D 2.3.

Matchmaking for Tailored NBS Implementation in Cities

9 September 2023

Responsible partner: BURST (Péter Szuppinger – Petra Horogh – Viktória Jónás – Balázs Kozák)

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ACRONYMS AND ABBREVIATIONS TABLE

Acronym / Abbreviation	Meaning
E-Institute	E-ZAVOD, ZAVOD ZA PROJEKTNO SVETOVANJE, RAZISKOVANJE IN RAZVOJ CELOVITIH RESITEV
UNIPASSAU	UNIVERSITAT PASSAU
LEITAT	ACONDICIONAMIENTO TARRASENSE ASSOCIACION
PATRAS	DIMOS PATREON
PRATO	COMUNE DI PRATO
Belfast Council	Belfast City Council
BURST	BURST NONPROFIT KFT
ICLEI	ICLEI EUROPASEKRETARIAT GMBH
BOKU	UNIVERSITAET FUER BODENKULTUR WIEN
BP18	BUDAPEST FOVAROS XVIII. KERULET PESTSZENTLORINC-PESTSZENTIMRE ONKORMANYZATA
BREDA	GEMEENTE BREDA
QUB	THE QUEEN'S UNIVERSITY OF BELFAST
IETU	INSTYTUT EKOLOGII TERENOW UPRZEMYSLOWIONYCH
Katowice City	KATOWICE - MIASTO NA PRAWACH POWIATU
NBS	Nature Based Solution
EU	European Union
KPI	Key performance indicator

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1 TASK GOAL

The main goal of Task 2.3 (Matchmaking for Tailored NBS Implementation in Cities) was to develop a theoretical fit-for-problem matrix. It was verified through demo cities' assessments combined with the developed NBS registry and the list of KPIs. Later, the matrix will be used for standardisation activities (Task 2.5) and exploitation (WP7 and WP8).

Figure 1 shows the connections among the different planned activities of WP2.

The matchmaking matrix (Task 2.3) is at the centre of the activities. It integrates the inputs from other tasks, namely the NBS registry, plant species selection, and the KPIs list. After the matrix is finished, it will serve as an input to Task 2.5, which will work on the standardization. The finalized matchmaking matrix will feed into exploitation and dissemination activities under WP7 and WP8.

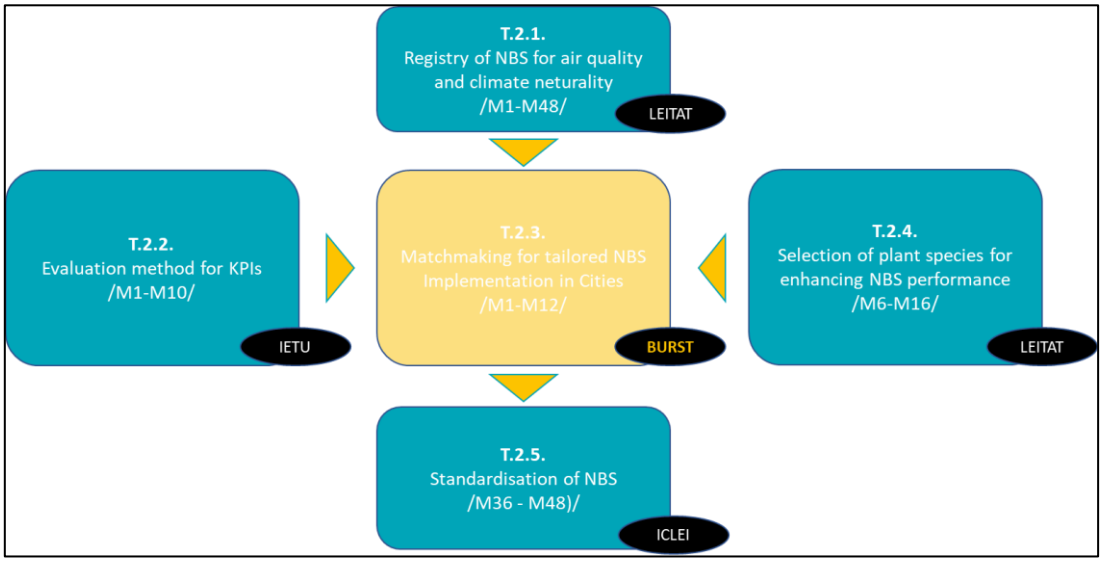

Figure 1 Flowchart of activities under WP2

2 PROCESS

As Task leader, BURST developed a process and timeline for implementing the task that was agreed with WP leadership and project coordination.

Figure 2 shows the steps of the development process. The basis for the assessment was the questionnaire developed following the topics/areas set in the proposal (see details on the topics/areas under chapter 3). The seven participating cities answered the questions, which provided the essential knowledge for WP2 experts to assess the environmental and socio-economic status of the cities from an NBS point of view. In parallel, WP experts identified the main potential challenges connected to certain topics. Altogether, 78 challenges were described in the matrix's 'List of challenges' part. After that, BURST developed the structure of the matchmaking matrix and finalised the matrix after two online and several e-mail consultations with the WP2 task leaders. The structure was presented to the donor as a milestone (MS3 in April 2022).

As a next step, the environmental and socio-economic status of the cities were assessed, and the matchmaking matrix was populated based on the assessment. The results were discussed through bilateral online meetings with each city, and the matrix was finalised using the outcomes of these meetings.

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Task 2.4 developed the species list for enhancing NBS performance, and the finalized list was added to the matchmaking matrix at the end of April 2023.

While developing the matrix, during the discussions, the option of developing the matrix into a html-based online tool was raised. Finally, it was decided that the first version would remain an Excel-based tool, with the possibility of later development into an online tool during the project, such as in WP4.

As for the utilization of the results of the activity, it will serve as an input to Task 2.5 on standardization and will be an important element of the exploitation and dissemination activities of the project. The matrix was developed so that any other cities can use it for a self-assessment (through the questions) to find potential challenges and consider the suggested matching NBSs for implementation (theoretical fit-for-problem matrix).

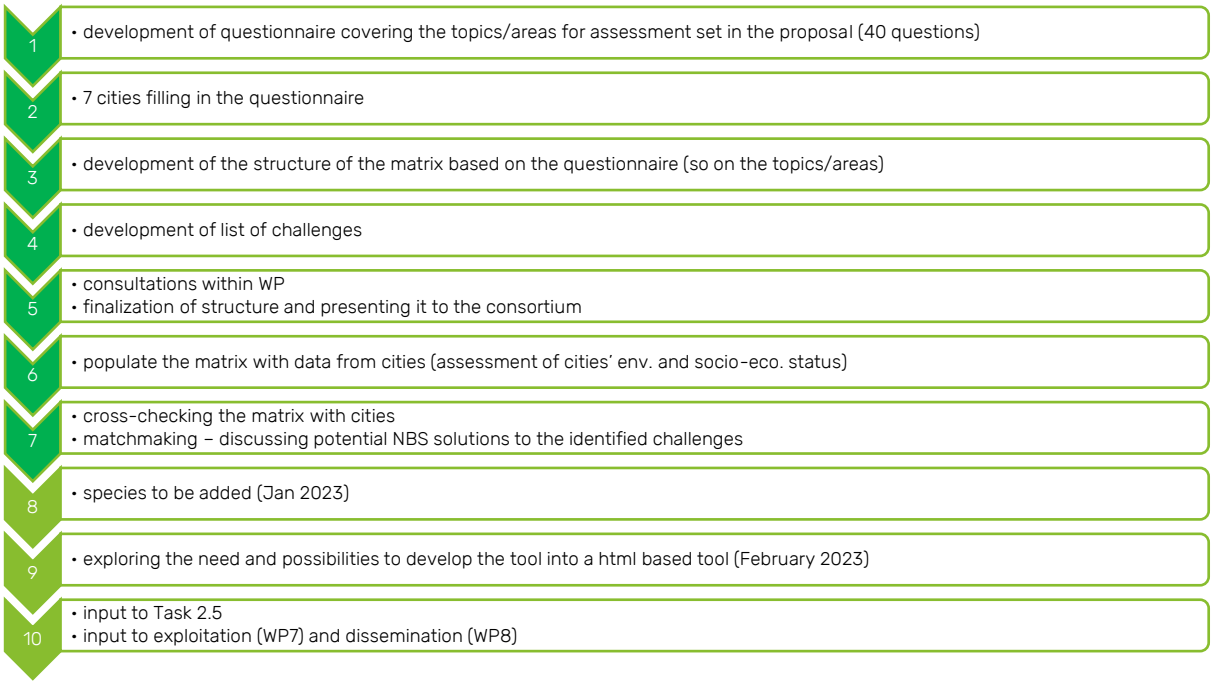

Figure 2 Planned steps of developing the matchmaking matrix

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3 THE MATCHMAKING MATRIX

The goal of the matchmaking matrix is to identify the challenges of the cities in the area of sustainability, including environmental and socio-economic issues. This is made by 43 self-assessment questions and with the help of a pre-defined list of 78 potential challenges. Based on the NBS registry, the matrix suggests nature-based solutions (maximum 15) and one to six KPIs for each challenge. A further element is the suggestion of species that connects to certain NBSs. Figure 3 shows the logic behind the matrix.

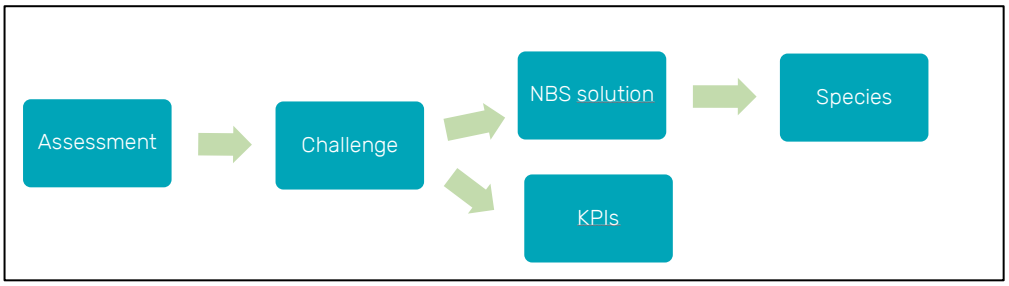

Figure 3 Structure of the matchmaking matrix

The self-assessments questions were made around the 10 areas that were derived from the 17 environmental and socio-economic topics defined in the proposal. This way, all pillars of sustainability are covered. Socio-economic questions were developed and agreed upon with University Passau experts (WP8). Challenges connecting to the questions are pre-defined in the matrix, making it easier for the cities to identify the relevant issues and problems. (See Figure 4)

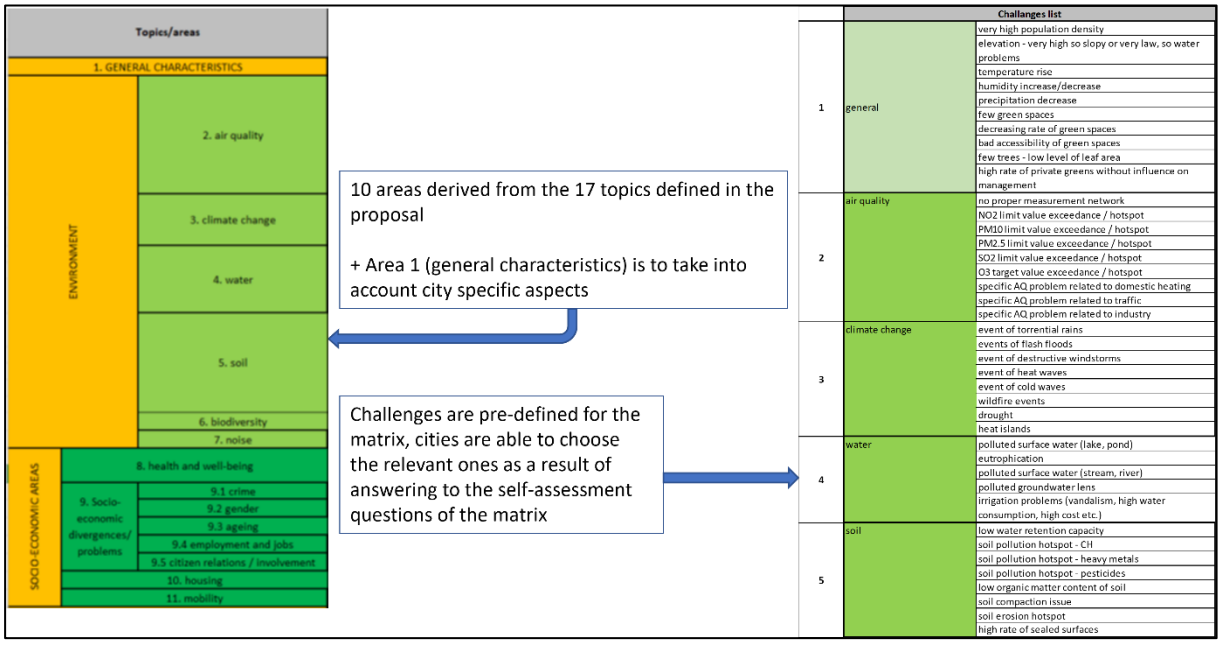

Figure 4 Identification of topics/areas and connecting challenges in the matrix

As cities are quite different in their natural and socio-economic environment, to find the most optimal NBS to a certain challenge in a certain city, specifics (climate, orography, urban structure, economic situation, etc.) should also be considered. As the matchmaking matrix is developed so that any other city can use it in the future, it was essential to consider these specifics somehow. On the one hand,

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an extra topic with assessment questions was added under the name 'general characteristics '. Furthermore, the NBS registry includes the pros and cons for certain NBSs. Thus, it gives planners and decision makers an idea of which suggested NBS are fitting or unfitting for their city. Species will also help to make the NBS tailor-made, e.g., suggesting drought tolerant species for dry and warm climate, etc.

4 SELECTION OF NATURE BASED SOLUTIONS

For making the matchmaking matrix, the experts working on the tasks matched the NBSs from the registry (prepared under Task 2.1) with the 78 challenges identified. Later, the selection was discussed and agreed upon within the WP and cross-checked with the cities and the consortium as part of the whole matrix.

An important comment on the selection is that as green spaces have quite complex effects, this selection cannot be a clear correspondence, these are just suggestions that aim to present the most suitable NBSs to a certain challenge. Of course, in most cases, to a certain extent, almost all nature-based solutions can positively impact the urban environment. Table 1 includes some explanations of the selections made.

Table 1 Explanations of matchmaking

Topics/ areas	No	Identified challenges	Explanation of the matching NBSs
GENERAL CHARACTERISTICS	1	very high population density	In areas with high population density, it is crucial to create the essential amount of green surfaces to improve the quality of life and provide people with the positive experience of being in nature. In these cases, microgreens, green roofs, green walls and facades, small community gardens, and rooftop gardens can be ideal nature-based solutions.
	2	elevation	Depending on whether the city is at a high or low altitude, problems originate from these conditions. The topography can lead to soil erosion, flash flooding, etc., on one hand, and water infiltration/retention problems on the other hand. Accordingly, special NBSs should be applied, like vegetation preventing soil erosion, sustainable drainage systems (SuDS), bioswales, etc.
	3	temperature rise	Changing climatic conditions are increasingly creating problems to which urban areas must adapt. Nature-based solutions are helpful tools in adaptation processes, they lower the effects and improve quality of life. Green areas generally moderate temperature, retain water and regulate humidity. Solutions like smart
	4	humidity decrease	
	5	humidity increase	

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		6	precipitation decrease	roofs, smart soils, climate adaptive gardens, etc., increase these positive effects.
		7	few green spaces	Volume, state, and accessibility of green spaces can be well influenced by NBSs even in areas where green space development runs into difficulties like lack of space (possible solution: green walls, green roofs, floating gardens, micro greens, etc.), accessibility (possible solution: green corridors) etc.
		8	decreasing rate of green spaces	
		9	bad accessibility of green spaces	
		10	green space management challenges	Generally, for cities, the main challenge related to green spaces is proper maintenance, which requires human and financial resources. In these cases, NBSs that require minimal maintenance effort (e.g., extensive green roofs, verges, fences, hedges) or those where citizens can be involved (urban farming, community gardens etc.) should be applied.
		11	few trees - low level of leaf area	By default, high-volume green space developments involving trees can be a solution to this challenge. However, when a lack of space or resources can hinder this kind of developments, smart NBSs help, like green corridors, trees renaturing parking, shading trees, etc.
		12	high rate of private greens without influence on management	In this case, the cities should work with campaigns and support to reach the citizens and their 'gardens'. Besides that, with green space development and maintenance, it is important to apply innovative solutions that, on the one hand, 'take citizens out' from their own garden to public green spaces as well (e.g., sensory gardens, and on the other hand show good examples on responsible, climate-adaptive green space management (e.g. climate adaptive gardens, bioswales, climate smart greenhouses, support to pollinators etc.).
ENVIRONMENT	air quality	13	no proper measurement network	If no measurement points are established at a certain area, complementary methods, such as bioindicators (e.g., moss) or alternative sensing (e.g., bee sensing), should be used to identify air quality problems.
		14	NO2 limit value exceedance / hotspot	In general, all new green areas contribute to decreasing air pollution levels; optimal solutions can be selected if the most relevant sources of pollution can be identified. For example, hedges, fences, and tree lines are very useful in traffic-related pollution and for certain industry pollutions; green facades and living walls are suggested to be helpful in PM pollution cases, etc.
		15	PM limit value exceedance / hotspot	
		16	SO2 limit value exceedance / hotspot	
		17	O3 target value exceedance / hotspot	
		18	specific AQ problem related to domestic heating	

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		19	specific AQ problem related to traffic	
		20	specific AQ problem related to the industry	
	climate change	21	event of torrential rains	Green surfaces, in general, are increasing a certain area's infiltration and water retention capacities. Still, some specific nature-based solutions should be applied in the case of torrential rains and the flash floods caused by those, e.g., climate adaptive gardens, different types of green roofs, and nature-based drainage systems.
		22	events of flash floods	
		23	event of destructive windstorms	Climate adaptive gardens, using the appropriate species, help to decrease the effects.
		24	event of heat waves	Mostly, all green areas have a temperature moderation effect; thus, they help to ensure a better comfort level in cities. Green facades and green roofs could also be useful because of their insulation potential.
		25	event of cold waves	
		26	wildfire events	Climate adaptive green areas, with the proper species selection, are useful to cope with this challenge.
		27	drought	Besides choosing the right species for the green areas, special water retention solutions are suggested to be used in such cases, e.g., bioswales, small lakes, trenches, etc.
		28	heat islands	As mostly all green areas have temperature moderation effects, all these are useful against heat island effects. Still, green walls, roofs, and NBSs involving trees and water surfaces (trenches, swales) are especially useful.
	water	29	polluted surface water (lake, pond)	Nature-based solutions for mitigating water related challenges, like bioswales, trenches, smart soils, wetlands and wet roofs, Sustainable Drainage System (SuDS) are helping to keep surface waters and groundwater cleaner and healthier.
		30	eutrophication	
		31	polluted surface water (stream, river)	
		32	polluted groundwater lens	
		33	irrigation problems (vandalism, high water consumption, high cost etc.)	
	soil	34	low water retention capacity	In general, mostly all green surfaces increase water retention capacity. Still, in dense city environments, the different types of green roofs should be highlighted as important solutions.
		35	soil pollution hotspot - HC	For soil pollution issues, NBSs can only be generally suggested. However, certain species

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		36	soil pollution hotspot - heavy metals	could be applied in light of certain types of pollution.
		37	soil pollution hotspot - pesticides	
		38	low organic matter content of the soil	NBSs that include agricultural activities are especially useful in these cases, e.g., urban farming, community gardens, and climate smart greenhouses.
		39	soil compaction issue	
		40	soil erosion hotspot	
		41	high rate of sealed surfaces	By default, all new green areas help to solve this issue. Still, several smart solutions are specifically useful in such cases, like green roofs, floating gardens, green covers on bus stops, etc.
	biodiversity	42	invasive species - flora	Besides solutions supporting pollinators, NBSs that can help in decreasing biodiversity related problems are mostly the ones with higher volumes (urban forests, arboretums, wildlife parks, etc.) or special applications with certain species that are tailor-made to certain challenges.
		43	invasive species - fauna	
		44	high/low population of a certain species that creates the problem	
		45	problems with plants planted earlier	
		46	challenges related to the management of protected areas	
		47	degradation of special habitats	
	noise	48	noise pollution hotspot	Green facades and other types of green barriers are known as effective solutions.
SOCIO-ECONOMIC AREAS	health and well-being	49	high morbidity due to air quality problems	NBS solutions that help solve air quality related problems (see above) contribute to mitigating such challenges.
		50	pre-mature death due to air quality problems	
		51	disease connected to a specific animal/plant/nature site	This challenge can be coped with through a variety of NBSs. The key in these cases is the selection of appropriate species.
		52	lack of resources for green space maintenance	This is generally the main challenge related to green spaces for cities, as maintenance requires human and financial resources and funds and support generally do not cover these costs. In these cases, NBSs that require minimal maintenance effort (e.g., extensive

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				green roofs, verges, fences, hedge) or those where citizens can be involved (urban farming, community gardens etc.) should be applied.
		53	pollen problems	This challenge can be coped with through a variety of NBSs. The key in these cases is the selection of appropriate species.
		54	low rate of blue-green space compared to built areas	By default, all NBS provides the solution to this challenge. However, to switch the ratio, high volume ones should be preferred, like urban arboretums, parks, forests, big extensive green roofs, longer bioswales, etc.
	inequalities	55	segregation of any kind	Segregation can be well tackled by community development. NBSs, like urban farming, community gardens, etc., are useful elements of such strategies.
		56	run-down neighbourhood	Well-developed and maintained green areas are increasing the quality of life in cities. Green space developments must be part of urban revitalizations. Depending on the area, this can include small green surfaces or green corridors for derelict areas, but also high-volume green surface developments like parks. For developing the community in the area, community gardens are a useful tool.
	crime	57	low level of perceived security in the city / certain areas	Well-developed and maintained green areas are also tools for solving crime-related issues. Properly designed green areas (not too dense vegetation, proper lighting, possibly security cameras, etc.) create green spaces that attract people and help build a strong community. Special elements, like green corridors on derelict infrastructure, create connections to other city areas and can help reconnect the area to the urban structure.
		58	crime hotspot areas	
	gender	59	gender issue	Some specific green space developments contribute to community development and could positively affect social challenges, e.g., sensory gardens and community gardens.
	ageing	60	area with an old population	
		61	area with a young population	
	employment and jobs	62	area with high unemployment rate	NBS developments contribute to lowering the unemployment rate if certain solutions come together with employment programs. Development of intensive types of green surfaces (e.g., intensive green roofs) or the ones that later can provide workplaces (e.g. urban farming) can positively affect the area.
		63	area with a high number of inbound commuters / parking lots	In areas with high levels of inbound commuters, it is important to develop green surfaces that compensate for the loss of green areas because of infrastructure needs (roads, parking places, etc.). NBSs provide solutions

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				that make complementary development possible, e.g., shading trees in parking areas, green-shaded shelters and structures, innovative water retention solutions, etc.
		64	area with a high number of outbound commuters / sleeping city issues	In the so-called sleeping cities, creating green spaces that attract citizens to spend at least part of their free time in the greens is important. Sensory gardens, small parks, and urban arboretums are helpful elements for this. In these areas, community development is also crucial, rooftop farming and community gardens can trigger that.
	citizen relations / involvement	65	citizens' perception of insufficient green space areas	Citizens' perceptions of environmental issues (green spaces, air quality, climate change effect, etc.) are mostly based on their own experience of what they see and feel in their urban environment. Unfortunately, large and important investments sometimes do not have highly visible effects (e.g., sewage system to improve groundwater quality, eliminating soil pollution, etc.). On the other hand, relatively small investments (e.g. sensory gardens, green bus stops, green corridors, floating gardens, moss walls, bioswales, etc.) can create high visibility if they are well selected and well communicated.
		66	citizens' perception of bad green space maintenance	
		67	citizens' perception of bad air quality	
		68	citizens' perception of negative climate change effects	
		69	lack of willingness from the citizens to participate in green space management	To increase the willingness of citizens to participate in green space management, NBSs that promote and trigger involvement could be preferred, like urban farming, urban rooftop farming, community gardens, sensory gardens, etc. On the other hand, it is crucial to involve citizens in all green space-related development issues.
		70	lack of participatory processes	
	housing	71	high rate of block of flats	In areas with a high rate of blocks of flats, NBSs like green walls and green roofs, combined with urban farming and gardens, are useful tools to increase the rate and usage of green spaces.
		72	high rate of houses with own gardens	In areas with a high rate of houses with their own gardens, small special green areas like sensory gardens can be applied. Besides that, different NBSs supporting pollinators can have a positive effect on private gardens as well.
		73	high fluctuation of inhabitants in the area	NBSs cannot solve high fluctuation itself, but if the reason behind this is connected to lower quality of life, developments using NBSs help to improve the situation.
	mobility	74	low level of walking	The modal split gives a good picture of how sustainable the mobility of a certain area/urban environment is. Several NBSs can contribute to creating a better, more attractive environment to prefer more sustainable ways of mobility. Nicely developed, safe green spaces make more people walk, green
		75	low level of cycling	
		76	low share of public transport	
		77	large parking areas	

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		78	high level of car usage/ car numbers	corridors make green connections among different parts of the city by walking or bicycle, green bus shelters, small green areas around the stations and stops can promote public transport, etc. If parking areas still need to be developed, this should be done in more environment friendly ways with the application of proper NBSs.

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5 CITIES ASSESSMENTS

Based on the filled in questionnaires and data provided at external links, WP2 experts assessed the partner cities' environmental and socio-economic status to identify those challenges where a nature-based solution can provide an answer to a certain issue or problem. Results were shown back to the cities for validation. The assessments went into more detail in relation to environmental challenges. At the same time, the socio-economic status of the pilot cities is being analysed in more detail under Task 8.1 by the University of Passau team. Task 8.1 aims to understand the full societal context of UPSURGE Place Labs. The final results of this analysis will be presented in D.8.1 Report on the social context of Place Labs in Month 24 of the project implementation.

Assessment under Task 2.3 used the matchmaking matrix and the filled in city questionnaire to get a clear picture of the environmental and socio-economic challenges partner cities face.

WP2 experts assessed the data related to the challenges and used three categories in the matrix.

- 'no data provided' – means that the city either doesn't have or did not provided a dataset related to the challenge / sub-challenge[1]
- 'not an issue' – indicates the categories where, based on the available datasets, experts assessed the situation as not challenging;
- 'yes, it is an issue' – with some additional explanatory text, it indicates the categories where experts assessed the situation challenging based on the available datasets.

Identified challenges are grouped in line with the topics/areas used in the project. Abbreviations used in Table 2-8 are the following:

Abbreviation	Topic/area	Abbreviation	Topic/area
GEN	general	INEQ	inequalities
AQ	air quality	CRIME	crime
CC	climate change	GENDER	gender
WATER	water	AGEING	ageing
SOIL	soil	EMPL	employment and jobs
BIODIV	biodiversity	CIT	citizen relation / involvement
NOISE	noise	HOUSING	housing
HWB	health and well-being	MOB	mobility

Below, we give a short summary of the assessment of the seven partner cities. Details can be found in the relevant sheets of the matchmaking matrix Excel file attached to this report as Annex 3.

[1] The task under the project did not include a specific data collection activity. Although the matrix, because of its planned role in later exploitation activities, is quite detailed on the selected topics, cities were not expected to implement extensive data gathering. This means that the cities used their existing data sets to provide information on the selected topics. If certain data did not exist or was not relatively easily available, or was not relevant enough to the city, no extra efforts were expected to get them. Here we should remark, that because of this, the number of identified challenges can differ city by city, 'no data' in itself, naturally does not mean that the certain challenge does not exist in the city.

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A comment on the covered area should be given here. The questionnaire, in line with the project goals, was intended to collect data and information at the level closest to the demo site(s). Of course, it was expected that this level of detail wouldn't be available in all cases at the demo site level. Therefore, we suggested the cities use information they thought was the most relevant. This way, mostly, we have received city-level data. However, in some cases, cities provided data specific to the demo sites. During the assessment, we indicated these specific data in the matrix.

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5.1 BELFAST

Out of the 78 challenges, no data were available/provided for 30.

For Belfast, in the cases of 30 challenges, the experts assessed the situation as not an issue.

Based on the assessment, we can conclude that in Belfast, there are no significant challenges in precipitation, with water bodies, or any specific biodiversity related one. Among the socio-economic challenges, no specific issue related to age structure and citizen involvement has been identified.

In 18 cases, the assessment showed that in that certain area, a challenge can be identified in the city. The challenges identified within the project frame in Belfast are the following:

Table 2 Challenges identified by the assessment under the frame of the UPSURGE project in Belfast / at the demo site

IDENTIFIED CHALLENGES			
GEN	1. temperature rise	CC	10. event of cold waves
	2. green space management challenges		11. wildfire events
AQ	3. NO2 limit value exceedance / hotspot		12. heat islands
	4. PM limit value exceedance / hotspot	SOIL	13. soil pollution hotspot - heavy metals
	5. specific AQ problem related to traffic	BIODIV	14. problems with plants planted earlier
CC	6. event of torrential rains	HWB	15. lack of resources for green space maintenance
	7. events of flash floods	INEQ	16. segregation of any kind
	8. event of destructive windstorms	CRIME	17. crime hotspot areas
	9. event of heat waves	GENDER	18. gender issue

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5.2 BREDA

Out of the 78 challenges, no data were available/provided for 22.
For Breda, in the cases of 38 challenges, the experts assessed the situation as not an issue.
Based on the assessment, we can conclude that there are no significant challenges in precipitation, with air quality limit values, with surface water bodies, and with soils (although the city has VOC pollution from an earlier industrial site for both soils and groundwater, it is well-mapped and monitored). Among the socio-economic challenges, no specific issue related to employment and jobs has been identified. For several socio-economic areas, proper data were unavailable (mobility, housing, citizens' perception of their environment).
In 18 cases, the assessment showed that in that certain area, a challenge can be identified in the city.
The challenges identified within the project frame in Breda are the following:

Table 3 Challenges identified by the assessment under the frame of the UPSURGE project in Breda / at the demo site

IDENTIFIED CHALLENGES			
GEN	1. temperature rise	BIODIV	10. invasive species – flora
	2. few green spaces		11. challenges related to the management of protected areas
	3. few trees - low level of leaf area		12. degradation of special habitats
CC	4. event of torrential rains	NOISE	13. noise pollution hotspot
	5. event of destructive windstorms	HWB	14. low rate of blue-green space compared to built areas
	6. event of heat waves	INEQ	15. segregation of any kind
	7. drought	CRIME	16. crime hotspot areas
	8. heat island	AGEING	17. area with an old population
WATER	9. polluted groundwater lens		18. area with a young population

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5.3 BUDAPEST 18TH DISTRICT

Out of the 78 challenges, no data were available/provided for 9.

For the 18th district of Budapest, in the cases of 35 challenges, the experts assessed the situation as not an issue.

Based on the assessment, we can conclude that there are no significant challenges with the volume of green spaces, with surface water bodies or with any specific biodiversity related issues. No specific issue has been identified among the socio-economic challenges related to inequalities, crime, age structure, employment, and jobs.

In 34 cases, the assessment showed that in that certain area, a challenge can be identified in the city. The challenges identified within the project frame in the 18th district of Budapest are the following:

Table 4 Challenges identified by the assessment under the frame of the UPSURGE project in the 18th district of Budapest / at the demo site

IDENTIFIED CHALLENGES			
GEN	1. elevation - very high, sloped or very low, so water problems	CC	18. heat islands
	2. temperature rise	WATER	19. polluted groundwater lens
	3. precipitation decrease		20. low water retention capacity
	4. decreasing rate of green spaces	SOIL	21. soil pollution hotspot – CH
	5. green space management challenges		22. soil compaction issue
	6. high rate of private greens without influence on management		23. high rate of sealed surfaces
AQ	7. NO2 limit value exceedance / hotspot	NOISE	24. noise pollution hotspot
	8. PM limit value exceedance / hotspot	HWB	25. lack of resources for green space maintenance
	9. specific AQ problem related to domestic heating		26. pollen problems
	10. specific AQ problem related to traffic		27. low rate of blue-green space compared to built areas
	11. specific AQ problem related to the industry	EMPL	28. area with a high number of inbound commuters / parking lots
CC	12. event of torrential rains	CIT	29. citizens' perception of bad green space maintenance
	13. events of flash floods		30. citizens' perception of bad air quality

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	14. event of destructive windstorms		31. citizens' perception of negative climate change effects
	15. event of heat waves	HOUSING	32. high rate of houses with own gardens
	16. wildfire events	MOB	33. low level of cycling
	17. drought		34. high level of car usage/ car numbers

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5.4 KATOWICE

Out of the 78 challenges, no data were available/provided for 26.

For Katowice, in the cases of 26 challenges, the experts assessed the situation as not an issue.

Based on the assessment, we can conclude that there are no significant challenges with the volume of green spaces. No specific issue has been identified among the socio-economic challenges related to inequalities, employment, citizen involvement and housing. In relation to water bodies, soils and mobility, no appropriate data were available.

In 26 cases, the assessment showed that in that certain area, a challenge can be identified in the city. The challenges identified within the project frame in Katowice are the following:

Table 5 Challenges identified by the assessment under the frame of the UPSURGE project in Katowice / at the demo site

IDENTIFIED CHALLENGES			
GEN	1. very high population density	WATER	14. irrigation problems (vandalism, high water consumption, high cost etc.)
	2. temperature rise	SOIL	15. low water retention capacity
	3. green space management challenges	BIODIV	16. invasive species - flora
AQ	4. NO2 limit value exceedance / hotspot		17. invasive species - fauna
	5. PM limit value exceedance / hotspot		18. challenges related to the management of protected areas
	6. specific AQ problem related to domestic heating	NOISE	19. noise pollution hotspot
	7. specific AQ problem related to traffic	HWB	20. pre-mature death due to air quality problems
	8. specific AQ problem related to the industry		21. lack of resources for green space maintenance
CC	9. event of torrential rains	CRIME	22. crime hotspot areas
	10. events of flash floods	AGEING	23. area with an old population
	11. event of heat waves	EMPL	24. area with a high number of inbound commuters / parking lots
	12. drought	CIT	25. citizens' perception of bad green space maintenance
	13. heat islands		26. citizens' perception of bad air quality

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5.5 MARIBOR

Out of the 78 challenges, no data were available/provided for 23.

For Maribor, in the cases of 30 challenges, the experts assessed the situation as not an issue.

Based on the assessment, we can conclude that there are no significant challenges in precipitation, the volume of green spaces, water bodies, or any specific biodiversity related one. No specific issue has been identified among the socio-economic challenges related to inequalities, crime, age structure and housing. For several socio-economic areas, proper data (mobility citizens' perception of their environment) were unavailable.

In 25 cases, the assessment showed that in that certain area, a challenge can be identified in the city. The challenges identified within the project frame in Maribor are the following:

Table 6 Challenges identified by the assessment under the frame of the UPSURGE project in Maribor/ at the demo site

IDENTIFIED CHALLENGES			
GEN	1. temperature rise	SOIL	14. soil erosion hotspot
	2. green space management challenges	BIODIV	15. invasive species - flora
AQ	3. PM limit value exceedance / hotspot		16. invasive species - fauna
CC	4. event of torrential rains		17. problems with plants planted earlier
	5. events of flash floods	NOISE	18. noise pollution hotspot
	6. event of destructive windstorms	HWB	19. high morbidity due to air quality problems
	7. event of heat waves		20. pre-mature death due to air quality problems
	8. event of cold waves		21. lack of resources for green space maintenance
	9. drought		22. pollen problems
	10. heat islands	EMPL	23. area with high unemployment rate
WATER	11. polluted surface water (stream, river)		24. area with a high number of inbound commuters / parking lots
SOIL	12. soil pollution hotspot – HC		25. area with a high number of outbound commuters / sleeping city issues
	13. soil pollution hotspot - heavy metals		

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5.6 PATRAS

Out of the 78 challenges, no data were available/provided for 15.

For Patras, in the cases of 45 challenges, the experts assessed the situation as not an issue.

Based on the assessment, we can conclude that there are no significant challenges with the volume of green spaces, surface water bodies, soil pollution, or any specific biodiversity-related issues. No specific issue has been identified among the socio-economic challenges related to inequalities, crime, ageing and citizen involvement. For mobility, proper data were not available.

In 18 cases, the assessment showed that in that certain area, a challenge can be identified in the city. The challenges identified within the project frame in Patras are the following:

Table 7 Challenges identified by the assessment under the frame of the UPSURGE project in Patras / at the demo site

IDENTIFIED CHALLENGES			
GEN	1. elevation - very high, slopy or very low, so water problems	CC	10. wildfire events
	2. temperature rise		11. drought
	3. precipitation decrease	WATER	12. polluted groundwater lens
	4. green space management challenges	SOIL	13. soil erosion hotspot
	5. high rate of private greens without influence on management	NOISE	14. noise pollution hotspot
AQ	6. PM limit value exceedance / hotspot	HWB	15. high morbidity due to air quality problems
	7. specific AQ problem related to domestic heating		16. lack of resources for green space maintenance
	8. specific AQ problem related to traffic	EMPL	17. area with high unemployment rate
CC	9. event of heat waves	HOUSING	18. high rate of houses with own gardens

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5.7 PRATO

Out of the 78 challenges, no data were available/provided for 19.
For Prato, in the cases of 44 challenges, the experts assessed the situation as not an issue.
Based on the assessment, we can conclude that there are no significant challenges in precipitation, with the volume and accessibility of green spaces, with air quality limit values, with surface water bodies, or with any specific biodiversity related issues. No specific issue has been identified among the socio-economic challenges related to age structure, employment and citizen involvement. For some socio-economic areas, proper data (housing citizens' perception of their environment) were unavailable.
In 14 cases, the assessment showed that in that certain area, a challenge can be identified in the city.
The challenges identified within the project frame in Prato are the following:

Table 8 Challenges identified by the assessment under the frame of the UPSURGE project in Prato / at the demo site

IDENTIFIED CHALLENGES			
GEN	1. temperature rise	SOIL	8. soil pollution hotspot - heavy metals
	2. green space management challenges	NOISE	9. noise pollution hotspot
CC	3. event of torrential rains	INEQ	10. segregation of any kind
	4. events of flash floods	CRIME	11. low level of perceived security in the city / certain areas
	5. event of heat waves	MOB	12. low level of cycling
WATER	6. polluted groundwater lens		13. low share of public transport
SOIL	7. soil pollution hotspot - HC		14. high level of car usage/ car numbers

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6 ANNEXES

1. Questionnaire template (pdf)
2. Questionnaires filled in by the seven partner cities (pdf)
3. Matchmaking matrix (Excel)

   This Excel file includes the following sheets:

   - MATRIX – the matchmaking matrix itself
   - NBS Registry – the registry developed under Task 2.1, including the identified NBS solutions with a detailed description.
   - KPIs – the final list of KPIs developed under Task 2.2
   - MATRIX sheets – assessments filled in for the seven participating cities: Belfast, Breda, Budapest 18. district, Katowice, Maribor, Patras, Prato.

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