Supplementary Material

1) Data

The data of the Global Urban Footprint used in this paper are accessible via the "GUF Data and Access" platform at DLR under the specific license conditions. https://www.dlr.de/eoc/en/desktopdefault.aspx/tabid-11725/20508_read-47944/

2) Mathematical details of the 'dispersion Index' (based on Taubenböck et al., 2018)

The dispersion index relies on two spatial metrics - the largest patch index (LP) and the number of patches (NP). Equations 1 and 2 introduce the mathematical details: n_i is the number of patches of patch type (class) i in the landscape and a_i is the size of the area of patch j (class i) in pixels (based on McGarigal & Marks, 1995; McGarigal et al., 2012).

(1) $$NP = n_i$$ (absolute)

(2) $$LP = \frac{\max_{i=1}^{n} a_i}{\sum_{j=1}^{n} a_{ij}} \cdot 100$$ (relative, percent)

These two metrics (LP, NP) span a two-dimensional feature space. To do so, we scale the model to equal-ranges for the NP as well as the LP by normalizing the values (varying from 0 to 100 for NP_n on the x-axis and for LP_n on the y-axis). In equations 3 and 4 mathematical details for normalizing NP_n and LP_n are presented.

(3) $$NP_n = \frac{NP - 1}{(\sum_{j=1}^{n} a_{ij}) - 1} \cdot 100 \qquad 0\% \leq NP_n \leq 100\%$$

(4) $$LP_n = \frac{LP - \frac{1}{\sum_{j=1}^{n} a_{ij}}}{100 - \frac{1}{\sum_{j=1}^{n} a_{ij}}} \cdot 100 \qquad 0\% \leq LP_n \leq 100\%$$

The *dispersion index* (DI) is intended to create a single metric for classification of the grade of dispersion within the feature space spanned by NP_n and LP_n. To derive the DI both metrics are weighted equally as introduced in equation 5.

(5) $$DI = \frac{NP_n + (100 - LP_n)}{2}$$ (unit-less)