GREEN SPACE MANAGEMENT

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7 RECOMMENDED INDICATORS OF GREEN SPACE MANAGEMENT

7.1 Green space accessibility

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Green space accessibility	Green Space Management
Description and	Public green and blue spaces (referred to as “green space” for simplicity) have positive impacts on quality of life and wellbeing (see e.g., Baidu at al., 2016; Chiesura et al., 2004). Different

justification	types of green spaces such as urban parks and gardens (including community gardens), cemeteries, sportsgrounds, public plazas, urban forests, orchards, arable lands, undeveloped lands, and other partly or completely vegetated areas demonstrated capacity to clean air, cool local temperature and manage surface runoff. Urban green space also plays a role in increasing the value of local real estate (Roebeling et al. 2017). The environmental, ecological and social benefits of urban green spaces are strongly influenced by green space size and their accessibility in terms of distance and travel time. Publicly accessible green spaces provide opportunities for a wide range of different types of nature-based recreational activities, which have been shown to deliver multiple co-benefits (e.g., Eigenschenk et al., 2019; Triguero-Mas et al., 2017). Green space accessibility is an important metric to evaluate the potential for the realisation of recreational opportunities and related co-benefits. Accessibility of green space can also be used to evaluate the relative success of urban greening policies focused on the provision of and equal access to urban green spaces, and to assess NBS co-benefits as a function of distance from accessible public green space. Many methods for the evaluation of accessibility are available (Handy and Niemeier, 1997). Here, we propose **a simplified cumulative measure** (Páez, Scott and Morency, 2012) based upon the World Health Organisation Regional Office for Europe recommendations related to urban green space accessibility for public health (WHO, 2016) and European Common Indicator of the availability of local public open areas and services (Lavalle et al., 2002).
Definition	Proportion of the population living within a 300 m maximum linear distance to the boundary of urban green spaces of at least 0.5 ha in size.
Strengths and weaknesses	+ Rapid and relatively simple method - Occasional lack of accurate data
Measurement procedure and tool	Data processing using QGIS (or other GIS software) has been designed to obtain one KPI value for the whole city. **Steps:** 1. Identify and map arrival points of public green, blue and blue/green spaces equal to or greater than 0.5 ha in size. Data can be provided by the relevant municipality or derived from publicly available land cover maps (e.g., Urban Atlas or Open street maps). 2. Identify and map buildings or census blocks (departure points). Data can be provided by the municipality or national/international statistics institutes.

3. Define circles with radii 300 m from the access point(s) to each identified public green space. This 300 m distance most likely represents a walk of five (Natural England) to 15 (European Common Indicator[5]) minutes, depending on walking pace.
4. Using census area or similar data, determine the total number of residents within all the mapped 300 m walking distance circles.

Alternative method:

1. Spatially join each (building) departure point to its nearest park access point (tool Distance to the nearest hub). As a result, a new shape-file is obtained with an attribute field containing the shortest distance to the closest park.
2. Classify proximity to the parks. Tamosiunas et al (2014) classified the distance to the closest park using a tertiles method. The resultant three categories classify proximity as high, moderate and low based upon distance (shown as an example):

Proximity category	High	Moderate	Low
Distance (m)	≤347.8	347.8-629.6	>629.6

To obtain this KPI in terms of walking time, the Field calculator tool can be used. A conversion factor has to be set to measure a pedestrian walking speed (Bosina & Weidmann, 2017). For example, the average pedestrian walking speed in Spain is 1.59 m/s, or 95.4 m/min. The distance value in minutes can be obtained by diving the distance in metres by the distance walked per minute. Note that it is generally not possible to walk in a completely straight line "as the crow flies" in urban areas. Thus, estimates of walking times based upon linear distances between two points in built-up urban areas (e.g., point of departure from building A to point of access to park B) are unlikely to be highly accurate.

Complementary data that may be useful in contextualizing the green space proximity index:

[5] "*The European Environment Agency, DG Regional Policy and ISTAT (Italian Istituto Nazionale di Statistica) all use the concept 'within 15 minutes' walk' to define accessibility. It may reasonably be assumed that this corresponds to around 500 m walking distance along roads or pathways on foot for an elderly person, which in turn may be equivalent to 300 m linear distance used in the European Common Indicators*" (Ambiente Italia Research Institute, 2003. Pages 79 and 185.).

	• City level descriptive statistics: It will measure the impact of the NBS at municipal level: Overall statistics can also be calculated by a QGIS tool called Basic statistics for numeric fields. As a result a set of measures is derived: o Descriptive statistics in terms of distance and travel time: ▪ Minimum / maximum distance to the closest park (m) ▪ Average distance to the closest park (m). o Statistics regarding number of inhabitants from each defined starting point (building) are also useful to contextualize the index. ▪ Number of people that live in the proximity of the facility ▪ Proportion of people having the closest park in the high, moderate or low proximity category. • District level descriptive statistics: A neighborhood level study is also recommended in order to find deficient areas in greenspace availability, or probability of overcrowded green areas.
Scale of measurement	District scale to city scale
Data source	
Required data	• Size, location and types of green spaces, including public accessibility (land use maps, green space maps, green space qualification, etc.). • Population data, e.g., census data (municipal departments, statistical services, etc.) • Optional data: total urban area (municipal departments, statistical services etc.); specific points of departure from large residential buildings (buildings) This KPI can be measured using specific software, such as GIS software and spreadsheet software. QGIS is the GIS software suggested, as it is an open source and multiplatform software that is distributed under Creative Commons Attribution-Share Alike 3.0 licence (CC BY-SA). Measurement Unit: % (or fraction) of population
Data input type	Spatial data (vector or raster data) on available public green and blue areas Spatial data (vector or raster data) on departure points of the buildings. Optional: Tabular data - population per census or other reporting unit to provide weighted values.

Data collection frequency	Recommend annual assessment; minimum before and after the NBS implementation
Level of expertise required	Moderate
Synergies with other indicators	Synergies with *Distribution of public green space, Proportion of natural area,* and *Availability and equitable distribution of blue-green space* indicators
Connection with SDGs	SDG 3 Good health and well-being, SDG 11 Sustainable cities and communities, SDG 15 Life on land
Opportunities for participatory data collection	No opportunities identified
Additional information	
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