Medellín's aerial cable-cars: social inclusion and reduced emissions[1]

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In 2004, Medellín, Colombia's second largest city, implemented the world's first modern urban aerial cable-car public transport system. As a relatively cheap, clean and highly visible response to urban transport problems, it has attracted widespread attention from city authorities throughout Latin America, Europe and Asia. The audacious application of proven ski-lift technology to densely populated and hilly low-income informal settlements was subsequently followed by major neighbourhood upgrading comprising new social housing, schools and other social infrastructure, as well as support to micro-enterprises. The combination of these two sets of interventions has helped upgrade and integrate into the city's fabric large areas marked for years by severe poverty and violence.

The addition of aerial cable-cars (known locally as *Metrocables*) to the public transport infrastructure in this city of three million inhabitants was an imaginative leap. The first system was built in the poor and inaccessible north-eastern *comunas* (districts). This area is marked by a difficult, steeply sloping terrain broken by deep smaller valleys carved by the numerous streams running down the hillside to the Medellín River. Developed through informal settlements and land invasions in the 1950s and 1960s, by the end of the 20th century it was the most densely urbanised part of the city, with over 400 dwellings per hectare.[2] Minimal road infrastructure made access difficult, although the area was relatively well served by conventional buses and limited numbers of taxis.

The first line was made possible through the combined technical foresight of the city's publicly owned Metro company and the political will of a newly elected mayor. It arose from the desire to promote social development in a deprived area, and increase passenger numbers for an underutilised overground mass-transit metro system.

There are currently three aerial cable-car lines in operation (with three more projected), two of which are urban public transport systems (Line K inaugurated in 2004 and Line J in 2008) and a third (Line L) introduced in 2010 to connect with Line K as a tourist route to a nature reserve on the edge of the city. Whilst the first line has been highly successful and runs at full capacity (approximately 30,000 passengers per day), the impact of the second cable-car line suggests that, to be economically and socially significant,

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[1] This case study draws on the first systematic independent appraisal of the pioneering experience of Medellín. For more information, see www.ucl.ac.uk/dpu/metrocables

[2] The municipality of Medellín, with an urban population of 2.2 million in 2005, comprises 16 *Comunas* (districts). It is the largest and richest of the nine municipalities that comprise the Medellín metropolitan area, with a combined urban population of 3.1 million in 2005.

cable-car systems require specific minimum conditions in terms of urban morphology and population density, as well as careful integration with the existing mass public transit network (Brand & Dávila n.d.).

Cable-car systems are relatively cheap and quick to construct, as little land needs to be publicly acquired and the technology is well-tested. Medellín's cable-car systems are a public sector project, financed jointly by the municipality and the Metro company. Low construction costs make public sector capital borrowing feasible; in Medellín's case all three lines were financed through capital investment budgets. The cost of the first line was close to US$24 million and the second US$47 million, with costs per kilometre comparing favourably with BRT and rail systems. However, due to technical limitations, aerial cable-cars are generally not considered to be mass-transit systems as they cannot transport significantly more than 3,000 passengers per hour (Brand & Dávila n.d.).

Under a new municipal administration, starting in 2004 the area around the first cable-car line became a prototype for social interventions in some of the poorest sectors of the city. This followed a policy of integrating the cable-car systems into the urban fabric through urban upgrading, in a strategy combining mobility, environment, housing and public space, and the goal of creating new dynamic centres in previously economically depressed areas. Municipal interventions across the city also involved increasing and upgrading the stock of social infrastructure such as schools and public libraries, including the construction of distinctive buildings designed by well-known national (and even international) architects. The Parque España Library is one such set of buildings, located close to the first cable car line, and has become a distinctive landmark for the city, in a neighbourhood where fear of violence would keep outside visitors from venturing in (McDermott, 2010). Another distinctive feature of the urban interventions is that The use of local manual labour was made a feature of all public work contracts, while the introduction of participatory budgeting allows local communities to collectively decide on the use of some 5% of the municipal budget allocated to these areas for investment.

Although the original drive for implementing the first aerial cable-car hinged on social and mobility considerations rather than environmental ones, potential environmental impacts were considered in the planning stages (Metro de Medellín 2004). Since 2003, the Metro company has sought to formally measure and evaluate the environmental contributions of this intervention through the use of internationally-accepted criteria. Under the aegis of the Clean Development Mechanism (CDM) framework, in 2003 the Metro company prepared a Project Design Document (PDD), which was examined by the CDM Executive Board in 2005 (CDM Executive Board 2009). The PDD proposed a baseline and a methodology to monitor the reduction in greenhouse gas emissions arising from the implementation of aerial cable-cars around the

world.[3] The proposed methodology was submitted to the UNFCCC in 2007 (Grütter 2007) and validated in 2009 (TÜV SÜD Industrie Service GmbH 2009).

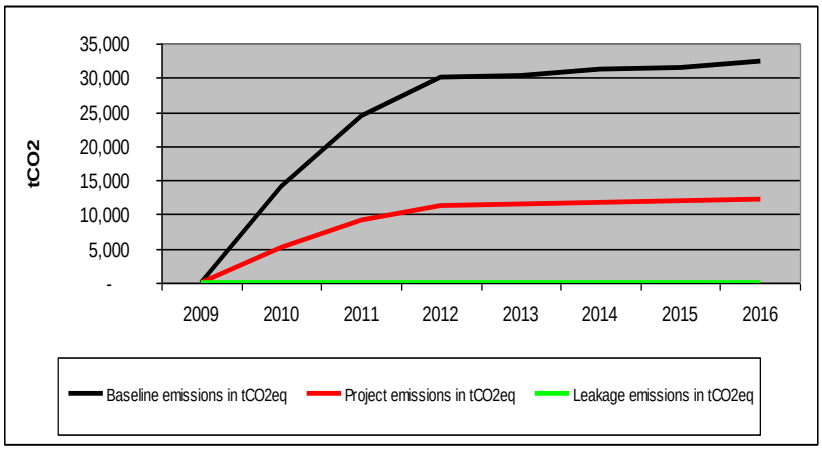
Baseline emissions were defined as those which would have resulted from the use of other modes of transport to cover the required origin and destination distances. In the case of Medellín, the modes available were minibuses, taxis and jeeps using fossil fuels such as gasoline and diesel (TÜV SÜD Industrie Service GmbH 2009). According to this baseline, the replacement of the fossil fuel operating vehicles by a system of hydroelectric-powered aerial cable-cars was projected to contribute to a reduction of up to 121,029 tCO_2 between 2010 and 2016 (CDM Executive Board 2009). The calculations contemplated the existing three lines and three additional lines projected to begin operations in 2011. Additionally, the CDM report states that volumes of trans-boundary air pollutants (mainly carbon monoxide and sulphur dioxide) drop as baseline modes of transport are replaced with a system relying on electricity, generated in Colombia predominantly through the use of renewable resources (CDM Executive Board 2009).

Figure 1: Medellín: Projected emission reductions from six aerial cable-cars

	2009	2010	2011	2012	2013	2014	2015	2016	total
Baseline emissions in tCO_{2eq}	-	14,005	24,434	30,103	30,382	31,189	31,458	32,311	193,881
Project emissions in tCO_{2eq}	-	5,135	9,083	11,208	11,450	11,724	11,980	12,274	72,853
Emissions reduction in tCO_{2eq}	-	8,870	15,350	18,895	18,932	19,465	19,478	20,038	121,029

Source: Grütter, J. (2009) Cable Cars Metro Medellin, Colombia: Clean Development Mechanism Project Design Document Form (CDM-SSC-PDD), Version 1.3. Unpublished document.

Figure 2: Comparative emissions: Baseline, project emissions and leakage



Source: Grütter, J. (2009) Cable Cars Metro Medellin, Colombia: Clean Development Mechanism Project Design Document Form (CDM-SSC-PDD), Version 1.3. Unpublished document.

[3] The PDD and the methodology for the PDD were prepared by Grütter Consulting.

Although measurement of the social and economic consequences of the Metrocables is fraught with difficulties, from an environmental and social perspective the impact of the aerial cable-cars can be said to be largely positive on balance. The system has helped to improve the quality of life of the urban poor by making it easier for them to access the opportunities of the city, by enhancing the visibility of the socially stigmatised areas in which they live, and by improving air quality. The first cable car and the associated urban upgrading interventions have given the area higher visibility to outsiders and a sense of social and political inclusion among local residents. This, coupled with substantially increased commercial activities particularly close to the stations, as well as greater police presence and a city-wide drop in violence resulting from changes in the nature of the illegal drug business (Hylton, 2007), have helped reduce levels of violence and crime in the neighbourhoods surrounding the aerial cable cars.

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