



2020 report

Quantifying greenness of global cities



About the report

Husqvarna Urban Green Space Index (HUGSI), is produced by Husqvarna in collaboration with Overstory.ai this report aggregates multiple data points captured in 2019 for 155 cities in 60 countries to produce the HUGSI 2020 index.

Please refer to our website hugsi.green for more information and specific details by identified cities.

City boundaries identified in the report are defined based on an Open Street Map (OSM) boundaries dataset, which is made available [here](#) under the Open Database License (ODbL).

Population data from Global Human Settlement Layer (GHS-POP) was used to adjust city boundaries, consideration was taken to identify areas where citizens actually reside. For more information on GHS-POP, please see Schiavina, Marcello; Freire, Sergio; MacManus, Kytt (2019): GHS population grid multitemporal (1975, 1990, 2000, 2015) R2019A. European Commission, Joint Research Centre (JRC) DOI: 10.2905/42E8BE89-54FF-464E-BE7B-BF9E64DA5218 PID: <http://data.europa.eu/89h/0c6b9751-a71f-4062-830b-43c9f432370>

Satellite image data is acquired from the Copernicus project, available [here](#), and it has been modified in order to establish this report. For the avoidance of doubt, it should be clarified that HUGSI is not officially endorsed or affiliated with any European Union institution.



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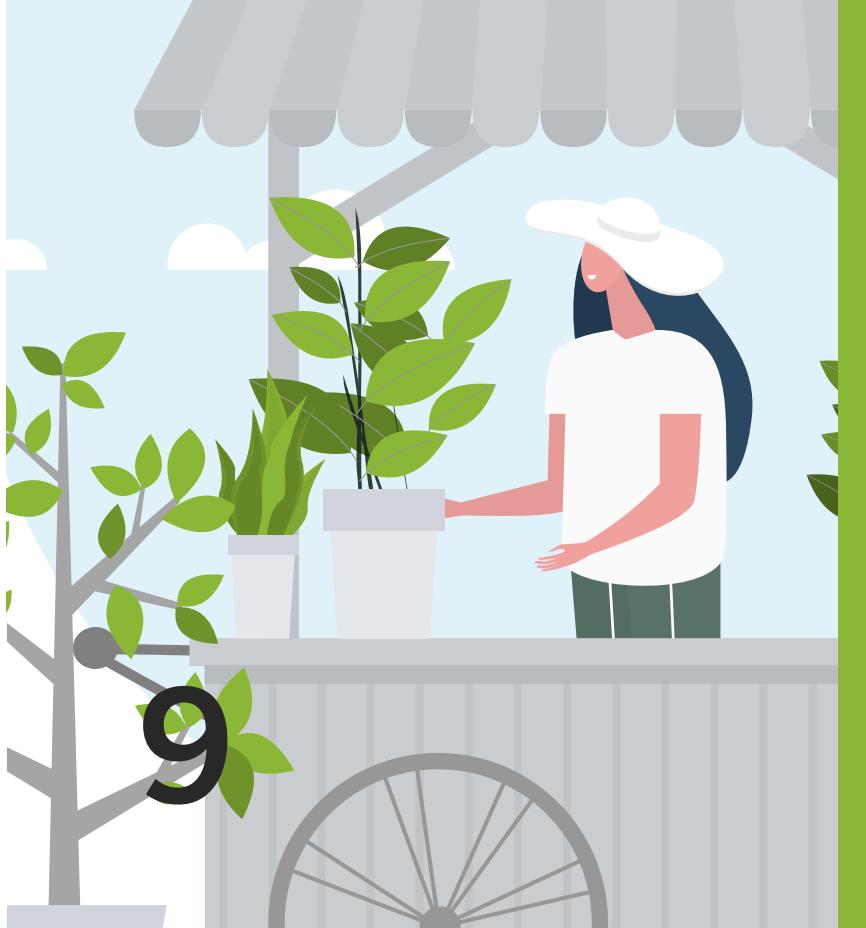
Legal disclaimer: All results are assumptions based on our open methodology and AI-models used. HUGSI Terms of use also apply to this report. hugsi.green/terms-of-use



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Regional results

This year HUGSI cover more cities than ever, adding up to 155 cities in 60 countries grouped by 7 regions. Get the Top-10 list for all regions and their top achievers to find out how your city ranks.

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In this report

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Why Green Space Matters

We make a great difference to those who shape green spaces and urban environments, through our leadership in sustainable, user-centered solutions. Husqvarna is driven by an intuitive passion for innovation, a true understanding of application and a commitment to improved experiences for customers around the world. HUGSI is a proprietary tool that allows us to share vital information about the state and development of urban green space in global cities. We are exploring smarter ways of working, engaging with others and innovating product ideas as well as business models that deliver a difference for both people and our planet.

Urbanization is happening

Urbanization is ongoing and green spaces are extremely important, supporting an improvement in air quality, managing flooding and rainwater as well as contributing to the physical and mental health of citizens. As this trend continues, it is vital to monitor, promote and develop our green areas. Today, approximately three quarters of the European population live in urban settings. Urban living limits the natural access to green space, that is why active city planning for improved and continued maintenance of green spaces is so critical. It takes political guidance, citizen participation and cross-sector collaboration to turn the vision for lush urban green space into reality.

HUGSI contribute with green KPI's

HUGSI can help monitor, track and guide a cities' green KPI's. This is partly why we created HUGSI – to raise the awareness about the value of urban green space among citizens, support city officials and politicians to make data informed decisions. It is our hope it will also facilitate collaboration across industries and organizations to make "smart and sustainable cities" a reality. HUGSI is another example of Husqvarna's 330-year commitment to nature, understanding the people and products that help shape what we love and where we live.

We want to recognize standards and practices that have made significant contributions to preservation of greenspace as well as actively greenifying their cities. By identifying the green KPI's, derived from recurring and thorough monitoring, cities can benchmark other leading cities or just benchmark themselves in their own development and thus strive to create a greener environment.

Sustainability and Innovation – it's how we're meeting the future.

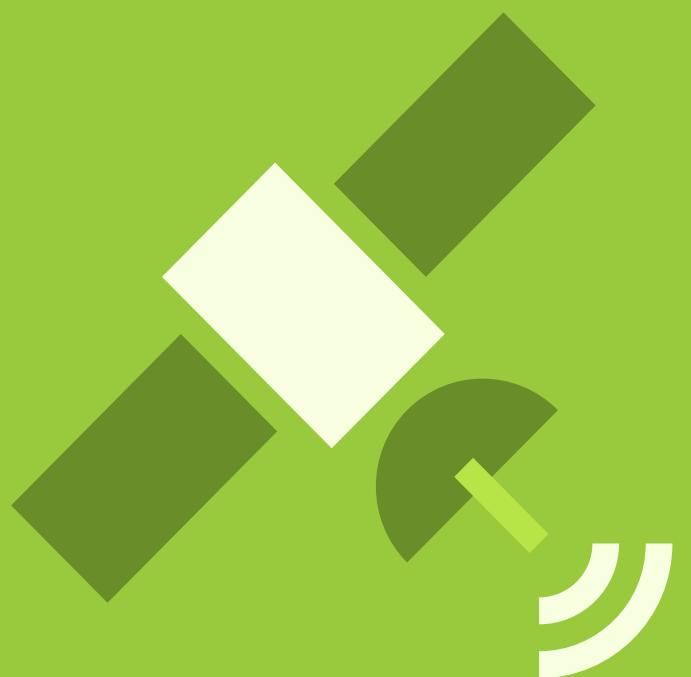
Sascha Menges

President, Husqvarna Division



Viewing the World from above

How green are the cities of the world really? Do they get greener or is densification of cities also reducing the valuable green in the cities? We wanted to find out! By applying computer vision and enhanced learning techniques on satellite images, HUGSI unveils insights about the current state and historic development of vegetation and its surrounding environment in urban areas.



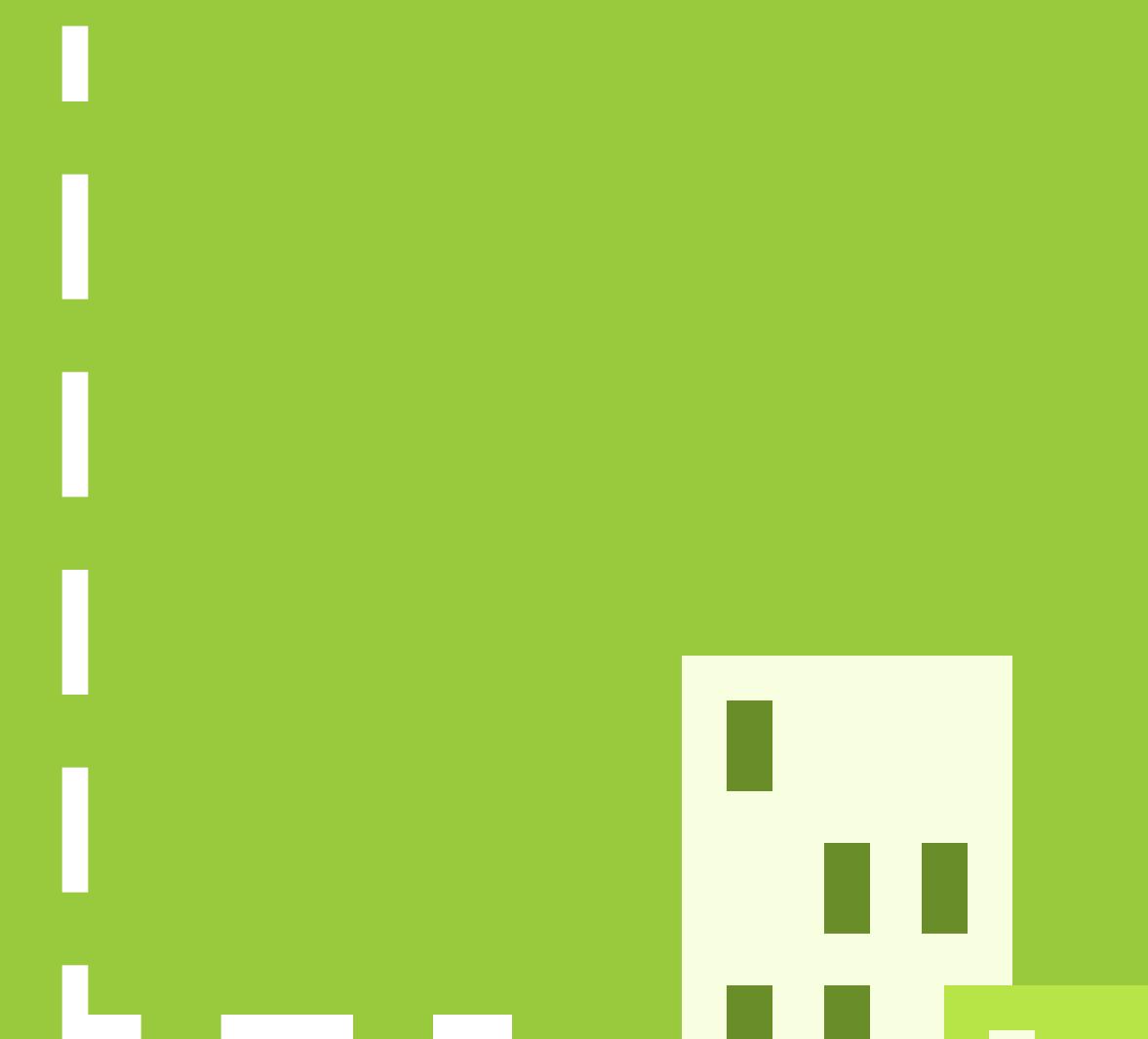
1 Satellite data acquisition

Satellite image data is acquired from Copernicus project supported by European Commission and European Space Agency (ESA). City boundaries are based on Open Street Map (OSM) data to identify the city administrative area, it is important to note that but unpopulated areas within city limit were excluded.



2 Data processing

Computer vision and machine learning techniques are applied to turn satellite image data into a range of urban green space metrics. Data from individual dates for each city is analyzed to find their individual peak green day during the full year.



3 Calculating the index

The overall greenness scores are calculated and are used to rank select cities. To score well the city included should have healthy and well distributed vegetation, with greater proportion in the populated parts of the city.

Trees are awarded twice the value of grass

The Green KPI's

HUGSI is based on a unique data set together with algorithms to analyze satellite images monitoring the proportion and health of green spaces in cities across the globe. To be able to compare and track the development of urban green spaces we have created the following six Key Performance Indicators (KPI's)



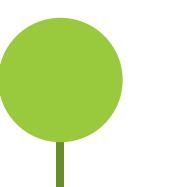
Percentage of urban green space

The area in actual size of green space, divided by size of total urban area of the city being measured.



Urban green space per capita

The area in actual size of green space, divided by population residing in urban area of a city



Percentage of urban green space covered by trees

HUGSI uses a machine learning model to specifically differentiate trees from other vegetation including bush.



Average health of urban green space

HUGSI measures health of vegetation with NDVI, a widely used indicator of vegetation health based on the absorption of visible and invisible light. NDVI value of living vegetation ranges from 0 to 1.



Distribution of urban green space

The greenness of a city can also be identified by how well distributed or spread out the vegetation is. Is all vegetation concentrated in one large park or is the green space spread throughout the city?



Percentage of urban green space covered by grass

HUGSI uses a machine learning model to differentiate grass from other vegetation.



Compare cities

Greenness is not a competition, although comparing cities and creating benchmarks can be a great learning opportunity. This year we have added "The Compare Cities" feature to HUGSI, where you can compare two cities based on their green KPI's.

Have fun, but be nice to your opponent!

[Try it for yourself](#)



Is the world getting greener?

Through the passage of time all cities change. These changes can be negative, positive or neutral depending on the viewpoint. The result is often derived from both deliberate actions from city development and the impact of specific weather conditions.

On a global average there has been a slight decline in urban greenspace, -0.01% less vegetation in 2019 compared to 2018. Extensive city developments in Central East Asia (China) accounts for most of the decline (-52km²). However, a strong positive development in Europe and North America (+38km²) helps to offset that on the global scale.

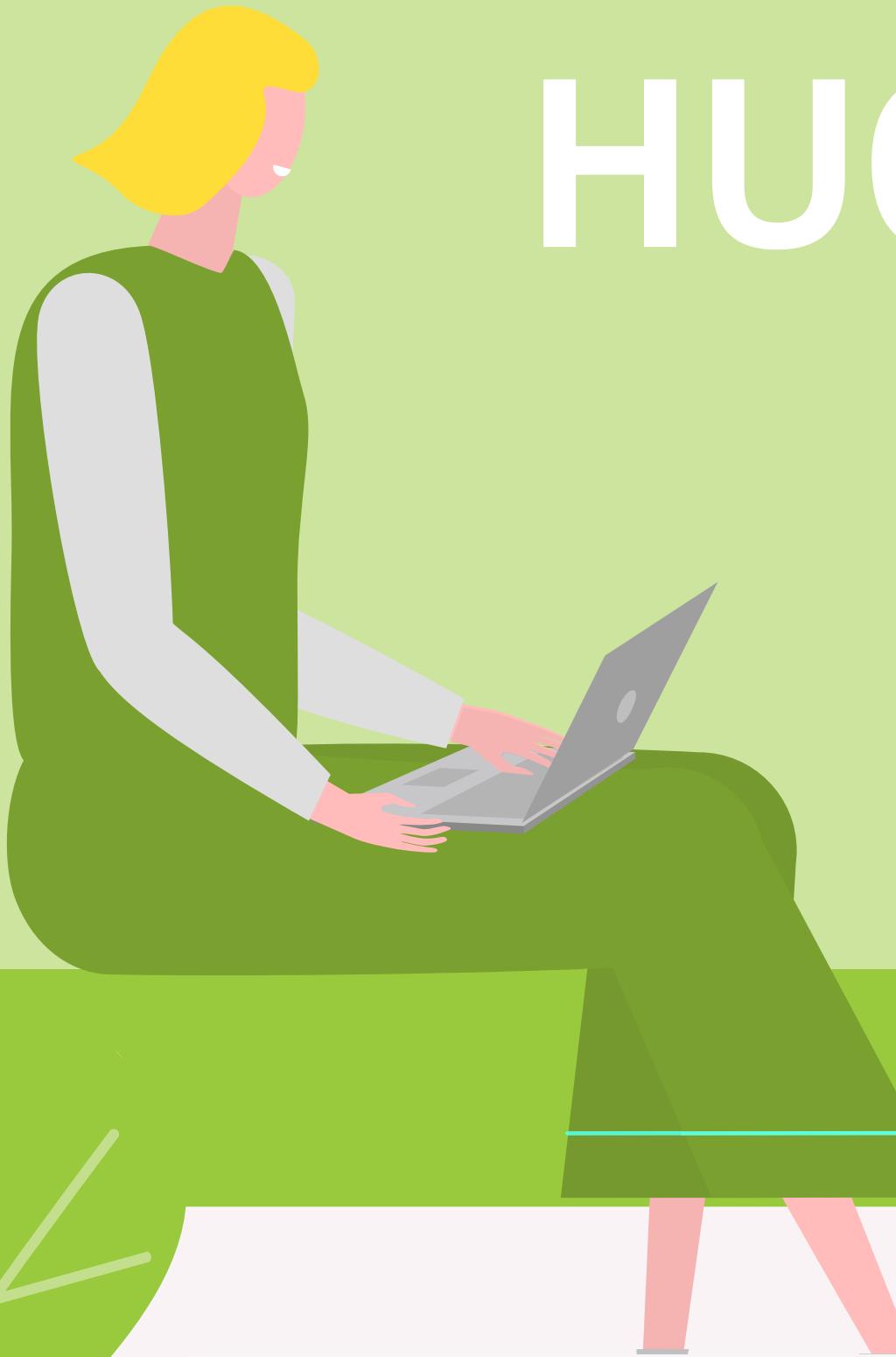
We wanted to find out

When we first started developing HUGSI we had two main questions that we wanted to answer; How green are the cities of the world? Are they getting greener? These are our north stars, that drive us to continue our efforts and the expansion of the HUGSI report. We have updated the report to include detailed Change analysis. To produce this new data set, we have analyzed the land use within the HUGSI-boundaries.

Adding a new layer to HUGSI

Adding a new layer to the HUGSI data, all cities were divided into multiple 250x250 m hexagon shapes. By applying learning models to the material, we were able to define a main class to each hexagon; trees, grass, water or other (urban hard made surfaces like houses, roads etc.). When we compare this main class for the last two years, our report detects any change. From a vegetation perspective the change is either positive, negative or neutral. We have classified positive change as water or other, into trees or grass – increasing the vegetation.

Want to know more about HUGSI?



Want to ask any question?

Partner with us?

Share data with us?

Use our data for research?

Just send us an email!

hello@hugsi.green



Cities analyzed

155 in 60 countries

Total urban population covered

600 million

Urban area analyzed

99 459 km²

Results from

World

Recognized achievements

% Highest percentage of urban green space

Charlotte (NC)

😊 Best health of urban green space

Charlotte (NC)

🌐 Best distribution of urban green space

Charlotte (NC)

👤 Most urban green space per capita

Charlotte (NC)

🌳 Highest % of urban green space covered by trees

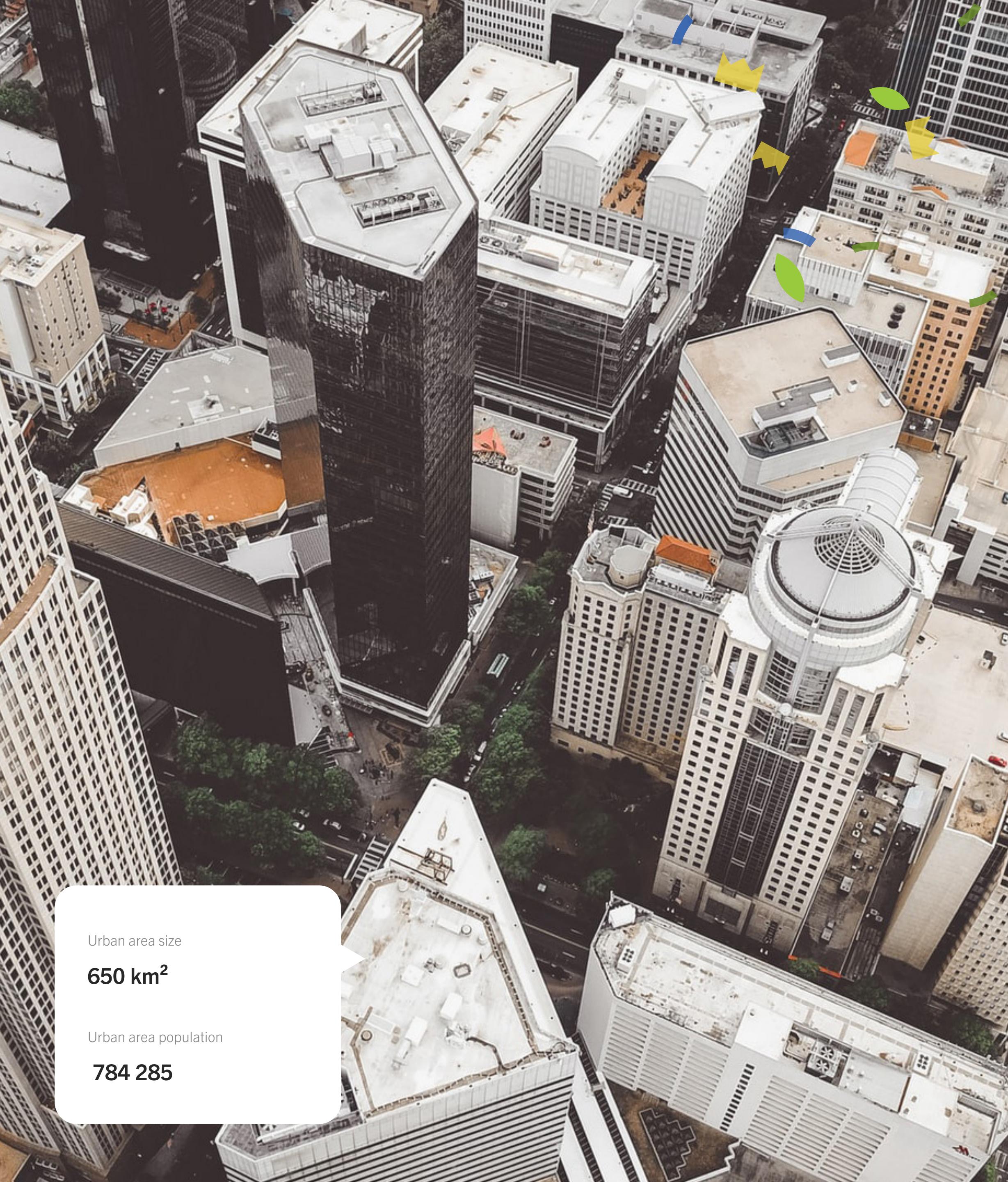
Charlotte (NC)

📊 Highest % of urban green space covered by grass

Jaipur

World top 10

	City	Country	Score	Distribution of land use
1st	Charlotte (NC)	USA	80.8	
2nd	Durban	South Africa	79	
3rd	Vilnius	Lithuania	77.7	
4th	Dortmund	Germany	77	
5th	Krakow	Poland	76.6	
6th	Stuttgart	Germany	76.5	
7th	Austin	USA	75.1	
8th	Wuerzburg	Germany	74.1	
9th	Zürich	Switzerland	73.1	
10th	Heidelberg	Germany	73.1	



Urban area size

650 km²

Urban area population

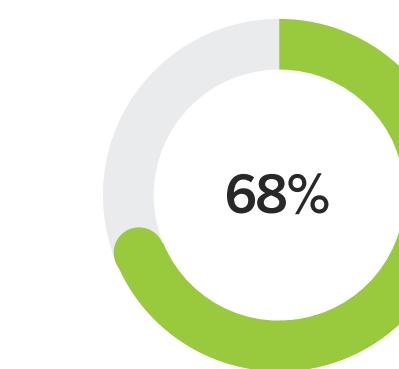
784 285

Global Green Model City of 2020

Charlotte (NC)

This year we are happy and proud to award the City of Charlotte, North Carolina (USA) as the Global Green Model City of 2020. Charlotte stands out as a role model city as they exceed global achievements in almost all categories identified by HUGSI. For Charlotte the greenness does not only come naturally; they have taken decisive action and put-up extensive targets to greenify their city, especially when it comes to tree canopy cover. Charlotte has many diverse ongoing projects and programs, they are engaging their community – people, companies and organizations to help care for and plant new trees and tend to green spaces.

Percentage of urban green space



Urban green space distribution



Distribution of urban green space

0.73

Average health of urban green space

0.79

Urban green space per capita

560m²

Percentag of urban green space covered by trees

56%

Percentage of urban green space covered by grass

12%

Greenness does not come by itself

Why are some cities greener than others? It is not a competition; it is a fact. Of course, the urban greenness of a city can depend on many things such as geographic location, overall climate and socio-economic factors – to just mention a few. Our HUGSI report identifies big differences in how the cities distribute in the ranking. But more importantly it is clear that top achievers are very green as a result of decisive actions to greenify their cities. They do not just sit and wait for their vegetation to grow, they have employed policies and set ambitious targets and goals.

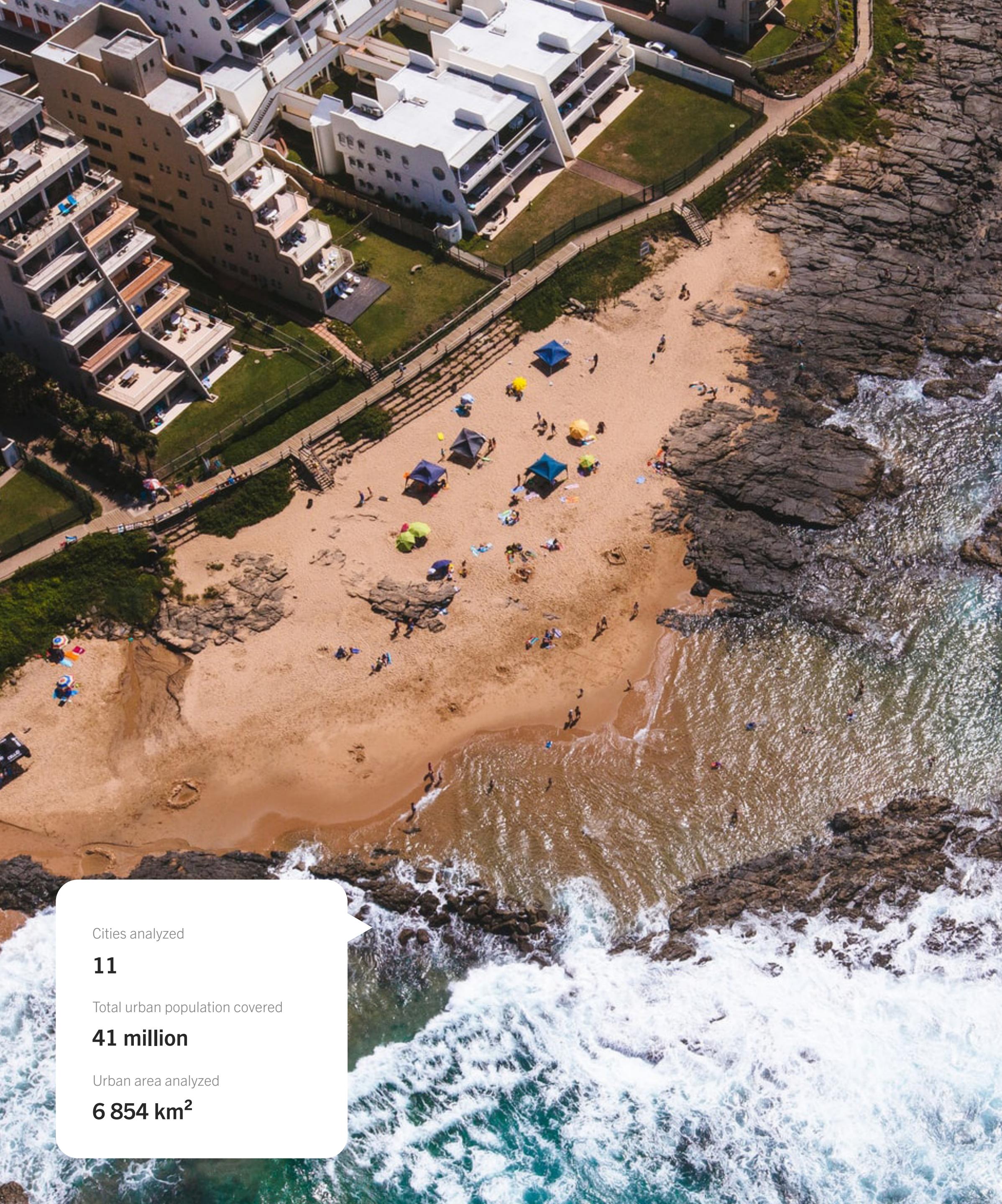
Greenification, an active decision

A greener city may have many potential benefits such as reduction of heat stress, better handling of excessive rainwater, reduction of noise levels, improved biodiversity and better air quality. They also benefit from an improved quality of life for the people living in or visiting the city. Urbanization is ongoing, city densification and expansion is how cities respond. To cope with these mega trends and large-scale changes many cities have begun to formulate a green plan.

Role models for change

Husqvarna is passionate about green spaces and the solutions used to manage and develop them. HUGSI can be used as a monitor for a city's current vegetative state and track their development. Last year's Global Green Model City as identified by HUGSI was Durban (South Africa). The vision for this coastal city is to be Africa's most caring and livable city by 2030. As part of a five-year strategic plan to develop and sustain spatial, natural and built environments, the city is implementing several projects focused on improving in these areas. The trend continues with this year with Charlotte, NC (USA) the newly appointed Global Green Model City. They have set an ambitious goal to have a 50% tree canopy cover in 2050. We can already see that the populated parts of the city analyzed by HUGSI have a 56% canopy cover. By engaging their community, the city gets support by many hands, such as the organizations like Trees Charlotte that every year plant 15 000 trees. It is our hope to continue to share examples and role to help greenify cities all over the globe.





Results from Africa

Recognized achievements

% Highest percentage of urban green space

Durban

😊 Best health of urban green space

Durban

🔗 Best distribution of urban green space

Durban

👤 Most urban green space per capita

Durban

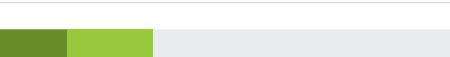
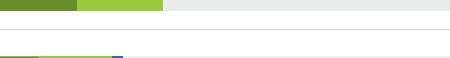
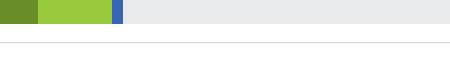
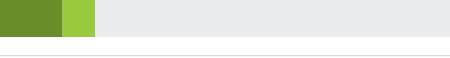
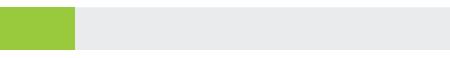
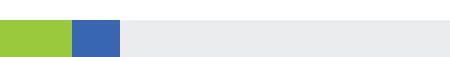
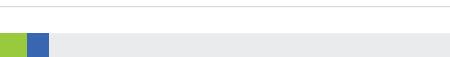
🌳 Highest % of urban green space covered by trees

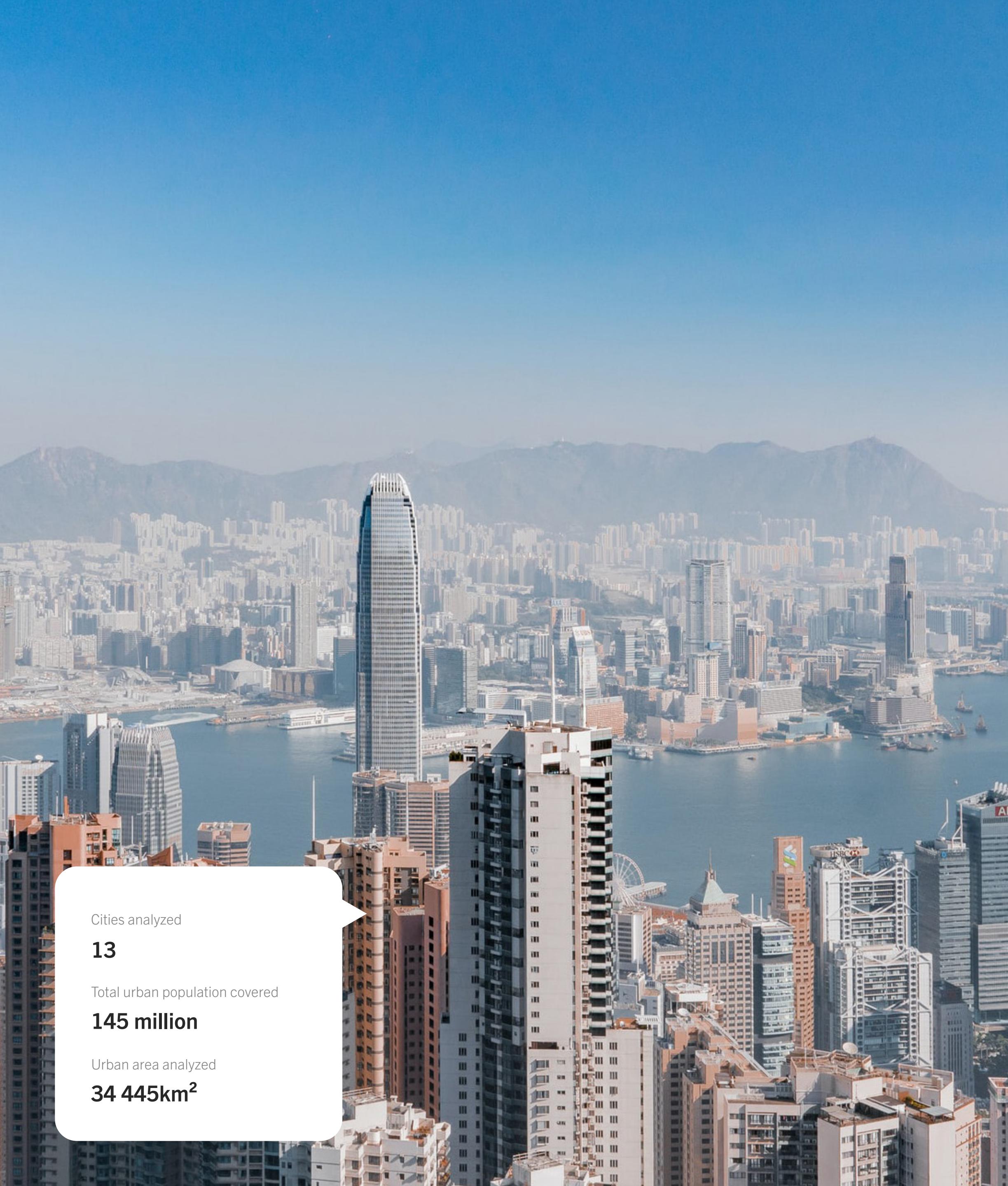
Durban

📊 Highest % of urban green space covered by grass

Dakar

Regional top 10

	City	Country	Score	Distribution of land use
1st	Durban	South Africa	79	
2nd	Dar es Salaam	Tanzania	70	
3rd	Johannesburg	South Africa	64.5	
4th	Tshwane	South Africa	64	
5th	Cape Town	South Africa	51	
6th	Nairobi	Kenya	47	
7th	Addis Ababa	Ethiopia	37	
8th	Dakar	Senegal	24	
9th	Accra	Ghana	21.9	
10th	Lagos	Nigeria	8.5	



Results from

Central East Asia

Recognized achievements

% Highest percentage of urban green space

Dalian

☺ Best health of urban green space

Hong Kong

⊕ Best distribution of urban green space

Dalian

👤 Most urban green space per capita

Zhenjiang

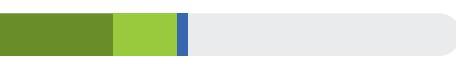
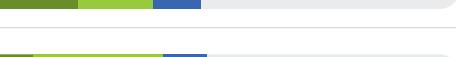
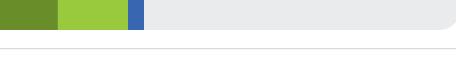
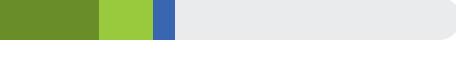
● Highest % of urban green space covered by trees

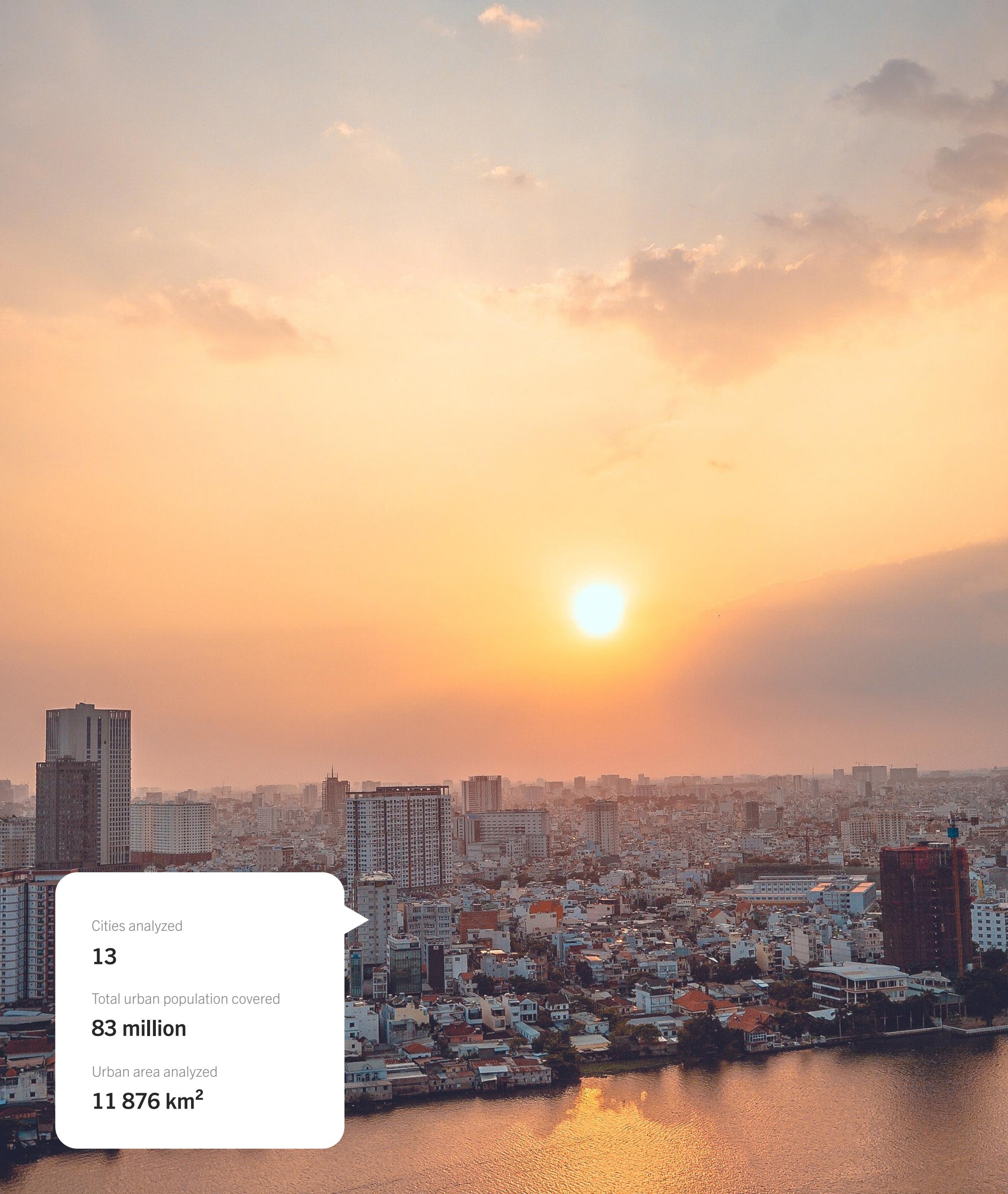
Beijing

📊 Highest % of urban green space covered by grass

Zhenjiang

Regional top 10

	City	Country	Score	Distribution of land use
1st	Hong Kong	China	68.8	
2nd	Beijing	China	67.9	
3rd	Dalian	China	67.3	
4th	Fuzhou	China	65.9	
5th	Nanjing	China	64.5	
6th	Zhenjiang	China	62.2	
7th	Chengdu	China	60.8	
8th	Qingdao	China	59.6	
9th	Guangzhou	China	59.4	
10th	Hangzhou	China	58.3	



Cities analyzed

13

Total urban population covered

83 million

Urban area analyzed

11 876 km²

Results from

East, Southeast Asia and Oceania

Recognized achievements

Highest percentage of urban green space

Hanoi

Best health of urban green space

Hanoi

Best distribution of urban green space

Hanoi

Most urban green space per capita

Hanoi

Highest % of urban green space covered by trees

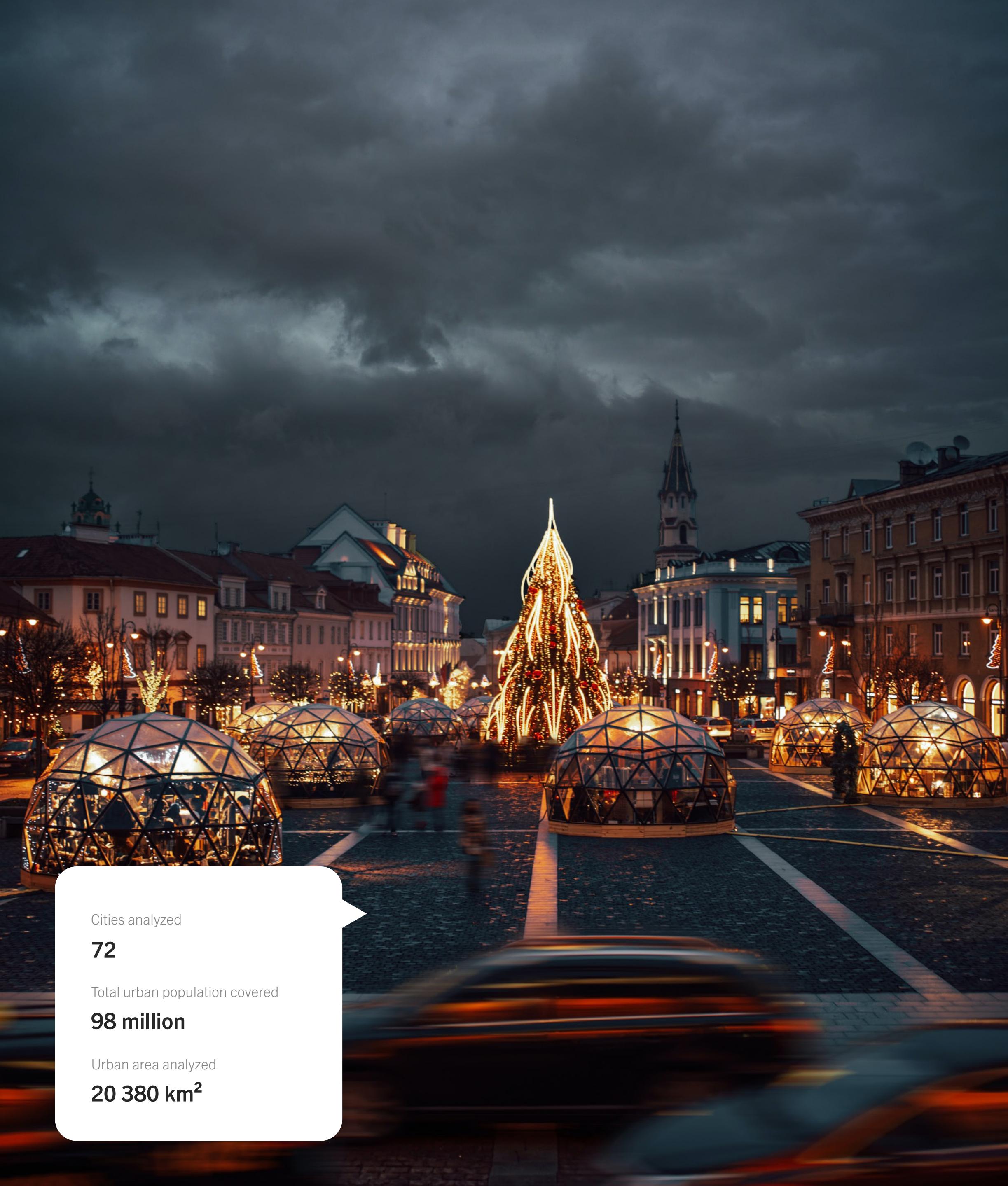
Sydney

Highest % of urban green space covered by grass

Hanoi

Regional top 10

	City	Country	Score	Distribution of land use
1st	Ho Chi Minh City	Vietnam	61.5	
2nd	Hanoi	Vietnam	61.2	
3rd	Singapore	Singapore	56.3	
4th	Bangkok	Thailand	53	
5th	Sydney	Australia	54.5	
6th	Auckland	New Zealand	51.2	
7th	Melbourne	Australia	51	
8th	Kuala Lumpur	Malaysia	50.1	
9th	Seoul	South Korea	45.8	
10th	Quezon City	Philippines	32.6	



Results from

Europe

Recognized achievements

 Highest percentage of urban green space

Vilnius

 Best health of urban green space

Vilnius

 Best distribution of urban green space

Vilnius

 Most urban green space per capita

Vilnius

 Highest % of urban green space covered by trees

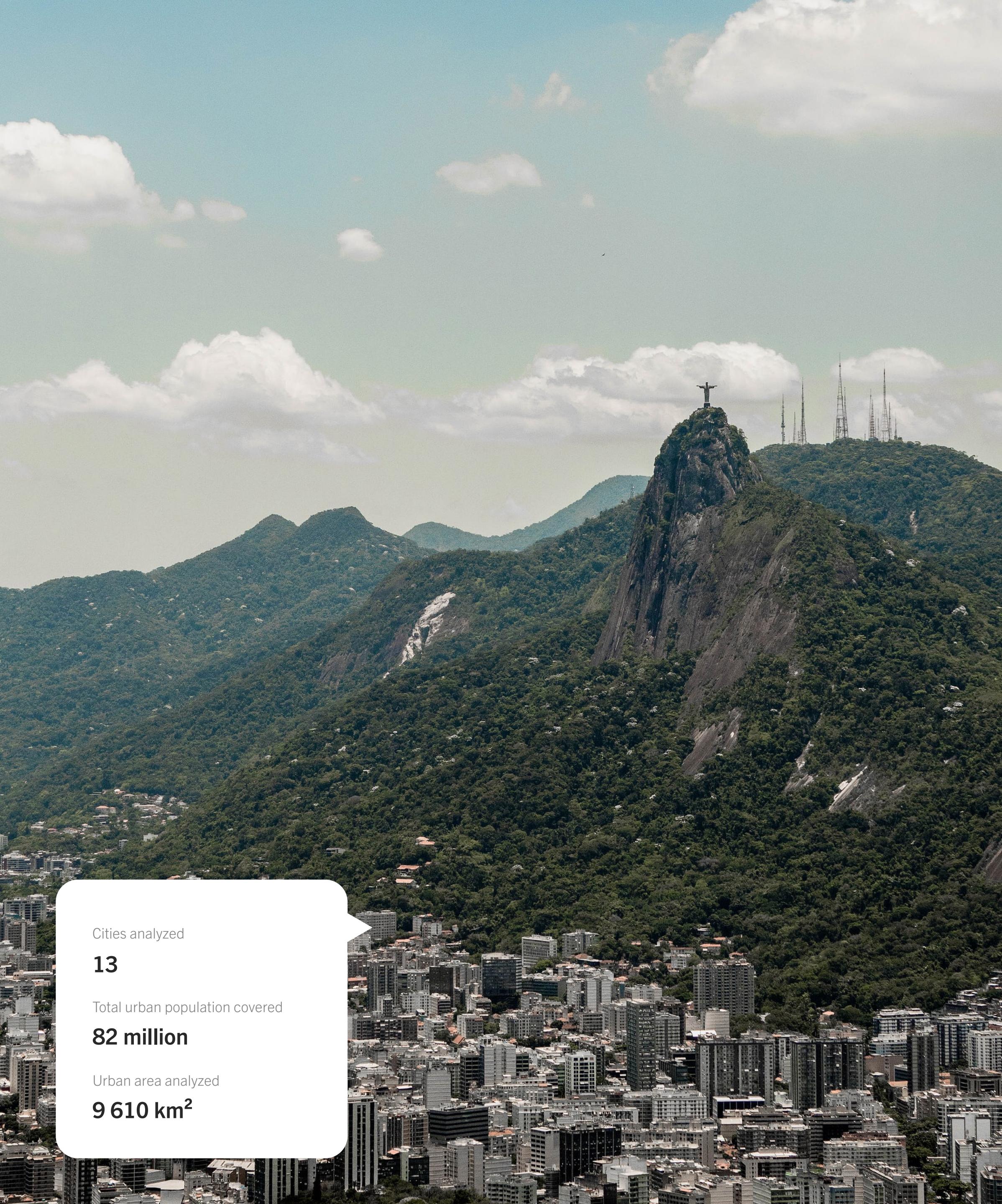
Vilnius

 Highest % of urban green space covered by grass

Bayreuth

Regional top 10

	City	Country	Score	Distribution of land use
1st	Vilnius	Lithuania	77.7	
2nd	Dortmund	Germany	77	
3rd	Krakow	Poland	76.6	
4th	Stuttgart	Germany	76.5	
5th	Wuerzburg	Germany	74.1	
6th	Zürich	Switzerland	73.1	
7th	Heidelberg	Germany	73.1	
8th	Hamburg	Germany	72.8	
9th	Prague	Czech Republic	72.7	
10th	Gothenburg	Sweden	72.5	



Results from

Latin America

Recognized achievements

Highest percentage of urban green space

Rio de Janerio

Best health of urban green space

São Paulo

Best distribution of urban green space

Rio de Janerio

Most urban green space per capita

Rio de Janerio

Highest % of urban green space covered by trees

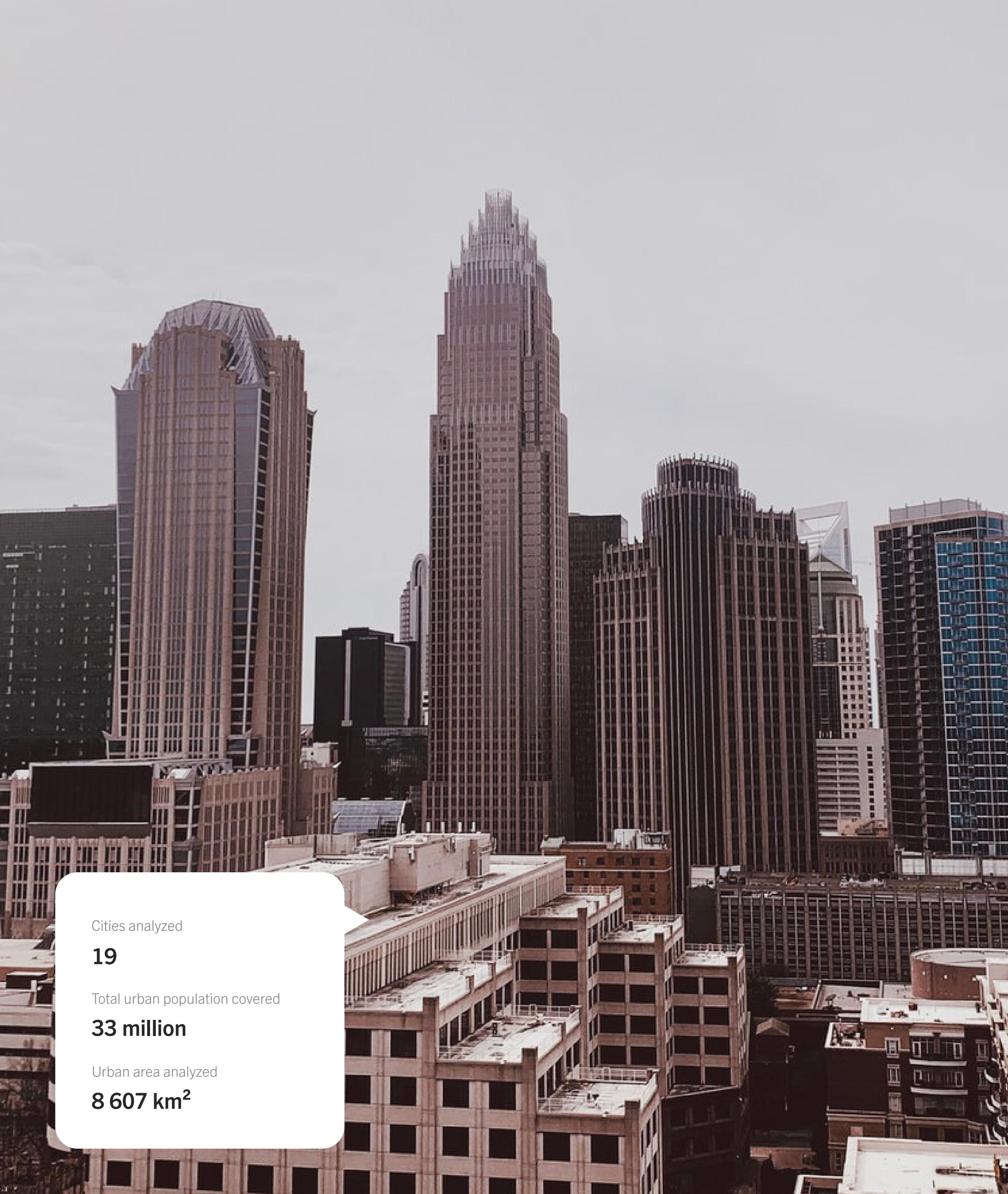
Caracas

Highest % of urban green space covered by grass

Bogotá

Regional top 10

	City	Country	Score	Distribution of land use
1st	Rio de Janerio	Brazil	72	
2nd	Caracas	Venezuela	62.1	
3rd	Curitiba	Brazil	58.6	
4th	São Paulo	Brazil	58.4	
5th	Salvador	Brazil	55.2	
6th	Medellin	Colombia	48.9	
7th	Quito	Ecuador	48.3	
8th	Bogotá	Colombia	38	
9th	Mexico City	Mexico	36.1	
10th	Buenos Aires	Argentina	16.8	



Results from

North America

Recognized achievements

% Highest percentage of urban green space

Charlotte (NC)

😊 Best health of urban green space

Charlotte (NC)

gMaps Best distribution of urban green space

Charlotte (NC)

👤 Most urban green space per capita

Charlotte (NC)

🟢 Highest % of urban green space covered by trees

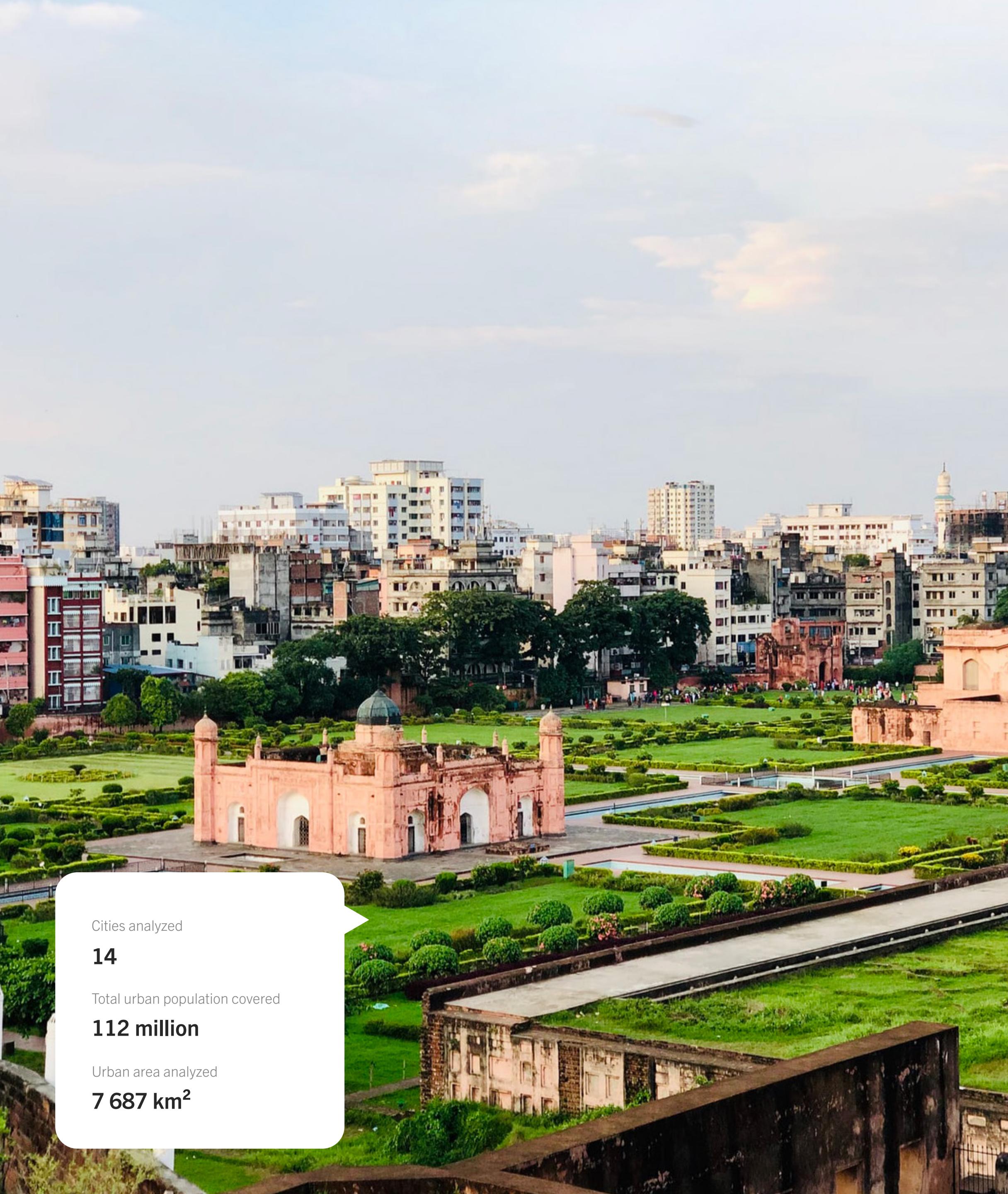
Charlotte (NC)

📊 Highest % of urban green space covered by grass

New Orleans

Regional top 10

	City	Country	Score	Distribution of land use
1st	Charlotte (NC)	USA	80.8	
2nd	Austin	USA	75.1	
3rd	Tampa (FL)	USA	73	
4th	Houston	USA	70.1	
5th	Minneapolis (MN)	USA	69.9	
6th	Washington, DC	USA	66	
7th	Vancouver	Canada	61.9	
8th	Portland	USA	61.3	
9th	Toronto	Canada	59.8	
10th	Philadelphia	USA	52.2	



Results from

South and West Asia

Recognized achievements

% Highest percentage of urban green space

Dhaka

😊 Best health of urban green space

Dhaka

🔗 Best distribution of urban green space

Dhaka

👤 Most urban green space per capita

Amman

🌳 Highest % of urban green space covered by trees

Dhaka

📊 Highest % of urban green space covered by grass

Jaipur

Regional top 10

	City	Country	Score	Distribution of land use
1st	Dhaka	Bangladesh	71.5	
2nd	Pune	India	56.9	
3rd	Bengaluru	India	50.5	
4th	Dehli NCT	India	50.2	
5th	Surat	India	43.3	
6th	Chennai	India	39.4	
7th	Mumbai	India	35.4	
8th	Jaipur	India	34	
9th	Hyderabad	India	32	
10th	Amman	Jordan	29.2	

Request your city

We are really proud of the 155 cities covered in this report. Even though we monitor cities spread over the globe accumulating to almost 600 million people with our analysis there are more areas to discover.

Please reach out to us and request a city relevant to you!

hugsi.green/request-your-city





About Husqvarna

Husqvarna is a brand within Husqvarna Group. Since 1689, Husqvarna has manufactured high performing products and delivered industry-changing innovations such as anti-vibration and automatic chain-break on chainsaws, as well as robotic mowers. Today, Husqvarna offers a broad range of high performing outdoor power products for parks, forest and garden, and represents technological leadership in the key areas; chainsaws, trimmers, ride-on mowers and robotic mowers. Husqvarna products are sold in more than 100 countries, mainly through servicing dealers.

About Husqvarna Group

Husqvarna Group is a global leading producer of outdoor power products and innovative solutions for forest, park and garden care. Products include chainsaws, trimmers, robotic lawn mowers and ride-on lawn mowers. The Group is also the European leader in garden watering products and a global leader in cutting equipment and diamond tools for the construction and stone industries. The Group's products and solutions are sold under brands including Husqvarna, Gardena, McCulloch, Poulan Pro, Weed Eater, Flymo, Zenoah and Diamant Boart via dealers and retailers to consumers and professionals in more than 100 countries. Net sales in 2019 amounted to SEK 42bn and the Group has some 13,000 employees in 40 countries.