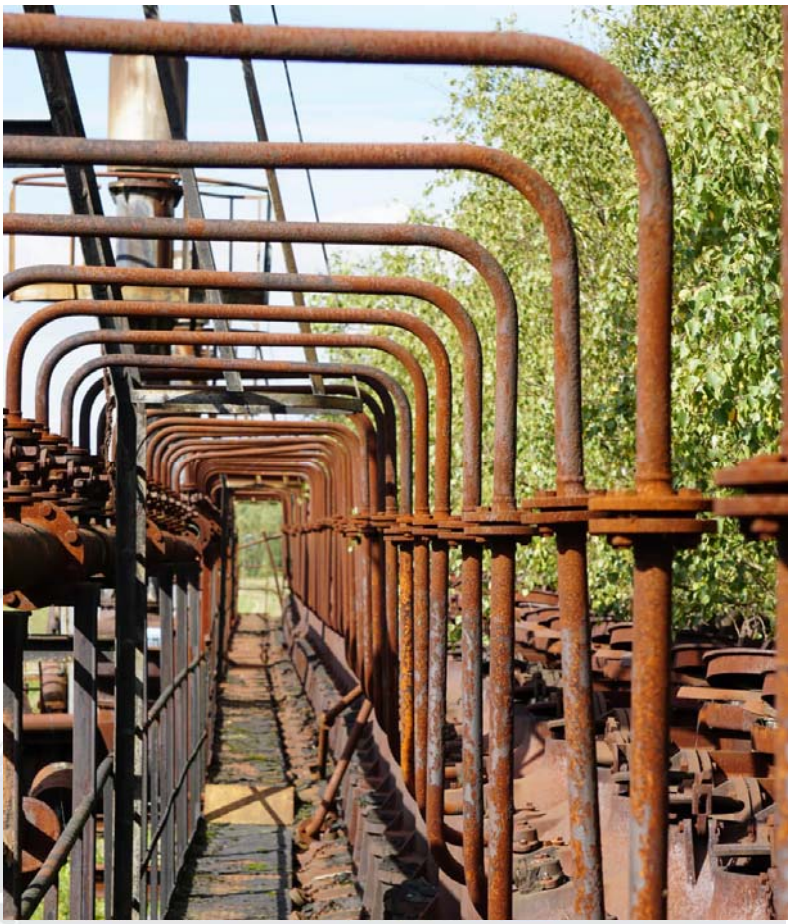
proGIreg



Hansa Coking Plant © ICLEI

Protocols of Measurements

Deliverable 4.3

Work package: 4

Dissemination level: PU

Lead partner: CNR

Author: Chiara Baldacchini

Due date: 31/03/2019

Submission date: 29/03/2019

Deliverable	**Protocols of Measurements**
Deliverable No.	4.3
Work Package	4
Dissemination Level	PU
Author(s)	Chiara Baldacchini, CNR.
Co-Author(s)	Carlo Calfapietra, Gabriele Guidolotti, CNR; Giovanni Sanesi, Giuseppina Spano, Yole de Bellis, UNIBA; Payam Dadvand, Carmen de Keijzer, ISGLOBAL; Elizabeth Gil-Roldán, SL; Federica Larcher, Federica Paradiso, Chiara Ferracini, Simona Bonelli, UNITO.
Date	28/03/2019
File Name	D4.3_Protocols of Measuraments_proGIreg_CNR_2019-03-28
Status	
Revision	
Reviewed by (if applicable)	Axel Timpe and Rieke Hansen, RWTH; Bernd Pölling, SWUAS; Dagmar Knappe, DORTMUND; Iva Bedenko, ZAGREB; Elena Deambrogio, COTO.
Information to be used for citations of this report	Baldacchini, C. (2019): Protocols of Measurements, Deliverable No.4.3, proGIreg. Horizon 2020 Grant Agreement No 776528, European Commission, 37.

CONTACT:
Email: progireg@la.rwth-aachen.de
Website: **www.proGIreg.eu**
This document has been prepared in the framework of the European project proGIreg.

This project has received funding from the EU's Horizon 2020 research and innovation programme under grant agreement no. 776528.

Contents

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Partner organisations

No.	Name	Short name	Country
1	Rheinisch-Westfaelische Technische Hochschule Aachen	RWTH	Germany
2	Stadt Dortmund	DORTMUND	Germany
3	Comune di Torino	COTO	Italy
4	Grad Zagreb	ZAGREB	Croatia
17	Starlab Barcelona SL	SL	Spain
20	Fundacion Privada Instituto de Salud Global Barcelona	ISGLOBAL	Spain
21	Università degli Studi di Torino	UNITO	Italy
22	Consiglio Nazionale delle Ricerche	CNR	Italy
24	Università degli Studi di Bari Aldo Moro	UNIBA	Italy

Abbreviations

Dx.x:	deliverable
EC:	European Commission
EWG:	Expert Working Group
FRC:	Front Runner City
GA:	Grant Agreement
GI:	Green Infrastructure
GIS:	geographic information system
LCA:	Life-Cycle Analysis
LL:	Living Lab
NBS:	nature-based solutions
NDVI:	Normalized Difference Vegetation Index
NGO:	non-governmental organisation
PM:	person months
proGIreg:	productive Green Infrastructure for post-industrial urban regeneration
SME:	small and medium enterprise
WP:	work package

Executive Summary

The project entitled “productive Green Infrastructure for post-industrial urban regeneration (proGIreg)” aims at implementing eight distinct types of nature-based solutions (NBS) in specific post-industrial sites of four different cities (called front runner cities - FRC). One of the main goals of the project is to assess the benefits produced by the implemented NBS with respect to four different domains: 1) socio-cultural inclusiveness; 2) increased health and wellbeing; 3) ecological and environmental restoration; and 4) economic and labour market, corresponding to the four tasks of proGIreg Work Package 4 (WP4 – “NBS benefit assessment and monitoring”). The experimental approaches that will be adopted are described in detail in deliverable 4.1 (D4.1 – “Monitoring and Assessment Plan”), together with the case studies developed within proGIreg. After a preliminary recall of the data types that will be used for the assessment, this document will present the detailed protocols of measuraments per each selected NBS implementation. Lastly, the specific indicators that are expected to be produced by the benefit assessment analysis are presented. This document is a key deliverable for WP4, since the indicators provided, whose methodology have been developed in compliance with the guidelines of the EKLIPSE – Expert Working Group (EWG) of the European Commission (EC), will be further used to compare the proGIreg results with those of sister projects within EC Taskforce 2 “NBS Impact Evaluation Framework 2.0”. This manual will be reviewed and updated when necessary.

1. Introduction

The proGIreg project will implement NBS in three different European cities and in one Chinese city (known as Front Runner Cities / FRC), whose municipal public authorities are partners of the project: Dortmund, Torino, Zagreb and Ningbo. The implemented NBS are productive Green Infrastructures (GI) and they will be realized in post-industrial sites with the aim of achieving a number of benefits, classified according to four domains, corresponding to the first four Tasks of the WP4 (Fig.1): Task 4.1 – Socio-cultural inclusiveness; Task 4.2 – Increased human health and wellbeing; Task 4.3 – Ecological and environmental restoration; and Task 4.4 – Economic and labour market benefits. For each one of the proposed assessment domains, specific indicators describing the associated benefits will be quantified.

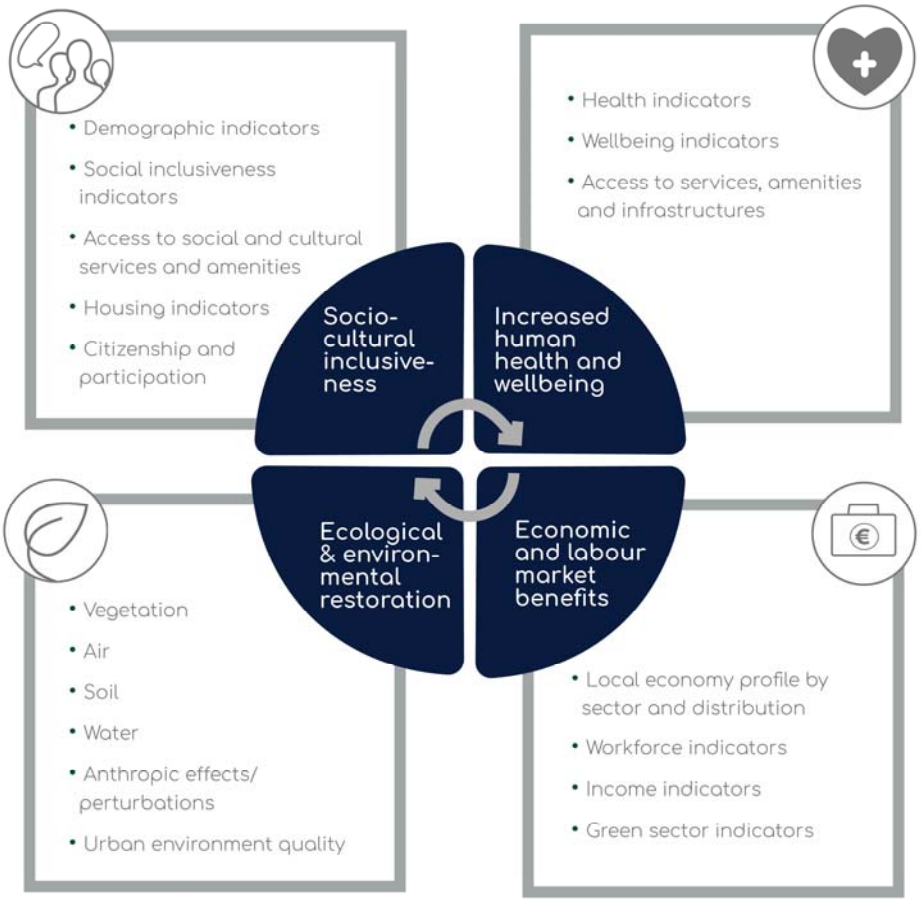

Figure 1 – The four assessment domains of WP4 (ICLEI).

To date, the city of Ningbo is not yet involved in WP4 activities. In the European FRC, eight different types of NBS will be implemented and monitored to assess their benefits. Not all the NBS types will be implemented in all three FRC. However, when possible, cross-city assessment will also be performed. The different NBS types, which will be described in detail in D3.2 (“Three implementation plans: Dortmund, Turin and Zagreb”), are:

- NBS1: Renaturing landfill sites for leisure use and energy production
- NBS2: New regenerated soil thanks to biotic compounds for urban forestry and urban farming
- NBS3: Community-based urban farming and gardening on post-industrial sites
- NBS4: Aquaponics as soil-less agriculture for polluted sites
- NBS5: Capillary GI on walls and roofs
- NBS6: Making post-industrial sites and renatured river corridors accessible for local residents
- NBS7: Establishing protocols and procedures for environmental compensation at local level
- NBS8: Pollinator biodiversity improvement activities and citizen science project

The monitoring of the benefits provided by the implemented NBS will be conducted at three different scales (city, LL district and NBS level) generating two types of data (Spatial and Experimental). How these data will be obtained, including a description of the theoretical background of each proposed experimental approach, are discussed in detail in D4.1[1]. An overview of the different approaches is presented in Chapter 2.

In Chapter 3, the NBS selected for the monitoring and assessement activity is presented together with a detailed overview of monitoring timing and activities for each implementation. Indeed, not all the proGIreg implementations will be monitored: case by case, the monitoring scales and times have been carefully defined to highlight measurable impacts which would strictly depend on NBS size and implementation time.

In general, the implementations to be monitored should respect the following criteria:

- Implementation should start after the delivery of the present document to provide pre-implementation monitoring;
- Implementation should be concluded no later than the summer of 2020 in order to provide post-implementation monitoring at least 24 months after implementation, as required by the proGIreg GA; and
- Implementation size should guarantee a measurable effect with respect to the other GI in the surrounding environment and to the cost of the experimental activity (in terms of both person month - PM - and money).

Nevertheless, the selection of NBS to be monitored has been flexible with respect to these constraints to remain in line with the proGIreg requirement of monitoring all NBS types and of providing cross-city assessments, where possible.

The final result of the monitoring and assessment activity will be the quantification of specific indicators, for each assessment domain, obtained by analysing the collected data. The indicators to be provided have been chosen according to the challenges and methodologies stated in the guidelines of the EKLIPSE - EWG report on NBS evaluation[2]. The indicators that will be used to describe the assessment of the proGIreg NBS are presented in Chapter 4. They constitute one of the main outputs of proGIreg, and their descriptory efficiency will be

[1] Baldacchini, C. (2019). Monitoring and Assessment Plan, Deliverable No. 4.1, proGIreg. Horizon 2020 Grant Agreement No 776528, European Commission.
[2] Raymond, et al. (2017). An Impact Evaluation Framework to Support Planning and Evaluation of Nature-based Solutions Projects. Report prepared by the EKLIPSE Expert Working Group on Nature-based Solutions to Promote Climate Resilience in Urban Areas. Centre for Ecology & Hydrology, Wallingford, United Kingdom.

compared with those provided by the sister projects within EC Taskforce 2 “NBS Impact Evaluation Framework 2.0”.

2. Data Collection

The monitoring of benefits will be performed using two different types of data over three different spatial levels. Spatial data from existing databases will be collected both at the city and living lab (LL) district level. New experimental data will be collected at the LL district and NBS level. Data acquisition design will depend on the type of data; it will be repeated on a yearly basis or will be conducted in a pre-post configuration, or be obtained by a single, post-implementation assessment.

Data obtained at the LL district and NBS level will be used to carry out the benefit assessment, further described by the indicators provided in Chapter 4, while data at city level will be employed to upscale the expected benefits according to an expert-based approach that explained in-depth in D4.6 (“Guidelines for upscaling”).

The definition of the three spatial levels has been extensively discussed in D2.2[3], and the same administrative borders previously defined will be adopted for data acquisition. Also, tools and sources for data collection are extensively presented in D4.1[1] and resumed in the following chapters.

All the data described herein will be collected and stored on the proGIreg platform, according to the description provided by D4.2[4]. Subsequently, the data will be analysed to obtain a quantification of the indicators listed in Chapter 4.

2.1. Spatial data

The spatial data produced at the city and LL district level belong to two different categories:

1. Administrative data from existing databases (BASE). This concerns basic information describing the four assessment domains in the city under investigation. A first screening for available data and data collection has been performed by proGIreg WP2 and provided in D2.2[3]. Every two years, the FRC will be requested to provide the same yearly data; i.e., in 2020, the FRC will collect data from 2019 and 2020, while in 2022 they will collect data from 2021 and 2022. The FRC will also have the opportunity to add data that were unavailable at previous requests, such as data that are measured

[3] Leopa, S.; Elisei, P. et al. (2019). Spatial Analysis in Front-Runner and Follower Cities, Deliverable No. 2.2, proGIreg. Horizon 2020 Grant Agreement No. 776528, European Commission.
[4] Mattioni, M. (2019). Data Management Plan, Deliverable No. 4.2, proGIreg. Horizon 2020 Grant Agreement No. 776528, European Commission.

on a multi-annual basis (e.g., census data). The total estimated effort for this survey is **2 PM** per FRC.

2. Spatial data elaborated from geographic information system (GIS) sources. In particular, the Normalized Difference Vegetation Index (NDVI) and Walkability Index will be obtained annually until 2022.

The results of the spatial data analysis at LL district level will be provided in D4.5 ("Report on benefits produced by implemented NBS") and D4.8 ("Updated report on benefits produced by implemented NBS") of proGIreg.

2.2. Experimental data

2.2.1. District level

Social, health, and economic indicators at LL district level will be collected by means of an anonymised general population survey (general questionnaire – GQ), performed in a pre-post design, according to the detailed description in D4.1[1]. The survey will involve 300 persons in the LL district and 300 in a different, comparable city district ("control district") where no NBS implementations are planned for the next 3 years.

The tentative timeline, based on the implementation timing of the different NBS in the European FRC, is as follows:

- April-July 2019: identification of the control district, translation and upload of the questionnaire on the "EUSurvey" platform[5], selection and training of interviewers, selection of the target and sending out the first-contact letter
- August-September 2019: first administration
- August-September 2022: second administration

The proposed three-year timeline would allow to assess as many NBS as possible close to the 24-month delay from implementation, as required by the project (many implementations will occur during 2020, or even later).

A more detailed timeline of the first two periods is reported in Fig. 2 below.

[5] https://ec.europa.eu/eusurvey/home/welcome

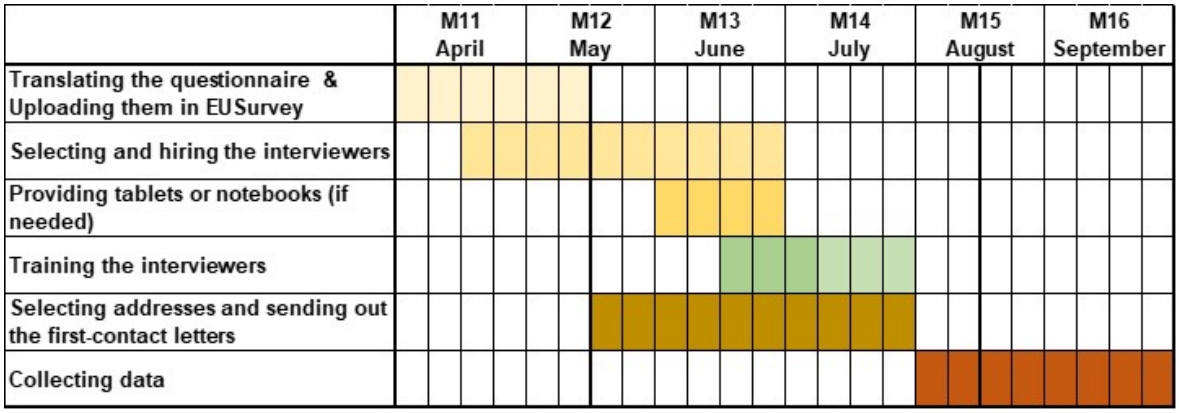

Figure 2 - Tentative timeline of the first months of the GQ survey preparation and administration (CNR).

The estimated time efforts and responsible partners of the tasks in Fig. 2 are:

1. Translation of the questionnaire in the local language: formally the task of the FRC, which estimated that a long time might be needed to recruit translators; other project partners could be involved to speed up the process;

2. Uploading the questionnaire on the platform for administration ("EUSurvey"[5]): the partners from T4.1 and T4.2 are in charge of this task; estimated time is 3 working days;

3. Selecting and hiring of interviewers: the FRC are in charge. The allotted time could be estimated to be ~1 PM; this depends on the city;

4. Training of the interviewers: partners from T4.1 will be in charge and train face-to-face or via telematically; this will require 6 working days on the part of the FRC;

5. Selecting addresses and sending out the first-contact letters: this task will be taken on by the FRC and will require about ~1 PM;

6. (if needed) Sending out reminder letters and selecting an additional sample of addresses: handled by the FRC in ~0.5 PM;

7. Sending out re-contacting letters after three years: task of the FRC (~0.5 PM);

8. Obtaining questionnaire data: assuming it takes 1.5 hours to obtain 1 questionnaire (including making the appointment, transportation time, informed consent procedures, etc.), it would require about 900 hours to obtain the pre-evaluation and 900 hours to obtain the post-evaluation (~12 PM, task of the FRC);

9. Data download, storage and analysis: handled by partners in T4.1, T4.2, and T4.4; a time range of 20 to 30 PM can be collectively estimated.

The results of the GQ will be provided at the end of the project (D4.8 – "Updated report on benefits produced by implemented NBS").

2.2.2. NBS level

The experimental activity at NBS level will involve all the four assessment domains. Nine different experimental tools have been developed to assess benefits at the NBS level. They have been extensively described in D4.1[1] and are resumed in the following table.

Table 1 – NBS monitoring tools. Estimated time effort for data collection by the FRC is provided for most of the tools. Etimated time for acquisition of the needed instruments by the FRC (when required) or for data analysis by the other partners in WP4 cannot be sufficiently estimated at this stage.

Code - Short name	Data type	Description of data collection
A - NBS-visitor questionnaire	Social and health indicators of a specific NBS	Anonymous survey to be performed 24 months after NBS implementation (**1 PM** per implementation, according to UNIBA and ISGLOBAL instructions)
B - SOPARC	Number of users and type of physical activity for a specific NBS	Survey performed by using the "System for Observing Play and Recreation in Communities"[6], in a pre-post design (**1 PM** per implementation, under the guidance of ISGLOBAL)
C - Economic and labour impact questionnaire	Economic impact indicators of a specific NBS	Survey about economic parameters to be submitted to the organisation in charge of NBS implementation as well as to the organisation in charge of long-term management (**1 PM** per FRC, under the supervision of SL)
D – Carbon impact	Carbon storage; saved carbon dioxide emissions	Mathematical models applied to a specific NBS, based on either environmental, GIS or economic data. (timing depends on the NBS)

[6] McKenzie, Cohen, Sehgal, Williamson, Golinelli, (2006). System for Observing Play and Recreation in Communities (SOPARC): Reliability and Feasibility Measures. J. Phys. Act. Health 3 Suppl 1, S208-S222.

E - Air quality	Ozone (O_3) and nitrogen dioxide (NO_2) concentrations	Discontinuous concentration measurements by passive diffusion tubes in the proximity of the NBS and in a control site, repeated before the implementation and two times after. For each monitoring site, 36 passive diffusion tubes are needed (3 tubes x 2 gases x 3 years = 18 passive tube samples for both sample and control sites). Samples should be placed onsite, removed after three weeks, and sent for analysis. FRC will be incharge of installing, removing and sending the sensors (**6 working days** in three years) and buying sensors for the two post implementation campaigns. CNR will be in charge of purchasing and installing the sensors for the pre implementation campaign
F - Air temperature	Air temperature	Continuous measurement of air temperature inside an NBS and in a control site over three years. For each monitoring site, 6 temperature sensors are needed (3 for the site and 3 for the control site). The sensors should be checked monthly for data download and battery (**9 working days** per NBS in three years). Installation sites will be set by CNR.
G – Particulate biomonitoring	Particulate matter uptake by the specific NBS	Leaf-deposited particulate matter estimation, using standard techniques, to be repeated twice. The FRC will be asked to sample 2 leaves for 3 replicate branches per sampling campaign (**2 working day**s in total) and to send them to CNR for analysis.
H – Environmental footprint	Life-Cycle Analysis (LCA) indicators for environmental impacts (e.g., Global warming potential, land use, ecosystem damage potential, resource depletion)	Data will be collected and provided by the stakeholder responsible for NBS management and implementation. The CNR and SME involved will perform LCA analysis.

I - Biodiversity	Bee, flower and butterfly number and species in the proximity of a specific NBS	Biodiversity monitoring surveys of selected species will be the responsibility of UNITO; to be performed according to specific protocols adapted to the NBS and observers, and repeated 2-3 times during the lifetime of the project.

Some of the monitoring tools are rather NBS specific, such as “H – Environmental footprint”, which can be applied only to NBS2 and NBS4. Others are instead generic and can assess benefits over a wide range of NBS types. For instance, “C – Economic and labour impact questionnaire” would provide economic assessement of all the productive GI implemented within proGIreg. In the following Chapter, the monitoring protocols per each NBS type, in the three European FRC will be presented. The time and monetary efforts required from the FRC in connection with this analysis will be tentatively summarized in Par. 3.9. The estimation of the time and monetary effort per monitoring activity for the other partners (namely, CNR, UNIBA, ISGLOBAL, SL and UNITO) is difficult at this stage.

3. NBS level monitoring protocols in the European FRC

The NBS implementations chosen for monitoring and assessing benefits within the proGIreg project are presented in this Chapter, together with the NBS-specific assessment protocols developed, based on implementation timing, size, and cost-effect *ratio*. Not all the implemented NBS have been selected for monitoring, as detailed in D4.1[1]. However, the requirements of monitoring at least one implementation per NBS type and to provide cross-city analysis (when possible) have been taken under consideration. The NBS implementations to be monitored will be presented per NBS type for each FRC. A more detailed description of these implementations, together with all others, are found in D3.2 (“Three implementation plans: Dortmund, Turin and Zagreb”).

For each implementation, the adopted NBS monitoring tools will be listed along with the proposed experimental timing and FRC expected effort. Lastly, for each assessement the deliverable in which the results will be presented is specified (either D4.5 – “Report on benefits produced by implemented NBS” or D4.8 - “Updated report on benefits produced by implemented NBS”).

3.1. NBS1: Renaturing landfill sites for leisure use and energy production

NBS1 will be implemented only in Dortmund where solar energy production (40 000 m²; 3.6 MWp) and sport activities on 2 ha will be integrated on the site of the renatured Deusenberg landfill. The solar panels have been already implemented, while the sport activities are under definition, since the site will be involved in further interventions related with the International Gardening Exposition in 2027. Protocols of measurements are presented in Table 2 for the three parts of the implementation.

Table 2 – NBS1 in Dortmund: New forest, solar panels and sport activity on the renatured Deusenberg landfill.

NBS monitoring tool	Analysis type	Timing for data collection	Deliverable	FRC efforts
NEW FOREST - Implementation timing: already implemented				
D – Carbon impact	Post	Summer 2020	4.5	**4 working days**, for field data acquisition
G – Particulate Biomonitoring	Post	Summer 2020	4.5	**1 working day**, for field data acquisition
SOLAR PANELS - Implementation timing: already implemented				
C - Economic impact questionnaire	Post	January 2021	4.5	**1 working day**
D – Carbon impact	Post	January 2021	4.5	
SPORT ACTIVITIES - Implementation timing: to be defined				
A - NBS-visitor questionnaire	Post	depending on implementation time	4.8	expected target: 100 people, expected time: **1 PM**
B - SOPARC	Pre-Post	depending on implementation time	4.8	**1 PM**
C - Economic impact questionnaire	Post	depending on implementation time	4.8	**1 working day**

3.2. NBS2: New regenerated soil thanks to biotic compounds for urban forestry and urban farming

NBS2 will be implemented only in Turin. Along the Sangone river, within the already existing Sangone public park, a 2000 m^2 area will be destined to the production of new soil that will eventually be sold. Also, a new forest will be planted in the Sangone park, close to the soil production site, to test the new soil. Protocols of measurements are presented in Table 3 for both parts of this NBS.

Table 3 - NBS2 in Turin: new soil production and new forest.

NBS monitoring tool	Analysis type	Timing for data collection	Deliver-able	FRC efforts
NEW SOIL - Implementation timing: 12/2018 - 04/2019				
C - Economic im-pact questionnaire	Post	January 2021	4.5	
H - Environmental footprint	Post	January 2021	4.5	
NEW FOREST - Implementation timing: 12/2018 - 04/2019				
A - NBS-visitor questionnaire	Post	Summer 2021	4.8	expected target: 100 people, expected time: **1 PM**
B - SOPARC	Pre-Post	Summer 2019 Summer 2021	4.8	**1 PM**
C - Economic im-pact questionnaire	Post	January 2021	4.8	**1 working day**
D - Carbon impact	Post	January 2021	4.8	**4 working days**, for field data acquisition
E - Air quality	Pre-Post-Post	Summer 2019 Summer 2020 Summer 2021	4.8	36 passive sensors, **6 working days**
F - Air temperature	Continu-ous	From Summer 2019	4.8	6 sensors, **9 working days**

G - Particulate bio-monitoring	Pre-Post	Summer 2019 Summer 2021	4.8	**2 working days**

3.3. NBS3: Community-based urban farming and gardening on post-industrial sites

NBS3 interventions will reuse abandoned places to create new spaces for social activities in the shape of urban farms and gardens. Moreover, they will provide economic benefits through the growth of vegetable products. It is the only NBS type that will be implemented in all three European FRC, thus providing a suitable example for cross-city analysis. In Turin and Zagreb, implementation sites and design are already defined, while in Dortmund the NBS is still under definition. In Turin, many NBS3 implementations will be developed, among which are the Gardens in Cascina Piemonte as the widest (2,5 Ha); it is already hosting a biodiversity monitoring activity. Two NBS3 implementations will be developed in Zagreb Sesvete City Garden consisting in the upgrade of an existing garden and a new therapy garden: the comparative assessment of the two implementations will provide valuable results. The four selected NBS3 implementations will be monitored using the same tools (except for biodiversity monitoring which will take place only in Turin), but at different times due to different implementation schedules. The protocols for the Turin and Zagreb implementations are presented in Table 4 below. **Dortmund's NBS3 will be monitored accordingly once timing is defined.**

Table 4 – NBS3 in Turin and Zagreb: Gardens in Cascina Piemonte, upgrade of the existing garden and new therapy garden in Sesvete City Garden.

NBS monitoring tool	Analysis type	Timing for data collection	Deliver-able	FRC efforts
GARDENS IN CASCINA PIEMONTE - Implementation timing: 05/2018 - 07/2020				
A - NBS-visitor questionnaire	Post	Summer 2021	4.8	expected target: 100 people, expected time: **1 PM**
B - SOPARC	Pre-Post	Summer 2019 Summer 2021	4.8	**1 PM**
C - Economic im-pact questionnaire	Post	Autumn 2021	4.8	**1 working day**

E - Air quality	Pre- Post- Post	Summer 2019 Summer 2020 Summer 2021	4.8	36 passive sensors, **6 working days**
F - Air temperature	Continu-ous	From Summer 2019	4.8	6 sensors, **9 working days**
G – Particulate bio-monitoring	Pre-Post	Summer 2019 Summer 2021	4.8	**2 working days**
I - Biodiversity	Pre- Post- Post- Post	Summer 2018 Summer 2019 Summer 2020 Summer 2021	4.8	
SESVETE CITY GARDEN - UPGRADE and NEW THERAPY GARDEN Implementation timing: 09/2019 - 06/2021				
A - NBS-visitor questionnaire	Post	Summer 2022	4.8	expected target: 100 peo-ple, expected time: **1 PM**
B - SOPARC	Pre-Post	Summer 2019 Summer 2022	4.8	**1 PM**
C - Economic im-pact questionnaire	Post	Autumn 2022	4.8	**1 working day**
E - Air quality	Pre- Post- Post	Summer 2019 Summer 2021 Summer 2022	4.8	36 passive sensors, **6 working days**
F - Air temperature	Continu-ous	From Summer 2019	4.8	6 sensors, **9 working days**
G – Particulate bio-monitoring	Pre-Post	Summer 2020 Summer 2022	4.8	**2 working days**

3.4. NBS4: Aquaponics as soil-less agriculture for polluted sites

Aquaponics combine aquaculture and hydroculture into a resource-friendly circulatory system which resembles the natural nitrogen cycle. The nutrient-rich waste stream generated

by aquaculture is used to fertilize plants in the hydroculture section. The plants withdraw nutrients from the processed water, which can be reused in aquaculture. The soil-less cultivation system allows to use areas with impoverished or contaminated soil, which makes it suitable for food production on post-industrial sites. Dortmund will lead the implementation of community-managed aquaponics systems in the three European FRC. However, Turin's implementation will be very small; thus a comparative assessment between Dortmund and Zagreb for NBS4 will be conducted, as depicted in Table 5.

Table 5 – NBS4 in Dortmund and Zagreb: aquaponic community testing systems.

NBS monitoring tool	Analysis type	Timing for data collection	Deliver-able	FRC efforts
Dortmund aquaponics system - Implementation timing: 06/2019 - 06/2021 Zagreb aquaponics system - Implementation timing: 12/2019 - 06/2020				
C - Economic im-pact questionnaire	Post	Autumn 2022	4.8	**1 working day**
H - Environmental footprint	Post	Autumn 2022	4.8	

3.5. NBS5: Capillary GI on walls and roofs

Modern green roofs and walls are building elements designed to support living vegetation in order to improve a building's performance. The benefits of these NBS include improved sound insulation, reduced heating and cooling requirements, reduced and slowed stormwater runoff, capture of gaseous and particulate pollutants, alleviation of urban heat island effects and increased biodiversity. NBS5 will be implemented in Turin and Zagreb in similar contexts. Among the several NBS5 implementations that have been selected and will be realised in Turin are a new green roof on top of a public building and a green wall on a school (to be co-designed). Once the co-design process is concluded and the school selected, a study of the impact of the green wall on childrens' health will be considered. In Zagreb, a green roof and a green wall will be implemented on the new Hub Centre in the Sesvete LL, together with a solar panel system.The same protocols will be adopted for the two roofs and the two walls, as shown in Table 6. The protocol for the photovoltaic system is also described and will be compared to an analogous system implemented in NBS1 in Dortmund.

Table 6 – NBS5 in Turin and Zagreb: green roofs and green walls.

NBS monitoring tool	Analysis type	Timing for data collection	Deliver-able	FRC efforts
TURIN NEW GREEN ROOF ON A PUBLIC BUILDING - Implementation timing: 12/2020 – 02/2021				
C - Economic impact questionnaire	Post	Autumn 2022	4.8	**1 working day**
E - Air quality	Pre- Post- Post	Summer 2019 Summer 2021 Summer 2022	4.8	36 passive sensors, **6 working days**
F - Air temperature	Continu-ous	From Summer 2020	4.8	6 sensors, **9 working days**
G – Particulate bio-monitoring	Pre-Post	Summer 2020 Summer 2022	4.8	**2 working days**
I - Biodiversity	Pre-Post	to be co-defined	4.8	
TURIN SCHOOL GREEN WALL - Implementation timing: to be co-defined				
A - NBS-visitor ques-tionnaire	Pre-Post	to be co-defined	4.8	Target should range be-tween 200-300 people, expected age 9-11, if possible. **Expected PM: 4**
C - Economic impact questionnaire	Post	to be co-defined	4.8	**1 working day**
F - Air temperature	Continu-ous	to be co-defined	4.8	6 sensors, **9 working days**
G - Particulate bio-monitoring	Pre-Post	to be co-defined	4.8	**2 working days**

ZAGREB GREEN ROOF ON HUB_S - Implementation timing: 02/2020 - 06/2021				
C - Economic impact questionnaire	Post	Autumn 2022	4.8	**1 working day**
E - Air quality	Pre- Post- Post	Summer 2019 Summer 2021 Summer 2022	4.8	36 passive sensors, **6 working days**
F - Air temperature	Continu-ous	From Summer 2020	4.8	6 sensors, **9 working days**
G - Particulate bio-monitoring	Pre-Post	Summer 2020 Summer 2022	4.8	**2 working days**
ZAGREB GREEN WALLS ON HUB_S - Implementation timing: 02/2020 - 06/2021				
A - NBS-visitor ques-tionnaire	Post	Spring 2022	4.8	expected target: 100 people, expected time: **1 PM**
C - Economic impact questionnaire	Post	Autumn 2022	4.8	**1 working day**
F - Air temperature	Continu-ous	From Summer 2020	4.8	6 sensors, **9 working days**
G – Particulate bio-monitoring	Pre-Post	Summer 2020 Summer 2022	4.8	**2 working days**
ZAGREB PHOTOVOLTAIC CELLS ON HUB_S - Implementation timing: 02/2020-06/2021				
C - Economic impact questionnaire	Post	Autumn 2022	4.8	**1 working day**
D – Carbon impact	Post	Autumn 2022	4.8	

3.6. NBS6: Making post-industrial sites and renatured river corridors accessible for local residents

Improving accessibility to river corridors and renatured post-industrial sites (brownfields, landfills) from disadvantaged urban areas makes the city more liveable and inclusive and helps to improve the physical and mental health of citizens. NBS6 was, in principle, one of the core implementations in proGIreg. Unfortunately, a number of technical problems arose and, to date, only Zagreb is still planning to implement an NBS6. The corresponding monitoring protocol is reported in Table 6. However, if NBS6 implementations are realised also in Dortmund and Turin, and if time is sufficient, they will be monitored following the same experimental protocol.

Table 7 – NBS6 in Zagreb – new cycling path

NBS monitoring tool	Analysis type	Timing for data collection	Deliverable	FRC effort
NEW CYCLING PATH - Implementation timing: 01/2020 - 12/2020				
B - SOPARC	Pre-Post	Summer 2019 Summer 2022	4.8	**1 PM**
C - Economic impact questionnaire	Post	Summer 2022	4.8	**1 working day**

3.7. NBS7: Establishing protocols and procedures for environmental compensation at local level

ProGIreg's FRC will establish an "environmental tariff" for temporary events taking place in a city (based on duration, public attendance, location, energy consumption, waste production, etc.) to achieve better fundraising for NBS. Implementation of NBS7 is planned in Turin and Zagreb. In Turin, implementation timing is still under definition, while in Zagreb it is planned for 2021. If timing allows, NBS7 economic impact on municipality incomes will be assessed by submitting the Economic and labour impact questionnaire to the municipality. Data could be collected in autumn 2022, with the results reported in D4.8.

3.8. NBS8: Pollinator biodiversity improvement activities and citizen science project

NBS8 consists in the creation of pollinator-friendly green spaces including the possibility of producing honey. Enhancing the presence of pollinators will increase biodiversity in the

green spaces, which will be monitored by citizen science projects related to biodiversity assessement. NBS8 in Turin is already implemented and monitored by UNITO. NBS8 will also be implemented in Dortmund, but it has been not possible to find available trained people to perform the monitoring.

Table 8 – NBS8 in Turin

NBS monitoring tool	Analysis type	Timing for data collection	Deliver-able	FRC efforts
C - Economic im-pact questionnaire	Post	Autumn 2020	4.5	**1 working day**
I - Biodiversity	Continu-ous	Summer 2019 Summer 2020	4.5	

3.9. FRC efforts in contributing to NBS monitoring

A first approximate estimation of the total expected efforts to be sustained by the three European FRC to participate in the monitoring activity of NBS benefits is resumed in the following table, in terms of both personnel costs and direct costs. Consequent to the different local settings of the three FRC, it has been possible to provide only direct costs related to the purchase of air quality (second and third campaigns: 15 € per each gas sensor, analysis included) and temperature sensors (80 € each; the maximum number of sensors required has been taken into account, but will be likely reduced). Assessment at the three spatial levels (city, LL district and NBS) is included. Those activities that do not involve the FRC at all (e.g., GIS data production or the Environmental footprint and Biodiversity monitoring tool) have not been included in the Table.

Nevertheless, as the table only regards netto-efforts on a best case estimation, it only represents part of the overall financial and time effort required of the respective FRC in order to manage WP4. For many activities, intensive preparation and subsequent work are needed. In part, external help will be necessary generating costs. The respective additional work and costs will vary in each FRC according to local settings, but will nonetheless increase the numbers in Table 9.

Table 9 – Expected FRC efforts in NBS level monitoring (PM: person/month; WD: working day; €: EUR for sensors, including analysis in the case of tool E).

	BASE	GQ	NBS monitoring tool						
			A (PM)	B (PM)	C (PM)	D (PM)	E (€ & PM)	F (€ & PM)	G (PM)
Dortmund	2	15	2	3	1	0.2	360 & 0.3	480 & 0.4	0.1
Turin	2	15	3	3	1	0.2	1080 & 0.8	1920 & 1.5	0.4
Zagreb	2	15	3	3	1	--	1080 & 0.8	1920 & 1.5	0.4

4. Indicators for benefit assessment

The Monitoring and Assessment Plan (D4.1[1]) and Protocols of Measurements (present document) proposed by proGIreg WP4 aim to assess the benefits produced by the implemented NBS in four different domains, corresponding to the first four tasks of the WP. Namely, the domains are: assessing socio-cultural inclusiveness (Task 4.1, lead by UNIBA), increased human health and wellbeing (Task 4.2, lead by ISGLOBAL), ecological and environmental restoration (Task 4.3, lead by CNR), and economic and labour market benefits (Task 4.4, lead by SL). The four domains have been defined according to the challenges discussed in the EKLIPSE – EWG report on nature-based solutions evaluation[2]. To describe benefit assessement, the EWG also recommended using specific indicators, which could easily and effectively describe the benefits and simultaneously provide efficient tools for comparing different NBS.

The data collected as previously described and by following the Monitoring and Assessment Plan (D4.1[1]), after having been stored in the proGIreg platform (see D4.2[4]), will then be analysed by the WP4 partners according to their Task responsability. For each of the above-mentioned domains, data analysis will quantify the benefits in terms of specific indicators, which will be calculated starting from the experimental data obtained. These indicators will be the final output of the proGIreg project and will be also used to compare the effectiveness of both the implemented NBS types and the developed monitoring protocols with those tested within the sister projects belonging, together with proGIreg, to EC Taskforce 2 “NBS Impact Evaluation Framework 2.0”.

The indicators that will be obtained based on the proGIreg proposed methodology are listed by domain in the following tables. For each indicator, a short explanation is provided along with the unit and type of data or data source from which it was derived. More information (e.g., method of scoring of all data) will be provided in D4.5 (“Report on benefits produced by implemented NBS”) or D4.8 (“Updated report on benefits produced by implemented NBS”).

Table 10 – Indicators for the socio-cultural inclusiveness.

Indicator	Explanation	Units	Data
Total population	Total number of persons living in the specific area. Indicator should be collected for both the city and LL district level	Number	BASE
Population density	Number of persons per square km of land area. Indicator should be collected for both the city and LL district level	n/(m*m)	BASE
Population growth rate	Average annual rate of change of population size (%). Indicator should be collected for both the city and LL district level	%	BASE
Migration rate	Net number of migrants per 1,000 population. Indicator should be collected for both the city and the LL district scale	%	BASE
Material deprivation rate	Material deprivation rates gauge the proportion of people whose living conditions are severely affected by a lack of resources	%	BASE
Work intensity	% employed out of total economically active population (15-64 years of age, according to the definition of the International Labour Organisation)	%	BASE
Diversity statistics	% foreign born residents (if available, for both scales) or population by ethnicity	%	BASE
Educational attainment	Average level of education completed by the 18 years of age and older population	Number	BASE
Recreational or cultural facilities	Relevant for LL/regeneration level: Number and identification of recreational and/or cultural facilities	Number	BASE
Accessibility of public urban green spaces	% population having access to green space within a 15-minute walking distance or within	%	BASE

	30 minutes' travel time by public transportation[7]		
Dwelling size	Availability of amenities[8]	Number	BASE
Public housing	Percentage of residents in public housing	%	BASE
Burden of housing costs	Average rent/m^2 in ppp; average rental burden[8]	%	BASE
Density of the built environment	Floor Area Ratio (Total floor area divided by total built surface area), or if unavailable, Building Coverage Ratio	%	BASE
Use of green and blue spaces	Change in time spent in natural environments (separate for parks/urban gardens, natural green spaces, agricultural fields, and blue spaces) in spring-summer and autumn-winter	Hours per week	GQ
Connectedness to nature	Sense of connectedness and oneness to nature[9]	Number (total scale score)	GQ
Self-perceived social support/cohesion	State of cohesiveness of society as a whole, measured in terms of individuals[10]	Number (total scale score)	GQ
Mindfulness	Ability of being conscious or aware of something within the environment[11]	Number (total scale score)	GQ

[7] http://www.euro.who.int/__data/assets/pdf_file/0005/321971/Urban-green-spaces-and-health-review-evidence.pdf?ua=1

[8]https://www.researchgate.net/deref/http%3A%2F%2Fwww.gesis.org%2Fen%2Fsocial_monitoring%2Fsocial_indicators%2FData%2FEUSI%2Findex.html)

[9] Mayer, F. (2004). The connectedness to nature scale: A measure of individuals' feeling in community with nature. Journal of environmental psychology, 24, 503-515.

[10] Broadhead, Gehlbach, de Gruy, Kaplan (1988). The Duke-UNC Functional Social Support Questionnaire: measurement of social support in family medicine patients. Medical Care, 26, 709–723.

[11] Feldman, Hayes, Kumar, Greeson, Laurenceau (2007). Mindfulness and emotion regulation: The development and initial validation of the Cognitive and Affective Mindfulness Scale-Revised (CAMS-R). Journal of psychopathology and Behavioral Assessment, 29, 177.

Perceived restorative quality of implemented NBS	Perception of restoration coming from an NBS[12]	Number (total scale score)	GQ
Greenness	Spatial map indicating the presence of green areas for each pixel	Normalized index (10 m pixel)	GIS
Walkability	GIS derived raster image, function of connectivity, accessibility and perceived pleasantness with values ranging from 0 to 1 where 1 indicates the most walkable area (e.g., a park with pedestrian lanes well connected to city hot spots like residential and working areas) and 0 indicates the least walkable area (e.g., a major urban road).	Normalized index (30-1000 m pixel)	GIS
Self-perceived increased restoration	Change in perception of restoration coming from an NBS	Number (total scale score)	A
Self-perceived increase of social interactions and cohesion	Self-perceived change in the quantity and quality of social contacts	Number (total scale score)	A

Table 11 – Indicators for human health and wellbeing.

Indicator	Explanation	Units	Data
Use of green and blue spaces	Time spent in natural environments[13]	Hours/ week	GQ
Visual exposure to green space	The amount of green space in the view from windows at home and the frequency of looking at the view	Number	GQ

[12] Hartig, Korpela, Evans, Gärling (1997). A measure of restorative quality in environments. Scandinavian housing and planning research, 14(4), 175-194.
[13] Nieuwenhuijsen, et al. (2014). Positive health effects of the natural outdoor environment in typical populations in different regions in Europe (PHENOTYPE): a study programme protocol. BMJ Open; 4, 4

Satisfaction with green and blue spaces	Satisfaction (scale 1 to 5) with the green/blue spaces in the neighborhood[13]	Number	GQ
Perceived general health	Self-perceived general health[14]	Number	GQ
Somatization	Somatization (scale 0 to 3) and category (low, moderately high, very high) [15]	Number	GQ
Self-reported mental health and well-being	Mental health and well-being (scale 1 to 6) [14]	Number	GQ
Perceived stress	Perceived Stress Scale (scale 0 to 4) [16]	Number	GQ
Self-reported anxiety	Anxiety (scale 0 to 3) and category (mild, moderate, severe)[17]	Number	GQ
Self-reported depression	Number of participants reporting depression	Number	GQ
Current asthma and/or allergies	Number of participants with asthma or allergy attacks/episode	Number	GQ
Physical activity	Physical activity levels, calculated as the metabolic equivalent of task (MET) minutes per week[18]	MET minutes /week	GQ
Overweight and obesity	Body Mass Index (BMI)-based overweight or obesity	kg/m^2	GQ

[14] Brazier et al. (1992). Validating the SF-36 health survey questionnaire: a new outcome measure for primary care. *BMJ;* 305,160.
[15] Terluin et al. 2006. The Four-Dimensional Symptom Questionnaire (4DSQ): a validation study of a multidimensional self-report questionnaire to assess distress, depression, anxiety and somatization. *BMC Psychiatry;* 6, 34.
[16] Cohen, Kamarck & Mermelstein. 1983. A global measure of perceived stress. *Journal of Health and Social Behavior;* 24, 4.
[17] Spitzer et al. 2006. A brief measure for assessing generalized anxiety disorder: The GAD-7. *JAMA Internal Medicine;* 166, 10.
[18] Lee, Macfarlane, Lam & Stewart. 2011. Validity of the international physical activity questionnaire short form (IPAQ-SF): A systematic review. *International Journal of Behavioral Nutrition and Physical activity.* 8,115.

Visits to and time spent in NBS(s)	Hours/week spent in NBS site(s)[19]	Hours/week	GQ (post only)
Perceived improvement in neighbourhoods	Number of participants perceiving an improvement in the Living Lab neighbourhood	Number	GQ (post only)
Physical activity	Physical activity, calculated as the metabolic equivalent of task (MET) minutes per week, performed in the NBSs[18]	MET-min/week	A
Visits to and time spent in the NBS	Number of visits and hours/visit spent in the NBS[13]	Hours/week	A
Perceived increase in visits to the NBS	Number of participants to report increased visits to the NBS site	Number	A
Satisfaction with the NBS	Score of satisfaction with the NBS[13]	Number	A
Perceived restoration	Score of restorative quality of the NBS[12]	Number	A
Adverse impact NBS	Number of participants reporting an adverse event while in the NBS[20]	Number	A
Use of the NBS	Number of visitors of the NBS per week[21]	Number	B
Activity type within the NBS	Number of visitors by activity types per week[21]	Number	B
Activity level within the NBS	Energy expenditure in the NBS per week, calculated as the metabolic equivalent of task (MET) minutes per week[21]	MET-hour/week	B

[20] Grellier et al. (2017). BlueHealth: a study programme protocol for mapping and quantifying the potential benefits to public health and well-being from Europe's blue spaces. *BMJ Open;* 7, 6.
[21] McKenzie et al. (2006). System for Observing Play and Recreation in Communities (SOPARC): Reliability and feasibility measures. *Journal of Physical Activity and Health;* 3, S1.

Table 12 – Indicators for ecological and environmental benefit assessment.

Indicator	Explanation	Units	Data
Reduction of air pollutants	Potential estimation of pollutant abatment[2,22]	%	BASE
Greenness	Spatial map indicating the presence of green areas for each pixel[23]	Normalized index (10 m pixel)	GIS
Carbon uptake	The estimation of the carbon sequestered by the NBS[2,22]	t C ha $^{-1}$ year^{-1}	D
Reduction of energy demands	The energy not consumed for heating and cooling buildings can be accounted with an estimation of reduction of CO_2 emissions[2,22]	t C year^{-1}	D
NO_2 Removed	Changes on NO_2 concentration within the NBS with respect to control point[2,22]	%	E
O_3 Removed	Changes on O_3 concentration within the NBS with respect to control point[2,22,24]	%	E
Air temperature modification	Changes on day and night average, minimum and maximum temperatures within the NBS with respect to control point[2]	ΔC° / day	F
PM removed	Estimation of PM removed by the green surfaces of the NBS[2,25]	g m^{-2}	G
Equivalent used soil	Total natural soil saved by using the regeneration procedures	m^2	H

[22] Nowak, Crane, Stevens, Hoehn, Walton, (2008). A ground-based method of assessing urban forest structure and ecosystem services 34, 347–358.
[23] Hystad, Davies, Frank, Van Loon, Gehring, Tamburic, Brauer (2014). Residential greenness and birth outcomes: evaluating the influence of spatially correlated built-environment factors. Environmental health perspectives, 122, 1095-1102.
[24] Manes, Marando, Capotorti, Blasi, Salvatori, Fusaro, Ciancarella, Mircea, Marchetti, Chirici, Munafò (2016). Regulating ecosystem services of forests in ten Italian metropolitan cities: Air quality improvement by PM10 and O_3 removal. Ecol. Indic. 67, 425–440.
[25] Sgrigna, Baldacchini, Esposito, Calandrelli, Tiwary, Calfapietra (2016). Characterization of leaf-level particulate matter for an industrial city using electron microscopy and X-ray microanalysis. The Science of the total environment, 548-549, 91-99.

Global warming potential (GWP)	GWP will be expressed on an equivalency basis relative to CO_2	kg	H
Water dependency (WD)	It is the quantity of water needed per kg of food production	m^3/kg	H
Shannon Diversity Index	Measure of species diversity related to species richness[26]	Number	I
Shannon Evenness Index	Measure of species diversity related to species equality[26]	Number	I
Simpson Diversity Index	Measure of species diversity related to species dominance[26]	Number	I
Simpson Evenness Index	Measure of species diversity related to species richness[26]	Number	I

Table 13 – Indicators for economics and labour market

Indicator	Explanation	Units	Data
GDP per capita	GDP (at PPS- Purchasing Power Standards), Euro Gross domestic product (GDP) is a measure for the economic activity. It is defined as the value of all goods and services produced less the value of any goods or services used in their creation. The volume index of GDP per capita in Purchasing Power Standards (PPS) is expressed in relation to the European Union (EU28) average set to equal 100. If the index of a country is higher than 100, this country's level of GDP per head is higher than the EU average and vice versa. Basic figures are expressed in PPS, i.e. a common currency that eliminates the differences in price levels between countries allowing meaningful volume comparisons of GDP between countries.[27]	Number	BASE

[26] Stiling, (1999). Ecology: theories and applications. Prentice Hall, 638.
[27] https://ec.europa.eu/eurostat/web/products-datasets/-/tec00114

Businesses in the area - Industrial	Number of companies of industrial sectors registered in the area per 1,000 inhabitants Industrial sectors are those with codes B-D-F of NACE Rev2 classification (Eurostat)	Number	BASE
Businesses in the area - Commercial	Number of companies in the service sector registered in the area per 1,000 inhabitants Service sectors are those covered by the EU Service Directive (0123/2006)[28]	Number	BASE
Public jobs	Total number of jobs in public sector	Number	BASE
Private jobs	Total number of jobs in private sector	Number	BASE
Public green jobs	Total number of public green jobs Green jobs are those within the environmental economy. These encompass two broad groups of activities and/or products: 'environmental protection' — all activities related to preventing, reducing and eliminating pollution and any other degradation of the environment; 'resource management' — preserving and maintaining the stock of natural resources and hence safeguarding against depletion.[29]	Number	BASE
Private green jobs	Total number of private green jobs	Number	BASE
Qualified jobs	Total number of qualified jobs	Number	BASE
Non-qualified jobs	Total number of non-qualified jobs	Number	BASE
Companies in the green sector	Number of companies with activity in the environmental economy [30]	Number	BASE

[28] https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Tertiary_sector
[29] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Environmental_economy_–_statistics_on_employment_and_growth
[30] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Environmental_economy_–_statistics_on_employment_and_growth

Turnover in the green sector	Companies with activity in the environmental economy; turnover in EUR	EUR	BASE
Employment rate	The percentage of employed persons in relation to the comparable total population[31]	%	BASE
Unemployment rate	The number of people unemployed as a percentage of the labour force, according to the Eurostat/ILO definition[32]	%	BASE
Revenues by household	Average household disposable income **Household disposable income** is the total amount of money households have available for spending and saving after subtracting income taxes and pension contributions.[33]	EUR	BASE
Current property sale value for residential use	Property value, average, EUR/m^2, for single- and collective housing, sale price	EUR/m^2	BASE
Current property rental value for residential use	Property value, average, EUR/m^2, for single- and collective housing, renting (monthly)	EUR/m^2	BASE
Current property value for commercial/ industrial/ office use	Property value, average, EUR/m^2, sale price	EUR/m^2	BASE
Current property rental value for commercial/ industrial/ office use	Property value, average, EUR/m^2, renting (monthly)	EUR/m^2	BASE
Free services	Total number of free public services/amenities: • Parks/green spaces • Public libraries	Number	BASE

[31] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Employment_rate
[32] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Unemployment
[33] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Households_disposable_income

	• Public sports facilities (with free access) • Cultural/civic centres		
Number of tourist visits	Measured as total number of overnight stays in tourism accommodations per year	number	BASE
Number of temporary events	Number of trade fairs, congresses, symposiums, concerts, parades before NBS implementation	number	BASE
Number of foreign students	% of foreign students out of total number of students enrolled in higher education	%	BASE
Retail trade turnover	The Retail Trade Index is a business cycle indicator which shows the monthly activity of the retail sector in value and volume. It is a short-term indicator for final domestic demand.[34]	EUR	BASE
Local taxes	Average local taxes per capita	EUR	BASE
Green investment programmes/funds	Public investment programs, and investment funds	EUR	BASE
Percentage of green jobs	Number of jobs that belong to the categories considered to belong to the environmental economy by Eurostat	%	GQ
Monthly disposable income	Income available each month for spending and saving after discounting taxes and social security. In the case of self-employed respondents, average monthly disposable income also after discounting taxes and social security.	EUR	GQ
Percentage of people renting houses	% of respondents who declare to rent their home.	EUR	GQ

[34] https://ec.europa.eu/eurostat/web/products-datasets/-/teiis200

Population mobility	% of respondents who declare to have moved in the past 1, 2, 5 years. The questionnaire asks the year they last moved.	%	GQ
Rental costs per m^2	Rent that respondents declare to pay by metres declared	EUR	GQ
Volume of new soil created	Volume of new soil created by NBS	m^3	C
Income from soil sold	Income produced from sale of soil by NBS	EUR	C
Number of jobs created to implement NBS	Number of FTEs (full time equivalents) used to construct/implement the NBS	Number	C
Labour costs of the NBS implementation	Labour cost of the construction/implementation of the NBS	EUR	C
Cost of NBS implementation	Cost of the NBS implementation discounting labour costs mentioned above. With breakdown into costs of permissions/licences, construction material and other equipment, land access, machinery rental, usage fees, taxes, etc.	EUR	C
New jobs created post implementation	Number of FTEs created after implementation (i.e. for the long term maintenance of the NBS)	Number	C
Labour costs of long-term maintenance of NBS	Cost of the jobs created to maintain the NBS in the long term.	EUR	C
Maintenance costs of NBS	Total costs of maintaining the NBS, including equipment, electricity, fresh water, plants/fish, taxes, rental of machinery, fees, land access, taxes, etc.	EUR	C

Number of visitors	Number of visitors received per year once the NBS is functioning, as measures/estimated by the organization in charge of maintaining the space (not SOPARC), if available.	Number	C
Extension of new green area created (m^2)	Extension of new green area created	m^2	C
Annual energy consumption per year of buildings	Energy consumption (for heating and cooling) of buildings where NBS (green roof/wall) are to be installed in each of the 5 years previous to NBS implementation and each year after implementation (based on utility bills)	kwh	C
Volume of food production	Volume of food production of the new NBS. Also breakdown into type of food, production method (organic/conventional) will be needed.	kg	C
Value of food sold (euros)	Income obtained from the sale of the food produced (honey, fruits/veg, fish, etc). If no income produced- market value of food produced and distributed by other means (donation, sharing, etc).	EUR	C
Bike lane extension created (km)	Length of bike lane added to the city network.	km	C
Area of river bank converted to beach (m^2)	Area of river bank converted into new usable space.	m^2	C
Renewable energy produced	Energy produced by NBS1. Also breakdown of: energy used and energy sold to the grid.	kWh	C
Value of energy produced	Value of the energy produced both in terms of cost avoidance (consumed) and value of energy sold.	EUR	C
Income produced by NBS7	New income streams produced by NBS7 implementation, with breakdown of typology/origin.	EUR	C