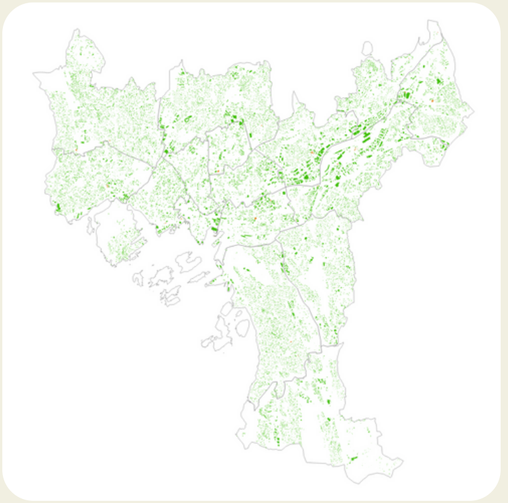


Scenario definition

Spatially explicit and considering:
- Building feasbility (slope+area)







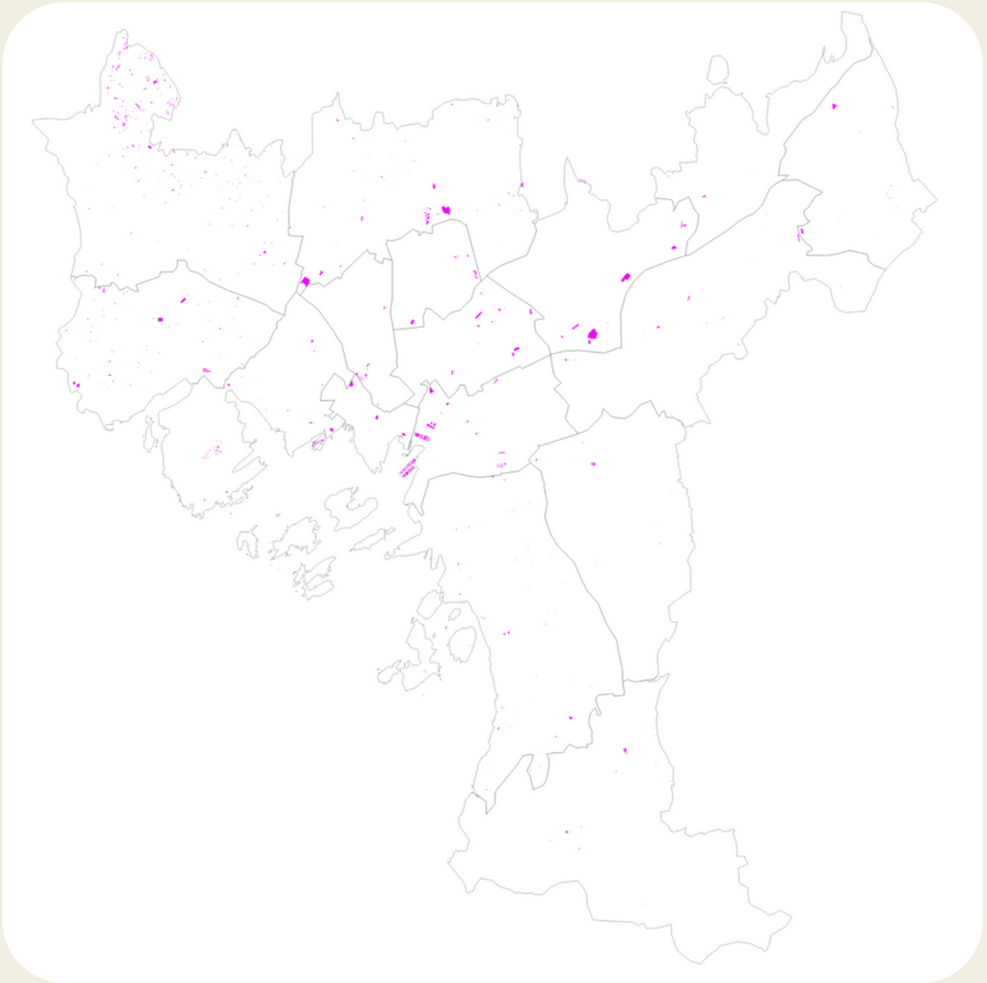
Where will the green roofs be evaluated?

SCENARIO 0

Reference scenario

Current state
Total green roofs: 957

From green roof Municipal survey (2017)

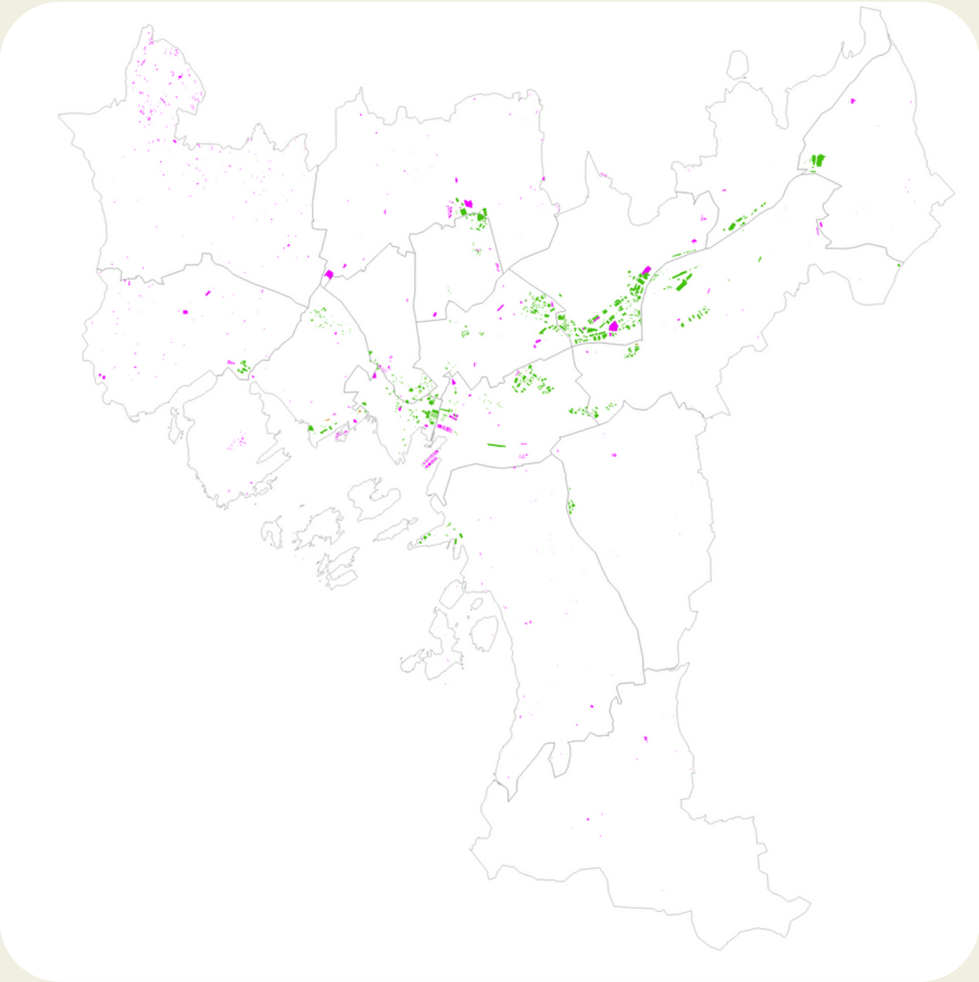


Where will the green roofs be evaluated?

SCENARIO 1

Business as usual

75 new green roofs per year until 2030
Total: around 2,000 new green roofs

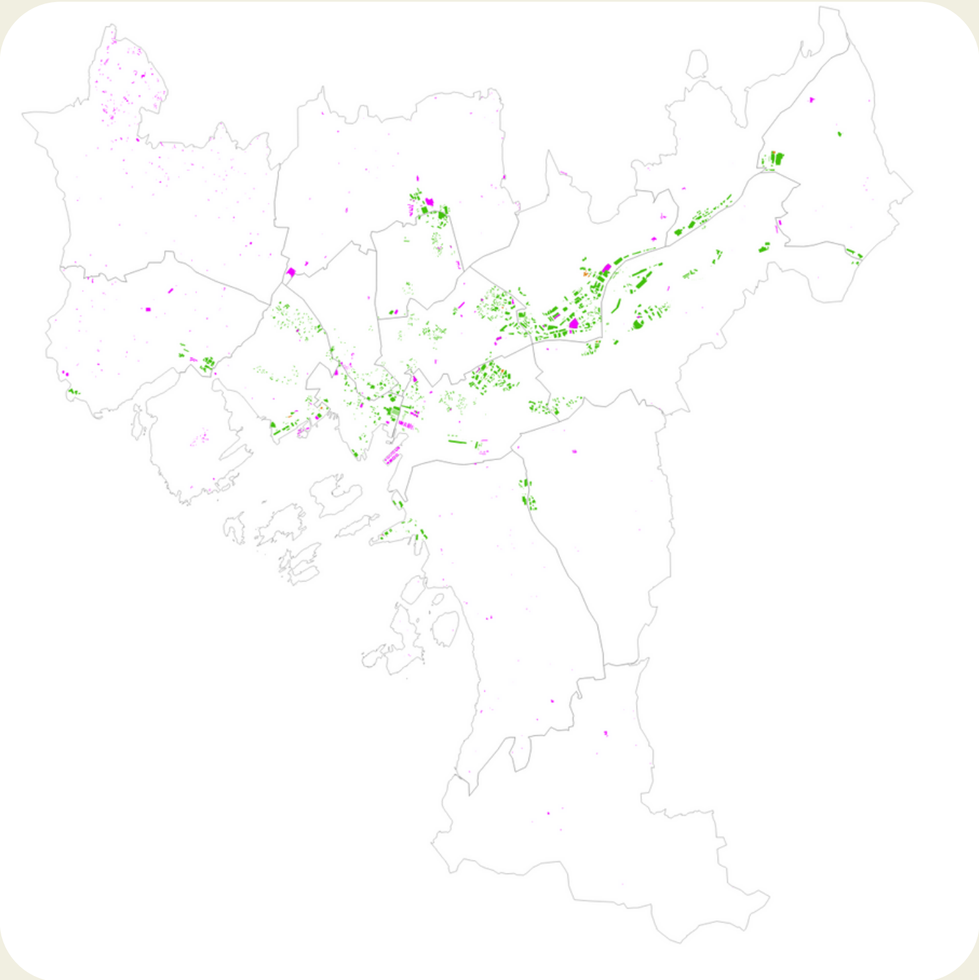


Where will the green roofs be evaluated?

SCENARIO 2

Ambitious

200 new green roofs per year until 2030
Total: 4,050 new green roofs

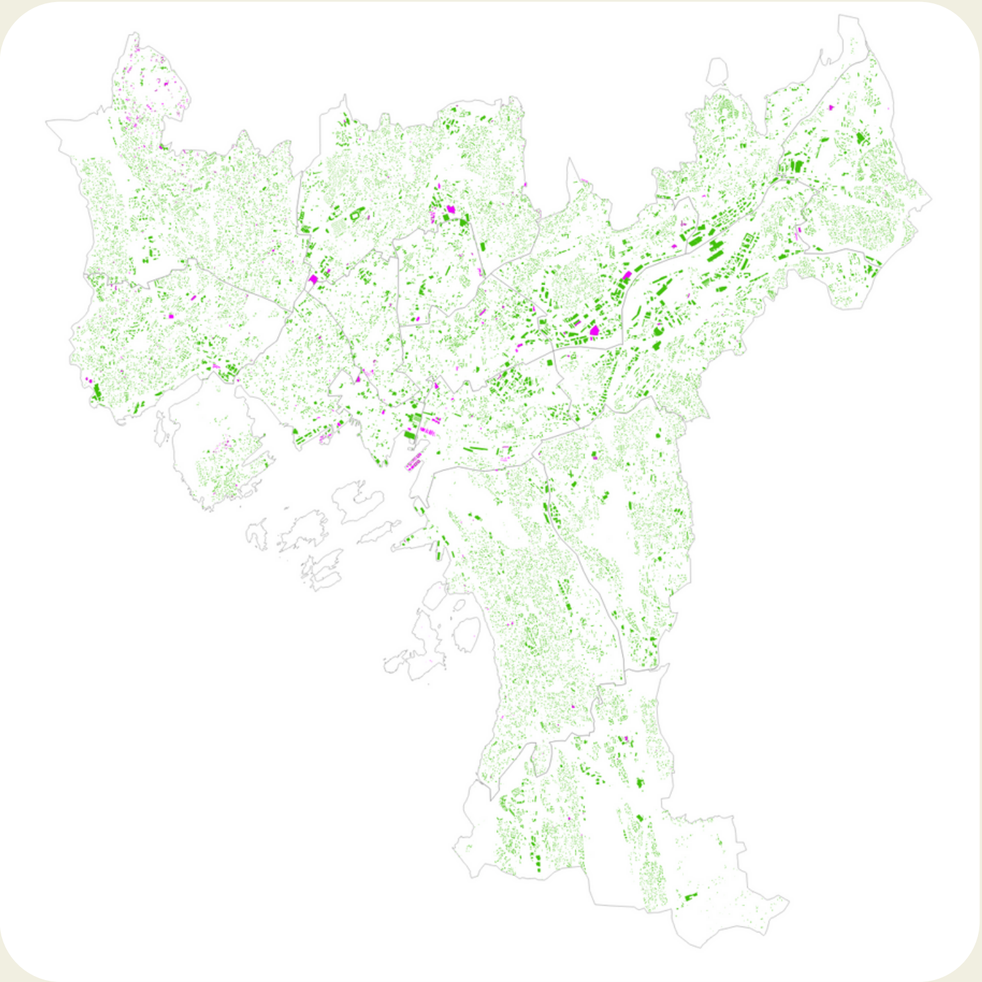


Where will the green roofs be evaluated?

SCENARIO 3

Maximization extensive

Total: 8,000 new green roofs

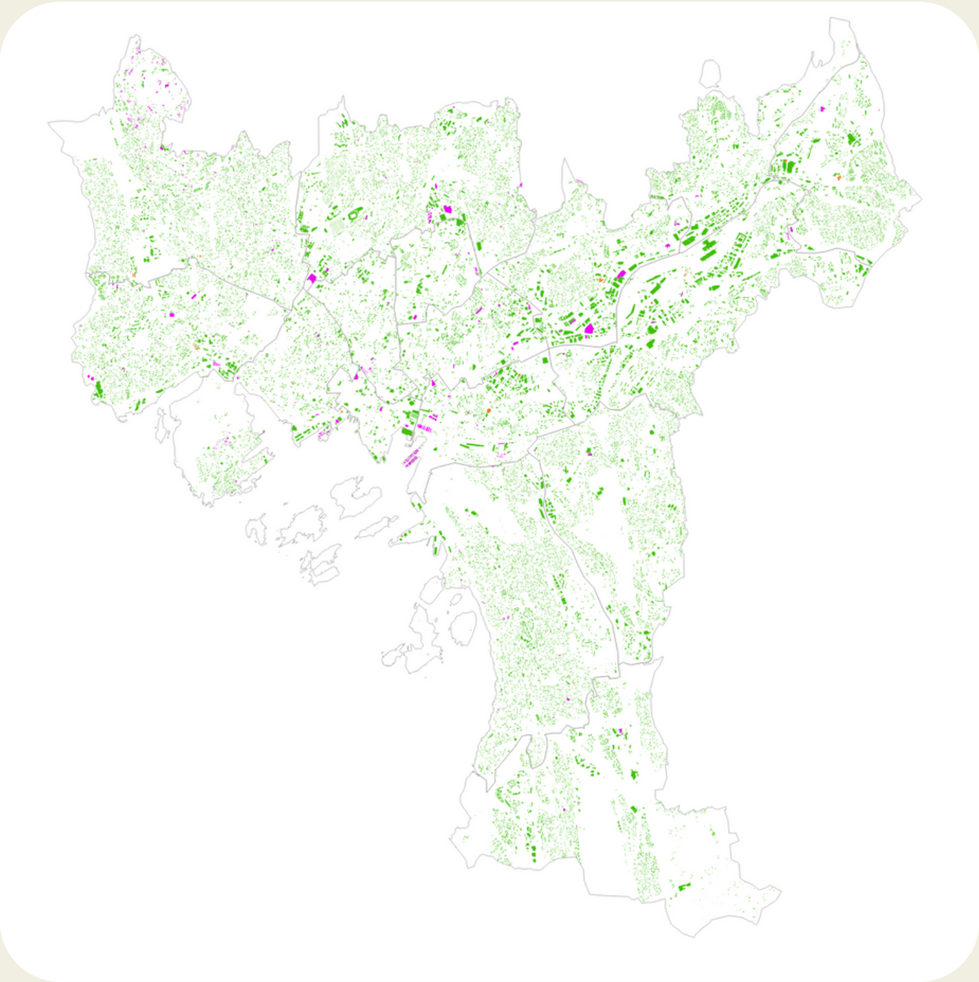


Where will the green roofs be evaluated?

SCENARIO 4

Maximization extensive & intensive

Total: 10,000 new green roofs



Where will the green roofs be evaluated?

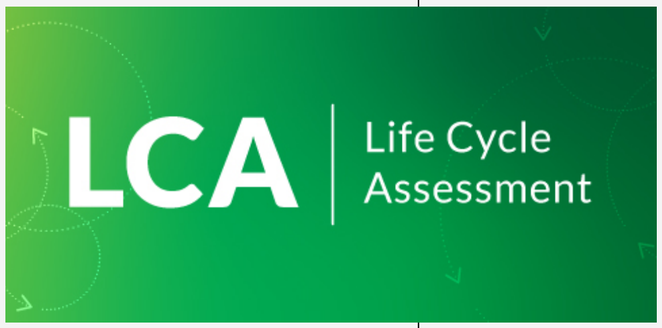
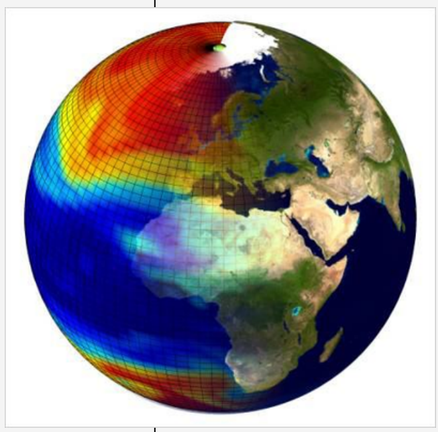
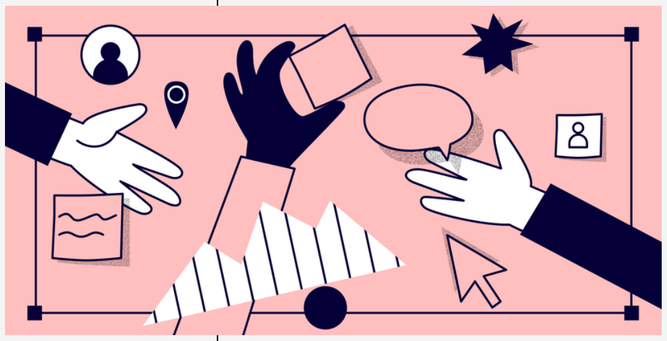
SCENARIOS BY 2030	
1) Business as usual	2,000 new green roofs
2) Ambitious strategy	4,050 new green roofs
3) Maximization 1	8,000 new green roofs
4) Maximization 2	10,000 new green roofs

Understanding the capacity of green roofs for shaping the city

Pre-selected criteria

SCENARIOS	SOCIO-ECOLOGICAL URBAN RISKS	BBENEFITS OF GREEN ROOFS	OBSTACLES OF GREEN ROOFS
CRITERIA	• Flood and runoff risks • Air pollution exposure • Heat risks • Lack of habitat for biodiversity • Risk of social segregation / Social divide • Lack of opportunities for cultural and recreational experiences • Neighbourhood degradation • Lack of opportunities for the involvement with natural environments	• Runoff and flood mitigation • Air pollution reduction • Thermal regulation • Provision of habitat for biodiveristy • Provision of environments for social cohesion / integration • Provision of environments for cultural and recreational experiences • Landscape aesthetics • Provision of environments for biosphere reconnection, environmental education and stewardship • Reduction of energy use • Reduction of greenhouse gases	• Costs of implementation • Costs of maintenance • Water depletion • Greenhouse gas emissions • Air Pollution • Soil Pollution • Water pollution • Energy use

Pre-selected criteria

SCENARIOS	REDUCTION OF URBAN RISKS	BENEFITS PROVIDED	OBSTACLES FOR IMPLEMENTATION AND MAINTENANCE
CRITERIA		 	

Impact matrix

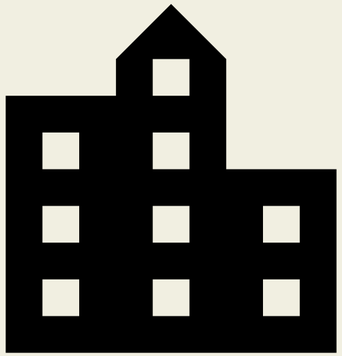
DIMENSION / SCENARIOS	BENEFITS PROVIDED	REDUCTION OF URBAN RISKS	OBSTACLES FOR IMPLEMENTATION AND MAINTENANCE
	CRITERIA	CRITERIA	CRITERIA
1) Business as usual			
2) Ambitious strategy			
3) Max: extensive			
4) Max: extensive + intensive			

Participatory stakeholder process (2022)

- Should any of the benefits of green roofs be considered more important than others?
- Are the negtive impacts of the green roofs relevant?
- Can green roofs solve some the urban risks of the city?

Missing information for the assessment

- Construction year of buildings in the city
- Energy efficiency rating of buildings in the city
- Building materials of main building typologies



Tusen takk!

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