Indicator: Pollinator abundance (# individual pollinators)

Naturvation challenge: Green space, habitats and biodiversity
SDG: 15
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Indicator description
Pollinators such as bumblebees, honeybees, wasp, hoverflies and butterflies are well known for their contribution to the production of vegetables and fruits through pollination - more than three quarters of the leading types of global food crops rely on animal pollinators, of which bees species are the most important [1]. While urban areas are generally perceived as low-quality habitat for most wildlife, cities often support a surprising degree of pollinators [see e.g. 2]. Urban green space such as parks, gardens and allotment areas sustaining a high abundance of pollinators in cities, and therefore, indirectly facilitates urban food production.

Pollinator abundance is measured by direct observation in the field, either by counting each pollinator visiting a flower/entering survey site within a certain times, or by capturing pollinators that landed on observed flowers with insect nets or pan traps/bowls. The observation time can differ between studies but often observations are performed for 10-15minutes on different moments of the day. Some studies present total number of individuals count within a certain time [e.g. 3, 4], other studies standardise to mean number of individuals e.g. flower visits per flower, site, type of NBS, hour or month [e.g. 5, 6]. There are also a few studies which estimated pollinator abundance by models (e.g. Pollinator occupancy modelling [7], Bayesian network models [8], InVEST [9]). Here we focus on empirical measurement of pollinator abundance only. Empirical measurements illustrate that the abundance of pollinators within an area is positively affected by the presence of flowers [10, 11] and size of the green area [12] as providing suitable food resources (i.e. nectar) and nesting sites. But also other local site characteristics such as the type of habitat/vegetation present [13] and the green space management (e.g. mowing management)[14] influence pollinators occurrence within the urban setting. Further, surrounding landscape characteristics strongly influence pollinator abundance, such as the proportion of impervious surface and number of greenspace patches [15, 16]. Pollinator abundance is also determined by which species studied [5, 17]. Here we will focus on bee species, due to their importance for pollination and data availability.

Indicator scoring
The values used for the indicator pollinator abundance scoring are based on 21 peer-reviewed studies measuring pollinator abundances in different urban settings by field observations (empirical data). Values were averaged per site per paper (e.g. averaged across varies measurement per site, across different pollinator species). Pollinators include bee species, such as honeybee and bumblebees, only as other insect pollinator species such as beetles and butterflies were excluded due to limited data availability. Scores were derived by normalizing the values between 0 and the maximum value onto the scale 1 to 5.

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Scores, pollinator abundance (# individual pollinators)		
Nature-based solution	**Score**	**Mean value (min – max)**
Park and (semi-)natural urban green areas	4	53.3 (1.9 – 351.5)
Urban green areas connected to grey infrastructure	5	83.4 (3.9 – 1529)
Blue spaces	No score	No values found
(External) building greens	3	39.0 (26.6 – 55.75)
Allotments and community gardens	5	73.5 (8.7 – 131)
Green areas for water management	No score	No values found

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