



INTEGRATING NATURE-BASED SOLUTIONS IN URBAN PLANNING

The proportion of the world's population living in cities continues to grow. We can expect extreme weather events to occur at a greater frequency as climate change continues. These projections create considerable challenges in planning for the world's urban areas. Greater use of natural elements in urban planning can help us meet these challenges, while providing multiple benefits that traditional engineering cannot.

Nature-based solutions¹ (NBS) have the potential to address challenges with:

- **WATER FLOW REGULATION AND FLOOD CONTROL**
Vegetation and natural basins provide water storage capacity and transport when linked to natural drainage systems, and provide protection against damages caused by intense rain events that are generally aggravated by impervious surfaces.
- **CLIMATE REGULATION**
Especially at lower latitudes, urban green spaces provide shading and help ameliorate the effects of high temperatures.
- **PROVISION OF SUFFICIENT CLEAN WATER**
Plants and soil organisms in catchment areas and along water bodies have the capacity to retain sediments, as well as absorb and decompose water pollutants.

- **HEALTH PROBLEMS IN RELATION TO SEDENTARY LIFE**
Urban and peri-urban green spaces are highly valued as settings for physical activity and outdoor recreation.
- **HEALTH PROBLEMS IN RELATION TO URBAN LIVING**
Living in an urban environment is a known risk factor for psychiatric diseases, mainly associated with social stress, which can even exceed the negative health effects of noise and pollution. NBS in city plans can also provide opportunities for actions that can counteract sources of social stress.
- **DISCONNECTION OF THE URBAN POPULATION FROM AND LACK OF KNOWLEDGE ABOUT NATURE**
Green infrastructure that is accessible to schools and the public provide opportunities for observing and learning about plants, animals and their physical environment.
- **ACCESS TO FOOD AND ECOLOGICAL FOOTPRINT**
Concerns regarding food security, carbon footprint and the loss of the connection to food production have prompted a growing interest in locally produced food. Urban agriculture is a NBS with the potential to provide multiple benefits if well integrated into urban planning
- **JOB OPPORTUNITIES IN URBAN AREAS**
NBS design requires knowledge generation about functioning (biological, ecological, hydrological) of natural elements, technical development to address problems related to the establishment, and maintenance of NBS structures.

1 <http://dx.doi.org/10.2777/765301>

KEY MESSAGES

- NBS represent a 'pro-active' approach to the planning and management of green infrastructure in urban areas.
- In urban areas the focus of NBS is on societal needs:
 - Urban health care: accessibility to urban green spaces that increase physical activity.
 - Urban liveability: including urban health care, comfort (air, noise, temperature), social cohesion.
 - Urban climate change.
 - Socio-economic benefits: employment and co-benefits, including increase of property values, improvements in labour productivity, reductions of social inequality, and improvements in environmental quality.
- NBS are not just about utilizing nature. If nature or natural processes in the area are overutilized to produce NBS, it can destroy the very basis of NBS resulting in failure of the concept.
- NBS can and should be developed in a way that is based on the multifunctionality of green infrastructure.
- With well-planned NBS, green infrastructure is well connected and it preserves the important nature areas from the point of view of biodiversity. Thus, NBS can also improve ecosystem health.

NATURE-BASED SOLUTIONS TO WHAT?

Examples from selected urban cases around Europe

CHALLENGE: MANAGING URBAN SURFACE WATER FLOWS

Planners in **VITORIA-GASTEIZ, SPAIN** restored a river ecosystem along one of the city's main urban arteries, improving the city's sewage system and enhancing the city's ecological resilience. The Avenida Gasteiz project, whose implementation began in 2014, redirected a portion of the Avendaño River such that it now flows at the surface along a central promenade. This river restoration will both slow storm water flows and prevent clean rainwater from entering the sewage system. The new green corridor will promote urban biodiversity by increasing habitat and its connectivity within the city and its surrounding areas.



River restoration action.
Source: Vitoria City Council

CHALLENGE: LOCAL FOOD, HEALTH CARE AND EMPLOYMENT

Developers and planners for a proposed extension to the Helsinki metro area in **SIBBESBORG, FINLAND** will employ "Green Care" to provide unique place identity and local livelihoods for the new area. Green care is the use of agricultural farms and nature for interventions promoting mental and physical health. The Majvik biodynamic farm in Sipoo, near Helsinki, already offers green care opportunities, and provides an example for future facilities. Planners will attract further green care entrepreneurship by allocating land to local food production adjacent to dense urban development and establishing a logistics centre for supplying the local food market.



Green care activity.
Source: Sipoo Municipality

CHALLENGE: REMOVING SOIL POLLUTANTS

Urban planners in **OSLO, NORWAY** constructed a park along the Alna River in a former heavy industrial site. Rather than simply covering the polluted sediments or transporting dredged sediments to an appropriate landfill, city officials were able to save money by using phyto-remediation. Willows (*Salix* species) planted on contaminated soils absorb heavy metals and other pollutants in their tissues as they grow, while microorganisms associated with tree roots break down dangerous oil derivatives. After three years, the willows were harvested and removed. The area was then covered with topsoil and planted with various grasses and ornamental trees.



Phyto-remediation site.
Picture: Wikimedia Commons

CHALLENGE: MATERIAL AND ENERGY EFFICIENCY

The municipality of **TRNAVA, SLOVAKIA** approved a "Climate adaptation strategy" in January 2015, including establishing small grants for local inhabitants and NGOs. Municipal planners are actively promoting green urbanism and green architecture that decreases land use, raw material consumption and energy requirements of urban buildings while simultaneously providing additional benefits from natural surroundings. These concepts consider local terrain conditions and local materials in design and construction, energy efficiency of buildings, green roof gardens, vertical gardens (green walls), interior and exterior greenery and water management measures (water retention and irrigation components).



Green atrium in Trnava.
Source: Trnava City Council

CHALLENGE: COMBATING THE NEGATIVE HEALTH EFFECTS OF HEATWAVES

The **BARCELONA** City Council in **SPAIN** recently initiated the transformation of a very important traffic node of the city into a large (13 ha) urban park. The "canòpia urbana" (urban canopy) project won an international design contest for Barcelona's Glòries square, going beyond traditional park design by incorporating micro-climate regulation and biodiversity as key design aspects. The new park will feature a dense tree canopy cover in some areas in order to provide substantially cooler conditions inside the park, especially during summer time. The project aims to boost urban biodiversity by creating specific habitat conditions within the park called biodiversity pearls.



Canòpia Urbana project.
Source: Barcelona City Council

OTHER EXAMPLES OF URBAN CHALLENGES AND POSSIBLE NATURE-BASED SOLUTIONS

Challenges

1. ADDING AESTHETICS.
2. IMPROVING COMMUNITY COHESION AND RECREATIONAL OPPORTUNITIES.
3. RAISING ENVIRONMENTAL AWARENESS OF ECOSYSTEMS' ROLE IN FOOD PRODUCTION.

1. ADAPTATION TO FUTURE CLIMATE CHANGE IMPACTS IN THE AREA.
2. ENSURING ECOLOGICAL RESILIENCE.
3. PREVENTION OF UNCOMFORTABLE LOCAL CLIMATE CONDITIONS.
4. PROTECTION OF PEOPLE FROM NOISE AND AIR POLLUTION EMISSIONS.

1. ENHANCING PHYSICAL AND MENTAL HEALTH AND WELL-BEING OF RESIDENTS.
2. PROVIDING PLACE ATTACHMENT OPPORTUNITIES.
3. SAFEGUARDING HISTORICAL AND CULTURAL VALUES.

Nature-based solutions

- Community gardens (herbs, vegetable, fruit, ornamental plants, flowers, etc.)
- Community fishing areas (fishing ponds)
- Productive and educational farming plots in vacant areas of the city – fields, meadows, pastures, orchards
- Recreational forests with limited economic utilisation (e.g. urban forests)

- Interior and exterior greenery as a climate regulation factor
- Green roof gardens, vertical gardens (green walls)
- Inclusion of terrain in construction design, i.e. buildings partly embedded into the ground / composed into terrain
- Water management measures on vacant areas – terrain arrangements, percolation components, greenery as a factor against evaporation, water retention, irrigation, soil structure improvement...
- Small water bodies within the public greenery areas: runoff retention, promotion of natural purification capacity of water
- Retention areas and polders at selected locations, designed for flooding
- Completion of functional greenery system within the city: Core greenery areas (distance to < 500 m, area at least 2 ha, tree cover at least 60%), interconnection through the line elements (corridors)
- Ecological network promotion: linking the landscape and urban green and blue areas through the linear components – alleys, hedges, riparian vegetation, ecoducts (green bridges), etc.
- Ecological restoration of watercourses, restoring of riparian vegetation (mainly outside of built-up areas), revitalization of watercourses within urban areas
- Domestic deciduous trees preference during the reconstruction of urban vegetation and replanting (min. 85% share)
- Revitalization of brownfields and abandoned areas, increase of natural components (restoration to natural biotopes)
- Vegetation wind-barriers (windbreaks, tree belts) – planting especially in windward locations
- Isolation greenery, green noise barriers and walls

- Health parks (ranches, farms, gardens) – designed to ecotherapy, zootherapy, hypotherapy
- Meditation gardens, health gardens – designed to psychotherapy, aromatherapy, rehabilitation
- Recreational forests (e.g. urban forests) and parks, recreational and educational facilities with a natural character
- Public green areas – parks with infrastructure, rest areas with a high quality landscape-architectural adjustment
- Children playgrounds with greenery and nature-friendly constructions and elements
- Areas supporting historical identity and genius loci based on natural elements (including sightseeing spots)
- Protection and reconstruction of historical green areas (parks, gardens, alleys, valuable trees, etc.)
- Protection of greenery within the sacral areas (calvary, monasteries and church gardens) – reconstruction, restoration, adaptation

HOW TO OVERCOME LIMITATIONS OR BARRIERS FOR INCORPORATING NATURE-BASED SOLUTIONS IN URBAN PLANNING

To get acceptance for NBS in planning cultures, a transition from the traditional grey planning towards planning with a nature approach is needed. Urban interventions using NBS need a long-term perspective to comprehend the benefits of NBS compared to grey solutions. The inherent nature of NBS is that they become better over time while the grey solutions tend to decline in time requiring more expensive maintenance. Also the lack of coordination between administrations could lead to unwilling trade-offs, i.e. maladaptation, overspending, inefficient use of resources, and redundant investment.

There are several ways to overcome these various barriers:

- Use regulations, e.g. by applying a green norm of 10 m²/person within 400 m or e.g. green roofs in local building codes.
- Invest in information and awareness raising about NBS benefits and co-benefits.
- Disseminate best practices and develop good narrative for them (before and after situations).
- Require more research on quantitative effects of NBS.
- Demonstrate scenarios to inspire discussion at local levels.
- Pay attention to the process of implementation (the co-operation of all stakeholders).
- Communicate the benefits of NBS approach for instance with good case examples.
- Lead by example in the public sector.
- Share information, practical guidance, databases and examples with everyone.
- Find financial support.
- Identify pioneers or pioneer groups.
- Consider NBS as a new paradigm, advocate NBS as 'normal', 'basic' or 'essential' and change the mindset.
- Look for and share success stories and good examples.
- Inform stakeholders on valuation tools.
- Plan and design multifunctional areas.
- Find an efficient way how to multiply small-scale projects.
- See the benefits in real life and help other people to see them, too.

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