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| | - Nature4Cities, D2.3 – NBS database completed with urban performance data https://www.nature4cities.eu/post/applicability-urban-challenges-and-indicators-real-case-studies<br>- Nature4Cities, D2.4 - Development of a simplified urban performance assessment (SUA) tool |

## 14.15 Access to public amenities

**Project Name:** CONNECTING Nature (Grant Agreement no. 730222)

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| **Access to public amenities (Applied and EO/RS combined)** | **Place Regeneration** |
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| **Description and justification** | Density of public amenities has been used as an indicator of compactness or urban sprawl (and less car use). Accessible local services and facilities can reduce travel, particularly by private cars and help ensure sustainable communities. It can also be viewed as an indicator of health/wellbeing and quality of life. Public amenities are services/facilities which are provided by the government or town/city councils for the general public to use, with or without charge, for instance libraries, social welfare points etc. (CITYkeys). Access to public amenities partially measures the mix and distribution of different facilities and uses in a city and the proximity of public services to the residential location of city dwellers.<br><br>Remote sensing imagery has been widely adopted for analysis of spatial inequalities in distribution and accessibility to public amenities in cities (Joseph et al., 2012). Major techniques for this include dasymetric mapping, regression models and geostatistical models (Jensen et al., 2004; Joseph et al., 2012), spatial visualization and overlay analysis with georeferencing and digitization (Borana and Yadav, 2017; Travland et. al., 2017). There are some studies on accessibility of public amenities where amenities services are shown with the help of the database management systems by using GIS and RS (Nilsson, 2014; Taylor et al., 2017). Research indicates that urban population today prefer more open, well designed, structured, and built amenities as opposed to wildland recreation areas (Johnson et al., 2004; Travland |

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| | et. al., 2017). Thus, an urban park should offer a variety of facilities and amenities including playgrounds, ball fields, and walking trails to cater the needs of a multicultural society (Duncan et al., 2012; Travland et. al., 2017).<br><br>Data on access to public amenities collected in these ways can be used to:<br>• Quantify the benefits of NbS in terms of improving access to public amenities;<br>• Assess the distribution of key public amenities in relation to planning new greenspace;<br>• Prioritise public amenity delivery through NBS design. |
| **Definition** | Share of population with access to at least one type of public amenity (social welfare points, social meeting centres, restrooms, information displays, public telephones, rain shelters, drinking fountains, etc.) within 500m (% of people) using earth observation and remote sensing methods. By incorporating these features into NBS schemes it may be possible to increase accessibility and reduce transport distances and vehicle use. |
| **Strengths and weaknesses** | **Applied methods:** The indicator is relevant to access to services, and can be linked to quality of the built environment. The CITYkeys scoring system allows for some subjectivity and does not explicitly account for quality of services or user acceptance. Density can be a perceived experience rather than an outcome of empirical calculations (Burton, 2000).<br><br>**Earth observation / Remote sensing methods:** Theoretical frameworks used to explain the location of public services and amenities include central place theory, aspects of industrial location theory and spatial diffusion theory which are all described as normative theories being able to optimize with respect to defined criteria operating in prescribed environmental conditions (Rushton, 1979). However, recent advancement in geospatial technologies has led to several applications in geographically orientated challenges, hence, the adoption of an effective decision tool like Geographic Information System (GIS), high resolution products of satellite remote sensing as well as the Global Positioning System (GPS) in solving the rather challenging task of optimal location for public amenities and facilities with respect to necessary criteria. Today, cities worldwide are affected adversely by the problem of appropriate location of public facilities and amenities. They are either |

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| | too far from their market zone or they are too congested in a particular location or hardly accessible by local citizens and in some cases, political consideration to the siting of these facilities dominate without given considerations to the necessary criteria for demands and public interest. A number of studies have aimed to investigate the optimal determination of the locations of some public facilities in cities using geospatial techniques. A fusion of remote sensing, geographic information system (GIS) and GPS techniques have been explored by recent studies in this field (Ahmed, 2007; Borana and Yadav, 2017; Duncan et al., 2012; Johnson et al., 2004; Michael, 2008; Travland et. al., 2017). Together they provide strong evidence on distribution and access. They underline the need for development of a Geodata base of existing public amenities and facilities, and the use of Euclidean-distance geometry to spatially analyse the appropriate locations with regards to the set of standard criteria.<br><br>According to existing studies, integrating remote sensing data and point-of-interest (POI) data (including location-rich semantic information) has been successfully applied in the identification of social functions of urban lands, but none were focused on a detailed and complete social functional map of UGS. Moreover, spatial patterns or distribution densities derived from the POI data have been extracted into feature vectors and then combined with physical properties derived from remote sensing data to improve the accuracy of land use identification. |
| **Measurement procedure and tool** | A variety of methods exist from applied/public participation techniques through to earth observation/remote sensing approaches. For further details on measurement tools and metrics, including those adopted by past and current EU research and innovation projects can be found in: Connecting Nature Indicator Metrics Reviews Env48_Applied and Env48_RS |
| **Scale of measurement** | **Applied methods:** Typically city-scale, but can be used over smaller scales (e.g., smaller administrative units).<br><br>**Earth observation/Remote sensing methods:** Can be applied at various geographical scales. |
| **Data source** | |
| **Required data** | Required data will depend on selected methods, for further details see applied and earth observation/remote sensing metrics reviews in: Connecting Nature Indicator Metrics Reviews Env48_Applied and Env48_RS |

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| **Data input type** | Data input types will depend on selected methods, for further details see applied or earth observation/remote sensing metrics reviews in: Connecting Nature Indicator Metrics Reviews Env48_Applied and Env48_RS |
| **Data collection frequency** | Data collection frequency will depend on selected methods, for further details see applied or earth observation/remote sensing metrics reviews in: Connecting Nature Indicator Metrics Reviews Env48_Applied and Env48_RS |
| **Level of expertise required** | **Applied methods**: Generally some GIS expertise is needed for mapping aspects.<br><br>**Earth observation/Remote sensing methods**: An increasing number of sensors, RS data products, processing algorithms, software and tools are available for the assessment of public amenities and urban green space availability. Selecting an applicable data source and the method to process data is a complicated process which needs expert knowledge. Cost, time, expertise, and technical properties of remote sensing data are factors in this process. Thus, the assessment should be made by experts engaged in the NBS project who have expertise not only in RS, but also in urban planning, forestry, landscape ecology, regional planning. Each of them will then assess all built and land cover type combinations. |
| **Synergies with other indicators** | Remote sensing imagery provides powerful tools for masterplanning and policy analysis regarding green urban area expansion. However, measures of public amenities cannot be solely based on indicators obtained from 2D geographical information. In fact, 2D urban indicators should be complemented by 3D modelling of geographic data. The spatial locational analysis of public amenities plays an important role in the decision making of local planning and development of new utilities services. As such, mapping for this indicator can have synergies with other health and well-being indicators and greenspace mapping indicators. |
| **Connection with SDGs** | SDGs 3, 4, 5, 7, 9, 10, 11, 13, 16, 17: Access health & wellbeing services; Greater access to education opportunities; Equal gender access to services; Equal access to clean energy; Equal access to infrastructure; Social equality in relation to access to services; Sustainable urban development; Climate change adaptation; Environmental Justice; Opportunities for collaborative working. |
| **Opportunities for participatory data collection** | **Applied methods:** citizen participation could be through a PPGIS tool such as GLOBE app. |

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| | **Earth observation / Remote sensing methods:** Uneven distribution of public amenities indicates that the existing planning might not produce acceptable results in terms of balanced development of different municipal wards. Since a number of the amenities are provided by the government, their availability and distribution must be planned carefully. A participatory approach can be an effective mechanism for assessing and ensuring the even distribution of urban amenities in a city. The results of the analysis of access to public amenities can help policy-makers and municipal authorities in proper planning in the distribution of public amenities. Validation of results on the ground as well as the participation of urban planner and policy makers is also essential. |
| **Additional information** | |
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