Urban ropeways: a sustainable transport option
Content

1. About us
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1. About us
Colombia context

2'417.325 habitantes
3'638.869 en el Área Metropolitana
380.34 Km² de extensión
Legal nature

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

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<td>A</td>
<td>B</td>
<td>K</td>
<td>J</td>
<td>L</td>
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<td>Férreo</td>
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<td>Cable aéreo</td>
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<td><strong>Vagón 400 usuarios</strong></td>
<td><strong>Vagón 400 usuarios</strong></td>
<td><strong>Telecabina 10</strong> 8 sentados, 2 de pie</td>
<td><strong>Telecabina 10</strong> 8 sentados, 2 de pie</td>
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<td>M</td>
<td>1 BUS</td>
<td>2 BUS</td>
<td>T-A</td>
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<td>Cable aéreo</td>
<td>BRT (Bus rapid transit)</td>
<td>Padrones</td>
<td>Férreo</td>
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<td><strong>Telecabina 10</strong> 8 sentados, 2 de pie</td>
<td><strong>Bus articulado 160 usuarios</strong></td>
<td><strong>Bus padrón 100 usuarios</strong></td>
<td><strong>Tranvía 300 usuarios</strong></td>
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<td><strong>3 Modos</strong> 10 Líneas</td>
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<td>3 transportation modes 10 lines</td>
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Millions of passengers
# Technical characteristics

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

- **Infrastructure**: Stations that allow switching between different modes with agility.

- **Payment card**: A single mean of payment to enter all modes.

- **Fare**: A single fare that allows the client to make changes between different modes.

- **Operational Integration**: Same schedules, same basic rules for the client.
Considerations for integration
Considerations for integration
Considerations for integration
Considerations for integration
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
Diagram of prioritization criteria for corridors.

1. Where to incentivize social inclusion?
2. Where to attend to current and future demand?
3. Where to reduce the risk of social exclusion associated with mobility?
4. Where to generate transport alternatives for private vehicles?
5. Institutional feasibility (according to category and municipal coordination)
6. Potential trips based on modal distribution (actual origin) + Buffer direct influence
7. Impact (affectation to properties)
8. Extension to coverage

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.
Land use model – Metropolitan component

Higher population growth in the suburbs
Social – economical segregation
Distribución Modal Área Metropolitana.
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
Promoting new territorial dynamics
Management begins before construction
... and continues during the operation

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
Transforming territories

Santo Domingo Savio - Before
Transforming territories

Santo Domingo Savio - After
Low space requirement
No displacements
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

0 2,000,000 4,000,000 6,000,000 8,000,000 10,000,000 12,000,000 14,000,000 16,000,000

Línea K
Línea J
Línea L
Línea H


- Línea K (2004): 161,825,055
- Línea L (2010): 13,596,309
- Línea H (2017): 615,300
- Total: 241,240,170
Operation hours (2004-2017)

- Línea K (2004): 87.678
- Línea J (2008): 63.797
- Línea H (2017): 3434
- Total: 183.650

19.5 hours / day
356 days / year
7,000 hours / year
Operational availability

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<tr>
<td>LK</td>
<td>99.80%</td>
<td>99.90%</td>
<td>99.82%</td>
<td>99.81%</td>
<td>99.13%</td>
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<tr>
<td>LJ</td>
<td>99.77%</td>
<td>99.80%</td>
<td>99.93%</td>
<td>99.87%</td>
<td>99.09%</td>
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</tbody>
</table>

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

- Operación comercial
  - Inicio: 04:15 h.
  - Fin: 00:00 h.
  - Duration: 19.75 h.

- Maniobras
  - Cambio vehículos
  - Pilonas, estaciones, cable portador
  - Duration: 3.75 h.

- Maintenance
  - Duration: 0.5 h.
Maintenance management

Maintenance activities characterization:

- Predictivo: 45%
- Preventivo: 30%
- Correctivo: 5%
- Rediseños: 10%
- Búsqueda fallas: 10%
Before,
Interventions were made to know the equipment conditions.

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

Maintenance management
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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