



Global Observatory of  
**Healthy and  
Sustainable Cities**

# **Wuhan China 2024**

**Spatial indicators for healthy and sustainable cities**  
1000 Cities Challenge report

*Yellow Crane Tower, Yanning Yang, 2024*



Full details of the data and methods are available at:

Global Observatory of Healthy & Sustainable Cities  
<https://www.healthysustainablecities.org>

Population data: Schiavina, M; Freire, S; Carioli, A., MacManus, K (2023): GHS-POP R2023A - GHS population grid multitemporal (1975-2030). European Commission, Joint Research Centre (JRC) [Dataset] doi: 10.2905/D6D86A90-4351-4508-99C1-CB074B022C4A

Urban boundaries: Florczyk, A. et al. (2019): GHS Urban Centre Database 2015, multitemporal and multidimensional attributes, R2019A. European Commission, Joint Research Centre (JRC). <https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>

Urban features: OpenStreetMap Contributors. OpenStreetMap.fr (2023). <http://download.openstreetmap.fr/extracts/asia/china/hubei.osm.pbf>

Colour scale: Crameri, F. (2018). Scientific colour-maps (3.0.4). Zenodo. <https://doi.org/10.5281/zenodo.1287763>

Global Healthy & Sustainable City Indicators Collaboration

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Report design and editing: Carl Higgs, Eugen Resendiz, Melanie Lowe and Deborah Salvo

## Spatial indicators for healthy and sustainable cities

### 1000 Cities Challenge report

This report outlines how Wuhan performs on a selection of spatial indicators of healthy and sustainable cities. As part of the 1000 Cities Challenge, we examined the spatial distribution of urban design and transport features that promote health and sustainability. The maps show the distribution of urban design and transport features across Wuhan and identify areas that could benefit the most from interventions to create healthy and sustainable environments.

### Wuhan context

Wuhan, the capital of Hubei Province, is a core city in the Yangtze River Economic Belt, located in the river's middle reaches. With numerous rivers, it is China's largest inland transport hub and a key shipping center in the Yangtze.

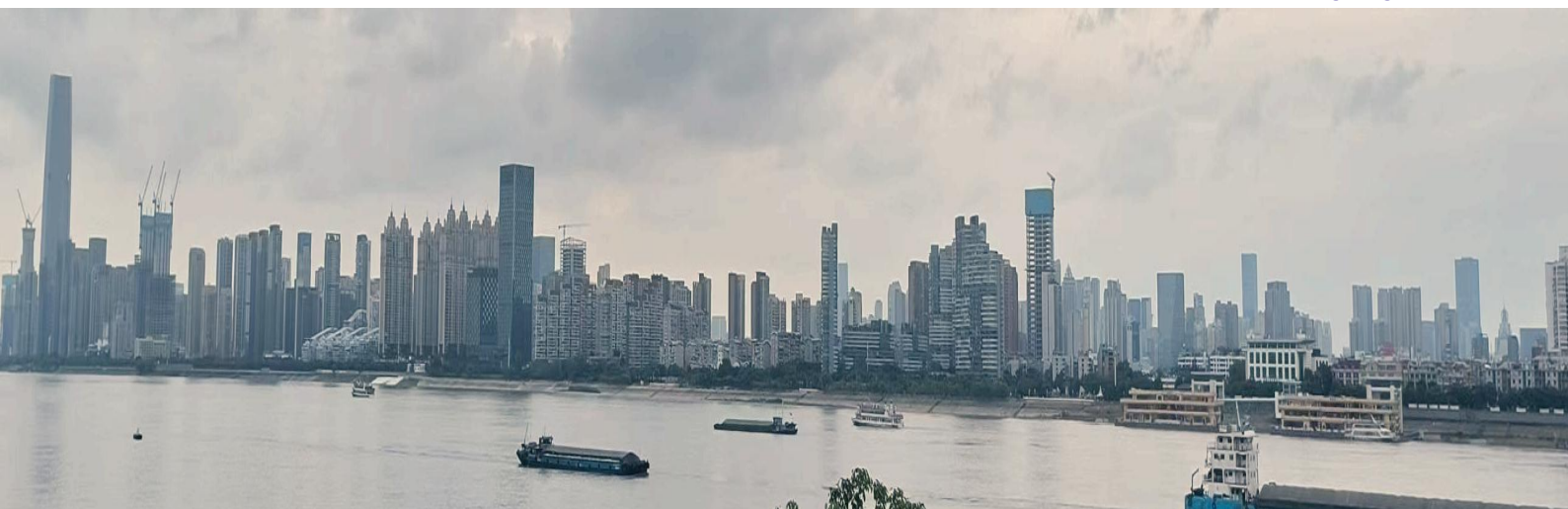
### Demographics and health equity

By the end of 2022, Wuhan's GDP reached 1.886643 trillion yuan, with a permanent population of 13.739 million. The city faces multiple health challenges, including major diseases such as cancer and chronic respiratory diseases, as well as common foundational diseases like hypertension and diabetes.

### Environmental disaster context

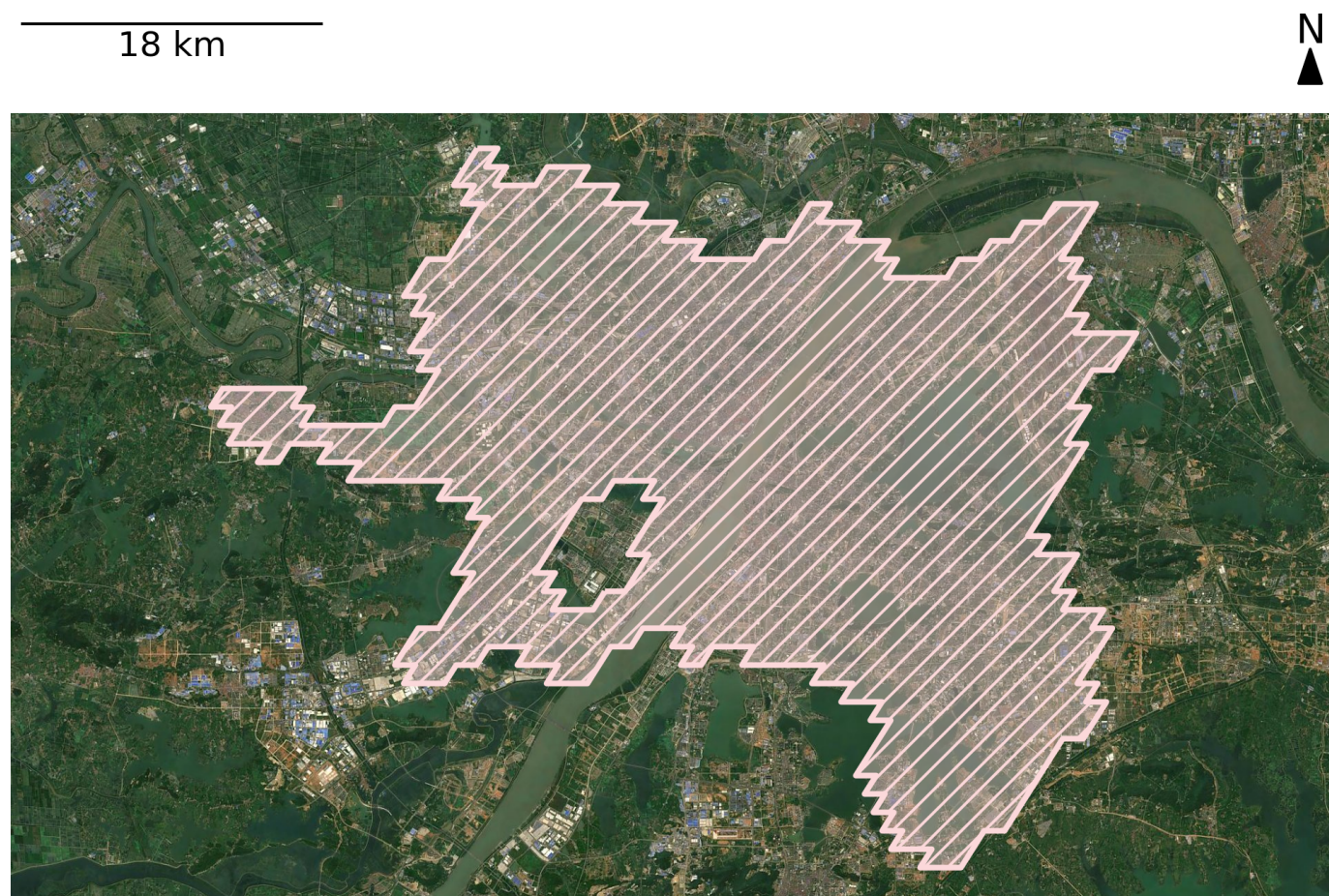
Wuhan faces various environmental challenges, including urban heat, heavy rain, hail, flooding, and cold waves.

Yaning Yang, 2024



## Study region

The study region used to calculate spatial indicators for the population of Wuhan presented in this report has been highlighted in the map below using parallel line shading.



Study region boundary (shaded region): Global Human Settlements urban centres: 2015 (EU JRC, 2020; Changsha Center only) under CC BY 4.0; GHSL - Global Human Settlement Layer under CC-BY-4.0 | Basemap: Sentinel-2 cloudless - <https://s2maps.eu> by EOX IT Services GmbH (Contains modified Copernicus Sentinel data 2021) released under Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License

### Map legend



Administrative boundary  
(GHSL - Global Human Settlement Layer.  
<https://ghsl.jrc.ec.europa.eu/download.php?ds=pop.>)



Urban boundary  
(Global Human Settlements urban centres: 2015 (EU JRC, 2020; Changsha Center only) (GHS:UC\_NM\_MN=='Wuhan' and CTR\_MN\_NM=='China'))

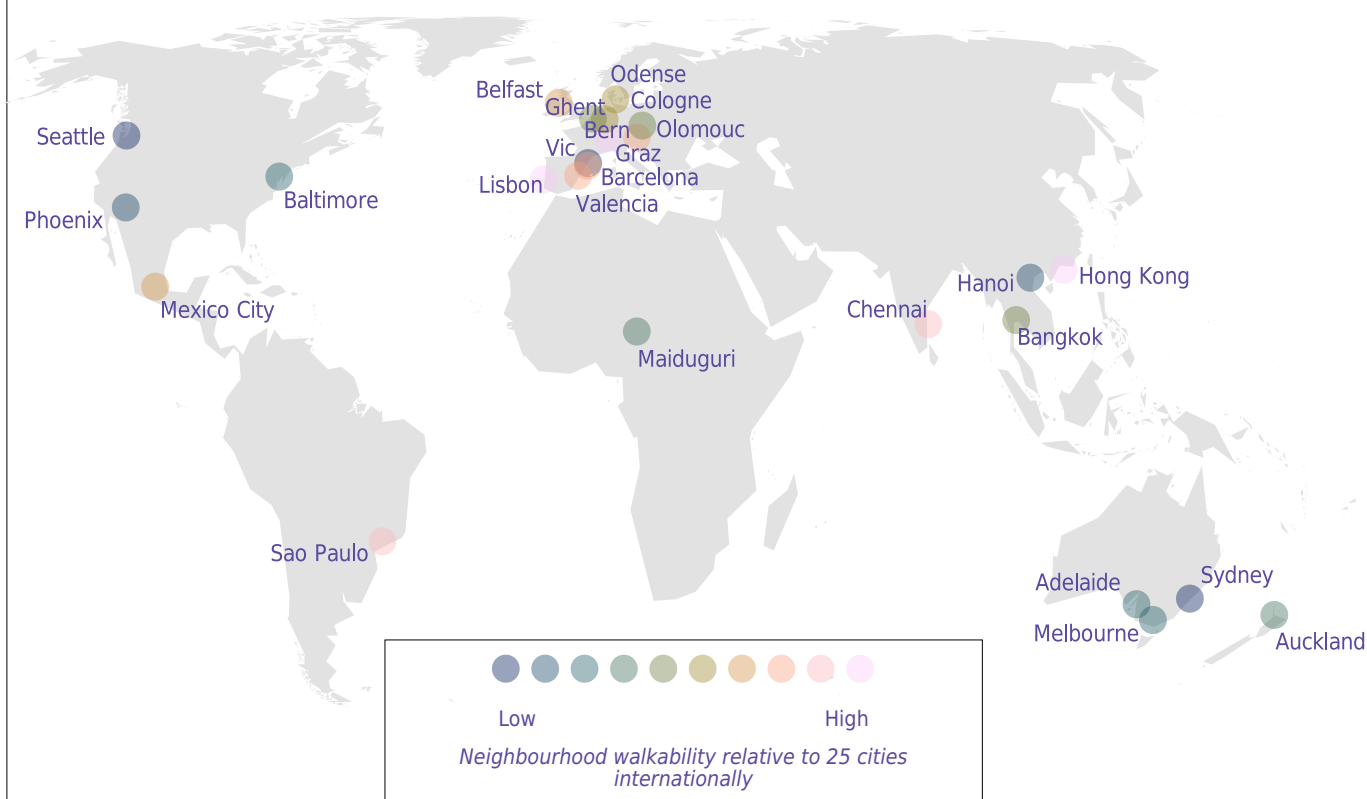


Study region boundary  
(intersection of administrative boundary and urban boundary)

### Box 1: The Lancet Global Health Series study of 25 cities internationally

The 1000 Cities Challenge extends methods for assessing the health and sustainability of cities outlined in the 2022 Lancet Global Health Series on urban design, transport, and health. Policy and spatial indicators were calculated, analysed and reported in multiple languages for 25 diverse cities across 19 countries and 6 continents. These cities provide a useful reference for comparisons, but are not a representative sample of all cities internationally.

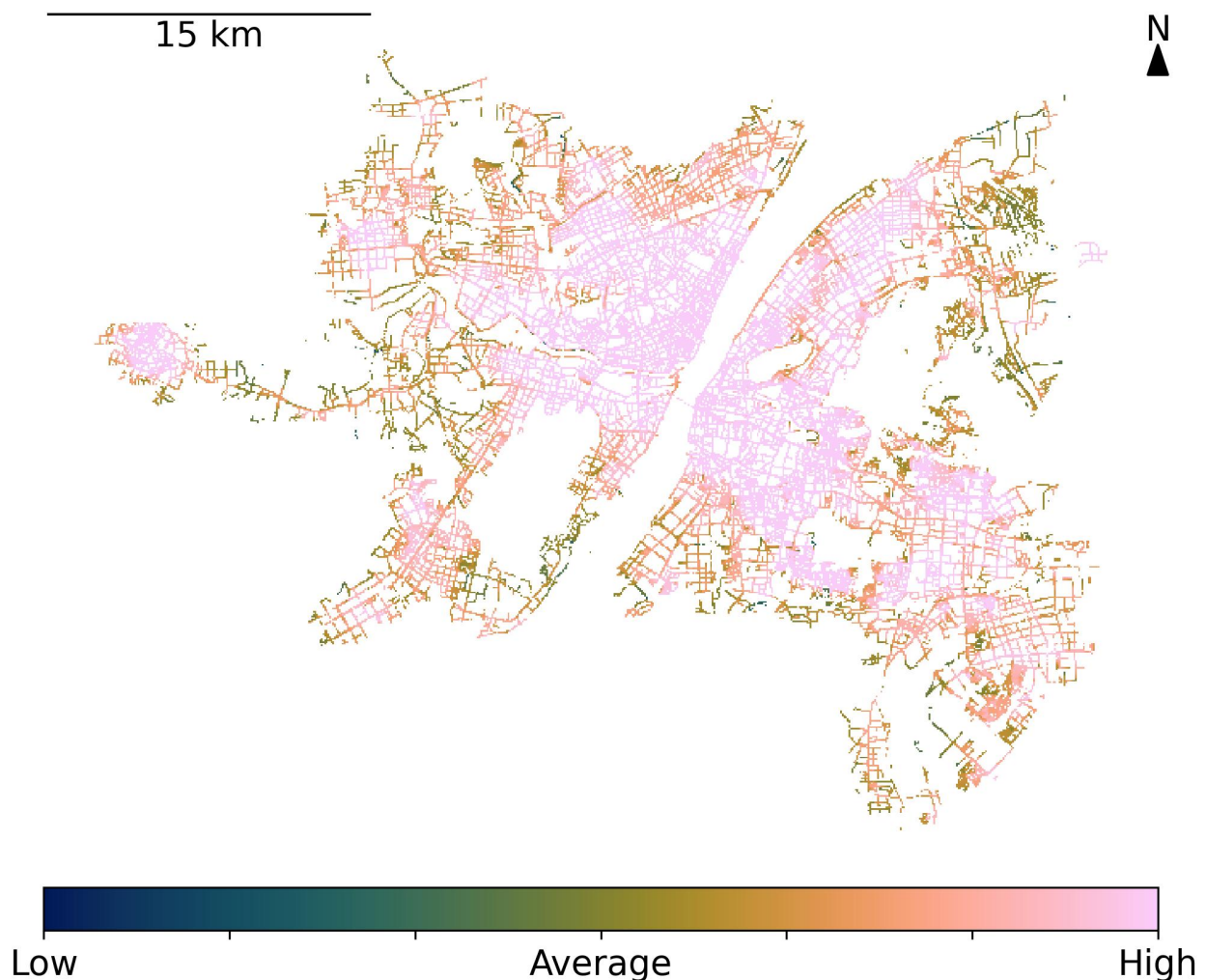
For more details, please see the 2022 The Lancet Global Health Series on Urban design, transport, and health (<https://www.thelancet.com/series/urban-design-2022>).



## Walkability and destination access

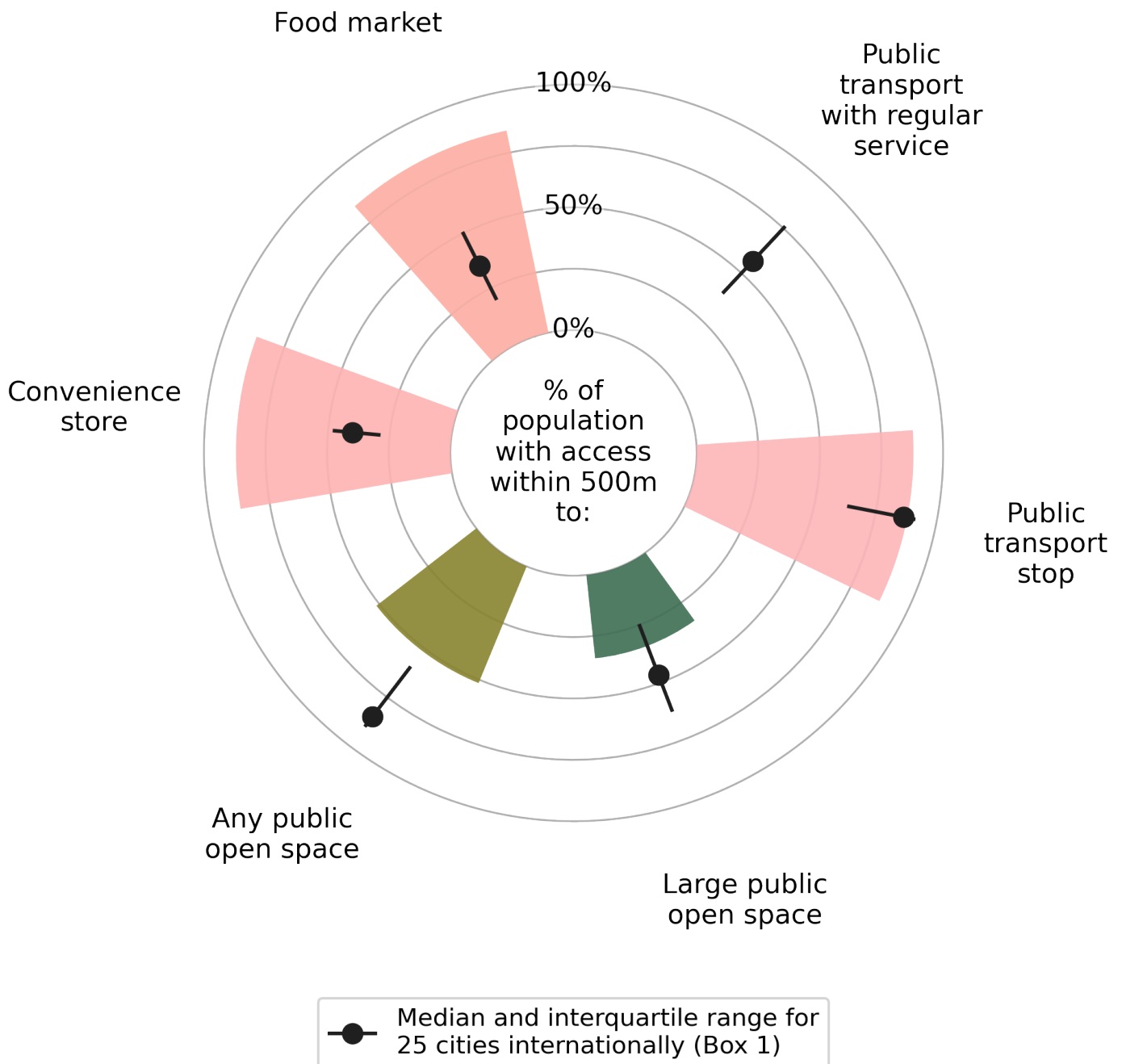
Walkable neighbourhoods provide opportunities for active, healthy, and sustainable lifestyles through having sufficient but not excessive population density to support adequate provision of local amenities, including public transport services. They also have mixed land uses and well-connected streets, to ensure proximate and convenient access to destinations. High-quality pedestrian infrastructure and reducing traffic through managing demand for car use can also encourage walking for transport.

### Neighbourhood walkability relative to 25 cities internationally



99.8% of the population in Wuhan live in neighbourhoods with walkability scoring above the median of 25 cities internationally (Box 1)

## Percentage of population with access to amenities within 500 metres (m)

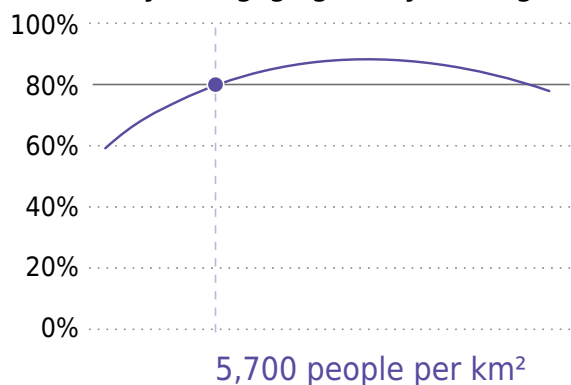


## Urban design thresholds to promote walking

The 2022 Lancet Global Health Series found that to achieve at least 80% probability of engaging in any walking for transport, an average urban neighbourhood would need a population density of at least 5700 people km<sup>2</sup> and street connectivity of at least 100 intersections per km<sup>2</sup>, approximately and depending on context. Preliminary evidence showed that street intersection density above 250 per km<sup>2</sup> and ultra-dense neighbourhoods (> 15,000 persons per km<sup>2</sup>) may have decreasing benefits for physical activity. This is an important topic for future research.

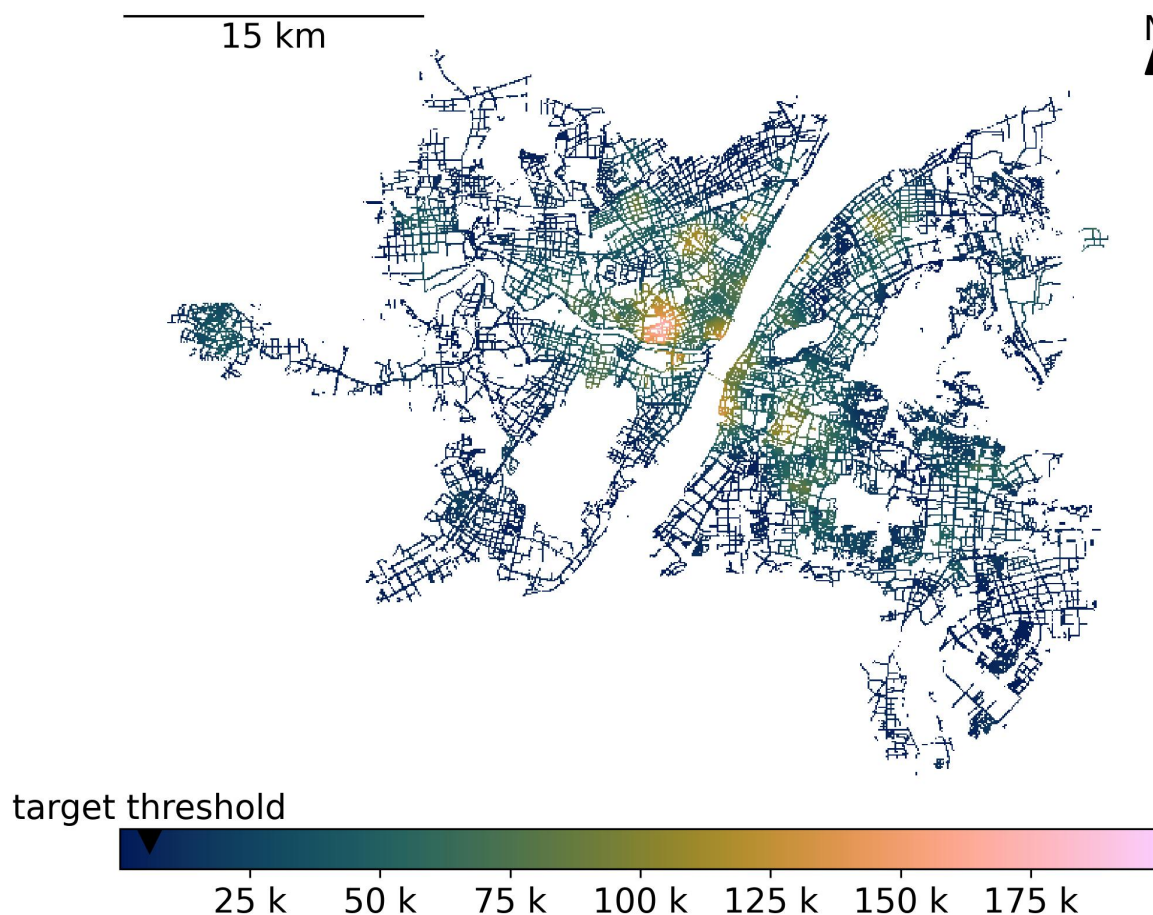
## Neighbourhood population density (per km<sup>2</sup>)

### Probability of engaging in any walking for transport



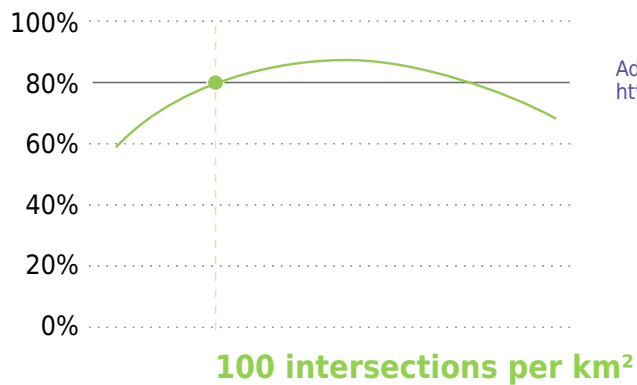
Adapted from The Lancet Global Health (2022):  
<https://www.thelancet.com/infographics-do/urban-design-2022>

96.7% of the population in Wuhan live in neighbourhoods meeting the population density threshold for 80% probability of engaging in any walking for transport (5,700 people per km<sup>2</sup>)



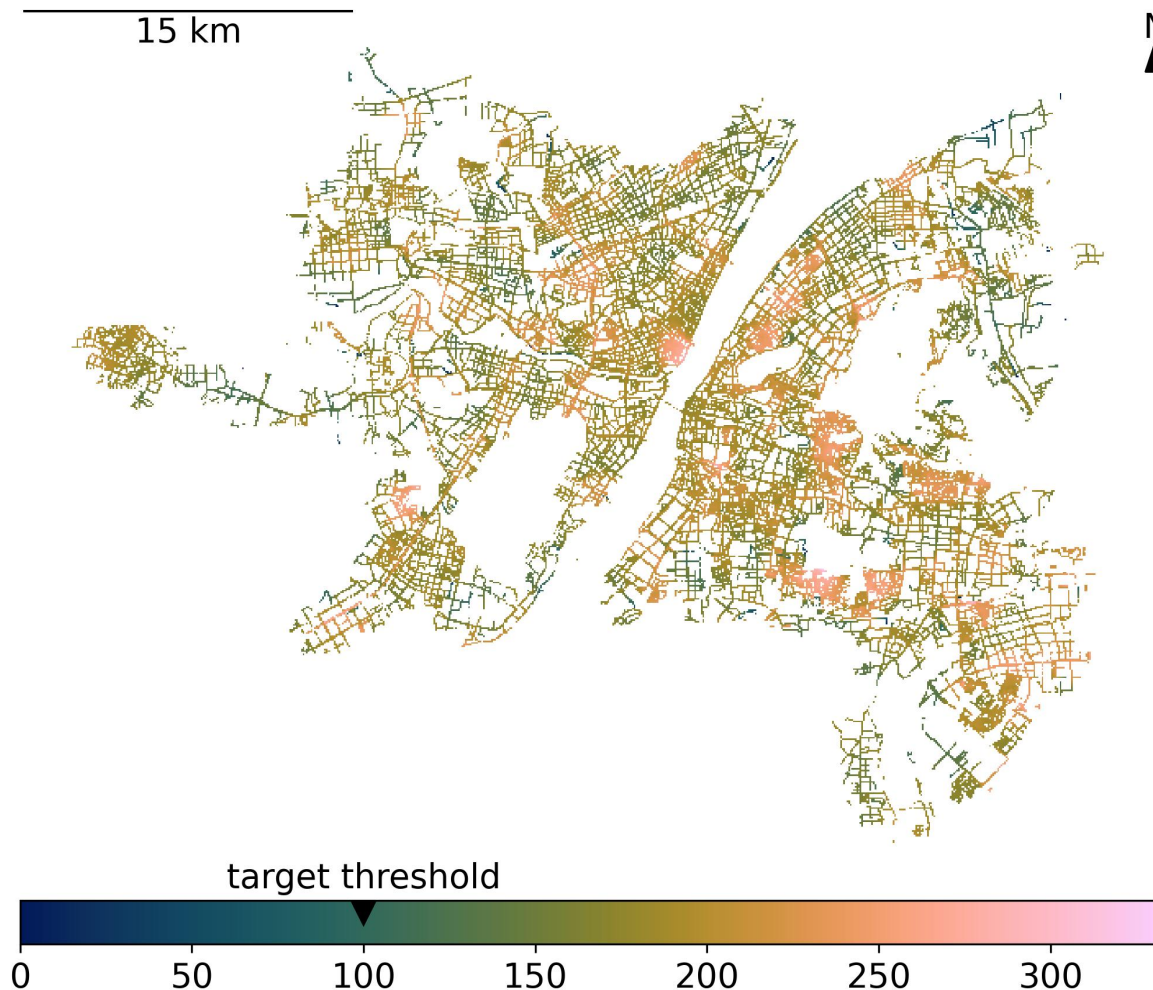
## Neighbourhood intersection density (per km<sup>2</sup>)

### Probability of engaging in any walking for transport



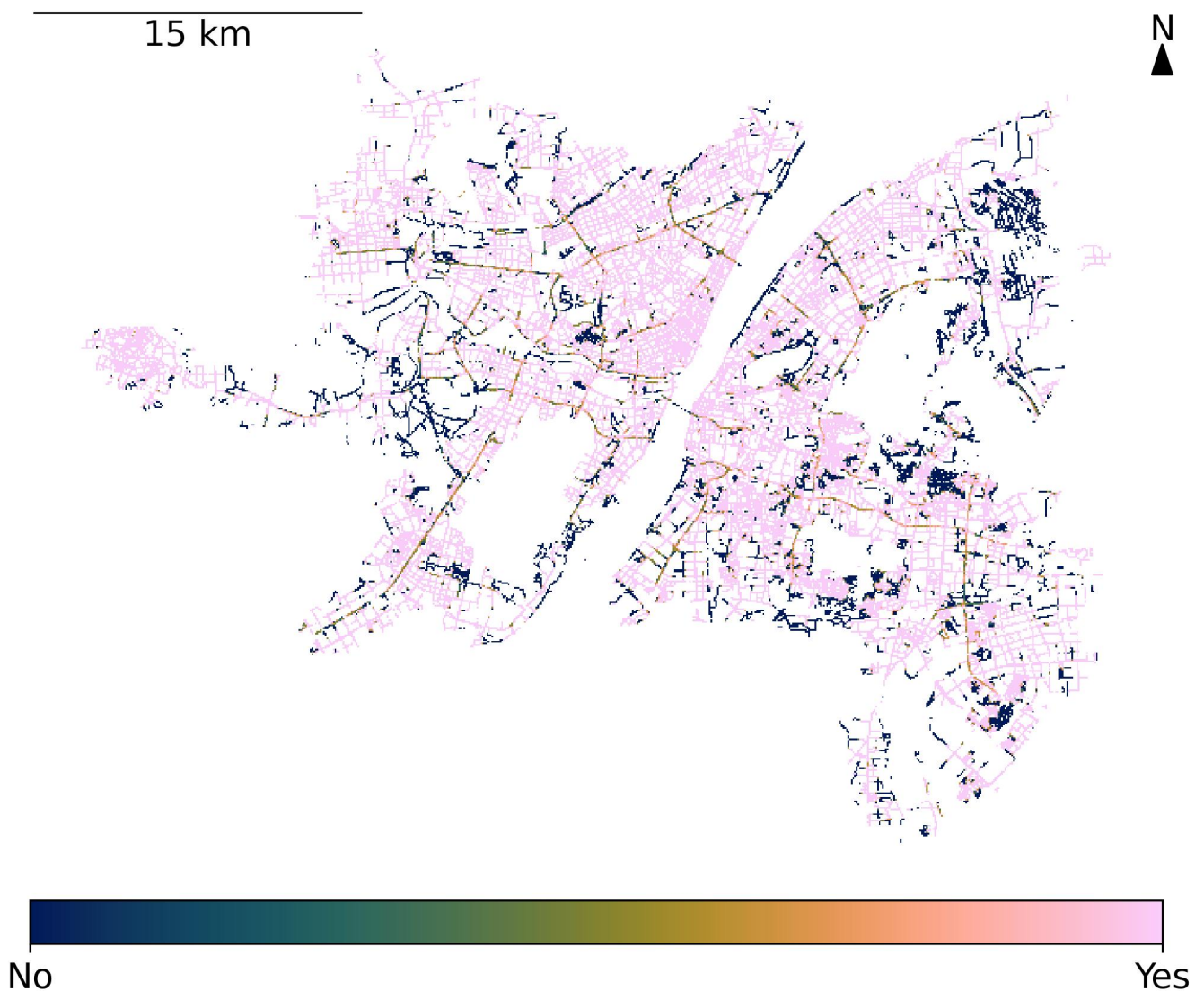
Adapted from The Lancet Global Health (2022):  
<https://www.thelancet.com/infographics-do/urban-design-2022>

99.8% of the population in Wuhan live in neighbourhoods meeting the street intersection density threshold for 80% probability of engaging in any walking for transport (100 intersections per km<sup>2</sup>)



## Public transport access

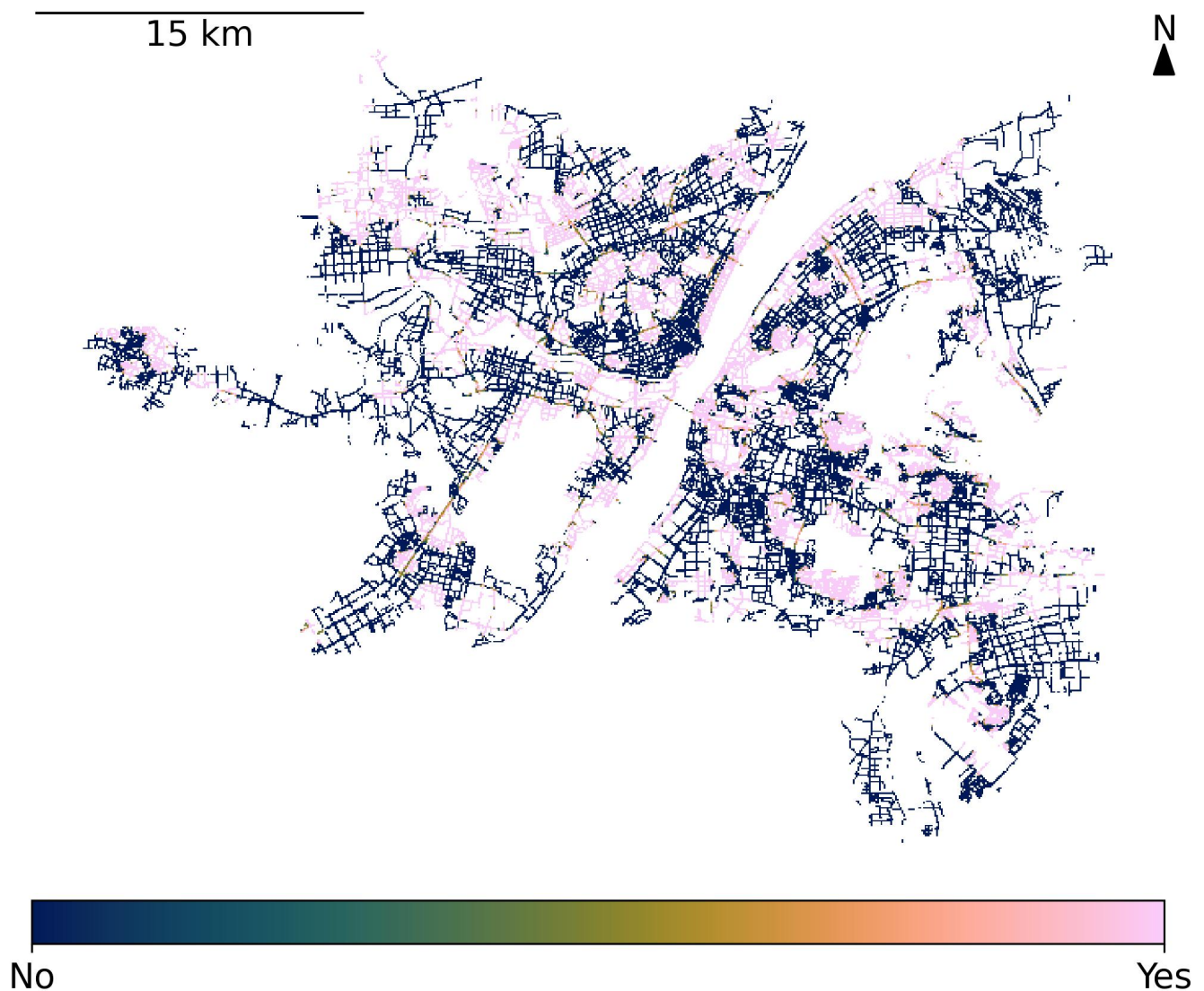
Easy access to frequent public transport is a key determinant of healthy and sustainable transport systems. Public transport near housing and employment increases the mode share of public transport trips, thus encouraging transport-related walking; offering access to regional jobs and services; improving health, economic development, and social inclusiveness; and reducing pollution and carbon emissions. The frequency of services also encourages public transport use, in addition to the proximity of stations or stops.



88.0% of the population in Wuhan live within 500m of public transport

## Public open space access

Local access to high-quality public open space promotes recreational physical activity and mental health. Nearby public open space creates convivial, attractive environments, helps cool the city and protects biodiversity. As cities densify and private open space declines, providing more public open space is critical for population health. Having public open space within 400 m of homes can encourage walking. Access to larger parks may also be important.



34.1% of the population in Wuhan live within 500m of public open space of at least 1.5 hectares in size

## Summary

Spatially, the accessibility of public transport stations and convenience stores in Wuhan is comparable to the average level of 25 benchmark cities, with approximately 88% of the population living within 500 meters of public transport. Wuhan performs moderately in terms of accessibility to public open spaces, with 51.4% of the population living within 500 meters of any open space. However, only 34.1% of the population lives within 500 meters of public open spaces that are at least 1.5 hectares in size. The walkability of Wuhan's communities is relatively high, with only 0.2% of the population residing in communities with walkability scores below the average of other cities. Additionally, 96.7% of the population lives in communities that meet the population density threshold for an 80% walking travel probability, and 99.8% of the population lives in communities that meet the street intersection density threshold for an 80% walking travel probability.

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## Citation

Ke Peng, Xiaoyu Cheng, Yaning Yang. 2024. 1000 Cities Challenge report: Wuhan, China 2024—Spatial indicators for healthy and sustainable cities (English). Global Observatory of Healthy and Sustainable Cities.



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