



# Urban ropeways: a sustainable transport option

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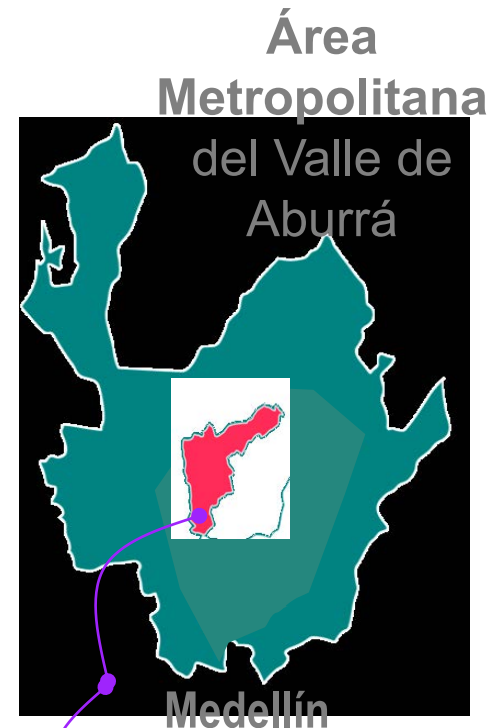
# 1. About us



# Colombia context



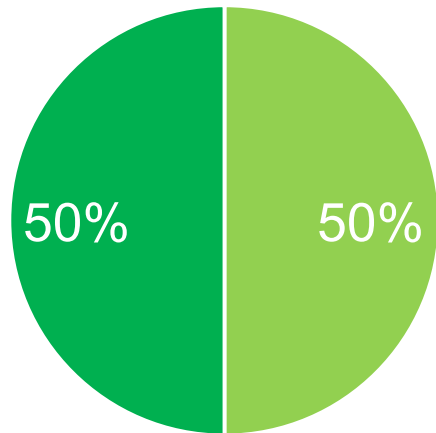
Antioquia en Colombia



2'417.325 habitantes  
3'638.869 en el Área Metropolitana  
380.34 Km<sup>2</sup> de extensión



# Legal nature



- Municipio de Medellín
- Departamento de Antioquia

Shareholders

Empresa de Transporte Masivo del Valle de Aburrá Limitada is a limited liability company between entities of public law, which for its operation is governed by the rules established for industrial and commercial enterprises of the State, Law 489 of 1989.












# Urban articulating and integrating territory system





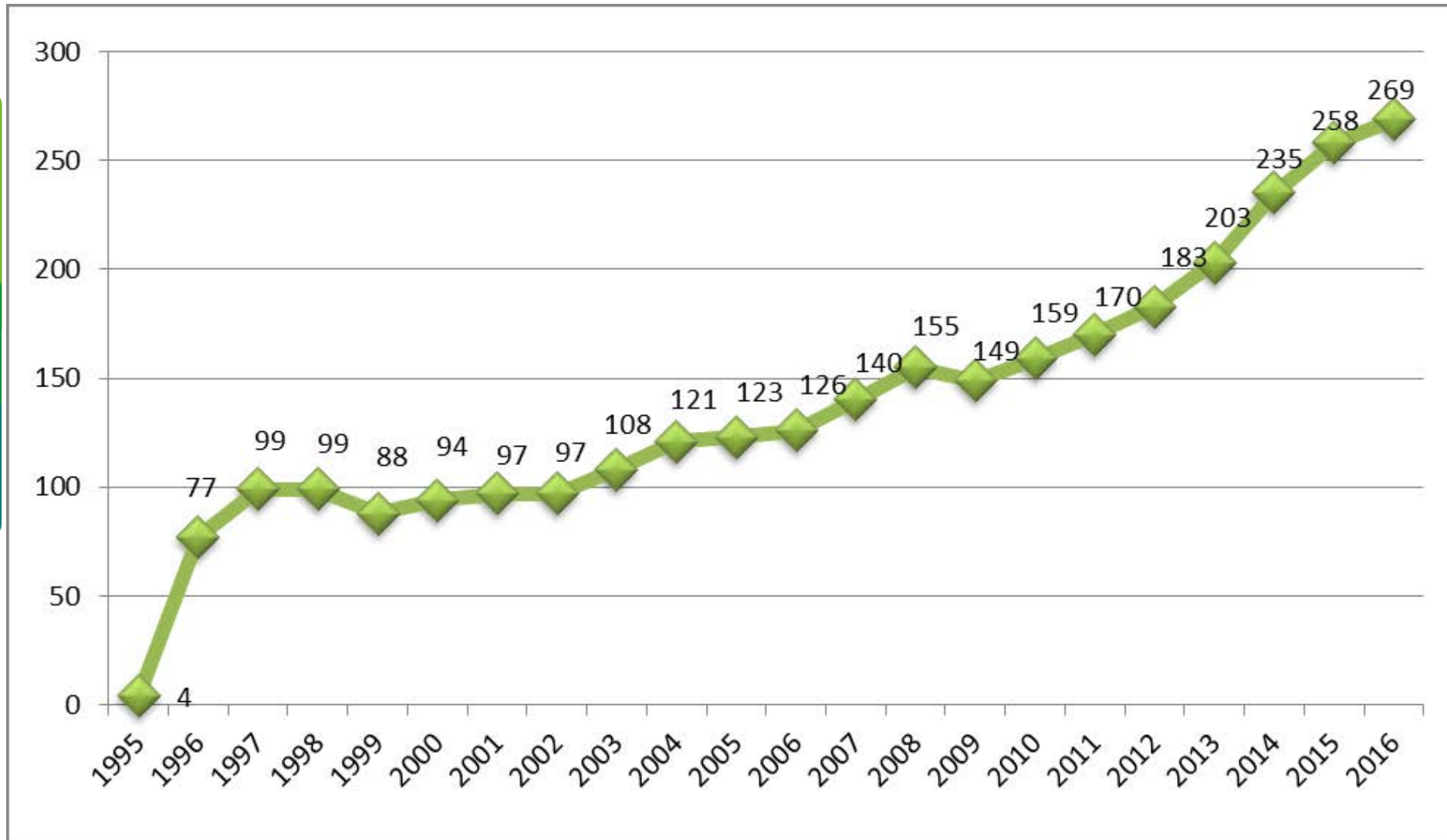
# Lines, technology, capacity

<b>A</b>	<b>B</b>	<b>K</b>	<b>J</b>	<b>L</b>	<b>H</b>
					
Férreo	Férreo	Cable aéreo	Cable aéreo	Cable aéreo	Cable aéreo
Vagón <b>400</b> usuarios	Vagón <b>400</b> usuarios	Telecabina <b>10</b> 8 sentados, 2 de pie	Telecabina <b>10</b> 8 sentados, 2 de pie	Telecabina <b>10</b> 8 sentados, 2 de pie	Telecabina <b>10</b> 8 sentados, 2 de pie

<b>M</b>	<b>1</b> BUS	<b>2</b> BUS	<b>T-A</b>	<b>TOTAL</b>
				
Cable aéreo	BRT (Bus rapid transit)	Padrones	Férreo	<i>3 transportation modes 10 lines</i>
Telecabina <b>10</b> 8 sentados, 2 de pie	Bus articulado <b>160</b> usuarios	Bus padrón <b>100</b> usuarios	Tranvía <b>300</b> usuarios	N/A



# Millions of passengers



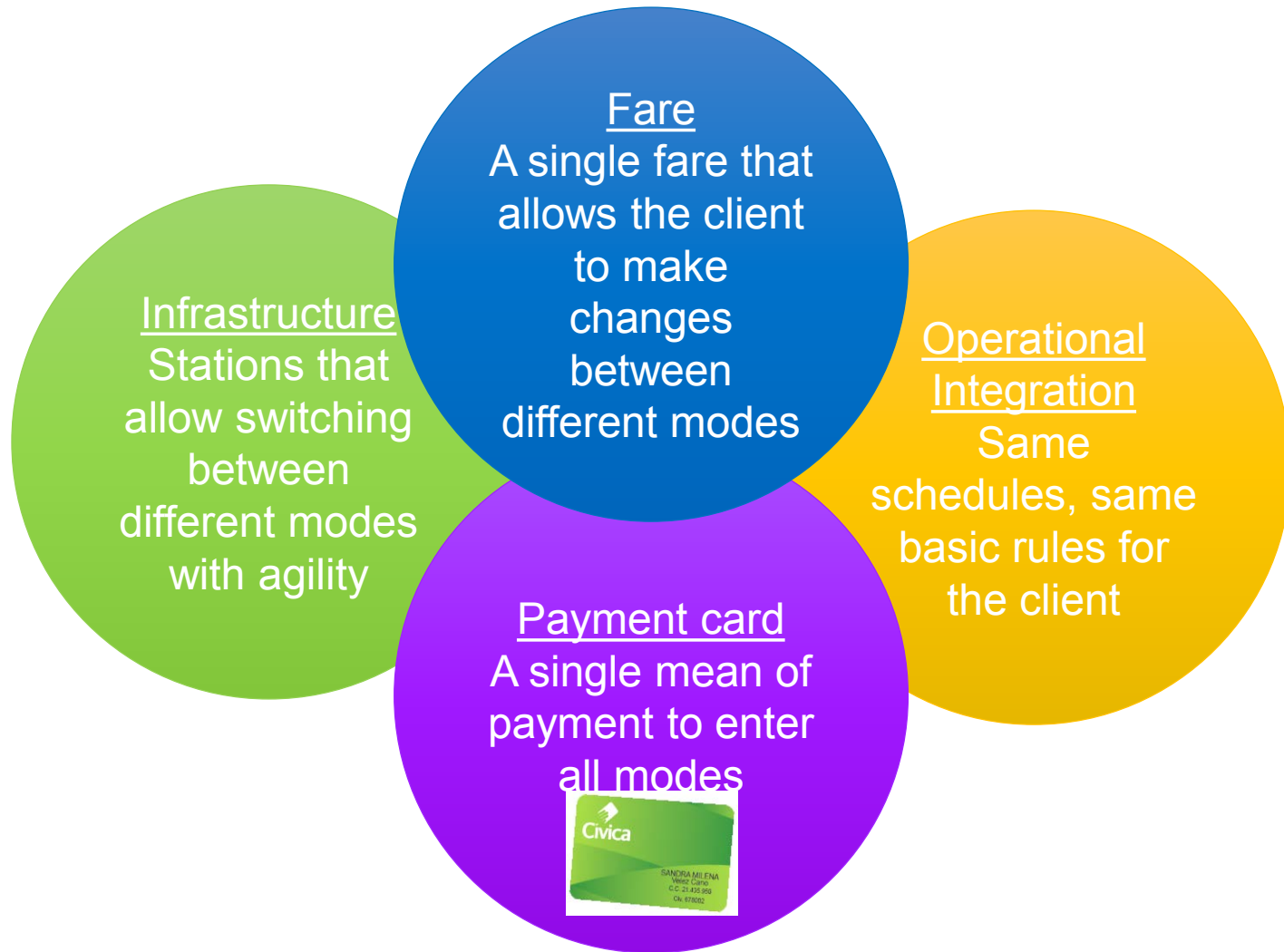




# Technical characteristics

Characteristics	Línea K	Línea J	Línea L	Línea H	Línea M
System	MGD-10	MGD-10	MGD-10	MGD-10	MGD-10
Opening year	2004	2008	2010	2016	2018
Length (m.)	2070	2764	4618	1409	1057
Speed (m/s)	5	5	5,8	5	5
Vertical rise (m.)	400	320	613	197	275
Towers	20	31	23	10	11
Power(KW)	1260	1260	680	530	530
Capacity (pas/h.)	3000	3000	1200	1800	2500
Track width (m.)	5,7	5,7	5,7	6,1	6,1
Stations	4	4	2	3	3
Cabins	93	119	57	42	49

# Considerations for integration





# Considerations for integration



Vista Línea K - Estación Andalucía



# Considerations for integration





# Considerations for integration



Vista Línea H - Integración Estación Oriente



# Considerations for integration



Vista Línea J - Integración Estación San Javier

## **2. Urban ropeways implantation**



# Our region







# Our region





# Our region



# Metro system



**Línea A**  
**Línea B**

Niquía – La Estrella  
San Antonio – San Javier



**Línea J**  
**Línea K**  
**Línea L**  
**Línea M**  
**Línea H**

San Javier – La Aurora  
Acevedo – Santo Domingo  
Santo Domingo – Arví  
Miraflores – Trece de Nov  
Alejandro E – La Sierra



U. de M. - Parque de Aranjuez  
**Línea 1**  
**Línea 2**

Av. Ferrocarril  
Av. Oriental



**Línea TA** San Antonio - Miraflores

## Otros medios



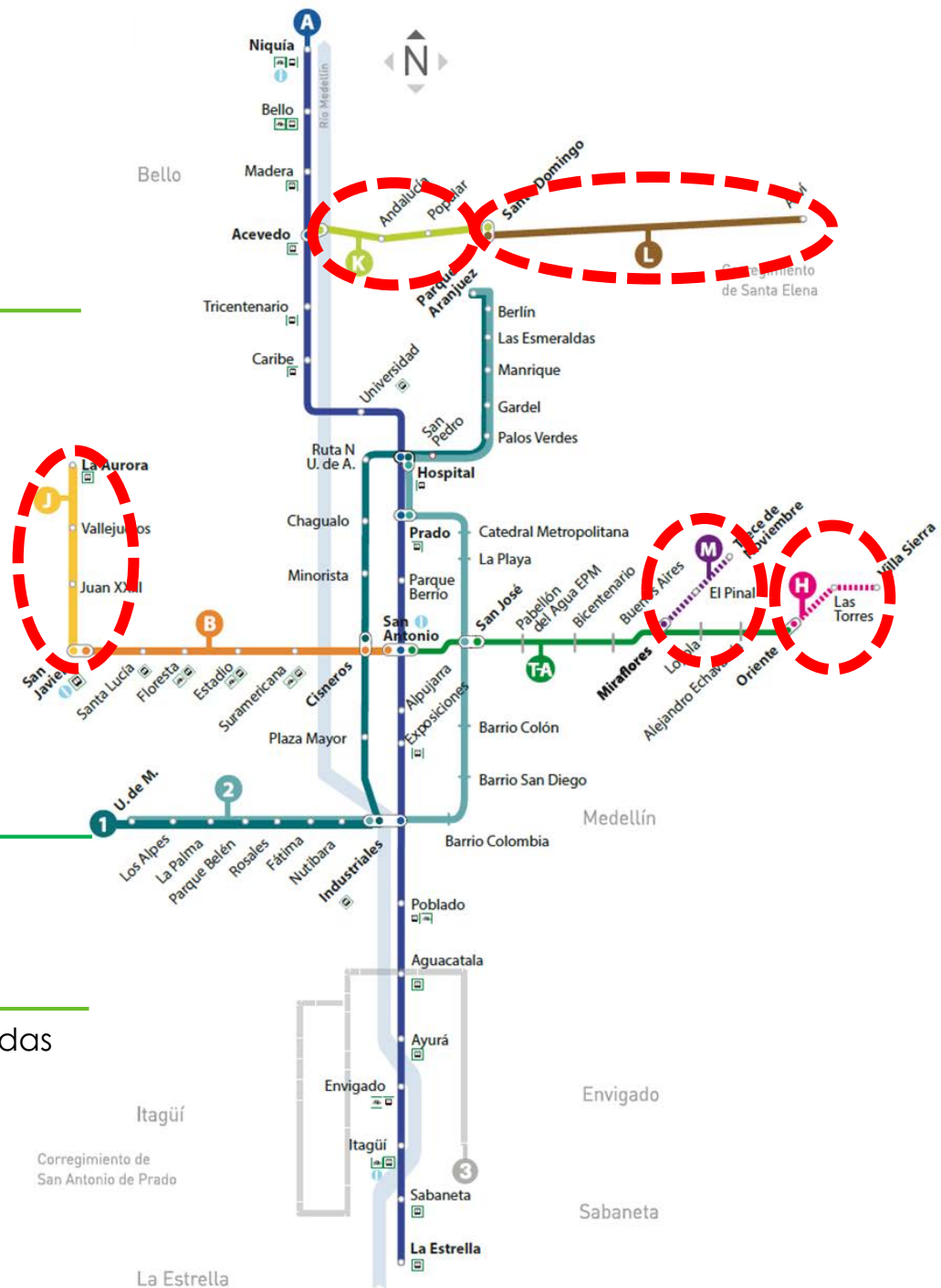
Alimentadores  
Cuencas 3 y 6



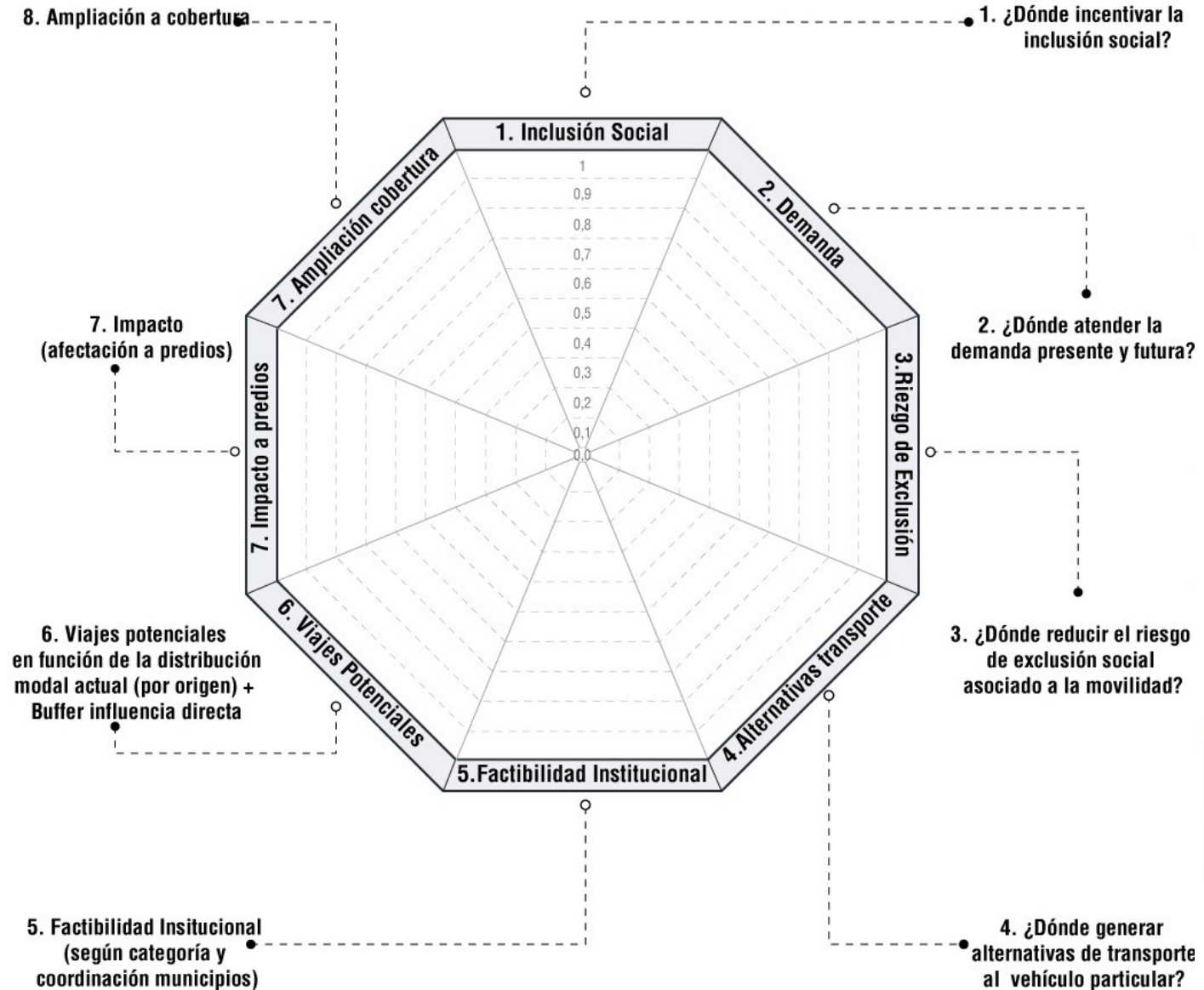
Rutas integradas  
143



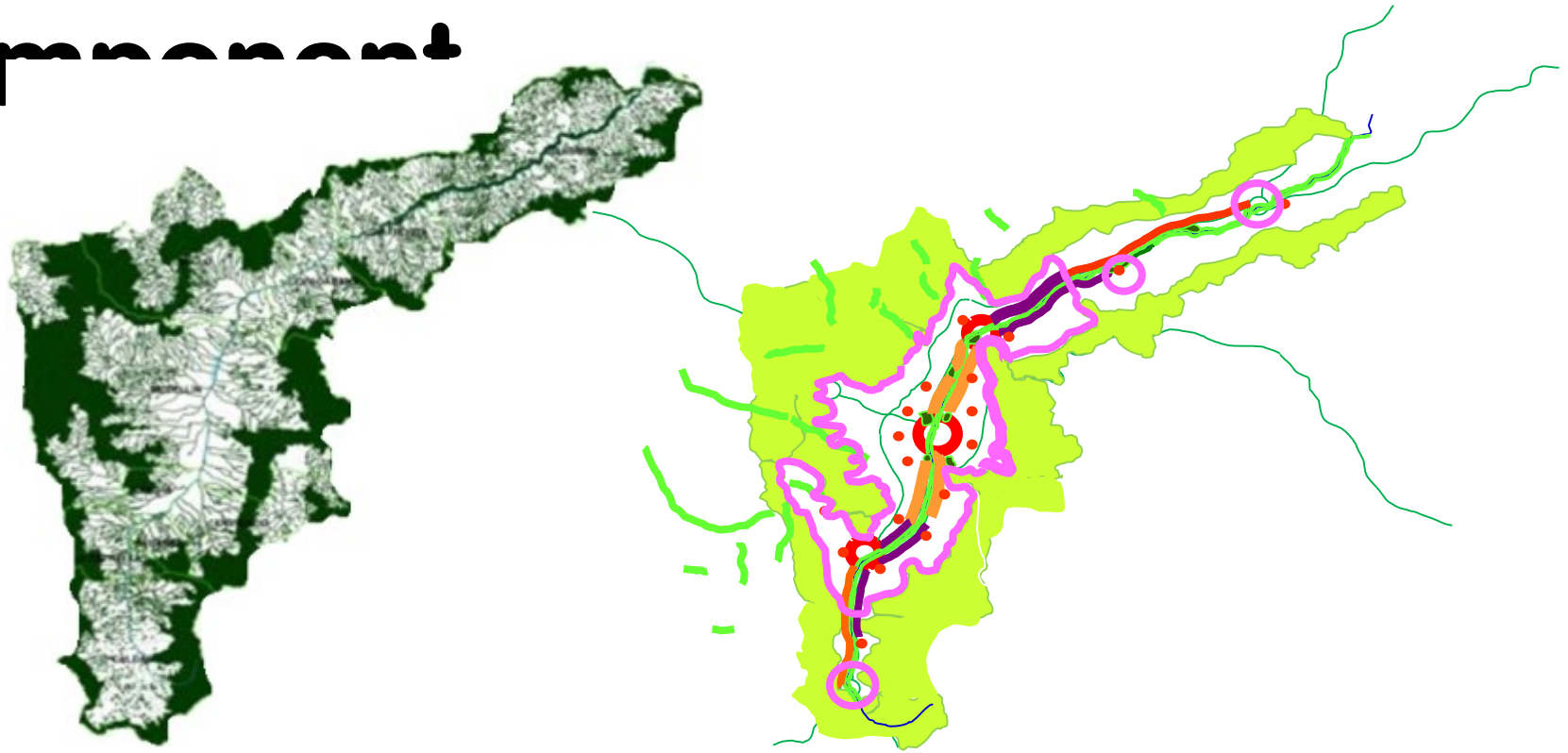
Parqueaderos



# Corridors prioritization criteria



# Land use model – Metropolitan component



One that attends the new global demands in environmental, technological, turistic, logistic and leisure matters, while working in reducing social inequality associated to land use, contributing to the consolidation of a metropolitan territory integrated on its mobility and that promotes the conservation of its natural basis and cares about inherit new generations, a territory that is socially equilibrated, globally connected and ecologically sustainable.

# Land use model – Metropolitan component



Looking for anticipate future demands set by local and regional planning

Modelo de Ocupación POT Medellín

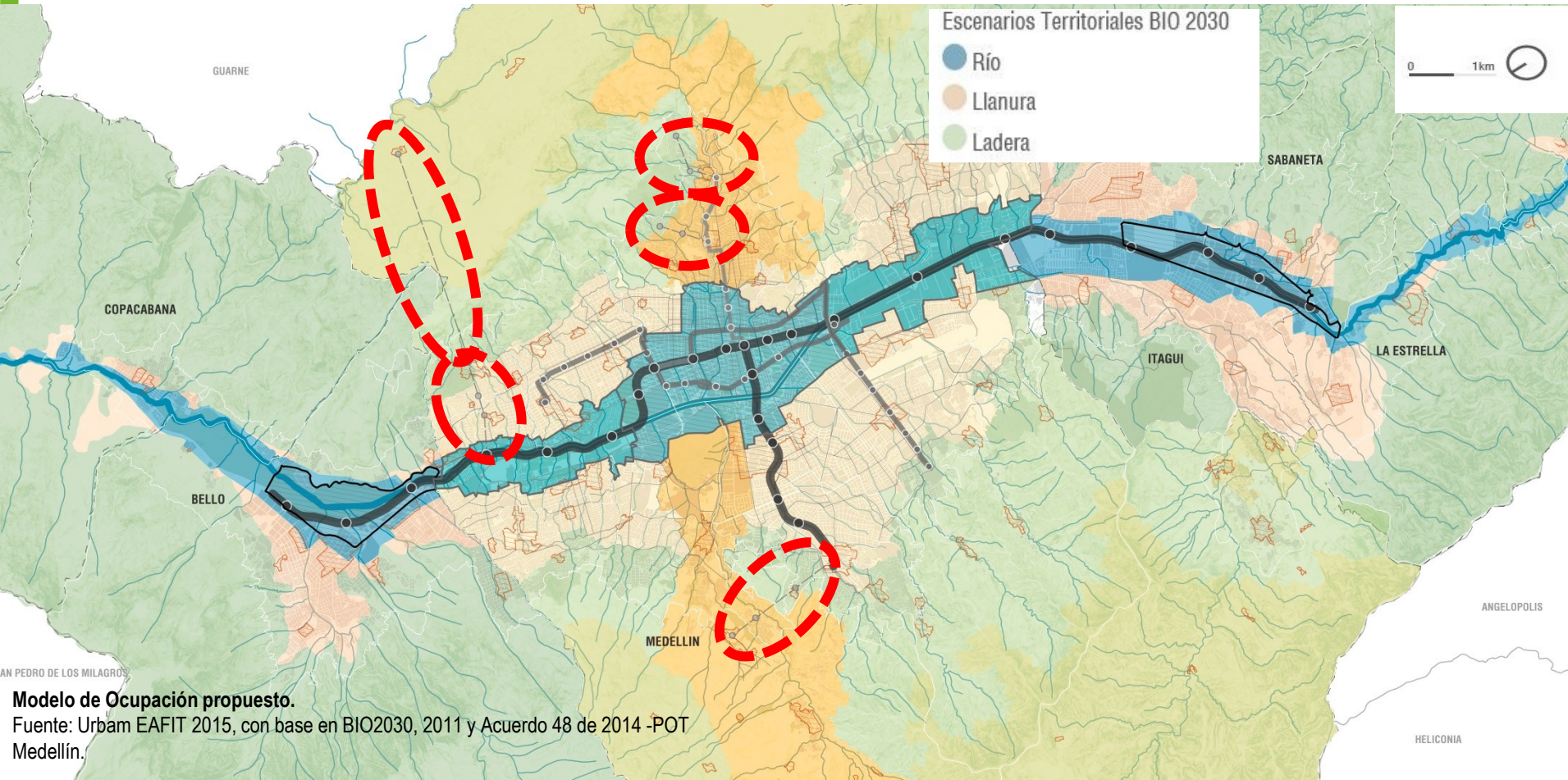
Corredor del río Aburrá

Transversalidades

Borde urbano-rural

Sistema de centralidades

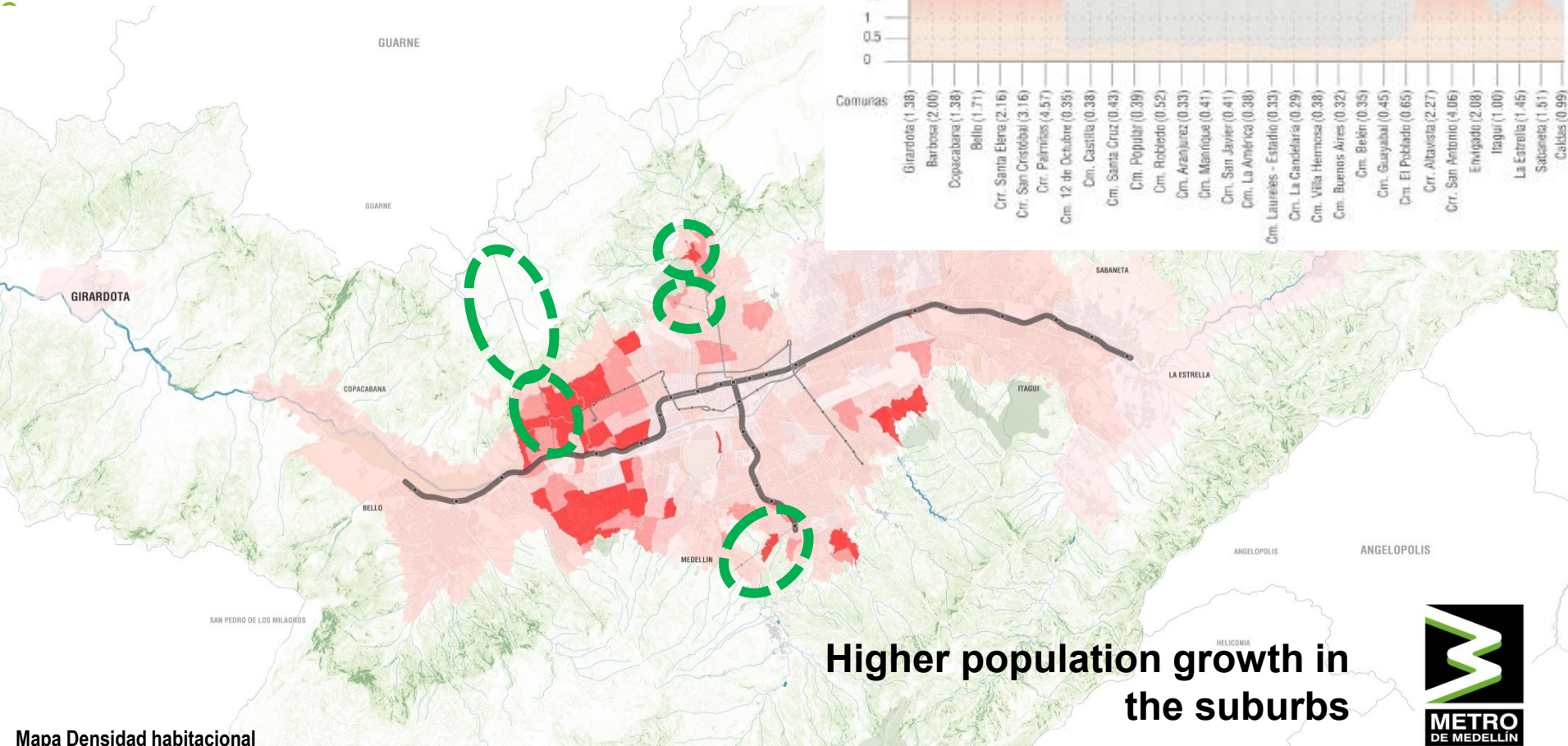
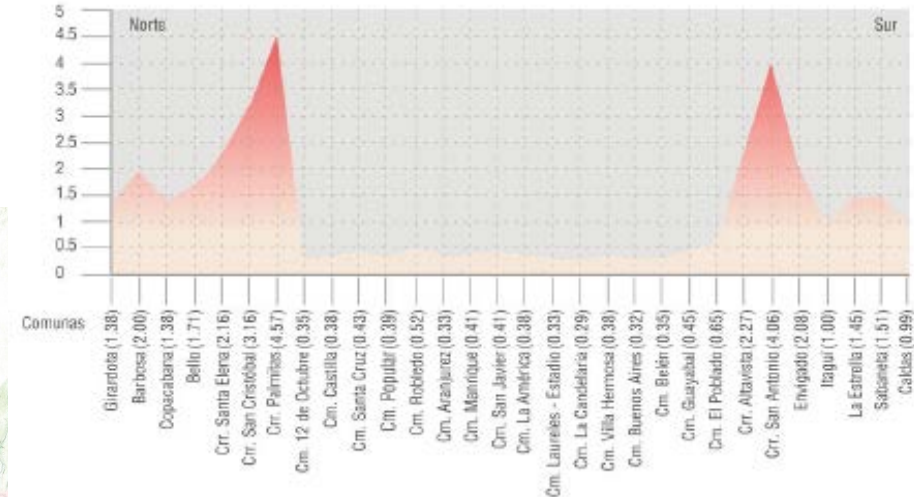
Zonas heterogéneas de media ladera



Modelo de Ocupación propuesto.

Fuente: Urbam EAFIT 2015, con base en BIO2030, 2011 y Acuerdo 48 de 2014 -POT Medellín.

# Land use model – Metropolitan component



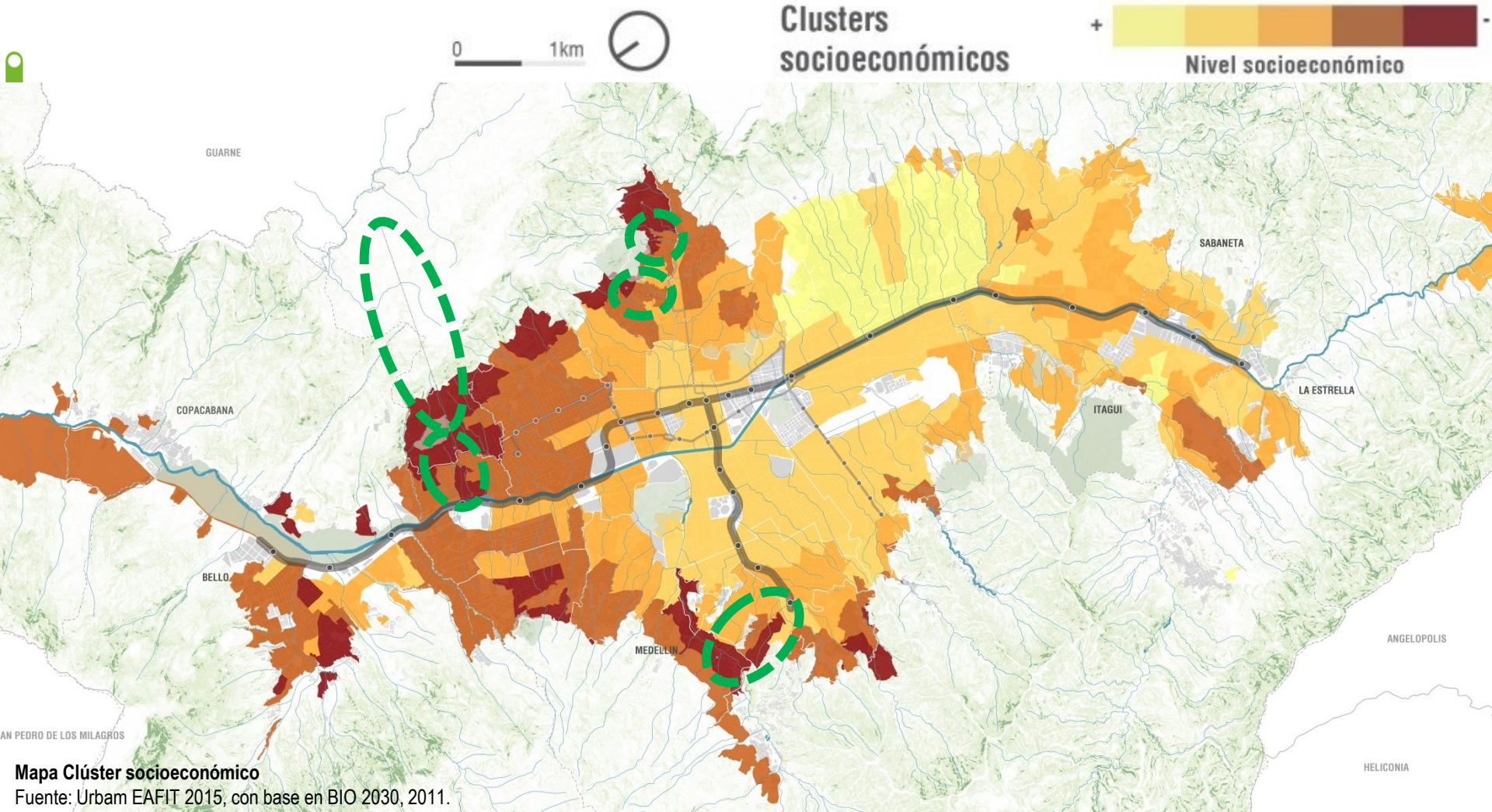
Higher population growth in the suburbs

Mapa Densidad habitacional  
Fuente: Urbam EAFIT 2015, con base en BIO 2030, 2011.





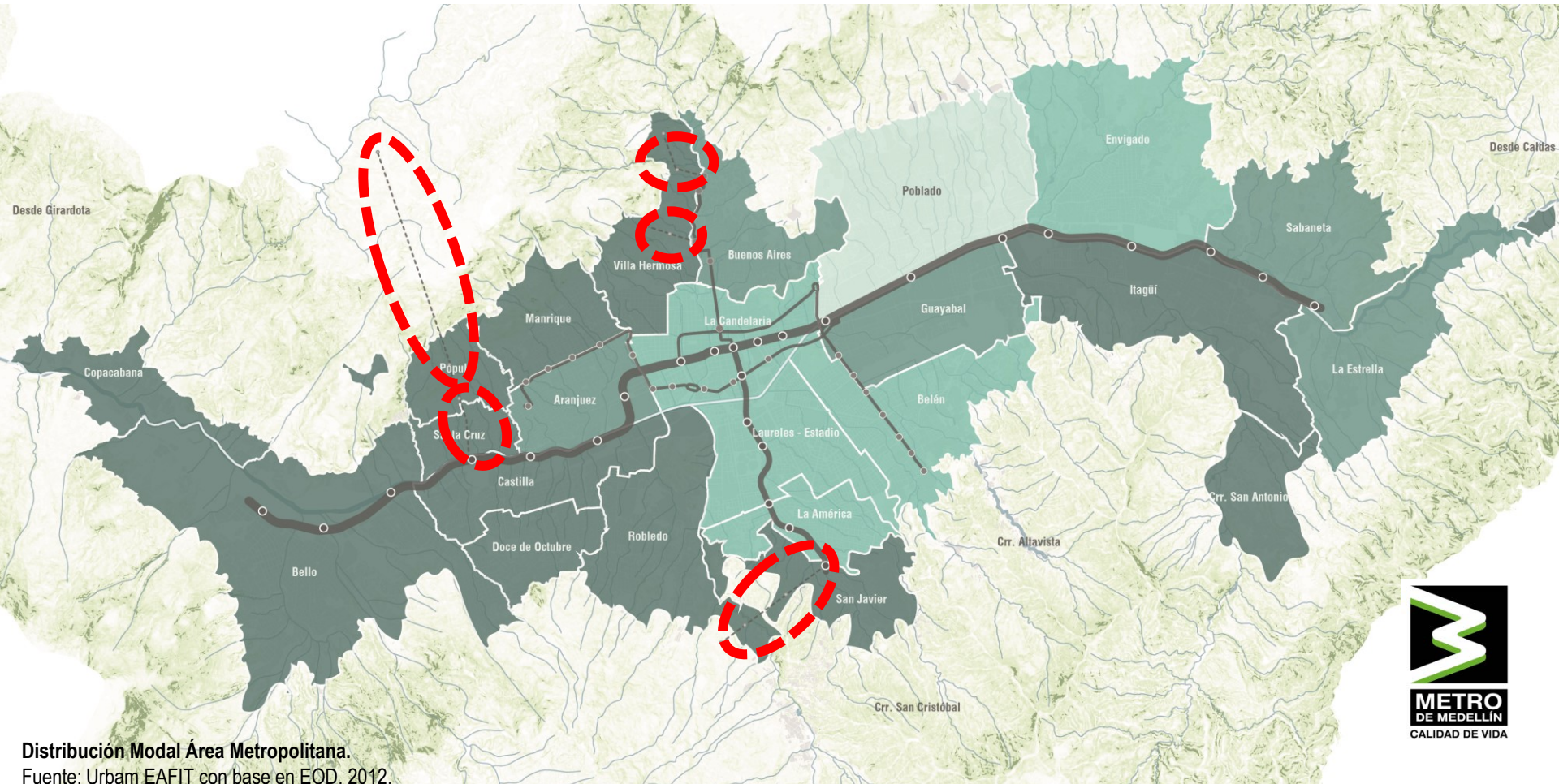
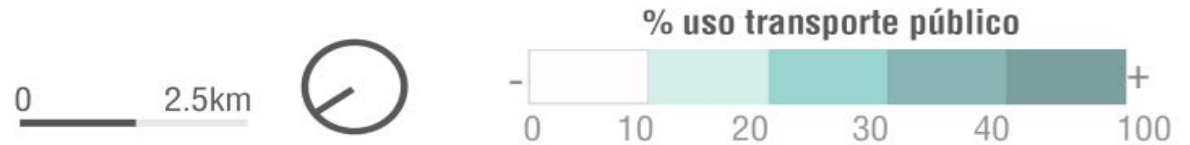
# Social – economical segregation



Mapa Clúster socioeconómico  
Fuente: Urbam EAFIT 2015, con base en BIO 2030, 2011.



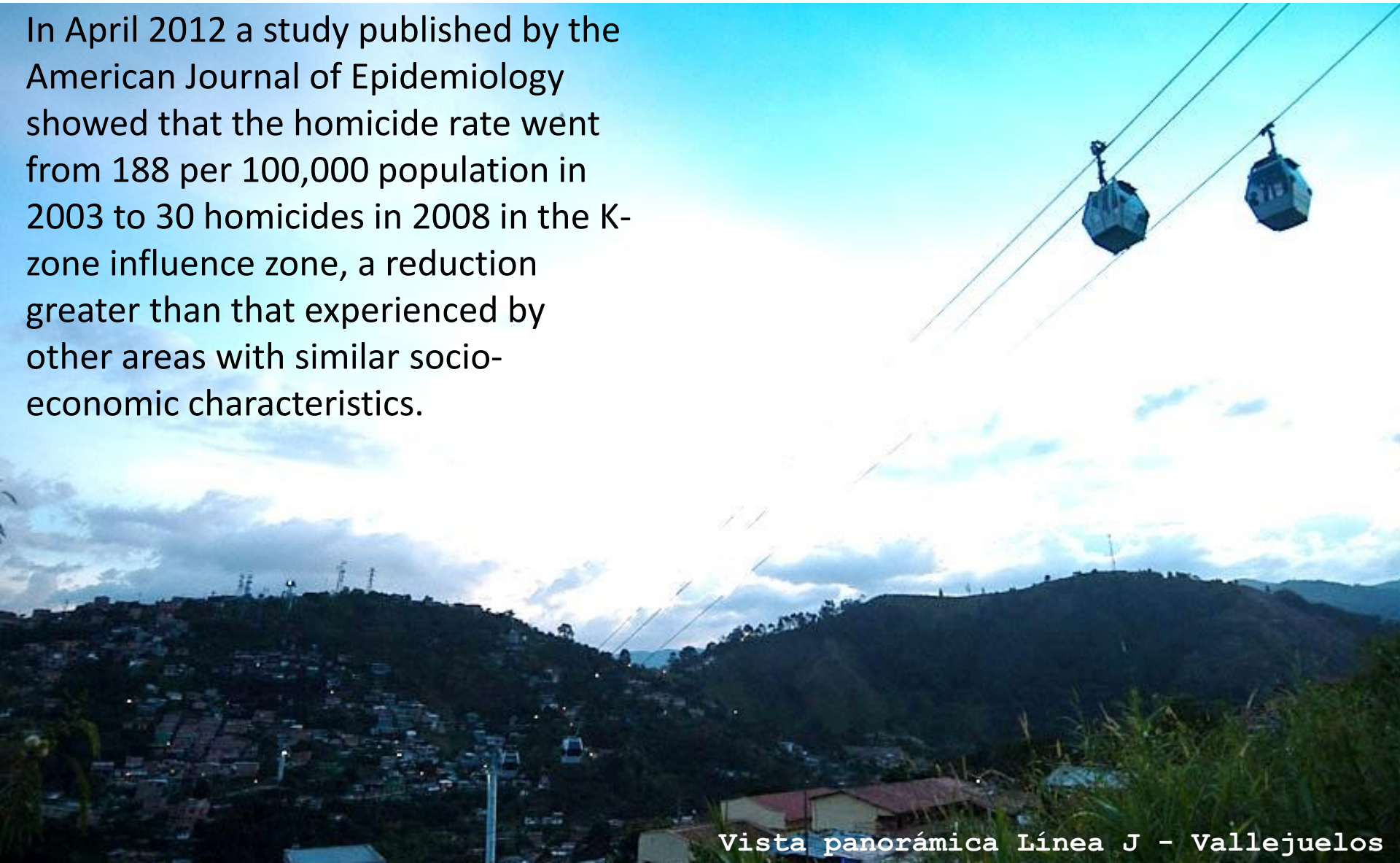
# Public Transport



# 3. Added value

# Urban transformation

In April 2012 a study published by the American Journal of Epidemiology showed that the homicide rate went from 188 per 100,000 population in 2003 to 30 homicides in 2008 in the K-zone influence zone, a reduction greater than that experienced by other areas with similar socio-economic characteristics.



# Responding to the needs of the population



Vista panorámica Línea J - La Aurora

# Promoting new territorial dynamics



# Management begins before construction

Santo Domingo Savio - Before



R

# ... and continues during the operation

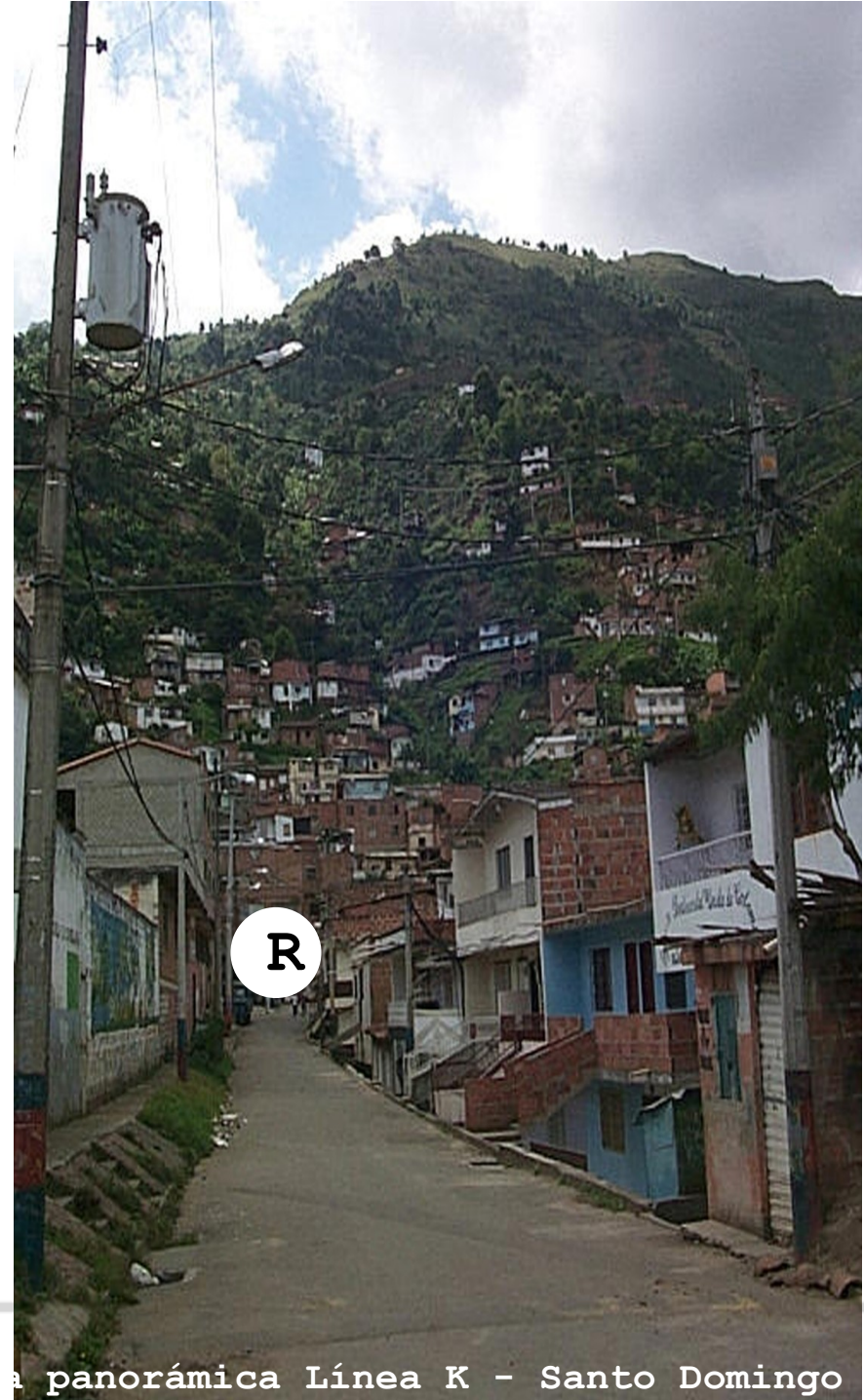
Santo Domingo Savio - After



R

# Transforming territories

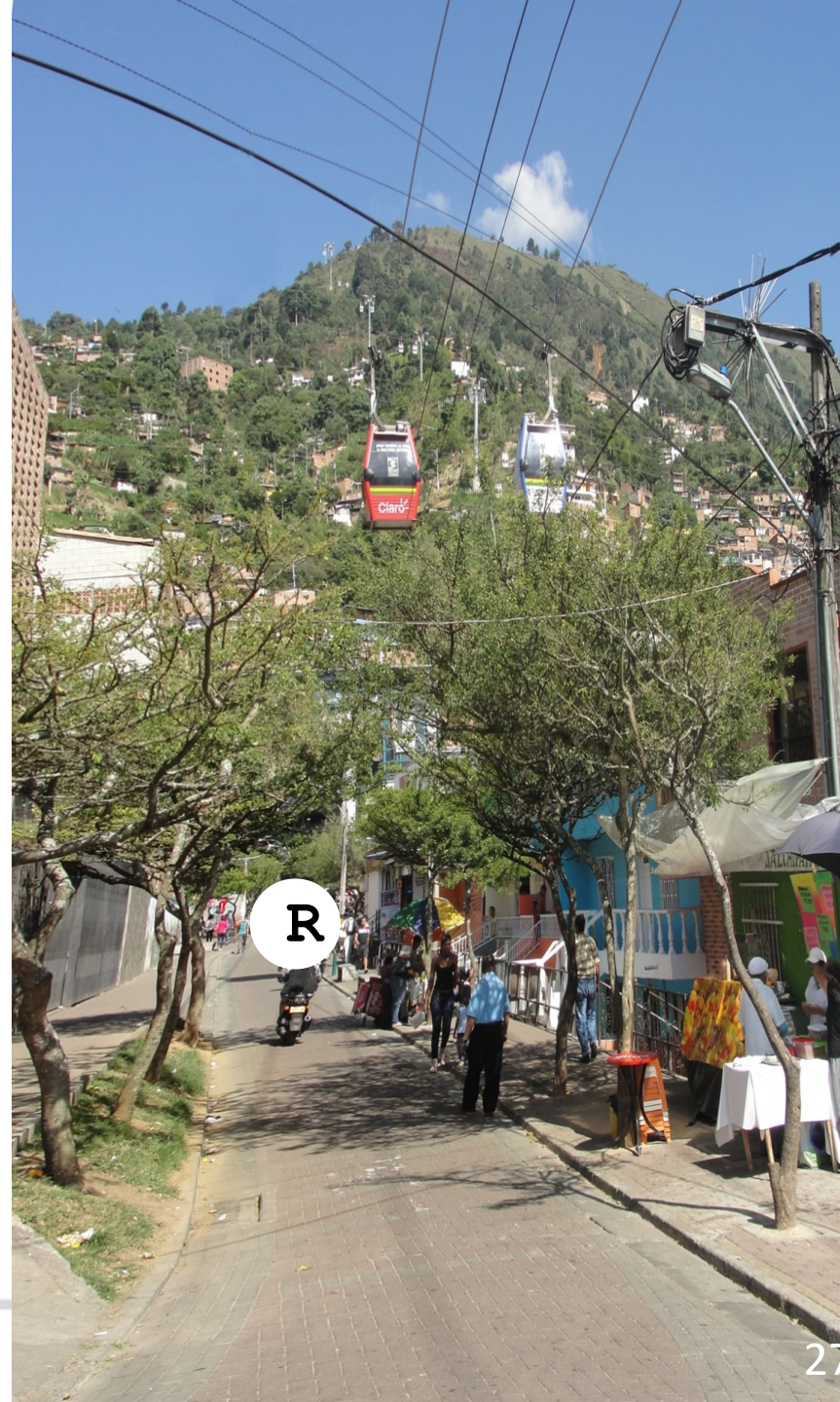
Santo Domingo Savio - Before





# Transforming territories

Santo Domingo Savio - After



# Transforming territories

Santo Domingo Savio - Before



# Transforming territories

Santo Domingo Savio - After



R

# Transforming territories

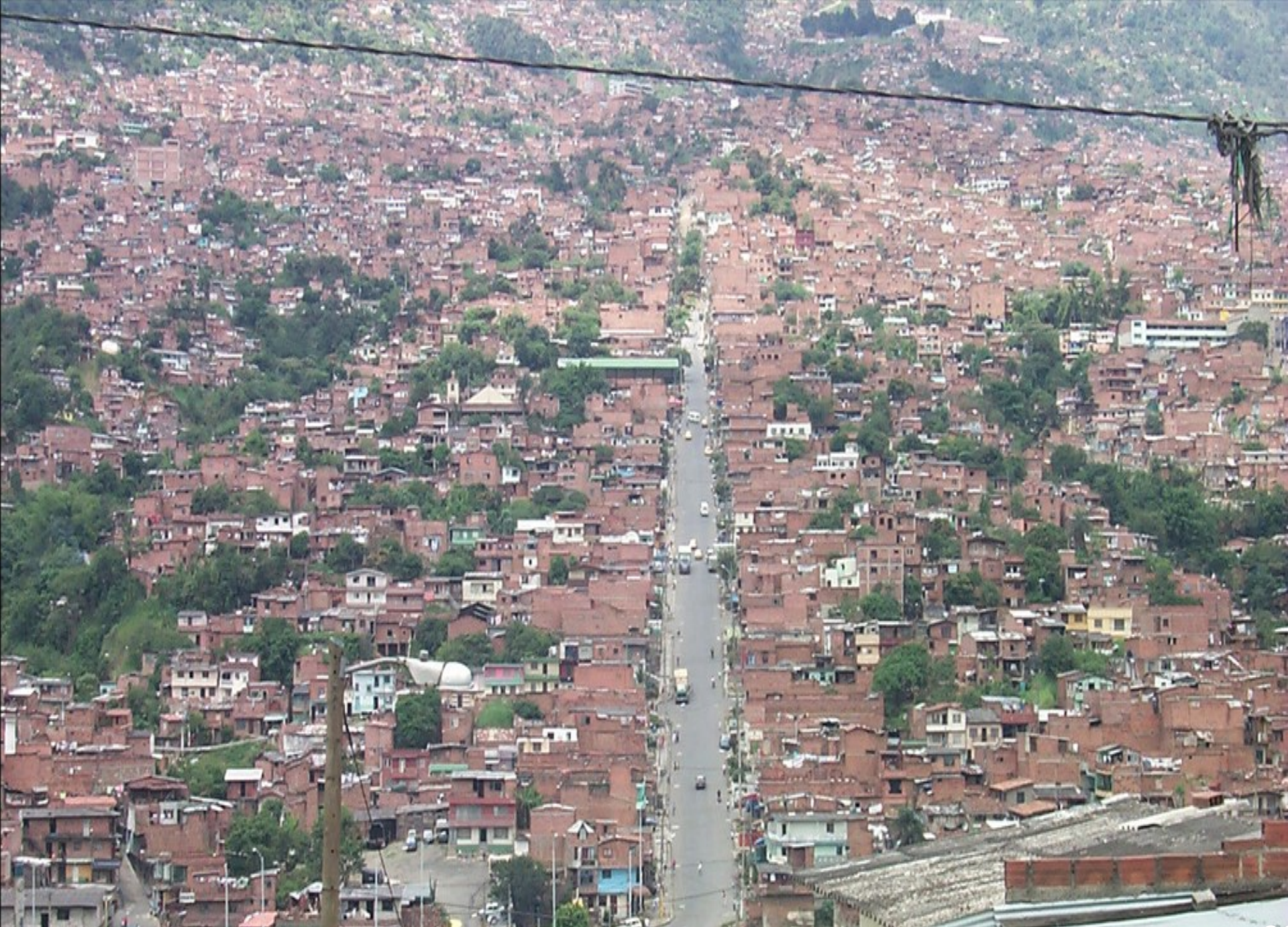
Santo Domingo Savio - Before



# Transforming territories

Santo Domingo Savio - After





Vista Línea K - Estación Acevedo Calle 107



Parque Biblioteca España

Cedezo Sto. Domingo

Paseo Urbano 106

Estación Santo Domingo

Estación de Policía

Parque Lineal la Herrera

Estación Popular

Puente Mirador

Estación Andalucía

[Empty white box]

Puente de la Paz

Proyecto Habitacional la Herrera 2

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[Empty white box]

Proyecto Habitacional Juan Bobo I y II

Paseo Urbano de la 107

Estación Acevedo

Low space requirement



Vista panorámica Línea K - Estación Popular



# No displacements



Vista panorámica Línea J - Estación Juan XXIII

# Externalities 2016



**Reducing CO2 emissions**

**20.391 (Ton. CO2)**

**Reduction of atmospheric pollutants**

**1.063 (Ton. Año)**

**Reduction of fossil fuels**

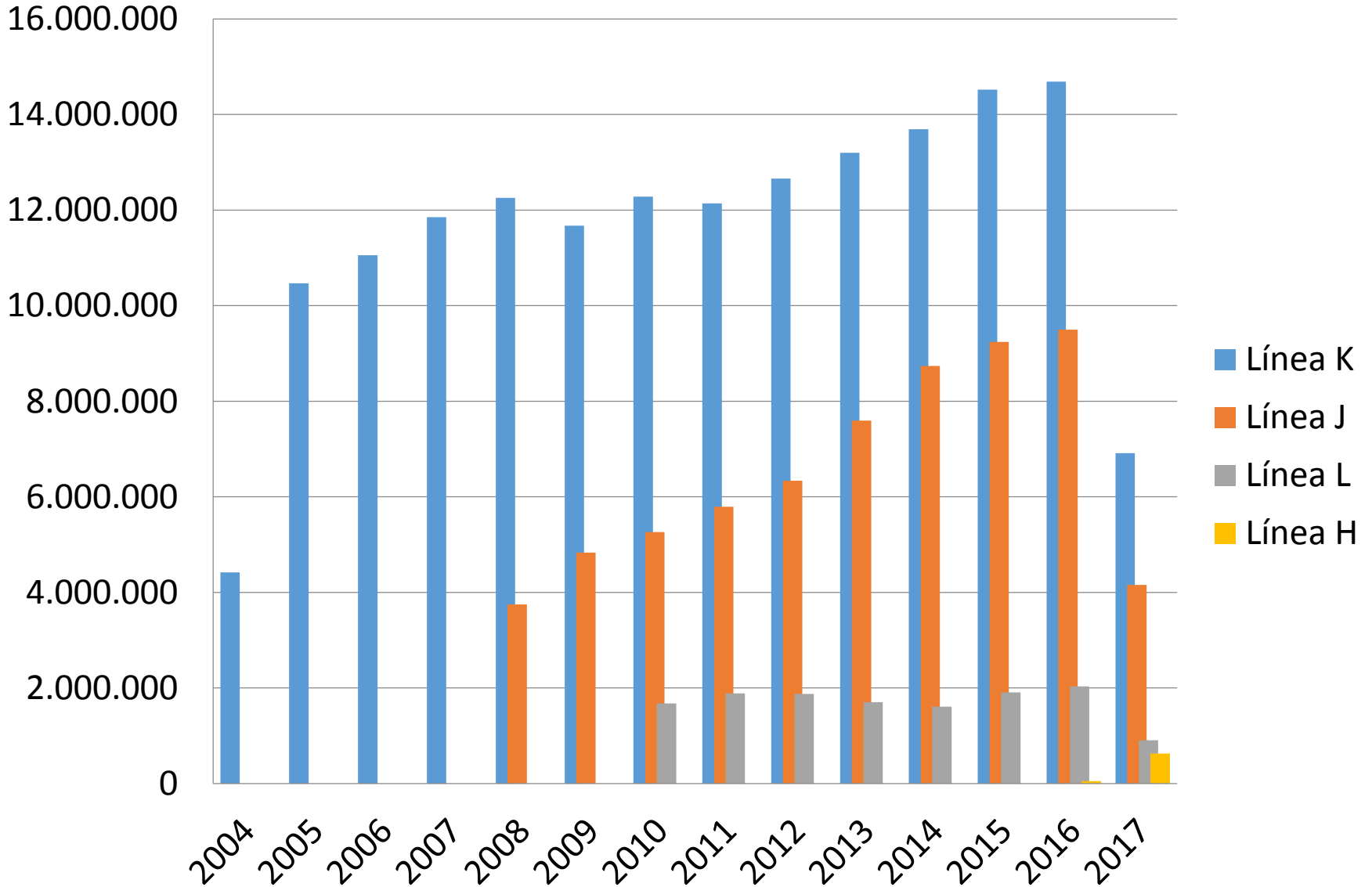
**2.142.299 Gal.**

**Safe Mobility**

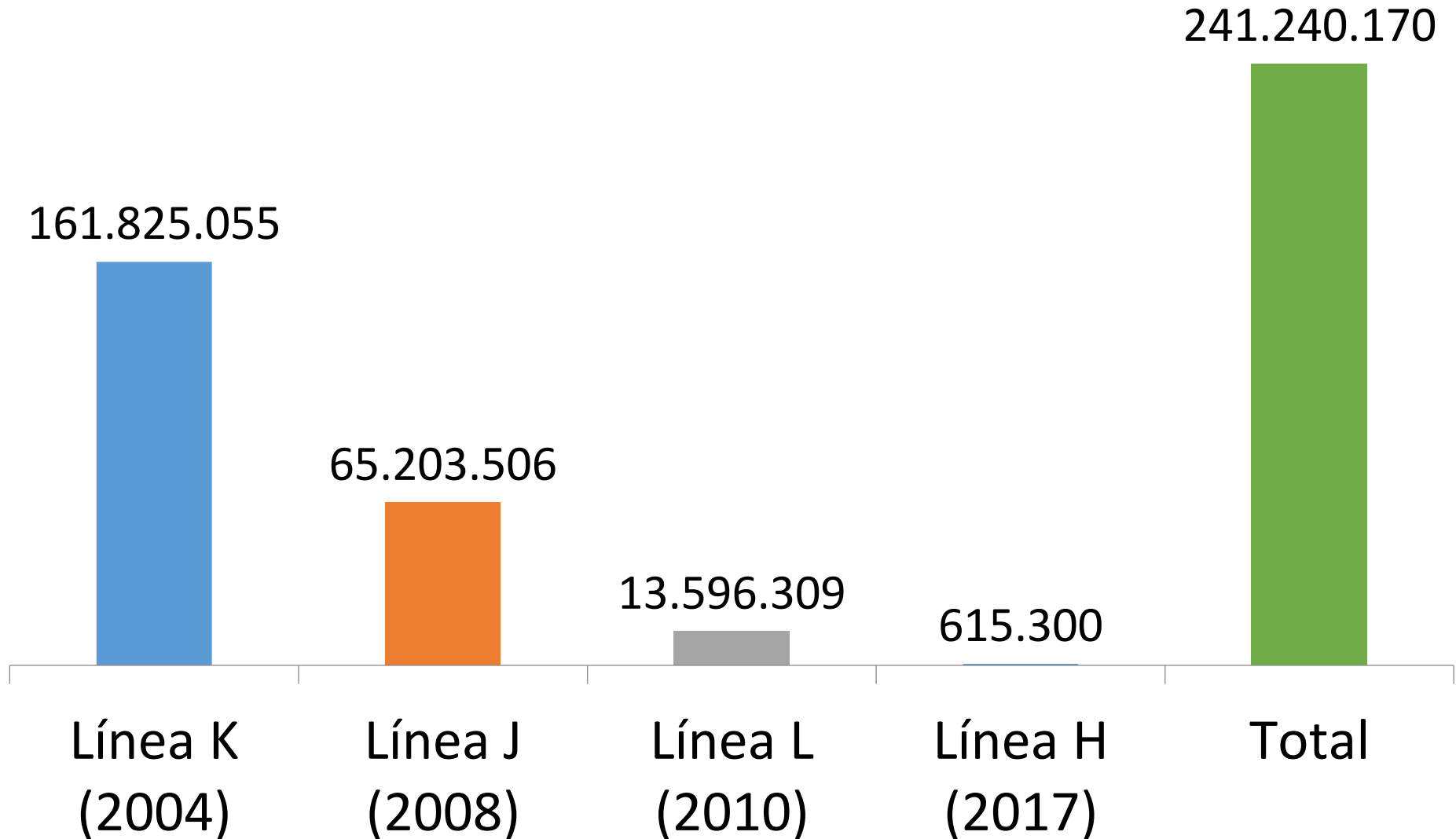
**No accident involving people**

# 4. Operation and maintenance management

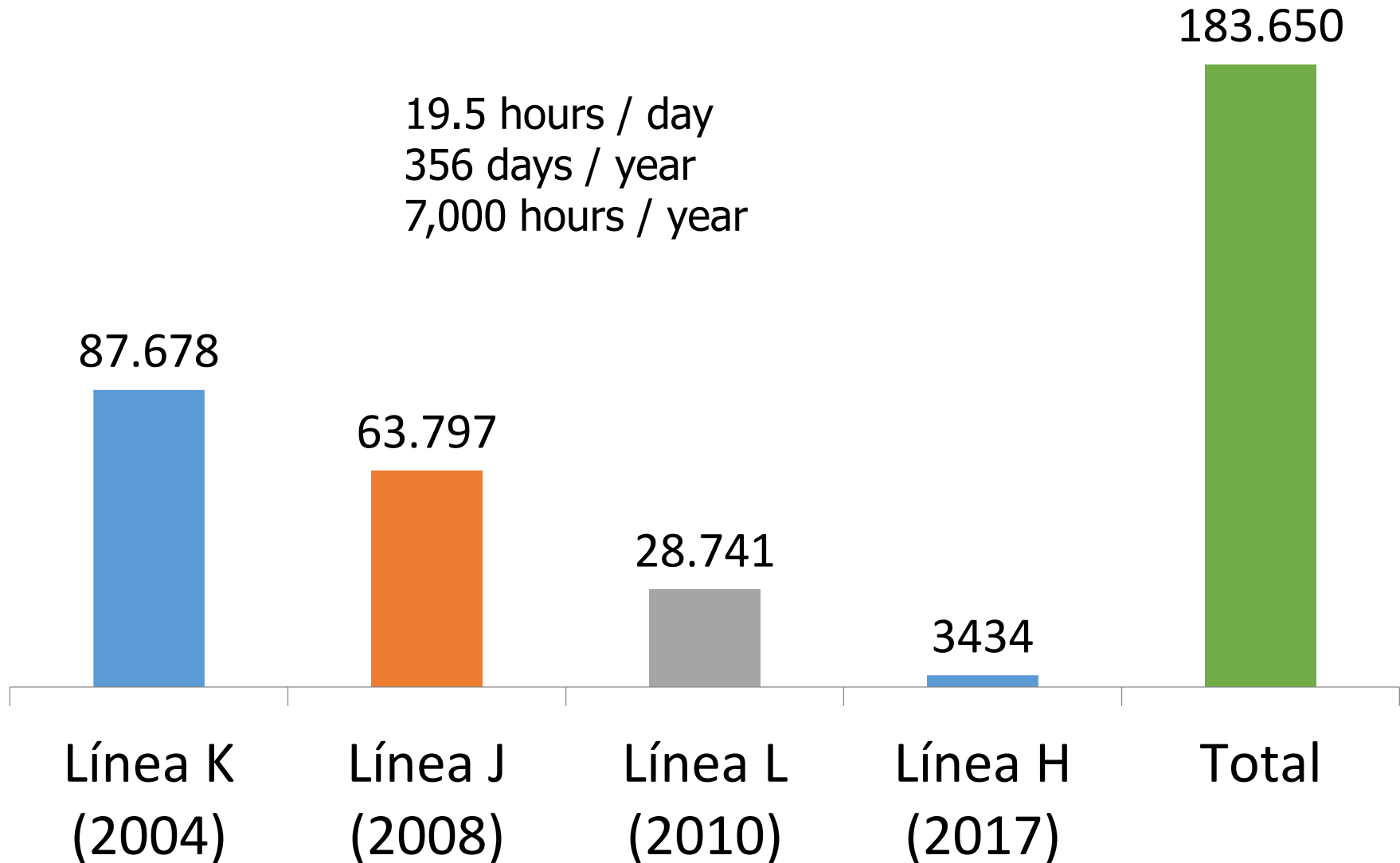
# Passengers



# Total passengers (2004-2017)



# Operation hours (2004-2017)



# Operational availability



	2012	2013	2014	2015	2016
LK	99,80%	99,90%	99,82%	99,81%	99,13%
LJ	99,77%	99,80%	99,93%	99,87%	99,09%

Caused by:

- Climatic conditions (atmospheric discharges): 73%
- Technical malfunctions: 14%
- Operational conditions (users, energy ...): 13%

# Safety - Security



## LEGISLATION

Norms, laws, agreements of law that act as mandatory means of regulation in order to have a positive impact on security level.  
Compliance with national or international standards.

## INFRASTRUCTURE SECURITY

Maintenance of systems  
Best maintenance practices  
Reliability models: RCM, AMFEC  
Responsible operation  
Investigation and development  
Surveillance

## EMERGENCY OPERATIONAL PLANS

Rescue by technical means  
Vertical evacuation of users  
Environmental management.

## RISK MANAGEMENT

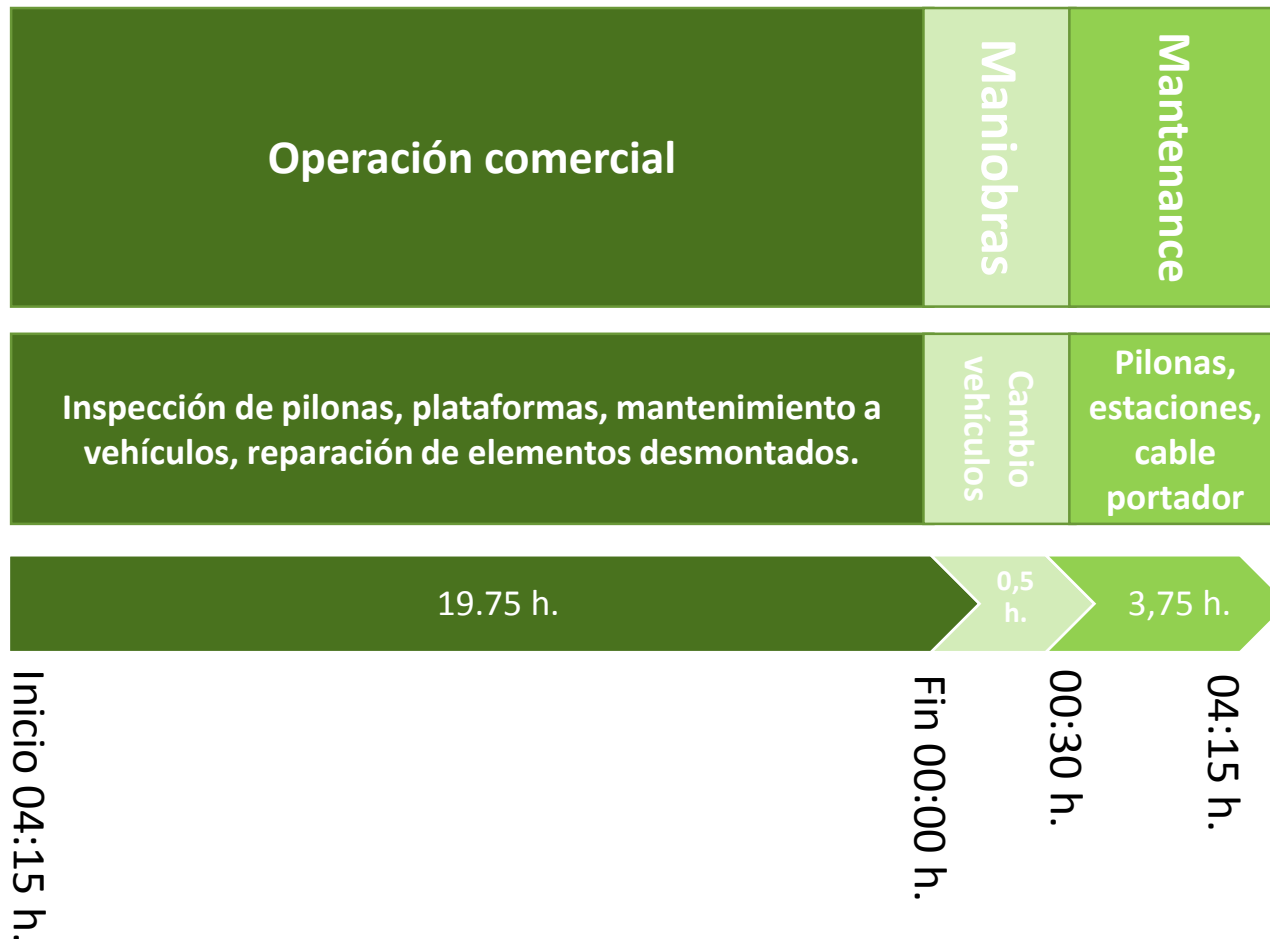
Risk analysis  
Risk Inspections  
Business Continuity  
Insurance  
Self-insurance fund



# Maintenance management



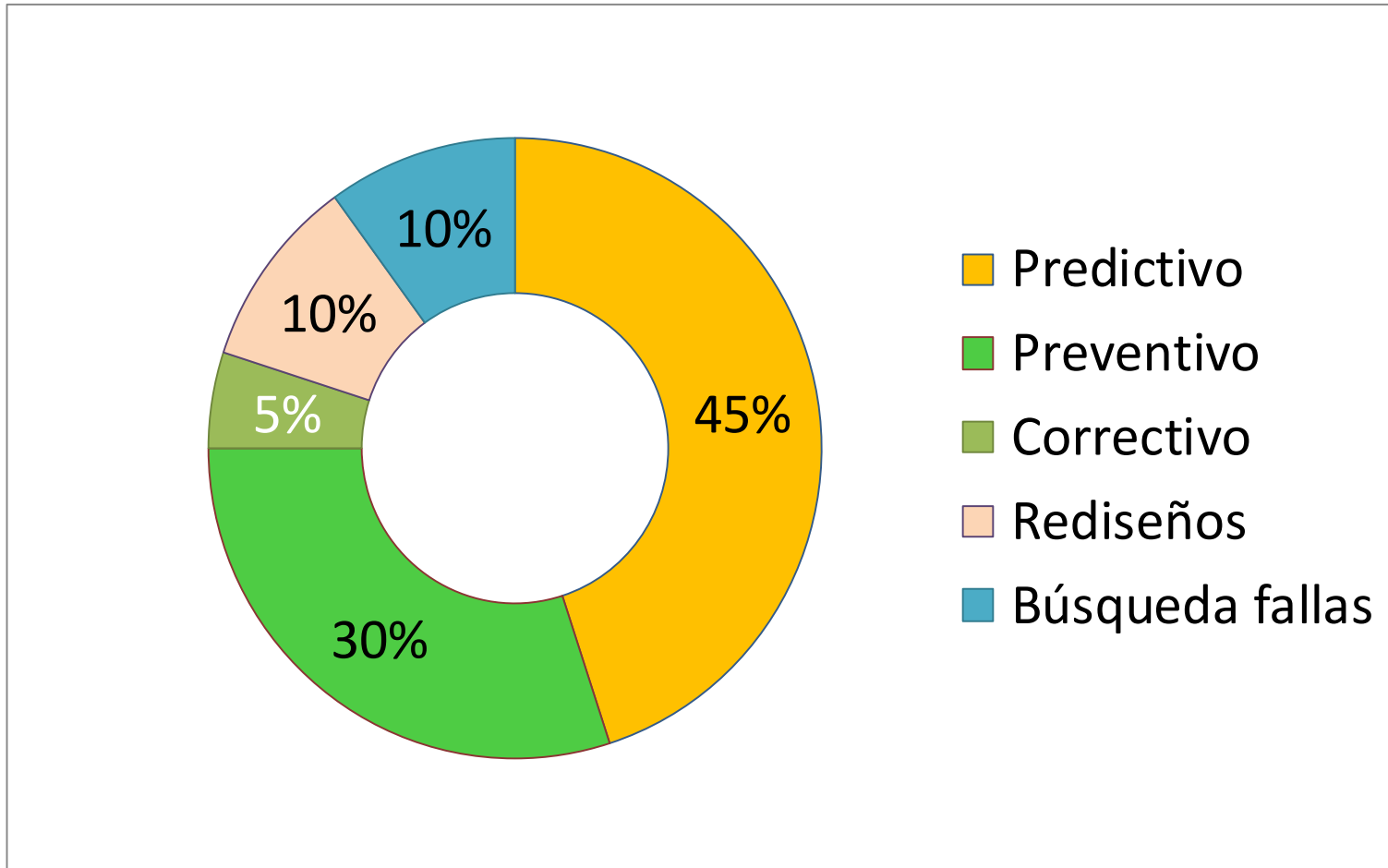
3.75 effective hours per night and 6 hours each weekend, for review and system maintenance:



# Maintenance management



## Maintenance activities characterization:



# Maintenance management



**Before,**

**Interventions were made to know the equipment conditions.**

**Today,**

**Interventions are performed because the actual conditions of these equipment are known.**

# 5. Conclusions

# Conclusion



**Urban ropeway have proven to be a sustainable transport option in densely populated cities, meeting the needs of the region and its inhabitants, becoming transformers of the territory, improving life quality of thousands of people who enjoy their direct benefits through their everyday use.**

**It will be essential to maintain high standards of reliability and safety in order to ensure that urban ropeways continue to be an efficient transport solution. Stakeholders, manufacturers, authorities and operators, need to dedicate their research, development and innovation efforts to achieve sustainable systems.**

# Thank you

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