A text-mining approach to assess impacts and benefits of Nature-Based Solutions

Leydy Alejandra **Castellanos Díaz** (1), Pierre Antoine **Versini** (1), Ioulia **Tchiguirinskaia** (1) and Olivier **Bonin** (2)

(1) HM&Co, Ecole des Ponts ParisTech, UPE, Champs-sur-Marne, France (leydy.castellanos@enpc.fr),
(2) LVMT, Ecole des Ponts ParisTech, UPEM, IFSTTAR, Champs-sur-Marne, France

Urban Sustainability Challenges

Urban sprawl

Climate changes effects

Nature-based Solutions

Urban resilience

Green walls

Green roofs

Green swales

Pervious pavements

Urban parks

Urban wetlands…

NbS “living solutions inspired and continuously supported by nature, which are designed to address various societal challenges in a resource-efficient and adaptable manner and to provide simultaneously economic, social, and environmental benefits**” EC, 2015**

Nature-based Solutions

European Commission

Physic, social and economic impacts and benefits?

Funding European projects: Review of scientific literature

EKLIPSE

Framework of design, development, implementation and assessment of NbS in the urban context.

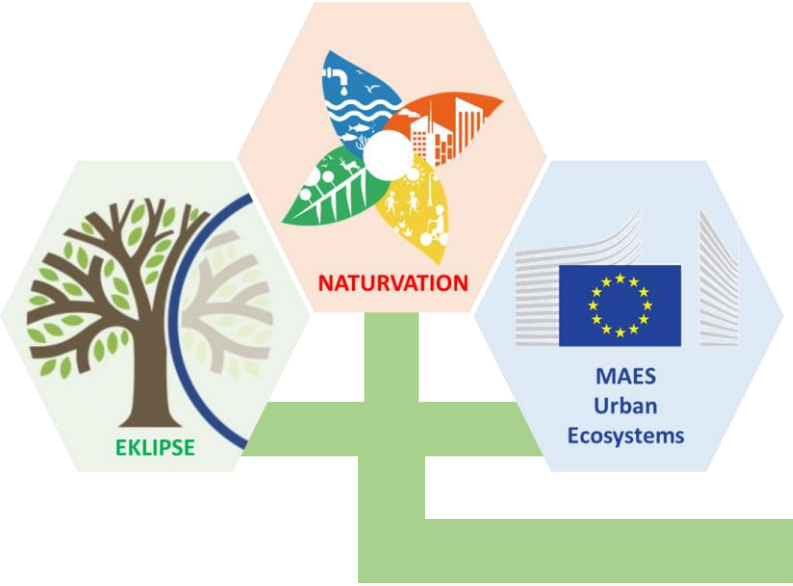
MAES Urban Ecosystems

Mapping and assessment of ecosystems condition and their services.

NATURVATION

NbS assessment tool for urban areas with their economic implications.

Literature review on Nature-based solutions



Text-Mining

Converting text data into a meaningful structured analysis, allowing to recognize concepts as well as to identify stakeholders and their position.

Objective analysis and comparison of documents

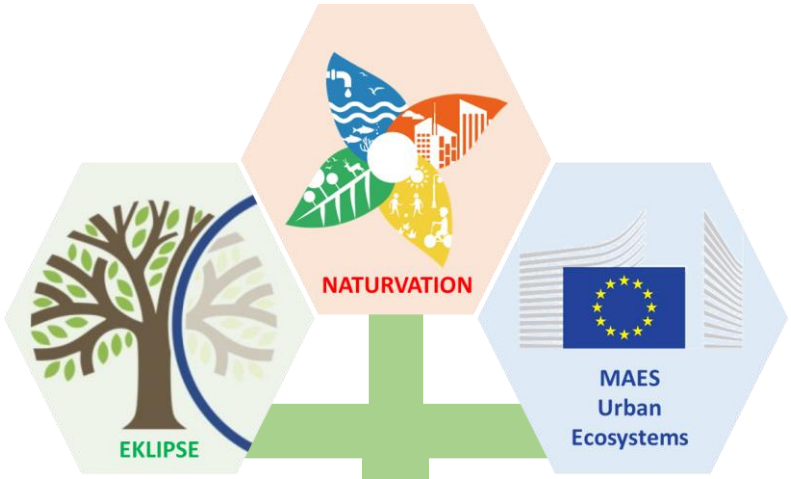
Traditional analysis

Metadata on scientific publications (abstracts, keywords, title, date of publication and author).

This analysis

Each report divided in smaller units.

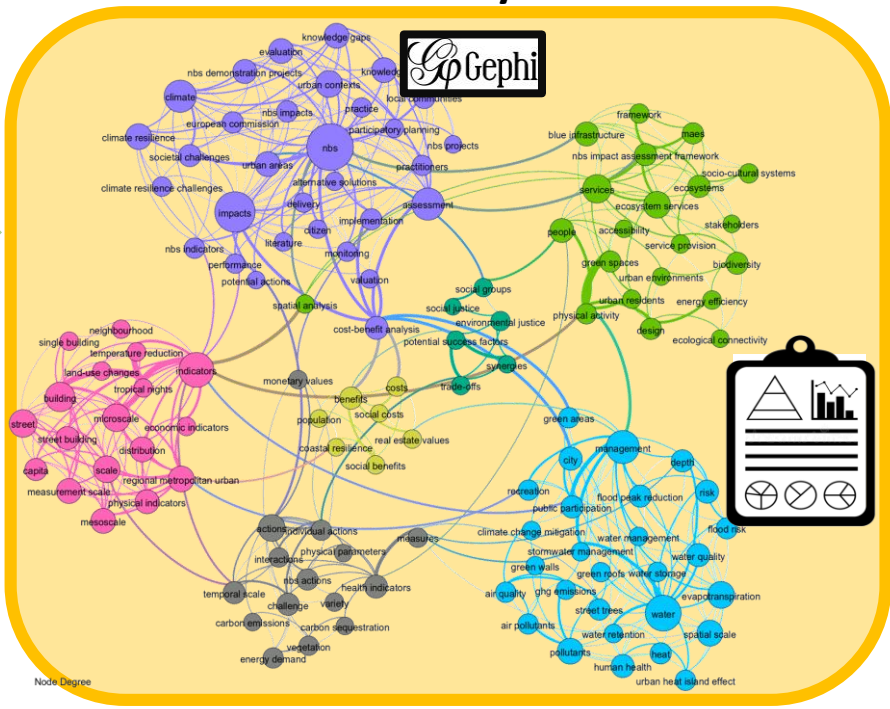
Literature review on Nature-based solutions



Text-Mining

Occurrence of terms in the report

Data visualization and statistical analysis

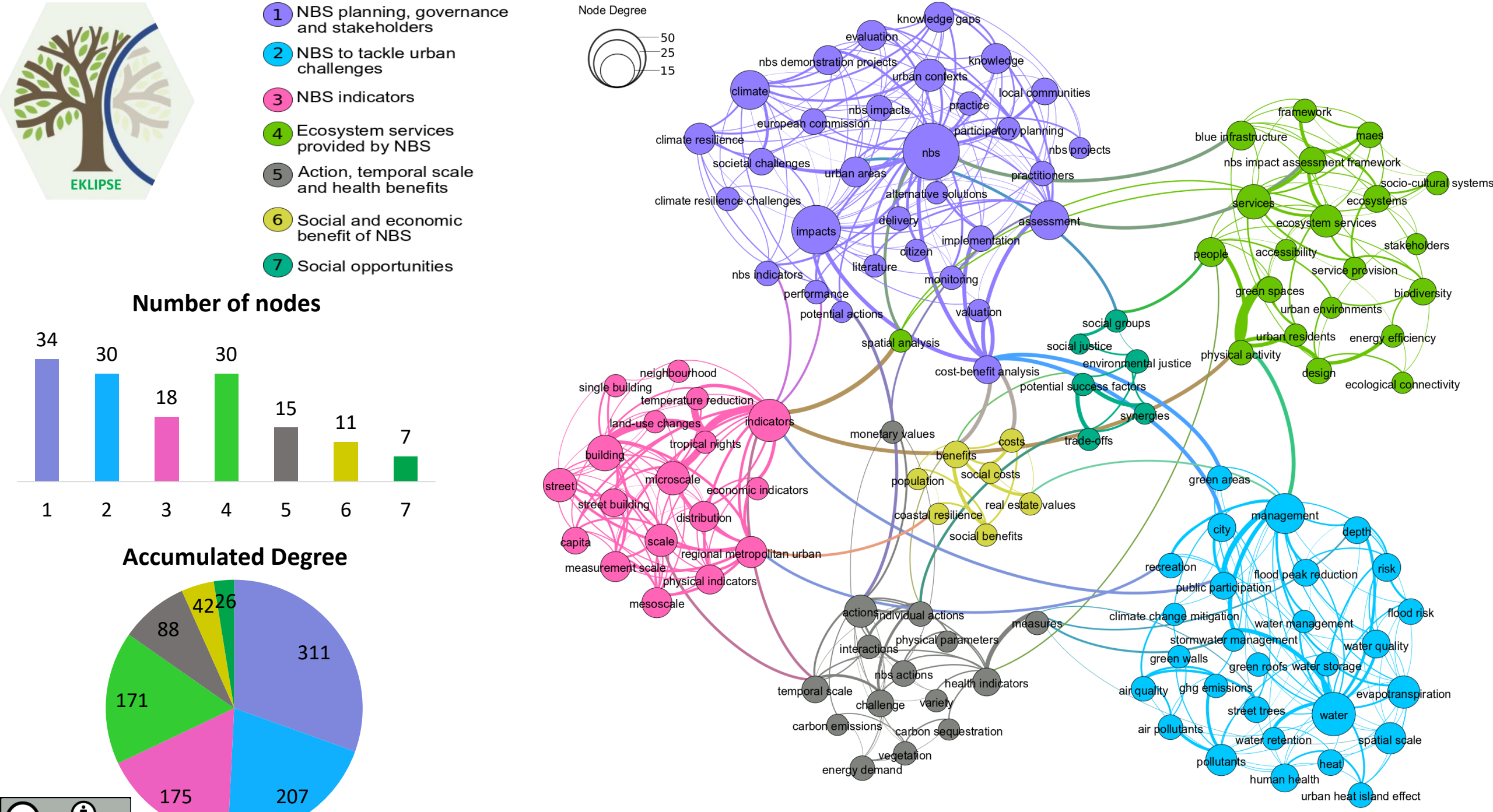


Network:

- Node: key terms
- Edge: connections between nodes
- Clusters: communities of nodes

Statistical analysis:

- Degree of nodes: number of edges connected to a node
- Edge weight: strength of link between nodes


1 NBS planning, governance and stakeholders
2 NBS to tackle urban challenges
3 NBS indicators
4 Ecosystem services provided by NBS
5 Action, temporal scale and health benefits
6 Social and economic benefit of NBS
7 Social opportunities
Node Degree
50
25
15
Number of nodes
34
30
18
30
15
11
7
1
2
3
4
5
6
7
Accumulated Degree
311
207
175
171
88
42
26
knowledge gaps
evaluation
nbs demonstration projects
knowledge
urban contexts
climate
local communities
practice
nbs impacts
european commission
participatory planning
climate resilience
nbs
nbs projects
societal challenges
urban areas
practitioners
alternative solutions
climate resilience challenges
impacts
delivery
assessment
implementation
citizen
literature
nbs indicators
monitoring
performance
potential actions
valuation
spatial analysis
framework
blue infrastructure
maes
nbs impact assessment framework
socio-cultural systems
services
ecosystems
ecosystem services
people
accessibility
stakeholders
service provision
green spaces
biodiversity
urban environments
urban residents
energy efficiency
physical activity
design
ecological connectivity
social groups
social justice
environmental justice
cost-benefit analysis
potential success factors
synergies
trade-offs
neighbourhood
single building
temperature reduction
land-use changes
indicators
tropical nights
building
monetary values
costs
benefits
street
microscale
economic indicators
population
social costs
street building
real estate values
distribution
coastal resilience
capita
scale
social benefits
regional metropolitan urban
measurement scale
physical indicators
mesoscale
green areas
management
city
depth
recreation
flood peak reduction
risk
public participation
actions
individual actions
measures
climate change mitigation
flood risk
physical parameters
water management
interactions
stormwater management
water quality
green walls
green roofs
water storage
nbs actions
health indicators
air quality
ghg emissions
evapotranspiration
temporal scale
challenge
variety
street trees
water
carbon emissions
carbon sequestration
air pollutants
water retention
spatial scale
vegetation
pollutants
heat
energy demand
human health
urban heat island effect
EKLIPSE
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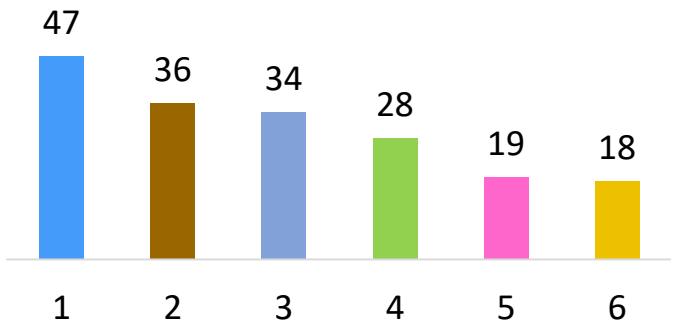
MAES
Urban
Ecosystems

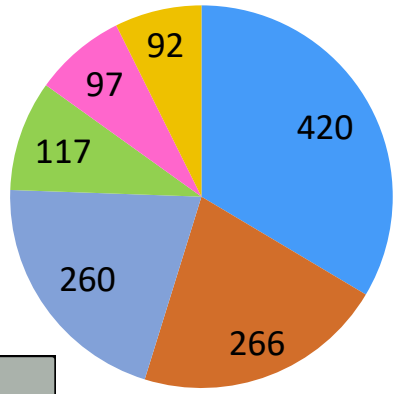
1. Urban policies and NBS
2. Ecosystem services provided by NBS
3. Urban land use
4. Urban planning
5. Ecosystem services assessment
6. Tools to asses ecosystem services

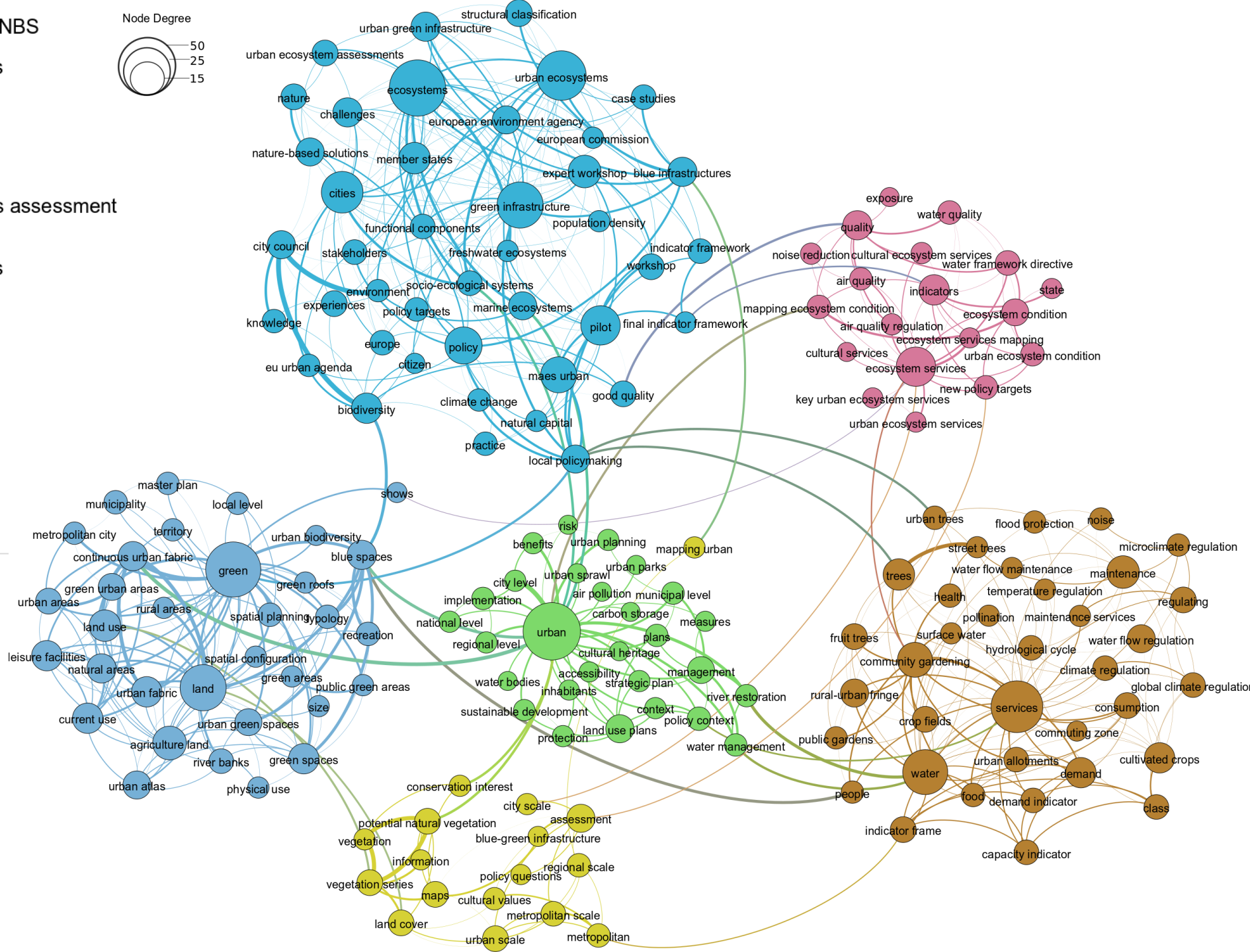
Node Degree
50
25
15

Number of nodes



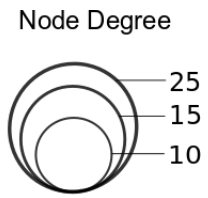
Accumulated Degree



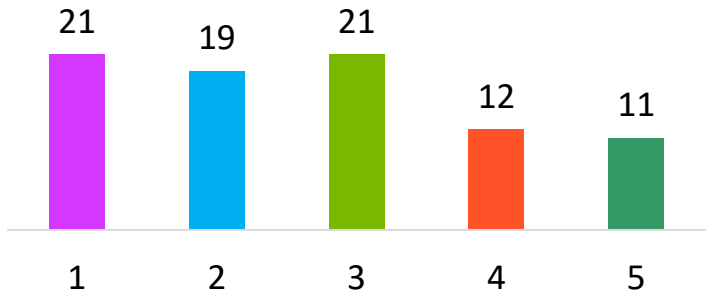


NATURVATION

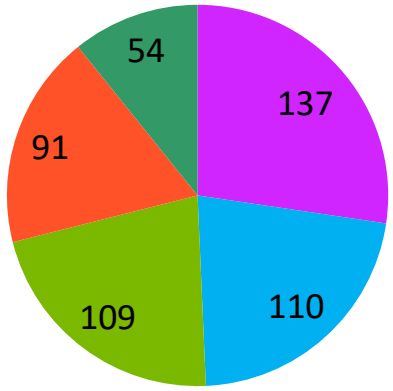
1. Economic valuation
2. Types of NBS
3. Ecosystem services provided by NBS
4. NBS terms
5. Economic values of nature

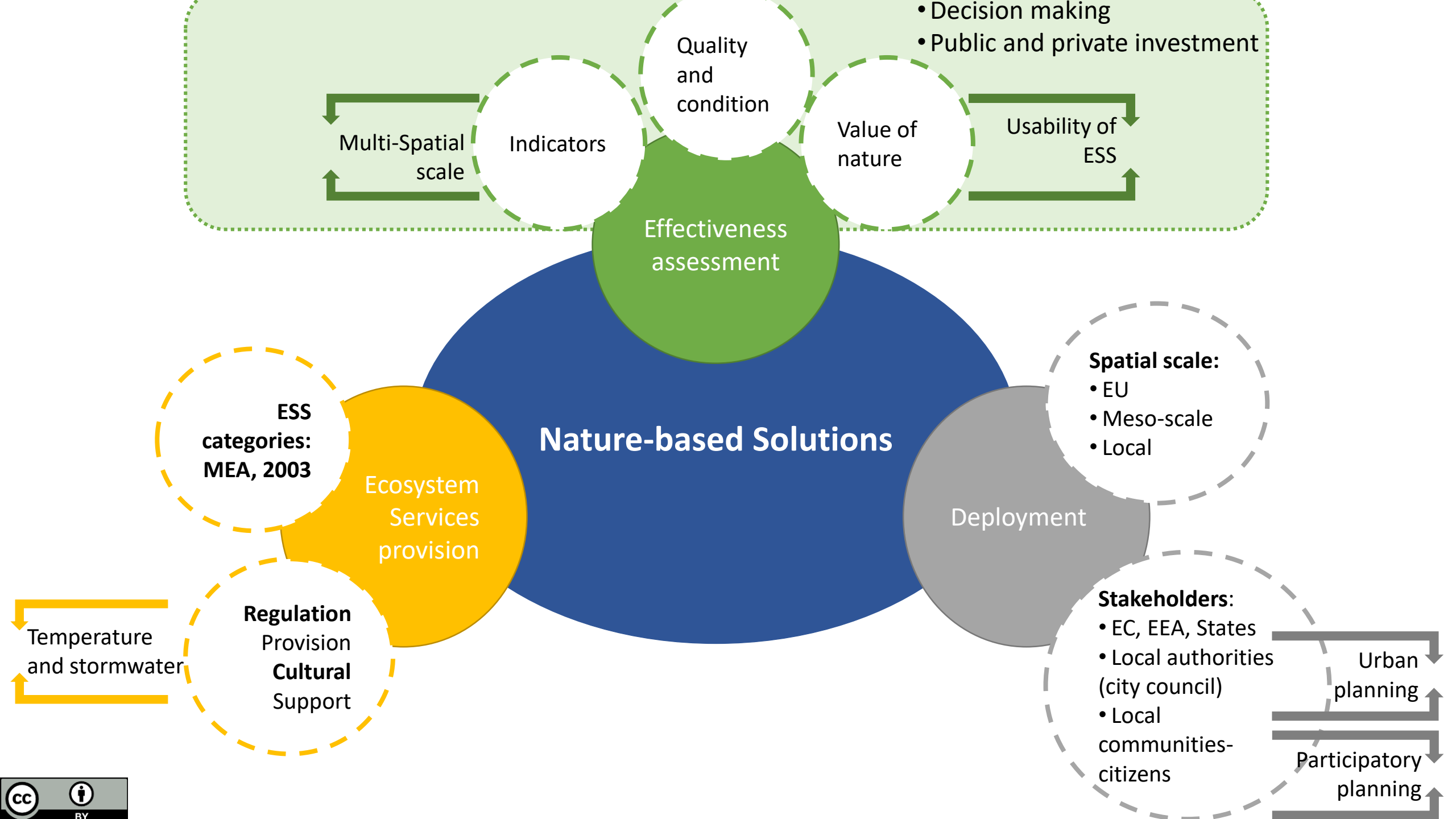


Number of nodes



Accumulated Degree




• Decision making
• Public and private investment
Quality and condition
Multi-Spatial scale
Indicators
Value of nature
Usability of ESS
Effectiveness assessment
Nature-based Solutions
ESS categories: MEA, 2003
Ecosystem Services provision
Deployment
Spatial scale:
• EU
• Meso-scale
• Local
Temperature and stormwater
Regulation
Provision
Cultural
Support
Stakeholders:
• EC, EEA, States
• Local authorities (city council)
• Local communities-citizens
Urban planning
Participatory planning