2025 – i-Tree Open Academy
Session 3: Using i-Tree Canopy Internationally

Understanding the benefits of trees for people, places, and planning

María Arroyave
Urban Ecology Coordinator
U.S. Forest Service – International Programs
Colombia Program
mariaarroyaveusfs@gmail.com

Starting Questions

1. Do we have an optimal tree cover?
2. Is there equity in the distribution of tree cover and green areas in the city?
3. Is tree cover increasing or decreasing over time?
4. What are the benefits of the tree cover?

i-Tree Canopy in Colombia

Cartagena
(3 *localidades*)

Medellín
(16 *comunas*)

Cali

Bogotá
(20 *localidades*)

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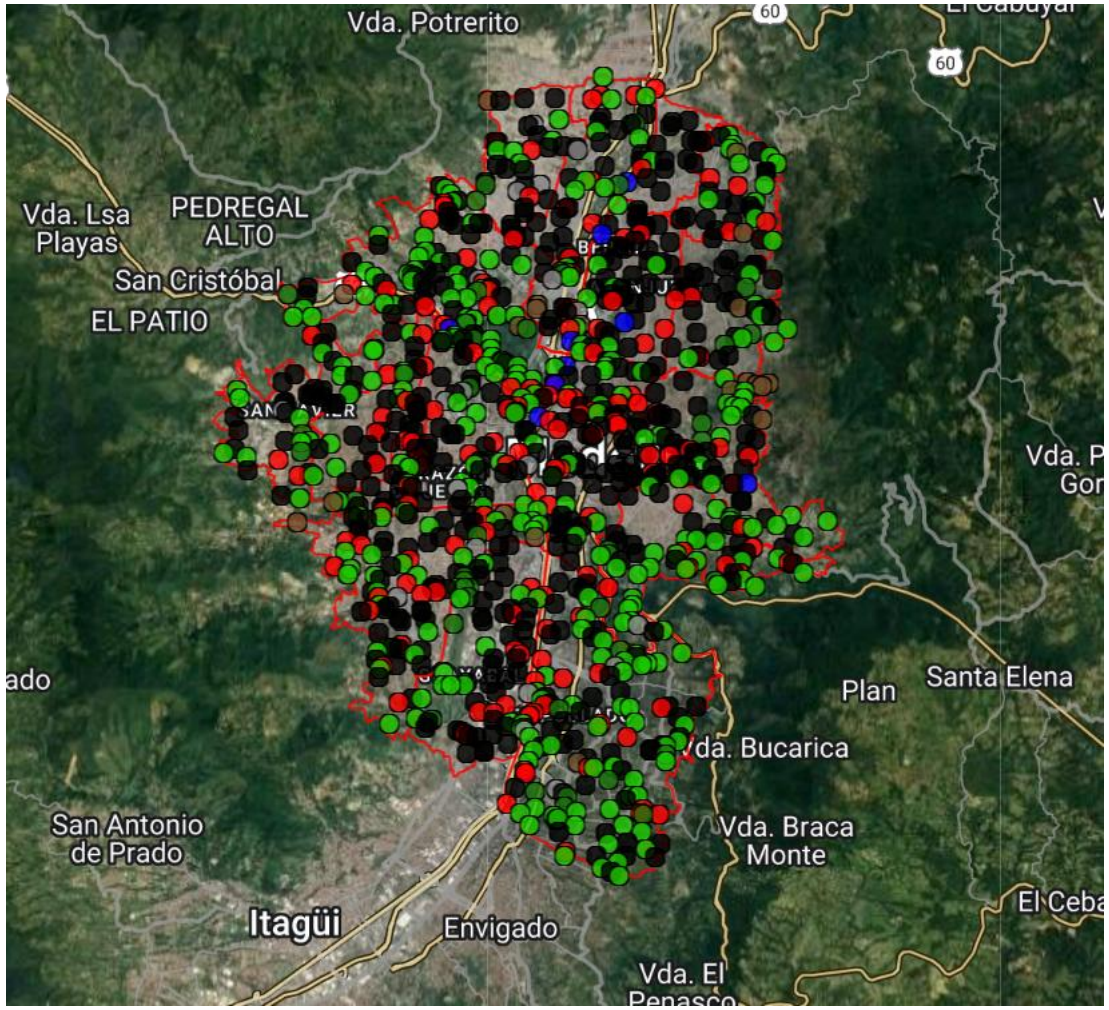
Collaborative Work

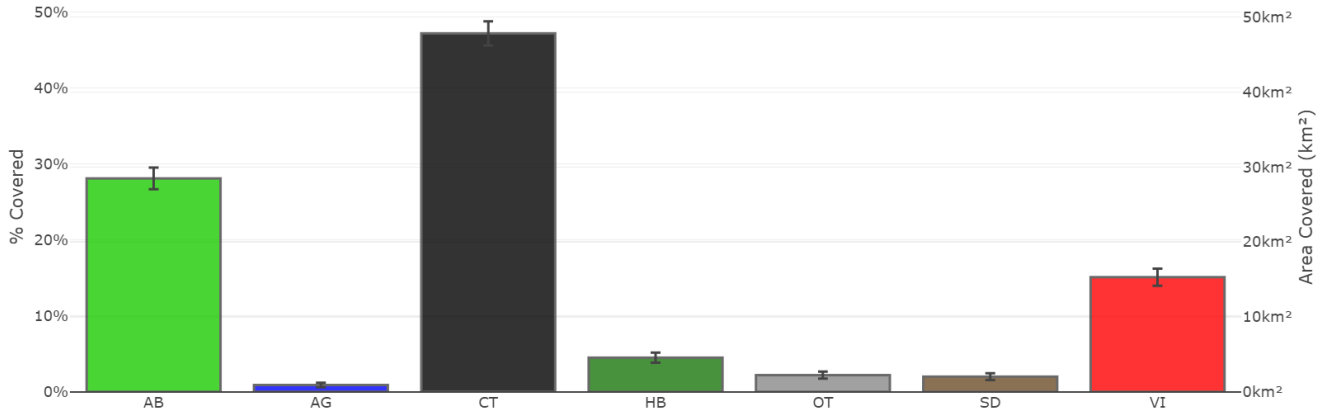
Name	Organization
Maria Arroyave	USFS-IP Colombia
Yeny Vélez	USFS-IP Colombia
Carolina Restrepo	Universidad EIA
Miguel Quirama	Bogotá Botanical Garden
Laura Monroy	Bogotá Botanical Garden
Catalina Ruiz	Independent
Bladimir Vera	ITM University
Camila Vega	ITM University
Diego Quintero	Metro
Natalia Salazar	Independent
Diana García	Independent
Gloria Martínez	CVC, Environmental Authority in Cali
Jalelys Leones	Universidad de Cartagena
Juan Felipe Restrepo	Colegio Montessori
High School students	Colegio Montessori

i-Tree Canopy in Medellín, Colombia

i-Tree Canopy Medellín – Colombia



Survey 2023



.	Clase de cobertura	Descripción	Puntos	% Cobertura ± SE	Área (km²) ± SE
AB	Arbórea	Incluye árboles y arbustos. Esta es la cobertura sobre la cual se analiza la remoción y retención de contaminantes.	281	28,10 ± 1,42	28,48 ± 1,44
AG	Agua	Incluye ríos, quebradas, lagos.	9	0,90 ± 0,30	0,91 ± 0,30
CT	Construcción	Incluye todo tipo de edificación y viviendas.	472	47,20 ± 1,58	47,83 ± 1,60
HB	Herbácea	Incluye pastos, grama y rastrojo.	45	4,50 ± 0,66	4,56 ± 0,66
OT	Otros	Incluye centros deportivos, parqueaderos y las demás coberturas que se encuentren en la ciudad y no se recojan en las anteriores	22	2,20 ± 0,46	2,23 ± 0,47
SD	Suelo desnudo	Incluye suelo sin ninguna cobertura.	20	2,00 ± 0,44	2,03 ± 0,45
VI	Vías	Incluye vías pavimentadas.	151	15,10 ± 1,13	15,30 ± 1,15
Total			**1000**	**100.00**	**101.34**

AB: Tree/Shrub ; AG: Water; CT: Buildings; HB: Herbaceus;
OT: Other; SD: Bare soil; VI: Roads

i-Tree Canopy Medellín-Ecosystem Services

Tree Benefit Estimates: Carbon (Metric units)

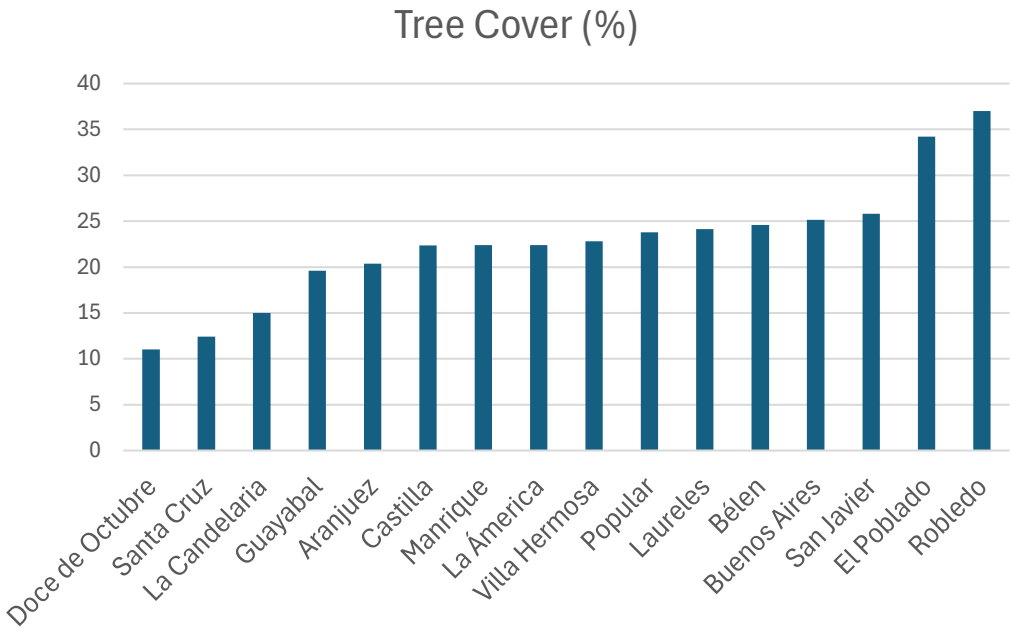
Description	Carbon (kt)	±SE	CO_2 Equiv. (kt)	±SE	Value (USD)	±SE
Sequestered annually in trees	13.53	±0.68	49.60	±2.51	$2,542,967	±128,633
Stored in trees (Note: this benefit is not an annual rate)	218.84	±11.07	802.41	±40.59	$41,141,496	±2,081,092

Tree Benefit Estimates: Air Pollution (Metric units)

Abbr.	Description	Amount (t)	±SE	Value (USD)	±SE
CO	Carbon Monoxide removed annually	5.83	±0.29	$8,570	±433
NO2	Nitrogen Dioxide removed annually	18.49	±0.94	$7,295	±369
O3	Ozone removed annually	196.09	±9.92	$611,535	±30,934
SO2	Sulfur Dioxide removed annually	5.87	±0.30	$756	±38
PM2.5	Particulate Matter less than 2.5 microns removed annually	8.50	±0.43	$1,114,692	±56,385
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	59.17	±2.99	$408,871	±20,682
Total		**293.95**	**±14.87**	**$2,151,719**	**±108,842**

i-Tree Canopy in Medellín

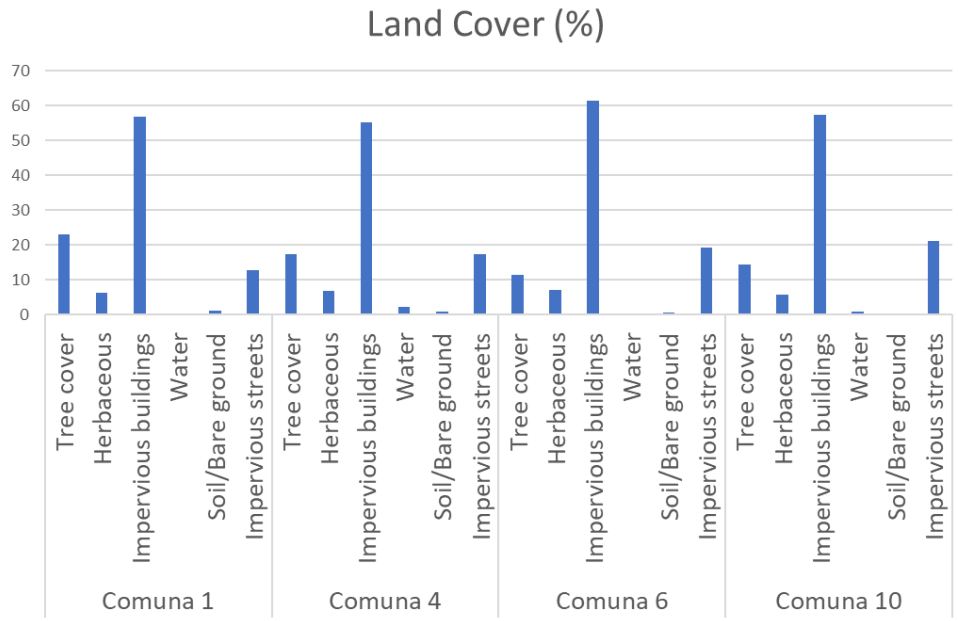
Comuna	Tree Cover (%)
Doce de Octubre	11
Santa Cruz	12
La Candelaria	15
Guayabal	20
Aranjuez	20
Castilla	22
Manrique	22
La América	22
Villa Hermosa	23
Popular	24
Laureles	24
Bélen	25
Buenos Aires	25
San Javier	26
El Poblado	34
Robledo	37

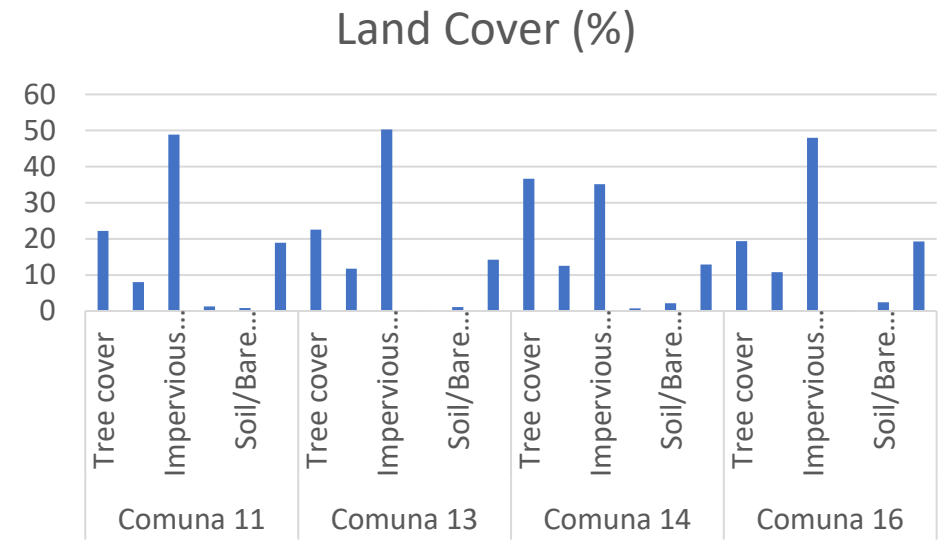


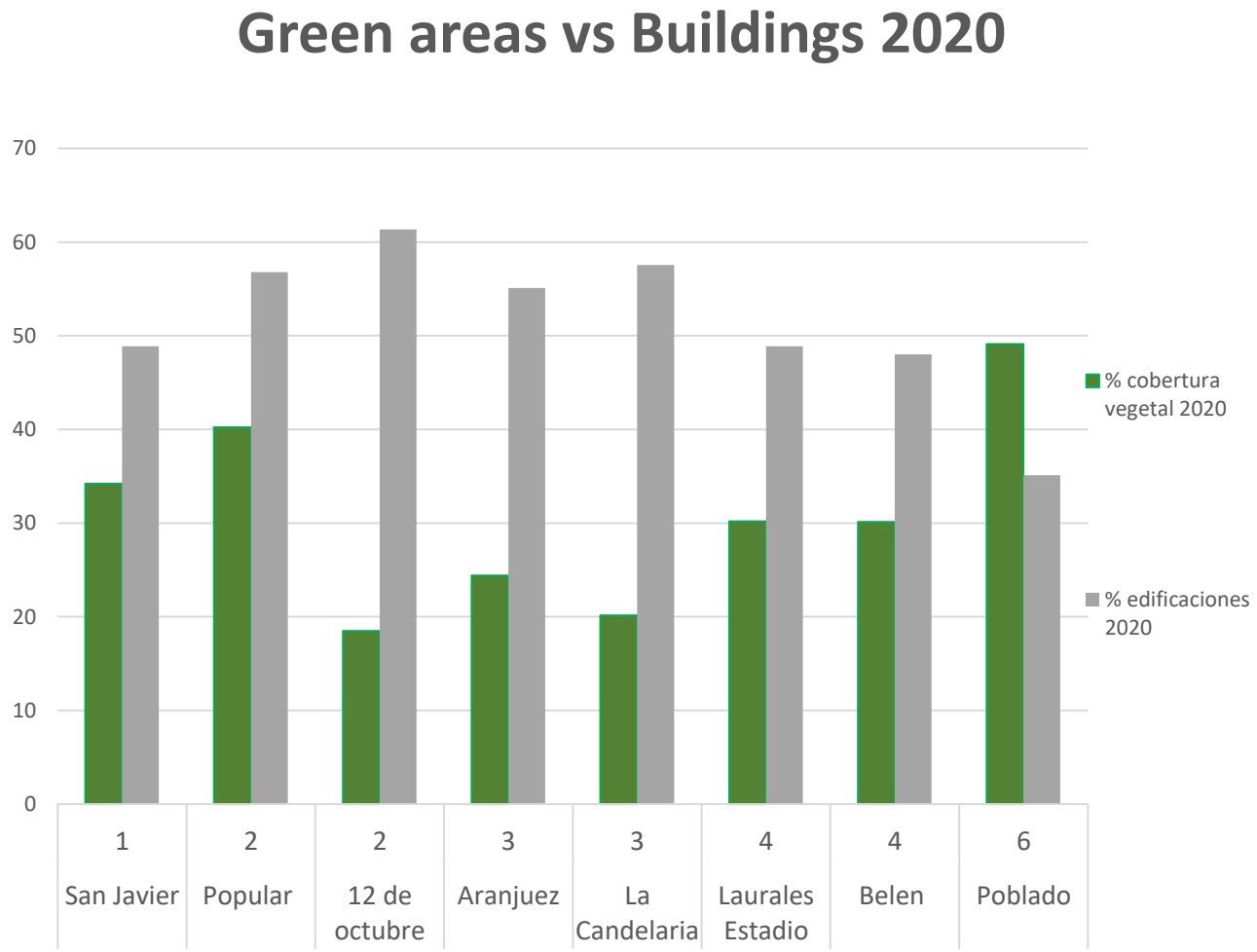
Source: Ruiz, et al 2024

Medellín has 16 *comunas*
(a group of neighborhoods).

Comparison in Land Cover among *Comunas*







Source: Restrepo, 2020

Changes in Tree Cover over Time

Comuna 14

Increase in tree cover between 2009 and 2020

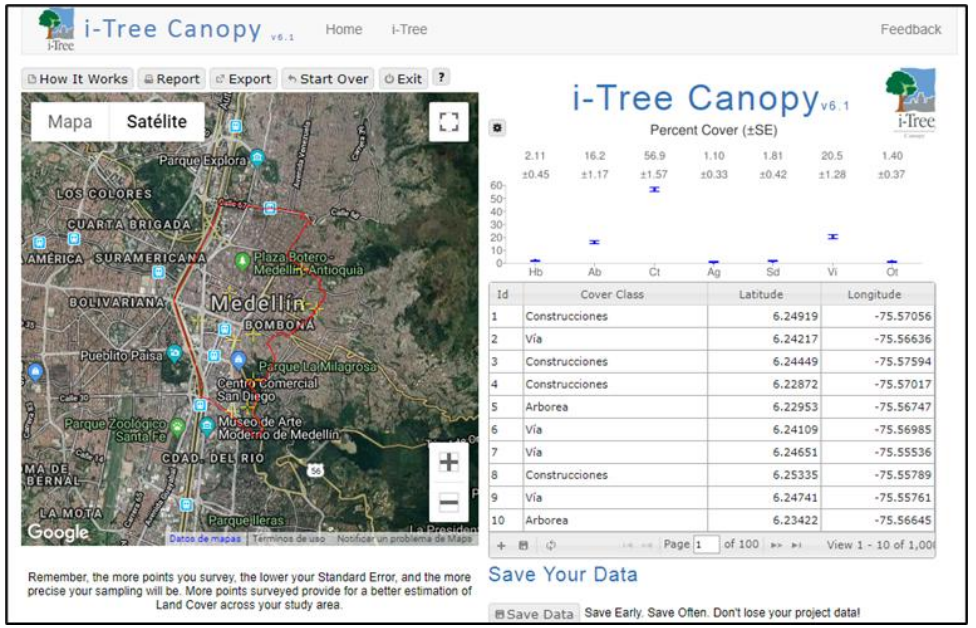
Comuna 13

Decrease in tree cover between 2009 and 2020

Land Cover Change Analysis
Study area: Comuna 10, Medellín

Located in downtown
Area: 73,563 km^2
20 neighborhoods

Land Cover Analysis



Cover Class	Abbreviation
Herbs	H
Trees	T
Impervious buildings	B
Water	W
Bare soil	BS
Impervious roads	S
Other	O

We analyzed 1000 points

Years: 2008 and 2018

Land Cover Change: 2008 - 2018

2008:

Cover Class	Description	Abbr.	Points	% Cover
Herbácea		Hb	55	5.51 ±0.72
Arborea		Ab	121	12.1 ±1.03
Construcciones		Ct	566	56.7 ±1.57
Agua		Ag	11	1.10 ±0.33
Suelo desnudo		Sd	35	3.50 ±0.58
Vía		Vi	201	20.1 ±1.27
Otro		Ot	10	1.00 ±0.31

2018:

Cover Class	Description	Abbr.	Points	% Cover
Herbácea		Hb	21	2.11 ±0.45
Arborea		Ab	162	16.2 ±1.17
Construcciones		Ct	567	56.9 ±1.57
Agua		Ag	11	1.10 ±0.33
Suelo desnudo		Sd	18	1.81 ±0.42
Vía		Vi	204	20.5 ±1.28
Otro		Ot	14	1.40 ±0.37

Land Cover Change 2008 – 2018 Comuna 10 (i-Tree Canopy)

Land Cover	2008		2018	
	Number of points	% Cover	Number of points	% Cover
Herbs	55	5.6	21	2.11
Trees	121	**12.1**	162	**16**
Impervious buildings	566	56.6	567	57
Water	11	1.1	11	1.1
Soil/Bare ground	35	3.5	18	1.8
Impervious roads	201	20.1	204	20.5
Others	10	1	14	1.4

Tree Benefits in *Comuna* 10

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	11.40 USD	±0.82	121.59 kg	±8.74
NO2	Nitrogen Dioxide removed annually	19.63 USD	±1.41	663.01 kg	±47.67
O3	Ozone removed annually	1,022.43 USD	±73.51	6.60 t	±0.47
PM2.5	Particulate Matter less than 2.5 microns removed annually	2,113.54 USD	±151.97	320.86 kg	±23.07
SO2	Sulfur Dioxide removed annually	3.43 USD	±0.25	417.81 kg	±30.04
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	742.26 USD	±53.37	2.21 t	±0.16
CO2seq	Carbon Dioxide squestered annually in trees	69,207.14 USD	±4,976.10	1.35 kt	±0.10
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	1,738,051.05 USD	±124,968.54	33.90 kt	±2.44

Use of i-Tree Canopy Results

1. Do we have an optimal tree cover?

2. Is there equity in the distribution of tree cover and green areas in the city?

3. Is tree cover increasing or decreasing over time?

i-Tree Canopy is a very useful tool for decision making process related to urban forest management

Do we have an optimal Tree Cover?

The Nature Based Solutions Institute introduced the 3-30-300 rule for developing urban forests and creating greener and healthier cities.

- Everybody should be able to see 3 trees from their home.
- Live in a neighborhood with at least **30% tree canopy (or vegetation) cover**
- And be no more than 300 meters from the nearest green space that allows for multiple recreational activities.

Source: Urban Systems Lab

Cecil Konijnendijk
Director of the Nature Based Solutions Institute

Thank You!

María Arroyave
Urban Ecology Coordinator
U.S. Forest Service – International Programs
Colombia Program
mariaarroyaveusfs@gmail.com