Latin American Transportation Research Network: A Tool for Transforming and Upgrading the Quality of Life

Submission date: July 29, 2005
Submission with corrections: November 10th, 2005
Word Count: 7415

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ABSTRACT

This paper presents a Transportation Research Network deployed as a tool for the development of methodologies and guidelines tailored to the reality of Latin American metropolises, fostering integration among research groups on this continent with the final aim of improving mobility conditions and upgrading the quality of life of its inhabitants. The core purpose of this Network is the joint preparation of trip generation models for large-scale urban development projects, which cluster a variety of activities producing significant numbers of trips. The location and the detailed planning of these developments are attuned to social interests and environmental constraints having an impact on their production and attraction of trips. The analysis of the relation between urban form and activities and travel patterns in these Trip Generation Hubs (TGHs) is a specific goal of the Research Network. The limited number of cases that could be sampled explains the absolute need for sharing experiences amongst researchers. The first step in the deployment of the network has been a review of the literature on trip generation and on Latin American metropolises, identifying their problems and characteristics, focusing on the transportation sector and the Brazilian case. TGHs are consequently examined, together with their potential effects on transportation and, more generally, on socio-economic and environmental aspects. The paper shows the conceptual structure of this Network and how, through the establishment of a common pool of expertise, it is building up and promoting the knowledge needed to introduce the desired transformations in TGH planning in Latin America.

1 METROPOLITAN CONTEXTS AND TRANSPORTATION IN LATIN AMERICA

By nature, cities normally present multiple – and conflicting – demands for social infrastructure and services, such as transportation. Due to their inherent limitations and matters of a political and financial nature, these collective resources are unable to meet all these needs (*1*). This process involves a certain complexity that becomes even more intense as demands rise rapidly in a disorderly manner that is spatially concentrated, as typically occurs in the metropolises of Latin America (*2*).

After World War II, the cities of Latin America underwent rapid urbanization processes due partly to waves of rural immigrants attracted by the relatively higher development potential of these urban areas. During the forty years between 1950 and 1990, the urban population of these countries rose from 41.6% to 71.4% (*3*). In some cases, such as Brazil and Venezuela, urbanization was even more intensive: in the forty years between 1960 and 2000, the urban population of Brazil increased more than fourfold, up from 32,004,817 to 137,953,959 (*4*), while in Venezuela it almost quintupled, up from 4.7 million to 20.2 million (*5*). Although the annual demographic growth rates of Latin America have slowed, particularly during the last decade, they still hover around an average of 1.4% (*4*), far higher than in the more developed nations. As an example, the forecast population growth of the UK for the 25 years between 1996 and 2021 is 7% (*6*).

Fast and intensive, the urbanization of Latin America was also concentrated in spatial terms, focused on just a few cities: Mexico City is home to some 25% of the nation's population, while Buenos Aires corresponds to one third, and Brazil's eleven main State capitals account for 78% (*4, 7, 8*). In contrast, only 44% of the world's urban population lives in cities and towns with more 500,000 inhabitants (*9*), while 46% of the population in the UK lives in towns and cities with more than 250,000 inhabitants (*6*), reflecting more evenly spread land occupancy. This situation means that Latin America has two of the world's most populous cities – Mexico and São Paulo – with other mega-cities that are complex and difficult to administer.

This excessively high population concentration at some locations perhaps reflects inequalities of access to means of transportation and spatial opportunities found at the national and regional scales, but more visible today in the metropolis. Within this setting, the most powerful influential groups impose pressures on frail and flawed institutions in order to channel Government investments towards their own interests, strengthening social and spatial difference (*3*).

According to the Economic Commission for Latin America and the Caribbean (ECLAC), these regions are the world's least equitative (*10*). According to the World Bank (*11*), the richest 10% of the population absorbs 48% of the total income, while the poorest 10% receives only 1.6%. Using the Gini Index that measures inequalities in income distribution and consumption, researchers concluded that from the 1970s through to the 1990s, inequality in Latin America and the Caribbean averaged out at ten points higher than Asia; 17.5 points higher than in the thirty countries belonging to the Organization for Economic Cooperation and Development (OECD) and 20.4 points higher than in Eastern Europe (*11*).

Added to this is the fact that resources are in short supply, as its steadily ballooning foreign debt is the factor that has most impoverished and impaired the countries of Latin America for the past thirty years. In 1970, they owed US$ 16 billion; by 1980 this reached US$ 257 billion; soaring to US$ 750 billion in 2000. Calculations by ECLAC and the Latin America Economic System (LAES) (*12*) indicate that this last-mentioned amount is equivalent to 39% of the Gross Domestic Product (GDP) and 201% of exports from this region.

Within this context, marked shortages have worsened the exclusion of more than 200 million poor people (*11, 13*), resulting in metropolitan areas that are characterized by: inadequate and low-grade equipment and service networks; high urban violence levels with significant negative impact on the right to life of the population; market spatial segregation and housing shortages, particularly among poorer segments that often squat in outlying areas with no infrastructure or at more central sites with restricted access (slums) that develop into neighborhoods that are hard to control, with limited connections to transportation system. For example, Brazil has a housing shortfall of 6.5 million homes, according to data issued by the Metropolis Observatory (*14*), with population growth in informal settlements 2.66 times higher than the average growth of the Brazilian population, between 1991 and 2000.

The transportation infrastructure falls within this context of disorder, shortage and improper use of Government funds. The massive investments channeled to this sector have not been sufficient, and have not been deployed fairly (*15*), as shown by some typical conditions noted in the metropolises of Latin America:

- Over much of the territory, accessibility is poor and unevenly distributed, with radial configurations for transportation networks ensuring easier access to more central areas with higher values (*16*).
- Downtown hubs also cluster activities and jobs, contributing to the dependency of outlying districts whose residents must cover significant distances in order to reach their work-posts. In Latin America, some 30% of jobs are found in the CBDs, compared to around 9% in the USA (*17*). For example, the average commuting time between home and work is 84 minutes in Rio de Janeiro and São Paulo (*18*), and 90 minutes in Bogotá (*19*).
- Although long commutes and corridors attracting huge numbers of trips (caused by radial networks) offer good conditions for introducing high-capacity transportation technologies such as subways and railroads, systems are based on road modes, such as automobiles and buses. The annual number of *per capita* boardings for subways and railroads in Europe is 162.2, while in Latin America this reaches only 19.2, almost nine times less (*17*). In the mega cities of Latin America, more than 90% of motorized commutes are usually by bus and automobile, which require relatively more space per passenger carried (*3*).
- The public transportation system is not hierarchized and integrated, with many informal and even illegal options. The informal transit system consists of van pools: shared taxis or jitneys that operate on fixed or semi-fixed routes, picking up and dropping off passengers at any point along the way. Illegal van systems compete directly with formal bus and rail systems in cities.
- The rapid growth of motorization is another aggravating factor, perhaps reflecting strong desires to own and drive automobiles (*19*). The motorization rates in Brazil and Mexico rose by 2.7% and 2.8% a year respectively between 1990 and 1999, almost four times more than the rate in the USA, at 0.7% (*20*). This significant number of vehicles added each year to the vehicular traffic must drive on a low-grade road infrastructure (*3*), with insufficient capacity (*19*) that is not hierarchized. While the USA has 0.156 meters of freeway *per capita*, this parameter reaches only 0.003 in Latin America (*17*), meaning that the supply of high quality thoroughfares is fifty times less.
- A high proportion of walk trips does not indicate sustainable mobility, but instead are often a type of exclusion, taking place outside the expected standards. Moreover, the pedestrian infrastructure is normally flimsy and deficient, particularly in poorer districts. In Brazil, lower-income segments of the population make 60% of their commutes on foot (*21*), curtailing their range of access and mobility, which in itself is another type of exclusion.

Other authors have studied (in far more detail) the characteristics of cities in the developing countries, such as those of Latin America. Among them we mention Flórez (*22*), Kenworthy (*17*) and Vasconcellos (*3*), who confirm some of the above-mentioned conditions and add others, such as those listed below:

- Despite the importance of public transportation for commutes, and the predominance of buses in this sector, few cities have managed to implement measures that rate their transit as high priority, due to heavy pressures and lobbying by automobile owners (*3*). However, the *Transmilênio* project in Bogotá shows that it is possible to implement these measures (*23*), as also occurred in Curitiba, Southern Brazil.
- Due to its higher population density and smaller proportions of space assigned to roads and parking areas, the urban fabric offers a setting that is more restricted in terms of motorized trips.
- Major differences in vehicle performance due to different models in the fleet traveling along the roads, ranging from vehicles driven by human force through to sports cars, in parallel to several types of trucks. This heterogeneity is reflected in traffic levels of service and safety. Added to this is shaky driving discipline and a certain propensity to flout the rules of the road, despite some successful attempts – such as Brasilia – to ensure respect and priority for pedestrians and crossings.

As a result of these conditions, excessively large numbers of vehicles are usually clustered in corridors that lack the capacity to handle them, with conflicts and traffic accidents, congestion, wasted fuel, adverse effects on the environment and a poorer quality of life. Several research projects have analyzed the high costs associated with this development model. A study carried out by the São Paulo Mayor's Office (*18*) indicates that Brazil's Metropolitan Regions lose some US$ 30 billion each year due to traffic congestion. Also in Brazil, Borne (*24*) mentions that 55 million Brazilians, around one third of its population, lack access to public transportation services, as they are unable to pay the fares; 30,000 deaths, 350,000 injured, 120,000 physically handicapped each year, absorbing 30% of the funds allocated to the Government-run healthcare system, at a cost of US$ 2 billion a year, with 52% of hospital beds filled by injuries caused mainly by traffic accidents.

Even acknowledging the heterogeneity of the urban processes and contexts noted in Latin America, it is quite likely that these external factors and conditions are reproduced in many cities on this continent.

2 TRAFFIC GENERATION HUBS AND THEIR EXTERNAL IMPACTS

As already mentioned, outstanding among the conditions that are characteristic of Latin American Metropolises is disorderly land occupancy – reflecting the prevailing disorder and inequality – in addition to poorly integrated transportation facilities and their introduction or upgrading as a tool ushering in changes and development.

Flórez and Portugal (*16*) affirm that Latin American cities frequently lack urban development plans that are properly grounded at the technical, political and social levels, providing responses to community interests as a whole. The lack of laws and/or control mechanisms to ensure compliance with such plans – when they exist – is another frequent problem. On the other hand, the lack of an infrastructure and transportation plan closely linked to land uses, within a broad-ranging long-term context, hampers the proper use of the available resources, such as available road capacity, in addition to their use as tools for development and income redistribution. Institutional flaws and poor democratic representativity pave the way for breaches of urban regulations, resulting in steady increases in density and incompatible land uses.

According to Seguí and Petrus (*25*), transportation networks in the developing countries offer poor and unequal accessibility levels, curtailing territorial integration. In contrast, networks in the industrialized nations tend to be internally cohesive, specialized and hierarchized, offering fairer accessibility standards. Perhaps as a result of this uneven supply of accessibility, and shortages in many areas, the effects of shifts in accessibility deriving from interventions in the transportation and road structure are more visible in urban land use at the local and regional level – for instance, new developments, redevelopments, new activities - as suggested by Hall and Banister (*26)*, Gakenheimer (*19*), and Flórez (*22*).

Although the use of land use planning as a mobility management tool – Travel Demand Management (TDM) – has a history slanted more towards the higher-income nations, Gakenheimer (*19*) nevertheless affirms that there is much potential for its application in the developing countries. He adds that higher densities and mixed uses, the weight of walk and transit trips found in the Metropolises of Latin America are conditions that favor TMD, which could be implemented through land use control and planning, in parallel to rapid urbanization growth that helps guide this development while ushering in the desired changes, particularly in terms of better-articulated transportation infrastructures.

In this process of land use-transportation interaction, large-scale urban projects are particularly noteworthy, here called Trip Generation Hubs (TGHs), meaning places or facilities of many different types with the common characteristic of activities performed at a scale serving as a magnet for the population, producing significant numbers of trips and requiring huge areas for parking, truck bays, as well as bus stop, and consequently causing potential impacts. Shopping centers and malls, hypermarkets, hospitals, universities, sports stadiums, cargo terminals, public transportation stations and even protected through-traffic areas with multiple facilities producing trip are just a few types of TGH (*27*).

Consequently, these hubs cluster activities in space have effects on the accessibility and performance of road and transportation systems, while also fostering changes in land use and urban development. As a result of their potential for generating external impacts, it is vital that these TGHs be planned, located and sized in order to maximize their positive effects and minimize their negative impacts. These impacts and their respective approaches and models are related not only to local characteristics and the type and size of TGH, but also to the nature of the flows (passengers, freight and both) and the modes of transportation involved (single or multi-mode), which explains the complexity of this topic.

As TGHs may be used as a way of changing urban land uses, they could – if well planned – develop into important centers for urban activities, accessible to many different types of people. As land use in most Latin American cities is segregated largely on the basis of income, these TGHs could well become meeting points for different income groups, like the old *plazas,* where different types of people used to meet – and in some places still do. Moreover, rail and multimode stations could constitute effective springboards for urban revitalization and social integration projects in degraded areas, which are also usually poor.

In Latin America, the frequent absence of Transportation and Master Plans, or the failure to implement and respect them, as already mentioned, curtails the availability of a development benchmark for the entire metropolis, which establishes regions whose transportation infrastructure has sufficient capacity to meet the trip

demands generated by the TGHs and the types of TGHs that are compatible with the vocations and requirements of each site. Added to this is the absence of hierarchized road networks that could also serve as additional criteria for the location and selection of the most appropriate TGHs.

On the other hand, even with state and national laws stipulating the need to carry out Traffic Impact Studies for the implementation or expansion of TGHs, local regulations are frequently lacking. For example, this is the case in Brazil. Since the 1970s, its laws have been in effect and consolidated during the subsequent decades (*28*), requiring Environmental Impact Studies, with the municipalities in charge of detailing the technical and administrative proceedings required for the implementation of this important provision. The National Traffic Authority (*29*) notes that – although these resolutions do not specifically mention TGHs as they address enterprises with environmental impacts in general − they include provisions on these Hubs. Promulgated in 2001, another law called the City Act strives to democratize the use of urban space in Brazil by defining management tools through which Town Councils and Mayor's Offices can intervene in order to build up urban policies based on Master Plans (*30*). The City Act helps settle disputes among agents, while also defining municipal responsibilities, including Neighborhood Impact Studies (NIS).

However, this Act stipulates that a municipal law will define the private or public enterprises and activities in urban areas that will require the preparation of a Neighborhood Impact Studies (NISs) in order to obtain construction, expansion or operating licenses issued by the municipal authorities. These studies should present the positive and negative effects of the enterprise or activity in terms of the quality of life or the population living in the area and its surroundings.

Although some four years have passed since this Act was promulgated, few municipalities – such as São Paulo – have done their part in terms of the regulation and systematization for TGH licensing processes, and the methodology for preparing Traffic Impact Studies. Offering an idea of the resistance and constraints on complying with the law, although Brazil's 1998 Rules of the Road consolidated the jurisdiction for urban traffic administration at the municipal level, under the responsibility of the local Government, a lack of technical and financial incentives for structuring municipal administrations in order to take over these duties and responsibilities has resulted in the fact that less than 10% of Brazil's 5,562 municipalities have actually established their own traffic commissions (*24*).

Within this context, the Mayor normally hands down decisions on these enterprises, whose designs will be submitted to traffic and environmental impact assessments. This generally occurs when the community becomes mobilized and starts to impose pressures. These studies are normally drawn up by inadequate technical staff using the methodologies, parameters and trip generation rates recommended for the developed countries, particularly by the Institute of Transportation Engineers (ITE) (*31; 32*).

Even the natural criticisms that occur in the modeling in general and more specifically in terms of the rates proposed by the ITE, such as those by Shoup (*33*), become even more critical due to differences between cities in the USA and their counterparts in Latin America.

In addition to criticisms of methodological aspects of ITE trip generation rated as statistically significant and sample selections in suburban areas where automobile use is more prevalent, it is worthwhile mentioning the excessively large number of parking slots proposed by these rates for various types of land use, within the context of cities in the USA, encouraging the use of this type of individual transportation (*33*).

In parallel to the special conditions mentioned in section 1, compared to the USA, the cities of Latin America generally tend to present:

- Multimodal transportation system with a large variety of modes and a high proportion of non-motorized and public transportation trips, instead of automobiles;
- Informal transportation systems that are less foreseeable;
- Urban heterogeneity that is expressed by different modal splits or choices within the same metropolis. For instance, according to Portugal and Goldner (*27*), a shopping center in a central area with good public transportation facilities and located close to housing areas will attract no more than 30% of the automobile trips. When located in a more outlying area with less density and scarcer public transportation, a shopping center may attract more than 80% of its trips by automobile (*27*).

Quite logically, the ITE rates do not respond to the real context of the cities of Latin America, and their application may overemphasize and overestimate the need for automobile space. Offering an idea of the scope of this incompatibility, the ITE estimates are typically some 300 % higher than the average trends in forecasts drawn up through models developed in Brazil and Venezuela for shopping centers with Gross Leasable Areas (GLAs) of up to 75,000 m^2 (*34*).

Moreover, gaps in the information systems are noted in terms of the road infrastructure and transportation services (in terms of flows, levels of service, road records, bus lines and passengers) hampering road performance and capacity analyses. There are also constraints in some municipalities on the use of more sophisticated computer tools. Additionally, some enterprise administrators are unwilling to provide information on the demands for trips and parking slots, hampering the development of appropriate models.

Some Government-run institutions, particularly universities, have been carrying out research projects in this field, although their findings and proposals are underused and undervalued. These efforts normally take place on a stand-alone basis with no common objectives. A network would generate synergies and establish a foundation that would open up the range of potential changes in the transportation sector in Latin America, as shown in the subsequent items.

Within this context, the complexity of the cities of Latin America and their TGHs offer challenges that can be met only through more competent and elaborate control and planning processes, based on solid technical, political and social grounds.

3 BASES FOR CHANGE

Several studies have been carried out in order to revert the current situation found in Latin America and its cities, such as that by the World Bank (*11*). Revealing the damage to their development, these studies list a series of recommendations that reflect the three main bases for change: reforms should be implemented in the social and economic fields and their institutions; better access for the poor to vital goods and services, especially education and health; and the implementation of social inclusion and income transfer policies. The transportation infrastructure and its interaction with land use in general and more particularly with the TGHs are vital tools in this process of change (*8, 27*), even acknowledging the multiple factors involved (*35*).

The Universal Culture Forum held in Barcelona in 2004 based its transformation proposal on six principles related to diversity and sustainability; dialog; creativity; exchange; cooperation and solidarity among organizations and good practices (*35*). The principles of Brazil's National Sustainable Urban Mobility Policy converge on the democratic principles of liberty, equality and fraternity that underpin modern democracies, while at the same time responding to the three macro-objectives mentioned above: integrated urban development; environmental sustainability; and social inclusion (*30*). Other concepts are also involved, used in mobility management whose principles are related to information, awareness heightening, knowledge, integration, participation, transparency and partnership (*30, 37*). They are crucial, particularly in complex contexts with many inequalities where resources are in short supply.

Many of these values and attributes are closely linked to planning, knowledge and the institutional and legal frameworks.

By looking ahead to future problems and preventing their occurrence, planning also encourages the exercise of citizenship as it deals with collective projects and resources. In addition to an educational process that highlights the shortage of resources and their effort to settle conflicts, this also encourages respect for difference and an attitude of solidarity and sharing, as it explains the need for cooperative joint actions for dealing with large-scale problems that cannot be handled at the individual level. Moreover, when supported by solid technical and social backing, it can cluster political forces around it and strengthen feelings of trust among neighbors as they implement projects together.

The knowledge resulting from an educational process – that involves teaching and learning with an attitude of change and creative flair – ushers in not only the transformation of knowledge and awareness, but also the entire setting. This knowledge may be expressed in many different ways, such as scientific grounds, professional experiences and practices, information systems, grassroots campaigns and community participation, staff training and teaching. The level of individual autonomy is established by knowledge, as well as collective responsibility, striving for a better world through change (*38*).

Intervening at the level of policies that avoid overlapping duties and responsibilities and ensure that resources (human, financial, technological, etc.) are compatible with their missions, using appropriate methodologies (*39*), institutional and legal frameworks underpin actions that result from planning, drawn up and grounded on knowledge, in order to usher in the changes desired by the population.

Following these guidelines, the transportation sector is included as it consists of a collective infrastructure that absorbs vast amounts of Government funds with a huge ability to affect the quality of life, depending on its level of articulation and integration with land use and development projects, stressing the TGHs here due to their nature, and also their ability to generate externalities.

Along the same lines, these measures are related to the TGHs as follows:

- In terms of planning, drawing up Master Plans as effective processes that are closely attuned to the public interest and upgrading the quality of life. In Brazil, they are mandatory for municipalities with more than 20,000 inhabitants, and by October 2006, a further 2,000 of them will have to draw up their Plans. As they play a structuring role in the territorial arrangements and establish the land use guidelines, they should serve as the criteria for selecting the site and type of TGH that could be implemented and deployed to foster sustained development. They also serve as a reference for integrated transportation and infrastructure planning, hierarchized and with a configuration that ensures accessibility standards that comply with the development proposal and also define the types of roads on which the TGHs may be built.
- In terms of institutional backing, the entities in charge of the TGH licensing processes must be specified, together with their duties and responsibilities, whole also ensuring that they have the necessary structure, resources and staff trained to perform the activities needed to analyze applications to build or expand these projects submitted by the developers. These processes should have the necessary legal backing, objectively defining for each municipality the type and size of the urban equipment constituting a TGH. Additionally, the construction requirements -such as the minimum number of parking slots and the geometrical configuration of the access routes – should be stipulated for each type of TGH Project.
- In terms of knowledge, the competitive bidding process must necessarily be properly systematized and conceptualized on transparent bases, encouraging the qualified participation of the many different players involved, such as construction companies and developers, the administration and the community. A guidebook should be drawn up listing the stages, criteria and techniques to be used for the Impact Studies. Additionally, universities and other entities involved with the generation and dissemination of current knowledge should be supported, when compatible with the local context, in terms of developing trip generation rates, models, methods, procedures and analysis tools, in addition to information systems and courses.

4 THE RESEARCH NETWORK: ITS CONCEPT AND RELEVANCE

By fostering integration interaction among several research groups, the Research Network underscores the importance of collective efforts, strengthening respect for difference and building up partnerships and links among supplementary competencies and skills, through working towards common objectives. It explores the full potential for individual acquisition and generation of knowledge, with this information made available and distributed, striving to build up a common pool of expertise with freedom of creation (*37, 39, 40*). As a result, it gathers together core values that are crucial for establishing the transformation bases defined previously.

There are some very successful networks functioning in several different fields of knowledge and fulfilling their missions (*41*), including the transportation sector (*42)*. The same trend is noted in Latin America, which is moving steadily to the fore in a globalized world, encouraging the formation of blocs of countries (*7, 11, 36, 43, 44, 45, 46*)

In the case of transportation, some initiatives are known, such as the RECOPE-FINEP Network (*47*) and inter-institutional projects called networks financed by Brazil's Ministry of Science and Technology/National Research Council (CNPq) (*48*), but all limited to teaching and research institutions in Brazil. At the Latin American level, networks cover correlated fields of action, such as the Metropolis Observatory (*14*), but do not focus specifically on transportation, far less on TGHs.

In the field of land use and transportation interaction, where the transfer of technology and practices should not be direct, but rather requires adjustment and adaptation to local characteristics, consolidation is required for expertise that meets the specific needs of the Latin American countries, which, as already

mentioned, have many similar aspects. However, relatively little stress is placed on successful experiments in the Latin American countries, as well as their scientific output. Projects under way at universities in the USA and Europe are known, but very little (if anything) at universities in neighboring countries.

Nevertheless, the Latin American nations have built up a critical mass of knowledge in their universities, consulting firms, Government-run entities and enterprises that carry out research projects and analyze transportation, TGHs and correlated areas. This is reflected in the steady stream of congresses organized regularly in this region, many of which date back more than twenty years, such as the Latin American Congress on Public Transportation (CLATPU) and the Pan-American Congress on Transportation and Traffic Engineering (PANAM), in addition to other events organized by Brazil's National Transportation Research and Teaching Association (ANPET) and the National Public Transportation Association (ANTP), as well as the Society of Transportation Engineers in Chile. These scientific events in the transportation sector are estimated to attract a total of more than 3,000 attendees, with some 500 papers and posters published each year. Several research projects have been investigating TGHs, mainly in Universities and from the early 1980s onwards. Particular attention is being paid to models of motorized traffic generated by shopping centers, with a recent survey identifying eight trip generation models developed in Latin America *(34)*. More recently, research projects have been analyzing other TGHs (such as supermarkets, teaching establishments, cargo terminals and transportation stations, as well as residential and recreational facilities) and their dimensions (including truck trip forecast models and procedures for assessing environmental impacts and socio-economic development). This increase in output is expressed through dozens of theses, dissertations and books, in parallel to hundreds of scientific articles written in Latin America.

Although this clearly indicates a keen awareness of the importance of interaction among research groups, funding shortages curtail initiatives in this direction. Today's telecommunications technologies, which are progressing steadily, foster interaction, integration and access to knowledge among the many different research groups in Latin America, without losing sight of the international community, and remaining open to contacts with it.

Within this context, the **Ibero-American Trip Generation Hub Study Network** is being set up in order to integrate university research groups throughout Latin America, in addition to Portugal and Spain (with similar cultural identities) symbolizing the commitment to other continents. Above all, this is intended to systematize knowledge about TGHs and transportation, their interactions and their research context, while also proposing procedures, models and parameters for analyzing the impacts that they cause on road systems, tailored to the local reality.

Throughout this process, it is expected that books, scientific articles, reports, manuals and guidelines will be published, in addition to master's and doctoral dissertations; courses will be run for local governments and technical staff in general; technical and scientific events will be organized and attended; guidelines, models and trip generation rates will be developed; a database will be set up, together with an internet website or portal. This portal (**http://redpgv.coppe.ufrj.br**) is intended to serve as tool meeting the need for a permanent discussion forum where the knowledge generated by the network can be disseminated, while helping:

- Universities develop and upgrade their research projects;
- Town Councils and Mayor's Offices to become better prepared and accept their duties and responsibilities of planning and controlling the construction and expansion of TGHs;
- Ensure that technical experts and consultants have more up-to-date procedures and parameters that are better tailored to specific local characteristics, drawing up Master Plans on more solid bases, as well as the Environment and Neighborhood Impact Studies and Reports;
- Developers and construction companies to fulfill their mission more appropriately when selecting sites and implementing their TGH projects, as well as;
- Communities exercise their citizenship and defending their rights, demanding appropriate Neighborhood Impact Studies when required to preserve the quality of life in their neighborhoods.

It is expected that this database will be useful for fine-tuning the planning, sizing and location of TGHs, while also ushering in the desired transformations and upgrading the quality of life of the peoples of Latin America. It should also contribute to strengthening the democratic and pluralistic formation of the population by encouraging participation and protection of community interests in more effective ways, in the urban and transportation planning and management processes.

Established in 2005, this Network was approved by Brazil's Ministry of Science and Technology through the Brazilian Scientific Research Council (CNPq), with funding sufficient to underwrite the conceptualization of the Portal and arrange the first working meeting, which was held in Rio de Janeiro in April this same year.

By year-end 2005, this Network consisted of seventeen Universities in nine countries: Argentina (Universidad Nacional de Córdoba); Brazil (Universidade Federal do Rio de Janeiro, da Bahia, de Brasília, do Ceará, Santa Catarina, Instituto Militar de Engenharia and the Universidade de São Paulo); Colombia (Universidad del Valle); Ecuador (Escuela Politécnica Nacional), Spain (Universidad Politécnica de Cataluña); Peru (Universidad Nacional Mayor de San Marcos); Portugal (Universidade de Coimbra, do Minho and Técnica de Lisboa); Uruguay (Universidad de la República) and Venezuela (Universidad Simón Bolívar). The members of the task force and professionals registered with the Network so far include more than a hundred university lecturers, professors and researchers. Interaction among all these members of the Network will be ensured through the Portal, as well as at congresses organized by the transportation sector and other specialized events and meetings.

The preliminary version of the Portal was launched in June 2005, written in Portuguese as it is addressed mainly to the Ibero-American nations. However, a Spanish version is being prepared, with an English version planned over the medium term, ensuring universal access to the information released through this Network. It receives a monthly average of over 5,000 visits, and has topped 10,000 in a single month, demonstrating the importance of this tool for the community. However, maintaining this Portal and keeping it updated at professional levels requires more funding than is available. Consequently, it is crucial to publicize this Network, encouraging new partnerships and sponsorships that will spur its growth and ensure that all its targets are met.

5 CONCLUSIONS AND RECOMMENDATIONS

A broad-ranging review of the bibliography clearly indicates that the poor social conditions in Latin American cities must change. Some successful experiments on urban development show that substantial improvement is possible. What is needed is to invest in creating an environment that stresses the value of knowledge and community participation, through processes attuned to the public interest. In other words, this means good integrated planning and to ensure that the power, which is largely restricted to certain influential groups, is adequately divided - with the necessary technical, political, institutional and legal backing - and shared with the population, in the quest to make their dreams come true, and to produce the sense of ownership that is essential for the success of any social project.

Major urban development projects require important transportation infrastructure investments, both in highways and public transportation, that must be part of an integrated plan based on sustainable land use and incorporating socio-economic measures aiming at an appropriate distribution of the benefits of the project. The transportation system is the most powerful tool to address sustainable urban development, which fosters greater equity and a better quality of life. Thus, in-depth knowledge of the relationship between social and economic activities and the mobility they generate is essential to TGH planning. The Latin American context shows strong variations, but has some fundamental identity characteristics that should allow research synergies in the analysis of this relationship.

Networking appears as the best way to share experience gathered in a necessarily limited number of TGH case studies in Latin America and in specialized research. The Ibero-American Trip Generation Hub Study Network, building up a common pool of expertise but ensuring creative freedom and individual autonomy for the acquisition, generation and distribution of knowledge, should contribute to the acceleration of integrated planning processes for TGHs in Latin America. Its aim is producing methods and models that are more compatible with local context, moving towards sustainable development in environmental, social and economic terms. The high value added of this type of cooperation, which has been so successful in the US and in Europe, should lead Latin American governments and international organizations to endow it with the resources and support needed to fulfill its mission.

ACKNOWLEDGEMENTS

The authors thank the National Research Council (CNPq) for its productivity grant and its support for the development of the Ibero-American Trip Generation Hub Study Network.

Josefina Flórez wishes to thank the Simon Bolivar University for its financial support during her sabbatical year, in addition to the Institute of Transportation Studies and UC Transportation Center for its support during her time as a Visiting Scholar at the University of California at Berkeley, and more particularly Professor Martin Wachs and Professor Elizabeth Deakin.

REFERENCES

1. Prazeres, L.M. A interface social seus desafios para gestores de política ambiental nas cidad. Presented at *Encuentro Internacional de la Ciudad de México. Sobre Participación Social en la Gestión del Medio Ambiente Urbano*. México City,16 al 18 de noviembre de 1998, http://web.idrc.ca/es/ev-23745-201-1-DO_TOPIC.html. Accessed abril 15 2005.
2. Piccini, M. Sobre a comunicação nas grandes cidades. *Revista Opinião Pública*, Vol. 9, No. 2, Campinas. Outubro, 2003. pp. 01-19.
3. Vasconcellos, E. A. *Transporte Urbano nos Países em Desenvolvimento. Reflexões e Propostas*. 3ª Ed. Editoras Unidas Ltda. São Paulo-Brasil, 2000.
4. IBGE – Instituto Brasileiro de Geografia e Estatística. http://www.ibge.gov.br/censo/divulgacao_internet.shtm. Acessed July 7, 2005.
5. Negrón, M. *Ciudad y Modernidad. El Rol del Sistema de Ciudades en la Modernidad de Venezuela: 1936-2000*. Ediciones del Instituto de Urbanismo, Universidad Central de Venezuela, Caracas, 2001.
6. Our Towns and Cities: The Future. Full Report. White Paper, John Prescott, Deputy Prime Minister. England. 183 p. www.odpm.gov.uk. Accessed March 22 2005.
7. América Latina y el Caribe: proyecciones 2005. *Serie Estudios Estadísticos y Prospectivos*. No. 32. April 2005. Comisión Económica para América Latina y el Caribe. www.eclac.cl. Accessed June 30 2005.
8. Ministério das Cidades. Motivações que Regem o Novo Perfil de Deslocamento da População Urbana Brasileira. Pesquisa de Imagem e Opinião sobre os Transportes Urbanos no Brasil. Brasil, Agosto, 2003.
9. http://europa.eu.int/comm/europeaid/projects/urbal/infos/urb11pt.pdf. Accessed June 5, 2005.
10. Estudo das Nações Unidas sobre a Região. A América Latina e o Caribe Cumprirão Algumas Metas do Milênio Porém a Região está Atrasada na Luta Contra a Pobreza. Comisión Económica para América Latina e o Caribe. June 16 2005. www.pnud.org.br/arquivos/ODM_CEPAL_geral.doc. Acessed July 10 2005.
11. World Bank. *Inequality in Latin America and the Caribbean: Breaking with History?*. World Bank, Washington. 2003. http://www.bancomundial.org.br/index.php?action=/content/view_document&cod_object=1725. Accessed July 12 2005.
12. Sistema Económico Latino Americano (SELA). Sonja Welch, Etapa Ministerial de la XXIX Reunión del Consejo Latinoamericano. Caracas, 25 de noviembre de 2003. http://www.sela.org/public_html/AA2K3/ESP/disc/discurso18.htm. Accessed July 15 2005.
13. Boye, O. *Los acuerdos regionales para la deuda externa en América Latina y el Caribe*. Palestra do Secretário Permanente do SELA, na Cúpula sobre a Dívida Social, organizada pelo Parlamento Latinoamericano. Caracas, julho de 2001. http://lanic.utexas.edu/~sela/AA2K1/ESP/ponen/ponen20.htm. Acessed June 15 2005.
14. Observatório das Metrópoles. www.ippur.ufrj.br/observatorio. Accessed 12 June, 2005.
15. Habitat, Centro de las Naciones Unidas para Asentamientos Humanos. *Informe mundial sobre los asentamientos humanos*. Edit. Ministerio de Obras Públicas y Urbanismo, Madrid. 1987.
16. Flórez, J. and Portugal, L. S. Caracterización y Análisis de la Accesibilidad, Calidad Urbana y Condiciones Sociales del Vecindario en la Selección Residencial. El Caso Latinoamericano. Presented at VII Congreso Iberoamericano de Urbanismo, Pamplona. Spain, 1996.
17. Kenworthy, J. *Making urban transport more sustainable in developed and developing cities: some key perspectives and poliy implications from the millennium cities database for sustainable transport*. I Course Internacional de Transporte e Sustentabilidade. ANTP/Movimento,São Paulo, 2005. pp. 200-227.
18. Prefeitura do Município de São Paulo. *Os Custos do Deslocamento do Trabalho no Brasil*, tomou por base informações da Pesquisa Nacional por Amostra de Domicílios (PNAD) do IBGE – Instituto Brasileiro de Geografia e Estatística. São Paulo. Maio de 2004. 12 p. http://www.econ.fea.usp.br/nereus/eae503/os_custos_do_deslocamento_do_trabalho_no_brasil.pdf. Accessed June 12, 2005.
19. Gakenheimer, R. Urban Mobility in the Developing World. *Transportation Research* Part A 33, 1999, pp. 671 – 689.

20. Lopes, S.P. *Elaboração de Models Matemáticos para Análise, Avaliação e Previsão da Motorização no Brasil.* Tese de Doutorado, COPPE/UFRJ, Rio de Janeiro, 2005.
21. Gomide, A. de Á. Transporte Urbano, Pobreza e Inclusão Social. In Panorama Nacional da Pesquisa e Ensino em Transportes. Anais *do XVII ANPET. Congresso de Pesquisa e Ensino em Transporte,* Vol. 2, Rio de Janeiro, Brasil, 2003, pp. 1082-1093.
22. Flórez, J. *Accesibilidad, Calidad Urbana y Groups Socioeconómicos en el Patrón de Localización Residencial. El Caso de Caracas.* Tesis Doctoral Universidad Politécnica de Cataluña, Escuela de Ingenieros de Caminos, Canales y Puertos de Barcelona, Spain 1998.
23. http://www.bogota-dc.com/trans/transmil.htm. Accessed July 1, 2005.
24. Borne, L. N. Plano Diretor, Transporte e Mobilidade Urbana, V Conferência das Cidades. Dezembro. Brasília, 2003.
25. Seguí, J. Y . and J. Petrus. *Geografía de las Redes de Transporte*. Espacio y Sociedad, Ediciones Síntesis, Madrid. 1991.
26. Hall, P.Y. and D. Banister. Summary and Conclusions. Charter 20 In: *Transport and Urban Development*. E&FN Spon, 1995.
27. Portugal, L.S. and Goldner, L.G. *Estudo de Pólos Geradores de Viagens e de seus Impactos nos Sistemas Viários e de Transportes.* Editora Edgard Blücher, São Paulo, 2003.
28. Gusmão, A.C. Programa de Capacitação Ambiental - Controle de poluição ambiental. Curso do Instituto de Biologia da UFRJ. 2001
29. DENATRAN – Departamento Nacional de Trânsito – MJ. *Manual de Procedimentos para o Tratamento de Pólos Geradores de Tráfego*. Brasília, DF. Dezembro, 2001.
30. Guilarte, M. A. Gerenciamento da Mobilidade: Uma Contribuição Metodológica para a Definição de Uma Política Integrada dos Transportes no Brasil. Presented at: Universidade Federal do Rio de Janeiro. (Exame de Qualificação) PET/COPPE/UFRJ. Brasil, 2004.
31. ITE – Institute of Transportation Engineers. *Trip Generation*. 7th Edition. Washington D.C. 2003.
32. ITE – Institute of Transportation Engineers. *Parking Generation*. 3rd Edition. Washington D.C. 2004.
33. Shoup, D. Truth in Transportation Planning. *Journal of Transportation and Statistics.* Vol 6 (1). 2003. pp1 – 12.
34. Andrade, E.P. Análise de Métodos de Estimativa de Produção de Viagens em Pólos Geradores de Tráfego. M.Sc Tesis. COPPE/UFRJ, Rio de Janeiro, 2005.
35. Wong, C. The Relationship Between Quality of Life and Local Economic Development: An Empirical Study of Local Authority Areas in England. *Cities*, Vol. 18, No. 1, 2001, pp. 25–32.
36. UNESCO. *Políticas culturais para o desenvolvimento: uma base de dados para a cultura*. Brasília : Brasil, 2003. 236 p.
37. Baud, I., S. Grafakos, M. Hordijk and J. Post. Quality of Life and Alliances in Solid Waste Management – Contributions to Urban Sustainable Development . *Cities*. Vol. 18, Issue 1 , February 2001, Pages 3-12
38. http://www.egs.edu/resources/hannaharendt.html. Accessed July 12, 2005.
39. Chiavenato, I. *Introdução à Teoria Geral da Administração*. Ed. Compacta. Rio de Janeiro: Campus, 1999.
40. Lévy, P. A *Inteligência coletiva: por uma antropologia do ciberespaço*. 3ª edição. São Paulo: Loyola. 2000. 212 p.
41. Castells, M. *La société em reseaux.* Fayard, Paris, 1998.
42. www.eu-portal.net. Accessed Octubre 15, 2005.
43. http://www.persocom.com.br/ulac - ULAC - Universidade Latino-Americana e do Caribe. Accessed June 2, 2005.
44. http://www.ufsm.br/mila - MILA - Mestrado em Integração Latino-Americana. Accessed June 23 2005.
45. http://www.iesalc.unesco.org.ve – IESALC - Instituto Internacional para o Ensino Superior para América Latina e no Caribe. Accessed July 2 2005.
46. www.oas.org - OEA - Organização dos Estados Americanos. Accessed June 25, 2005.
47. Nassi, C.; Brasileiro, A. ; Kawamoto, E. ; Lindau, L.A. Transportes: experiências em rede. Rio de Janeiro: Finep, 2001. 300 p.
48. http://metro.det.ufc.br/redetrafego. Accessed June 1, 2005.