

Nature-based solutions in urban planning: Challenges and opportunities

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Nature-based Solutions (European Commission)

Is it supported by nature/natural processes?

Does it provide environmental benefits?

Is it cost-effective?

Does it provide social benefits?

Does it have a net-benefit on biodiversity?

NbS have the potential to address many urban challenges



Climate Mitigation and
Adaptation



Water Management



Coastal Resilience



Green Space
Management



AirQuality



Urban Regeneration



Participatory Planning
and Governance



Social Justice and
Social Cohesion



Public Health and
Well-being



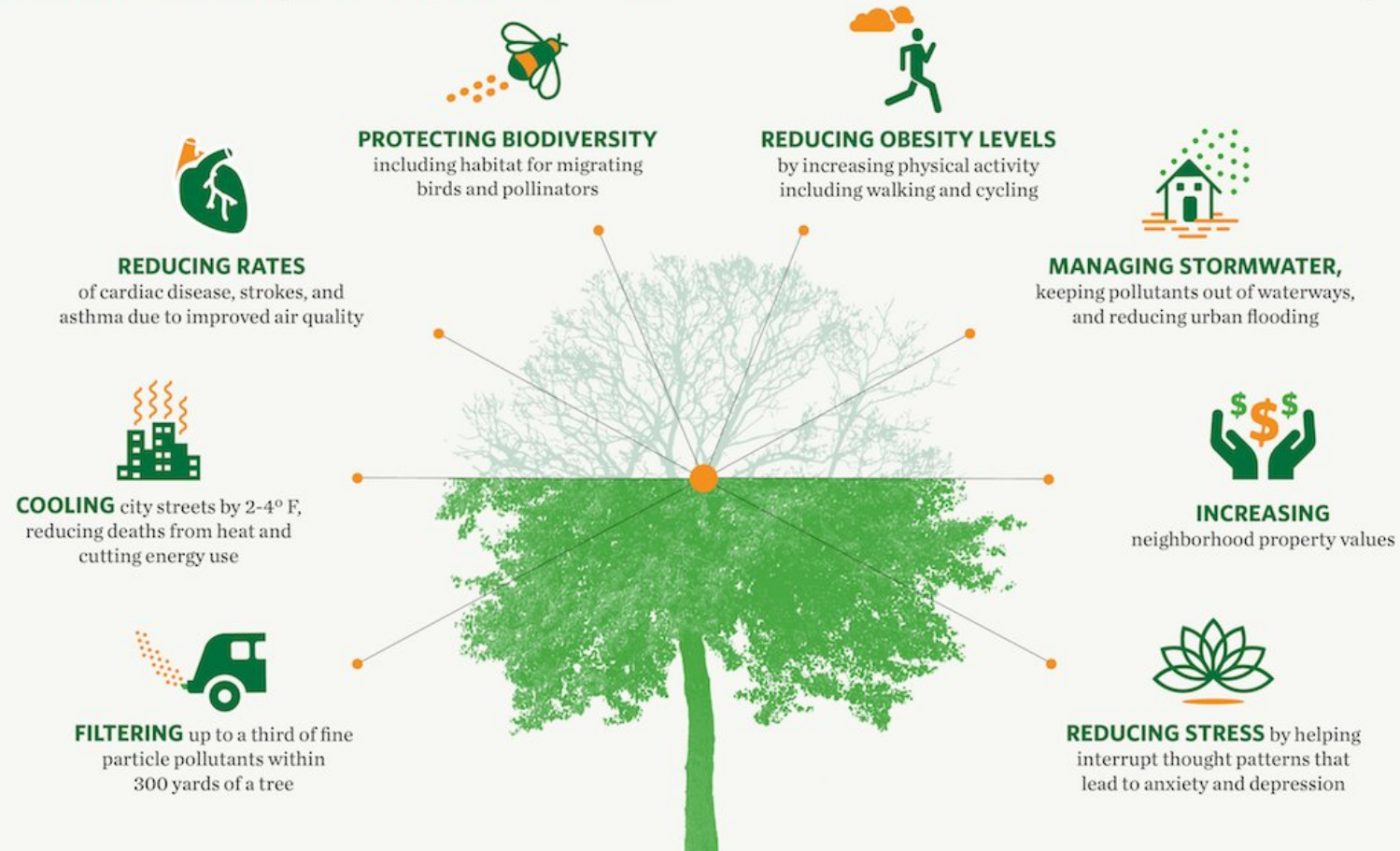
Economic Opps. and
Green Jobs

Raymond, C.M., Frantzeskaki, N., Kabisch, N., Berry, P., Breil, M., Nita, M.R., Geneletti, D. and Calfapietra, C., 2017. A framework for assessing and implementing the co-benefits of nature-based solutions in urban areas. *Environmental Science & Policy*, 77, pp.15-24.

Benefits of Urban Trees

Research has linked the presence of urban trees to...

The Nature Conservancy 



- ✓ **Targeted design:** *How to ensure that NbS provide the benefits that we expect?*
- ✓ **Procedural upscaling:** *How to systematically integrate NbS in urban plans?*
- ✓ **Spatial upscaling:** *How to assess the cost-effectiveness of implementing NbS across urban scales?*
- ✓ **Beneficiaries and trade-offs:** *How to understand the distribution of beneficiaries and the justice implications?*

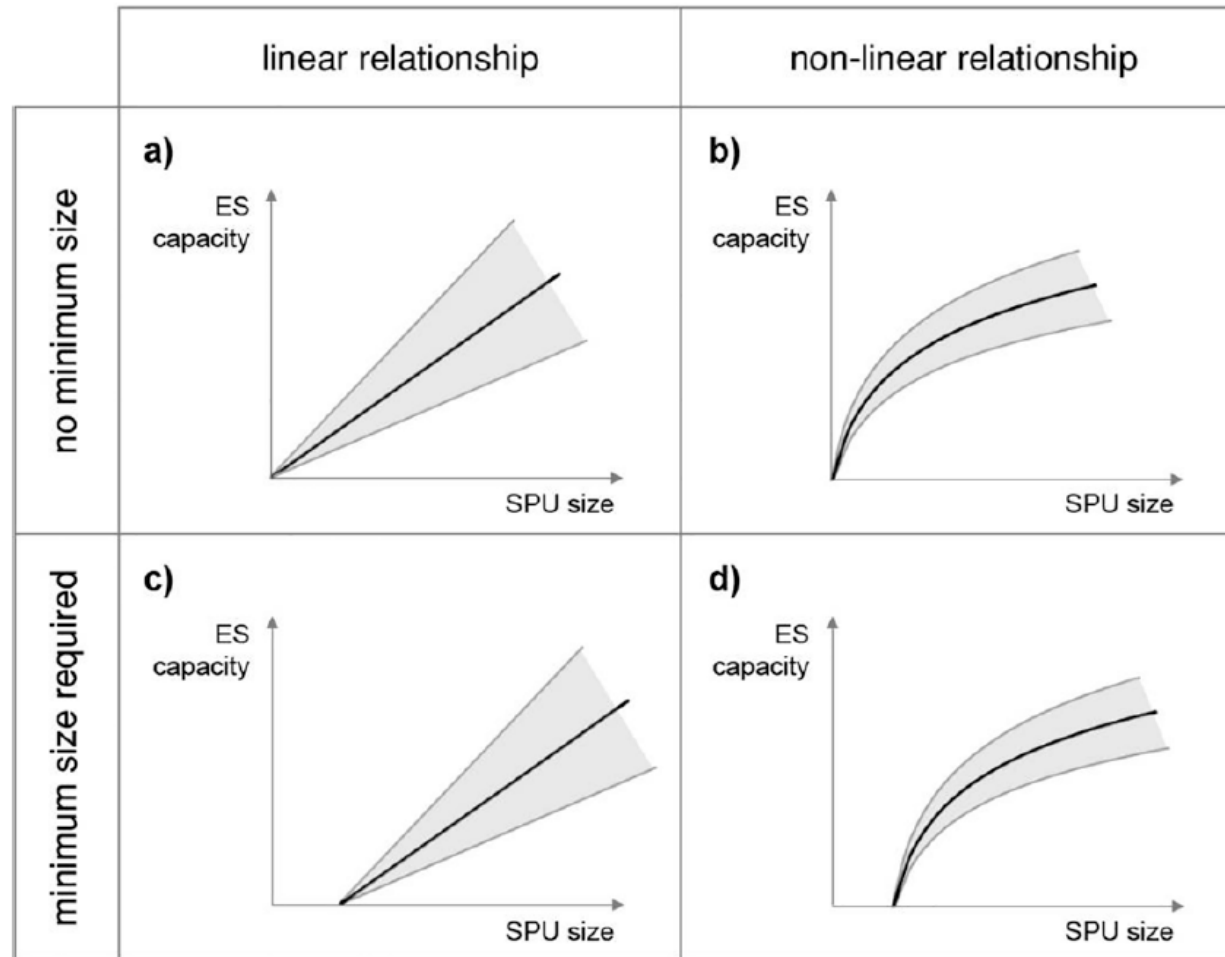
NbS components, size and spatial configuration Vs ecosystem service supply



Functionality of different NbS components

URBAN REGULATING SERVICES	NbS COMPONENTS							
	trees	shrubs	herbaceous vegetation	permeable surfaces	wetlands	water courses	water bodies	soil
air purification	X	X						
urban micro-climate regulation	X	X	X		X	X	X	
global climate regulation	X	X						X
run-off mitigation and flood control	X	X		X	X			
noise reduction	X	X	X					
moderation of extreme events	X				X			
waste treatment				X	X		X	

Size-effect relationship



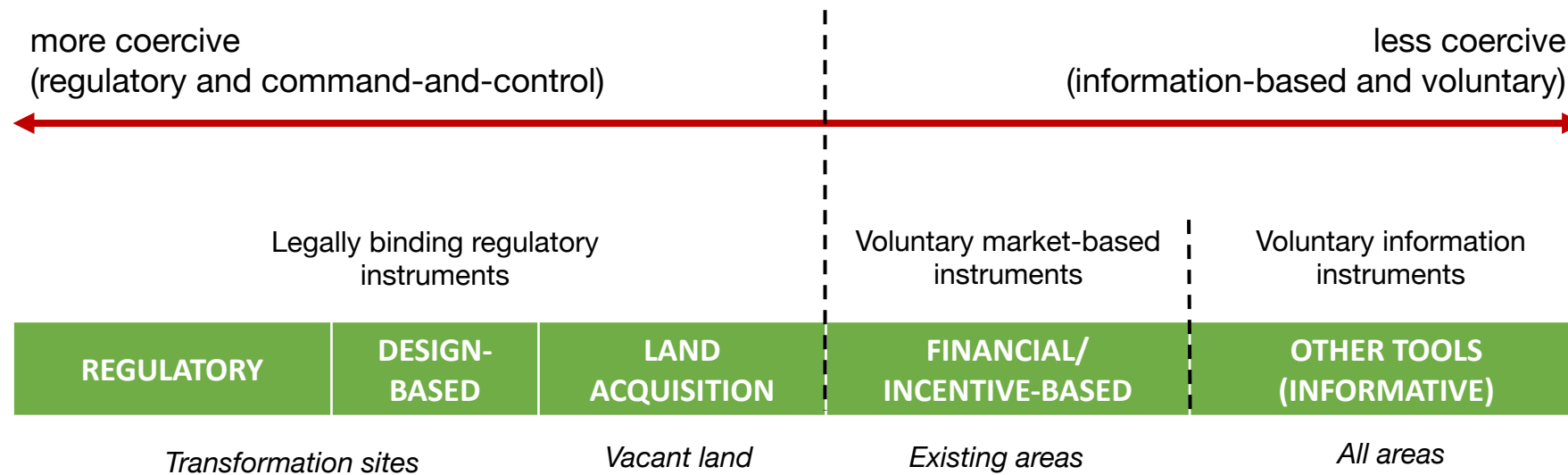


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“The promotion of healthy ecosystems, green infrastructure and **nature-based solutions** should be systematically integrated into urban planning, including in public spaces, infrastructure, and the design of buildings and their surroundings”

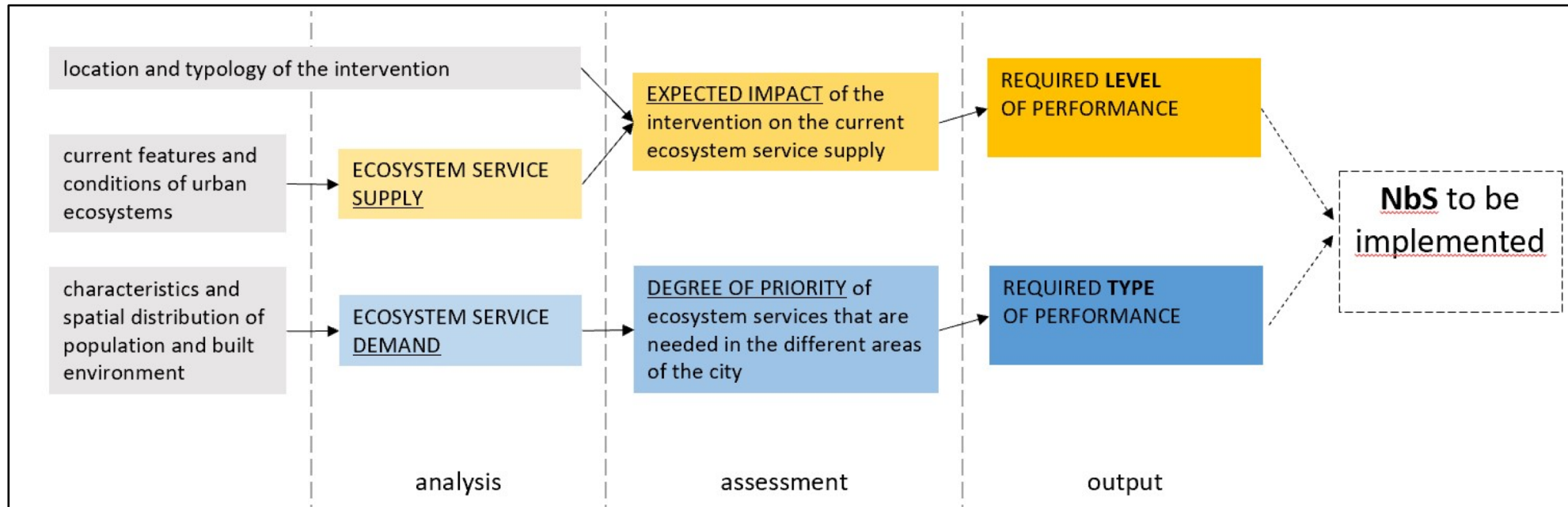
EU Biodiversity Strategy for 2030

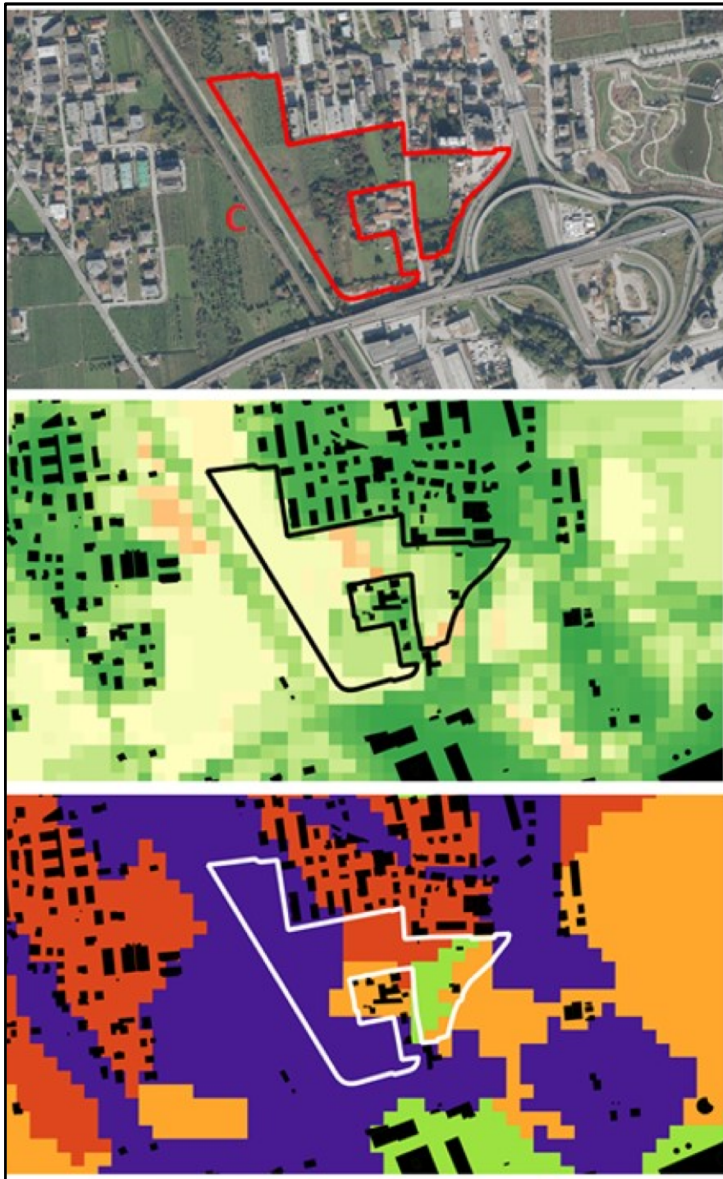
Possible policy instruments in urban plans



REGULATORY	DESIGN-BASED	LAND ACQUISITION	FINANCIAL/ INCENTIVE-BASED	OTHER TOOLS (INFORMATIVE)
Quantitative targets or standards	Ad hoc design solutions for specific site development	Fee (simple) acquisition programs	Preferential tax treatments	Guidelines or criteria for public space design
Technological requirements		Development rights acquisition programs	Subsidies/ grants	Principles for territorial management
Compensation measures			Density bonuses	Promotion of good practices
Performance-based (zoning) approaches			Financial bonds	
Conservation zones or protected areas			Transfer of development rights	
Other regulatory tools related to zoning				

Example of a performance-based approach to integrate NbS in urban transformations





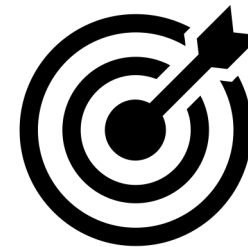
Proposed
transformation

Analysis of
ecosystem
service supply



Level of
performance

Analysis of
ecosystem
service demand



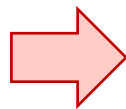
Type of
performance



Level of
performance



Type of
performance



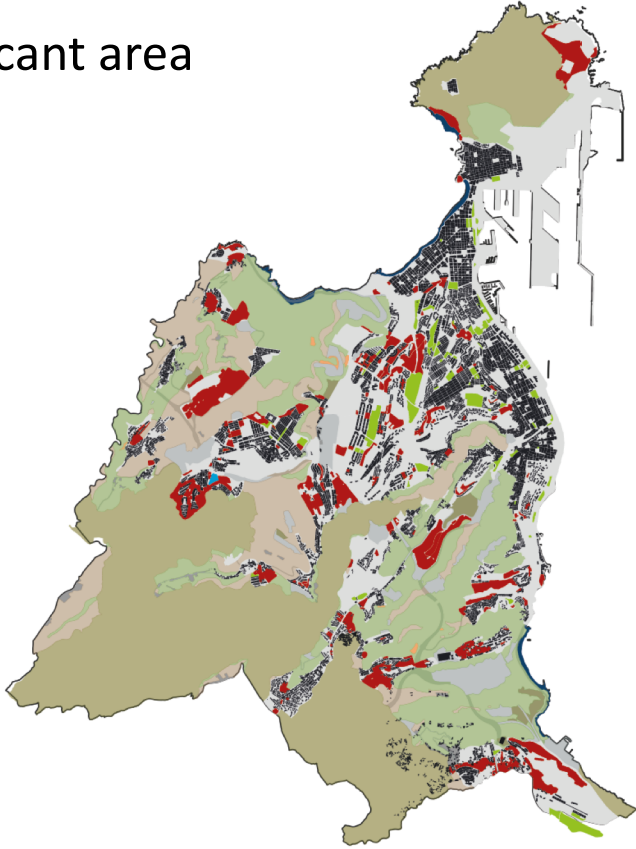
Design and location of NbS
required to implement the
proposed urban transformation



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Spatial upscaling: Understanding the cumulative effects

■ vacant area

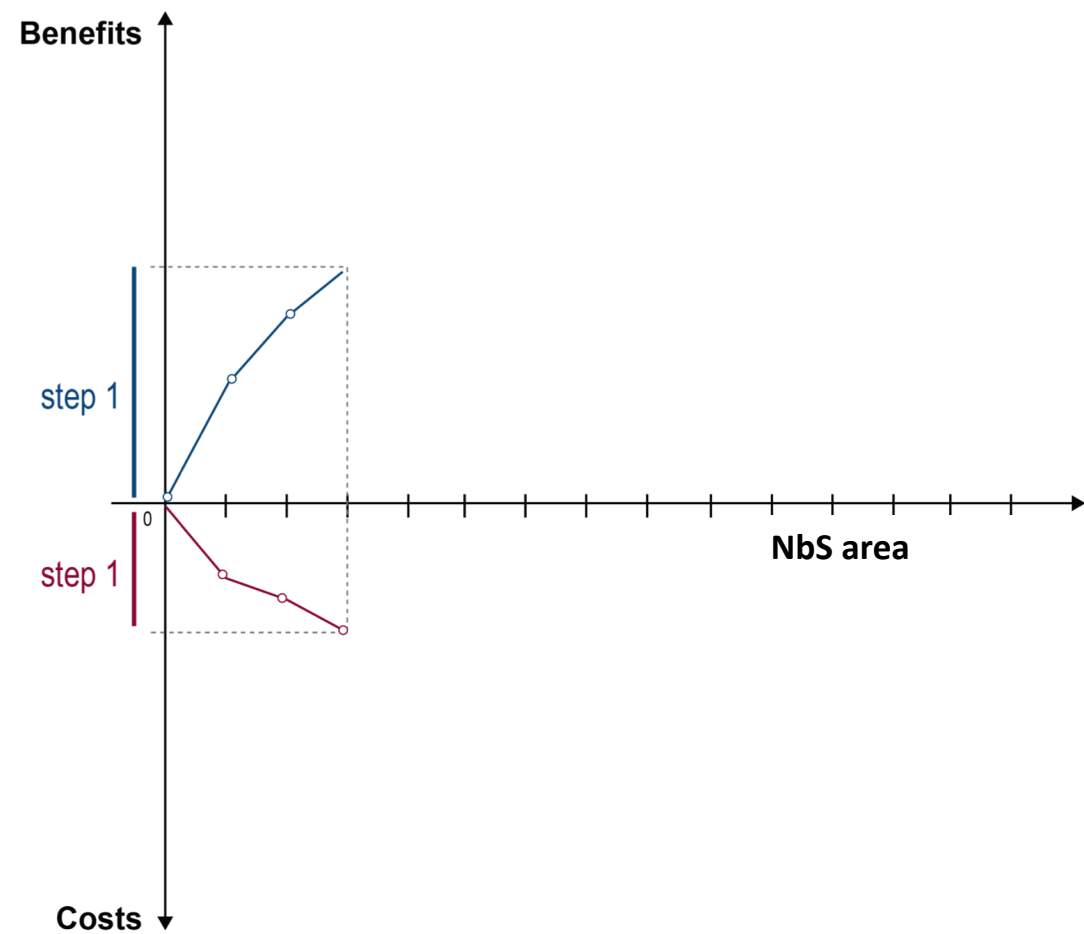
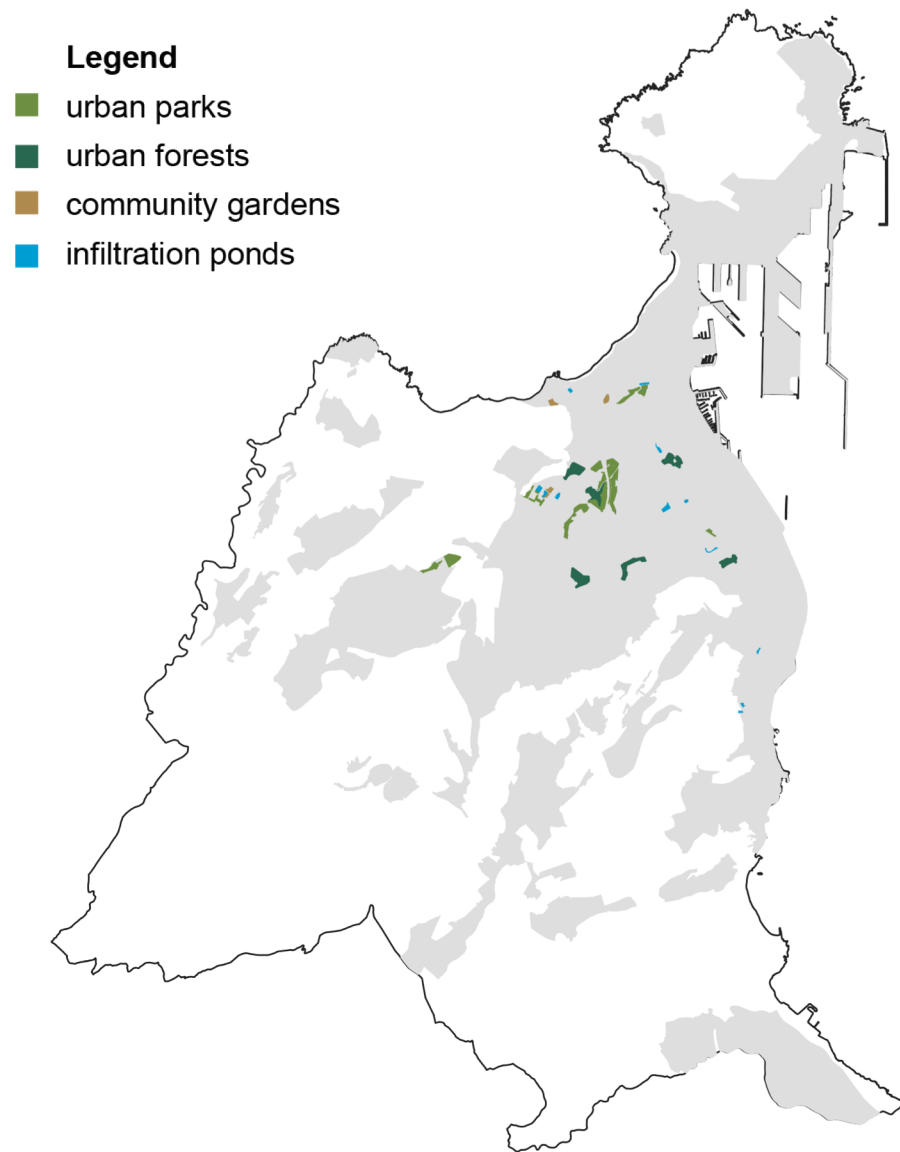


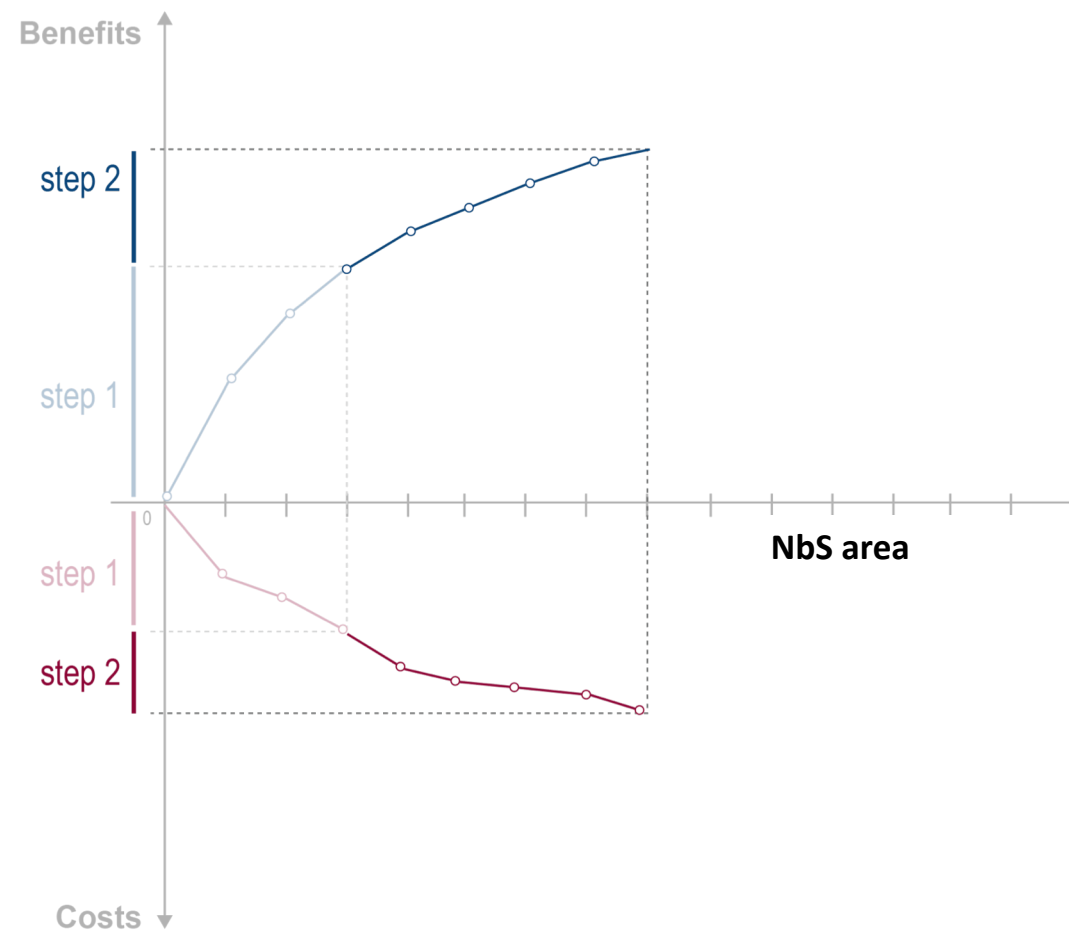
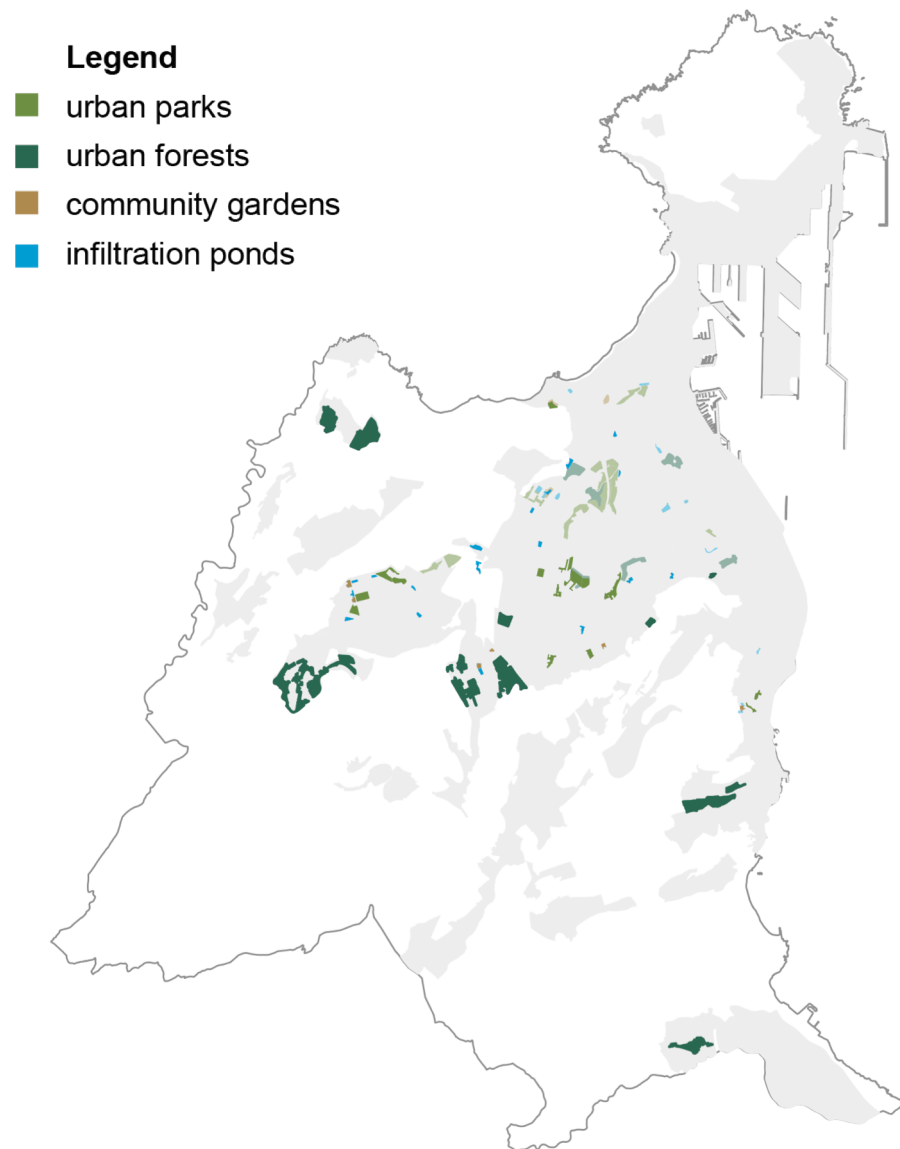
Las Palmas de Gran Canaria

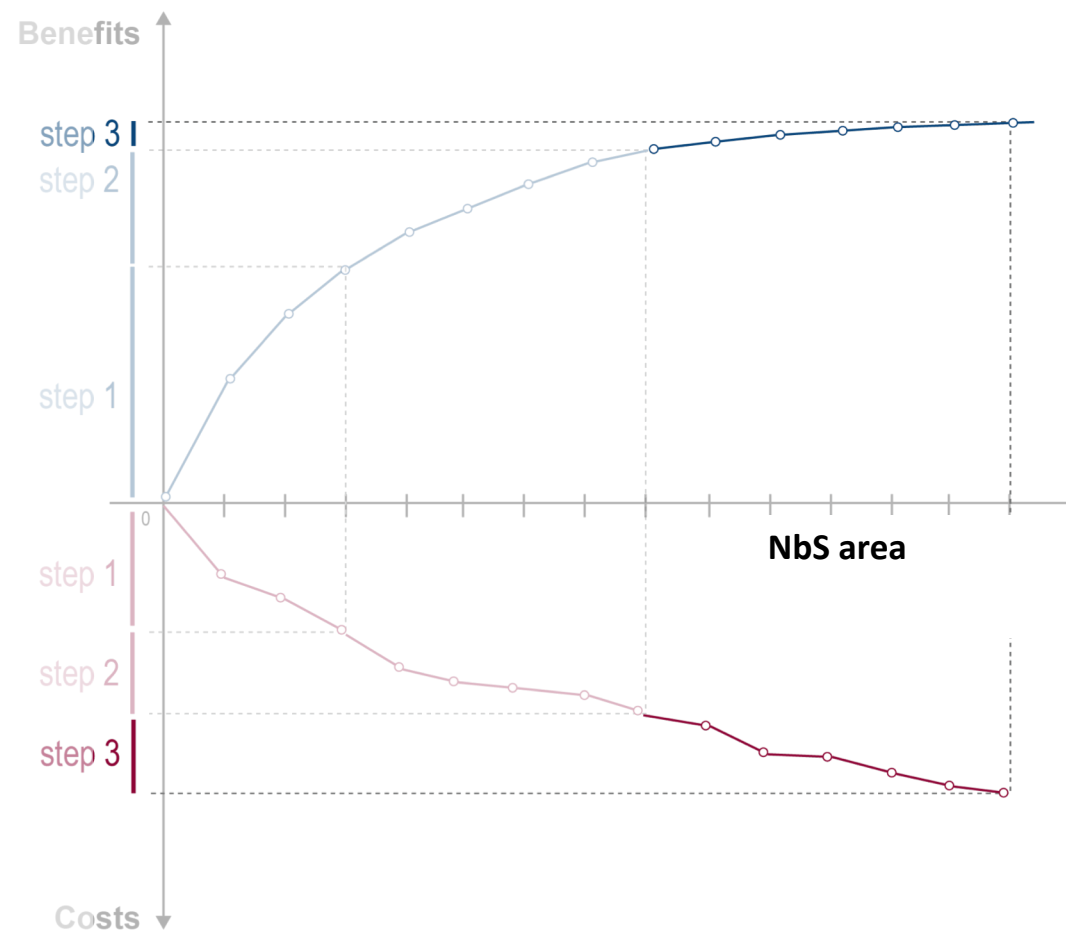
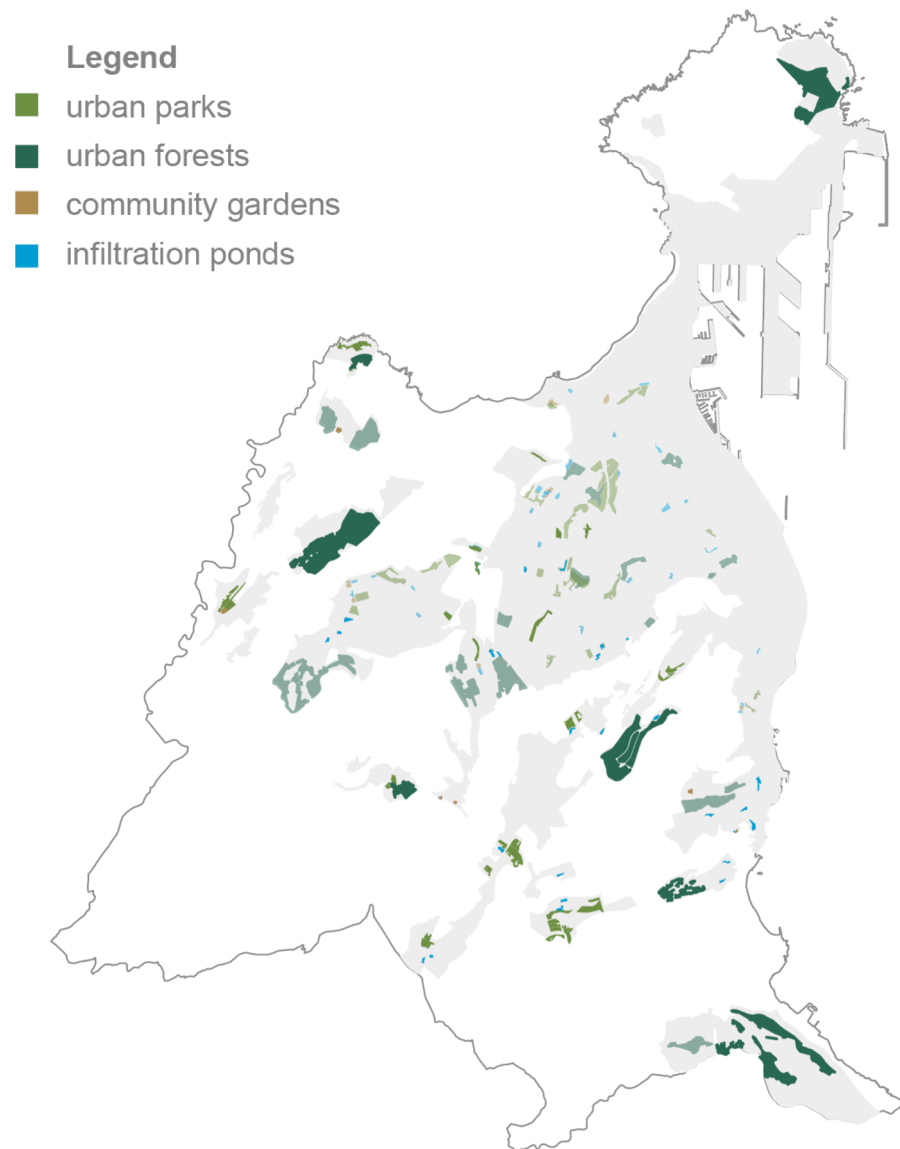
Where?

How many?

When?





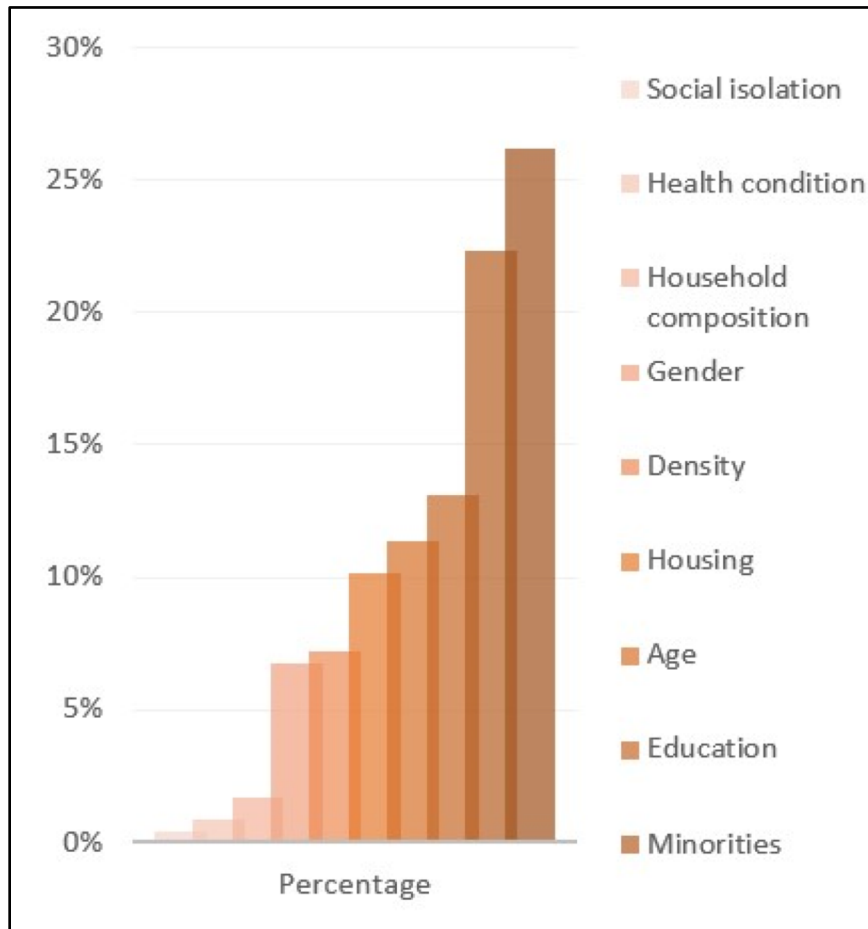


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Benefits for whom?



Environmental justice: Socio-cultural indicators in the literature



Variable	Example of variable	Example of data retrieved
Ethnic minorities	African American alone	% black/African American
	Immigrants alone	% immigrants
	Hispanic alone	% Hispanic
	Latino	% Latin identity
	General	% population not identified as white (non-white residents)
Economic status	Religion	% religious minorities
	Income	Median household income
		% below poverty line
		Mean per capita income
		% food insecure population
Education	Services	Household disposable income (after taxes, transfers, and social contributions)
	Unemployment	Household without car, computer, internet
	Degree achievement	% population without a job employment rate
		% without high school degree
		Residents with only primary education or no studies
Age	Illiteracy	% illiteracy
	Children	Population below 6 years old
Gender	Elderly	Population above 60 years old
	Female	% women
Household	Gender identity	% female working population
	Parenthood	% population identified with a different gender (non-binary or transgender)
	Marriage	% single-parent households
Social isolation	Ownership	% marriage
	Social barriers	% renters
	Linguistic barriers	% population living alone
Density	Population density	% population with limited of local language proficiency
		Inhabitants/ha
Health		Persons/km ²
	Healthcare	% population with healthcare access
	Structure	Housing type (commodity, welfare, affordable)
	Age	Building age
	Dimension	Housing dimension/size (m)
Housing	Prize	Housing price/average housing price (\$)

Environmental risk



Urban green space benefits



Social disadvantages



Exposure

Proximity

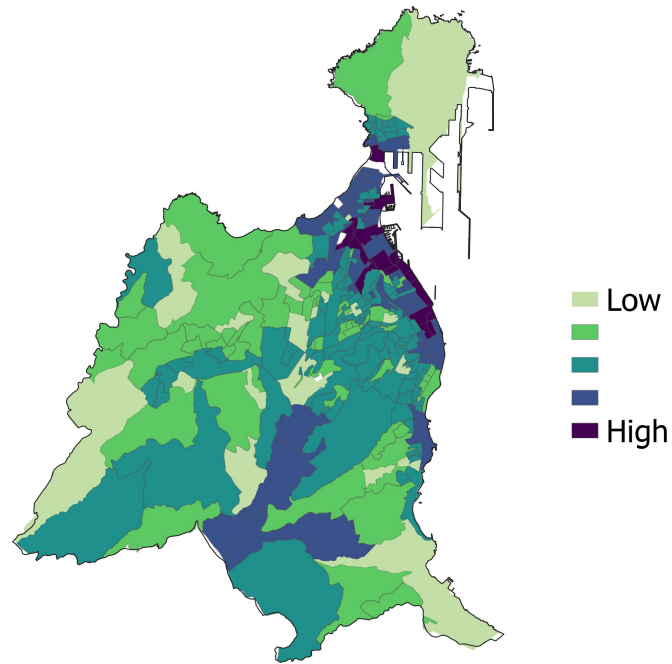
Mitigation
/regulation

Aesthetic and
recreational

Economic capacity

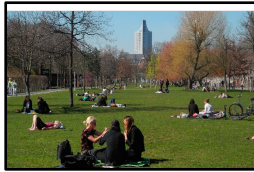
Age

Social
isolation

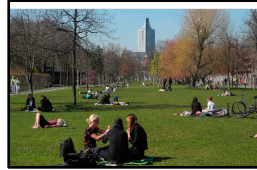


Las Palmas de Gran Canaria

A proposal for an Environmental
Justice Index to prioritize NbS
implementation



Intra-generational equity



Intra-generational equity

Inter-generational equity

time





Intra-generational equity



Inter-generational equity

time



Thank you!



<https://planes.dicam.unitn.it>

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