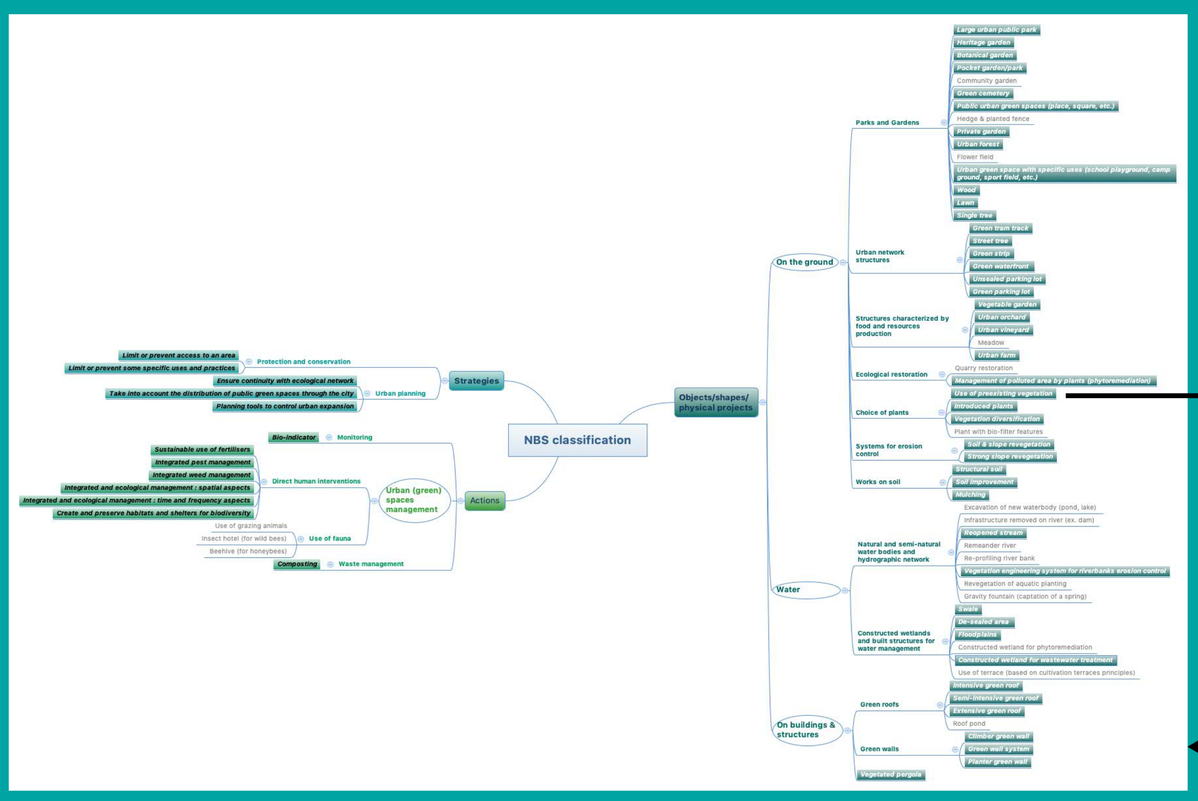
NATURE 4 CITIES

A knowledge diffusion and decision platform for renaturing cities

N4C knowledge databases and NBS frameworks

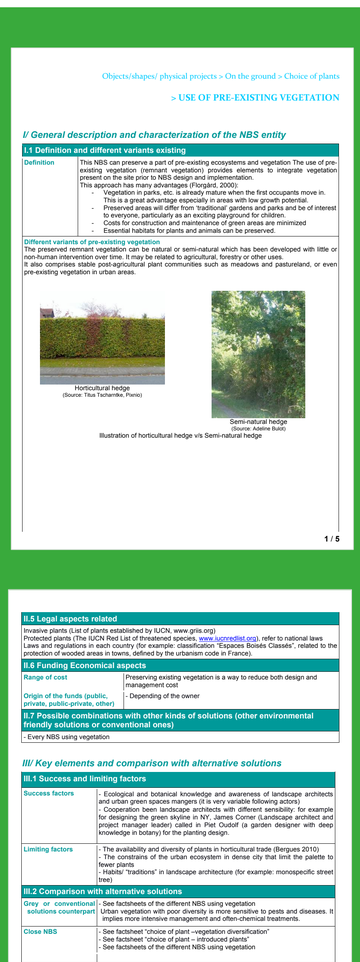
N4C NBS typology

A NBS classification based on solutions' nature has been built so that to structure knowledge and enable to have a global view of all NBS



NBS catalogue

57 NBS have been fully documented
For each one: a description of the solution is given, the challenges it adresses are identified, as well as the stakeholders, enablers and barriers to implementation…



Objects/shapes/ physical projects > On the ground > Choice of plants

> USE OF PRE-EXISTING VEGETATION

I/ General description and characterization of the NBS entity

I.1 Definition and different variants existing

Definition

This NBS can preserve a part of pre-existing ecosystems and vegetation The use of pre-existing vegetation (remnant vegetation) provides elements to integrate vegetation present on the site prior to NBS design and implementation.
This approach has many advantages (Florgård, 2000):
- Vegetation in parks, etc. is already mature when the first occupants move in. This is a great advantage especially in areas with low growth potential.
- Preserved areas will differ from 'traditional' gardens and parks and be of interest to everyone, particularly as an exciting playground for children.
- Costs for construction and maintenance of green areas are minimized
- Essential habitats for plants and animals can be preserved.

Different variants of pre-existing vegetation

The preserved remnant vegetation can be natural or semi-natural which has been developed with little or non-human intervention over time. It may be related to agricultural, forestry or other uses.
It also comprises stable post-agricultural plant communities such as meadows and pastureland, or even pre-existing vegetation in urban areas.

Horticultural hedge
(Source: Tiua Tscharnke, Pixnio)

Semi-natural hedge
(Source: Adeline Bulot)

Illustration of horticultural hedge v/s Semi-natural hedge

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Remnant hedges preserved in urban areas
(Source: H. Daniel)

Suburban areas with horticultural hegdes
(Source: Ramblersen, Wikimedia commons)

Illustration of suburban areas with planted horticultural hedges v/s trees or preserved semi-natural hedges in a landscape planning

Semi-natural space (ex: urban park)
(Source: Mtzt, Wikimedia commons)

Botanical garden
(Source: Creative commons)

Illustration of semi-natural space v/s botanical garden

I.2 Urban challenges and sub-challenges related + impacts

Main challenges and sub-challenges targeted by the NBS	04) Biodiversity and urban space > 04-1 Biodiversity 07) Public Health and well-being > 07-2 Quality of life	- Increase of biodiversity - Provide a habitat for birds and insects, and other animals - Aesthetic value - Contact with nature - Support for education
Co-benefits and challenges foreseen	01) Climate Issues > 01-1 Climate mitigation > 01-2 Climate adaptation 2) Water Management > 02-1 Urban water management 03) Air quality > 03-2 Air quality locally 04) Biodiversity and urban space > 04-1 Biodiversity > 04-2 Urban space development and regeneration > 04-3 Urban space management	- By already grown plant acts in favour of urban heat island reduction and helps filter air and water pollutants - Keeping vegetation is in favour of carbon sequestration
Possible negative effects	07) Public Health and well-being > 07-3 Health	- Presence of undesired insects - Presence of weeds - Allergies

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II/ More detailed information on the NBS entity

II.1 Description and implication at different spatial scales

Scale at which the NBS is implemented	The object: a green space. The district: diversity of plants for example can be done at the quarter scale in order to diversify ecological habitats (forests, open herbaceous areas, …) The city: planning of green infrastructures
Impacted scales	The 3 scales impacted Regional scale is also impacted when ecological connectivity is ensured

II.2 Temporal perspective (including management issues)

Expected time for the NBS to become fully effective after its implementation	Immediately when the pre-existent vegetation is conserved.
Life time	It depends on several factors: - The protection measures implemented to preserve plants during the urban works. - For rural plants integrated in a city - Long term, it depends mainly on vegetation management
Sustainability and life cycle	This type of vegetation is often more resilient
Management aspects (kind of interventions + intensity)	This type of vegetation most often requires a continuation of previous management conditions, the most often of low intensity.

II.3 Stakeholders involved / social aspects

Stakeholders involved in the decision process	- Owners, co-owners (in case of a joint ownership property) - Users of public areas - Municipality
Technical stakeholder's networks	- Landscape architects - Landscape planners at the city scale - Specialized green spaces management firms, horticulturist and gardeners. - Naturalists' NGO - horticultural producers
Social aspects	Environmental education, Awareness campaign, training, participatory process, nature conservation

II.4 Design / techniques/ strategy

Knowledge and how-know involved	- Selection of plant adapted to: • challenges targeted • the traffic intensity (the level of perturbation) - Vegetation management - Botanical skills - Landscape architecture and landscape planning skills
Materials involved	- Inventory of existing plants - Maps of ecological habitat

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II.5 Legal aspects related

Invasive plants (List of plants established by IUCN, www.griis.org)
Protected plants (The IUCN Red List of threatened species, www.iucnredlist.org), refer to national laws Laws and regulations in each country (for example: classification "Espaces Boisés Classés", related to the protection of wooded areas in towns, defined by the urbanism code in France).

II.6 Funding Economical aspects

Range of cost	Preserving existing vegetation is a way to reduce both design and management cost
Origin of the funds (public, private, public-private, other)	- Depending of the owner

II.7 Possible combinations with other kinds of solutions (other environmental friendly solutions or conventional ones)

- Every NBS using vegetation

III/ Key elements and comparison with alternative solutions

III.1 Success and limiting factors

Success factors	- Ecological and botanical knowledge and awareness of landscape architects and urban green spaces mangers (it is very variable following actors) - Cooperation been landscape architects with different sensibility: for example for designing the green skyline in NY, James Corner (Landscape architect and project manager leader) called in *Piet Oudolf* (a garden designer with deep knowledge in botany) for the planting design.
Limiting factors	- The availability and diversity of plants in horticultural trade (Bergues 2010) - The constrains of the urban ecosystem in dense city that limit the palette to fewer plants - Habits/ "traditions" in landscape architecture (for example: monospecific street tree)

III.2 Comparison with alternative solutions

Grey or conventional solutions counterpart	- See factsheets of the different NBS using vegetation Urban vegetation with poor diversity is more sensitive to pests and diseases. It implies more intensive management and often-chemical treatments.
Close NBS	- See factsheet "choice of plant –vegetation diversification" - See factsheet "choice of plant – introduced plants" - See factsheets of the different NBS using vegetation

IV/ References

IV.1 Scientific and more operational references (presented jointly)

Florgård C. 2009. Preservation of original natural vegetation in urban areas : an overview. In Ecology of Cities and Towns : a Comparative approch, Ed M.J. McDonnell, A. Haas & J. Breuste, Cambridge University Press, pp 360-398

Lososová, Z., Chytrý, M., Tichý, L., Danihelka, J., Fajmon, K., Hájek, O., … & Řehořek, V. (2012). Native and alien floras in urban habitats: a comparison across 32 cities of central Europe. Global Ecology and Biogeography, 21(5), 545-555.

List of plants established by IUCN, www.griis.org

The IUCN Red List of threatened species, www.iucnredlist.org

Trees in Hard Landscape – A guide for delivery, 2014. Trees and Design Action Group.

UFEI - SelecTree: A Tree Selection Guide: hpds://www.selectree.calpoly.edu

IV.2 Sources used in this factsheet

Florgård, Clas. « Long-term changes in indigenous vegetation preserved in urban areas ». Landscape and Urban Planning 52(2): 101 16

Bergues Martine, 1992. Actes des pépinières, arbres des paysages : une étude de logiques professionnelles, SRETIE Ministère de l'Environnement / Ecole Nationale Supérieure d'horticulture / Ecole Nationale Supérieure du Paysage, Rapport final, 174 pages.

Bergues, Martine. 2010. "Fleurs jardinières et fleurs feuristes." *Ethnologie française* 40 (4): 649–56. https://doi.org/10.3917/ethn.104.0649.

Hitchmough, James. 2011. "Exotic Plants and Plantings in the Sustainable, Designed Urban Landscape." *Landscape and Urban Planning at 100* 100 (4): 380–82. https://doi.org/10.1016/j.landurbplan.2011.02.017.

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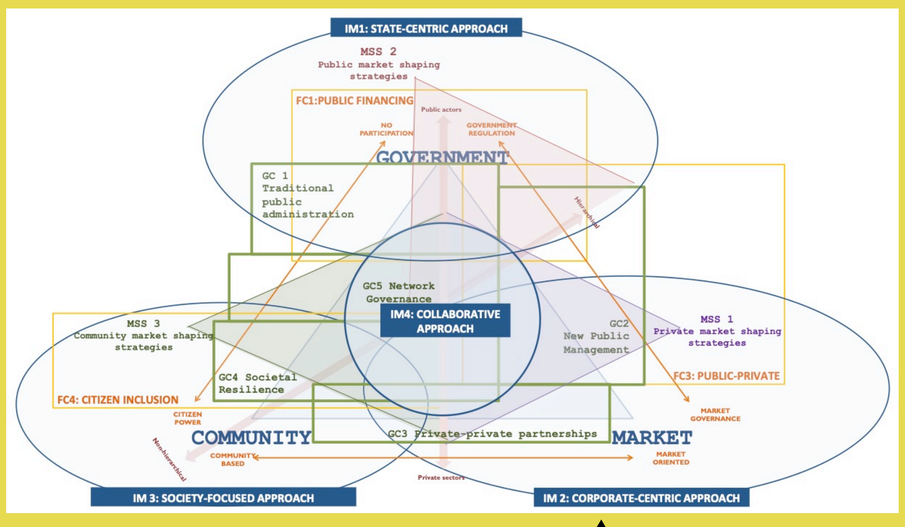
Implementation Models

Implementation Models (governance models, financing schemes and business models) have been classified according to their capacity to overcome barriers, to become drivers of NBS implementation and to be adapted to different social, economic, cultural and regulatory contexts

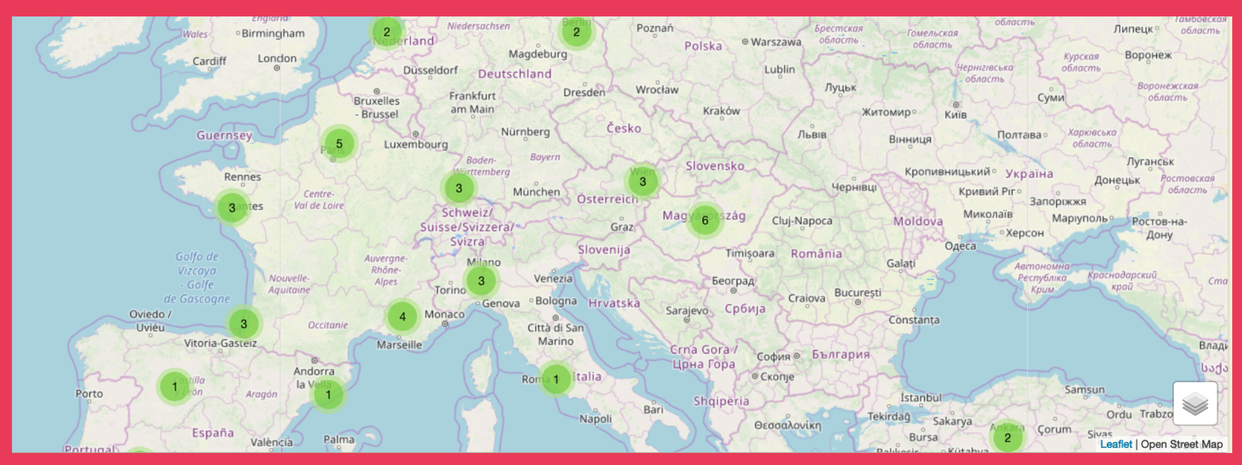


Urban Challenges

11 urban challenges and 25 sub-challenges have been identified, as well as Key Performance Indicators (KPI) and tools to assess NBS impacts on the challenges

Project database

Projects have been selected with regards to their pioneer feature or because the present a interesting implementetion model. They have been documented and gathered in a database. They are also in OPPLA NBS database



NATURE 4 CITIES

Analysis grid for the documentation of NBS pioneer cases

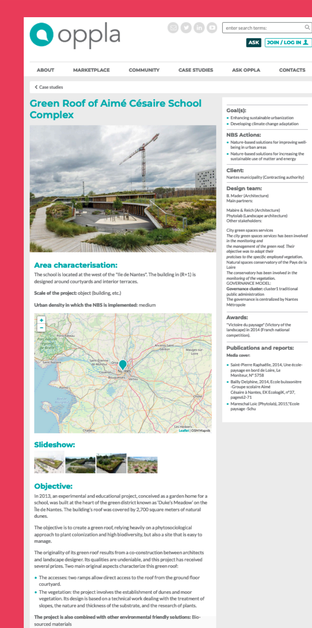
Reference of the case	IT 4

I. General description of the pioneer NBS

I.1 Identity – main elements

Title	**Flood retention basins of Lura river – Milan**			
A short description of the NBS	Milan's metropolitan region is affected by severe flooding during heavy rain events because of the high sealing rate of urban areas and increasing effects of climate change. Among several measures planned by the regional government there is a wide retention area that has been planned as flood control device, which also creates high quality natural areas and reconnects slow-mobility routes and recreational spaces inside the Lura Valley park. The project consists of the implementation of two rolling basins connected by an open air ditch and a pond filled with ground water. The basins will be temporarely flooded by Lura river during intense rainy periods through natural inlet from the river bed, whilst the pond will recharge constantly the ditch to maintain wetland vegetation all over the year to guarantee its phytodepuration functions. The balance of ground movements within the project is null as the volumes excavated are reused to create mounds and dikes. Wide areas of the river banks and plains have been upgraded through afforestation with native species.			
Ref. photos	IT 4 1	IT 4 2	IT 4 3	
NBS Types	Objects Shapes	Water	Constructed wetlands and built structures for water management	Constructed wetland for phytoremediation

Location	Country: Italy	City: Milan	
	Street or location: Lomazzo/Cadorago		
	Geographic coordinates	Latitude: 45,6967 Longitude: 9,03427	
State of progress of the project: Project delivered			
Dates (for project delivered): 2017			



> 6 leading Research and Technology Organizations

NOBATEK/INEF4 (FR) – Coordinator
Cerema (FR), Tecnalia (ES), Eurecat (ES), Cartif (ES), Luxembourg Institute of Science & Technology (LU)

> 4 universities

University of Nantes / IFSTTAR (FR), Agrocampus Ouest (FR), University of Szeged (HU), Middle East Technical University (TR)

> 2 leading industrial organizations

Acciona Construction (ES), Acciona Ingeneria (ES), Rina Consulting (IT)

> 9 Small and Medium-sized Enterprises (SMEs)

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

> 2 clusters of stakeholders

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

> 4 pilot cities

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

Join the community!

www.nature4cities.eu

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