METRO DE MEDELLÍN
CALIDAD DE VIDA

Urban ropeways: a sustainable transport option

metrodemedellin

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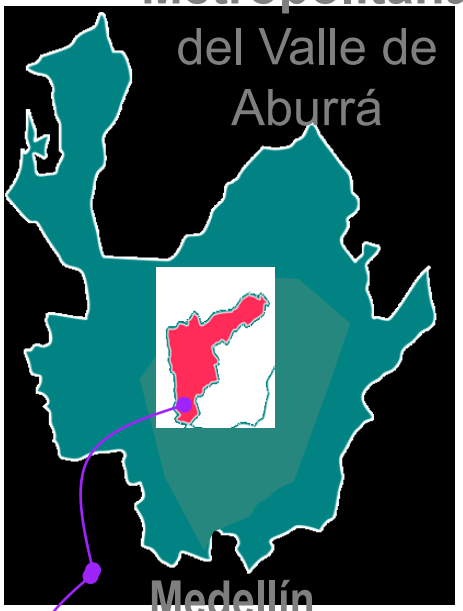
1. About us

Colombia context

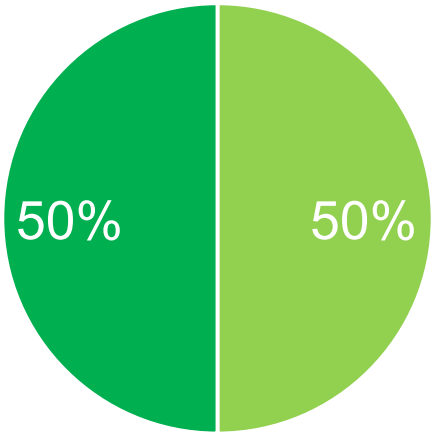


2’417.325 habitantes

3’638.869 en el Área Metropolitana

380.34 Km^2 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

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

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

<u>Fare</u>
A single fare that allows the client to make changes between different modes

<u>Infrastructure</u>
Stations that allow switching between different modes with agility

<u>Operational Integration</u>
Same schedules, same basic rules for the client

<u>Payment card</u>
A single mean of payment to enter all modes

Considerations for integration

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 Niquía – La Estrella
Línea B San Antonio – San Javier

Línea J San Javier – La Aurora
Línea K Acevedo – Santo Domingo
Línea L Santo Domingo – Arví
Línea M Miraflores – Trece de Nov
Línea H Alejandro E – La Sierra

U. de M. - Parque de Aranjuez
Línea 1 Av. Ferrocarril
Línea 2 Av. Oriental

Línea TA San Antonio - Miraflores

Otros medios

Alimentadores
Cuencas 3 y 6

Rutas integradas
143

Parqueaderos

Corridors prioritization criteria

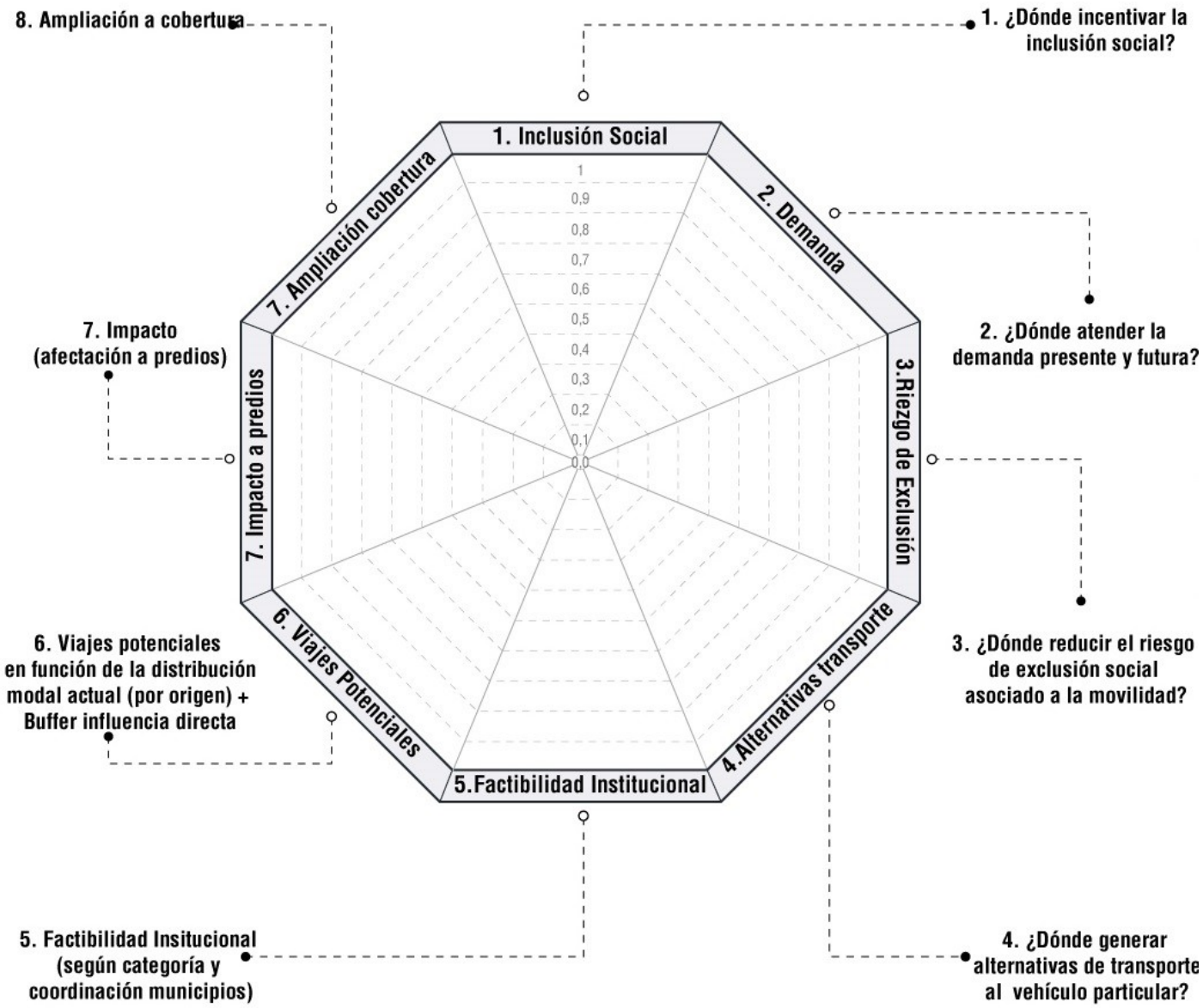
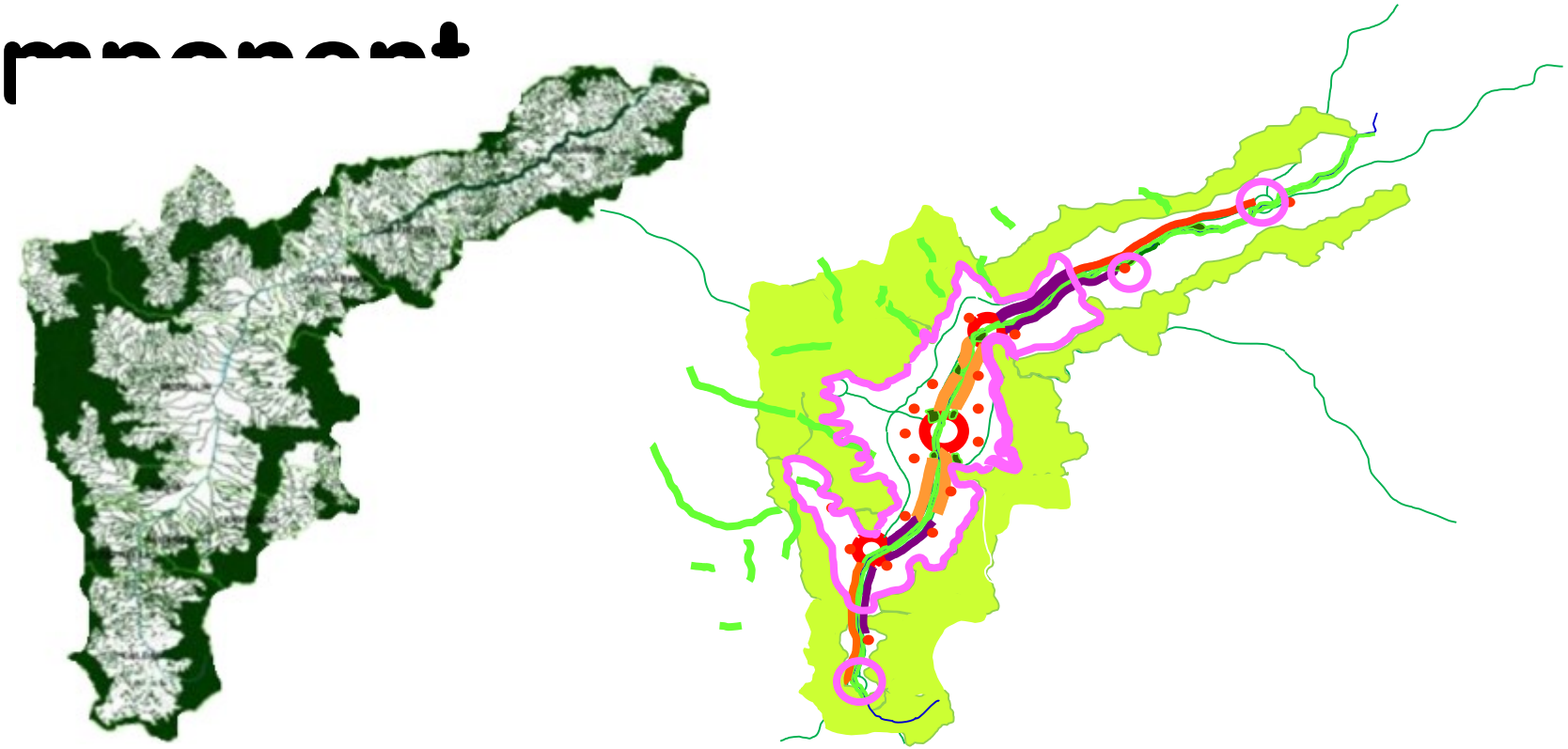


Diagrama de criterios para la priorización de corredores.
Fuente: Urbam EAFIT, 2016.

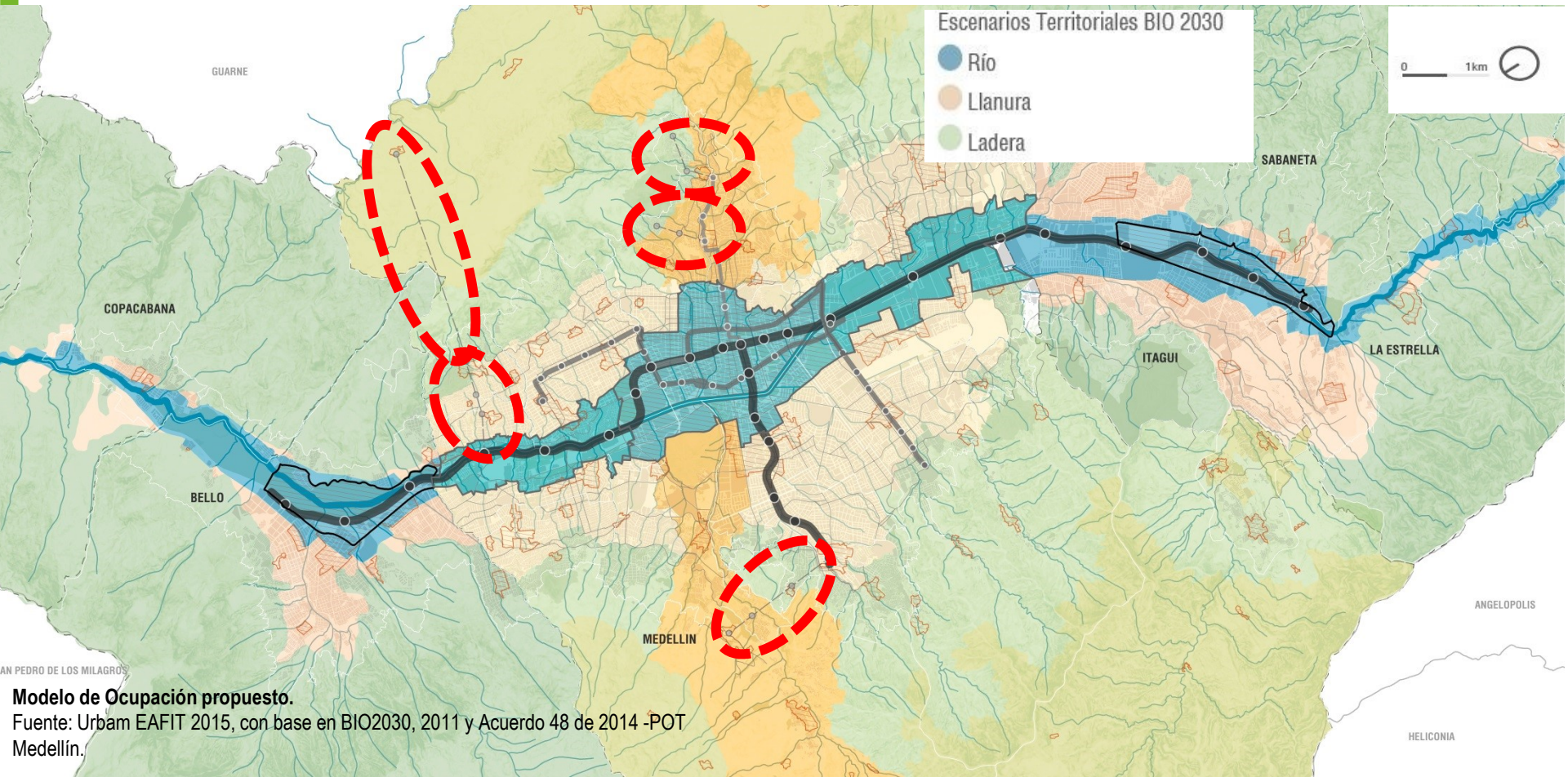
Land use model – Metropolitan component



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.

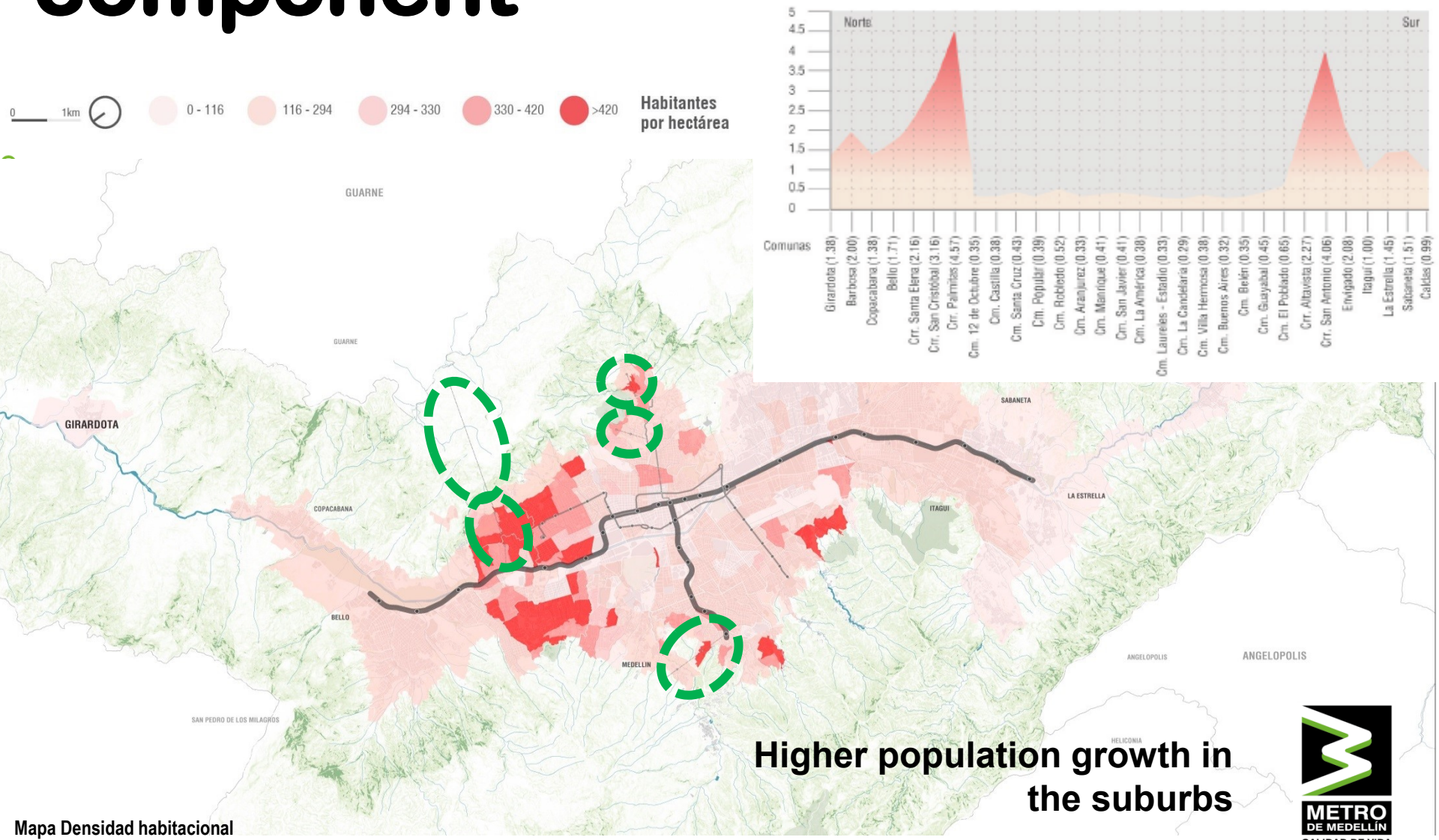
Land use model – Metropolitan component

Looking for anticipate future demands set by local and regional planning



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

Land use model – Metropolitan component



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

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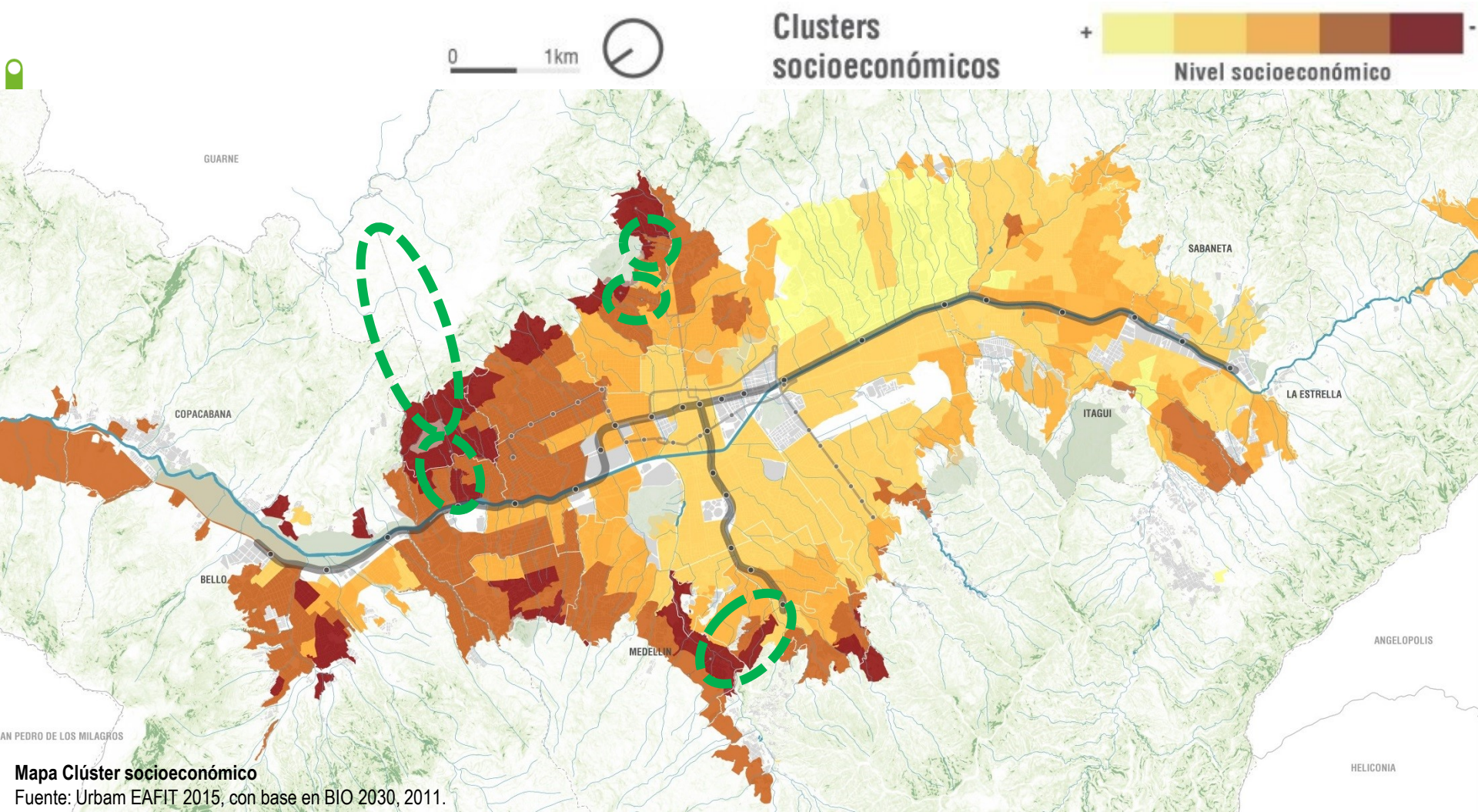
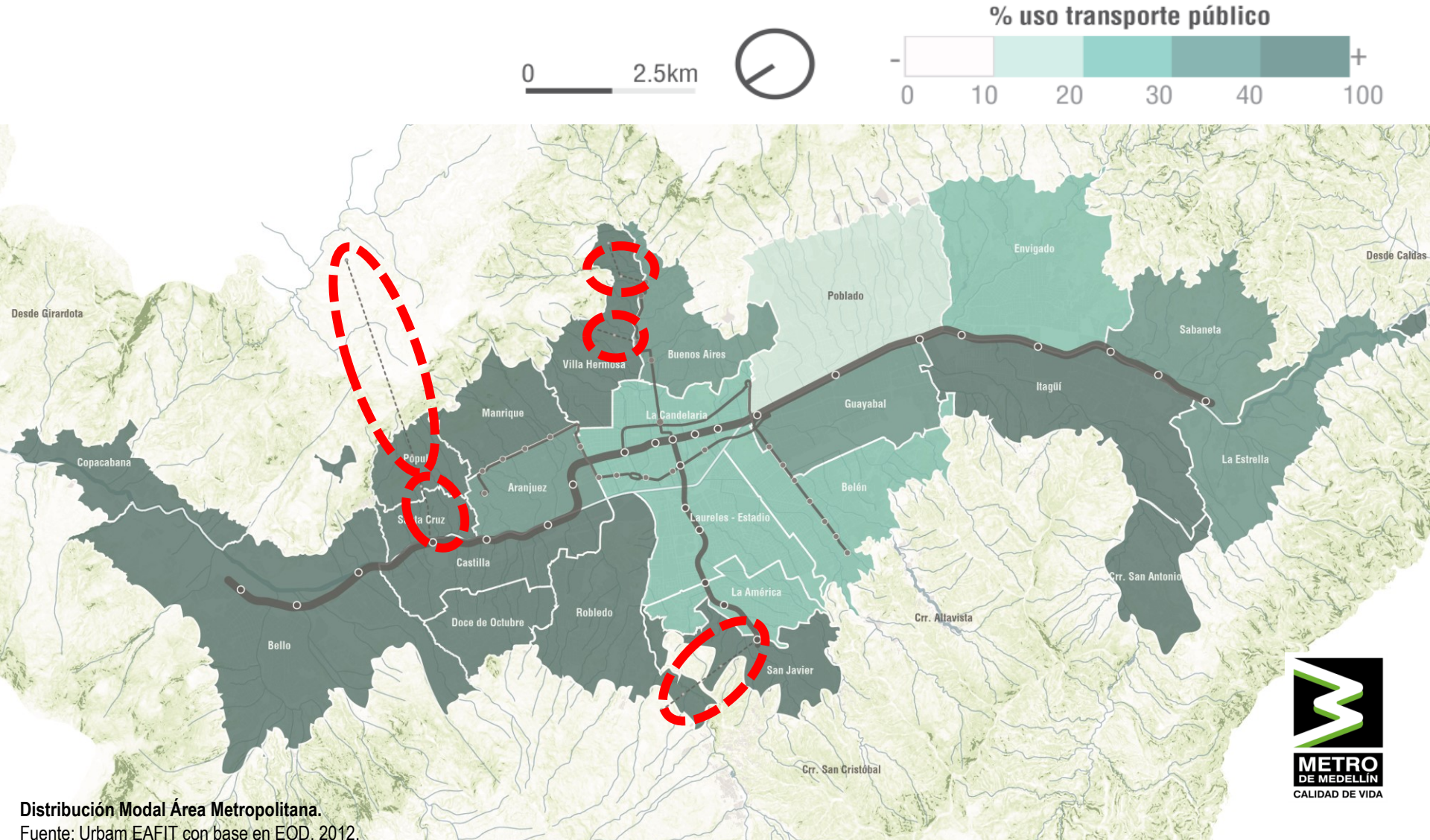
Social – economical segregation



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

Public Transport

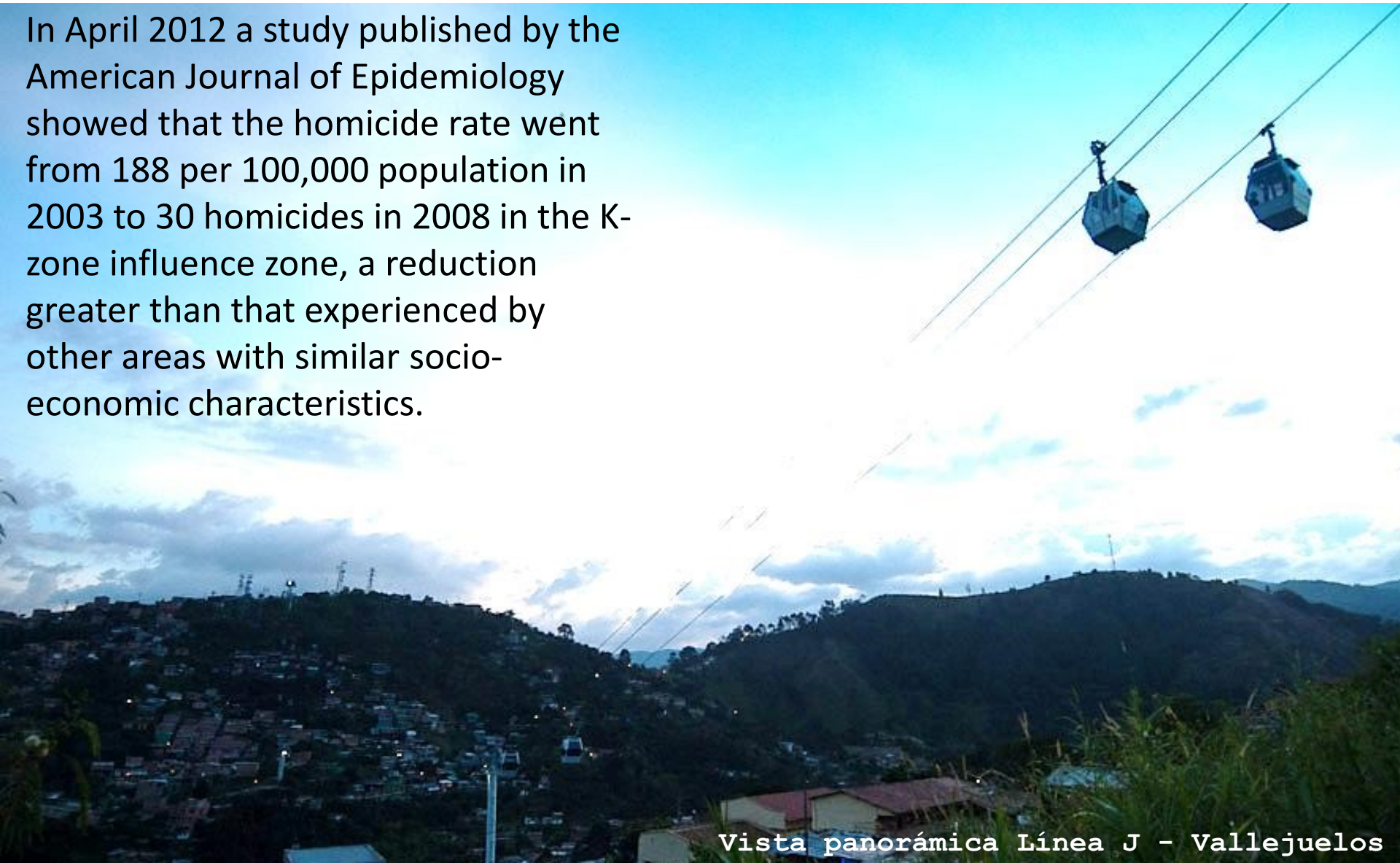


Distribución Modal Área Metropolitana.
Fuente: Urbam EAFIT con base en EOD, 2012.

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

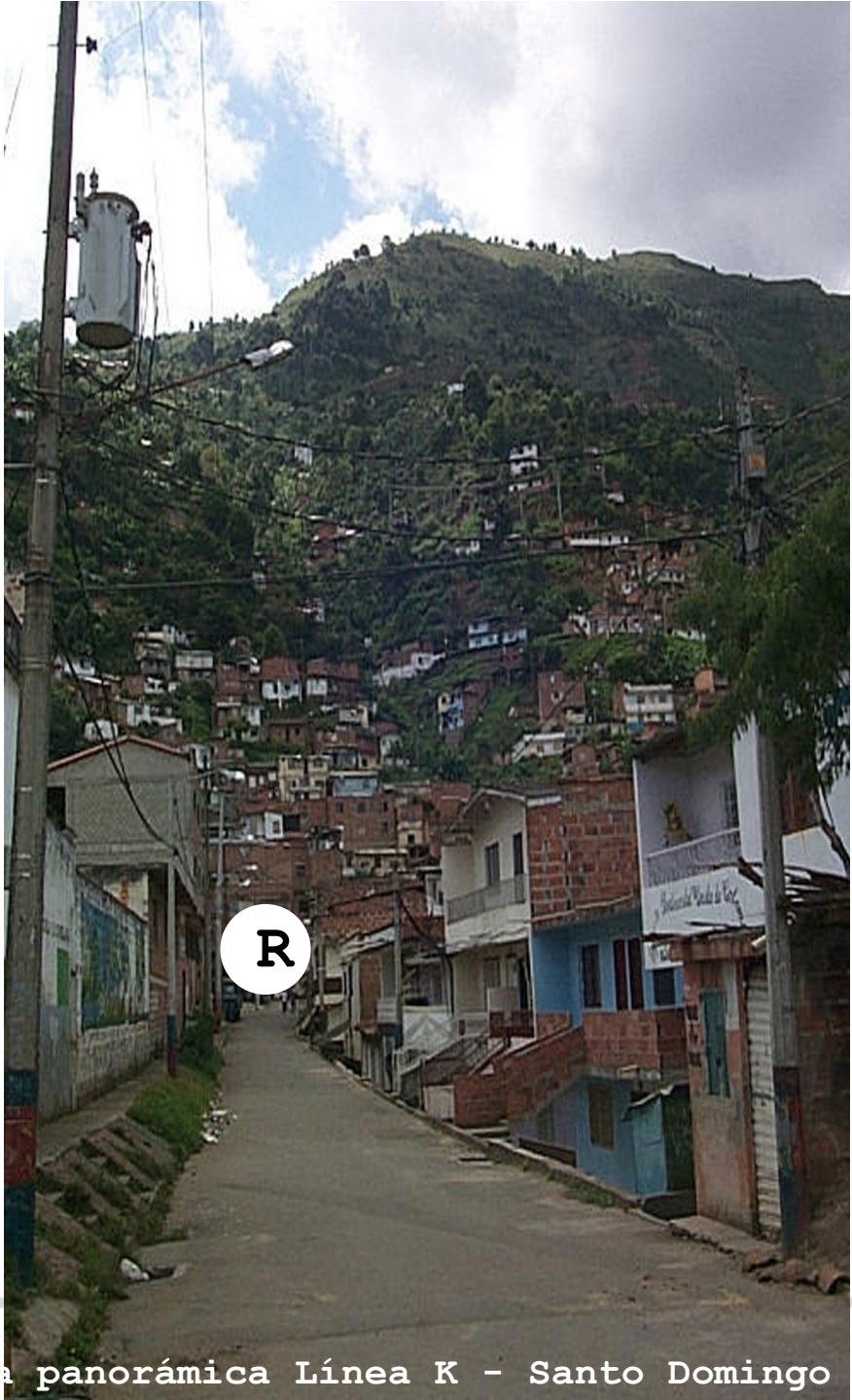
Promoting new territorial dynamics

Management begins before construction

… and continues during the operation

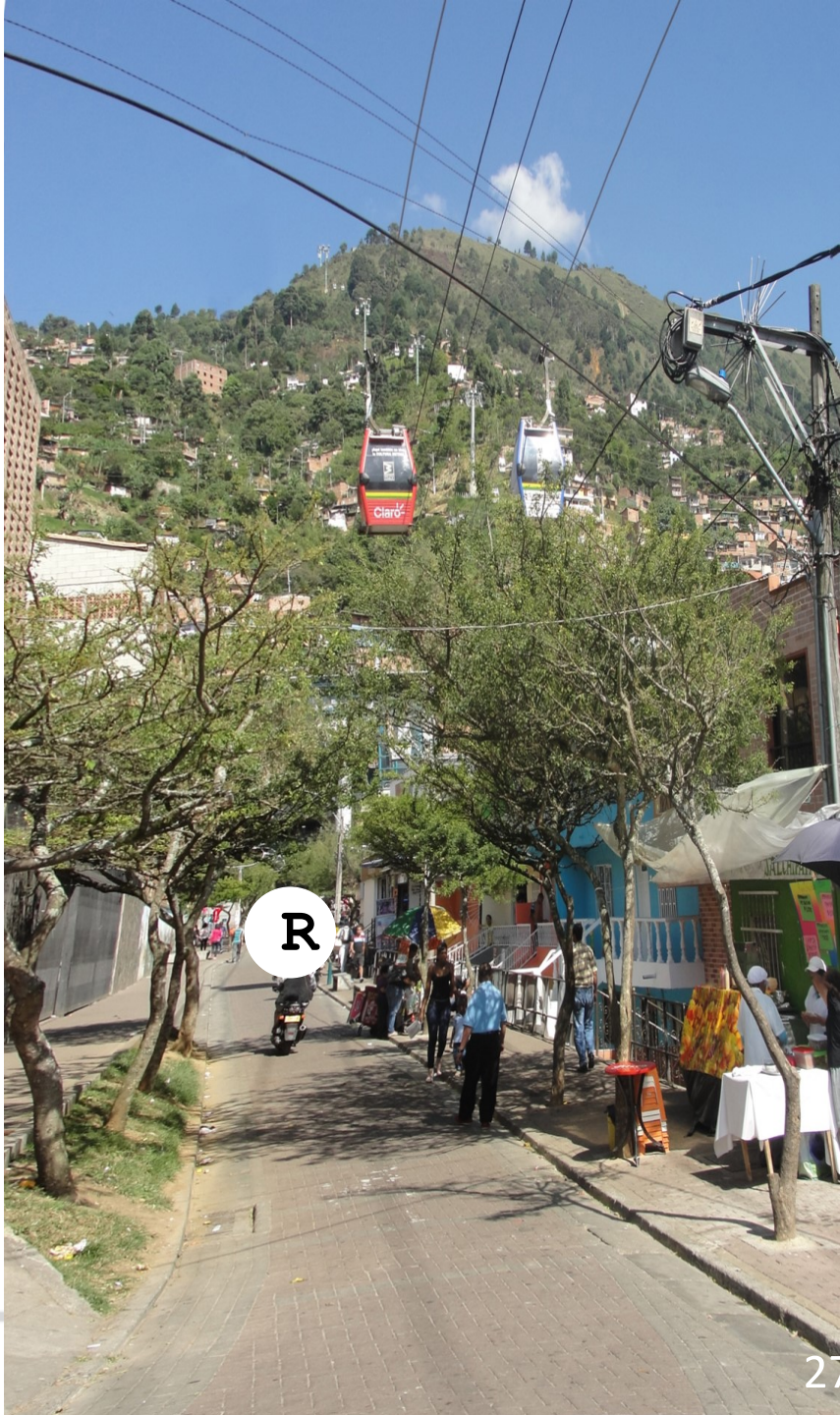
Transforming territories

Santo Domingo Savio - Before



Transforming territories

Santo Domingo Savio - After



Transforming territories

Santo Domingo Savio - Before

Transforming territories

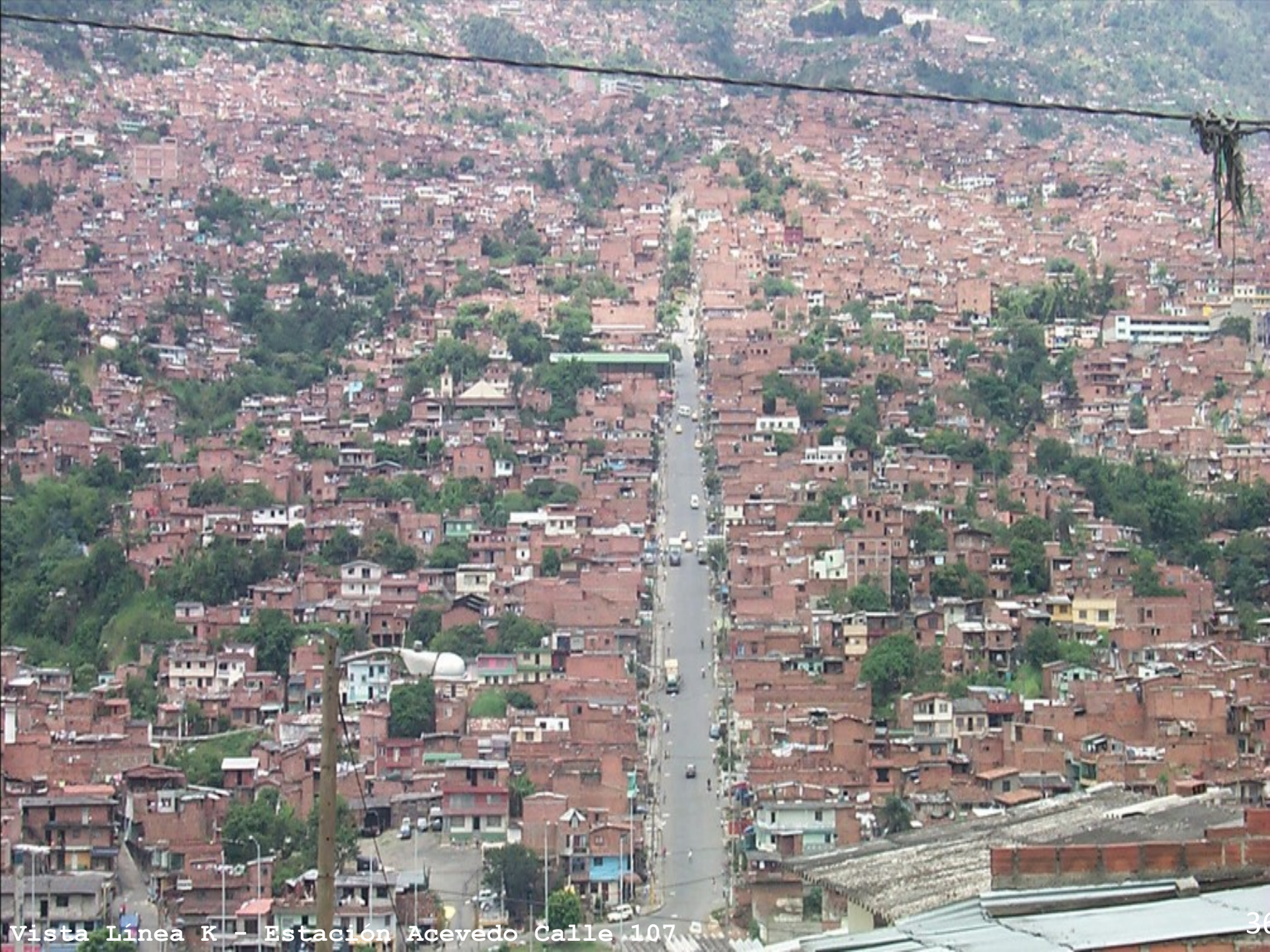
Santo Domingo Savio - After

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
Puente de la Paz
Proyecto Habitacional la Herrera 2
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)

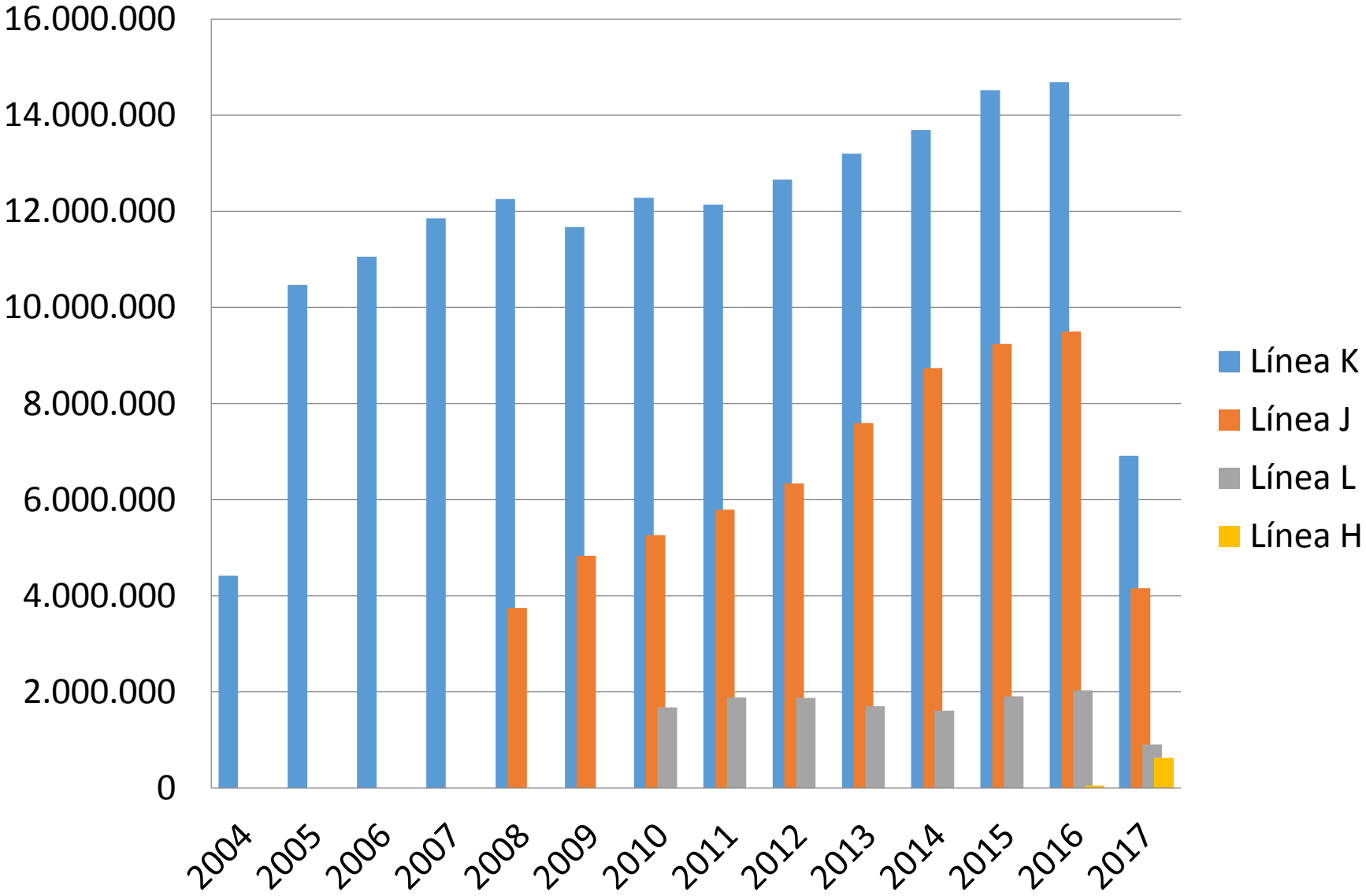
Reduction of atmospheric pollutants
1.063 (Ton. Año)

Reduction of fossil fuels
2.142.299 Gal.

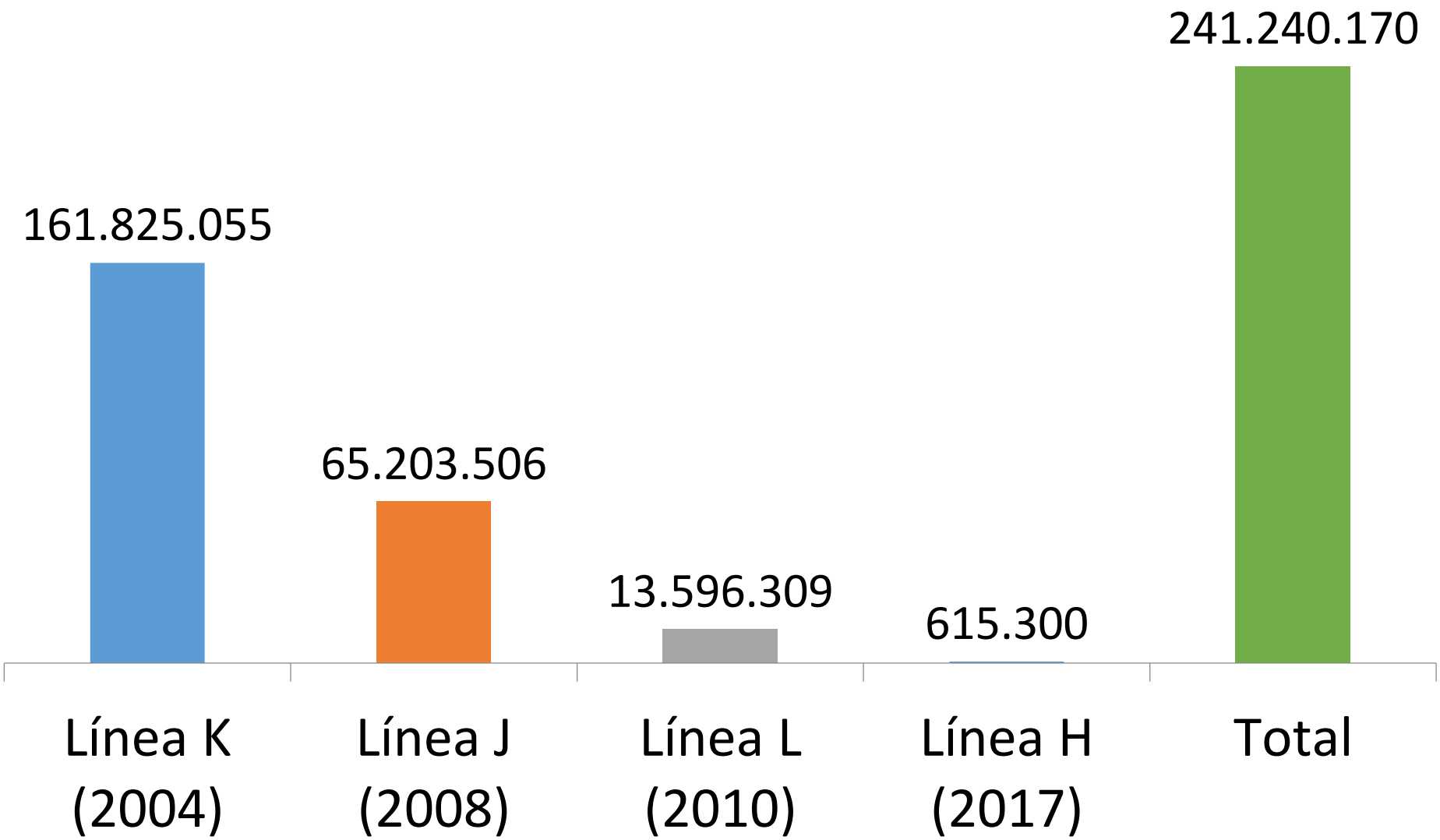
Safe Mobility
No accident involving people

4. Operation and maintenance management

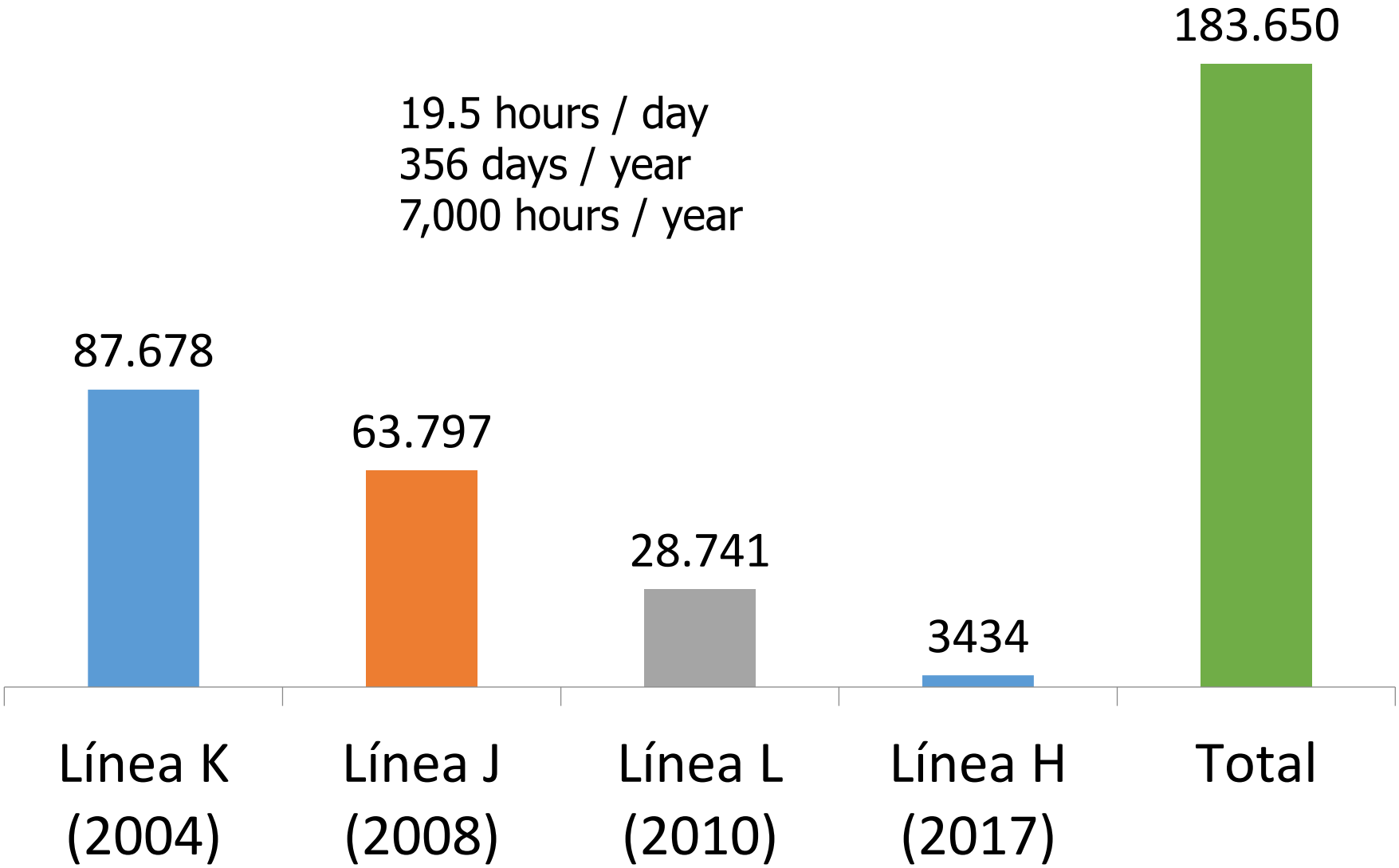
Passengers


16.000.000
14.000.000
12.000.000
10.000.000
8.000.000
6.000.000
4.000.000
2.000.000
0
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
Línea K
Línea J
Línea L
Línea H

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.

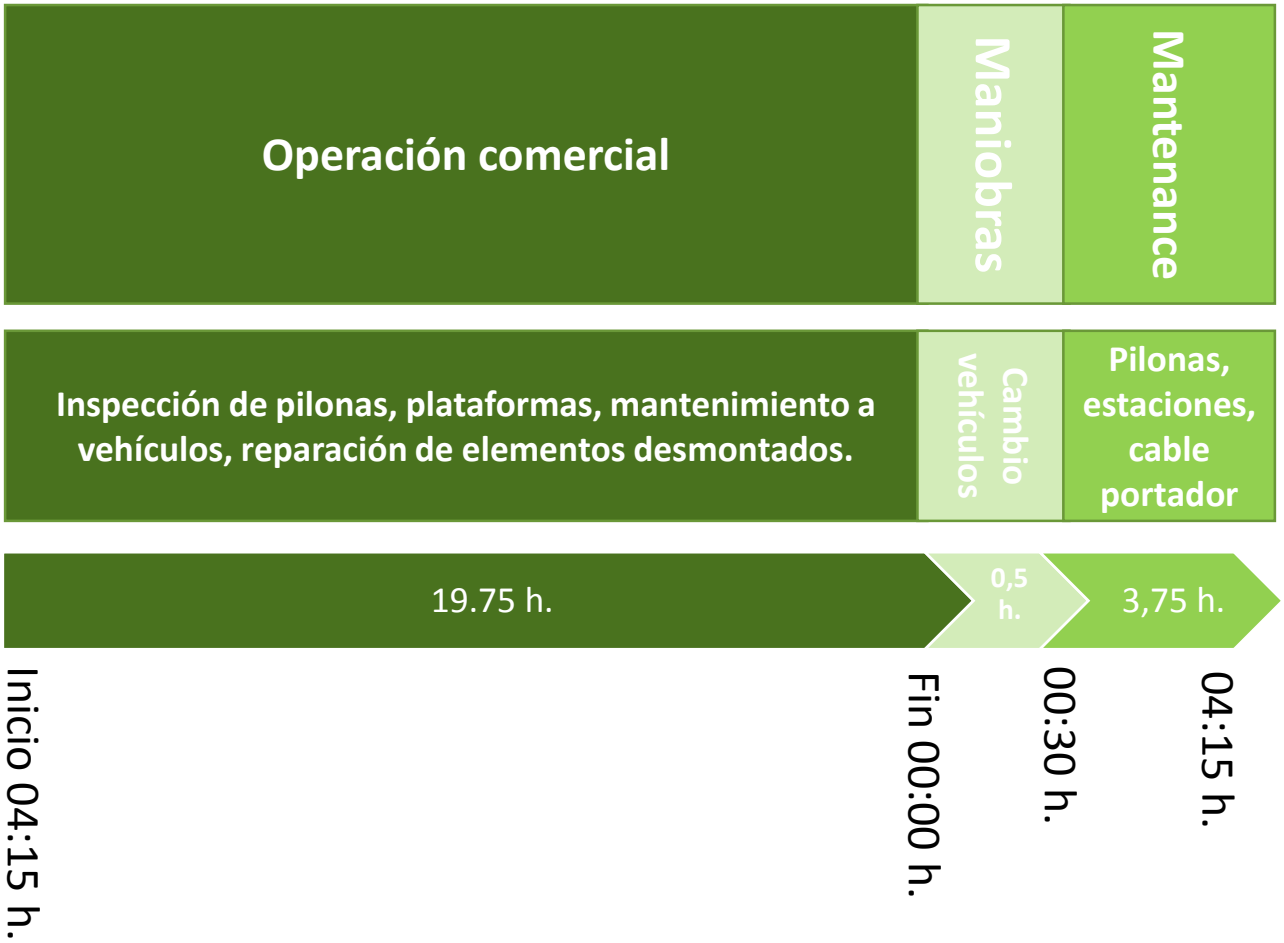
INFRASTRUCTURE SECURITY
Maintenance of systems
Best maintenance practices
Reliability models: RCM, AMFEC
Responsible operation
Investigation and development
Surveillance

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

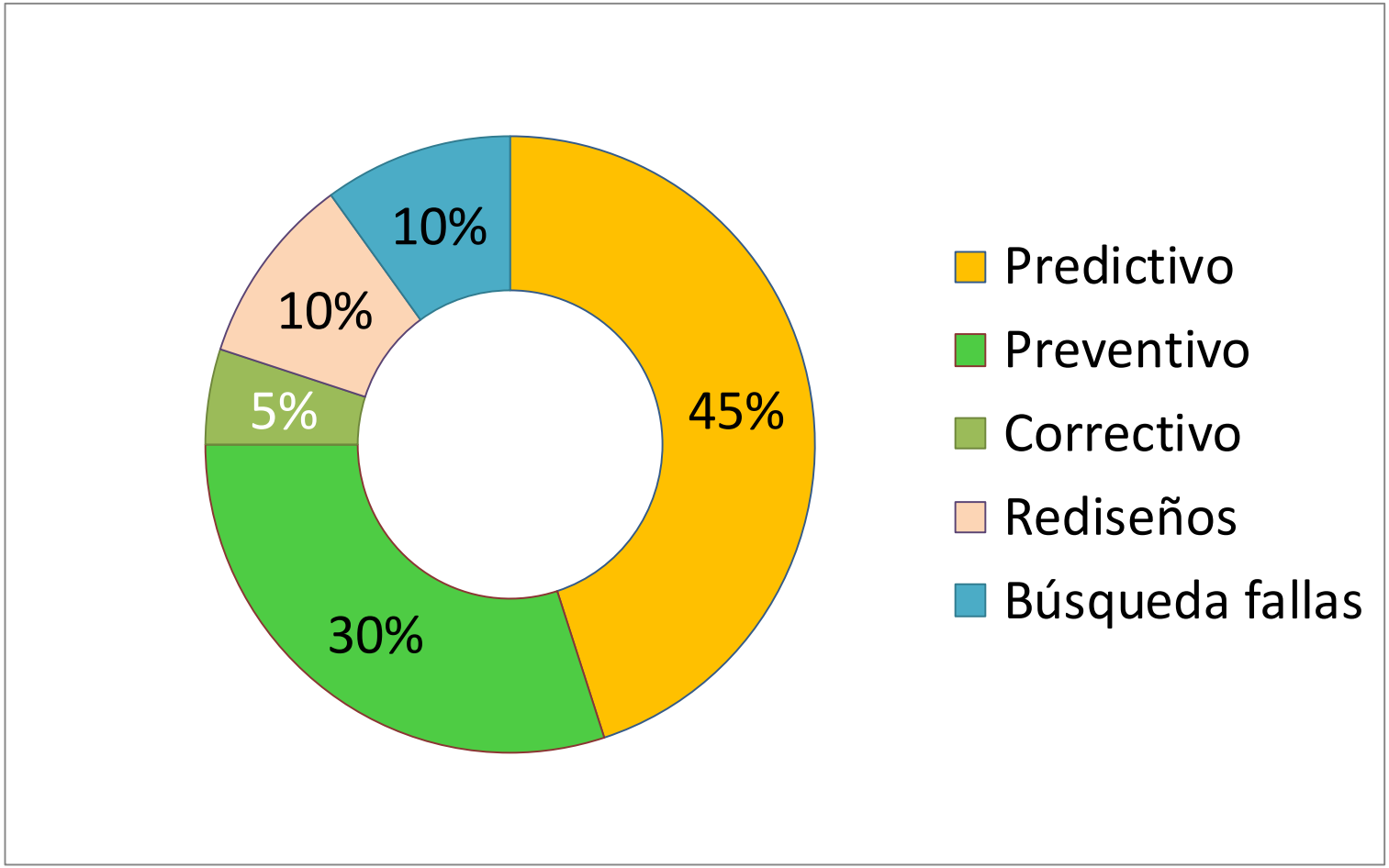
Maintenance management

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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