

# A methodology for the assessment of urban regeneration projects through nature-based solutions

The use of nature-based solutions (NbS) in urban regeneration processes has increased in the last years, not least due to their potential to serve as multifunctional solutions to address multiple challenges in parallel. NbS can, for example, increase the resilience of the built environment by reducing the exposure to natural hazards while also contributing to improved environmental quality, socio-economic well-being, and human health and well-being. At the same time, this multifunctional character also presents challenges in terms of measuring and evaluating NbS impacts.

In the CLEVER Cities project, the city of Madrid has developed a comprehensive strategic framework for assessing urban regeneration impacts resulting from NbS implementation (**Figure 1**). This framework aims to serve as a replicability guide arising out of the methodology implemented in a specific project - “Del Río a Pradolongo”. Ultimately, the assessment framework can be used as a cross-sectional evaluation tool that provides a continuous learning method between all of the parties involved.



**Figure 1:** A framework for a replicable methodology creation

## Replicable strategic assessment framework

The assessment framework’s methodology is structured along three axes: governance, environment, and human health and well-being. The foreseen evaluation is based on an iterative five-phase process, based on collaboration and collective intelligence (**Figure 2**).

The first 3 phases of the evaluation are focused on the selection of Key Performance Indicators (KPIs), which serve as a basis to propose the

three axes assessment framework. A review of available resources, performed activities, and products related to those activities make up the baseline research, upon which the KPIs are selected. The evaluation is performed in two fundamental areas: the design process and the benefits and co-benefits of the NbS implementation (phase 1). Phase 2 then enables the definition of indicators through a self-evaluation process, involving different expert groups





Figure 2: Five-phase strategic assessment framework

from the project. Phase 3 consists of the the evaluation of the indicators, through different expert groups: governance indicators, environmental indicators, socioeconomic indicators, and health indicators (Table 1).

The last two phases of the assessment framework involve conducting an analysis to evaluate critical relationships across all actors involved in the NbS. The main purpose is to understand the interconnectedness between the different actors and the NbS implementation, in terms of stakeholder function, experience, and influence level (Figure 3). Spaces

for interorganizational collaboration need to be built to promote these connections and give legitimacy to these new collaboration models. This phase is more of an iterative process than a linear methodology due to the involvement of multiple variables as well as the impacts of the technical, economic, and social spheres of an entire community. The replicability of this assessment framework, therefore, also relies on an evaluation of these multiscalar and multi-layered relationships as well as a sound understanding of social innovation as a transversal element to the whole process, and collaborative governance as a management model.

GOVERNANCE	Capacity innovation and interdisciplinarity	Legal/Financial framework	Organizational Framework		
	<ul style="list-style-type: none"> <li>• Citizen participation</li> <li>• External experts</li> <li>• Gender perspective</li> <li>• Public worker training</li> <li>• Co-leadership</li> </ul>	<ul style="list-style-type: none"> <li>• Legislative framework support</li> <li>• Inter-sectoral coordination</li> <li>• Financial support</li> </ul>	<ul style="list-style-type: none"> <li>• Multidisciplinary integration</li> <li>• Role definition clarity</li> <li>• Continuous evaluation</li> <li>• Intersectorial impact definition</li> <li>• Definition of Specific objectives</li> <li>• Result transfer</li> </ul>		
ENVIRONMENTAL	Public Space Use	Surface Treatment	Shading	Vegetation & Biodiversity	Water
	<ul style="list-style-type: none"> <li>• Road Traffic Index</li> <li>• Parking Index</li> </ul>	<ul style="list-style-type: none"> <li>• Albedo coefficient</li> <li>• Biotic Soil Index</li> </ul>	<ul style="list-style-type: none"> <li>• Shading Density Index</li> <li>• Shade density in residential areas</li> <li>• Shading Index in Pedestrian Traffic</li> <li>• Global Shading Index</li> <li>• Spatial Perception Index</li> </ul>	<ul style="list-style-type: none"> <li>• Plant Occupation Index in Public Space</li> <li>• Spatial Perception Index</li> <li>• Species Diversity Index</li> </ul>	<ul style="list-style-type: none"> <li>• Mean Runoff Coefficient</li> <li>• Pollutant Vulnerability Index</li> </ul>
SOCIOECONOMIC & HEALTH	Neighbourhood scale Mobility	Climate Change Adaptation	Identity, sense & use	Maintenance & Safety	Social Diversity & Cohesion
	<ul style="list-style-type: none"> <li>• % of pedestrian area</li> <li>• Public transport line</li> <li>• Access to public space</li> </ul>	<ul style="list-style-type: none"> <li>• Public space Quality</li> <li>• Green reas</li> <li>• Acoustic comfort</li> <li>• Thermal comfort</li> </ul>	<ul style="list-style-type: none"> <li>• Public space use</li> <li>• Participatory process quality</li> <li>• Intergenerational exchange</li> </ul>	<ul style="list-style-type: none"> <li>• Lightning</li> </ul>	<ul style="list-style-type: none"> <li>• Commercial activity</li> <li>• Consumption pattern change</li> <li>• Job creation</li> <li>• Additional financing</li> </ul>

Table 1: Key Performance Indicators matrix, based on the three indicator groups

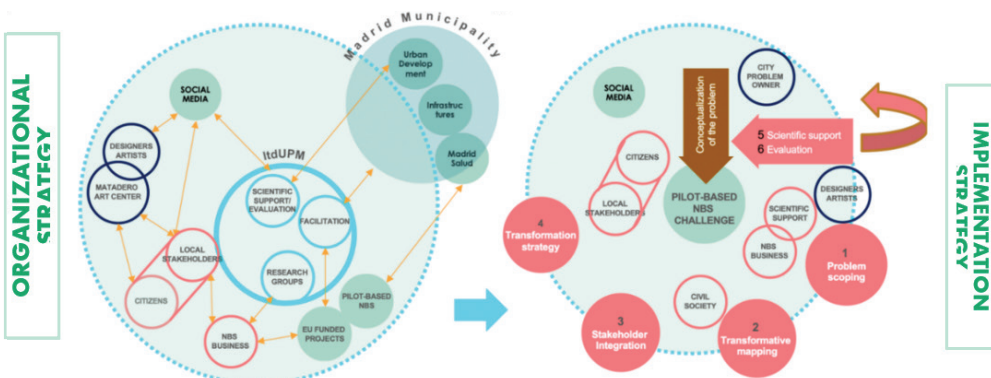


Figure 2: Five-phase strategic assessment framework