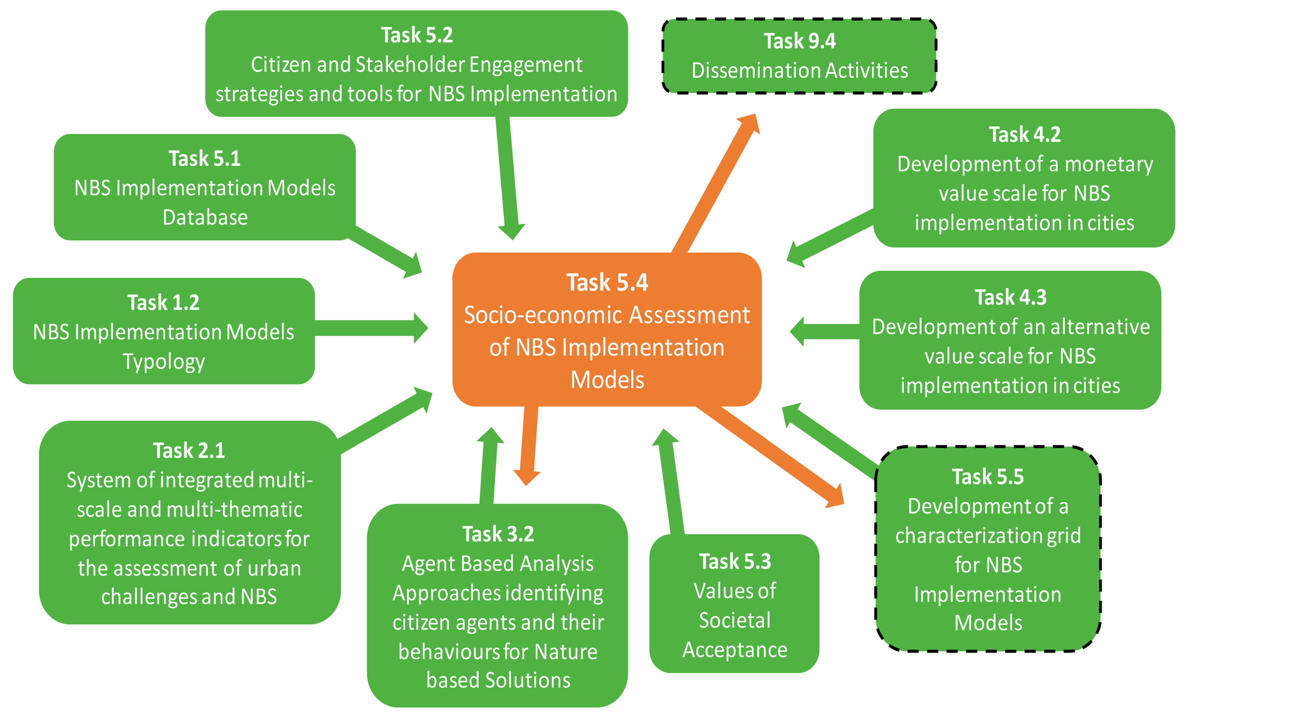
NATURE 4 CITIES

A knowledge diffusion and decision platform for renaturing cities

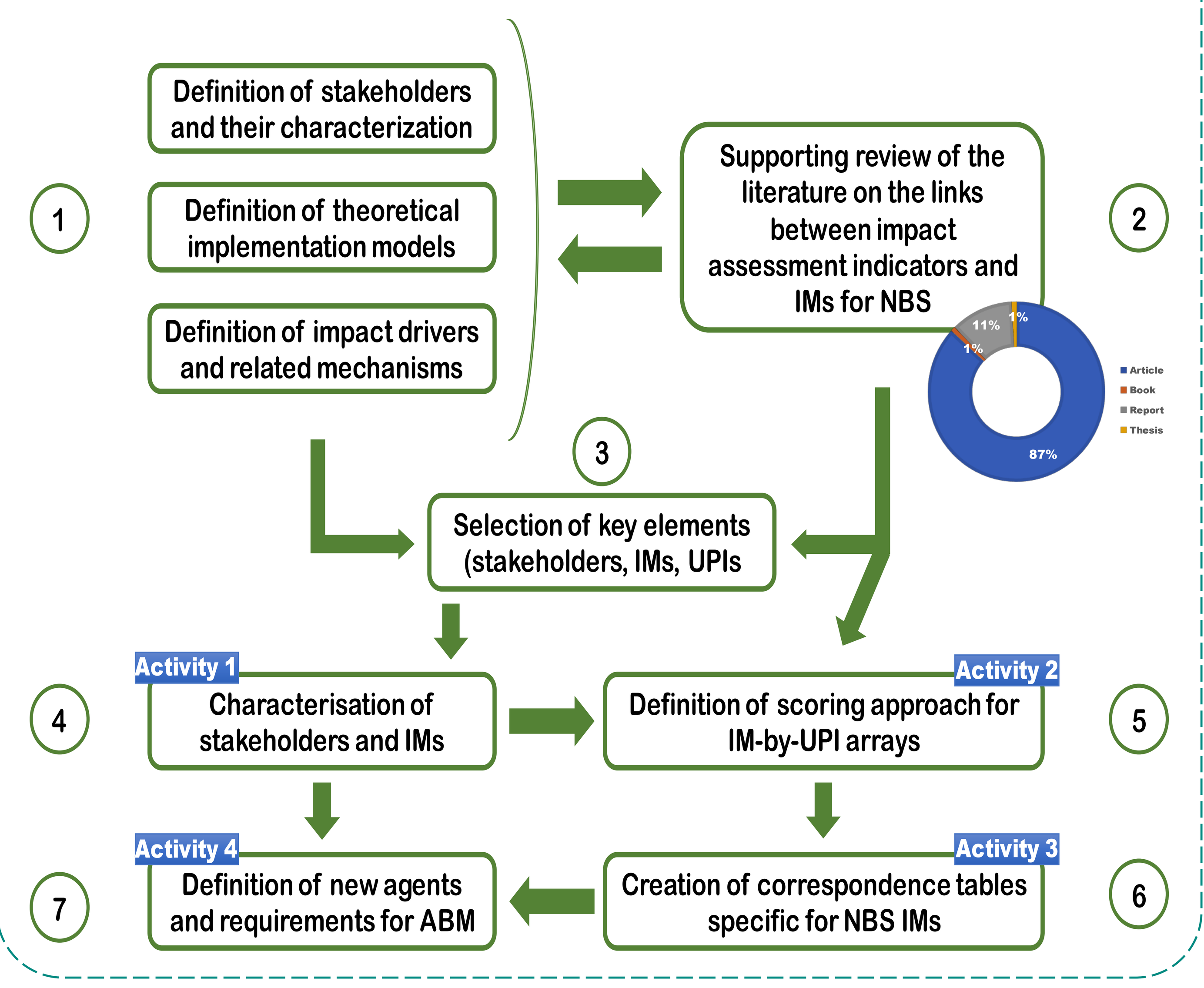
Socio-economic Assessment of NBS Implementation Models



Objectives

1. to characterize the **socio-economic impact of NBS projects** taking into account the choice of **specific Implementation Models (IMs)**
2. to prospect an adjustment to the **types and definition of stakeholders** included in previously developed **agent-based models (ABMs)** of Task 3.2

Seven methodological steps



Activity 1

READ ME: Stakeholders characterization (number of times specific stakeholder typologies have been observed)

STAKEHOLDER GROUP	STAKEHOLDER TYPOLOGY	TYPE OF COMPANY	KNOWLEDGE LEVEL: Technical	Social	Economic	Environmental	PHASE: Design	Plan	Implementation	Validation	ROLE: Decision making	Regulation	Definition	Financing	Management	Consultation	Development	Installation	Assessment	Maintenance
GOVERNMENT	Regional / national government	-	3	0	1	2	0	1	0	2	3	2	2	3	0	2	1	0	0	0
	Local government/municipality	-	7	6	6	8	5	7	6	5	8	7	6	5	5	5	6	5	8	8
	Semi-government organizations / institutions	-	2	2	1	2	1	2	2	0	0	0	1	1	2	3	0	2	1	2
	Other	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MARKET	Private sector	Architect/urban planner/landscape planner	7	3	2	7	6	5	3	1	2	1	1	0	0	6	3	2	1	2
		Consultants/engineerings	6	2	3	2	7	3	4	1	1	0	1	0	1	4	2	2	1	2
		NBS manufacturer	3	1	1	2	2	2	1	0	0	0	1	0	0	1	1	0	0	1
		Constructor	4	1	1	1	1	1	6	0	0	0	0	0	1	2	3	4	0	2
		Gardening	4	1	3	3	3	3	2	0	0	0	0	0	2	2	3	0	0	4
		Other: promoters of urbanization area	1	1	1	1	1	1	1	0	0	0	1	2	1	1	1	0	0	1
	Social enterprises /social enterpreneurs	-	0	1	1	0	1	0	1	0	0	0	0	1	1	0	0	1	0	1
	Other	-	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0
CIVIL SOCIETY	NGO's/ CSO's/ interest groups	-	0	3	1	0	2	1	1	0	0	0	0	1	1	2	0	1	0	2
	CBO's / neighborhood communities	-	0	3	1	1	2	1	2	0	0	0	0	1	1	2	0	1	0	2
	Citizens	-	0	4	1	1	4	3	2	0	2	0	0	1	3	2	2	2	0	3
	Research institutions	Research centers	0	2	1	1	2	1	1	0	0	0	0	1	1	2	0	1	0	1
		Universities	0	4	1	1	3	2	1	0	0	0	0	1	1	2	0	1	0	1
	Other	Social experts	0	1	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0

STAKEHOLDER TYPOLOGY	TYPE OF COMPANY	PARTICIPATORY MODEL: Community based	Government participation	Co-creation	Citizen participation	Government	NBS TYPES – Objects – On the ground: Parks and gardens	Structures associated to urban networks	Food and resource production	Choice of plants	Works on soil	Ecological restoration	Erosion control	Water: Water bodies & hydrographic network	Wetlands & built structures for water	On building: Green roofs	Green walls & facades	Actions & strategies – Green: Human interventions	Use of fauna	*Waste management*	*Protection strategies*	*Urban planning strategies*
Regional / national government	-	0	1	0	0	2	1	0	0	0	1	1	1	2	1	0	0	0	1	1	3	2
Local government/municipality	-	0	5	1	2	3	6	3	4	2	3	2	2	3	1	1	2	4	2	4	4	6
Semi-government organizations / institutions	-	1	1	1	1	0	2	1	1	1	1	1	1	1	0	2	2	1	1	1	0	2
Other	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Private sector	Architect/urban planner/landscape planner	0	1	3	1	1	5	3	3	4	4	2	2	3	2	2	2	2	3	2	2	4
	Consultants/engineerings	0	1	3	2	1	4	3	2	2	2	2	2	3	2	2	3	2	2	2	2	3
	NBS manufacturer	0	0	0	0	0	3	3	1	2	1	1	1	2	2	3	4	2	1	1	1	1
	Constructor	1	1	3	2	1	2	3	0	0	1	0	0	1	1	1	1	0	0	0	0	1
	Gardening	0	0	2	1	0	4	3	1	2	2	2	2	2	1	3	4	1	1	0	1	3
	Other: promoters of urbanization area	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Social enterprises /social enterpreneurs	-	1	0	1	1	0	1	0	1	0	0	1	1	1	0	0	0	1	0	1	1	0
Other	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGO's/ CSO's/ interest groups	-	1	0	1	2	0	1	0	1	0	0	1	1	1	0	0	0	1	0	1	1	1
CBO's / neighborhood communities	-	1	0	1	3	0	2	0	1	0	0	1	1	2	0	0	0	1	0	1	1	1
Citizens	-	3	0	1	3	1	3	1	2	1	1	2	2	3	0	1	1	4	1	2	2	2
Research institutions	Research centers	1	0	1	2	0	1	0	1	1	1	1	1	1	0	0	0	1	0	1	1	1
	Universities	1	0	1	3	0	2	2	1	1	1	2	2	2	0	1	1	1	1	1	1	2
Other	Social experts	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1

Activity 2

IMs	IM clusters	TRADITIONAL: SZ	CAN	MIL	AH	TOTAL	INNOVATIVE: ACC1*	ACC2*	G4C1**	G4C2*	R2M1	R2M2	R2M3	R2M4	R2M5	R2M6	R2M7	R2M8	R2M9	R2M10*	TOTAL
GMs	Traditional public administration	X	X	X	X	4	X	X		X											0
	New public management					0						X			X	X		X			4
	Private-private partnership					0											X				1
	Societal resilience					0					X			X							2
	Network governance					0			X				X						X	X	3
FMs	Public financing	X			X	2	X					X	X	X					X		4
	Financial institutions					0									X						1
	Citizen inclusion					0											X				1
	Public-private		X	X		2		X	X	X	X					X		X			4
BMs	Technological		X	X		2		X	X	X			X	X			X	X	X	X	6
	Social	X	X	X	X	4	X	X	X	X		X	X				X	X	X	X	6
	Organizational			X	X	2					X	X			X	X	X	X	X	X	7

* IMs not considered for the analysis.
** G4C1 = R2M10

READ ME: Impact scores (Likert-type scale based on expert value-judgement) ranging from 1 to 3, being *1 = high impact* associated with the IM on the analyzed sphere of interest – i.e. economic, social, institutional, cultural and environmental – using the UPIs as proxies for the five spheres; *2 = moderate impact*; and *3 = no impact*.

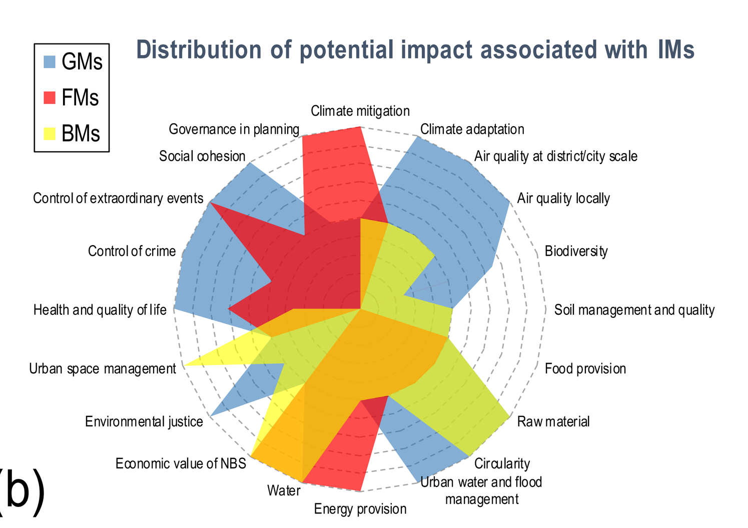
Typology of IM	"Traditional" models	"Innovative" models
GOVERNANCE MODELS		
Traditional public administration	Government has the leading role in the process while the community is considered the end user or client. Low-moderate participation levels. (All the partner cities have identified this GM as their reference model)	Not considered an innovative GM.
New public management	Not found. None of the cases analysed apply this IM.	Governments establishing a partnership with market actors that bring their own expertise and try to get benefit from the utilization of environmental resources thanks to their economic competitiveness. (R2M5, R2M8)
Private-private partnership	Not found. None of the cases analysed apply this IM.	Not found. None of the cases analysed apply this IM.
Societal resilience	Not found. None of the cases analysed apply this IM.	Communities that have been organized to plan and manage projects by their own, without almost no intermediaries and with strong participatory processes from the local community of citizens and associations. (R2M1and R2M4)
Network governance	Not found. None of the cases analysed apply this IM.	Collaborative development of projects among different public bodies, where citizens, NGOs and other stakeholders can influence decision-making. (R2M3 and R2M9)
FINANCIAL MODELS		
Public financing	Municipal budget and other different public funding sources like taxation, fees, grants, etc. (AH, SZEG).	Same as traditional models.
Financial institutions	Not found. None of the cases analysed apply this IM.	Municipal Green bonds. (R2M5)
Citizen inclusion	Not found. None of the cases analysed apply this IM.	Cooperatives. (R2M7)
Public-private	A combination of public and private sources. (CAN, CMM)	Same as traditional models
BUSINESS MODELS		
Technological	Focused on technological improvements that allow minimising environmental impacts (waste reduction, use of fewer resources, ...). (CAN, CMM)	Same as traditional models.
Social	Actions that positively affect citizens' way of life or consumption patterns. (All the partner cities)	Same as traditional models.
Organizational	Oriented in delivering social and environmental benefits. (CMM, AH)	Same as traditional models.

Activity 3

(a)

Impact-by-IMs	GMs	FMs	BMs
Env_Im	◕	◑	◑
Eco_Im	◕	●	●
Cul_Im	●	○	◑
Soc_Im	●	◕	◑
Ins_Im	◕	◕	○

READ ME: Qualitative analysis of the relationships between impact drivers and IMs: (a) relevance of the five spheres of impact (environmental: Env_Im, social: Soc_Im, institutional: Ins_Im, cultural: Env_Im, and economic: Env_Im) for the three types of IMs (GMs: governance models; FMs: financial models; BMs: business models), quantified with a scale that goes from empty circles ("no detected relationship") to full circles("highest relevance of the impact sphere for the IM"); (b) distribution of the relevance across impact spheres translated in the form of urban performance indicators (UPIs), according to the same qualitative scale; (c) same approach of (b) with data populated in a table, for a more detailed overview



(b)

(c)

Correspondence table for 20 clusterised UPIs				
Aggregated indicators	**Impact sphere**	**GMs**	**FMs**	**BMs**
Climate mitigation	Environmental	◑	●	◑
Climate adaptation	Environmental	●	◑	◑
Air quality at district/city scale	Environmental	●	○	◑
Air quality locally	Environmental	●	○	◑
Biodiversity	Environmental	◕	◑	◔
Soil management and quality	Environmental	◑	○	◑
Food provision	Environmental	◑	◑	◑
Raw material	Environmental	●	◑	●
Circularity	Environmental	●	◑	●
Urban water and flood management	Economic	●	◑	◑
Energy provision	Economic	◑	●	◑
Water	Economic	●	●	●
Economic value of NBS	Economic	◑	●	●
Environmental justice	Cultural	●	○	◑
Urban space management	Social	◑	◑	●
Health and quality of life	Social	●	◕	◔
Control of crime	Social	●	◑	○
Control of extraordinary events	Social	●	●	○
Social cohesion	Institutional	●	◑	○
Governance in planning	Institutional	◑	●	○

Activity 4

ABMs	Applicable Governance Implementation Models	Applicable Financial Models	Applicable Business Models
Heat_ABM	Traditional Public Administration, Network governance, **new public management**	Public financing, financial institutions, **public-private**	Technological, **organizational**
Socio_ABM	Traditional Public administration, **network governance**	**Public financing**, public-private	**Social**, organizational
Water_ABM	**Societal resilience**, Network governance.	Public financing, **citizen inclusion**	**Social**, Organizational
Mechanisms	**Potentially relevant indicators for emergence of NBS under IMs (selected from Table 10)**	**Relevant rules and agents (mechanisms) requiring enhancement in the ABM for IM implementation**	**Alignment with Task 5.4's stakeholders and impact scores**
Heat_ABM	1.2.1 AT - Air Temperature 1.2.5 PET - Physiological equivalent temperature 6.1.9 BEN Building Energy Needs 7.3.2 HIM – Heat induced mortality 11.3.2 HPI Housing Pricing Index	- Changes in building regulations that incentivise the implementation of green roofs/green walls. - Economy of scale effects on costs of green roof/green wall implementation. - Linkages between building comfort (PET), building energy cost (BEN), and house pricing (HPI) affecting desirability in green roof/green wall investment.	New Agents for New public Management including private green/roof and green wall suppliers with capacity and costings models for supply, public agent that sets building regulations driving incentives, and public/private owners of buildings that drive green roof/green wall investments.
Socio_ABM	4.1.1 Urban Green Space Proportion 4.1.2 SDIH Shannon diversity index of habitats 7.2.1 QOL Quality of Life 8.2.1 Social Capital	- Design options of existing and new parks through different NBS implementation options. - Impacts of the NBS implementation options on the relevant indicators providing variable park benefits and trade-offs. - Enhanced impacts in relation between economic effects of parks that are attractive and Quality of Life of nearby residents.	New agents for Network Governance including community/public organisations that manage parks and have the capability to introduce new NBS in the park space and open these to the public, with feedback loops on design choices on park perceptions of benefits on design choices.
Water_ABM	2.1.3 PFvar – Peak flow variation 2.2.2 TRFvol – Total rainfall volume 3.1.1 CAQI – Common Air Quality Index 3.2.1 EAQLVlocal – Exceedance of air quality limit value 6.1.11 WS – Water Scarcity 7.2.1 QOL Quality of Life 7.3.3 AQEshort – Air Quality short term health effects 7.3.4 AEQlong Air Quality long term health effects 11.3.2 HPI Housing Pricing Index	- Evaluation of changes in Quality of Life and perceptions thereof associated with particular private garden changes. - Impacts on air quality of different NBS gardens versus tiled gardens and perceived benefits thereof (or lack of benefits). - Impacts of peak flow variation and flooding on the housing price index and related feedback on private garden arrangement (or lack thereof) given perceived solution of garden change on flooding.	New agents for Societal Resilience including a community network bonding agent (representing a fluid community or neighbourhood organisation) that results in a looser or tighter network of citizens with variable influence of people's values around gardening within the network.

Key-messages

1. Novel methodological approach for **qualitative diagnostic analysis** of potential **impact of NBS** IMs aiming to provide benefits for the society
2. Several **improvements still needed** to translate this approach into a decision support tool
3. Three clusters of **innovative governance models** associated with "new public management", "societal resilience" and "network governance" highly **related to multiple impact indicators** across five impact spheres

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> 6 leading Research and Technology Organizations

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Green4Cities (AT), Terranis (FR), Colouree (IT), Duneworks (NL), Argedor (TR), Ekodenge (TR), Innova Integra (UK), R2M Solution (IT), Grün statt Grau (AT)

> 2 clusters of stakeholders

Plante & Cité (FR), Hungarian Urban Knowledge Center (HU)

> 4 pilot cities

Alcala de Henares (ES), Città Metropolitana Di Milano (IT), Szeged (HU), Çankaya (TR)

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