## Indicator 2.2.3: Urban Nature

*Headline finding: Globally, urban greenspace has remained stable over the past decade. However, peak-season NDVI has varied substantially across individual cities. In 2024, greenspace increased slightly from the 2015-2020 average (0.2%), worldwide, with individual city changes ranging from -34% to +69%.*

Green spaces serve to reduce the intensity of heat islands at the neighborhood scale in urban centers, while positively affecting physical and mental health. (1-4) The indicator of urban green space uses Normalized Difference Vegetation Index (NDVI) from Landsat satellite data to estimate greenspace exposure on a 30 x 30 km grid for 1041 urban centers across 174 countries (see Figure 1). Global population-weighted peak-season NDVI has remained the same since 2015 (0.28). While NDVI has remained stable over the past decade on a global, and even regional, scale, 2024 brought large changes in greenness across individual cities, with NDVI diverging from 2015-2020 levels by as much as -34% to +69%. On average, cities with “Very High” and “High” Human Development Indices (HDI) experienced slight increases in NDVI in 2024 (+1.6%), while those with “Medium” and “Low” indices experienced slight decreases (-2.1% and -1.7%, respectively). However, there was a large spread within each HDI category. Amongst the Lancet Countdown country groupings, the South and Central America, Africa, and Asia regions had the lowest peak NDVI across all years.

Urban blue spaces, such as rivers, lakes, and coastlines have also been shown to improve mental and physical health by providing many of the same advantages as greenspaces, such as places for recreation and social gathering, natural beauty, and cooling (5-7). Using the University of Maryland land type classifications from the MODIS 500m landcover dataset, we calculated the percentage of each urban area that was green (forests, shrublands, savannas, grasslands, croplands) or blue (water bodies, permanent wetlands). Considering this combined measure of green and blue space, low HDI cities had a higher proportion of nature (0.42) than cities classified as “High” (0.29) or “Very High” (0.20), on average.



Figure 1: Level of urban greenness in urban centers with more than 500,000 inhabitants in 2024 (Panel A). Urban greenness is characterized by the population-weighted peak (greenest) season Normalized Difference Vegetation Index (NDVI). Panel B shows the percent change in the population-weighted peak-season NDVI between a baseline period (2015-2020) and 2024.

#### References

(1) Gago EJ, Roldan J, Pacheco-Torres R, Ordonez J. The city and urban heat islands: A review of strategies to mitigate adverse effects. RENEWABLE & SUSTAINABLE ENERGY REVIEWS 2013 SEP;25:749-758.

(2) Callaghan A, McCombe G, Harrold A, McMeel C, Mills G, Moore-Cherry N, et al. The impact of green spaces on mental health in urban settings: a scoping review. JOURNAL OF MENTAL HEALTH 2021 MAR 4;30(2):179-193.

(3) Iungman T, Cirach M, Marando F, Pereira Barboza E, Khomenko S, Masselot P, et al. Cooling cities through urban green infrastructure: a health impact assessment of European cities. Lancet 2023 Feb 18;401(10376):577-589.

(4) Frumkin, H, Bratman GN, Breslow SJ, Cochran B, Kahn PH, Jr., Lawler JJ, Levin PS, Tandon PS, Varanasi U, Wolf KL and Wood SA (2017). "Nature Contact and Human Health: A Research Agenda." Environ Health Perspect **125**(7): 075001.

(5) Ampatzidis, P., Cintolesi, C., & Kershaw, T. (2023). Impact of Blue Space Geometry on Urban Heat Island Mitigation. *Climate*, *11*(2), 28. <https://doi.org/10.3390/cli11020028>

(6) Brückner, A., Falkenberg, T., Heinzel, C., & Kistemann, T. (2022). The Regeneration of Urban Blue Spaces: A Public Health Intervention? Reviewing the Evidence. *Frontiers in Public Health*, *9*, 782101. <https://doi.org/10.3389/fpubh.2021.782101>

(7) Hunter, R. F., Nieuwenhuijsen, M., Fabian, C., Murphy, N., O’Hara, K., Rappe, E., Sallis, J. F., Lambert, E. V., Duenas, O. L. S., Sugiyama, T., & Kahlmeier, S. (2023). Advancing urban green and blue space contributions to public health. *The Lancet Public Health*, *8*(9), e735–e742. https://doi.org/10.1016/S2468-2667(23)00156-1