# More than Mobility: Cable Car Systems as Symbolic Infrastructure in Medellín, Colombia and Rio de Janeiro, Brazil

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## Introduction

Until fifteen years ago, aerial cable cars would have conjured images of snowy peaks in European ski resorts. How strange it might seem that that in recent years they have proliferated in a vastly different context: the hillside shantytowns dotting Latin American cities, variously known as *comunas*, *barrios*, or *favelas*, where approximately 30% of the region's population is estimated to reside (Echeverri and Orsini 2010). Across country contexts, these settlements share high levels of poverty, informality, social exclusion and government neglect, along with poor transportation options (Fay 2005). Barriers to mobility reinforce residents' real and perceived sense of exclusion from the city's economic and civic life (Heinrichs and Bernet 2014).

Recognizing the significance of connectivity for urban development and social integration, a creative mayor in Medellín, Colombia opted to provide public transportation for its most neglected neighborhoods in the form of the region's first cable car system, Metrocable Línea K, launched in 2004. What was mocked as an audacious project in short time was taken seriously as a template for other Latin American cities, which were especially impressed by the project's headline-grabbing success in reducing crime. However, the impact and local reception in other contexts has been less encouraging, particularly in the case of Rio de Janeiro's nowshuttered Teleférico do Alemão, built in 2011. The contrast between Medellín's celebrated Metrocable and Rio's scorned Teleférico invites us to ask what explains the diverging results.

In this paper, I argue that the greatest possibilities offered by cable-propelled transit (CPT) are not their immediate boost to mobility, but rather their symbolic significance as investments in and engagement with neglected communities. I submit that CPT systems are particularly visible emblems of the political processes that produce them, and as such, can be subjects of disdain or openings for public trust, depending on the degree of community participation. I begin with an overview of cable car technology, covering their material advantages and drawbacks as a form of public transit for Latin American cities. Next, I explain their symbolic significance, situated in the principles of "urban acupuncture" (Lerner 2016) and humanistic urban design. I highlight Medellín's pioneering experience with CPT, focusing on its participatory process and holistic approach. Rio's first foray into CPTs gives a sense of what can go wrong when a local government ignores public participation in planning for symbolic infrastructure. Contrasting these two cities reveals the extent to which citizen participation affects the implementation, acceptance, and impact of cable car systems in peripheral neighborhoods.

#### Appeal of cable cars for Latin American transit

CPT is justifiably considered a cost-effective method for addressing Latin American cities' particular challenges of hilly topography and density (*The Economist* 2017). The 20 largest cities in the region have steeply sloping terrain (Fay 2005). The areas with the steepest gradients are often also the cities' poorest sites and characterized by high levels of informal settlement. The topography, poor road conditions and dense clusters of buildings common in developing contexts rule out many mass transit options (Vasconcellos 2001). Aerial cable cars, in contrast, literally transcend these ground-level problems (Dale, Chu, and Imhauser 2013). They require little dedicated land beyond what is needed for the towers and stations, which keeps costs low and minimizes the displacement of local residents (*The Economist* 2017). Building a cable car system is fairly inexpensive, costing two-thirds less than rail systems (Brass 2014; Dale, Chu, and Imhauser 2013). They can also be constructed quickly: an entire system can be built in less than 18 months (*The Economist* 2017). Aerial cable car systems are particularly

useful for solving "last mile" problems—the challenge of linking commuters with mass transit systems currently in place (Brass 2014).

Safety and comfort are a perpetual concern in the developing cities, where informal, unregulated transport are popular options in underserviced areas (de Soto 1989) and traffic fatalities are high (Vasconcellos 2001). Here, too, cable car technology offers significant advantages over alternative forms of transport. Because of their dedicated "track" in the air, they pose no risk of collisions with other vehicles or pedestrians. Cable car manufacturers are also subject to strict regulations. Accordingly, the fatality rate for cable patrolled transit is extremely low: approximately one in every 900 million passengers—about 1/30<sup>th</sup> of the rate for other transit systems (Dale, Chu, and Imhauser 2013).<sup>1</sup> As continuous conveyors freed from competing with traffic and street-level disruptions, CPT are also highly reliable forms of transit. Even when wait times are long, travelers can see the cars steadily arriving, which alleviates the frustration that accompanies waiting for other modes of transit. Freeing passengers from fixed or uncertain timetables also improves trip flexibility (Heinrichs and Bernet 2014).

The comfort benefits of cable cars are particularly promising for women, who depend heavily on public transportation and exhibit distinct patterns of movement that have typically been ignored by urban planners (Burgess 2008). Women's trip patterns tend to be multipronged, reflecting their varied roles as workers, caretakers, and domestic proprietors (Burgess 2008; Heinrichs and Bernet 2014). They are also more vulnerable to sexual harassment, particularly in crowded trains or buses where groping can escape detection, and at night. CPT assuages many gender-based concerns. Cars uphold strict caps on capacity, limiting standing room and eliminating the sense of anonymity in a crowd that can facilitate harassment and assault

<sup>&</sup>lt;sup>1</sup> Still, an indeterminate proportion of the population suffers from a fear of heights that even the most encouraging CPT safety statistics would be unlikely to override.

(Heinrichs and Bernet 2014). Cars are also equipped with emergency buttons and passengers can switch cars at any station, each of which is constantly monitored by attendants (Dale, Chu, and Imhauser 2013).

Finally, cable cars are also one of the most environmentally friendly modes of transit available. Per passenger kilometer, they emit less carbon monoxide, carbon dioxide, volatile hydrocarbons and nitrogen oxides than buses, trams or light rail trains. They also produce zero point source emissions (Dale, Chu, and Imhauser 2013). These advantages go a long way in the ameliorating concerns about air pollution and its effect on human health—concerns that abound in developing contexts and Latin American cities in particular (Molina and Molina 2002). Cable cars also consume less energy and can leverage gravity as an energy source (Dale, Chu, and Imhauser 2013).

### **Limitations of CPT**

Cable cars are indeed a promising and cost-effective transit alternative for Latin American cities; however, they are not a panacea. First, cable car systems are not mass transit; their capacities are substantially lower than alternative modes of public transportation, and they cannot accommodate spikes in demand such as rush hours (Brass 2014). Their maximum speeds are also lower—around 20 km/hour, compared with 100 km/hour for buses—although they are nearly equal in terms of average speed (Dale, Chu, and Imhauser 2013). Accounting for walking to the station and waiting for a cable car during rush hour, traveling by cable car can take as long as a conventional bus (Heinrichs and Bernet 2014).

Cable cars have notable accessibility constraints. Perhaps the most limiting factor for the impoverished communities they are adopted to serve is cost. Tickets are often priced the same as for other forms of mass transit and provide free connections to existing transit systems, yet these

fares may remain out of reach for the very poor, particularly for non-essential trips (Heinrichs and Bernet 2014). CPT regulations prohibit passengers from carrying bulky loads, which limit their usefulness for certain professions and for shopping trips (Brand and Dávila 2011). Cable cars are also not accessible for the elderly and physically disabled because they do not fully stop for passengers.

Although cable cars have relatively small footprints on the ground, they are not without land-use controversies. Stations generate noise, which can disturb neighbors (Dale, Chu, and Imhauser 2013). Most troublingly, cable cars can provoke a loss of privacy for people living below their paths, as they offer elevated views of their dense residential areas. Of particular concern is the attractiveness of cable car trips for tourists, who are drawn to the sweeping city views and comfortable access they offer. CPTs servicing poor, peripheral neighborhoods run the risk of exacerbating poverty tourism by enabling "touristic safari[s]" in which visitors can gawk at impoverished conditions without setting foot in them. (Khoury 2014).

#### Symbolic infrastructure

Accepting that CPT offers concrete, though limited, advantages for improving mobility in Latin American cities, we should also consider non-material factors to assess whether they are worthwhile investments. A simple cost-benefit framework ignores one of CPT's most unique and promising traits: they are striking, highly visible infrastructure projects that conjure notions of connectivity and modernity. This symbolic quality represents their distinct potential to signal to historically poor and neglected neighborhoods that they are not forgotten; that they are valued parts of the city's social fabric (Dávila et al. 2013). This aim is rooted in a philosophy of humanistic urban design, advocated by visionary urbanists including Jan Gehl (2010) and Jaime Lerner (2016). Adherents believe that high quality architecture and a concern for livable public

space reinforces the dignity of a neighborhood's inhabitants and has ripple effects in improving social outcomes. In *Urban Acupuncture*, an ode to place-based urban revitalization, Lerner argues that improving a community's self-esteem can help mobilize citizen engagement—one half of a "co-responsibility equation" between communities and their governments (p. 70). Urban policies in this vein are sometimes classified under the umbrella of the "Barcelona model," defined by Peter Brand as "intermediate scale architectural and urban space interventions deployed with the intention of reconstructing the urban fabric and rearticulating a sense of place, local identity and spatial equality" (2011, p. 3).

Cable cars are charged with symbolic importance. They are visually salient, dramatic projects that transform a neighborhood's landscape while permitting "self-recognition" via panoramic aerial views from above (Brand 2011; Blanco and Kobayashi 2009; Dávila et al. 2013). In developing contexts, they assert state presence in areas that are highly informal and oftentimes effectively beyond the government's control. While they are sizable investments, they take up little land and are installed relatively quickly, in line with Lerner's advice to implement place-based interventions with "speed and precision" for maximal impact (p. 109). CPT also breaks down mobility barriers in both directions, not only improving access to opportunities in the city center, but inviting visitors to enter peripheral neighborhoods that were once considered no-go zones (Dávila et al. 2013). Cable cars present new possibilities for social integration and quite literally announce them from the hilltops.

#### Medellín: Social urbanism and Línea K

Medellín might seem an unlikely candidate to pioneer CPT adoption in Latin America. In the 1980s and 1990s, notorious drug lord Pablo Escobar's hometown was the epicenter of the drug trade and its concomitant violence. In 1991, Medellín had the highest murder rate in the world, at 380 per 100,000 people (Brodzinsky 2014). Its comunas were effectively ruled by warring drug traffickers and paramilitary groups—so much so that certain areas had virtually no state presence, aside from the repressive military strategies that failed to stem the violence (Echeverri and Orsini 2010). As a result, already precarious peripheral neighborhoods suffered from decades of crippling disinvestment and stigmatization.

The tide began to change in 2004 with the election of Sergio Fajardo, the son of an architect, as Mayor of Medellín. Fajardo's philosophy of "social urbanism," inspired by the Barcelona model (Brand 2011), aimed to craft architecture and city plans "in the service of the people," with a strong participatory component (Empresa de Desarrollo Urbano de Medellín, n.d.). The city's leadership made clear that improving the quality of life in its poorest neighborhoods was an institutional priority, and that investments in infrastructure would be a pillar of its approach. Mayor Fajardo announced: "Our most beautiful buildings must be in our poorest areas" (Scruggs 2014). Such messaging set the stage for the government's goal to "repay the city's historical debt" owed to the long-neglected comunas (Brand and Dávila 2011).

What did Medellín do well? CPT was only one component of a holistic community development program focusing on Comunas 1 and 2 in the city's northeast, which scored lowest on human development indices (Blanco and Kobayashi 2009). Mayor Fajardo's office launched the Metrocable to serve these neglected neighborhoods as part of the Proyecto Urbano Integral Nororiental (PUI), or the Northeast Integrated Urban Project. The PUI model consisted of three main prongs: institutional coordination, a social component, and a physical component (Blanco and Kobayashi 2009). While the Metrocable was the cornerstone of the physical component, other infrastructure plans included libraries, schools, recreation centers, pedestrian bridges and other high-quality public spaces (Echeverri and Orsini 2010). The PUI's social component was predicated upon genuine community participation and long-term capacity building (Blanco and Kobayashi 2009). Mayor Fajardo correctly recognized that mending social fissures and increasing trust in government required a different approach from the top-down policies that led to the divide. Toward this end, Medellín implemented participatory budgeting, granting the comunas the power to allocate at least 5% of their portions of the municipal budget as they saw fit (Dávila et al. 2013; Brand and Dávila 2011). The city convened *talleres de imaginarios*, imagination workshops, inviting the community to convene and set the agenda for how to upgrade its own public spaces (Blanco and Kobayashi 2009). The PUI Nororiental also employed locals in the construction process, resulting in the creation of 2,300 short-term jobs (Echeverri and Orsini 2010). Prior to launching the Metrocable, the city implemented in-depth training programs for residents in how to use it (Brand and Dávila 2011). The construction of Línea K was completed in a swift 14 months, and costs were kept low, at US\$24 million (Brand and Dávila 2011). Its quick construction was a clear demonstration of the government's competence and its commitment to high-quality projects in the comunas.

The Metrocable's improvements to transit outcomes are clear and measurable: in ideal conditions, the Metrocable shortened an hour-plus journey on foot from the highest station to the river valley to only 15 minutes (Brand and Dávila 2011). It also improved passenger comfort and safety, particularly for women, according to focus group interviews conducted by Heinrichs and Bernet (2014). The Metrocable is also well utilized: 43,000 passengers ride it on an average day, with demand approaching capacity during peak hours (Heinrichs and Bernet 2014). However, accessibility remains a barrier for many comuna residents. The fare is out of reach for the city's poorest. And when walking times and long rush hour wait times are factored in, conventional buses often were faster and more flexible options (Heinrichs and Bernet 2014). An analysis of

trip patterns reveals that a high proportion of users were likely workers traveling to work sites outside of the comunas, who are likely to be employed in the formal sector. Data suggests that only 10% of residents from the comunas rode the cable cars (Brand 2011). In all, material improvents to mobility were marginal, particularly for the worse-off residents.

Defining neighborhood successes is complex, and attributing causal effect to the Metrocable alone is beyond the scope of this paper; still, the PUI's impact was most impressive in the comunas serviced by Línea K. Brand (2011) found that average family income increased in the areas of interest from 2004-2009, although this was reflective of broader city trends. Cerda et al. (2011; n.d.) sought to isolate the exogenous effect of the new transit system on neighborhoods that were served by the line by comparing them with similar areas that were not. While homicide rates decreased overall, the drop was 66% larger in the serviced areas. Measures of collective efficacy also saw greater improvements, as did trust in the criminal justice system: the proportion of respondents willing to call the police to report something suspicious increased by 77% in the intervention group, but only 14% in the control group. While these studies highlight the Metrocable's contribution to decreasing crime and increasing a sense of pride and institutional trust, they do not disentangle CPT from other PUI projects. Furthermore, research is hampered by the difficulties of collecting data on informal sectors (Brand and Dávila 2011).

#### Rio de Janeiro: top-down planning and Teleférico do Alemão

Medellín's Metrocable was widely praised by urban planners and paved the way for cable cars' acceptance as a feasible mode of transit in other Latin American cities. Rio's hills are also peppered by poor, largely informal settlements (favelas), so the city was inspired to adopt the technology. In 2011, a cable car system (*teleférico*) was installed in the Complexo do Alemão favela in the north as part of the government's two-phase Growth Acceleration Program (PAC).

As elsewhere, the cable car succeeded in shortening travel times to the city—from over an hour on foot to just 16 minutes from the highest station to the base (Freitas 2013). Additionally, ticket prices were set up so that residents of Alemão were allowed one free round-trip ride per day—a feat even Medellín failed to achieve.

While mobility in Alemão improved for some as a result of the Teleférico, Brazilian authorities encountered resistance from the community during the decision-making process. Alemão residents had made clear in earlier stages of the process that their highest priority was improving basic sanitation; mobility concerns were ranked lower (Richardson 2017). In 2008 meetings with the Rio de Janeiro State Construction Company (EMOP), community leaders expressed their skepticism regarding the usefulness of a cable car system, claiming that the hill to reach the stations was too steep. They also voiced a preference for widening the main road over installing CPT (Freitas 2013). And yet, the government ignored the community's wishes and proceeded to install the Teleférico and postpone the sanitation upgrades. PAC funds financed the project, and at a high cost: the Teleférico do Alemão spent 133 million (2011 USD), compared with 26 million (2004 USD) for Medellín's Línea K (Dale, Chu, and Imhauser 2013).

While some residents surely benefitted from shorter travel times to the city center, the Teleférico was woefully underutilized: in 2014, it was used by only 12,000 passengers on an average day—that constitutes less than half of the 30,000 daily riders the government projected (Viva Favela 2014), and annually less than one-third of Medellín's ridership (Dale, Chu, and Imhauser 2013). Moreover, 60% of passengers were tourists (de Lima 2013). Actual usage statistics therefore stood in sharp contrast with the government's stated goals of improving mobility for favela residents. Ultimately, the cable cars stopped running only a month after the 2016 Summer Olympics, after the state stopped covering the operation costs. This affirmed

residents' predictions that the cable car system would become a "white elephant" after the Games. Closing the Teleférico might have left residents even worse off than before, as it erased any semblance of street life that had existed around the stations (Richardson 2017).

Teleférico do Alemão represents a cautionary tale for what can go wrong when local needs are disregarded when planning for infrastructure. The government's community input processes served merely to inform residents of where PAC funds would go (Freitas 2013). A local NGO argued before the Public Ministry that the process violated federal law 10.257, which requires "public participation in decisions regarding government interventions" (Freitas 2013). Using Sherry Arnstein's framework of a "ladder of citizen participation" (1996), this insincere form of community involvement can be seen as "informing" at best, and "manipulation" at worst. An unfortunate consequence of the Teleférico's top-down implementation was that it further entrenched distrust amongst the marginalized groups for whom the cable car could have been a symbolic bridge. Although no systematic analysis of resident attitudes seems to have been undertaken, local media suggested that cynicism took hold. Favela residents and community leaders accused Rio's government of diverting PAC funds toward impressing tourists ahead of the approaching Olympics, while papering over the genuinely dire needs of the community. The project also stoked concerns about privacy, as they invited tourists to gawk at poverty from above, while avoiding engaging with residents and supporting local businesses (Richardson 2017; Khoury 2014). If anything, the Teleférico might have deepened the stigmatization of the Alemão favela—or at least its perception as such. Sadly, Rio repeated its mistakes and continued to ignore community resistance by moving forward with CPT in two other favelas.

# Managing opportunities and risks

Cable cars' visibility and boldness is perhaps their strongest asset, but also their greatest risk. Whether they are perceived as Trojan horses or olive branches depends on the degree to which the community is engaged. CPT is not a one-size-fits-all solution to mobility problems in Latin American cities; I have made a case that they are only as good as the processes that produce them. Some might counter that confounding variables complicate a true comparison of Medellín and Rio, and that under no conditions would the deprived citizens of Alemão have welcomed a cable car system. It is true that a unique feature of Medellín is that its public utility company (EPM) is mandated to provide clean water, electricity and sanitation to all residents, even in the comunas (Kimmelman 2012), so it is conceivable that citizens' baseline needs were better met there than they were in Rio. Still, a visitor to Pablo Escobar's Medellín likely never would have imagined the Metrocable's implementation and positive reception. While further research should explore other predictors of support for urban cable cars in developing countries, including varying budgets, political climates, and accessibility concerns, Medellín's successful social integration is an encouraging point of departure.

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