

8.8 Biotope Area Factor

Project Name: Nature4Cities

Author/s and affiliations: Pauline Laille¹, Stéphanie Decker²

¹ Plante & Cité, Maison du végétal, 26 rue Jean Dixméras, 49066 ANGERS Cedex 1, France; e-mail: pauline.laille@plante-et-cite.fr

² NOBATEK/INEF4, 67 Rue de Mirambeau, 64600 Anglet, France

Biotope Area Factor	Green Space Management
Description and justification	The BAF is calculated by dividing the amount of surface area available for nature and vegetation by the total surface area considered. Each type of soil/ ground cover/ land use is affected a coefficient related to its potential for vegetation growth & nature implementation (e.g., sealed surface = 0; semi-permeable = 0.3; green wall = 0.5; green roof = 0.7; in-ground plantations = 1).
Definition	<p>Thresholds and goals can then be determined based on the expected performance or current land use / urban planning objectives (e.g., the City of Berlin expects BAF to be produced for each new project – the result must be between 0.3 and 0.6, depending of the project's nature). The BAF takes values between 0 and 1. It increases with in-ground planted areas (Nature4Cities, D2.1).</p> <p>The literature shows a dozen of different ground cover typologies, each with different coefficients (Casella et al., 2016; Dizdaroglu et al., 2009; Farrugia et al., 2013; Hirst et al., 2008; Huang et al., 2015; Kazmierczak et al., 2010; Kruuse, 2011; Lakes et al., 2012; SenStadtUm, 2009; Vartholomaios et al., 2013).</p> <p>Based on those examples, a new BAF version was proposed for Nature4Cities, based on the literature, partners' inputs and considering the projects goals (Nature4Cities, D2.4).</p> <p>The Nature4Cities BAF takes values between 0 and 1.7. A score of 0 means that the whole area is sealed. A score of 1 means that the whole area is vegetated, and that vegetation substrate is the natural soil or connected to it. A score superior to 1 indicates that different woody stratum is present, enhancing the ecological interest of the area in an urban setting.</p> <p>For this indicator, outputs can be both map-like and numerical. For the simplified assessment, that outputs will be numerical only.</p>
Strengths and weaknesses	<p>This indicator is interesting :</p> <ul style="list-style-type: none"> • To describe / maximize the amount of surface area available for greening / planting • To set goals or thresholds relative to expected performances, local urban planning rules, soil preservation, local offer in nature / open space / green space <p>It is capable to describe initial planning problems, like e.g., green / grey ratio ; proportion of artificialized area, etc.</p>
Measurement procedure and tool	<p>MEASUREMENT UNIT: %</p> <p>GIS analysis</p> $\text{BAF} = \frac{\text{ecologically-effective surface areas}}{\text{total land area}}$

	This indicator calculation is integrated in the Nature4Cities platform.
Scale of measurement	<input checked="" type="checkbox"/> Neighbourhood/catchment <input checked="" type="checkbox"/> Object
Data source	<ul style="list-style-type: none"> • Geodatabase of land use / land cover Parameters with BAF coefficients
Required data	<ul style="list-style-type: none"> • Land use map • Ground cover / surface materials
Data input type	<ul style="list-style-type: none"> • surface area
Data collection frequency	<ul style="list-style-type: none"> • Once, during conception, to characterize the project • Before / after the project's implementation, to characterize its effects on the local environment
Level of expertise required	<p>Easy to calculate but requires data.</p> <p>The uncertainty of the result resides in the accuracy of the surface area measures.</p>
Synergies with other indicators	
Connection with SDGs	SDG 13 Climate action, SDG 15 Life on land
Opportunities for participatory data collection	
Additional information	
References	<p>Becker, G. M. R., & Mohren, R. (1990). The Biotope Area Factor as an Ecological Parameter. <i>Landschaft Planen & Bauen, Berlin</i>. Available: http://www.stadtentwicklung.berlin.de, 24.</p> <p>Casella V., Franzini M. & De Lotto R. « GEOMATICS FOR SMART CITIES: OBTAINING THE URBAN PLANNING BAF INDEX FROM EXISTING DIGITAL MAPS ». ISPRS - International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences XLI-B2, (2016), 689-94. https://doi.org/10.5194/isprsarchives-XLI-B2-689-2016.</p> <p>Dizdaroglu D., Yigitcanlar T. & Dawes L. « Sustainable urban futures: an ecological approach to sustainable urban development », (2009).</p> <p>Farrugia S., Hudson M. & McCulloch L. « An evaluation of flood control and urban cooling ecosystem services delivered by urban green infrastructure », <i>International Journal of Biodiversity Science, Ecosystem Services & Management</i>, (2013), 136-145, DOI: 10.1080/21513732.2013.782342</p> <p>Liénard, S., & Clergeau, P. (2011). Trame Verte et Bleue: Utilisation des cartes d'occupation du sol pour une première approche qualitative de la biodiversité. <i>Cybergeo: European Journal of Geography</i>.</p>

- Hirst, J., Morley, J., & Ban, K. (2008). Functional landscapes: Assessing elements of Seattle Green Factor. Seattle: City Department of Seattle. <http://www.seattle.gov/dpd/cs/groups/pan/@pan/documents/webinformational/dpds021359.pdf>
- Huang, P.-S., Tsai, S.-M., Lin, H.-C., Tso, I.-M., 2015. Do Biotope Area Factor values reflect ecological effectiveness of urban landscapes? A case study on university campuses in central Taiwan. *Landsc. Urban Plan.* 143, 143–149. doi:10.1016/j.landurbplan.2015.07.004
- Kazmierczak A. & Carter J. « Adaptation to Climate Change Using Green and Blue Infrastructure A Database of Case Studies », (2010), 182. <http://www.grabs-eu.org/downloads/EP6%20FINAL.pdf>.
- Lakes T. & Hyun-Ok K. « The urban environmental indicator “Biotope Area Ratio”—An enhanced approach to assess and manage the urban ecosystem services using high resolution remote-sensing ». *Ecological Indicators* 13, no 1 (2012), 93-103. <https://doi.org/10.1016/j.ecolind.2011.05.016>.
- Pao-Shen Huang, Su-Mei Tsai, Hui-Chen Lin, I-Min Tso, Do Biotope Area Factor values reflect ecological effectiveness of urban landscapes? A case study on university campuses in central Taiwan, In *Landscape and Urban Planning*, Volume 143, 2015, Pages 143-149, ISSN 0169-2046, <https://doi.org/10.1016/j.landurbplan.2015.07.004>. (<http://www.sciencedirect.com/science/article/pii/S0169204615001425>)
- SenStadtUm (Senatsverwaltung für Stadtentwicklung, Umweltschutz und Technologie), (2009).
- Taking biodiversity into account in local urban planning rules : a synthesis from the French Ministry for Housing and Territorial Equality (French)
- Vartholomaïos A., Kalogirou N., Athanassiou E. & Papadopoulou M. « The green space factor as a tool for regulating the urban microclimate in vegetation-deprived Greek cities. » *Skiathos island, Greece*, 2013. <https://doi.org/10.13140/2.1.1598.8484.shtml>
- Nature4Cities, D2.1 - System of integrated multi-scale and multi-thematic performance indicators for the assessment of urban challenges and NBS. <https://www.nature4cities.eu/post/nature4cities-defined-performance-indicators-to-assess-urban-challenges-and-nature-based-solutions>
- Nature4Cities, D2.2 - Expert-modelling toolbox
- Nature4Cities, D2.3 – NBS database completed with urban performance data <https://www.nature4cities.eu/post/applicability-urban-challenges-and-indicators-real-case-studies>
- Nature4Cities, D2.4 - Development of a simplified urban performance assessment (SUA) tool