

The 13th International Conference on Innovation in Urban and Regional Planning
Methods, Models and Technologies for Future Cities and Regions

8-9-10 September 2025



Fostering Nature Based Solutions in Urban Planning: Results from a systematic literature review

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SESSION 09 | Impact Assessment of Nature Based Solutions
in Cities: Theoretical, Methodological, and Practical Perspectives

Pavia - September 9, 2025

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Title: "Nature for sustainable cities: planning cost-effective and just solutions for urban issue"

Acronym: NatSolis

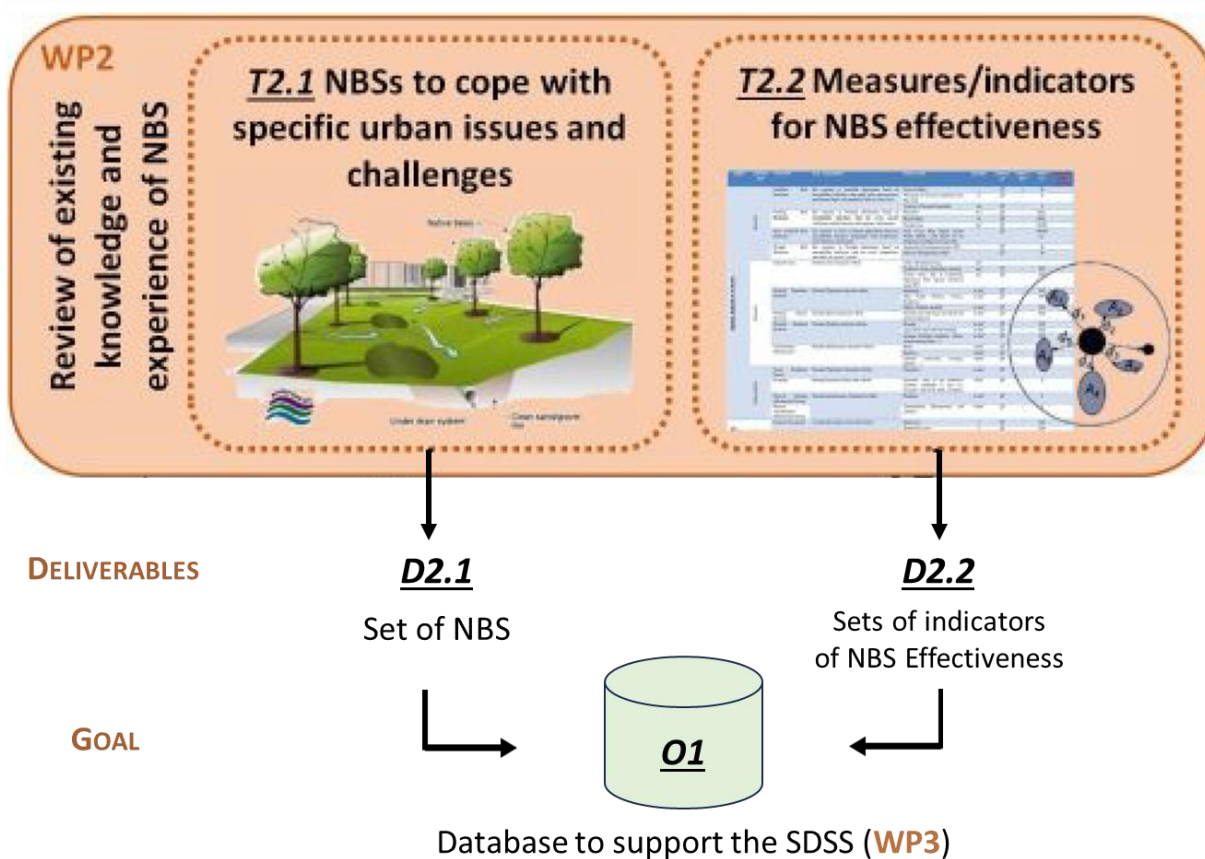
Period: 24 months
(from 2023 to 2025)

Project Number:
2022ZLE8HC

Grant: Research
Programs of Great
National Interest
(PRIN)

Call: PRIN 2022

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Ministero
dell'Università
e della Ricerca



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DI RIPRESA E RESILIENZA



Review of existing knowledge and experience of NBS

WP2

"Nature AND Based AND
Solutions AND Urban
AND Planning"

**70 reviews
(2016-2024)**

"Nature AND Based
AND Solutions AND
Urban AND Planning
AND Issues"

**11 reviews
(2019-2024)**

From a previous review performed
alongside the **WP2**, it emerged that
NBS cost-effectiveness is not always
investigated, let alone measured,
threatening NBS implementation
in urban planning
(Marra & Grimaldi, 2024)

Aim of the study

With the aim of deepen the work
done, this study concerns a
systematic review of the
academic literature, aimed at
finding answers to relevant
questions

Research Questions (QR)



QR1: Types of NBS discussed

QR2: Spatial scale of investigation

QR3: Benefits associated

QR4: How benefits are measured

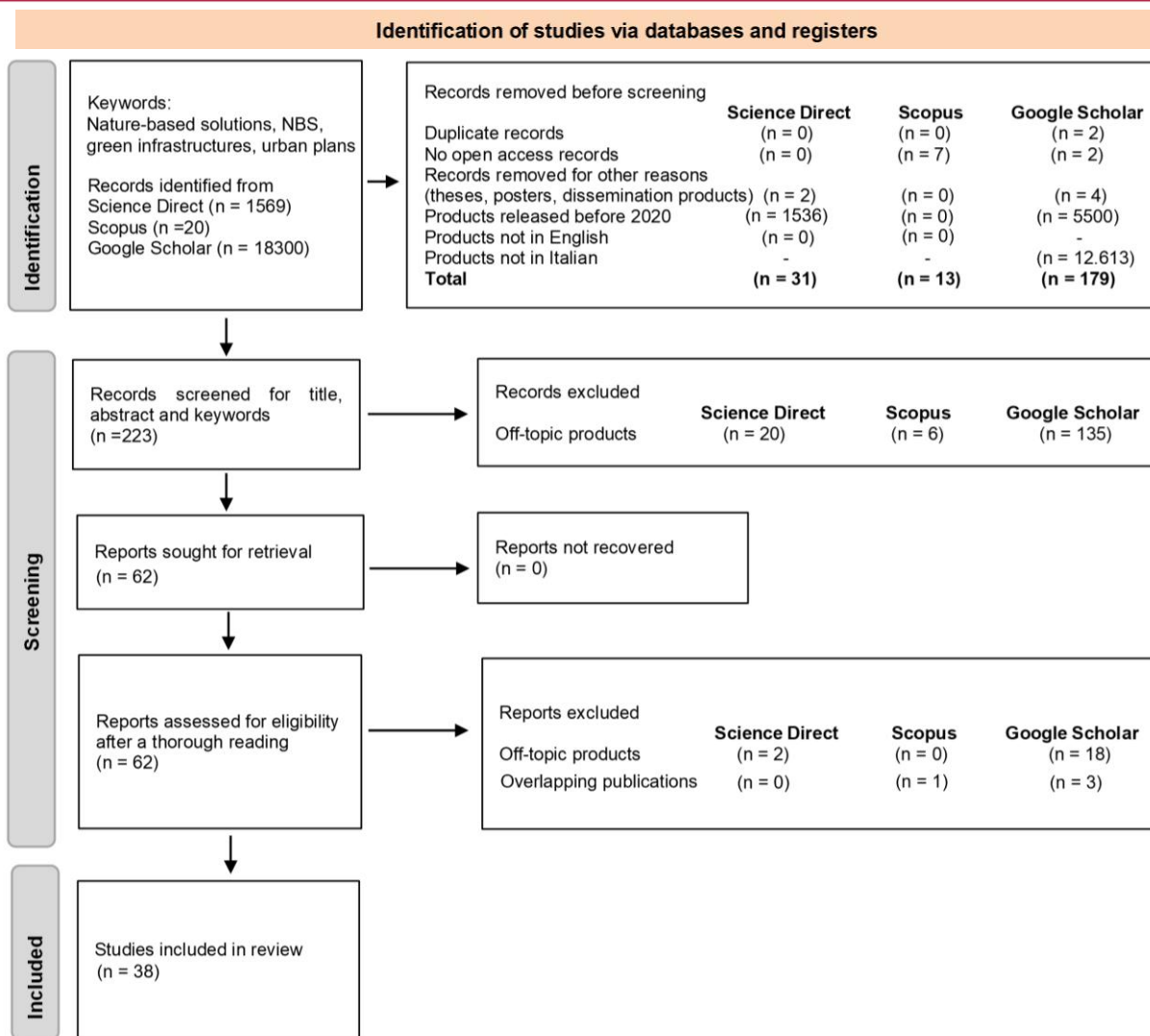
QR5: Costs associated

QR6: Methodologies adopted

QR7: Tools/software used

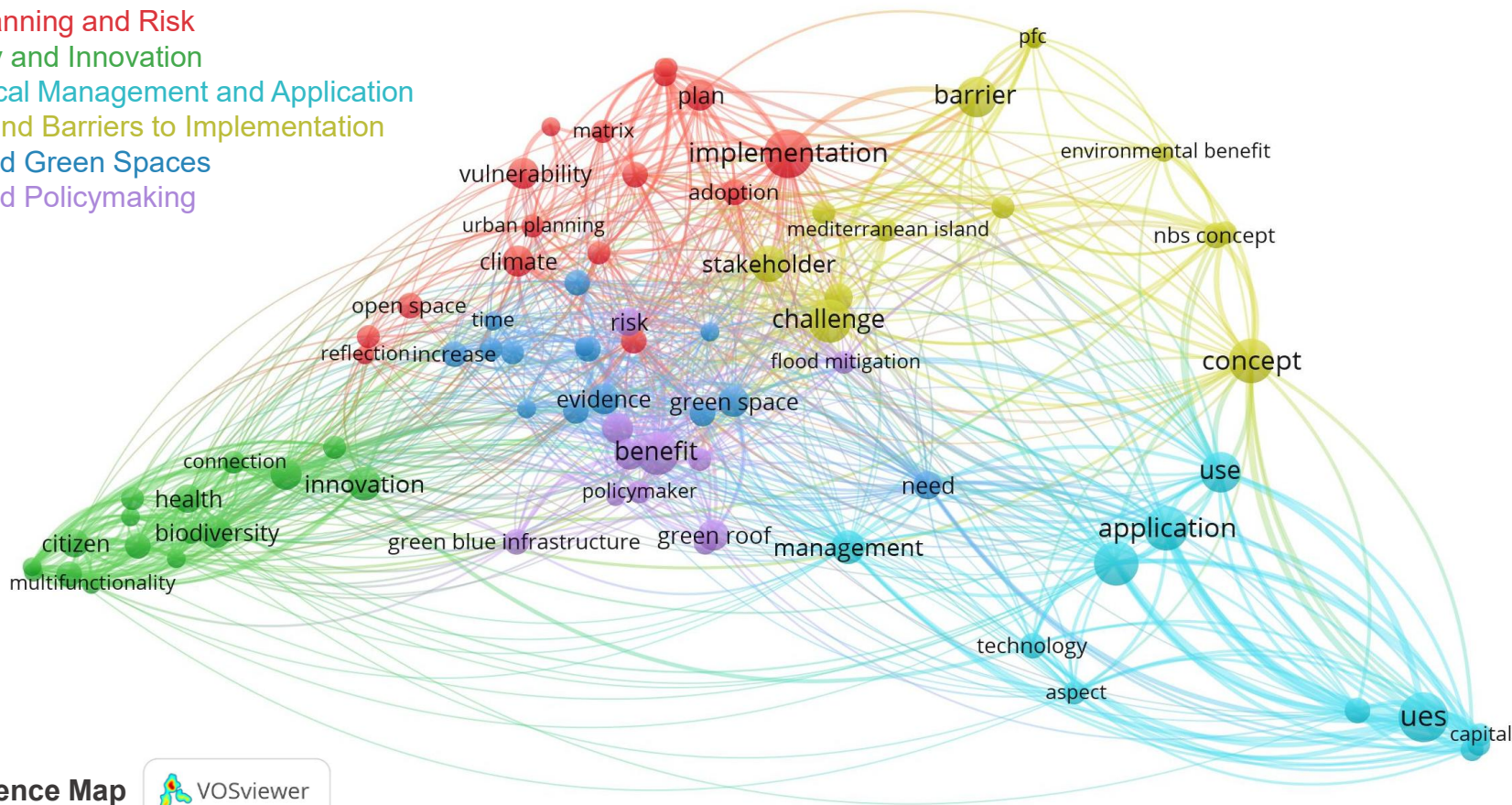
Search string used
for Scopus and Science Direct:
("Nature-based solutions" OR
NBS) AND "green infrastructures"
AND "urban plans"

Workflow diagram according to the
PRISMA protocol.
Source: own elaboration on the
PRISMA 2020 diagram for the new
systematic reviews that include
database and registry searches
(Page et al., 2021)



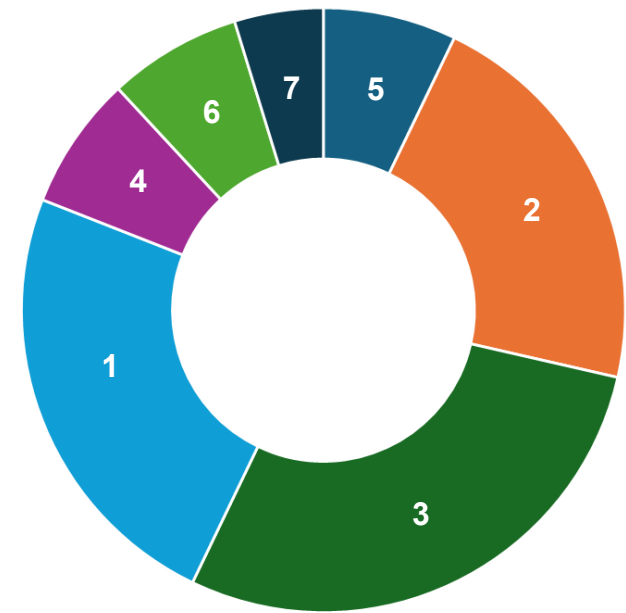
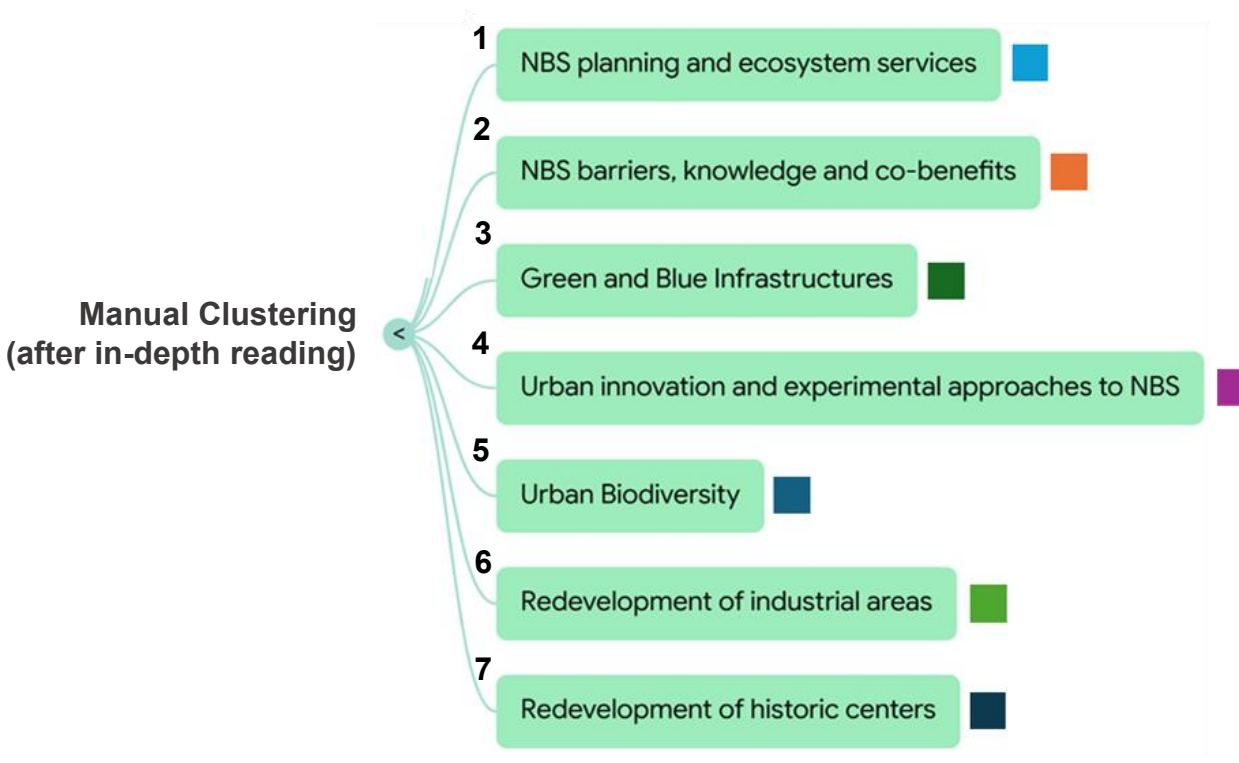
Preliminary Clustering (Title, abstract and keywords)

1. Climate Planning and Risk
2. Biodiversity and Innovation
3. Technological Management and Application
4. Concepts and Barriers to Implementation
5. Benefits and Green Spaces
6. Benefits and Policymaking



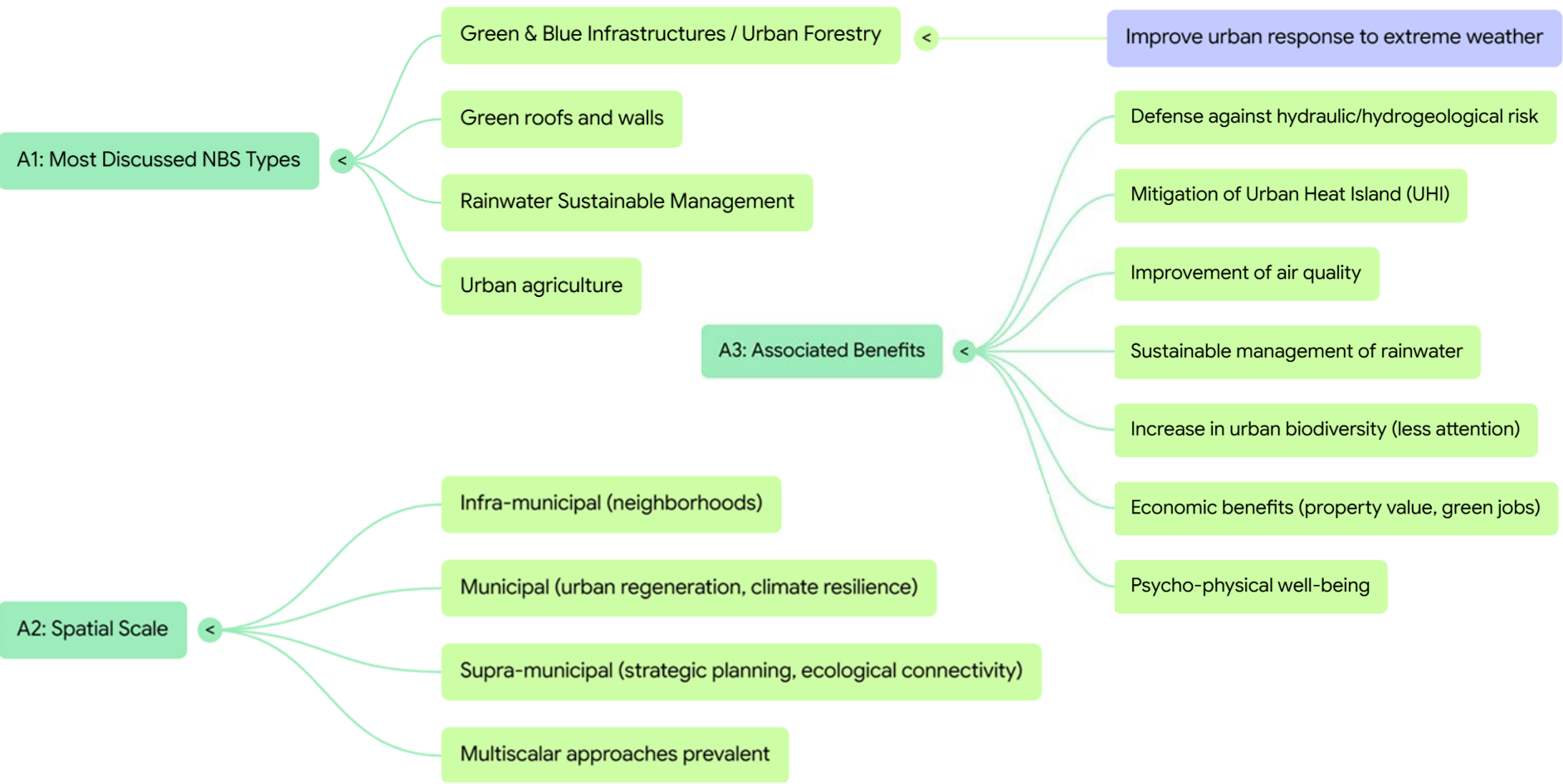
Co-occurrence Map





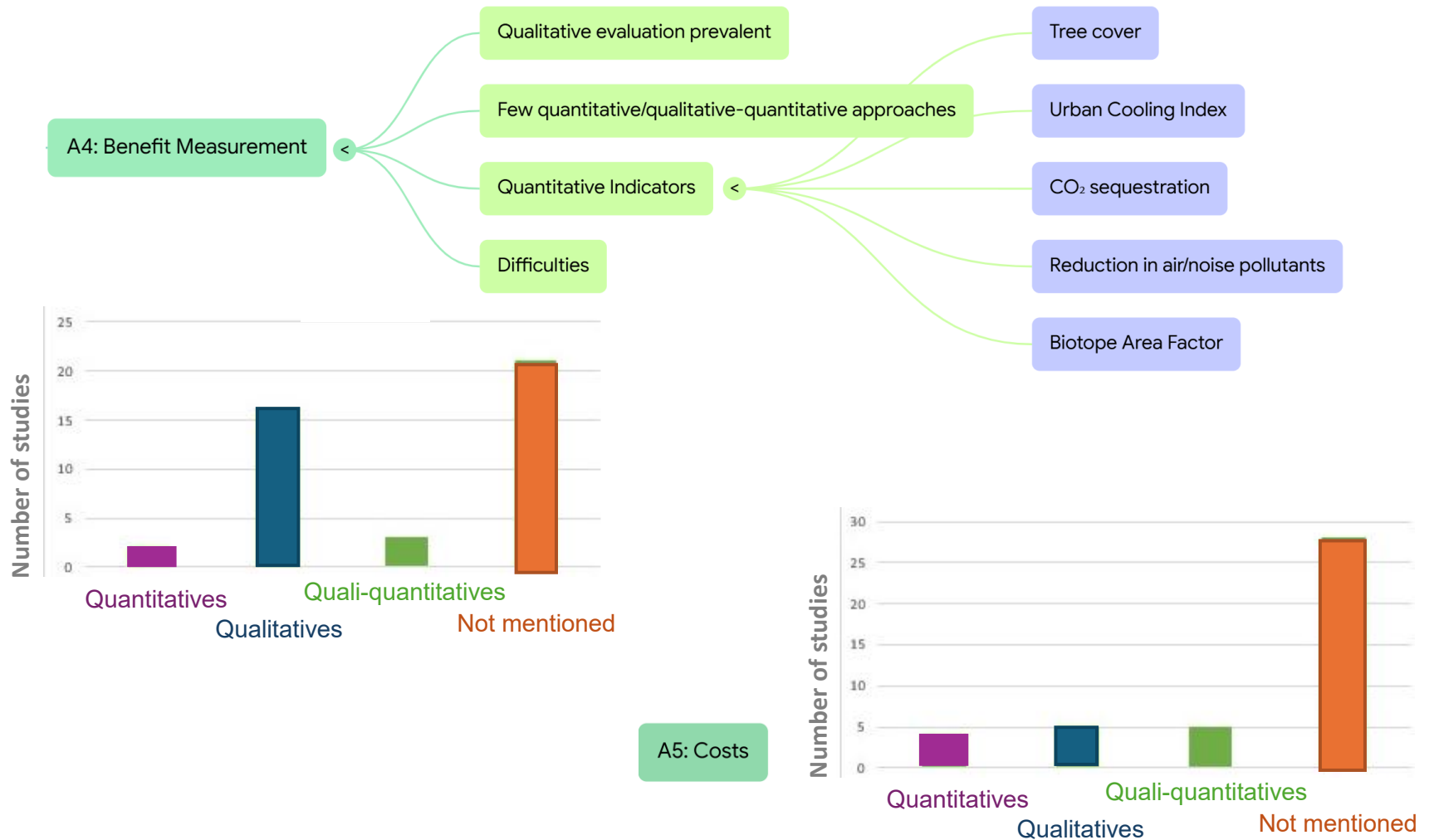
Results and Discussion

In-depth analysis to address the RQs



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Results and Discussion

In-depth analysis to address the RQs

A6: Methodologies for Evaluation

Fuzzy Cognitive Maps (FCM)

Causal Loop Diagrams (CLD)

Group Model Building techniques

Multi-criteria methods

Qualitative assessment tools (Likert scale)

Participatory Approaches

Interviews with experts

Workshops

Delphi method

A7: Tools/Software

Knowledge-sharing platforms

Climate Adaptation app

Oppla

GeolKP

Urban Nature Atlas

GIS Software

WebGIS Platforms

Environmental/Microclimatic Modelling

InVEST

ENVI-met (UHI mitigation)

SWMM (Storm Water Management Model)

ESTIMAP (Ecosystem Service Mapping Tool)

I-Tree Eco

I-Tree Design

ARIES

GI-VAL

ORVal

Simulsoil

Ecosystem Service Estimation

Results summary

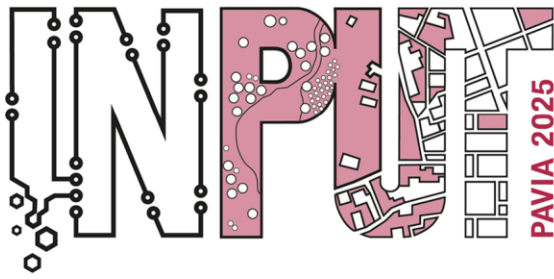
Still few studies adopt quantitative approaches to assess the NBS potential benefits and even less of the costs associated with them. It is necessary to address the barriers behind this to foster NBS implementation in urban planning



Limitations and future research developments

- Pre-register the protocol or perform a quality assessment of the publications included in the final sample analysis
- Il metodo proposto è trasferibile ad altri
- The integration of academic literature with the 'grey literature' (Schöpfel, 2012)
- Focusing on biodiversity, understand how a Green Infrastructure Plan of an urban area affects the possible improvement of ecological connectivity





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Thank you for your kind attention!

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