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Cities, Rivers and Urban network in the Brazilian Amazon

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ABSTRACT

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One important axis of analysis has been missing in the studies on the urbanization of the Brazilian Amazon: the western section. In order to understand the urbanization process in this area a methodology was established and

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the urban network along the river Solimões-Amazonas analyzed. This methodology is based on the analysis of institutional frameworks such as demographic data, education, health, food prices, housing prices, public finance and security, products extracted from the forest and other relevant data. A city typology, that takes into consideration the relationship inter and intra-city, was created permitting new approaches to the understanding of the urban processes in the area. This paper will present the methodology of the research; the results obtained from field work; the typology proposed and discusses how the analysis of the urban network is necessary for establishing a socio-ecological sustainable and effective territorial management in the region.

KEY-WORDS:

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RESUMO: CIDADES, RIOS E REDE URBANA NA AMAZÔNIA BRASILEIRA. Um importante eixo de análise está ausente nos estudos da urbanização na Amazônia Brasileira: a região ocidental. A fim de entender o processo de urbanização nesta região uma metodologia foi estabelecida, e a rede urbana ao longo do rio Solimões-Amazonas foi analisada. Esta metodologia é baseada na análise de arranjos institucionais, tais como dados demográficos, educação, saúde, preço de alimentos e da construção civil, finança e segurança pública, produtos extraídos da floresta e outros dados relevantes. Uma tipologia de cidades, que levou em consideração a relação entre e intra-cidade, foi criada permitindo novas abordagens para o entendimento do processo de urbanização na região. Este artigo apresenta a metodologia da pesquisa; os resultados obtidos do trabalho de campo; a tipologia proposta e a discussão de como a análise da rede urbana é necessária para estabelecer uma gestão territorial efetiva e sócio-ecológica sustentável na região.

PALABRAS-CLAVES

Red urbana
Tipología de ciudad
Río "Solimões-Amazonas"
Amazonas
Brasil

RESÚMEN. CIUDADES, RÍOS Y RED URBANA EN LA AMAZONIA BRASILEÑA. Un punto importante del análisis está ausente en los estudios de la urbanización en la Amazonia Brasileña: la región occidental. A fin de comprender el proceso de urbanización en esta región se estableció una metodología, y se analizó la red urbana a lo largo del río "Solimões-Amazonas". Esta metodología se basa en el análisis de arreglos institucionales, como los datos demográficos, la educación, la salud, el precio de alimentos y de la construcción civil, la finanza y la seguridad pública, los productos extraídos de la floresta y otros datos relevantes. Una tipología de ciudades, que llevó en cuenta la relación entre la intraciudad, fue creada

permitiendo nuevos enfoques para la comprensión del proceso de urbanización en la región. En este artículo se presenta la metodología de la investigación; los resultados obtenidos del trabajo de campo; la tipología propuesta y la discusión de cómo el análisis de la red urbana es necesaria para establecer una gestión territorial efectiva y socio-ecológica sostenible en la región.

Introduction

There has been a long tradition in the study of cities and urbanization in the Brazilian Amazon (CORREIA, 1987; GODFREY, 1988; BECKER, 1990; among others). Most of them are centered on three distinct axis. Historically the urbanization in the Amazon has been dealt with on a regional scale. The studies done by the Brazilian Statistical and Geographical Institute, IBGE (FAISSOL, 1971; AMAZONAS-SEPLAN, 1976; AMAZONAS-SEPLAN, 1990; CARNEIRO, 1998; IPEA et al, 1999; IBGE, 2007) and furthermore the classic studies of Becker (1982) that in the 1980's recognized the Amazon as an "urbanized forest" are good examples of how the regional scale determined the understanding of the urbanization process and dynamics in the Amazon basin.

Manaus and Belém, the two historically central towns in the Amazon have also been subject to an interesting matrix of historical-geographical analysis. Both of them constitute metropolitan regions in the Amazon and have similar historical background that remotes to the exploitation of indigenous labour in search for "drogas do sertão" (plants and other elements from the forest) to be exported to Portugal (LEONARDI, 1999). The history of latex production and its influences on the regional networks and in the urban structures in Belém and Manaus remain present in the urban tissue and have been themes of diverse fiction books (HATOUM, 2000; HATOUM, 2002), films (Herzog's Fitzcarraldo or Iracema: uma transa-amazônica, for example) and academic studies (TRINDADE JÚNIOR, 1997; TRINDADE JÚNIOR, 2005; TRINDADE JÚNIOR, 2006; TRINDADE JÚNIOR, 2007A; TRINDADE JÚNIOR, 2007B; CASTRO, 1999; MESQUITA 2000; OLIVEIRA 2000; OLIVEIRA; SCHOR, 2009; OLIVEIRA; SCHOR, 2011). The third axe, much more recent in the history of the Amazon basin, describes the urbanization occurring in the agricultural frontier in the Pará state, interpreting the urbanization of boomtowns related to the construction of roads, agricultural processes and/or mining activities (MORAN, 1981; SCHMINK, 1988; MITSCHIN et al, 1989; BROWDER; GODFREY, 1990; ROBERTS, 1992; BATISTELLA, 2001; CASTRO, 2008). These three axes (regional scale, geohistory and agro-pastoril-mineral frontier) define much of what has been described and understood as urbanization in the Amazon.

The urbanization processes that has happened and is happening in the core of the Amazon forest, specifically the western part of the Brazilian Amazon, has been missing in the Amazonian studies. The western part of the Amazon forest, mostly in the Amazonas state, is home to a complex socio-biological diversity having within its territory the last non-contacted tribal groups and areas of unknown forest. In this area most of the cities connect themselves only by boat and the river

system still commands, as so brilliantly described by Tocantins (1952) in his classical book "O rio comanda a vida" (The river commands the life), the socio-cultural sphere. Some of the cities inside this vast territory are as old as Manaus, which became a Villa in 1755, (Tefé in 1759, for example) or even older (Barcelos in 1728, the first capital of the state). Other cities and human agglomerates have such a large indigenous population that the main language spoken is still Nheengatu, the general language, *lingua brasilica*, created by the Jesuits in the early 17th century and banned by the Portuguese crown in 1758. São Gabriel da Cachoeira is the only Brazilian city and municipality that has four official languages (Portuguese, Baniwa, Tukano and Nheengatu, Municipal Law 145/2002).

This paper will present and discuss results obtained through an extensive field work that started in 2006 by the Center for City Studies in the Brazilian Amazon (Núcleo de Estudos e Pesquisas das Cidades na Amazônia Brasileira-NEPECAB) at the Federal University of Amazonas that aimed at understanding the urban network along the rivers Solimões and Amazonas in the Amazonas state (SCHOR et al, 2007a; SCHOR et al, 2007b; SCHOR, 2008; OLIVEIRA; SCHOR, 2010; OLIVEIRA; SCHOR, 2011). In order to do so, a unique methodology of urban studies was developed and will be presented throughout the paper emphasizing previously undiscussed results emerged in terms of city classification and typification which changes the understanding of the urbanization process in the western area of the Brazilian Amazon and contributes to the debate on the contemporary urbanization of the Amazon forest.

Demographic criteria and city classification in the Amazon

City classification is an important tool not only for regional and territorial management, but also in order to understand urban networks. Traditionally the classification is done based mainly on demographic criteria, especially total population and/or employment ratio/index (BERRY, 1972). This type of criteria is problematic particularly in regions with a low-density population ratio and where the total population is significantly smaller than in the rest of the country, and in areas where formal employment is mainly white-collar federal employees. This is the case for the Brazilian Amazon. In these regions criteria used for city classification generated for the country as a whole are unable to characterize the differences in-between cities. This is also the case for the Brazilian cities located in the Amazon basin, in particular the western part of the basin.

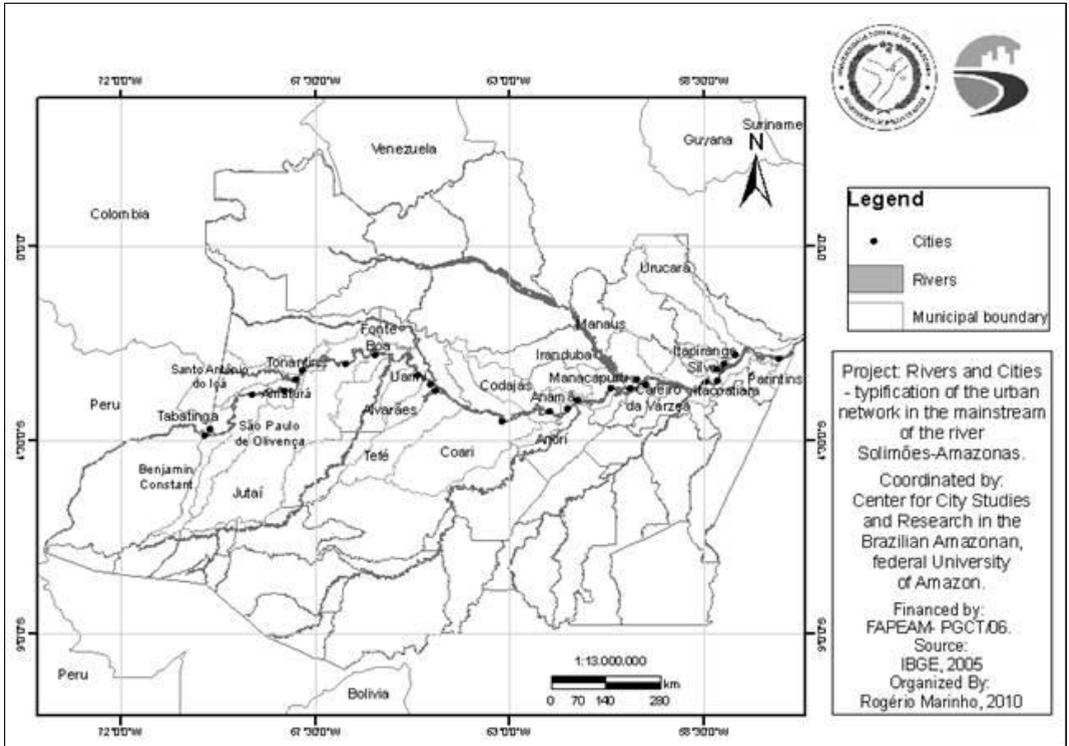


Figure 1: Location of the cities along the rivers Solimões and Amazonas, Brazil

In order to think through new and more effective forms (socially just and ecologically sustainable) of territorial management it is necessary to not only understand the complexity of the region but also consider the urban networks that characterize the inter-regional relationships. In the Amazon region approximately 70% of the population lives in cities (BECKER, 2004; IBGE, 2007), specifically in the western section of the Brazilian Amazon approximately 50% of the population lives in the municipal headquarters, that due to the Brazilian law, are classified automatically as cities. These cities are separated from each other by large forest areas and linked, especially in the Amazon state, mainly by boat. To capture the urban network in the Amazon basin is one of the strategic points for territorial management and inclusive policies, particularly when considering the social-ecological sustainability of the Amazon forest.

In 2000 the Brazilian Institute of Geography and Statistics (IBGE) changed the definition of the city classification. Until this date cities classified as medium sized where those considered having an urban population between 50.000 and 250.000 inhabitants. In 2000, that number was elevated for cities with population between 100.000 and 500.000 inhabitants. This change, based exclusively on demographic criteria, transformed the typology of the cities located in the Amazon state. Until then five cities, all of them located along the river Solimões and Amazonas, where classified as medium and one as big (which is

Manaus, the capital, with a estimated population of 1,738,641 inhabitants in 2009; IBGE, 2009). After this change the cities in the Amazon state, with exception of Manaus, were classified as small. This classification produces an urban typology based essentially on demographic criteria which is not useful to understand the urban reality and differences in the Amazon.

The analysis of the city classification schemes based primarily on total population reaffirms the need to associate the demographic criterion for the construction of city typology with other criteria such as those of historical, economical and social order including their functionality. This is necessary to mitigate erroneous and/or mistaken analysis on the real role played by some cities of the Amazon, especially those located on the mainstream of the rivers Solimões and Amazon.

Institutional arrangements in order to grasp city-diversity in the Amazon

In order to understand and characterize the urban network and construct a city typology which can be helpful for comprehending the distinct reality in the Amazon Basin, and thus elaborate more adequate subsidies for public policy for territorial management, the Center for City Studies in the Brazilian Amazon of the Federal University of the Amazon, proposes a differentiated methodology for the classification of urban typology and network. This methodology includes not only the demographical aspects but also the analysis of some important institutional frameworks that helps characterize the cities in *si* and *per si*. The methodology is essentially multi-scalar, permitting the comprehension of the diverse scales and their interaction in the urban space of the Amazon.

The institutional frameworks defined for the research are summarized below (Box 1):

Box 1: Institutional Framework

Institutional Framework	Collected data
Populational dynamics	Population size, recent population growth, population size with relation to housing condition, origin of non-native population, age-sex pyramid
Historical variables	Origin of the city; historical maps; chronology; description of the structure of power; historical families; comparative iconography (current pictures with images of the past)
Intra and inter city relationship variables	Trade and transport fluxes.
Services and commerce	Telephone system, cellular, public phones; radio (AM, FM, free); antennas of telecommunications; internet providers. Commercialization of foods (supermarkets, local markets, fairs, municipal markets). Commercialization of inputs for the civil construction (businesses, commercial boats, river markets - <i>flutuantes</i>).
Locational tendency of	Manufacture and local industries; agricultural

economic activity	systems; mineral extraction; fishing industry.
Governmental Budget Income	Municipal tax related to urban housing and services (IPTU, ICMS); municipal revenue earned from the state and federal government; royalties.
Food Basket	Based on the Brazilian national food basket index a regional food basket indicator was created and data (i.e. price) collected for all the cities during the dry and wet season.
Index for civil construction inputs	A group of inputs were chosen to characterize an index for civil construction (wood, sand, pebble, roofs, and bricks) with collection of prices in the cities.
Non-timber products extracted from the forest	Organization form (association/union); production; commercialization and price of non wooden forest products.
Social movements, NGOs and religious practices	Unions; associations; NGOs; religious institutions.
Urban infrastructure	Data of health (beds, types of hospitals, health centers, centers for malaria diagnosis, doctors and dentists, destiny of residues of health services); education (Types of schools; number of teachers, school libraries); public security (number and type of police stations, forums, registry offices, juridical attendance, courts, most frequent occurrences); hostelry, mortuaries, armed forces; financial system (bank agencies, lottery, postal bank, cooperative bank, financial, insurance companies); system of supply of water and energy; basic sanitation, ports.
Transport fluxes	Intercity transport system (load and passengers, routes, frequencies, price) and urban transport (types, amount and organization form).

These institutional frameworks were analyzed and data collected for the following 24 cities along the river Solimões and Amazonas as shown in Figures 1. It is important to notice that these cities are located on the mainstream, defined as the principal channel of navigation, of the rivers Solimões and Amazonas. These cities are linked mainly by boat and in some cases by aircrafts, only between Manaus and Itacoatiara there is a paved road. There is no road or railway system linking these cities to the rest of the country. This isolation is also reflected in the communication system, there is no connection of optical cables between these cities and no connection between Manaus and the rest of the country. Communication, telephone and Internet, is via satellite. The urban network is strongly influenced by the seasonality of the river (water level oscillating 12- 15 meters during the year) which is responsible not only for the main transport system but also for agricultural activities which happen during the low water season.

It is also important to notice that Manaus was removed from the analysis of the urban network. This is due to the fact that Manaus concentrates most of the economic activities and population in the region and when the data for the institutional frameworks are put together Manaus shades the other cities. So, in

order to make the invisible visible it was necessary to exclude Manaus while constructing the urban network along the Solimões-Amazonas River. This does not mean that Manaus disappeared, on the contrary, as the results will show Manaus has a very strong influence in how the urban network is established.

Each variable described in Table 1 was collected for all of the cities between 2006 and 2008. Some data was only collected once and checked its veracity during other fieldworks while other data, specifically those that vary with the water level such as local food production, was systematically collected twice during the year for at least one year and in some cities for more than a year.

All data collected was georeferenced and was organized in a Geographical Information System. A basic cartographic plate was developed on which all variables were drawn constructing a set of more than 150 thematic maps, essential for the analysis of the collected data. It is also important to note that we constructed a basic cartographic reference in order to maximize the use of our data to serve the needs of local schools and other institutions and individuals. The region in which the research was done lacks basic cartographic material, which is an important tool for school and municipalities, so the thematic maps developed have become important resources for local institutions.

Spatializing the institutional framework

By updating the concepts of cities network and urban system we are able to read the urban phenomenon as a totality in movement. A classification based only in demographic criteria and/or employment ratios is unable to evaluate the changes in the urban reality given the impacts of the restructuring of the economy, of the privatization of the public services, the political-administrative decentralization and the new social division labor as well as the diverse conservation politics that redefines territories in the Amazon. In this sense to put two distinct cities such as Manacapuru and Anori in the same classification is to neglect important differences. Manacapuru is an important intermediate city between the Solimões networks and Manaus, while Anori is a small city which lacks most of urban infrastructure.

In order to view the city as a totality, independent of its size and location, efforts were made to combine traditional demographic criteria with an understanding of the disposal of services and infrastructure that is evident in differences among the cities along the river Solimões-Amazon. The institutional frameworks permitted a closer look at the differences between the cities by adjusting the scale of analysis in order to understand how the different networks functions and how these cities relate intra-network, regionally, nationally and internationally.

The results will not address each variable independently but will look for a city classification that best represents the urban network in the western section of the Brazilian Amazon.

Methodologically, the analysis starts with the criterion of population dynamics. We identified the recent demographic changes in the cities not only in terms of population size, but also to evaluate the percentage of urban population and to understand which cities exercise migrant attraction and the migrant's origin. The

analysis of population dynamics is essential for the understanding of the fluxes (transportation for example) and infrastructure in the cities.

For the population data, in 2000 it was noticed that 3 (three) of the 5 (five) most populous cities in the Amazon state were located along the mainstream of the river Solimões and 2 (two) of the Amazon river, being Parintins the one that possessed the highest population rate after Manaus with 92,118 inhabitants, followed by Manacapuru (73,695 inhabitants), Itacoatiara (72,015 inhabitants), Coari (67,096 inhabitants) and Tefé (64,457 inhabitants). The least populous ones, in this period, were the cities of Anamá, Amaturá, Itapiranga and Silves, all with less than 10,000 inhabitants, also located along the mainstream of these two rivers.

In the 2010 IBGE's census the 5 (five) most populous cities continued to be the ones that registered larger values in 2000 (Parintins 102,033; Itacoatiara 86,839; Manacapuru 85,141; Coari 75,965 and Tefe 61,453), however the ones that presented larger relative growth in the period were Urucurituba and São Paulo de Olivença, while the ones that presented larger population decrease were Fonte Boa and Jutaí, which became one of the 5 (five) less populous in the state.

There has been a significant debate in the Amazon state related to the adequacy of IBGE's counting methods and political implications that these results imply. Large percentage of increase or decrease causes substantial growth or decline in federal aids, which gives the population count in this region a strong political character. When IBGE released the population count results in 2008 and then in 2010, there were intense debates and political fights over the numbers. We participated in some of these public debates and recognized that many mayors feared a drastic decrease in their federal revenues due to diminishing population totals and argued that the region was badly counted due to lack of infrastructure of IBGE to reach distant villages. Many mayors did in fact have a point, for the study of the region has shown that some villages are more than two days small boat trip from the city and IBGE did not have infrastructure nor personnel to actually arrive at these distant localities. During an interview with IBGE in Tefé we were shown the area they were supposed to cover which included the city of Tefé, Alvaraes, Uarini, Maraã and Japurá in an area of approximately 9,000 square kilometers. Even considering these debates the data obtained by IBGE gives an interesting and reliable picture of the population dynamics in the region.

The largest municipalities are also those that have the oldest cities, built between 1750 and 1900, and have a strategic role in the historical process of occupation of the territory including strong influence from the Catholic Church and military bases.

Considering the parameter of total population in urban area only 13 of the 25 cities analyzed have urban population above 50%. Regional statistics for the Amazon region considers that 70% of the population lives in cities, in the Amazonas state the figures are lower and there exists high variation (from 99% of urban dwellers in Manaus to 4.67% in Careiro da Varzea, which is the closest city to Manaus and is a supplier of vegetables to the metropolis).

The fact that most of the municipalities have a population around 50% that considers themselves as urban dwellers leads us to the discussion of what is urbanity in the Amazon, how this urbanity is distinct from urban life in the cities

in other regions of the country and the world, and how this urbanity may be thought of as an important and necessary for the socio-ecological sustainability of the forest and rivers. In order to approach these questions and understand the changes that are happening in the Amazon it is necessary to construct an analysis that can take into account the diverse institutional frameworks in the perspective to understand the functionalities and capabilities of interconnection that these cities establish between themselves and with other cities outside of this region.

In order to relate the demographic dynamics with other aspects of urbanization, the institutional framework data were collected for all the variables and systematized in an integrated digital bank. This data was spatialized and the results were transformed into analytical maps. These maps were fundamental for the elaboration of the proposed city classification which leads to a new city typology and urban network analysis. Before this typology is presented some of the important maps are shown below:

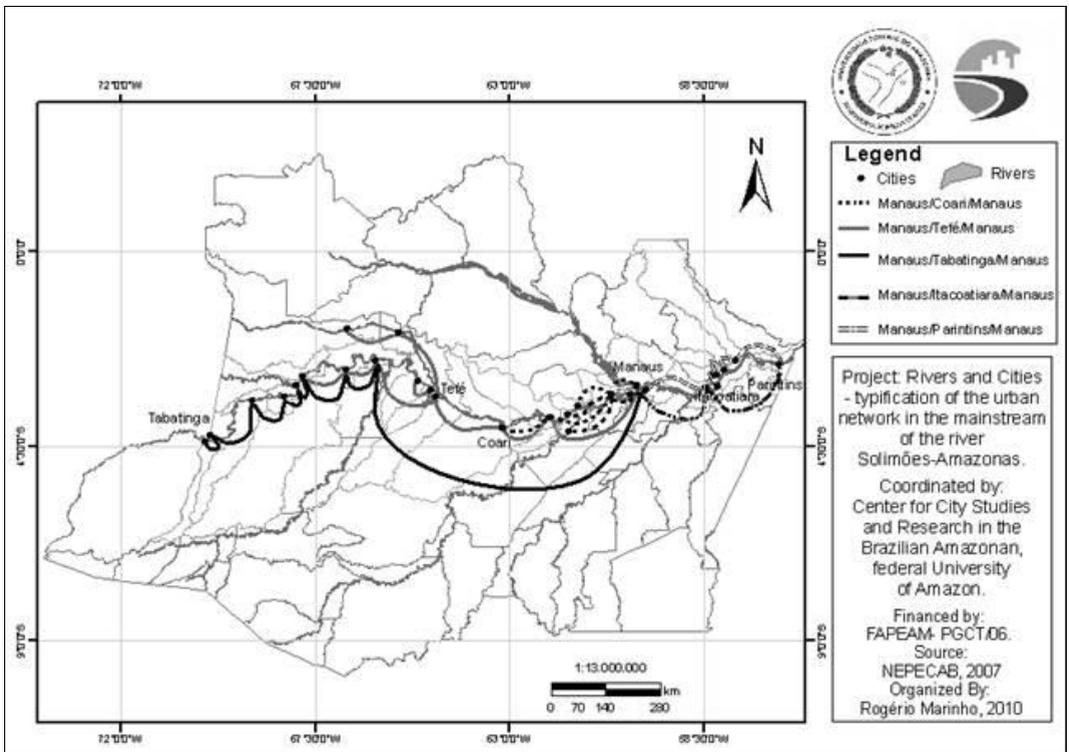


Figure 2: Transport Fluxes – Fluvial.

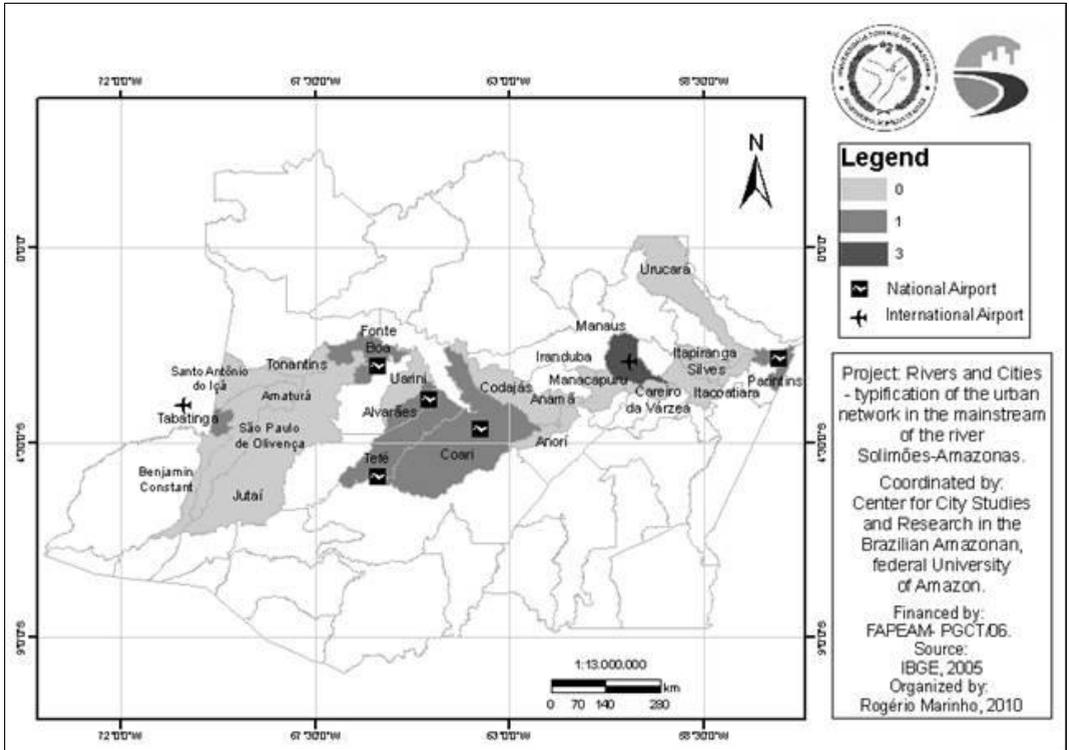


Figure 3: Transport Fluxes – Airports.

Notice the importance of the city of Tefé and Tabatinga, which centralize regionally the transport system. Except for Manaus and Tabatinga, which is a frontier city, the other cities that do have an airport can accept only smaller planes. Most of the cities do not have an airport usually only having track landing areas.

Another transport system is the motorcycle taxi. This system is offered in all cities through different associations that distinguish themselves by the color of the jacket. The moto-taxi transport system is the most used and efficient way of transport in the city.

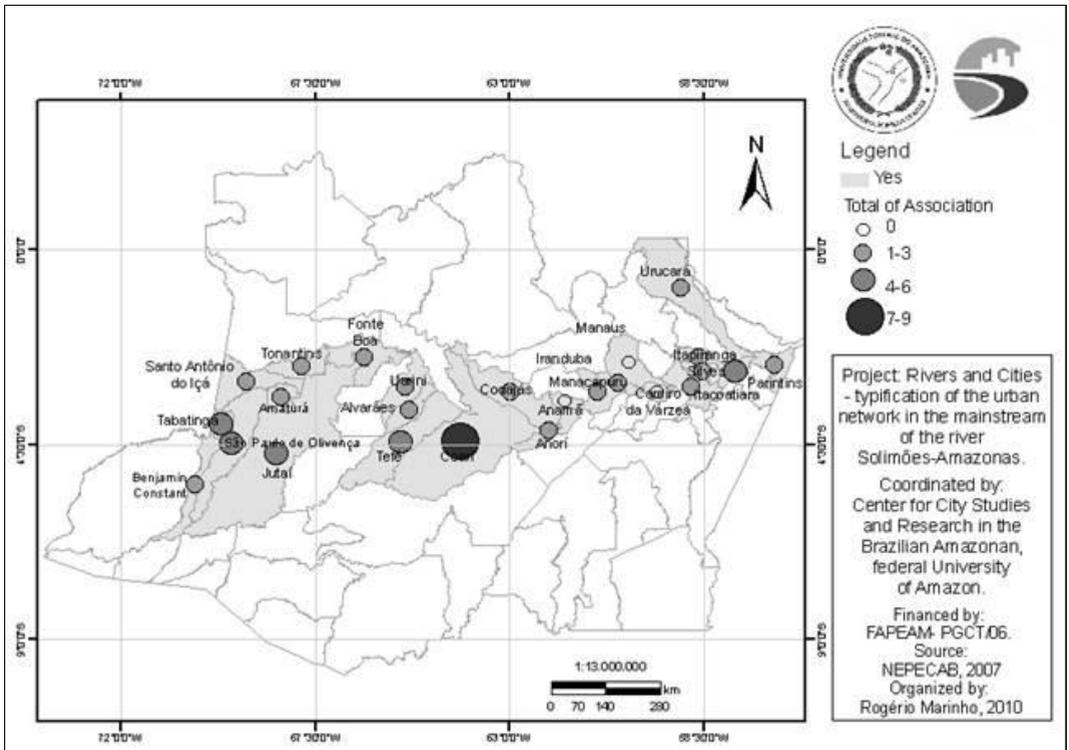


Figure 4: Transport Fluxes: Moto-taxi System

Not only through transportation do the cities interact. The television, internet and telephone systems are important communication networks in the region that define the different scales of integration into the local, regional and global networks (MELO; SCHOR, 2008). In the Solimões river urban network only one television firm predominates sending the signal through satellites. There are no cable options in-between the cities; only the cities next to Manaus have more than one cable TV option. In some cities the signal captured by the satellites does not correspond to regional broadcasting, but comes from a distant region such as Minas Gerais, southeastern Brazil. In the frontier towns it is common to watch the neighbor-country broadcast via television or radio. The communication networks are fluid and multi-scalar connecting distant places and disconnecting neighboring towns.

Telephone land lines are common in all the cities but Cellular telephones access divide into two distinct networks; one along the Solimões River and the other along the Amazonas. It is interesting to note that in some cities, even though the services are offered, it is limited to the analog technology. The companies claimed that these areas had cell-phone coverage but during field work we checked the strength of the signal and were unable to make cell phone calls from most of the cities specially those situated along the Solimões River.

The access to internet is also a determinant factor in terms of network linkages. All the cities have some kind of access to the internet usually through local schools

that participate in a federal program called “digital citizenship”. Some cities have only this access, no ciber-cafés or any other public means of internet access, but these are restricted to the micro-region of the Alto-Solimões (between Tabatinga and Fonte Boa). Most of the cities have one or more local internet cafés and some have local internet providers (such as Tefé). In the mainstream of the river Solimões-Amazonas there is one “digital city” which is Parintins. In 2008 Parintins gained the title of “digital-city” due to the establishment of a free-internet zone in a square at the center of the town (MELO; SCHOR, 2008). Parintins city is located in an island and has become famous, nationally and internationally, due to the Festivities of the Bull (Festa do Boi) which attracts annually hundreds of tourist who flock the city by air and boat including big cruise ships from Fort Lauderdale. The tourist industry creates demand for internet facilities transforming the city into what Melo; Schor (2008) called the “digital island”.

Another very important institution that helps define the urban network are bank agencies. The Brazilian economy as a whole is very dependent on its financial and banking system. All of the federal and state subsidies as well as inclusive politics that are based on cash distribution make use of plastic money which requires that the individual goes to a bank to have access to the money. Some cities do not have any bank agencies and limited financial services such as Postal Bank, most of the cities that compose the micro-region of Alto Solimões fall into this category, which makes them extremely dependent on other cities in the network (ALVES, 2007; ALVES, 2008).

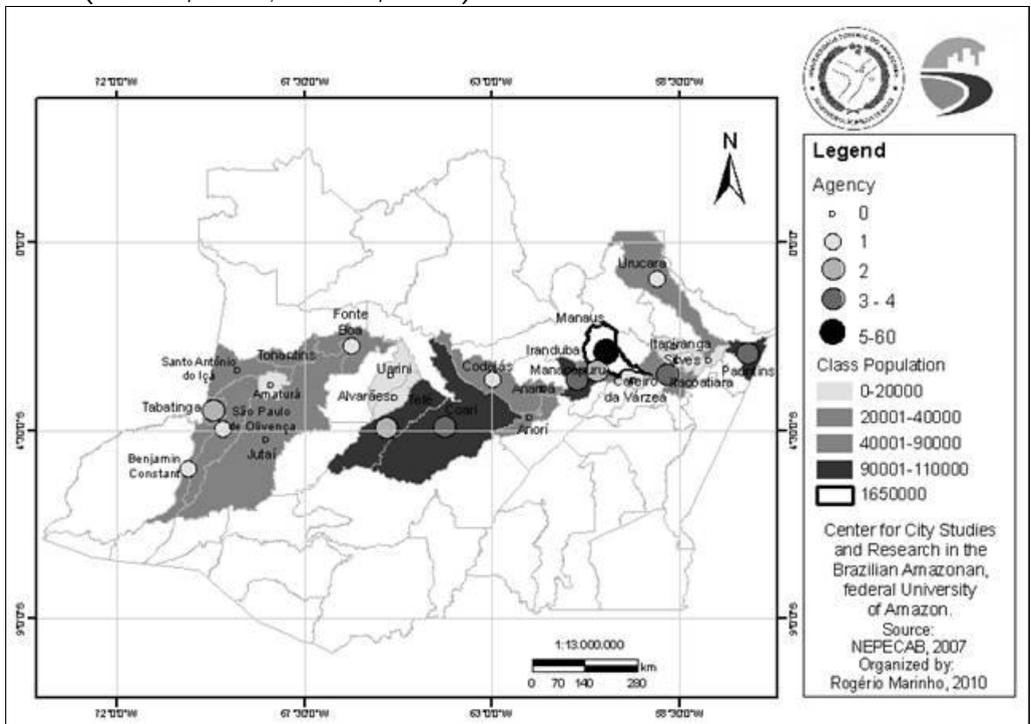


Figure 5: Bank agencies/Total population

Access to health system, hospitals, clinics and malaria diagnosis laboratories are an important factor in human mobility in the Amazon. The analysis of the infrastructure of health reaffirmed the existence of cities that occupy strategic role in the concentration of services. Once again the primacy of Manaus is evident.

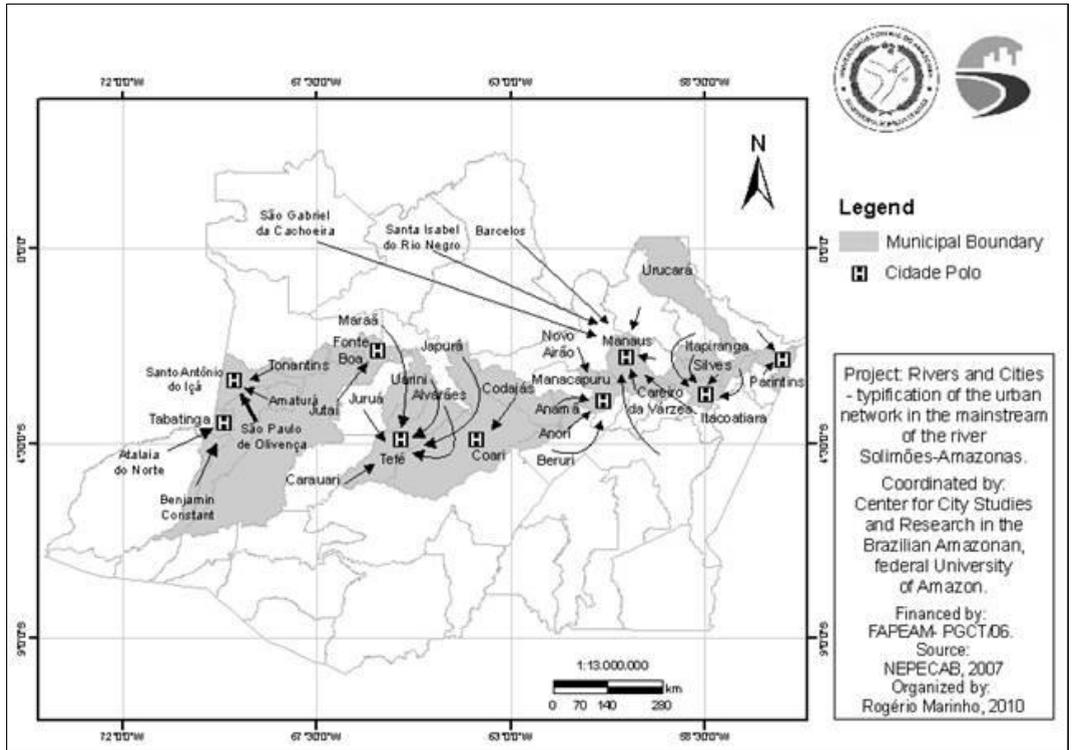


Figure 6: Regional Hospitals

The analysis of the results, visually represented in the thematic cartography, show a diverse urban structure and networks. There are clear distinction between the two river systems (Solimões and Amazonas) and intra-regionally especially when the focus is on the mainstream of the Solimões River. These differences and similarities when analyzed dynamically, identifying permanences and transformations, help construct a city typology more adequate for areas of low-city density. The typology constructed is discussed below.

A typology for areas of low-city density

It can be concluded from the spatial analysis that the cities located in the mainstream of Amazon river and those along the Solimões river near to Manaus (Iranduba and Manacapuru) are those that presents a larger amount and diversity of infrastructure, services and fluxes. This situation can be explained at first by the process of historical-geographical development, due to the fact that these

cities are located in between the two metropolitan regions of the north of the country Manaus and Belém (Pará state).

The analysis also shows distinct urban networks when considering infrastructure and fluxes of commodities and people; the Solimões and the Amazon are not only distinct rivers but are also distinct urban networks. The urban network along the Solimões River is much more fragile with fewer infrastructures and much more closed in itself, depending greatly on the capital Manaus and on the cities of Tabatinga and Tefé.

The urban network along the Amazonas River is more dynamic and is opened to other parts of the country through the Madeira River system that links Itacoatiara to Porto Velho in Rondônia state and from there to the rest of the country and also the network Parintins-Santarem which through a longitudinal road system of 1,780 km (BR 163 Cuiabá- Santarem) links the area to the central part of Brazil. Also the boat fluxes between Manaus and Belém leave its footprints along the cities on the Amazon River.

The differences between the urban network along the two river systems is a very important distinction when thinking about urban and regional politics in the Amazon state. Different river systems imply different urban networks. Each one of the main river systems (Negro; Solimões; Amazonas; Purus; Jutai; Madeira) should be considered and analyzed as a different urban network. The geographical and historical differences conforms different necessities when addressing development policies for the region.

Finally, the integrated analysis of the institutional framework allows us to classify two groups of cities (small and medium), with internal differentiations (territorial responsibility, external economic development, intermediate and special) and hierarchy. This classification leads to a city typology described and spatialized below (Box 2):

Box 2: City Typology for the Cities in the Western Amazon

Typology	Characteristic	City
Medium cities of territorial responsibility	Fulfills a role in the urban network that exceeds the cities characteristics in itself, for they have a territorial responsibility that makes them an important knot in the network. They excise diverse urban functions not only for themselves but also for the cities next to them. The territorial importance of the city is originated in the historical-geographical development of the region which includes religious and military base and frontier aspects. Normally the economic development of these cities aggregate value in the region. Looked from a national or international perspective these cities seems to be stagnant and with no dynamics, which is not the fact if we consider the other aspects proposed.	Tabatinga Tefé Parintins
Medium city with external economic dynamic	Has an importance for its insertion in an external economical dynamics. The bonds with the others cities in the network are not necessarily strong, nor will its economic development imply in a significant regional development, because the main economic activity which characterizes the city doesn't aggregate value neither in the place nor regionally. These usually are mining cities, in the case of	Coari

	Coari natural gas extraction.	
Intermediate cities	These cities functions as intermediate locations for the fluxes of people and commodities between the Solimões and Amazonas urban network and Manaus. The proximity to Manaus and their geophysical characteristics historically establishes this role.	Manacapuru Itacoatiara
Small cities of territorial responsibility	Exercises an intermediate function, between the transport fluxes and commercialization, between the medium cities and the others small cities and villas. They also have an important role in indigenous organization.	Fonte Boa; Santo Antônio de Itá; Benjamin Constant
Small cities with external economic dynamic	Have economy based in the export of some products, usually agropastoril and tourism, for the regional metropolis, in this case Manaus. These cities have little relevance in the maintenance of the urban network.	Irlanduba Codajás
Special cities	Due to the absence of infrastructure which brings difficulties in the exercise the urban functions and for their geographical location that makes it more complicated for its relationship with the central channel of the river, they become dependent of the medium and small cities of territorial responsibility.	Amaturá; Alvarães; Uarini; Anori; Tocantins; Silves; Urucurituba; Anamã; Jutaí; Careiro da Varzea; São Paulo de Olivença; Urucará

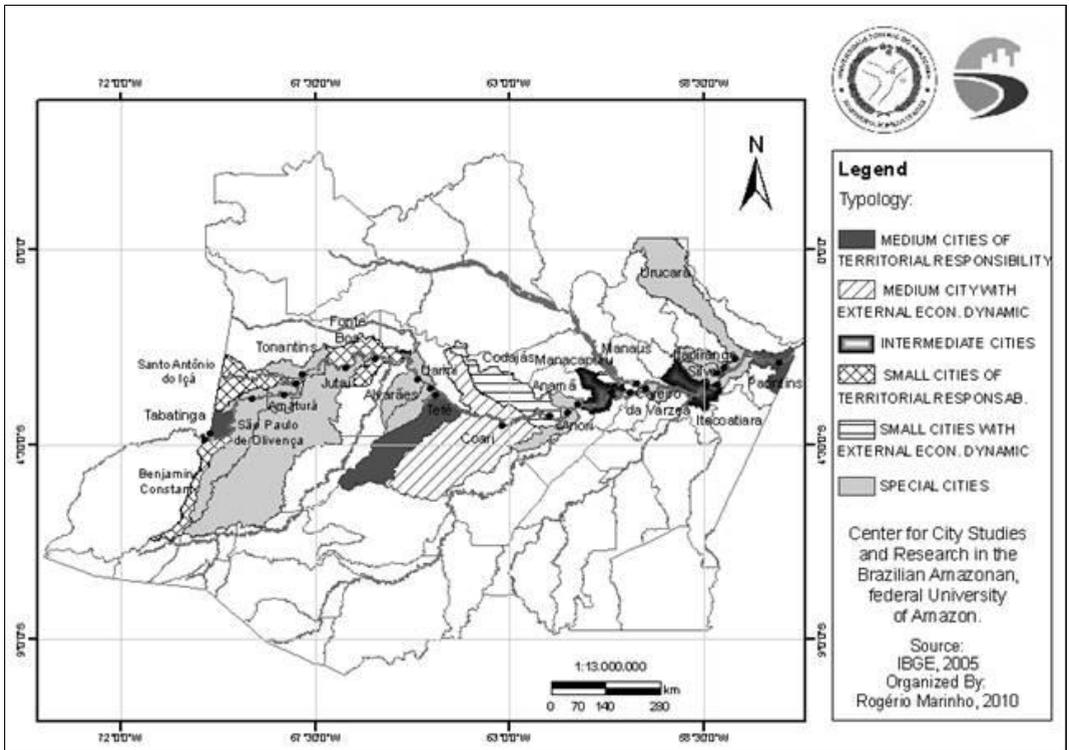


Figure 7: City Typology.

The spatial analysis and the cartographic representation of the urban networks along the Solimões and Amazonas Rivers permit a differentiated understanding of how the urban system functions in the region. The methodology developed still needs calibration and some of the variables are incomplete but the results obtained are synthesized in the City Typology shows us new possibilities of understanding and recognizing the differences in the urbanization structure and function in the Amazon. This comprehension should be useful for subsidizing urban and regional development policies and thus territorial management which should include not only economic development but also social-ecological sustainability.

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