

An aerial photograph of a large, open urban square or park. The area features several green roofs in the foreground and middle ground, where many people are sitting or walking. In the background, there are more people walking on paved paths and a few street lamps. The overall scene is bright and sunny.

2019 Report

HUGSI

Husqvarna Urban Green Space Index

www.hugsi.green

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HUGSI – Husqvarna Urban Green Space Index – an index to safeguard green spaces in urban areas

Imagine New York without Central Park, London without Hyde Park, or that the little pocket park closest to your own home would be replaced with a new office building or a parking lot. As urbanization continues, the battle for land and resources intensifies, putting parks and all types of green spaces at risk.

Green spaces, trees and plants are the lungs of our cities, improving air quality, managing rainwater, and contributing to the physical and mental health of the citizens. With more people sharing the same space, it becomes vital to safeguard the green spaces, ensuring that the green space per capita is not jeopardized.

Peter Drucker said, "What gets measured, gets managed". That is exactly why we developed HUGSI. By applying computer vision and deep learning techniques on satellite images, HUGSI unveils insights about the current state and historic development of vegetation and their surrounding environment in urban areas. This makes it possible to find out how green cities really are and if densification is reducing the amount of urban green spaces.

We hope and believe, that this index will empower city representatives with the data needed to safeguard green spaces. We also believe that using this technology will make parks greener, safer, and enable resources to last longer through prediction of future growth and taking preventive actions. Knowing the health status of a tree can not only minimize the risk of dead branches falling but also compliment, and in some cases replace date scheduled maintenance with need-based care to improve the green spaces and give landscapers time for other tasks.

For HUGSI, we have monitored 98 cities around the world. As a baseline, we used the cities that are members of C40, the network of the world's megacities committed to addressing climate change, representing 700+ million citizens and one quarter of the global economy. Imagine the positive effects when these cities collaborate with the insights and opportunities from HUGSI and begin employing the benefits of digitalization in their green spaces.

Digitalization, robotics and autonomous solutions will play a key role in making the green spaces of cities more sustainable, HUGSI is a milestone on the journey.

Anders Johanson
CTO, Husqvarna Group

The full HUGSI data set on regional and city level is available at www.hugsi.green
HUGSI has been developed by Husqvarna Group AI Lab in collaboration with 20tree.ai



Viewing green space from above

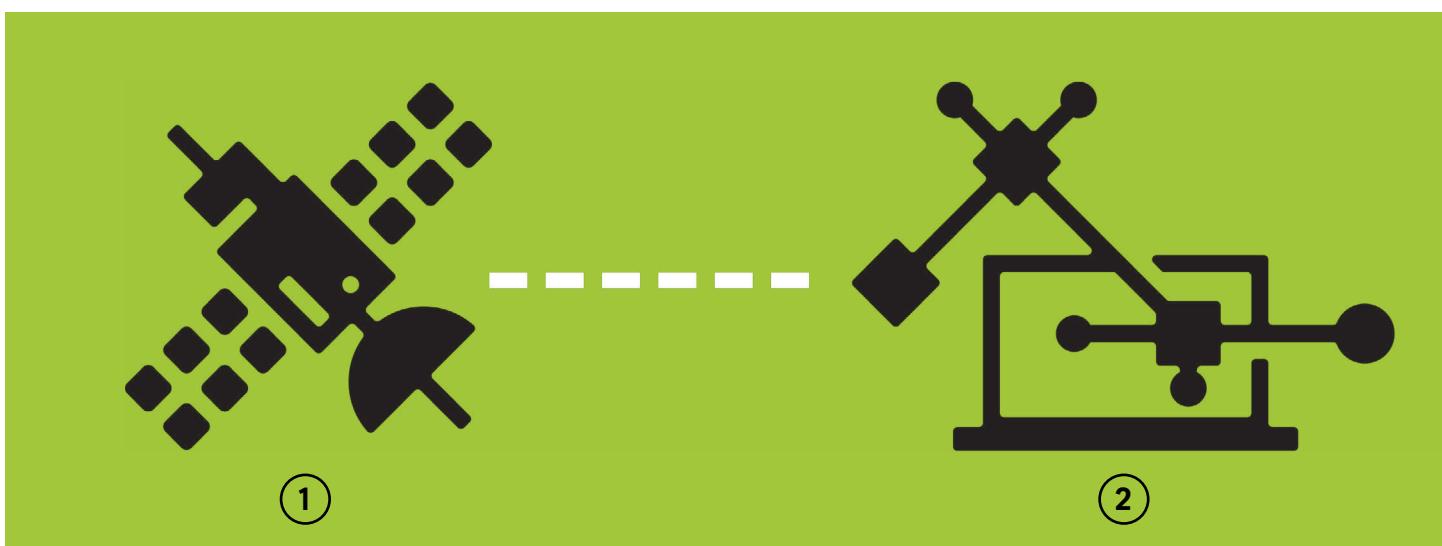
What is HUGSI

HUGSI stands for Husqvarna Urban Green Space Index — a digital innovation initiative developed by Husqvarna in collaboration with 20tree.ai. The ambition is to help safeguard and improve maintenance of green spaces in urban areas. By applying computer vision and deep learning techniques on satellite images, HUGSI unveils insights about the size, proportion, distribution, and health of green space in urban areas.

Why HUGSI matters

Urbanization is happening at an unprecedented pace. Cities are increasingly focused on sustainable development. With proven environmental and recreational value, the development and management of urban green space is becoming a focus area for cities across the globe. It takes political guidance, citizen participation and cross-sector collaboration to turn the vision for urban green space into reality.

That's 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 and facilitate the collaboration across industries and organizations to together make "smart and sustainable city" a reality.





Highlighting cities with “green” commitment

How the cities were chosen

The index includes 98 cities in 51 countries. The city selection is based on C40 members*, including temporarily inactive cities. Since the C40 cities also care a lot about sustainability it was a perfect match for us. In addition, we have added Geneva (Switzerland), Brussels (Belgium), Gothenburg (Sweden) and Marseille (France) to allow domestic comparisons in key European countries.

How urban area of a city is defined

City boundaries in HUGSI are defined based on OSM Boundaries dataset provided by Open Street Map. Population data from Global Human Settlement Layer (GHS-POP) is used to adjust city boundaries so we only take into consideration urban areas where citizens actually reside.

For detailed information about the method behind

HUGSI please visit

hugsi.green

Read more about C40: <https://www.c40.org/>

Read more about OSM Boundaries data:

<https://wambachers-osm.website/boundaries/>

Read more about Global Human Settlement Layer:

https://ghsl.jrc.ec.europa.eu/ghs_pop2019.php

*C40 is a network of the world's megacities committed to addressing climate change. C40 supports cities to collaborate effectively, share knowledge and drive meaningful, measurable and sustainable action on climate change.



How it works

- ① Satellite image data is acquired from Copernicus project supported by European Commission and European Space Agency (ESA).
- ② Computer vision and machine learning techniques are applied to turn satellite image data into a range of urban green space metrics.
- ③ The overall greenness scores are calculated and are used to rank select cities.



Global ranking

The HUGSI-index compares the level of greenness in 98 cities from 51 countries, divided into 7 regions. By identifying and recognizing these green heroes, we hope that the top ranking cities in this index can serve as inspiration for others on how to increase and distribute green spaces in urban areas.

As the cities are located in different climate zones, we have used data for the index from the greenest day of each individual city.

Hence, all cities are assessed when they are at their greenest.

The index calculation is based on the percentage of vegetation (trees and grass) and weighing in the average health and distribution of the urban vegetation.

To learn more about the index, visit hugsi.green.

Category winners



Highest % of urban green space

Durban



Best health of urban vegetation

Brussels



Highest percentage of urban area covered by grass

Jaipur



Best distribution of urban green space

Dhaka



Most urban green space per capita

Austin



Highest percentage of urban area covered by trees

Durban

Top 10

Rank	City	Relative Score (0-100)	Distribution of land usage				Grasses	Trees	Water	Other
1st	Durban	84.0	17.5%	42%		1.6%				38.9%
2nd	Rio de Janeiro	78.2	13.3%	38.6%		2.8%				45.3%
3rd	Austin	77.4	13.4%	41.7%		0.8%				44.1%
4th	Beijing	77.3	11.9%	37.5%		2.2%				48.4%
5th	Geneva	76.5	30.2%	25.8%		5.5%				38.5%
6th	Dalian	76.1	14.2%	35.8%		4.8%				45.2%
7th	Gothenburg	75.5	11.3%	38.3%		6.1%				44.3%
8th	Heidelberg	75.0	13.9%	37.4%		3.1%				45.6%
9th	Qingdao	74.4	10.7%	34.4%		4.2%				50.7%
10th	Caracas	74.3	10.1%	39.1%		0%				50.8%



Durban South Africa

Urban area size

1,030 km²

Urban Area Population

3,30,1769 (2015)

City area and population

Congratulations Durban, and foremost, congratulations to everyone living in the city of Durban (eThekini), South Africa. Not only is Durban the global winner of the first HUGSI index, the African megacity with more than 3 million inhabitants also scored the highest percentage of green space in urban areas and highest percentage of urban area covered by trees.

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 environment, the city is implementing several projects to make eThekini a green-leading city. The city has specifically focused on urban forestry, and to engage the community in greening their environment.

To learn more about Durban's commitment to green spaces, visit: <http://parks.durban.gov.za>



Statistics



Percentage of urban green space

60%



Distribution of urban green space

66%



Average health of urban green space

0.73



Urban green space per capita

185.8 m²

Type of vegetation

17.5%

42%

1.6%

38.9%



Grasses



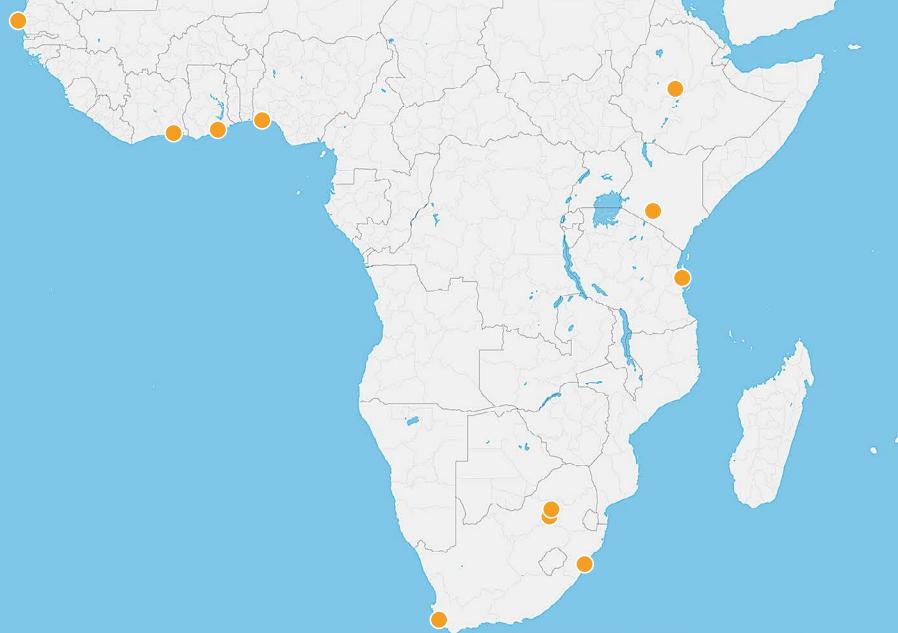
Trees



Water



Other



Results from Africa

Category winners



Highest % of urban green space

Durban



Best health of urban vegetation

Durban



Highest percentage of urban area covered by grass

Dakar



Best distribution of urban green space

Durban



Most urban green space per capita

Durban

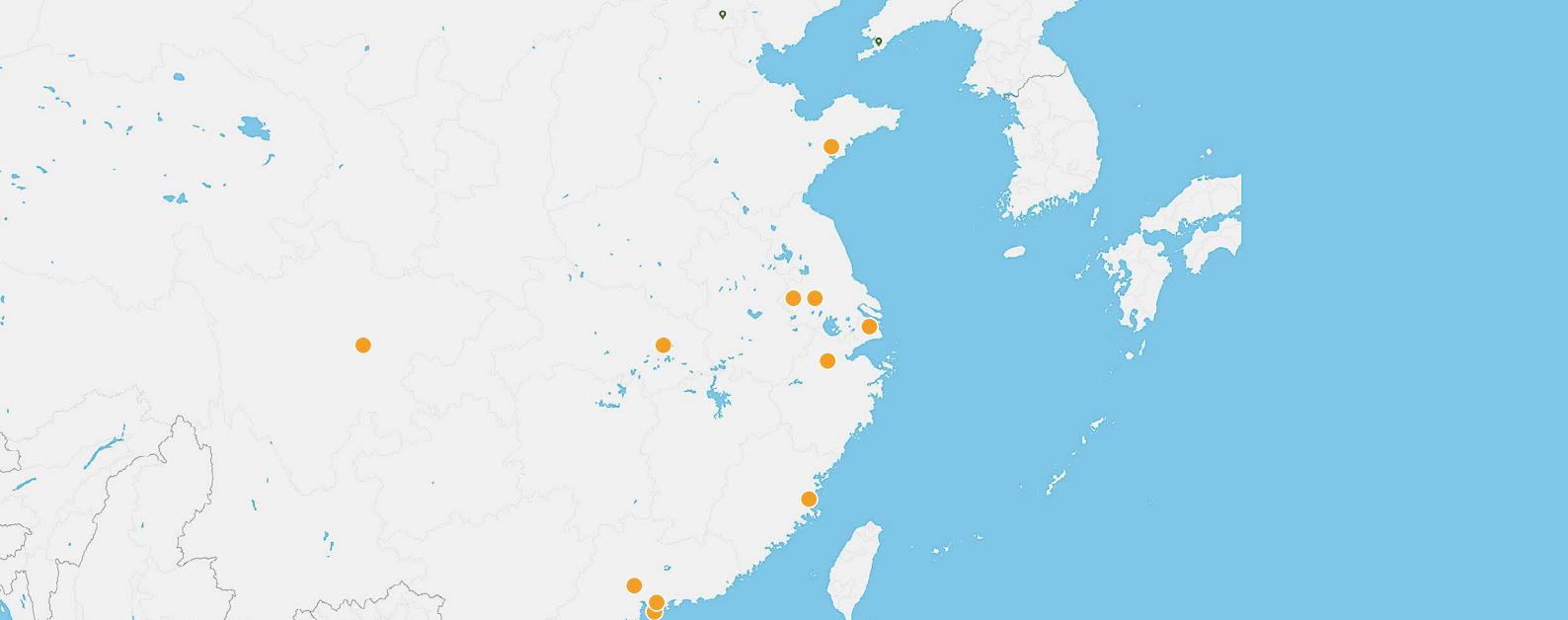


Highest percentage of urban area covered by trees

Durban

Top 10

Rank	City	Relative Score (0-100)	Distribution of land usage				Grasses	Trees	Water	Other
1st	Durban	84.0	17.5%	42.0%	1.6%	38.9%				
2nd	Dar es Salaam	72.0	21.2%	28.3%	2.5%	48%				
3rd	Tshwane	71.1	10.2%	32.5%	0.2%	57.1%				
4th	Johannesburg	70.6	15.1%	27.4%	0.3%	57.2%				
5th	Cape Town	61.1	14.5%	21.0%	2.2%	62.3%				
6th	Nairobi	47.4	4.8%	25.4%	0.1%	69.7%				
7th	Addis Ababa	47.2	16.5%	12%	0.1%	71.4%				
8th	Dakar	29.2	23.8%	1.7%	9.4%	65.1%				
9th	Accra	26.4	13.2%	6.1%	3.9%	76.8%				
10th	Lagos	18.8	12.2%	2.4%	19.9%	65.5%				



Results from Central East Asia

Category winners



Highest % of urban green space

Dalian



Best health of urban vegetation

Nanjing



Highest percentage of urban area covered by grass

Zhenjiang



Best distribution of urban green space

Dalian



Most urban green space per capita

Zhenjiang

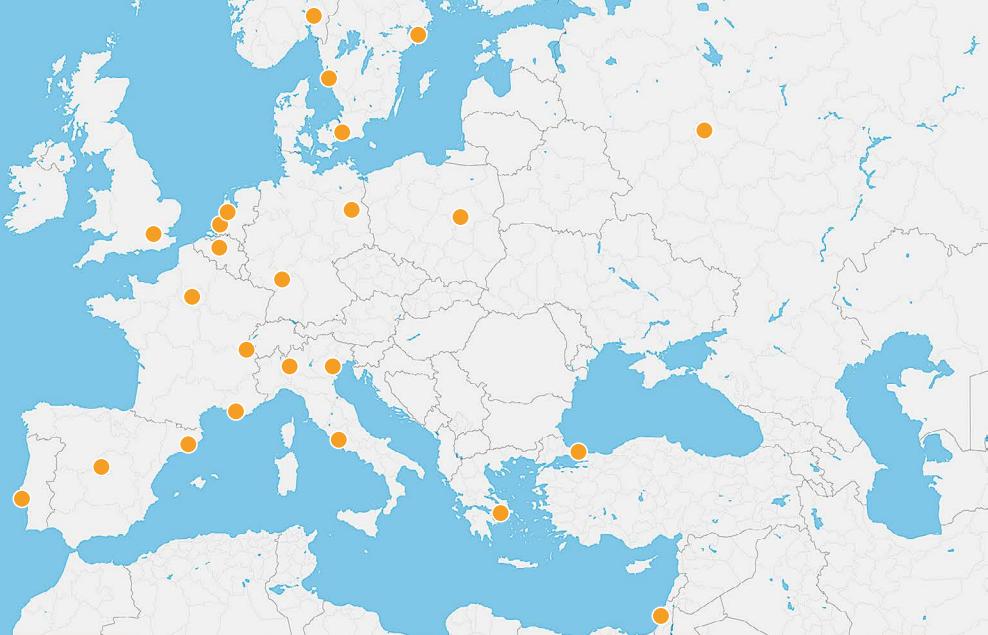


Highest percentage of urban area covered by trees

Beijing

Top 10

Rank	City	Relative Score (0-100)	Distribution of land usage			
			Grasses	Trees	Water	Other
1st	Beijing	77.3	11.9%	37.5%	2.2%	48.4%
2nd	Dalian	76.1	14.2%	35.8%	4.8%	45.2%
3rd	Qingdao	74.4	10.7%	34.4%	4.2%	50.7%
4th	Nanjing	73.5	14.9%	30.4%	8.7%	46.0%
5th	Fuzhou	73.2	19.8%	28.2%	9%	43.0%
6th	Hong Kong	71.6	18.4%	29.6%	11.4%	40.6%
7th	Zhenjiang	70.5	24.5%	22%	8.4%	45.1%
8th	Shanghai	67.5	20.2%	20.5%	7%	52.3%
9th	Wuhan	66.3	23.6%	17.9%	10.8%	47.7%
10th	Chengdu	66.1	11.1%	27.4%	2.9%	58.6%



Results from Europe

Category winners



Highest % of urban green space

Geneva



Best health of urban vegetation

Brussels



Highest percentage of urban area covered by grass

Rome



Best distribution of urban green space

Geneva



Most urban green space per capita

Gothenburg

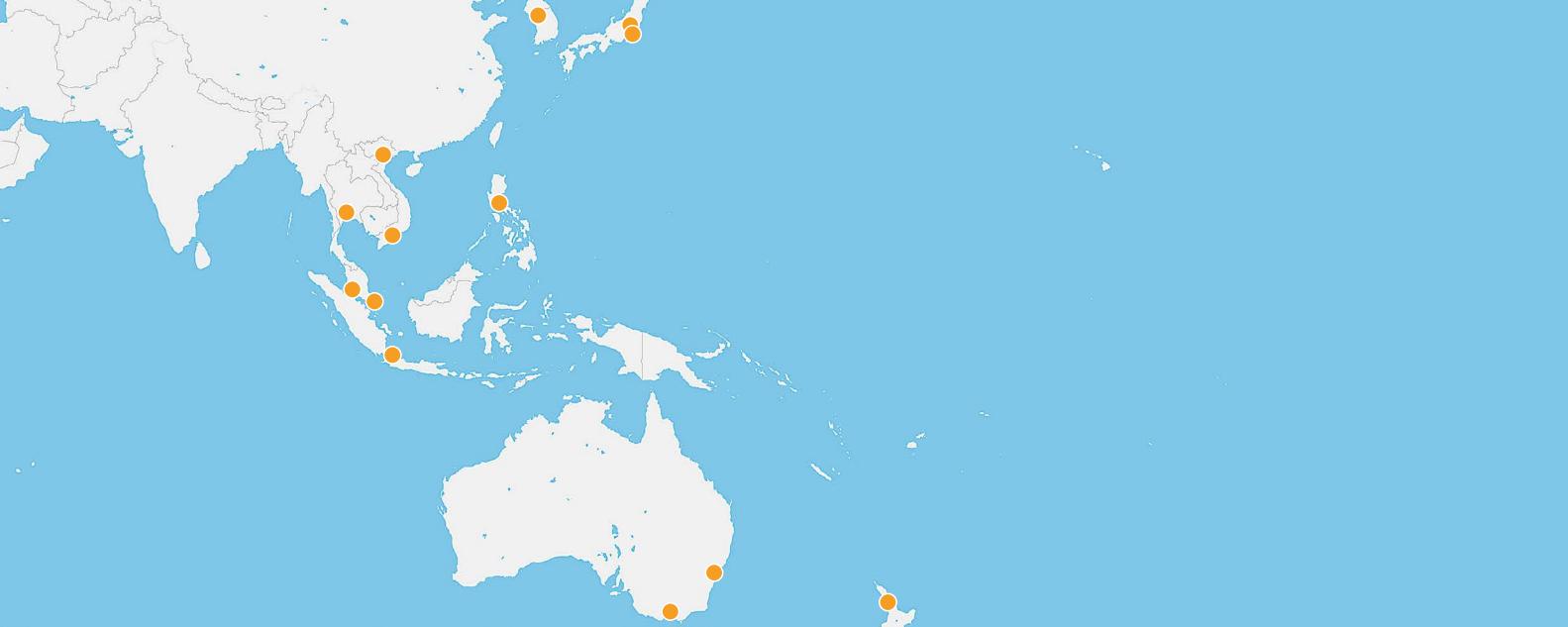


Highest percentage of urban area covered by trees

Berlin

Top 10

Rank	City	Relative Score (0-100)	Distribution of land usage			
			Grasses	Trees	Water	Other
1st	Geneva	76.5	30.2%	25.8%	5.5%	38.5%
2nd	Gothenburg	75.5	11.3%	38.3%	6.1%	44.3%
3rd	Heidelberg	75.0	13.9%	37.4%	3.1%	45.6%
4th	Warsaw	73.1	13.1%	37.9%	1.8%	47.2%
5th	Oslo	72.3	9.5%	38%	3.8%	48.7%
6th	Barcelona	70.4	22.3%	20.7%	2.1%	54.9%
7th	Berlin	68.9	9.2%	40.6%	3.9%	46.3%
8th	Stockholm	67.6	8.4%	35.9%	9.9%	45.8%
9th	Marseille	66.3	12.8%	28.2%	4.7%	54.3%
10th	Moscow	65.9	7.8%	37.2%	3.1%	51.9%



Results from East, Southeast Asia & Oceania

Category winners



Highest % of urban green space

Hanoi



Best health of urban vegetation

Auckland



Highest percentage of urban area covered by grass

Hanoi



Best distribution of urban green space

Hanoi



Most urban green space per capita

Auckland

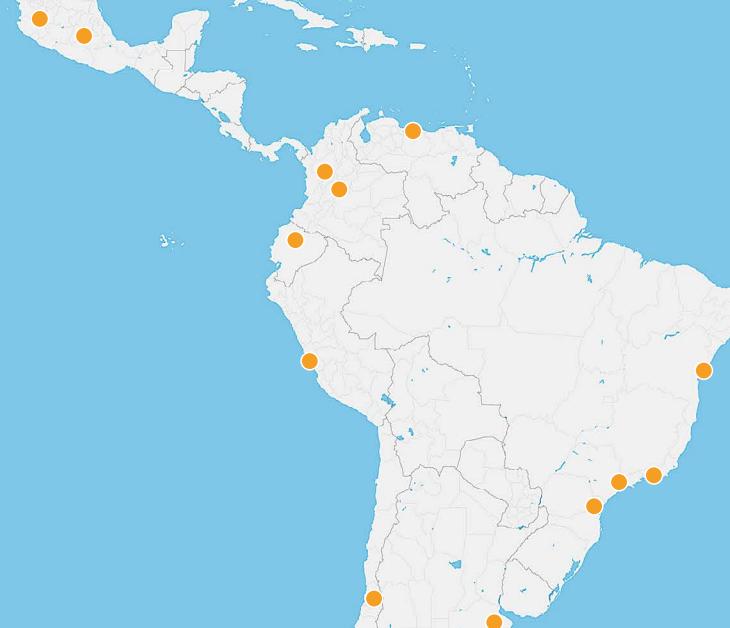


Highest percentage of urban area covered by trees

Ho Chi Minh City

Top 10

Rank	City	Relative Score (0-100)	Distribution of land usage	Grasses	Trees	Water	Other
1st	Auckland	66.0	<div style="display: flex; justify-content: space-between;"><div>8.3%</div><div>28.7%</div><div>11.3%</div><div>51.7%</div></div>				
2nd	Ho Chi Minh City	65.3	<div style="display: flex; justify-content: space-between;"><div>11.7%</div><div>28.8%</div><div>8.6%</div><div>50.9%</div></div>				
3rd	Hanoi	65.1	<div style="display: flex; justify-content: space-between;"><div>31.4%</div><div>19.0%</div><div>11.2%</div><div>38.4%</div></div>				
4th	Bangkok	61.9	<div style="display: flex; justify-content: space-between;"><div>11.5%</div><div>19.5%</div><div>5%</div><div>64%</div></div>				
5th	Singapore	59.3	<div style="display: flex; justify-content: space-between;"><div>9.6%</div><div>27.1%</div><div>4.7%</div><div>58.6%</div></div>				
6th	Kuala Lumpur	54.8	<div style="display: flex; justify-content: space-between;"><div>6.2%</div><div>25.9%</div><div>2%</div><div>65.9%</div></div>				
7th	Seoul	52.6	<div style="display: flex; justify-content: space-between;"><div>4.6%</div><div>26.6%</div><div>5.5%</div><div>63.3%</div></div>				
8th	Quezon City	42.1	<div style="display: flex; justify-content: space-between;"><div>4%</div><div>19.0%</div><div>2.3%</div><div>74.7%</div></div>				
9th	Sydney	37.6	<div style="display: flex; justify-content: space-between;"><div>7.1%</div><div>13.0%</div><div>8.4%</div><div>71.5%</div></div>				
10th	Yokohama	35.2	<div style="display: flex; justify-content: space-between;"><div>3.7%</div><div>15.5%</div><div>5.4%</div><div>75.4%</div></div>				



Results from Latin America

Category winners



Highest % of urban green space
Rio de Janeiro



Best health of urban vegetation
Salvador



Highest percentage of urban area covered by grass
Bogota



Best distribution of urban green space
Rio de Janeiro



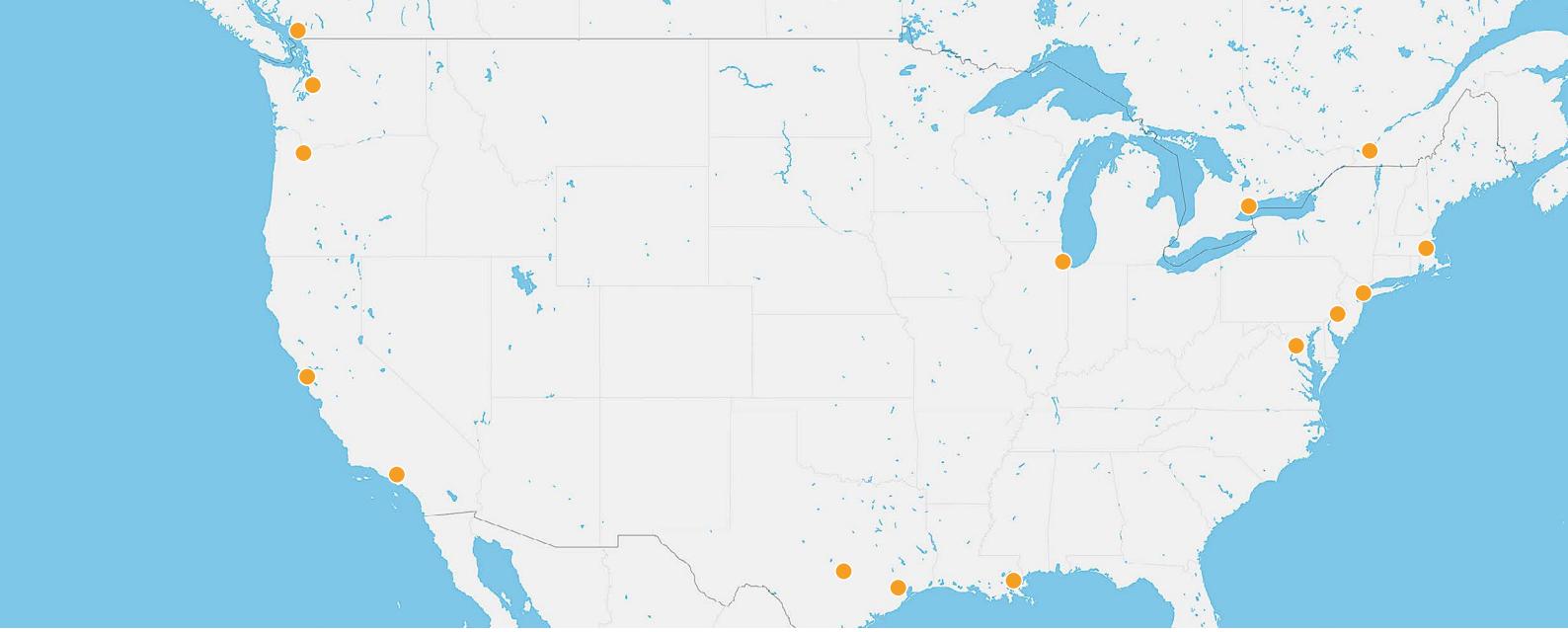
Most urban green space per capita
Rio de Janeiro



Highest percentage of urban area covered by trees
Caracas

Top 10

Rank	City	Relative Score (0-100)	Distribution of land usage	Grasses	Trees	Water	Other
1st	Rio de Janeiro	78.2	13.3% 38.6%	2.8%			45.3%
2nd	Caracas	74.3	10.1% 39.1%	0%			50.8%
3rd	Sao Paulo	66.3	10.8% 26.6%	1.4%			61.2%
4th	Quito	65.2	12.8% 22%	0.1%			65.1%
5th	Curitiba	63.9	11.7% 22.4%	0.5%			65.4%
6th	Medellin	56.9	13.4% 16.9%	0.3%			69.4%
7th	Salvador	56.5	5.6% 27.1%	7.3%			60%
8th	Bogota	47.7	17.1% 15.8%	0.6%			66.5%
9th	Mexico City	44.0	3.6% 25.1%	0.2%			71.1%
10th	Buenos Aires	23.9	4.2% 9.9%	4.4%			81.5%



Results from North America

Category winners



Highest % of urban green space
Austin



Best health of urban vegetation
Vancouver



Highest percentage of urban area covered by grass
New Orleans



Best distribution of urban green space
Austin



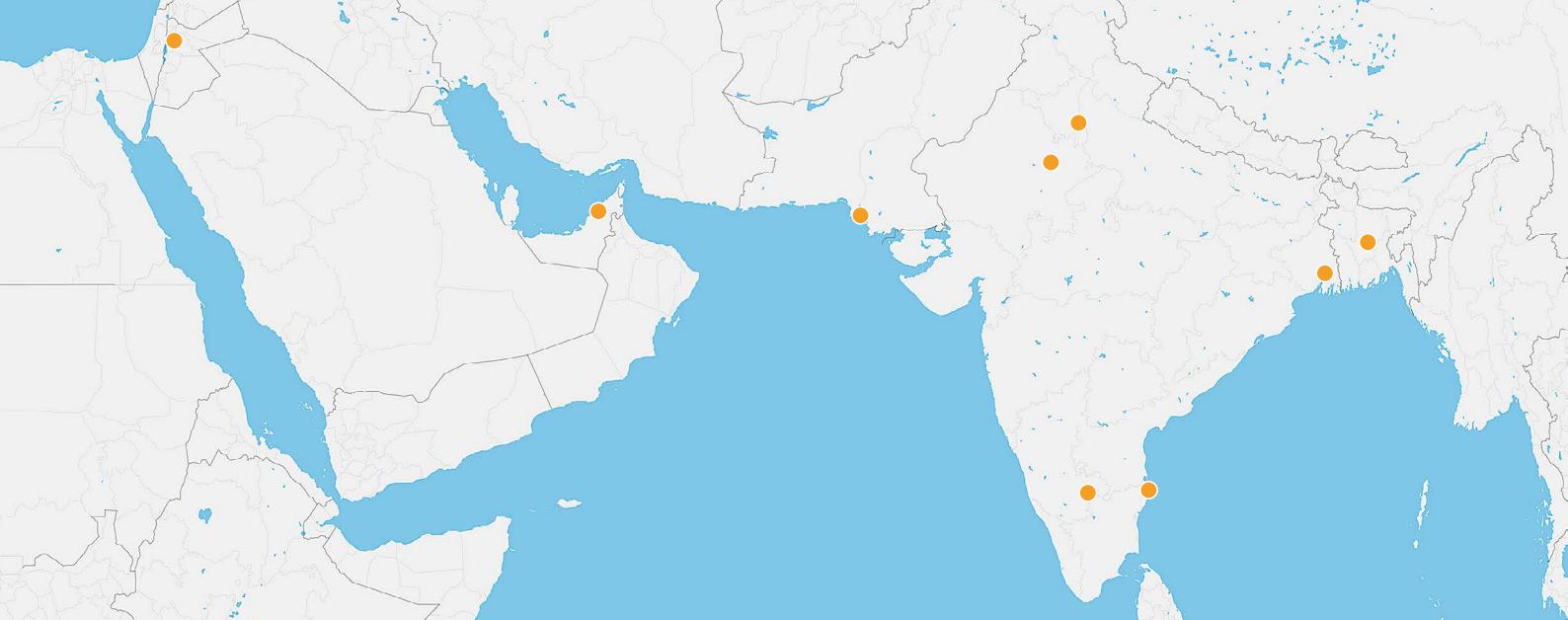
Most urban green space per capita
Austin



Highest percentage of urban area covered by trees
Austin

Top 10

Rank	City	Relative Score (0-100)	Distribution of land usage				Grasses	Trees	Water	Other
			13.4%	41.7%	0.8%	44.1%				
1st	Austin	77.4	13.4%	41.7%	0.8%	44.1%				
2nd	Houston	71.8	14.8%	32.3%	0.8%	52.1%				
3rd	Washington, DC	68.1	7.2%	38.2%	1.9%	52.7%				
4th	Toronto	66.0	12.6%	22.3%	1.9%	63.2%				
5th	Portland	62.4	6.6%	30.6%	2%	60.8%				
6th	Vancouver	62.0	13.4%	24.4%	4.6%	57.6%				
7th	Philadelphia	55.6	6.8%	25.9%	1.6%	65.7%				
8th	New Orleans	53.5	23.4%	12%	7.7%	56.9%				
9th	Seattle	53.2	4.7%	27.9%	12.5%	54.9%				
10th	Boston	51.7	5.1%	27.1%	7.9%	59.9%				



Results from South and West Asia

Category winners



Highest % of urban green space

Dhaka



Best distribution of urban green space

Dhaka



Best health of urban vegetation

Bengaluru



Most urban green space per capita

Amman



Highest percentage of urban area covered by grass

Jaipur

Highest percentage of urban area covered by trees

Dhaka

Top 10

Rank	City	Relative Score (0-100)	Distribution of land usage				Grasses	Trees	Water	Other
1st	Dhaka	73.1	26.4%	28%	6.8%	38.8%				
2nd	Delhi NCT	60.1	18.8%	19.8%	2.4%	59%				
3rd	Bengaluru	59.5	13.7%	19.2%	1.5%	65.6%				
4th	Chennai	46.8	13.9%	12.1%	6%	68%				
5th	Amman	36.8	19.3%	7.2%	0%	73.5%				
6th	Jaipur	32.4	43.4%		5.7% 0.4%	50.5%				
7th	Kolkata	20.2	1.9%	10.9%	9.1%	78.1%				
8th	Karachi	1.6	3.8%	1%	1.5%	93.7%				
9th	Dubai	1.0	3.9%	0.5%	5.3%	90.3%				

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 2018 amounted to SEK 41bn and the Group has around 13,000 employees in 40 countries.

What is HUGSI?

HUGSI stands for Husqvarna Urban Green Space Index — a digital innovation initiative developed by Husqvarna in collaboration with 20tree.ai. The ambition is to help safeguard and improve maintenance of green spaces in urban areas. By applying computer vision and deep learning techniques on satellite images, HUGSI unveils insights about the size, proportion, distribution, and health of green space in urban areas.

