



Global Observatory of
**Healthy and
Sustainable Cities**

Changsha China 2023

Spatial indicators for healthy and sustainable cities
1000 Cities Challenge report

Qican Weng, 2023



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//hunan.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

City team members: Ke Peng, Xiaoyu Cheng, Yaning Yang

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 Changsha 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 Changsha and identify areas that could benefit the most from interventions to create healthy and sustainable environments.

Changsha context

Changsha, the capital of Hunan Province, is located in the northeastern part of the Province. It is a major central city in the middle reach of the Yangtze River and the core city of the Chang-Zhu-Tan urban agglomeration. The city features diverse terrain, numerous rivers and lakes, and a mild climate with abundant rainfall.

Demographics and health equity

By the end of 2022, Changsha's GDP reached 1.3 trillion yuan, with a permanent population of 10.421 million. The city faces various health challenges, including rising chronic diseases and critical concerns in managing infectious diseases like hepatitis, tuberculosis, and AIDS.

Environmental disaster context

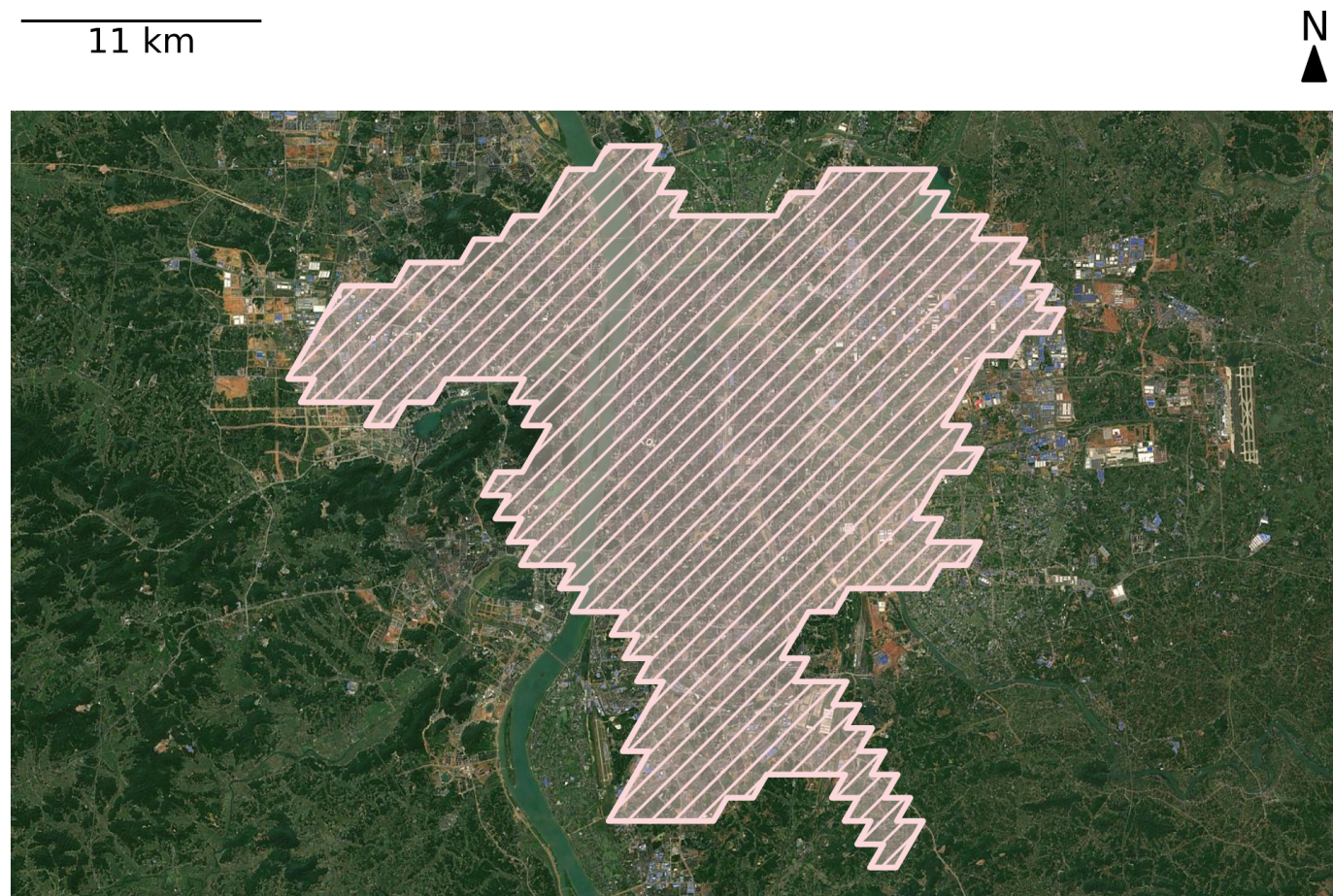
Changsha faces various environmental challenges, such as heavy rainstorms, hailstorms, floods, mudslides, landslides, cold waves, and urban heat.

Qican Weng, 2023



Study region

The study region used to calculate spatial indicators for the population of Changsha 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=='Changsha'
and CTR_MN_NM=='China'))

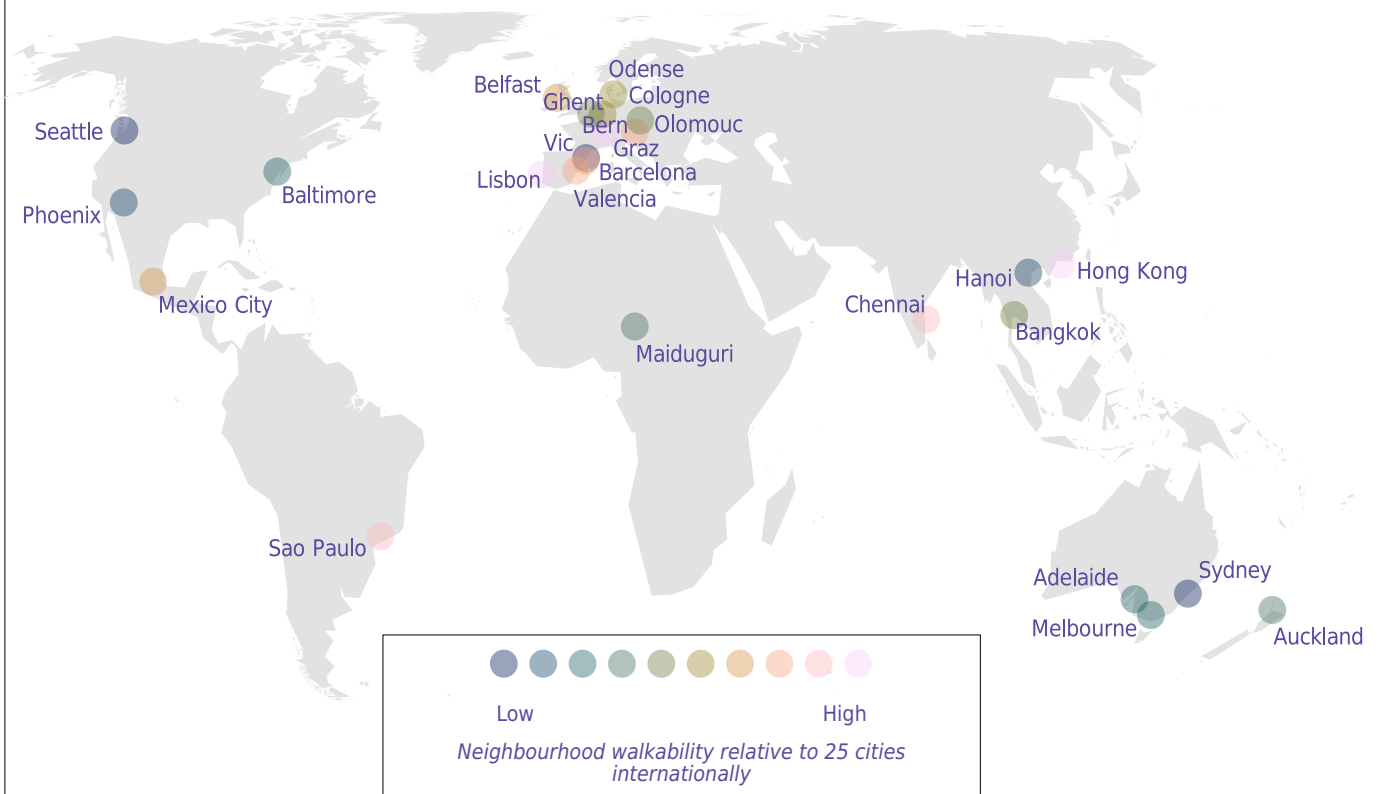


Study region boundary
(intersection of administrative
boundary and urban boundary)

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.

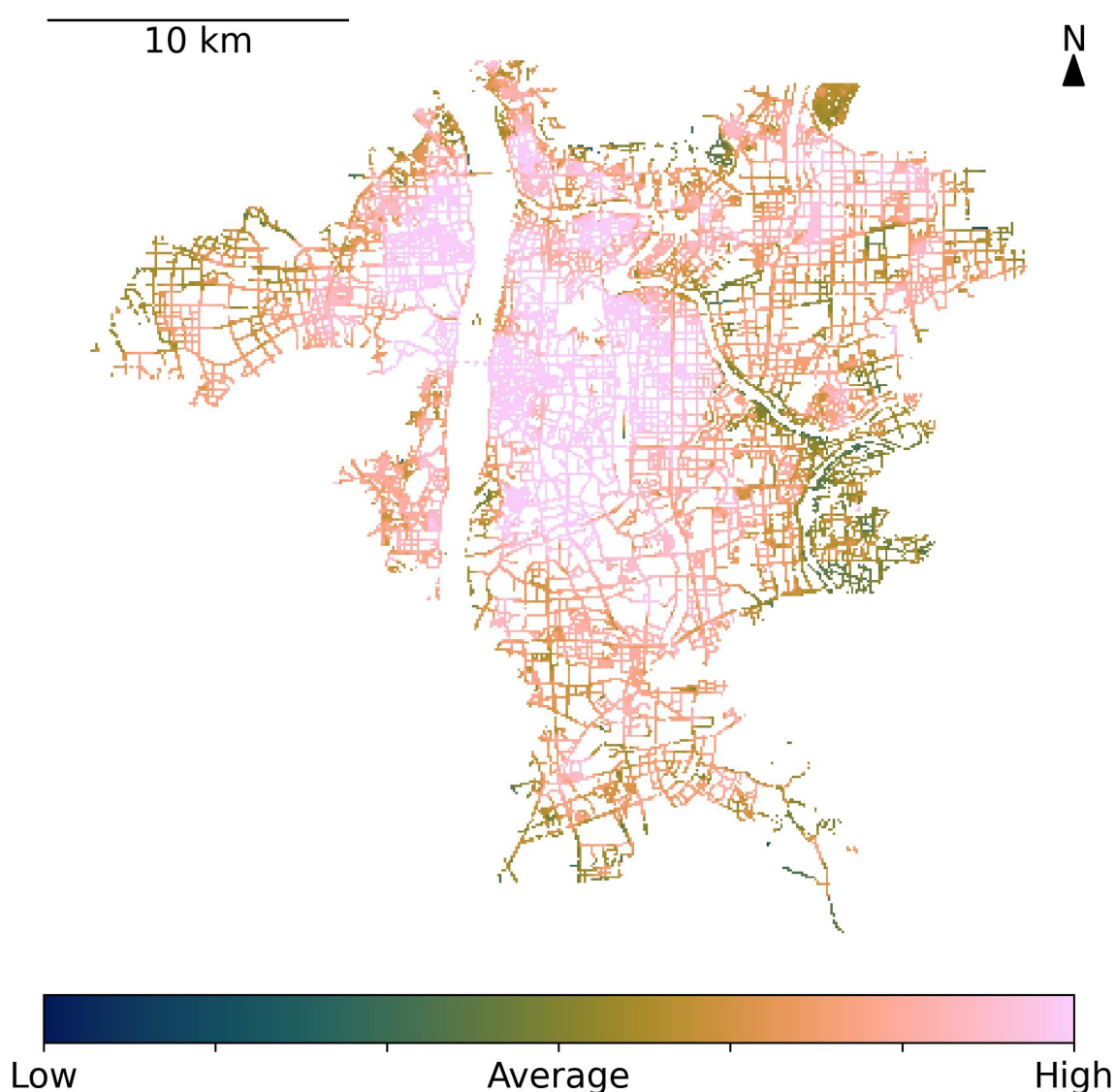
For more details, please see the 2022 The Lancet Global Health Series on Urban design, transport, and health (<https://www.thelancet.com/series/urban-design-2022>).



Walkability and destination access

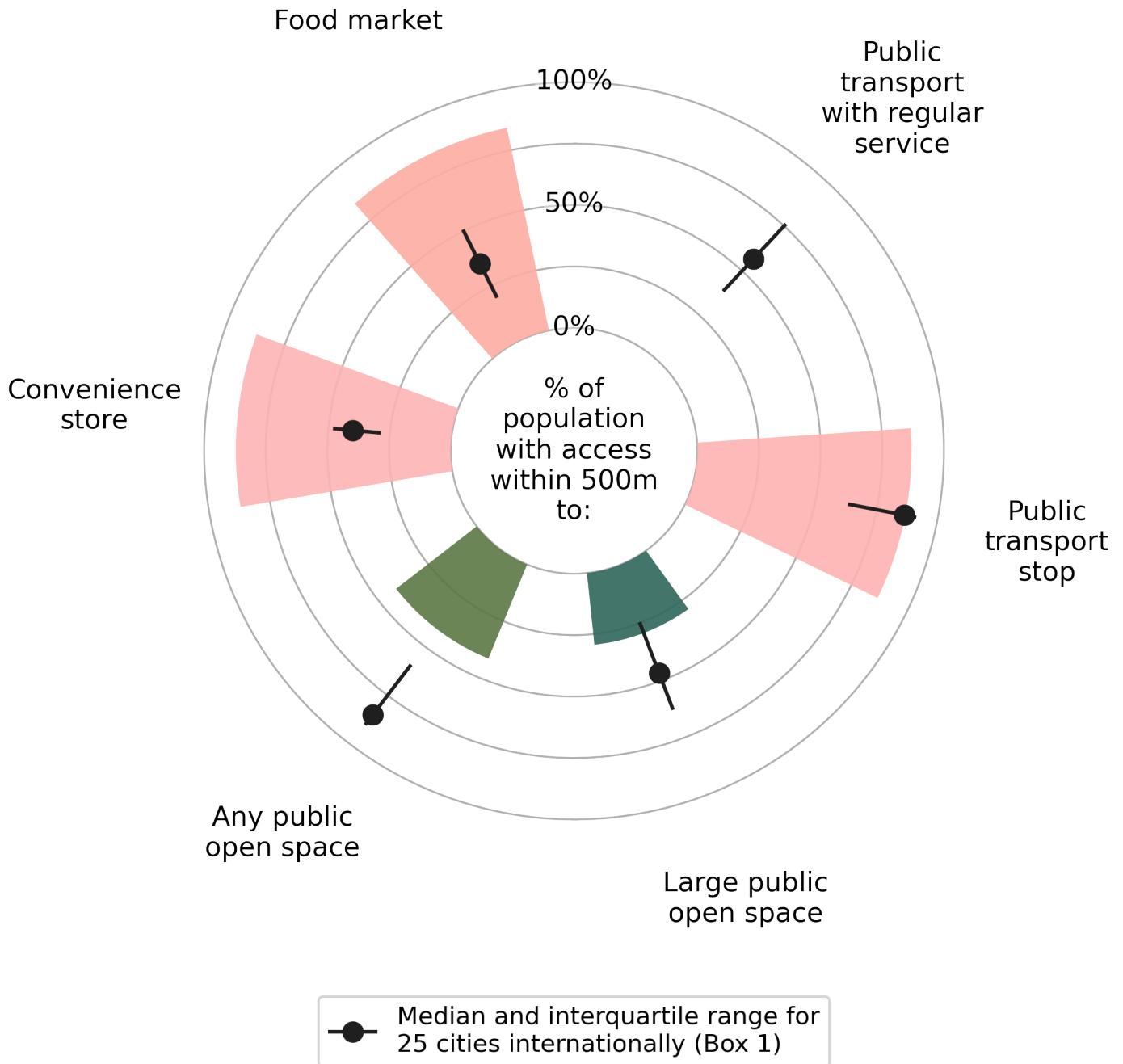
Walkable neighbourhoods provide opportunities for active, healthy, and sustainable lifestyles through having sufficient but not excessive population density to support adequate provision of local amenities, including public transport services. They also have mixed land uses and well-connected streets, 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



99.7% of the population in Changsha 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)

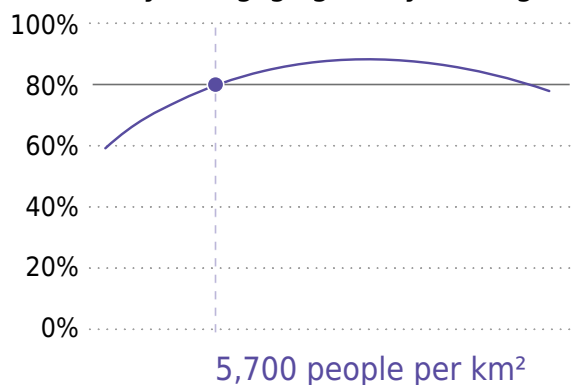


Urban design thresholds to promote walking

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 km² and street connectivity of at least 100 intersections per km², approximately and depending on context. Preliminary evidence showed that street intersection density above 250 per km² and ultra-dense neighbourhoods (> 15,000 persons per km²) may have decreasing benefits for physical activity. This is an important topic for future research.

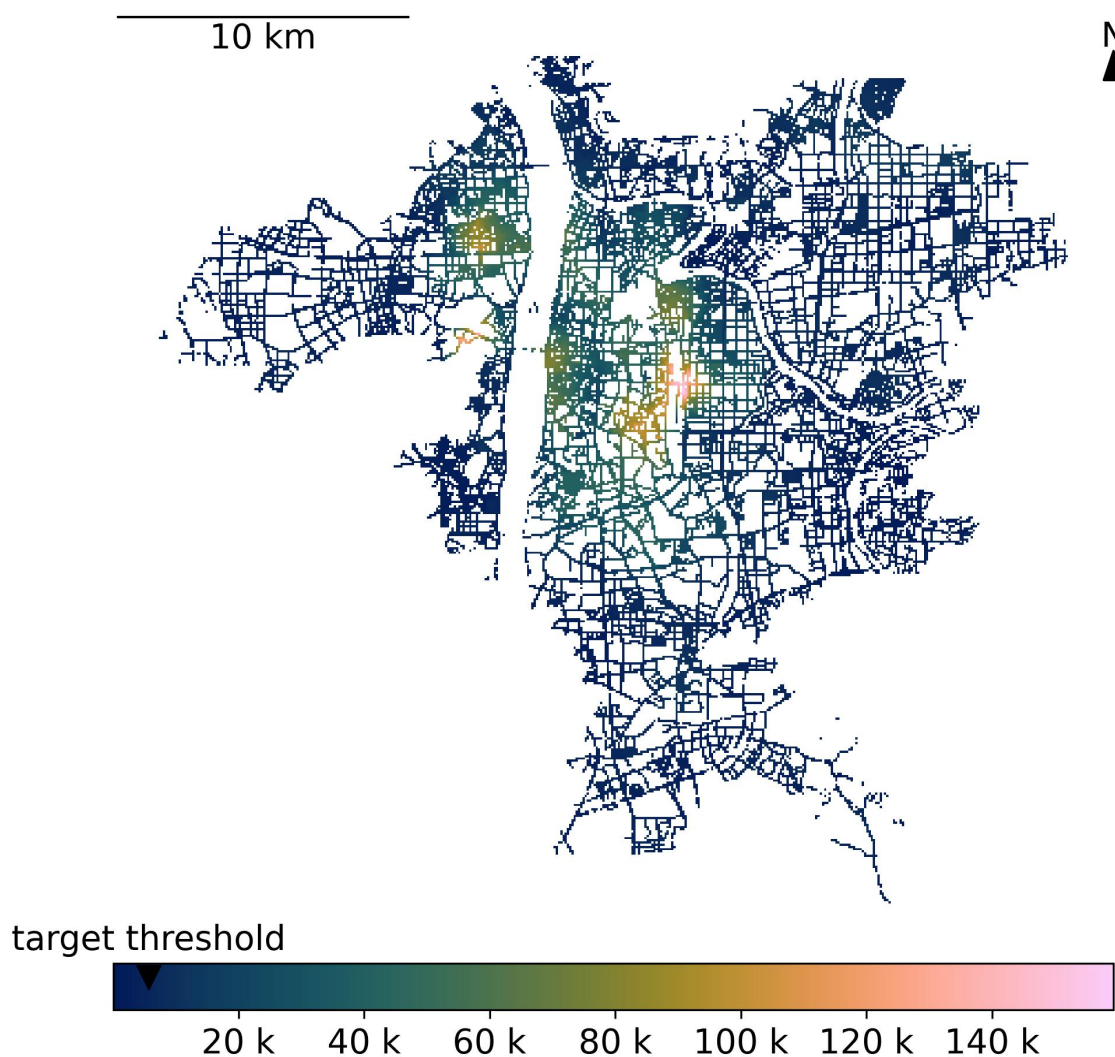
Neighbourhood population density (per km²)

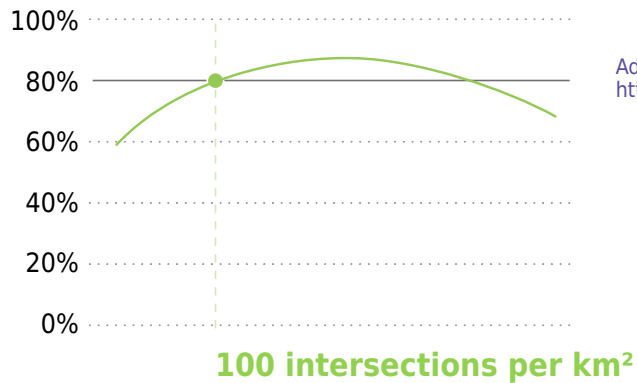
Probability of engaging in any walking for transport



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

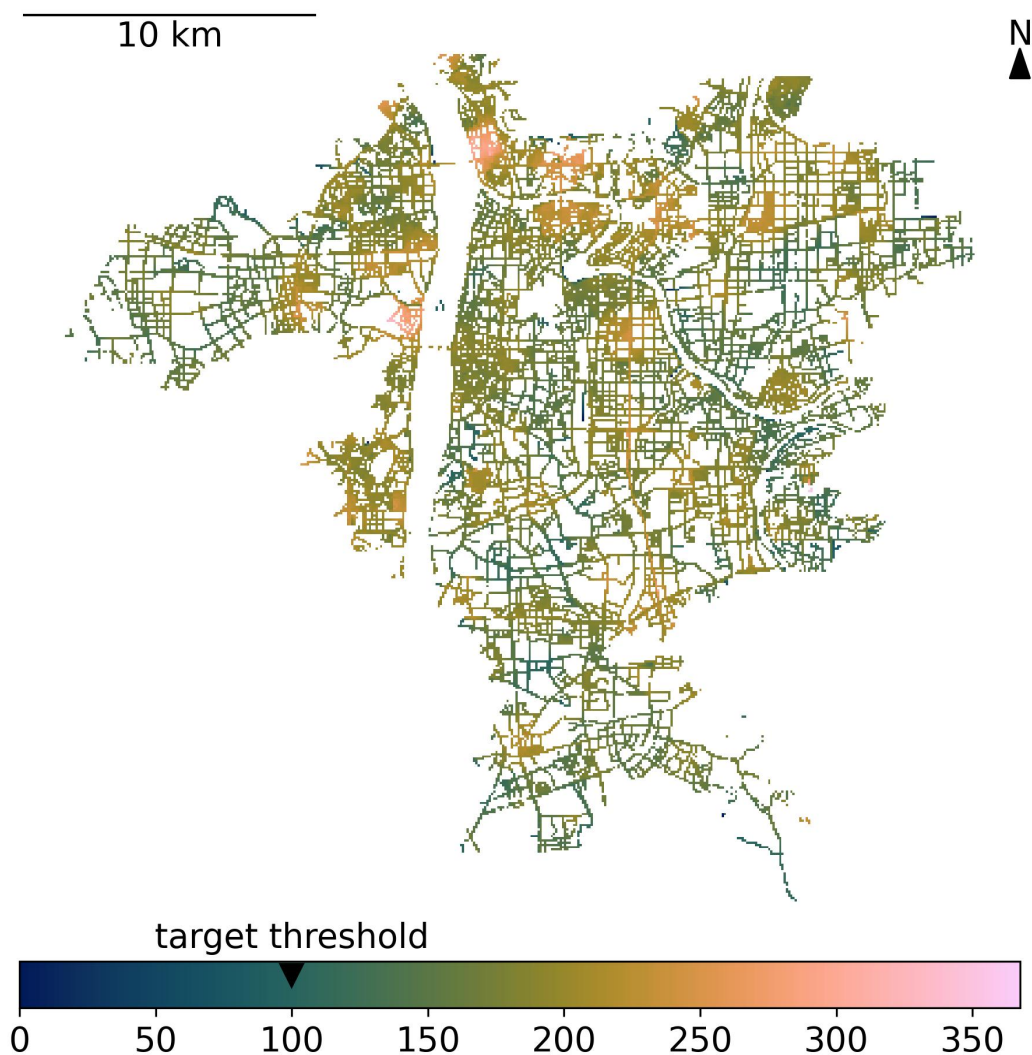
91.3% of the population in Changsha live in neighbourhoods meeting the population density threshold for 80% probability of engaging in any walking for transport (5,700 people per km²)



Neighbourhood intersection density (per km²)**Probability of engaging in any walking for transport**

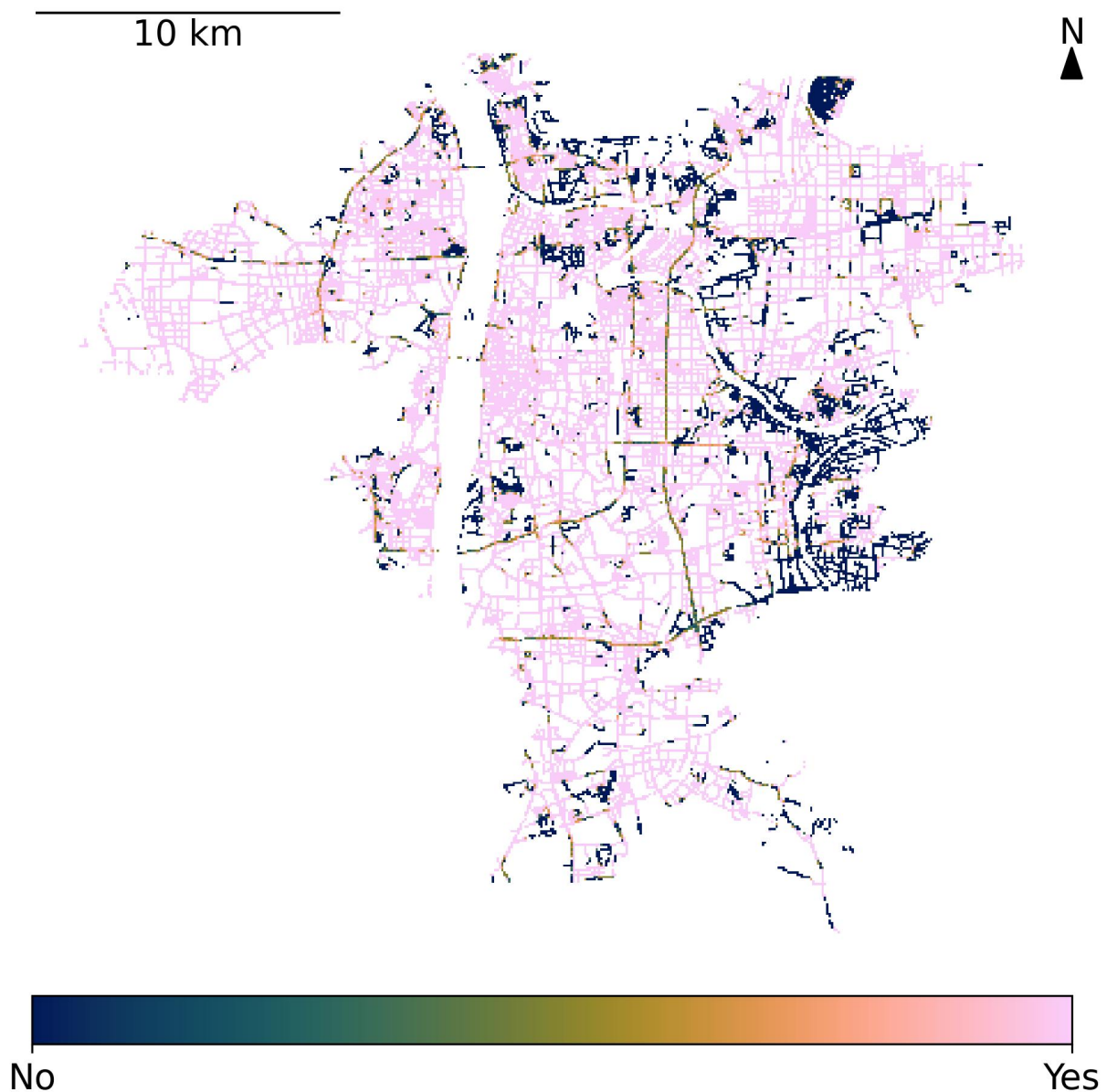
Adapted from The Lancet Global Health (2022):
<https://www.thelancet.com/infographics-do/urban-design-2022>

99.8% of the population in Changsha live in neighbourhoods meeting the street intersection density threshold for 80% probability of engaging in any walking for transport (100 intersections per km²)



Public transport access

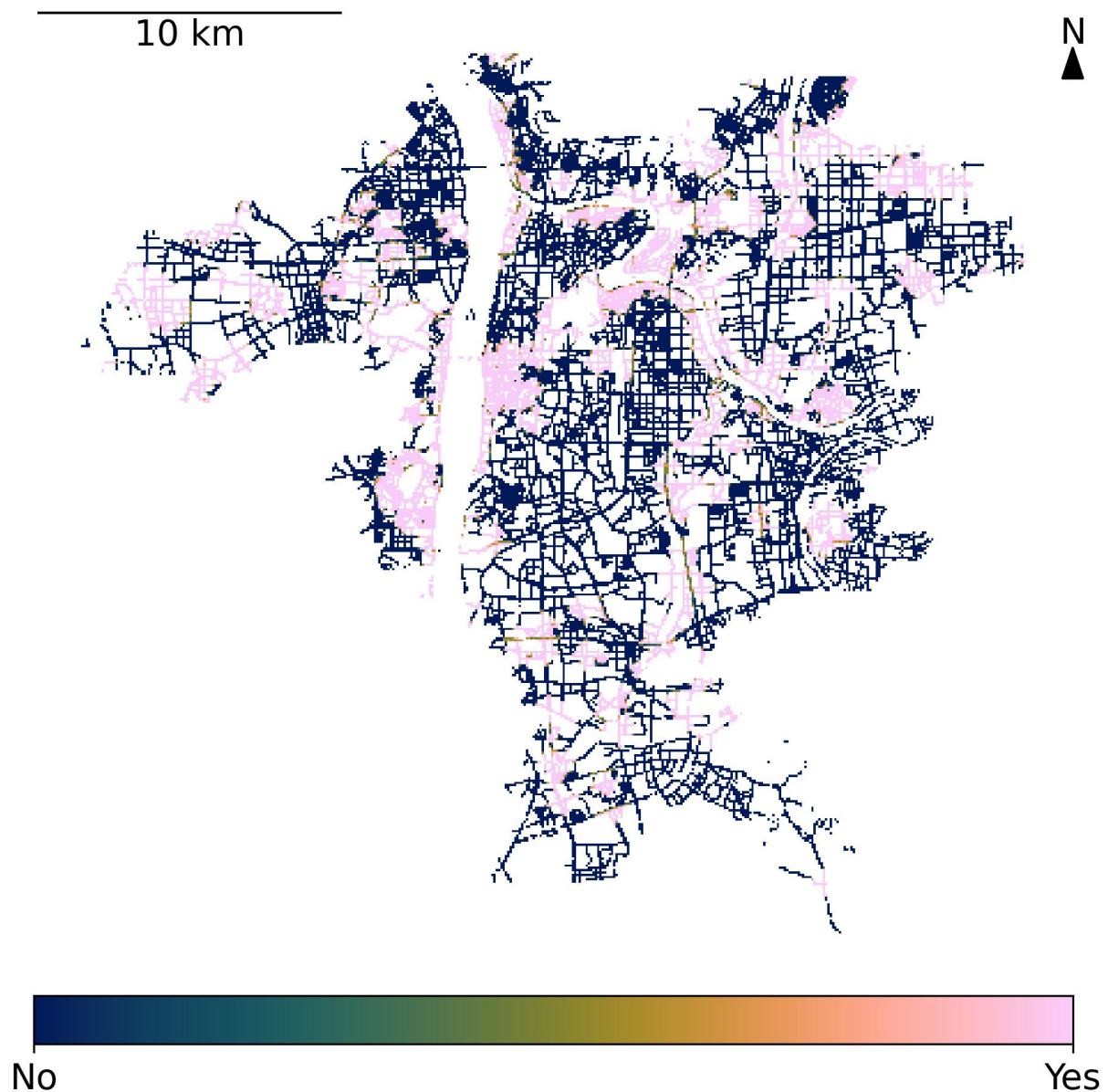
Easy access to frequent public transport is a key determinant of healthy and sustainable transport systems. Public transport near housing and employment increases the mode share of public transport trips, thus encouraging transport-related walking; offering access to regional jobs and services; improving 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.



86.9% of the population in Changsha 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.



29.4% of the population in Changsha live within 500m of public open space of at least 1.5 hectares in size

Summary

In terms of the quality of built environment, the accessibility of public transport stations and convenience stores in Changsha is on par with the average level of 25 benchmark cities, with an approximately 90.6 percent of the population residing within a 500-meter radius of public transport. However, Changsha performs poorly in accessibility to public open spaces, as only 29.4 percent of the population residing within a 500-meter radius of public open space covering an area of at least 1.5 hectares. The city demonstrates a high level of walkability at the neighborhood level, with only 0.3 percent of the population residing in neighborhoods with a pedestrian accessibility score below the average level of other benchmark cities. 89.3 percent of the population residing in neighborhoods meeting the threshold of population density for an 80 percent of likelihood of travelling by walk. 99.8 percent of the population resides in neighborhoods meeting the threshold of street intersection density for an 80 percent of likelihood of travelling by walk.

Citation

Ke Peng, Xiaoyu Cheng, Yaning Yang. 2023. 1000 Cities Challenge report: Changsha, China 2023—Spatial indicators for healthy and sustainable cities (English). Global Observatory of Healthy and Sustainable Cities.



This work is licenced under a Creative Commons CC BY-NC Attribution-NonCommercial 4.0 International License.
