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# The South American Bus Rapid Transit Systems and the Renaissance of Tram and Light Rail in Europe

Los sistemas suramericanos de transporte rápido de bus y el renacimiento del tranvía y el tren ligero en Europa

**Hartmut H. Topp**

Kaiserslautern University of Technology, Germany. El profesor Hartmut H. Topp estuvo recientemente de visita en la Universidad de los Andes. Gracias a su visita se concretaron varios trabajos de cooperación mutua, entre ellos el que motiva el tema de este artículo.

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**Keywords:** tram, light rail, bus rapid transit, low floor, track sharing

**Palabras claves:** tranvía, tren ligero, transporte rápido de bus, piso bajo, vías de ferrocarril compartidas.

**ABSTRACT :** Bus Rapid Transit, like TransMilenio, and Light Rail Transit are different approaches in public transport of high demand. A comprehensive comparison, which is still missing, is being envisaged within a joint master thesis at the University of Los Andes and the Kaiserslautern University of Technology, Germany. This article focuses on the renaissance of tram and light rail systems in France and Germany. Significant innovations are low-floor trams, track sharing with railways, appealing design of the vehicles as well as the stops and the streetscape in general.

**RESUMEN :** Sistemas de transporte rápido de bus, como TransMilenio, y de tren ligero son enfoques diferentes para el transporte público de alta demanda. Una comparación integral, que no existe, se está realizando con una tesis conjunta entre la Universidad de Los Andes y la Universidad Tecnológica Kaiserslautern en Alemania. Este artículo es un enfoque al renacimiento de sistemas de tranvía y tren ligero en Francia y Alemania. Innovaciones significantes son: los tranvías de piso bajo, que comparten vías de ferrocarril y atractivos diseños de los vehículos, así como también diseños de las vías y los paraderos.



In public transport of high demand between metro systems and traditional bus lines South America and Europe are following different paths. The success story of the South American bus rapid transit systems (BRT) started 1974 in Curitiba, Brazil. Today, BRT systems are wide-spread in Brazil, and systems like Ecovia and Trolevia in Quito or TransMilenio in Bogotá represent a world renowned label of innovation in public transport. At the same time in Europe, especially in France and in Germany, tram and light rail systems are celebrating their renaissance since 1985, when the first re-introduction of a new tram system took place in Nantes, France.\*

Both kinds of public transport systems - the South American bus rapid transit systems and the European tram and light rail systems - have a similar range of application with a capacity between metro systems and traditional bus lines. Bus rapid transit, as well as, tram and light rail have strongly convinced supporters in the professional world and in politics. A comprehensive comparison between both kinds of systems, including the economical and social backgrounds, is still missing. Such a comparison could provide answers to some questions which arise from the different approaches in public transport in South America and in Europe: Under which conditions are bus rapid transit systems really cheaper than light rail systems? Are the success stories of Curitiba, Quito, Bogotá and other South American cities transferable to European cities or to other parts of the world? Could light rail be a solution in those streets of Bogotá which are too narrow for TransMilenio, like Carrera 7? Therefore, as a result of a discussion at the transport department at the University of Los Andes on the occasion of my visit to Bogotá in February 2005, a joint master thesis on

a fair comparison between bus rapid transit and light rail transit at our two universities was started.\*\*

With this background, this article is intended to provide information about some aspects of the renaissance of tram and light rail systems in Europe, especially in France and in Germany. Throughout history of trams, France and Germany have gone different ways: In Germany, similar to Austria, Belgium, the Netherlands, Poland, and Switzerland, some cities kept their old tram networks, continued to maintain and improve them, and finally, since about 15 years, expanded and upgraded them, in some cases considerably. In Germany, some 55 tram systems survived - half of them in Eastern Germany -, and 3 were newly introduced. In other countries, like in France, Great Britain, or Italy, tram networks were almost totally abandoned during the 1960s. Today, new tram systems in 10 French cities represent best practice examples.

Of course, today's tram and light rail systems are not the same as grandmother's trams some decades ago. A lot of development has taken place. A few milestones are: (1) in 1984, in Geneva, Switzerland, the first low-floor tram was introduced, followed, two years later, by the inauguration of the first low-floor system in Grenoble, France; (2) in 1992, the first light rail/tram services with a dual current system in the world shared railway tracks in Karlsruhe, Germany; and (3) in 1994, the introduction of the first tram line in Strasbourg, France, was part of an urban design offensive of the City (Figure 1). Since then, light rail and urban design are inseparably connected: "The tram gave us back our city!" This expression of Strasbourg citizens shows quite well what happened and is still happening, mostly in French cities, but also in Germany.

\* Worldwide the renaissance of tram and light rail systems started even earlier, and, surprisingly enough, in car-oriented North America in 1978 in Edmonton, Canada, followed by some 15 systems in the USA.

\*\* Professor Arturo Ardila Gómez is the supervisor on the Colombian side.

Is there a difference between tram and light rail? That is a simple question without a simple answer. If you take a textbook and look for definitions, you will find as many as you find textbooks. From a transport and town planner's view, the main issue for definition is the kind of right-of-way. With 'right-of-way' we label how certain space in the roadway is provided and dedicated for a tram. A traditional tram is sharing road space with car traffic on street sections and at intersections; its main characteristic is shared right-of-way. A modern tram has reserved or segregated right-of-way on street sections and priority at traffic lights; its main characteristic is the combination of different types of right-of-way. A light rail transit (LRT) system, finally, ranges from modern tram to mini-metro with exclusive right-of-way. Trams usually serve within the city, whereas light rail also serves within the city and is used to connect the surrounding region. Recently, this is achieved more often by track sharing with railways. Another point in defining tram and light rail is, of course, what the term 'light rail' directly suggests: the weight of the vehicles and, in a wider sense, the 'weight' of the system.

The length of a tram-train is another important issue, since that determines capacity. In Germany, it is allowed to run trams up to 75 meters in length on public streets; that means, a tram-train with one driver can carry up to 450 passengers or about three times more than an articulated bus. It also means that a tram driver is economically three times more efficient than a bus driver. Under European conditions a bus driver makes up to about 60 to 65 percent of the total operating costs including the vehicle in terms of depreciation and interest. Similar to bus rapid transit systems light rail covers the capacity gap between a metro and traditional bus lines.

What are the reasons behind the remarkable renaissance of tram and light rail systems in Europe, especially in France and in Germany? First of all, it is the changed perception of urban ambience: during the car-oriented 1960s and 1970s the tram was considered an obstacle for car traffic; it had to go underground or to be replaced by more flexible buses. Today, we aim at people-friendly, not car-oriented cities; we want to travel in a comfortable ambience, experience the city, and be a part of urban



fotografías tomadas por el autor

life. In the inner city the dominance of the car is no longer accepted: surface, taken over by the car, is given back to pedestrians, cyclists, buses, trams, and to service and delivery vehicles. Tram and light rail systems are also used to set limits to car traffic, and, even more important, to redesign urban streets to a human scale, for face lifting of the inner city, and as parts of redevelopment programs for inner city problem areas. A second important reason are the vast costs of underground public transport: as a rule of thumb, with the same amount of money for constructing one kilometer of underground metro, about 10 to 15 kilometers of onground light rail can be built. Finally, with today's sophisticated technology for traffic control it is much easier to deal with different modes of transport on the same level than it was 20 or 30 years ago.

Low-floor is one of the most important vehicle features (Figure 2) and very common in the meantime. Usually, low-floor with trams and light rail means that the floor of the vehicle is at 30 cm above the rail. In these cases barrier-free access for wheel-chair persons - step-free, gap-free - needs platforms of 26

to 28 cm height, which are easy to integrate into the streetscape. In Germany, equal access for handicapped people to public transport is mandatory by law since three years. Therefore, low-floor has become a prerequisite for access for all and more comfort for all - not alone for handicapped but also for parents with a stroller, and for senior citizens. Even more, it accelerates the system by shortening the dwell time at the stations and it enables design of less intrusive stations and thus more human scale and passenger-friendly alignment within the streets and pedestrian zones.

Track sharing between railways and trams is another innovation in public transport - worldwide known as the Karlsruhe Model. The biggest advantage for the passenger is the direct ride from the surrounding areas right into the city center without changing modes at the railway station. In Karlsruhe, the urban tram network was linked with the railway network by three connections, with the effect that all of a sudden the light rail network was more than ten times larger than it used to be. We have track sharing in very different forms depending on how the



railway track is used by railway trains; the easiest case (1) is to use an abandoned track. That means that a direct current electricity system with usually 750 volts has to be installed. If the tram uses meter gauge instead of the normal gauge of 1435 mm, gauge width has to be changed. Platform height and edge need adjustments, maybe combined with adjustments of the vehicles like retractable steps or ramps. When the railway track is still used by some freight train with diesel propulsion (2) the necessary adjustments are basically the same though they might be more restricted. In cases of meter gauge of the tram, for instance, a three rail track is needed. A third case being considered (3) is mixed operation of trams and passenger railway trains with diesel. Adjustments are similar like with freight trains, but additional problems with platform height and edge might arise. The most complex case realized so far, finally, is the Karlsruhe case (4), where we have mixed operation of dual current trams and electric passenger railway trains (Figure 3).

Trams and light rail systems in their different kinds are success stories in European cities. They are extremely flexible and they can be extended step by step. You travel on the surface, experience urban life, and you are part of it, while waiting at the stop or riding on the tram; that is why people like trams more than any other public transport mode. No other mode of public transport contributes as much to the ambience of the city as the tram does. In several cases it has proven to be a tool for urban regeneration and for triggering public and private investments.

What can we learn from two success stories in public transport: the South American bus rapid systems, like TransMilenio, and the European light rail systems? Could one system complement the other and create synergetic effects? The joint master thesis at the University of Los Andes and the Kaiserslautern University of Technology will answer some of these questions. I am looking forward to this interesting cooperation.

