Demographic dynamism and instabilities in the Brazilian Amazon's urban nets

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1 Introduction

In the Legal Amazon, the intensification of natural resource exploitation within the territory through mining and mineral extraction, organized and financed by large companies, as well as intense deforestation and land incorporation by agricultural and livestock industries along with the colonization projects and the policies induced and financed by the State, promoted a migratory outbreak with a demographical growth that launched new challenges for the Region's public policies (Monte-Mór, 1994, 2004; Sathler, 2009).

The opening of major highways in the frontier areas, after the 1960's decade, stimulated a differentiated occupation pattern in the Legal Amazon, under the influence of the flow intensification between the main centralities belonging to a great "road arch". Stimulating this type of occupation offered several logistic and location advantages, unlike what occurred around the Region's main fluvial paths. The present study seeks, at first, to offer some empirical evidence on the recent demographical transformations in the Amazonian municipalities. For this, the information obtained from Geometric Growth Rates (GGR), migration rates and distribution of Active Age Population in the Legal Amazon were put to use. Furthermore, the study seeks to explore some aspects related to the recent transformations in the dynamism of the regional flows, not only concerning migratory movements but also the information and merchandise circulation under the perspective of Amazonian urban nets. In order to accomplish this task, the study uses information published in the "*Influence Regions in the cities 2007*" (2008) and, finally, the Centrality Indicator (CI) is presented, formulated from own methodology with the goal of complementing the suggested analyses.

2 Occupation and demographic growth in the Legal Amazon

In the middle of the last century, the Amazonian cities were organized in a dispersed and simplified manner, supported by a colonial-like economy. In 1950, only two cities, Belém and Manaus, stood out in terms of population size in the Brazilian Amazon; both exceeded, then, the 100,000 inhabitant limit. Geiger (1963, p. 408) highlights the enormous contrast in the Amazon, since "after these capitals, the next biggest city is Santarém, with 14,000 inhabitants in 1950, followed only by a few locations with a population greater than 5,000 inhabitants." The author (1963) complements that, in 1950,

> "*most of them, situated along some river, have less than 5,000 inhabitants, presenting contents and shape that repel the city denomination, for those that have the image of more evolved regions*" (Geiger, 1963, p. 408).

Still according to Geiger (1963),

> "*of those cities with over 5,000 inhabitants, some owe their importance partially to the fact that they are administrative capitals of federal territories. This is the case of Porto Velho, Amazon's fourth city, with 10,000 inhabitants, Macapá, with 9,750 inhabitants, Rio Branco, with 9,400 inhabitants. In 1950 the following cities had over 5,000 inhabitants, apart from the ones previously mentioned: Bragança, Abaetuba, Soure, Itacoatiara and Parintins; none, however, reached 6,000*" (Geiger, 1963, p. 408).

Throughout the last decades, the increase in the urban net dynamism along the main Amazonian highways greatly explains the high Geometric Growth Rate (GGR) in the Region. According to Demographical Censuses, the GGR of the Legal Amazon population between 1970 and 1980 (4.43% per year) was quite higher than the national average (2.5% p.y.)[1]. Between 1980 and 1991, the GGR in the Region was reduced to 3.51% p.y., decreasing even more between 1991 and 2000 (2.48% p.y.). Based on the 2007 Population Count data (IBGE)[2] and the estimates carried out for the medium and large municipalities that were not covered in the survey, it is noticeable that the GGR continued to decrease, reaching 1.64% p.y. between 2000 and 2007, but still maintaining higher values than the national average in the same period (1.15% p.y.). (IBGE, 1970, 1980, 1991, 2000, 2007).

Regarding the evolution of the cities growth, TABLE 1 presents the distribution of the municipalities by population size classes, between 1970 and 2007. In 1970, there were only 20 municipalities with a population exceeding 50 thousand inhabitants, and only 5 possessed over 100 thousand inhabitants, whereas 239 (72% of the Region's municipalities) presented population sizes less that 20 thousand. But in 1980, an increase in the Amazonian urban net complexity degree is perceived, which counted on the presence of 12 municipalities with over

[1] The relatively small population stock in the Legal Amazon at the beginning of this period must be taken into account in interpreting the high GGRs between 1970 and 1980.

[2] When using the "municipal population 2007", one must bear in mind the limitations of the 2007 Population Count, which presents a series of insufficiencies that, in fact, compromised the data quality, mainly for the Amazonian cities. Even so, facing the lack of precise information on population at a municipal scale, it was decided to adopt this variable be adopted, which that is also inserted in the GGR computation.

100 thousand inhabitants and 31 municipalities with population between 50 and 100 thousand.

In 1991, there were a few more than 500 municipalities in the Legal Amazon, and 16 out of them had between 100 thousand and 1 million inhabitants. It is important to highlight that, in that year, Belém and Manaus had already exceeded the 1 million people margin and that, even with an increment of 140 new municipal units by emancipation, between 1980 and 1991 the participation of the more populated municipalities in the regional total kept on rising; those with more than 50 thousand inhabitants represented 12% of the total of municipalities in 1991.

Tabela 1 – Legal Amazon – Distribution of the municipalities by population size classes (1970-2007)

Number of inhabitants	1970		1980		1991		2000		2007	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
less than 20.000	239	71,99	221	60,38	303	59,88	529	69,65	515	67,81
20.000 a 50.000	73	21,99	102	27,87	142	28,06	167	21,94	170	22,34
50.000 a 100.000	15	4,52	31	8,47	43	8,50	43	5,65	49	6,44
100.000 a 1.000.000	5	1,51	12	3,28	16	3,16	19	2,50	24	3,15
over 1.000.000	0	0,00	0	0,00	2	0,40	2	0,26	2	0,26
Total	**332**	**100**	**366**	**100**	**506**	**100**	**760**	**100**	**760**	**100**

Source: IBGE. Demographical Censuses from 1970 to 2000. Population Count.

The 1990's decade was characterized, in of the entire Brazil, by an explosion of small municipalities, resulting of the emancipations that occurred, mainly in the years of 1993 and 1997. In this period, 254 new municipalities showed up in the Legal Amazon. As most of these new localities were emancipated with less than 20 thousand inhabitants, the participation count of this class grew at the cost of the others, reaching numbers similar to those of 1970. On the other hand, the number of municipalities with over 100 thousand inhabitants, in absolute terms, increased from 18 to 21, between 1991 and 2000. According to more recent data in TABLE 1, it seems clear that the population concentration in Amazonian medium-sized cities increased. The number of municipalities with between 100,000 and 1,000,000 inhabitants was 19 in 2000, jumping to 24, in 2007. In the same way, the municipalities with between 50,000 and 100,000 residents rose to 49 in the last year analyzed, against 43 in 2000.

As a way of broadening the interpretational possibilities of TABLE 1, the spatial distribution of the Amazonian municipalities demographical transformations in the same

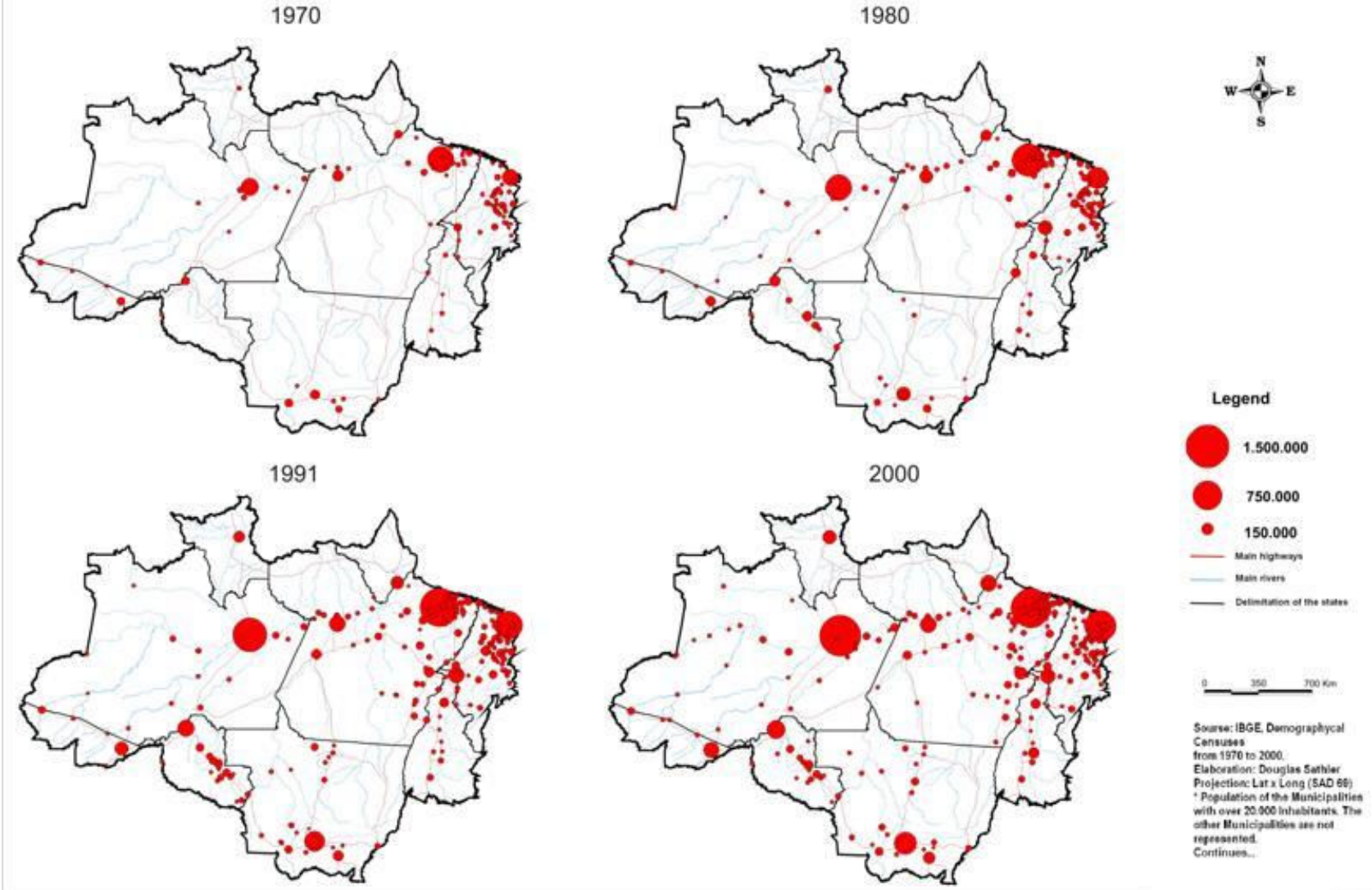
period can be visualized in IMAGE 1[3]. The urban (and population) expansion was more intense, mainly along the highways that cut through the Southern, Southeastern and Eastern portions of the Region, apart from the occupation that follows the borders of the Amazonas River to Manaus. Thus, the road net impact on the development of the regional urban agglomerations becomes clear. However, there is still a vast region of low occupation in Southeastern Pará and a great part of the Amazonas state, not to mention the top portion of the Amazonas River, extending through the South of Roraima to the North of Amapá.

The opening of large highways in the Amazonian territories stimulated these high GGR greatly, which, without a shadow of doubt, has increased the demands for infrastructure and public services in the Amazonian cities, apart from the great pressure applied on the natural resources in these territorial portions. This manner of occupying the Amazonian territory in the last decades generated a differentiated pattern in the population structure in the areas that experienced more intense growth. IMAGE 2 demonstrates that the highest rates of Active Age Population (AAP) of the Legal Amazon's municipalities, in 2000, was concentrated in those that were crossed by the Amazonian "road arch", mostly in the region's southern portion. The municipalities that experienced the border expansion of Mato Grosso and Rondônia stand out due to high AAP values, almost always higher than 61.3% of the population.

The cartographical representations of IMAGES 1 and 2 clearly show the relation between demographical size and AAP in the Legal Amazon, which at many times seems to be positive, that is, the bigger the population concentration and the size of the centers, the bigger the proportion of people in active age. This is related to the selective character, by age, of the migration in these portions of the Legal Amazon. At the other extreme, the states of Amazonas and Acre, characterized by diffuse occupation and low demographical density, are those that present the smallest AAP amounts in the year 2000.

[3] The representations are according to the municipal net of each year. In this period, the population data for the emancipated municipalities are not aggregated.

Image 1 - Legal Amazonia - Evolution of the municipalitie´s population size (1970-2007)



Source: IBGE, Demographycal Censuses
from 1970 to 2000.
Elaboration: Douglas Sathler
Projection: Lat x Long (SAD 69)
* Population of the Municipalities with over 20.000 inhabitants. The other Municipalities are not represented.
Continues...

Image 1 - Legal Amazonia - Evolution of the municipalitie´s population size

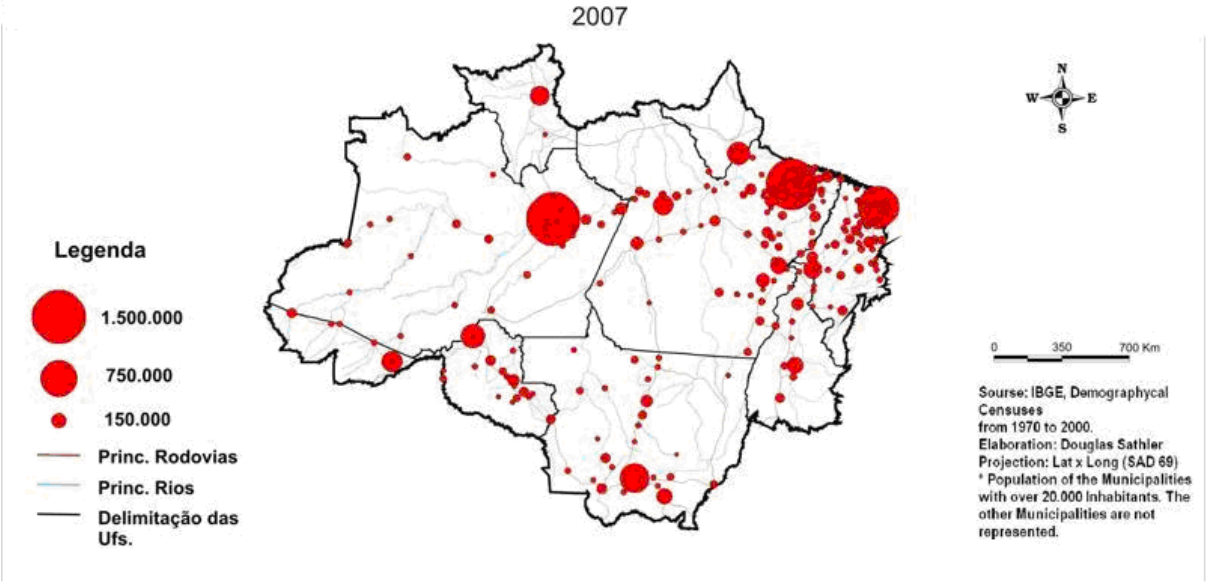
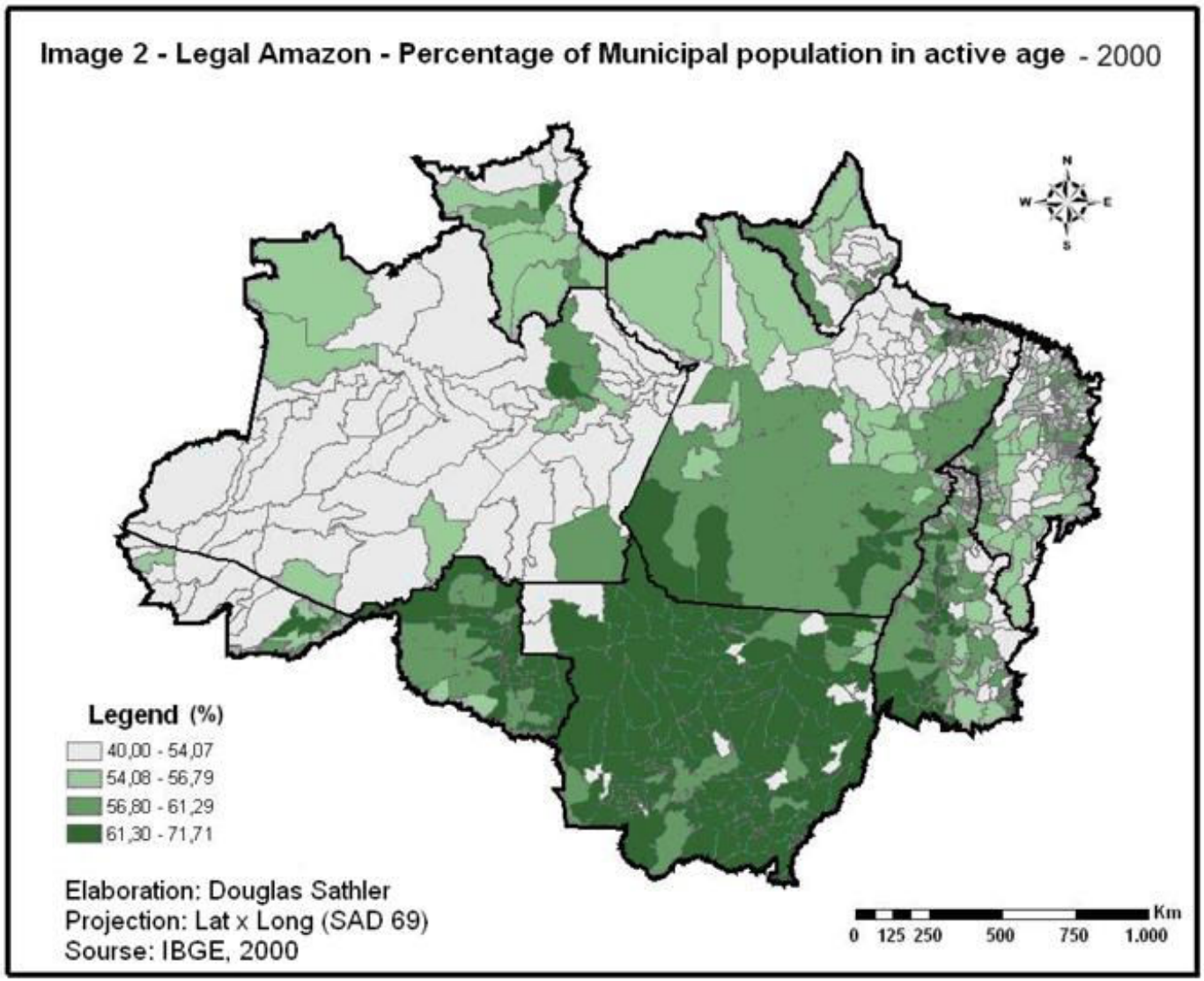


TABLE 2 contains information on the people over the age of 5 that did not reside in the municipality in 09/01/1986 and in 07/31/1995 according to the data of the 1991 and 2000 Censuses, respectively. In Brazil, the information on migration (Fixed Date) only exists, in the municipal scale, for the referred years. Also, it presents information on the domicile situation before the immigrants, the municipal population in the Censuses years and the proportion of municipal immigrants with fixed date[4] in relation to the total population of the analyzed Censuses. It is worth noting that this proportion cannot be interpreted as being the Liquid Migration Rate (LMR), once that the inter-municipal movements within the Federal States are also accounted. Yet, the present chart does not refer to Migratory Balance (MB), but only to the fixed date immigrants that resided in the Amazonian municipalities in the reference periods of the 1991 and 2000 Censuses, not offering, therefore, information on the emigrants.

[4] In this study, immigrants were considered as those older than 5 years of age that in 1986 and 1995 did not reside in the current residential municipality, respectively, in 1991 and 2000 (fixed date).

Image 2 - Legal Amazon - Percentage of Municipal population in active age - 2000



Elaboration: Douglas Sathler
Projection: Lat x Long (SAD 69)
Sourse: IBGE, 2000

Table 2 - People over 5 years of age that did not reside in the municipality on 09/01/1986 and in 07/31/1995, situation of the previous residence, total population (1991 and 2000), percentage of immigrants in relation to the total population (1991 and 2000)

		Immigrants		Population		%		Evolution
		1986-1991	1995-2000	1991	2000	1991	2000	
	Total	30.138	42.022	417.718	557.882	7,21	7,53	increased
Acre	Urban	17.701	28.767	258.520	371.223	6,85	7,75	increased
	Rural	12.437	13.255	159.198	186.659	7,81	7,10	decreased
	Total	30.342	58.774	289.397	477.032	10,48	12,32	increased
Amapá	Urban	20.406	43.957	234.131	427.058	8,72	10,29	increased
	Rural	9.936	14.817	55.266	49.974	17,98	29,65	increased
	Total	115.722	190.214	2.103.243	2.817.252	5,50	6,75	increased
Amazonas	Urban	87.425	146.440	1.502.754	2.111.246	5,82	6,94	increased
	Rural	28.297	43.774	600.489	706.006	4,71	6,20	increased
	Total	426.523	434.511	4.930.253	5.657.552	8,65	7,68	decreased
Maranhão*	Urban	214.944	273.537	1.972.421	3.363.108	10,90	8,13	decreased
	Rural	211.579	160.974	2.957.832	2.294.445	7,15	7,02	decreased
	Total	391.103	420.444	2.027.231	2.505.245	19,29	16,78	decreased
Mato Grosso	Urban	259.114	322.446	1.485.110	1.988.183	17,45	16,22	decreased
	Rural	131.989	97.998	542.121	517.061	24,35	18,95	decreased
	Total	541.605	606.546	4.950.060	6.195.965	10,94	9,79	decreased
Pará	Urban	339.276	434.432	2.596.388	4.122.101	13,07	10,54	decreased
	Rural	202.329	172.114	2.353.672	2.073.864	8,60	8,30	decreased
	Total	216.341	212.888	1.132.692	1.380.952	19,10	15,42	decreased
Rondônia	Urban	124.726	143.326	659.327	884.785	18,92	16,20	decreased
	Rural	91.615	69.562	473.365	496.167	19,35	14,02	decreased
	Total	39.017	60.593	217.583	324.397	17,93	18,68	increased
Roraima	Urban	31.243	46.953	140.818	247.810	22,19	18,95	decreased
	Rural	7.774	13.640	76.765	76.587	10,13	17,81	increased
	Total	143.139	197.997	919.863	1.157.690	15,56	17,10	decreased
Tocantins	Urban	92.407	154.412	530.636	863.752	17,41	17,88	decreased
	Rural	50.732	43.585	389.227	293.938	13,03	14,83	decreased
Amazônia Legal	Total	1.933.930	2.223.989	16.988.040	21.073.967	11,38	10,55	decreased
	Urban	1.187.242	1.594.270	9.380.105	14.379.266	12,66	11,09	decreased
	Rural	746.688	629.719	7.607.935	6.694.701	9,81	9,41	decreased

Source: IBGE. Demographical Censuses from 1991 to 2000

*The state of Maranhão was considered in its totality

TABLE 2 suggests that the considered periods were marked by an intense demographical dynamism in what refers to the fixed date immigrants presence in the Legal Amazon's municipalities. Totally, it is noticeable that the total of registered municipal immigrants constituted a little over 10% of the States population in the two analyzed periods. However, in Acre, Amapá, Amazonas and Roraima, this proportion increased between the information on 1991 and 2000.

In 1991, the data indicated that there were 1,933,930 people with over 5 years of age that resided in another municipality 5 years before the Census reference date. But in 2000, this amount jumped to 2,223,989 people, although without the same proportional weight in light of the bigger population stock in comparison with the previous Census. Of the total of immigrants, in 1991, 1,187,242 (61.39%) were coming from domiciles situated in urban areas, according to the delimitation adopted by IBGE. In 2000, this number went to 1,594,270 (71.68%) people.

The next topic aims to supply a series of elements that are related to the debate on the urban nets flows dynamism in the Legal Amazon. The variables being explored, such as the relation intensity of Amazonian municipalities, of *travel time* between the municipalities and the Centrality Indicator (CI) can, to some point, be incorporated also to the studies that investigate, in a more profound manner, the processes related to the migration in the Amazon, as well as in the entire country.

3 Instability in Amazonian connections: using the Centrality Indicator (CI)

In the Amazon, the great distances between local centers, middle-sized cities and the largest cities of the Region create limitations to the flow of people, goods and services between the several urban hierarchical levels. The proper distribution of urban centers throughout the Amazonian territory is very uneven, with a clear concentration of cities around a "road arch" formed by large federal highways that involve and/or cut through the Region, without, however, presenting strong penetration and internal articulation intensity with the regional spaces. Along with other limitations of a socioeconomic and infrastructural nature, this creates an obvious difficulty regarding the flows within the cities that belong to the "arch" and the other centers further within the territory (see Sathler, 2009).

In this context, the study performed by IBGE, "*Influence Regions of cities 2007*", released in 2008, presents some interesting results that meet the affirmations from the previous paragraph. Thus, 12 first level urban nets were identified in Brazil, commanded by the main metropolises. Among them, Manaus and Belém were mentioned as the two main structuring centers of the Amazonian territory, commanding the nets that extend themselves in this portion of the country[5].

[5] According to the IBGE (2008,3), "the nets are differentiated in terms of size, organization and complexity and present interpenetrations due to the occurrence of entailing more than one center, resulting in double or triple intersection in the net."

TABLE 3 demonstrates the dimension of the first level nets outlined in IBGE study (2008). Only São Paulo's and Brasília's nets present areas bigger than the two first level nets in the Amazon. It is important to remember that the territorial size of the Amazonian nets is not a result of a great regional articulation capacity of the Region's largest centralities, but due to existing spatial peculiarities. The nets of Manaus (1.7%) and Belém (3.8%) sum only 5.5% of the Brazilian population, but with demographic density of 2.15 and 5.53 inhabitants/km², respectively. Out of the 83 regional capitals[6] identified by the IBGE, only four are in Manaus's (1) and Belém's (3) nets. These two nets possess 13 of the 199 sub-regional centers. Only 14 of the 666 Brazilian zone centers are in the influence range of the two biggest Amazonian cities. Although the influence area of São Luís (MA) and Cuiabá (MT) are not mentioned by the IBGE within the biggest nets of the country, it is important to remember that these cities also stand out in the Legal Amazon from the demographic and functional point of view.

Table 3 – Brazil – Dimension of first level nets, 2007

First Level Nets	Dimension					
	Regional capitals	Sub-regional centers	Zone centers	Municipalities	Population	Area (km²)
São Paulo	20	33	124	1028	51.020.582	2.279.108,45
Rio de Janeiro	5	15	25	264	20.750.595	137.811,60
Brasília	4	10	44	298	9.680.621	1.760.733,86
Fortaleza	7	21	86	786	20.573.035	792.410,65
Recife	8	18	54	666	18.875.595	306.881,59
Salvador	6	16	41	486	16.335.288	589.229,74
Belo Horizonte	8	15	77	698	16.745.821	483.729,84
Curitiba	9	28	67	666	16.178.968	295.024,25
Porto Alegre	10	24	89	733	15.302.496	349.316,91
Goiânia	2	6	45	363	6.408.542	835.783,14
Manaus	**1**	**2**	**4**	**72**	**3.480.028**	**1.617.427,98**
Belém	**3**	**11**	**10**	**161**	**7.686.082**	**1.389.659,23**

Source: IBGE, Population Count; official territorial area. Rio de Janeiro (2007).

IBGE (2008) also offers a variable denominated "Relationship Intensity", which refers to the number of times that a determined city was mentioned in the IBGE questionnaire. The Relationship Intensity values of the cities of Manaus and Belém are, respectively, 554 and 1,575. The city of Cuiabá (1,410) presents a Relationship intensity close to that of Belém, whereas São Luís (2,072) stands out for having the highest Relationship Intensity value in the

[6] According to the IBGE (2008), the *regional capital* possesses management activities immediately inferior to the metropolis's and has a regional influence area, being referred to as a destination by a great set of municipalities. The *sub-regional center* possesses less complex management activities and a more reduced acting area. Its external relations to its own net are usually only with three national metropolises. As for the *zone Center*, it presents an acting range restricted only to its immediate area.

Legal Amazon. In order to have a notion of this concept, the Relationship Intensity values for São Paulo, Brasília, Rio de Janeiro and Belo Horizonte are, respectively, 12,857, 2,908, 3,124 and 8,520. All the data points to a fragile situation in the Amazonian urban nets regarding the structural capacity of the territory, especially in Manaus's case, with a Relationship Intensity value lower than some middle-sized cities in the Center-Southern country region, such as Juiz de Fora (1,268), Ribeirão Preto (853) and Montes Claros (845).

Manaus has its condition as regional articulator harmed by its unfavorable location within the Amazon and distant from the main road axles of the Region. In this case, the centralized positioning of Manaus in the Amazon creates several conflicts for this great city's centrality in the net. That is, even in face of the fluvial transport importance through the Amazonas River, it is possible to say that the heart of the Amazon is far from the main veins and arteries that make the Region's flows dynamic.

In a more favorable situation, Belém, due to its eccentric geographic location, situated in the extreme north of the eastern Amazon, is also incapable of playing the articulating role of the Amazonian urban nets, which would be fitting to a regional metropolis of its size.

São Luís presents the highest Relationship Intensity in the Legal Amazon due to its strategic placement, between Belém, Teresina and Fortaleza. Furthermore, it is important to highlight the articulation of this center with other cities within its own state, such as Pinheiro, Santa Inês, Bacabal, Presidente Dutra, Pedreiras, Caxias, Chapadinha, Parnaíba, as well as Imperatriz and Balsas (IBGE, 2008).

Cuiabá is the biggest center of the southern portion of the Legal Amazon's road arch. It is the main gateway to the economic agents from the south of the Region to the Amazonian interior. This city articulates with Cáceres, Rondonópolis and Barra do Garças in the southern portion of the state, as well as Sinop, further within the Amazon (IBGE, 2008).

Based on the study *Central Registration of the Enterprises* (2004), which had some results published in IBGE (2008), it is possible to calculate the Enterprise Relationship Intensity of the main Amazonian cities. IBGE (2008) defines this variable as being "the sum of the number of existing branches in city A of enterprises with headquarters at city B". This data generated a series of valuable information that can be visualized in TABLES 3 and 4.

The first thing that draws attention in TABLE 4 is that, in an overall manner, Manaus presents an Enterprise Relationship Intensity higher than Belém, considering the 20 connections that stand out the most. It is worth remembering that, as was previously stated, the Relationship Intensity of Manaus (554) with the other cities in its net is far smaller compared to what occurs in the Belém's (1575) net. Such a situation seems unlikely and

incompatible with reality, were it not for Manaus's GIP (Gross Internal Product) (R$ 27.214.213.000), over double of Belém's GIP (R$ 11.277.414.000), in 2005.

TABLE 4 – Enterprise Relationship Intensity, Belém and Manaus, 2004

Order	Belém			Manaus		
	City	n	%	City	n	%
1	São Paulo (SP)	360	23,53	São Paulo (SP)	602	37,23
2	Rio de Janeiro (RJ)	150	9,80	Rio de Janeiro (RJ)	184	11,38
3	Manaus (AM)	140	9,15	Belém (PA)	140	8,66
4	Macapá (AP)	119	7,78	Brasília (DF)	104	6,43
5	Brasília (DF)	115	7,52	Porto Velho (RO)	96	5,94
6	Fortaleza (CE)	103	6,73	Boa Vista (RR)	64	3,96
7	São Luís (MA)	83	5,42	Recife (PE)	49	3,03
8	Castanhal (PA)	72	4,71	Belo Horizonte (MG)	48	2,97
9	Santarém (PA)	50	3,27	Fortaleza (CE)	46	2,84
10	Marabá (PA)	47	3,07	Campinas (SP)	38	2,35
11	Recife (PE)	45	2,94	Porto Alegre (RS)	36	2,23
12	Curitiba (PR)	40	2,61	Cuiabá (MT)	33	2,04
13	Belo Horizonte (MG)	36	2,35	Curitiba (PR)	33	2,04
14	Altamira (PA)	30	1,96	Macapá (AP)	32	1,98
15	Abaetetuba (PA)	28	1,83	Rio Branco (AC)	25	1,55
16	Goiânia (GO)	24	1,57	Itacoatiara (AM)	20	1,24
17	Capanema (PA)	23	1,50	Salvador (BA)	18	1,11
18	Santa Isabel do Pará (PA)	22	1,44	Goiânia (GO)	17	1,05
19	Paragominas (PA)	22	1,44	Manacapuru (AM)	16	0,99
20	Breves (PA)	21	1,37	São Luis (MA)	16	0,99
Total		**1530**	**100**		**1617**	**100**

Source: IBGE, Central Registration of the Enterprises 2004. Cities' Influence Regions 2007.

The Enterprise Relationship Intensity of Belém and Manaus with the two biggest national metropolises are among the highest of TABLE 4 order. It is possible to notice that São Paulo and Rio de Janeiro exceed the enterprise relationship even between Belém and Manaus. If, on one hand, this serves as evidence for the great influence of the two biggest metropolises of the southeastern Amazon, on the other, it also reflects the low regional integration between Belém and Manaus.

The Enterprise Relationship Intensity of Belém with the municipalities in Pará which are among the first 20 in the order (20.6%) demonstrates a larger balance when compared to what occurs in the neighboring state. In Amazonas, Manaus possesses Enterprise Relationship Intensity of only 2.22% with the other municipalities in Amazonas present in TABLE 4. All the other cities present in this table are not in Amazonas, four of them being in the Brazilian Southeast.

It is possible to perceive that the Enterprise Relationship Intensity relations of the biggest Amazonian axles, Belém and Manaus, with the cities of São Luís and Cuiabá are relatively weak. In Manaus's case, Cuiabá (33) and São Luís (16) are mentioned in TABLE 4,

occupying the twelfth and the twentieth positions, respectively. But Belém possesses a significant Enterprise Relationship Intensity only with São Luís (83), since Cuiabá is not among the first 20 cities with a higher relation value with Belém.

São Luís and Cuiabá, according to TABLE 5, possess high Enterprise Relationship Intensity levels with São Paulo, 160 and 307, respectively. However, the city of Rio de Janeiro, unlike what happens regarding Manaus and Belém (TABLE 4), is not among the first four positions in terms of Enterprise Relationship Intensity with São Luís (78) and Cuiabá (68), occupying the fifth and sixth positions, respectively, in the list of cities with larger values for the variable, in 2004.

TABLE 5 – Enterprise relationship intensity, São Luís and Cuiabá, 2004

Order	São Luís (MA)			Cuiabá (MT)		
	City	n	%	City	n	%
1	São Paulo (SP)	160	19,75	São Paulo (SP)	307	24,08
2	Fortaleza (CE)	111	13,70	Campo Grande (MS)	140	10,98
3	Belém (PA)	83	10,25	Brasília (DF)	117	9,18
4	Brasília (DF)	82	10,12	Rondonópolis (MT)	109	8,55
5	Rio de Janeiro (RJ)	78	9,63	Sinop (MT)	71	5,57
6	Recife (PE)	51	6,30	Rio de Janeiro (RJ)	68	5,33
7	Imperatriz (MA)	50	6,17	Tangará da Serra (MT)	60	4,71
8	Terezina (PI)	42	5,19	Goiânia (GO)	57	4,47
9	Belo Horizonte (MG)	21	2,59	Curitiba (PR)	38	2,98
10	Bacabal (MA)	20	2,47	Campinas (SP)	38	2,98
11	Salvador (BA)	19	2,35	Porto Velho (RO)	35	2,75
12	Manaus (AM)	16	1,98	Primavera do Leste (MT)	34	2,67
13	Santa Inês (MA)	15	1,85	Manaus (AM)	33	2,59
14	Balsas (MA)	11	1,36	Santo Antônio do Leverger (MT)	30	2,35
15	Itapecuru Mirim (MA)	9	1,11	Sorriso (MT)	26	2,04
16	Caxias (MA)	9	1,11	Presidente Prudente (SP)	25	1,96
17	Macapá (AP)	9	1,11	Cáceres (MT)	24	1,88
18	Pineiro (MA)	8	0,99	Barra do Garças (MT)	23	1,80
19	Goiânia (GO)	8	0,99	Porto Alegre (RS)	20	1,57
20	Vitória (ES)	8	0,99	Cascavél (PR)	20	1,57
Total		**810**	**100,00**		**1275**	**100,00**

Source: IBGE, Central Registration of the Enterprises 2004. Cities' Influence Regions 2007.

São Luís presents strong Enterprise Relationship Intensity with other states' capitals. Thus, the first six cities with larger Enterprise Relationship Intensity are state capitals (São Paulo, Fortaleza, Belém, Brasília, Rio de Janeiro and Recife) and sum 69.8% of TABLE 4 total. Imperatriz is the first city of the state of Maranhão with high Enterprise Relationship Intensity with São Luís, which appears on TABLE 5 at the seventh position.

Cuiabá, in the total outcome (1,275), is at a higher level than São Luís (810). In comparison with Cuiabá, São Paulo presents 21.4% of the chart total, whereas Rio de Janeiro

presents only 5.3%. It is also worth highlighting the high enterprise relationship level of Cuiabá with Campo Grande (140) and, also, with Brasília (117).

As a way of broadening this topic analyses, TABLE A 1 presents the municipal population (2007), the travel time between the Amazonian centers and the closest municipalities, with largest population, as well as the type of transportation. This information was extracted from Guia 4 Rodas 2007 and applies differentiated weights when calculating the *travel time* variable, according to the type of path and means of transportation (c = car, b = ferry and cb = car and ferry).

The value of *travel time* between the cities in TABLE A 1 varies according to city isolation level, the type of transportation and the size of the municipal population. In an overall manner, the cities that are not on the main Amazonian road axles suffer a much higher *travel time* in comparison to those connected by highways, not only by the disperse positioning in the forest, but also by longer displacement time verified in the Region's fluvial ways.

Out of the 30 cities which *travel time* is higher than 10 hours, only 6 were connected exclusively by road transportation. Of these cities, 5 had a displacement time higher than 50 hours in 2007 (São Gabriel da Cachoeira, Einurepé, Santarém, Tabatinga and Macapá). It is noticeable that 49 cities presented travel time higher than 5 hours, which, although this is a relatively high value, it can be considered reasonable for Amazonian standards. The space/time notion seems to be different in the Amazon if compared to the country's Center-South.

In the case of Itaituba, the closest large city is Santarém, which, according to TABLE A 1, was a little over 10 hours away, by ferry. In reality, this value is higher, if stops for embarking and disembarking people and merchandise are taken into account. This same route can be made by motorboat, taking effectively 7 hour. As if the great distances were not enough, Itaituba's airport was almost closing recently, in 2008, in face of the low demand in a city that is going through a post-mining economic depression. From Santarém, the largest closest cities are Belém and Manaus, connected by the Amazonas River through days of ferry travel. This is how the net between the Amazonian cities works in this territorial portion. However, in the minds of the regional population, this fragile and distant situation seems to be accompanied by a feeling of apparent and virtual "proximity". This is why, after all, the people were apparently forced to be used to the fact that the closest major city is 10 hours away, in the case of Santarém and Itaituba. Despite this fact, one can think that these great spatial barriers are important regarding the effective territorial occupation in the Brazilian

Amazon, since the great distance between the more populated centers provided a more wide coverage of the Amazonian territory.

Based on the information stated in TABLE A 1 on *travel time* between the Amazonian centers, the Centrality Indicator (CI) was elaborated (TABLE 6). The CI measures the number of times that a determined city was identified as the closest, with larger population, in comparison with another center of a population count of over 20,000 inhabitants in 2007, considering *travel time*. It is important to highlight that the second to seventh order centers were also accounted in this indicator, with differentiated weights. For example, Manaus is the immediately closest city, with larger population, of 14 centers (order 1) with over 20,000 inhabitants in the Legal Amazon, which grants 14 points to Manaus's CI. Yet, 3 out of these 14 cities were verified as being the biggest, closest to another center (order 2), each one, which granted 1.5 points to Manaus's CI, that is, 0.5 for each one.

The CI is one of the many variables that grant power in urban hierarchy, since it measures the articulation degree, from a purely spatial point of view, among the regional centers. Using this type of variable helps to understand the centrality distribution and the insertion level of the cities in the urban nets.

Out of the 242 analyzed cities[7], 100 had CI higher than 1, whereas 142 had a total amount equal to zero. Belém (34.81), São Luís (27.84) and Imperatriz (22.56) stand out due to the high CI in comparison with other Amazonian cities. Thus, the CI reveals the high importance level of these three cities in the Legal Amazon's urban nets.

Although Manaus is classified as having the fifth largest CI (16.63) of the Region, it is important to highlight that this value is at a differentiated level and clearly inferior to that of Belém, São Luís and Imperatriz. This helps to understand the importance of spatial variables in the net dynamics. In Manaus's case, it is evident that the low Relationship Intensity, as mentioned before, is related to the city low CI. Thus, it is interesting to observe that, in face of the economic force of the largest Amazonian GIP, the Enterprise Relationship Intensity is very elevated, in a low Relationship Intensity center.

With the exception of Belém and São Luís, the other Amazonian state capitals do not present high CI. Porto Velho (10.75) and Macapá (9.13) are at a lower level than that of Manaus (16.63) and Cuiabá (17.5). With far lower values are Rio Branco (3.75) and Palmas (3.5). In comparison with the state capitals, Boa Vista presents a minimal value, with CI equal

[7] Colniza was not considered in the analysis in face of the deficiency of information available for this municipality. Thus, the considered municipalities, larger than 20,000 inhabitants in the Legal Amazon, are 242.

to 1, that is, Roraima's capital is the biggest, largest city, to only one Amazonian center with a population superior to 20,000 inhabitants in 2007. Among the middle-sized cities of the interior (non-capitals), with population higher than 50,000 inhabitants, 14 had a CI higher than 5, and of these, six possess CI higher than 10, according to the information on TABLE 6.

Apart from the population size, the CI depends greatly on the density with which the centers are distributed on the net, that is, the cities that are along the "road arch" and on the axle of the Amazonas River tend to present higher CI values. Some cities with medium demographical size in the proximities of the Region's larger cities, such as Ananindeua and Castanhal, end up incorporating a large number of points in the CI, due to the existence of several other centers that gravitate around large cities such as Belém and São Luís.

Table 6 - Legal Amazon – Centrality indicator (CI), 2007

Name of the municipality	Ordem							IC
	1	2	3	4	5	6	7	
Belém	6	21	36	53	37	12	1	**34,81**
São Luís	6	20	30	29	11	1	0	**27,84**
Imperatriz	8	19	18	4	1	0	0	**22,56**
Cuiabá	4	15	18	10	4	0	0	**17,50**
Manaus	14	3	3	3	0	0	0	**16,63**
Bacabal	7	10	11	7	0	0	0	**15,63**
Santa Inês	7	8	6	0	0	0	0	**12,50**
Castanhal	6	9	3	2	0	0	0	**11,50**
Marabá	7	7	2	0	0	0	0	**11,00**
Porto Velho	4	9	7	4	0	0	0	**10,75**
Araguaína	6	7	2	1	0	0	0	**10,13**
Ananindeua	2	7	14	5	2	0	0	**9,75**
Macapá	4	6	7	3	0	0	0	**9,13**
Abaetetuba	6	3	2	1	0	0	0	**8,13**
Ji-Paraná	4	6	3	0	0	0	0	**7,75**
Santarém	4	6	2	0	0	0	0	**7,50**
Sinop	5	3	1	0	0	0	0	**6,75**
Santa Isabel do Pará	5	2	0	0	0	0	0	**6,00**
Várzea Grande	3	4	2	0	0	0	0	**5,50**
Redenção	5	1	0	0	0	0	0	**5,50**
Açailândia	3	3	0	0	0	0	0	**4,50**
Cacoal	3	3	0	0	0	0	0	**4,50**
Pinheiro	3	3	0	0	0	0	0	**4,50**
Tefé	3	3	0	0	0	0	0	**4,50**
Bragança	3	2	1	0	0	0	0	**4,25**
Rondonópolis	3	2	0	0	0	0	0	**4,00**
Marituba	1	5	2	0	0	0	0	**4,00**
Monte Alegre	3	2	0	0	0	0	0	**4,00**
Rio Branco	3	1	1	0	0	0	0	**3,75**
Coroatá	2	3	1	0	0	0	0	**3,75**
Capitão Poço	3	1	1	0	0	0	0	**3,75**
Palmas	3	1	0	0	0	0	0	**3,50**
Tangará da Serra	3	1	0	0	0	0	0	**3,50**
Viana	3	1	0	0	0	0	0	**3,50**
Presidente Dutra	3	1	0	0	0	0	0	**3,50**
Coari	1	3	3	0	0	0	0	**3,25**
Parintins	3	0	0	0	0	0	0	**3,00**
Santa Luzia	2	2	0	0	0	0	0	**3,00**
Tabatinga	3	0	0	0	0	0	0	**3,00**
Santa Helena	3	0	0	0	0	0	0	**3,00**
Breves	2	1	1	0	0	0	0	**2,75**
Tucuruí	2	1	0	0	0	0	0	**2,50**
Capanema	2	1	0	0	0	0	0	**2,50**
Parauapebas	2	0	0	0	0	0	0	**2,00**
Paragominas	2	0	0	0	0	0	0	**2,00**
Ariquemes	2	0	0	0	0	0	0	**2,00**
Buriticupu	2	0	0	0	0	0	0	**2,00**
Oriximiná	2	0	0	0	0	0	0	**2,00**
Itapecuru-Mirim	2	0	0	0	0	0	0	**2,00**
Rolim de Moura	2	0	0	0	0	0	0	**2,00**

Source: Self elaborated based on the data of the Guia 4 Rodas, 2007. Continues...

Table 6 – Legal Amazon – Centrality indicator (CI), 2007

Name of the municipality	Ordem							IC
	1	2	3	4	5	6	7	
Acará	2	0	0	0	0	0	0	**2,00**
Primavera do Leste	2	0	0	0	0	0	0	**2,00**
Laranjal do Jari	1	1	1	0	0	0	0	**1,75**
São José de Ribamar	1	1	0	0	0	0	0	**1,50**
Altamira	1	1	0	0	0	0	0	**1,50**
Cáceres	1	1	0	0	0	0	0	**1,50**
Cruzeiro do Sul	1	1	0	0	0	0	0	**1,50**
Sorriso	1	1	0	0	0	0	0	**1,50**
Igarapé-Miri	1	1	0	0	0	0	0	**1,50**
São Bento	1	1	0	0	0	0	0	**1,50**
Igarapé-Açu	1	1	0	0	0	0	0	**1,50**
Almeirim	1	1	0	0	0	0	0	**1,50**
Irituia	1	1	0	0	0	0	0	**1,50**
Água Azul do Norte	1	1	0	0	0	0	0	**1,50**
Oeiras do Pará	1	1	0	0	0	0	0	**1,50**
Boa Vista	1	0	0	0	0	0	0	**1,00**
Itaituba	1	0	0	0	0	0	0	**1,00**
Cametá	1	0	0	0	0	0	0	**1,00**
Paço do Lumiar	1	0	0	0	0	0	0	**1,00**
Itacoatiara	1	0	0	0	0	0	0	**1,00**
Balsas	1	0	0	0	0	0	0	**1,00**
Viseu	1	0	0	0	0	0	0	**1,00**
Jaru	1	0	0	0	0	0	0	**1,00**
Novo Repartimento	1	0	0	0	0	0	0	**1,00**
Jacundá	1	0	0	0	0	0	0	**1,00**
Santana do Araguaia	1	0	0	0	0	0	0	**1,00**
São Miguel do Guamá	1	0	0	0	0	0	0	**1,00**
Paraíso do Tocantins	1	0	0	0	0	0	0	**1,00**
Guajará-Mirim	1	0	0	0	0	0	0	**1,00**
Humaitá	1	0	0	0	0	0	0	**1,00**
Juína	1	0	0	0	0	0	0	**1,00**
Dom Eliseu	1	0	0	0	0	0	0	**1,00**
Rosário	1	0	0	0	0	0	0	**1,00**
Pontes e Lacerda	1	0	0	0	0	0	0	**1,00**
Colinas	1	0	0	0	0	0	0	**1,00**
Uruará	1	0	0	0	0	0	0	**1,00**
Curuçá	1	0	0	0	0	0	0	**1,00**
Pimenta Bueno	1	0	0	0	0	0	0	**1,00**
Tarauacá	1	0	0	0	0	0	0	**1,00**
Afuá	1	0	0	0	0	0	0	**1,00**
Vitória do Mearim	1	0	0	0	0	0	0	**1,00**
Guarantã do Norte	1	0	0	0	0	0	0	**1,00**
Lucas do Rio Verde	1	0	0	0	0	0	0	**1,00**
Colíder	1	0	0	0	0	0	0	**1,00**
Mãe do Rio	1	0	0	0	0	0	0	**1,00**
Tucumã	1	0	0	0	0	0	0	**1,00**
Estreito	1	0	0	0	0	0	0	**1,00**
Porto de Moz	1	0	0	0	0	0	0	**1,00**
Baião	1	0	0	0	0	0	0	**1,00**
Curralinho	1	0	0	0	0	0	0	**1,00**
Alcântara	1	0	0	0	0	0	0	**1,00**

Source: Self elaborated based on the data of the Guia 4 Rodas, 2007

4 Final considerations

The recent transformations mentioned in this article have generated interpretations that are often not correspondent to the urban-regional reality, supported on the untruth that the Amazonian cities would not be organized in a simplified urban net model, of the dendritical or monocentrical type, which would have been broken with the introduction of new medium-sized cities and the growth outbreak of small municipalities in the Region.

However, even in face of the high growth rates in the last decades, the Amazonian urban nets do not present the same balance and complexity level found in Brazil's dynamic regions, or even in other of the world's developed regions. In the Amazon, the economic-spatial integration promoted by globalization was not enough to reduce the distances between the small cities and the other hierarchical levels of the urban nets significantly, due to a series of conflicts that reduce or make the several types of flow impracticable.

It is possible to notice that, in the past decades, the transformations associated with the globalization process impose new displacement patterns that should be carefully studied, even in the Brazilian regions that are peripheral to the country itself, as is the Amazon's case. Thus, it is fitting to thoroughly explore the Amazonian specificities in this transformational context and to better understand what the impacts of this on the migratory movements are.

The information made available by IBGE (2008) has shown itself to be of great worth and importance in order to understand the regional urban nets dynamic, as well as the orientation of recent migratory movements.

Finally, regarding the CI, it is suggested that this indicator be applied in other territorial units in different regional contexts. The incorporation of space in the flow nets studies (migratory, goods and merchandise flows, among others) helps in understanding the new social-spatial configurations that have resulted from the recent transformations in Brazil over the last decades.

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ANNEX

Table A 1 – Legal Amazon – Travel time between the municipal headquarters and the closest cities, with larger population and type of transportation, 2007.

Nome do município	Pop. 2007	Distância (h,m)	Município maior mais proximo	Tipo de transporte
São Gabriel da Cachoeira	39130	85,06	Manaus	b
Eirunepé	29411	67,68	Tefé	b
Santarém	274285	65,03	Macapá	cb
Tabatinga	45293	59,00	Tefé	b
Macapá	344153	50,67	Belém	cb
Barcelos	24567	42,24	Manaus	b
Coari	65222	36,00	Manaus	b
Carauari	25110	29,50	Tefé	b
Manaus	1646602	29,17	Brasilia	cb
Parintins	102044	28,18	Santarém	b
Santo Antônio do Içá	29249	26,00	Tabatinga	b
Nova Olinda do Norte	29184	20,79	Manaus	cb
Belém	1408847	19,18	Fortaleza	c
Tefé	62920	19,00	Coari	b
Borba	31098	18,65	Itacoatiara	b
Breves	94458	17,65	Abaetetuba	b
Porto Velho	369345	17,52	Cuiabá	c
Altamira	92105	16,55	Marabá	c
Cruzeiro do Sul	73948	16,25	Rio Branco	c
São Paulo de Olivença	30727	15,21	Tabatinga	b
Maués	47020	13,71	Parintins	b
Jacareacanga	37073	12,42	Itaituba	c
Novo Progresso	21598	12,06	Guarantã do Norte	c
Manicoré	44327	11,43	Manaus	c
Laranjal do Jari	37491	11,36	Macapá	c
Boa Vista	249853	11,32	Manaus	c
Anajás	24942	10,50	Afuá	b
Itaituba	118194	10,29	Santarém	cb
Cametá	110323	10,26	Marabá	c
São Félix do Xingu	59238	10,06	Redenção	c
São Luís	957515	9,58	Belém	c
Oriximiná	55175	9,52	Monte Alegre	c
Colniza	27882	9,22	Juína	c
Monte Alegre	61350	8,53	Santarém	b
Juína	38422	8,44	Tangará da Serra	c
Imperatriz	229671	8,34	São Luís	c
Cuiabá	526831	8,33	Campo Grande	c
Palmas	178386	8,32	Imperatriz	c
Afuá	31183	8,00	Macapá	b
Oeiras do Pará	25420	7,68	Breves	b
Gurupá	24384	7,56	Porto de Moz	b
Soure	21395	6,51	Belém	cb
Confresa	21361	6,03	Santana do Araguaia	c
Nova Esperança do Piriá	22447	5,74	Capitão Poço	b
Barra do Garças	53243	5,43	Rondonópolis	c
Tarauacá	32171	5,31	Cruzeiro do Sul	c
Alenquer	52661	5,10	Monte Alegre	c
Boca do Acre	29818	5,04	Rio Branco	c
Juruti	33775	5,00	Oriximiná	b

Fonte: Guia 4 rodas e Contagem de 2007. Continua...

Table A 1 – Legal Amazon – Travel time between the municipal headquarters and the closest cities, with larger population and type of transportation, 2007.

Name of the municipality	Pop. 2007	Distance (h,m)	Closest municipality	Type of transportation
Portel	45586	4,62	Breves	b
Porto de Moz	26489	4,56	Almeirim	b
Rorainópolis	24466	4,43	Boa Vista	c
Alta Floresta	49140	4,38	Sinop	c
Ji-Paraná	107679	4,35	Porto Velho	c
Redenção	64583	4,33	Araguaína	c
Machadinho D'Oeste	31475	4,30	Ariquemes	c
Rurópolis	32950	4,26	Santarém	c
Guajará-Mirim	39451	4,22	Porto Velho	c
Autazes	29907	4,17	Manaus	cb
Viseu	53217	4,16	Capanema	c
Muaná	28796	4,15	Abaetetuba	b
Ponta de Pedras	24276	4,12	Belém	b
Carutapera	20285	4,11	Viseu	c
Balsas	78845	4,04	Araguaína	c
Tucuruí	89264	4,02	Marabá	c
Prainha	26436	4,02	Monte Alegre	c
Careiro	31070	4,01	Manaus	cb
Barreirinha	26645	4,00	Parintins	b
Água Azul do Norte	28658	3,55	Redenção	c
Barra do Corda	78718	3,54	Bacabal	c
Bacabal	95124	3,50	São Luís	c
São Bento	37449	3,48	São Luís	c
Itacoatiara	84676	3,46	Manaus	c
Paragominas	90819	3,40	Açailanida	c
Grajaú	54135	3,29	Imperatriz	c
Guarantã do Norte	30754	3,24	Sinop	c
Tangará da Serra	76657	3,23	Várzea Grande	c
Pinheiro	74123	3,15	Santa Inês	c
Gurupi	71413	3,10	Palmas	c
Humaitá	38559	3,08	Porto Velho	c
São Geraldo do Araguaia	24872	3,08	Araguaína	cb
Medicilândia	22624	3,08	Uruará	c
Marabá	196468	3,06	Imperatriz	c
Araguaína	115759	3,06	Imperatriz	c
São Sebastião da Boa Vista	20500	3,00	Curralinho	b
Pontes e Lacerda	37910	2,50	Cáceres	c
Óbidos	46793	2,50	Oriximiná	c
Almeirim	30903	2,50	Laranjal do Jari	cb
Novo Repartimento	51645	2,47	Tucuruí	c
Tucumã	26513	2,47	Água Azul do Norte	c
Curralinho	25388	2,18	Oeiras do Pará	b
Ariquemes	82388	2,09	Ji-paraná	c
Benjamin Constant	29268	1,65	Tabatinga	b
Pontes e Lacerda	37910	2,50	Cáceres	c
Óbidos	46793	2,50	Oriximiná	c
Almeirim	30903	2,50	Laranjal do Jari	cb
Novo Repartimento	51645	2,47	Tucuruí	c
Tucumã	26513	2,47	Água Azul do Norte	c

Source: Guia 4 Rodas 2007. Continues…

Table A 1 – Legal Amazon – Travel time between the municipal headquarters and the closest cities, with larger population and type of transportation, 2007.

Name of the municipality	Pop. 2007	Distance (h,m)	Closest municipality	Type of transportation
Canaã dos Carajás	23757	2,44	Parauapebas	c
Rondonópolis	172783	2,04	Cuiabá	c
Vilhena	66746	2,36	Cacoal	c
Santana do Araguaia	49053	2,36	Redenção	c
Careiro da Várzea	23023	2,34	Manaus	cb
Cáceres	84175	2,34	Várzea Grande	c
Pacajá	38365	2,32	Novo Repartimento	c
Buritis	33072	2,27	Ariquemes	c
Parauapebas	133298	2,26	Marabá	c
Mirassol d'Oeste	24538	2,26	Pontes e Lacerda	c
Baião	26190	2,24	Igarapé-Miri	c
Tailândia	64281	2,02	Abaetetuba	c
Arame	27229	2,17	Buriticupu	c
Presidente Dutra	40004	2,17	Coroatá	c
Colíder	30695	2,16	Sinop	c
Rondon do Pará	45016	2,14	Açailanida	c
Paranatinga	20033	2,13	Primavera do Leste	c
Alcântara	21349	2,12	São Bento	c
Campo Novo do Parecis	22322	2,01	Tangará da Serra	c
Guaraí	21669	2,09	Paraíso do Tocantins	c
Sena Madureira	34230	2,03	Rio Branco	c
Acará	47923	1,58	Santa Isabel do Pará	c
Capitão Poço	50839	1,56	Castanhal	c
Bragança	101728	1,54	Castanhal	c
Limoeiro do Ajuru	23284	1,52	Cametá	c
Cururupu	34018	1,49	Pinheiro	c
Primavera do Leste	44729	1,47	Rondonópolis	c
Buriticupu	61480	1,46	Santa Luzia	c
São Miguel do Guaporé	22622	1,46	Rolim de Moura	c
Turiaçu	32491	1,46	Santa Helena	c
Presidente Figueiredo	24360	1,41	Manaus	c
Amarante do Maranhão	35727	1,41	Imperatriz	c
Alto Alegre do Pindaré	31992	1,40	Santa Luzia	c
Jacundá	51511	1,36	Marabá	c
Peixoto de Azevedo	28987	1,36	Colíder	c
Itapecuru Mirim	54573	1,35	São Luís	c
Xinguara	38457	1,35	Redenção	c
Carolina	24442	1,34	Araguaína	c
Viana	47466	1,33	Santa Inês	c
Pedro do Rosário	21714	1,32	Pinheiro	c
Estreito	26490	1,29	Araguaína	c
Araguatins	25973	1,27	Imperatriz	c
Campo Verde	25924	1,27	Primavera do Leste	c
Colinas do Tocantins	29298	1,25	Araguaína	c
Conceição do Araguaia	45267	1,25	Redenção	c
Santa Helena	34022	1,24	Pinheiro	c
Manacapuru	82309	1,23	Manaus	c
Bequimão	20735	1,22	Alcântara	c
Santa Inês	82026	1,21	Bacabal	c
Tomé-Açu	47081	1,21	Acará	c

Source: Guia 4 rodas 2007. Continues...

Table A 1 – Legal Amazon – Travel time between the municipal headquarters and the closest cities, with larger population and type of transportation, 2007.

Name of the municipality	Pop. 2007	Distance (h,m)	Closest municipality	Type of transportation
Coroatá	60589	1,20	Bacabal	c
Nova Mutum	24368	1,02	Lucas do Rio Verde	c
Ulianópolis	31881	1,19	Paragominas	c
Cacoal	76155	1,18	Ji-paraná	c
Poconé	31118	1,17	Várzea Grande	c
Colinas	35692	1,17	Presidente Dutra	c
Iranduba	32869	1,16	Manaus	cb
Abaetetuba	132222	1,16	Belém	c
Garrafão do Norte	24619	1,16	Capitão Poço	c
Sorriso	55134	1,15	Sinop	c
Rio Preto da Eva	24858	1,12	Manaus	c
Governador Nunes Freire	24012	1,12	Santa Helena	c
Goianésia do Pará	27166	1,10	Jacundá	c
Barra do Bugres	32490	1,09	Tangará da Serra	c
Itupiranga	42002	1,06	Marabá	c
Pedreiras	37984	1,06	Coroatá	c
Feijó	31288	1,05	Tarauacá	c
Salinópolis	37066	1,03	Capanema	c
Bujaru	22535	1,03	Santa Isabel do Pará	c
Jaru	52453	1,00	Ji-paraná	c
Dom Eliseu	38150	1,00	Açailanida	c
Vitorino Freire	30235	1,00	Bacabal	c
Turilândia	20119	0,60	Santa Helena	c
Curuçá	33768	0,58	Castanhal	c
Riachão	21016	0,58	Balsas	c
Eldorado dos Carajás	28554	0,57	Parauapebas	c
Paraíso do Tocantins	40290	0,56	Palmas	c
Rolim de Moura	48894	0,56	Cacoal	c
Lucas do Rio Verde	30741	0,56	Sorriso	c
São Miguel do Guamá	42987	0,55	Castanhal	c
São Domingos do Capim	27094	0,55	Castanhal	c
Jaciara	24945	0,54	Rondonópolis	c
Lago da Pedra	42666	0,53	Bacabal	c
Açailândia	97034	0,52	Imperatriz	c
Zé Doca	45008	0,51	Santa Inês	c
Várzea Grande	230307	0,50	Cuiabá	c
Porto Nacional	45289	0,50	Palmas	c
Bom Jesus das Selvas	23827	0,50	Buriticupu	c
Concórdia do Pará	21422	0,50	Acará	c
Rosário	37920	0,48	São Luís	c
São Domingos do Araguaia	21094	0,47	Marapá	c
Barcarena	84560	0,47	Abaetetuba	c
Ipixuna do Pará	39563	0,47	Paragominas	c
Vigia	43847	0,47	Santa Isabel do Pará	c
Capanema	61350	0,45	Bragança	c
São Mateus do Maranhão	38045	0,44	Bacabal	c
Nova Mamoré	21162	0,44	Guajará-Mirim	c
Maracanã	28296	0,44	Igarapé-Açu	c
Irituia	29746	0,43	Capitão Poço	c
São Domingos do Maranhão	32557	0,42	Colinas	c

Source: Guia 4 rodas 2007. Continues...

Table A 1 – Legal Amazon – Travel time between the municipal headquarters and the closest cities, with larger population and type of transportation, 2007.

Name of the municipality	Pop. 2007	Distance (h,m)	Closest municipality	Type of transportation
Marapanim	26651	0,41	Curuça	c
Santa Luzia	69306	0,40	Santa Inês	c
Anajatuba	23941	0,39	Itapecuru-Mirim	c
Igarapé-Açu	33778	0,38	Castanhal	c
Monção	27558	0,38	Santa Inês	c
Igarapé-Miri	54673	0,36	Abaetetuba	c
Alta Floresta D'Oeste	23857	0,36	Rolim de Moura	c
Vitória do Mearim	30935	0,36	Viana	c
Mocajuba	23258	0,36	Baião	c
Dom Pedro	21479	0,34	Presidente Dutra	c
Icatu	24432	0,34	Rosário	c
Mãe do Rio	27614	0,34	Irituia	c
Castanhal	152126	0,32	Ananindeua	c
Alto Alegre do Maranhão	22002	0,32	Bacabal	c
Pio XII	21821	0,31	Santa Inês	c
Marituba	93416	0,30	Ananindeua	c
Pimenta Bueno	32893	0,30	Cacoal	c
Santa Rita	30882	0,30	Itaperucu Mirim	c
Ouro Preto do Oeste	36040	0,29	Jaru	c
Tocantinópolis	21334	0,29	Estreito	c
Presidente Médici	22197	0,27	Ji-paraná	c
São José de Ribamar	131379	0,26	São Luís	c
Moju	63821	0,26	Abaetetuba	c
Espigão D'Oeste	27867	0,26	Pimenta Bueno	c
Bom Jardim	37659	0,25	Santa Inês	c
Santa Maria do Pará	22147	0,24	São Miguel do Guamá	c
Breu Branco	47069	0,23	Tucuruí	c
Penalva	33473	0,21	Viana	c
Raposa	24201	0,19	Paço do Lumiar	c
Santana	92098	0,18	Macapá	c
Tuntum	37894	0,18	Presidente Dutra	c
Augusto Corrêa	37086	0,16	Bragança	c
Itinga do Maranhão	25100	0,16	Dom Eliseu	c
Tracuateua	26129	0,15	Bragança	c
Santo Antônio do Tauá	24814	0,14	Santa Isabel do Pará	c
Paço do Lumiar	98175	0,13	São José de Ribamar	c
Santa Isabel do Pará	51763	0,13	Marituba	c
Ourilândia do Norte	20415	0,13	Tucumã	c
Senador La Rocque	20793	0,12	Imperatriz	c
Ananindeua	484278	0,11	Belém	c
Matinha	20422	0,09	Viana	c
Arari	27753	0,09	Vitória do Mearim	c
Pindaré-Mirim	30927	0,08	Santa Inês	c
Benevides	43282	0,08	Santa Isabel do Pará	c
Aurora do Pará	21239	0,08	Mãe do Rio	c

Source: Guia 4 rodas 2007.