

data collection	
Additional information	
References	<p>Ruf, K., Gregor, M., Davis, M., Naumann, S. and McFarland, K., 2018. The European Urban Biodiversity Index (EUBI): a composite indicator for biodiversity in cities. ETC/BD report to the EEA:</p> <p>Also: CBI Indicator 10: https://www.nparks.gov.sg/biodiversity/urban-biodiversity/the-singapore-index-on-cities-biodiversity</p> <p>European Capital of Biodiversity Indicators 10: https://www.capital-biodiversity.eu/uploads/media/Indicators_on_urban_biodiversity_-_LIST_-_European_Capitals_of_Biodiversity.pdf</p>

9.4 Species diversity within defined area per Shannon Diversity Index

Project Name: proGReg (Grant Agreement no. 776528)

Author/s and affiliations: Francesca Martelli¹, Chiara Ferracini¹, Federica Paradiso¹, Monica Vercelli¹, Simona Bonelli¹

¹ Università degli Studi di Torino, Turin, Italy

Shannon Diversity Index	Biodiversity
Description and justification	The Shannon Diversity is a very common index used in ecology to quantify diversity in a community. The index provides more information about the fauna and flora composition than simply area richness. It takes into consideration both the number of different species observed and their relative abundances
Definition	<p>Shannon Diversity Index it is calculated as follows:</p> $H = - \sum_{i=1}^S p_i \ln p_i$ <p>P_i is the proportion of total number of individuals of i^{th} species, divided by total number of individuals of all species recorded.</p>
Strengths and weaknesses	<p>Strengths</p> <ul style="list-style-type: none"> • applicable to different taxonomic groups • easy to apply and very plastic, in fact we can use it for flora and fauna • repeatable and standardized • cheaper data collecting <p>Weaknesses</p> <ul style="list-style-type: none"> • high staff specialization • high sampling efforts
Measurement	Shannon Diversity Index needs semiquantitative data. In our case, data must be collected through linear transects (linear paths with

procedure and tool	fixed length), in which experts record number of specimens for each species
Scale of measurement	Interval scale
Data source	
Required data	Number of individuals for each species recorded
Data input type	Number of individuals for each species recorded
Data collection frequency	Butterflies survey: at least once a month from April to September Bees survey: at least once a month from April to September Plants survey: at least once a month from April to September
Level of expertise required	Shannon Diversity Index is easy to apply but data collection requires a high level of taxonomic knowledge, in order to recognise the correct species, for each target taxon.
Synergies with other indicators	Shannon Diversity Index is in synergy with “Global Warming Potential” indicator, because our target taxa (bees, butterflies and vegetation) are very sensitive to Global Warming and so we can see remarkable change in the community composition. This index has also a connection with “Equivalent used soil”, indeed we know that soil with a high degree of naturalness hosts a greater biodiversity. This indicator could also be interrelated with “Greenness” and “Walkability” indicators, since number of pollinator species is high in open meadows.
Connection with SDGs	Shannon Diversity Index is in connection with 15th SDGs that aims to protect and preserve a suitable use of terrestrial ecosystem. Indeed, this index could be a scientific evaluation of change in biodiversity richness and can guide political choices in land management
Opportunities for participatory data collection	It is possible to involve citizens in butterfly surveys, through Citizen Science projects. It is necessary to provide proper volunteer training to enable correct recognition of butterfly species and to learn transect sampling method.
Additional information	
References	https://ec.europa.eu/eurostat/statisticsexplained/index.php/Glossary:Shannon_evenness_index_(SEI) https://ec.europa.eu/eurostat/statisticsexplained/index.php?title=File:Shannon_Diversity_Index_and_Shannon_Evenness_Index,_2009.PNG Mårtensson, R. (2016). Species and Biological Diversity-Choices of Diversity Indices and their Potential Consequences for Nature Conservation