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ENVIRONMENTAL IMPACT STUDY (EIA-RIMA)

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LD Celulose S/A

Dissolving pulp mill in Indianópolis and Araguari cities, Minas Gerais State

VOLUME II – ENVIRONMENTAL DIAGNOSIS

TOMO III – SOCIOECONOMIC ENVIRONMENT

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8.3 Socioeconomic Environment
8.4 Overall Environmental Quality

Annex

Distribution

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Rev.	Data/Autor	Data/Verificado	Data/Aprovado	Data/Autorizado	Observações

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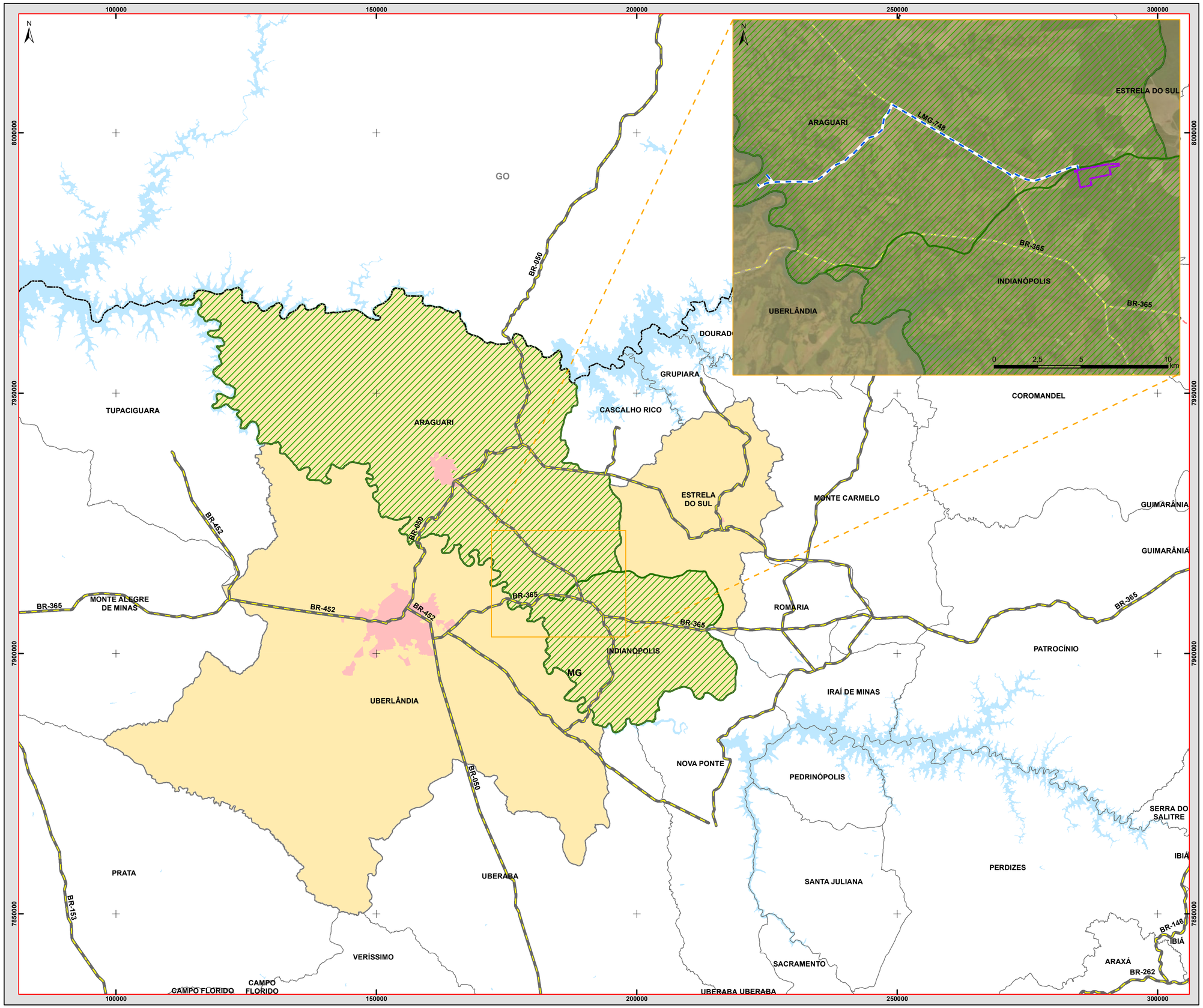
8.3 Socioeconomic Environment

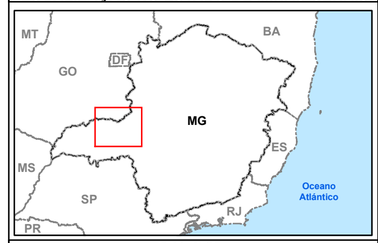
The socioeconomic diagnosis of the anthropic environment aims to describe the characteristics of all aspects associated with economic and socio-environmental issues at the project area of influence, in order to allow the identification of demands and of potential developments for the cities where the project will be installed.

For the socioeconomic diagnosis, it was established that the Direct Influence Area (AID) of the project is composed by Indianópolis-MG and Araguari-MG cities, and the Indirect Influence Area (AII) of the project is composed by Uberlândia-MG and Estrela do Sul – MG cities, as the following figure.

Figure 1 – Direct Influence Area (AID) and Indirect Influence Area (AII) – Socioeconomic Environment



LOCALIZAÇÃO NO ESTADO DE MINAS GERAIS



LEGENDA

- Área Diretamente Afetada - ADA - Área de Implantação da Fábrica
- Linha de Transmissão
- Tubulação 22 km
- Rodovia de Acesso - 5 km
- AID para o Meio Socioeconômico - Municipios de Araguari e Indianópolis
- AII para o Meio Socioeconômico - Municipios de Araguari, Indianópolis, Estrela do Sul e Uberlândia
- Via Pavimentada
- Área Urbana
- Corpo D'água
- Limite Municipal
- Limite Estadual

ESCALA GRÁFICA: 0 5 10 20 30 km

DATUM: SIRGAS 2000 - Fuso 23K
PROJEÇÃO: UTM

REFERÊNCIAS UTILIZADAS:
- Limites Municipais/Estaduais e Hidrografia (IBGE, 2015);
- Área Urbana (IBGE, 2005)
- Vias (DENIT, 2017)

PÖYRY

PROJETO AMADEUS

ESTUDO DE IMPACTO AMBIENTAL

ARAGUARI, ESTRELA DO SUL, INDIANÓPOLIS E UBERLÂNDIA

AII E AID - SOCIOECONÔMICO

ESCALA: 1:500.000	DATA: Outubro/2018		
DESENHO Nº: XXX	FOLHA: 1/1	TAMANHO: A2	
RESP. TÉCNICO:	ASSINATURA:	REV: 0	

8.3.1 Methodology

The socioeconomic diagnosis was based on secondary information collected from official data base research institutions at national, State and municipal level, widely used as support to the analysis and preparation of public policies. The consulted databases were: the Brazilian Institute of Geography and Statistics (IBGE), Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira (INEP-MEC), database of the unified health system (DATASUS), João Pinheiro Foundation (FJP), among other.

In addition to these data, there were made consultations on the available information at official websites of the mentioned institutions, and of the municipal administrations, universities, Tourism Ministry, State Environment Secretariat (SEMAD), Environment Ministry (MMA), the National Institute of Colonization and Agrarian Reform (INCRA), National Department of Transportation Infrastructure (DNIT), National Indians Support Foundation (FUNAI), Brazilian Agricultural Research Corporation (EMBRAPA), other State and municipal institutions, among other social organizations.

8.3.2 Cities Characterization

8.3.2.1 AID Cities Characterization

8.3.2.1.1 Indianópolis

The city is located in the Triângulo Mineiro mesoregion, at the southeastern of Minas Gerais State, as shown in the following figure. It has 830.03 km² area and is located 540 km away from the state capital: Belo Horizonte. The city borders the following cities: Araguari, Estrela do Sul, Nova Ponte, Uberaba and Uberlândia.

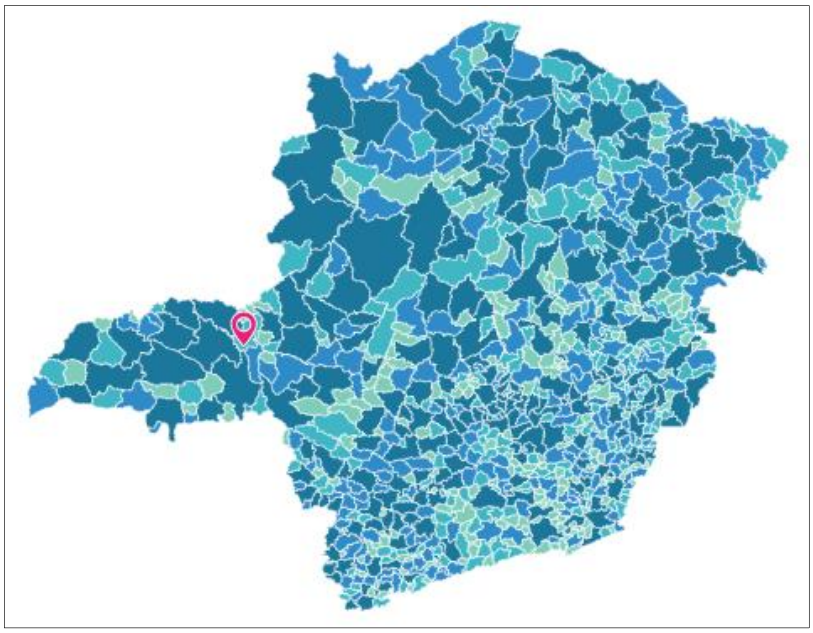


Figure 2 – Indianópolis city location (bookmark in pink). Source: IBGE (2018).

8.3.2.1.2 Araguari

The city is located in the Triângulo Mineiro mesoregion, at the southeastern of Minas Gerais state, as shown in the following figure. It has 2,729.508 km² area and is located 671 km away from Belo Horizonte. It borders the following cities: Estrela do Sul, Tupaciguara, Corumbaíba, Catalão, Cumari, Anhanguera, Cascalho Rico, Indianópolis and Uberlândia.

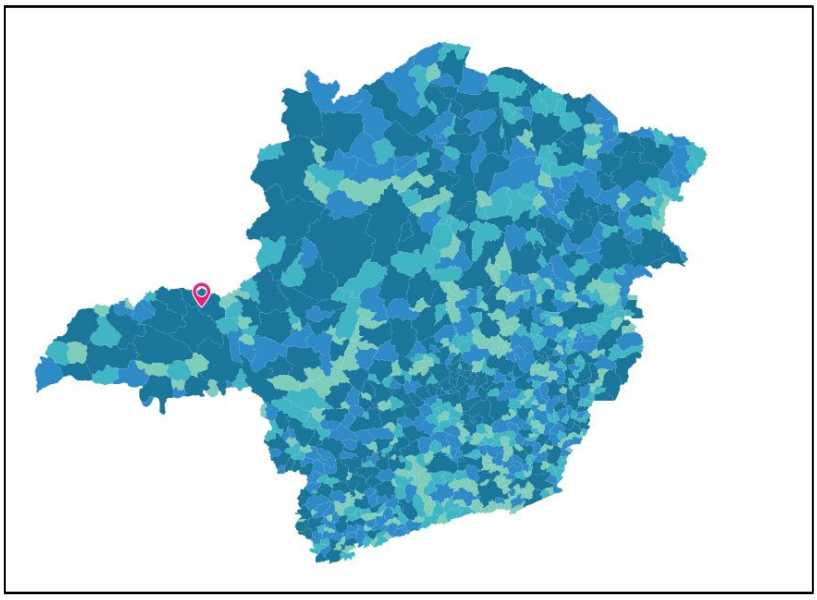


Figure 3 – Araguari city location (bookmark in pink). Source: IBGE (2018).

8.3.2.2 AII Cities Characterization

8.3.2.2.1 Uberlândia

Uberlândia is the second most populous city in the Minas Gerais State. It is located in the Triângulo Mineiro mesoregion, at the southeastern of Minas Gerais state, as shown in the following figure. The city has 4,115.206 km² area and is located at 537 km away from Belo Horizonte. It borders the following cities: Veríssimo; Uberaba; Araguari; Indianópolis; Monte Alegre de Minas; Tupaciguara and Prata.

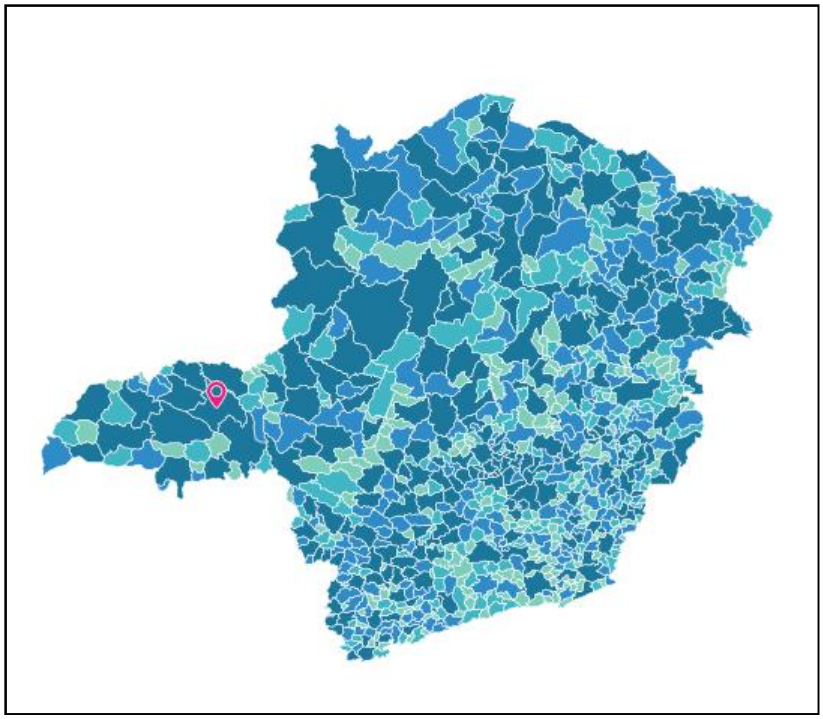


Figure 4 – Uberlândia city location (bookmark in pink). Source: IBGE (2018).

8.3.2.2.2 Estrela do Sul

The city is located in the Triângulo Mineiro mesoregion, at the southeastern of Minas Gerais state, as shown in the following figure. It has 822.454 km² area and is located 520 km away from Belo Horizonte. It borders the following cities: Monte Carmelo, Grupiara, Cascalho Rico, Araguari, Indianópolis, Nova Ponte and Romaria.

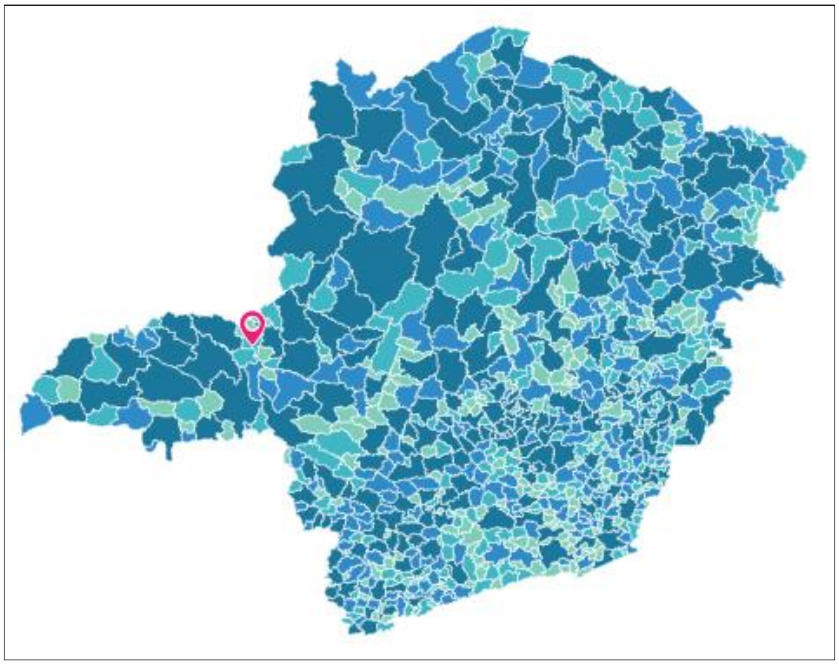


Figure 5 – Estrela do Sul city location (bookmark in pink). Source: IBGE (2018).

8.3.3 Soil Use and Occupation

Araguari soil use and occupation was regulated by law n^{o}. 34 from 2004, which divided the territories into different zones. Indianópolis hasn't yet its soil use and occupation regulated, however it has been compiled data during preparation of the ecologic-economic zoning of Minas Gerais (ZEE-MG) which structured in a geographic information system using spatial matrix data model, also known as raster, available at Minas Gerais environmental website by the Environment and Sustainable Development State Secretary - SEMAD.

The following figure presents the soil use and occupation map of the studied region.

Figure 6 – Soil Use and Occupation Map

100000
150000
200000
7950000
7900000
7850000
N

GO
MG
TUPACIGUARA
ARAGUARI
CASCALHO RICO
GRUPIARA
DOURADOQUARA
ABADIA D
DOURADO
ESTRELA
DO SUL
MONTE CAR
ROMARIA
IRAÍ DE I
INDIANÓPOLIS
UBERLÂNDIA
MONTE ALEGRE
DE MINAS
PRATA
MG02634
PEDRINÓPOLIS
NOVA PONTE
SANTA JULIAN
UBERABA

Área de
Implantação
da Fábrica

LOCALIZAÇÃO NO ESTADO DE MINAS GERAIS

LEGENDA

- Área Diretamente Afetada - ADA - Área de Implantação da Fábrica
- AID para o Meio Socioeconômico - Municipios de Araguari e Indianópolis
- AII para o Meio Socioeconômico - Municipios de Araguari, Indianópolis, Estrela do Sul e Uberlândia
- Limite Municipal
- Limite Estadual

Uso e Ocupação do Solo

- Área Antropizada (Pastagens/Agricultura)
- Campo
- Cerrado
- Corpo D'água
- Reflorestamento
- Floresta estacional semidecidual montana
- Floresta estacional semidecidual sub montana
- Área Urbana
- Vereda

ESCALA GRÁFICA:
0 5 10 20 km

DATUM: SIRGAS 2000 - Fuso 23K
PROJEÇÃO: UTM

REFERÊNCIAS UTILIZADAS:
- Limites Municipais/Estaduais e Hidrografia (IBGE, 2015);
- Uso e Ocupação do Solo (SISEMA, 2009)

PROJETO AMADEUS

PÖYRY

ESTUDO DE IMPACTO AMBIENTAL

ARAGUARI, ESTRELA DO SUL, INDIANÓPOLIS E UBERLÂNDIA

USO E OCUPAÇÃO DO SOLO

ESCALA: 1:350.000	DATA: Junho/2018		
DESENHO Nº: XXX	FOLHA: 1/1	TAMANHO: A2	
RESP. TÉCNICO:	ASSINATURA:	REV: 0	

8.3.4 Cities Occupation History

8.3.4.1 AID Cities Occupation History

8.3.4.1.1 Indianópolis

The current Indianópolis city was originated from the primitive Santana do Rio das Velhas village, founded around 1750, by Antônio Pires de Campos Colonel, after expelling the caiapó Indians of the region. The indigenous village domain, entrusted to the Jesuits, soon was delivered to the bororós Indians.

The Jesuits were persecuted and expelled of the area, but the Indians soon lost their land to the “white” people.

The settlement grew and, in 1840, it was elevated to parish area, with the name of Freguesia dos Índios da Aldeia de Santana do Rio das Velhas.

It became district of Araguari in 1882, elevated to city area in 1938, with the name of Indianópolis.

Source: IBGE (2018).

8.3.4.1.2 Araguari

The region was initially ruled by Bartolomeu Bueno da Silva, ‘the Anhanguera’, who aimed to reach Goiás state.

The Triângulo was inhabited by the Caiapó Indians; they often prepared ambushes to ‘white invaders’, thus harming the communication between Goiás province and São Paulo. In order to solve such problem it was organized, in 1748, a great expedition, composed mainly by ‘meek Indians’, to expel the Caiapó people; and they were subsequently housed in 18 villages along the Anhanguera road (which crossed the whole region, linking São Paulo to Goiás).

In this context, Araguari occupation history dates back to the early 19th century, when Antônio Resende Costa, the so called ‘Major do Córrego Fundo’, Commissioner of Allotment at Triângulo region, demarcated, among others, the Sesmarias do Serrote (nowadays being Fundão) and Pedra Preta Allotment (nowadays being Cunhas), beginning the current municipality of Araguari.

The Major took land possession, also of a terrain between the two Allotments, donating they, later, to the Church as the parish heritage which established there, under the Ventania invocation. This was the first step towards the construction of the village. Around the new parish headquarter the inhabitants of Brejo Alegre were concentrated. The traditional religious Church festivals attracted pilgrims from nearby farms.

The evolution and the urban development of the Brejo Alegre town was slow, natural and unsystematic.

Source: IBGE (2018).

8.3.4.2 AII Cities Occupation History

8.3.4.2.1 Uberlândia

Triângulo Mineiro region discovery - also known as Sertão da Farinha Podre – and its settlement were intrinsically linked to the gold cycle in Brazil.

The scarcity of ores in the gold regions 'Geraes' caused the population dispersion to other areas. In the colony times, this Triângulo area was configured as metals supplier and foothold to ores migrants to Brazil Center-West, supplying them, also with foodstuff.

With the mining decline, there was the population influx to the region. Despite that, there were still remained areas called "empty region". These received incentives of settlement by the metropolis when creating the Imperial Law n^{o}. 514 from 1530, relating the land grants amounts for colonization.

Motivated by land grants, Pathfinder expeditions began to move to this region of the Triângulo Mineiro seeking for land tenure.

According to the manuscripts ceded by descendants of Sir João Pereira, the first land tenure began in 1817 and not in 1818 as believed. In the manuscripts there are reports of three families who left Paraopeba, near Vila Rica in order to delimit their allotments, which were: the brothers Caetano and José Alves Rezende with their families, including their brother-in-law João Pereira da Rocha; and a friend called Francisco Rodrigues Rabello, who also brought his family.

Caetano Alves Rezende settled in the area belonging to Uberaba municipality, which called Boa Esperança do Rio Claro Allotment. The copy of Francisco Rodrigues Rabello Allotment Letter, constant in these writings, indicates that it was the same area named as Ribeirão da Rocinha Allotment. But the absence of detailed description about the situation in this land caused the inaccuracy of the municipality area.

The third land possessor, José Alves Rezende, had João Pereira da Rocha as one of the land constraints, whose mark was a stream which in this region received the name of córrego da Divisa. Its area was called Sesmaria Monjolinho. All these demarcations and land tenure occurred in 1817, although the document of possession record has been made between 1820 and 1821.

According to João Pereira da Rocha, after having traversed the region with his brothers-in-law, he returned to Fazenda Rocha in Cachoeira do Campo searching for his family – wife and eleven children. This time he went back to the old way with his family and slaves carrying their belongings in the back of donkeys. This, however, already took place in 1818.

During the exploration walk and knowledge of his allotment, João Pereira named certain areas and streams that later became names of farms or region, such as Fazenda da Estiva, because there was handled the access path to the pasture; the stream on which they settled during Saint Peter's day received the name of this Saint and nearby there was left installed a couple of Lagoinha family's slaves.

Names until today known as Letreiro, which was the name given by Francisco Alves Pereira to the area that pleased him on the pathway where he left his initials on the trunk of a tree called pau-terra, and so on, the capons that he named Marimbondo;

Tenda, where he raised a Ranch pau-a-pique (covered with grass) and installed a blacksmith tent; the stream named by Córrego do Salto whose proximity was the seat of the Fazenda do Salto, as well as many others, and finally, the area they reached on 04th October 1818, San Francisco's day, which was given name to the known Fazenda São Francisco de Assis.

Ricardo Gonzaga dos Santos and João Vermelho also came as land possessors of Sesmarias "Rocinha" and "Registro". There were also the Cabral de Menezes that lodged in the point named watering hole. These residents had the habit of hunting for consumption and to facilitate and eliminate the dangers they armed rustic wood on forks tied with vine, which took the form of a loft ('sobrado'), resulting the local name as: Sobradinho farm.

According to the document, when it was built the Letreiro farm headquarters, Francisco Alves Pereira, needing specialized men in fittings for bull cars, he heard the news that Campo Belo do Prata knew the business, and went to look for them. It was then that he met the family Carrejo, which counted with excellent professionals. Francisco made a good relationsheep with some members of this family by combining the sales of land in good conditions, facilitating their coming to the region. They were transferred bringing their wives and children, some slaves, pets and appreciable amount of food, seeds and agricultural tools.

They acquired the land from José Diogo da Cunha and part of the João Pereira da Rocha lands. Luís Alves Carrejo, owner of greater extension area, in order to balance the units between them, he facilitated the acquisition of his excesses lands by smaller shareholders. He got part of what is today the Olho D'Água farm.

Francisco Alves Carrejo claimed for Fazenda Laje, Felisberto settled on the farm of Tenda; Antonio Alves Carrejo took the area named Marimbondo.

At this time there was a large village on the banks of the córrego São Pedro do Uberabinha, initiated by the slaves left there by João Pereira da Rocha and other families that came in to work in the crops of São Francisco Allotment.

These families used woods in the construction of their ranches, near waterholes, at the site known as Fundinho. To comfort all of them, Francisco Alves Pereira with his relatives and friends, built a ditch that started at the waterfalls of São Pedro stream, at the right side, that ran with abundance water, along the current Rio Branco Avenue, until reaching the Fundinho village.

The chapel was inaugurated in 1853 with the celebration of the first mass and had its surroundings reserved for "campo santo", i.e. the first cemetery of the city. Five years later, it was elevated to main church. The old part of the chapel became the sacristy. At that time, the Freguesia already had approximately 3,000 parishioners, which required an enlargement of the temple. This church existed until 1943, when it was demolished by the city mayor called Vasconcelos Costa, to build in place the old bus station that functioned in the current Municipal Public Library building.

Four years after the Chapel construction, in order to give legal form to the land acquired in consent to the twenty-one owners, the prosecutors promoted the Division and demarcation of that Heritage to the municipal judge of Uberaba, in October 1857,

the camp already named as Nossa Senhora do Carmo and São Sebastião da Barra de São Pedro de Uberabinha.

At that time, Ms. Custódia Fernandes dos Santos (Luiz Alves Pereira wife) and others, have donated 12 bushels of their property terrain in Campo Alegre till Nossa Senhora da Abadia, in the Sao Pedro de Uberabinha village, already populated by their slaves. This site is still today known as the Abadia's Heritage.

Source: IBGE (2018).

8.3.4.2.2 Estrela do Sul

Triângulo Mineiro and Alto Paranaíba region occupation took place between 1722 and 1925, with the Anhanguera road opening by the 'bandeirantes'[1], linking São Paulo to the Central of Brazil called 'Planalto Central'. It was during this foray that, in 1722, the Bandeirante João Leite da Silva Ortiz, found the first diamond in the Bagagem River, where originated Estrela do Sul city.

The first donated allotments in this area were granted in 1818, to father Fortunato José de Miranda and Manoel Dias da Rocha, but during the first half of the 19th century, the region was a place of mining camp.

At the beginning of the Brazilian colonization, the Triângulo Mineiro area, at that time known as Sertão da Farinha Podre, was inhabited by Indians (mostly the Caiapós people). Most of these Indians were nomadic and moved in the neighborhood, with no fixed home, changing from time to time in search of hunting and fishing. This nomadic life was understood as a defense strategy, both in relation to animals hunting as to hide from the enemy tribes. The Defense was easier in forests, mountains and caves environments for sheltering and offering better hiding conditions than in the natural region ecosystem Cerrado open areas. These indigenous life characteristics indicate little natural environment transformation evidence, which, at that time, was practically insignificant.

When the bandeirantes and the colonizer farmers arrived, the Indians ran away searching areas without white man presence, and without the changed natural environment. Thus, the Indian escape, also justifies the bandeirantes enter into the hinterland. According to Holanda (1997), this hinterland entry occurred in function of this Indians capture attempt. As a way to solve the livelihood problem, the pioneers hided in the hinterlands, making the clearance of territories a profession for teenagers, both for the imprison expeditions as for hinterland clearance in General.

The Sertão da Farinha Podre, comprised all the lands located between the rivers Quebra Anzol, das Velhas, Grande and Paranaíba, it belonged at first to São Paulo captaincy, then, to Goiás captaincy, and, only in 1816, they went to Minas Gerais domain.

[1] Bandeirantes were mainly men from São Paulo who acted in the capture of fugitive slaves, imprisonment of indigenous and other related tasks. They also acted in search of precious stones and metals in the interior of Brazil. They were always armed and used violence in capturing Indians and fugitive slaves. The pioneers bandeirantes were responsible for clearance of the Brazilian territory.

Until the early 18th century, the region lands didn't awake interest for the bandeirantes, because, geographically, they didn't offer guarantees to find metals and precious stones. Only after the intention of clearing the countryside in search of existing riches elsewhere, is that those lands began to be passages of the expeditions through the region.

The first bandeirante who passed through the Sertão da Farinha Podre was Bartolomeu Bueno da Silva — the Anhanguera. In 1722, his son, Bartolomeu Bueno da Silva Jr. — the Anhanguera II —, following orders from the colonial Government to find the gold mines, left Piratininga with a group composed by whites, Indians and slaves people, adding up to 152 people in total, and it was when the route clearing started that gave rise to the first settlements of the Triângulo Mineiro region. It was in charge of this group, that the pioneer did a course with hikers up the banks of the Jeticaí — Rio Grande, and crossed the mouth of the do Carmo river until reaching the opposite bank, the Sertão da Farinha Podre.

Subsequently to Anhanguera, with the discovery of precious stones in the interior of Goiás and Mato Grosso and, consequently, with the successive passages of bandeirantes and people by the region, towards the country interior, from São Paulo and coastal cities, looking for richness, the formation of festivals in the Sertão da Farinha Podre began. The Real Road name of the crossing area at that time, conditioned the formation of multiple and small festivals like Desemboque, Sacramento, Uberaba and Uberlândia, among others. In the words of Soares, these festivals constituted a passage point between the coast and the hinterland.

Thus, by farming and mining, the farms have had a fundamental role in the historical process of urban agglomerations formation in the interior of Brazil. The first farms had their formations from the Allotment system and, later, with the land tenure by relatives and people who came together to take possession of land. The proportions of appropriated lands were large and with difficult access and regulated by the owners. In 1795, on the basis of the License land demarcation, it became mandatory the demarcation of these lands, with the aim of solving problems between Allotment owners and squatters.

The Allotment system ended in 1822, but even so, many people still took possession of their land during and after this period. It was in this context that several municipalities in the Triângulo Mineiro region were developed; it started between the Allotment system, to the Indian's capture, livestock and the decline of gold and precious stones exploitation in the interior of the country.

The urbanization process has only been intensified from 1852, when it was discovered the famous ″Estrela do Sul″ diamond. In the same year it was created the District of Paz in the Arraial da Bagagem belonging to the region of Patrocínio, by law n^{o}. 575 from May 4th.

In 1854 the curate was elevated to parish category by law n^{o}. 667 from April 27th. By law n^{o}. 777 from May 30th 1856, the district was elevated to Village, with the name of Bagagem, installed on September 30th 1858.

Due to the large place growth, in 1861, the Vila de Bagagem village was elevated to the category of city, by law n^{o}. 1101 from September 19th. It was at this time that the city reached a population of approximately 30,000 inhabitants. However, it was

noticed that this population was directly linked to the mining camp, presented significant turnover in search of diamonds and resided in improvised shelters, which were lost in time.

Around XIX century, the city exercised a fascination in the region which translated into a large population and also an ideological-political influence over much of the Triângulo Mineiro region. This reinforces the importance and expression already exerted by the municipality in the region and that, nowadays, it has been trying to recover the political influence.

Source: IBGE (2018).

8.3.5 Population Characterization

8.3.5.1 Population Growth

The population growth in Minas Gerais State and in the municipalities under study is presented in the following table.

Table 1 – Resident and growth population

State and Municipalities	Resident population (inhabitants)			Growth (%)	
	2000	2010	2017[1]	2000-2010	2010-2017[2]
Minas Gerais	17.891.494	19.597.330	21.119.536	9,53%	7,77%
Indianópolis	5.387	6.190	6.806	14,91%	9,95%
Araguari	101.974	109.801	117.445	7,68%	6,96%
Uberlândia	501.214	604.013	676.613	20,51%	12,02%
Estrela do Sul	6.883	7.446	7.981	8,18%	7,19%

Source: IBGE (2018). [1]IBGE – Population Estimation. [2]Calculated from the population estimation and the area.

The State of Minas Gerais has an estimated total population of 21,119,536 (2017), being that this population had 7.77% growth during the period from 2010 to 2017.

Among the studied municipalities, Uberlândia had the largest population increase, which occurred in the period from 2000 to 2010.

Uberlândia city presents the largest population with 676,613 inhabitants, followed by Araguari (with 117,445 inhabitants), Estrela do Sul (with 7,981 inhabitants) and Indianópolis (with 6,806 inhabitants).

8.3.5.2 Age Composition

The age composition assessment through the pyramid is used, not only to monitor the sex and age structure, but as a complement to the life quality studies, since it is possible to see the average life time, the mortality rate and the regularity or not, of the

population over time. The higher the pyramid, greater life expectancy and, consequently, there will be better living conditions for that population. It is possible to notice that the more economically and socially developed countries, have their pyramid form closest to a rectangle.

The following table presents the total population by age group, and in the following figures there are presented the age pyramids of Minas Gerais State and municipalities under study.

Table 2 – Resident population by age group

State and Municipalities	Age Group	Population (people)		Population growth (%)	
		2000	2010	2000	2010
Minas Gerais	Less than 15 years old	5.077.523	4.423.188	28,4	22,6
	From 15 to 60 years old	11.704.109	13.582.593	65,4	69,3
	60 years old or more	1.109.862	1.591.549	6,2	8,1
Indianópolis	Less than 15 years old	1.685	1.526	31,28	24,65
	From 15 to 60 years old	2.999	4.043	55,67	65,32
	60 years old or more	414	621	7,69	10,03
Araguari	Less than 15 years old	26.199	22.440	25,69	20,44
	From 15 to 60 years old	65.838	72.987	64,56	66,47
	60 years old or more	9.946	14.374	9,75	13,09
Uberlândia	Less than 15 years old	130.935	125.589	26,12	20,79
	From 15 to 60 years old	332.707	416.750	66,38	69,00
	60 years old or more	37.572	61.674	7,50	10,21
Estrela do Sul	Less than 15 years old	1.857	1.641	26,98	22,04
	From 15 to 60 years old	4.314	4.869	62,68	65,39
	60 years old or more	712	936	10,34	12,57

Source: IBGE (2018).

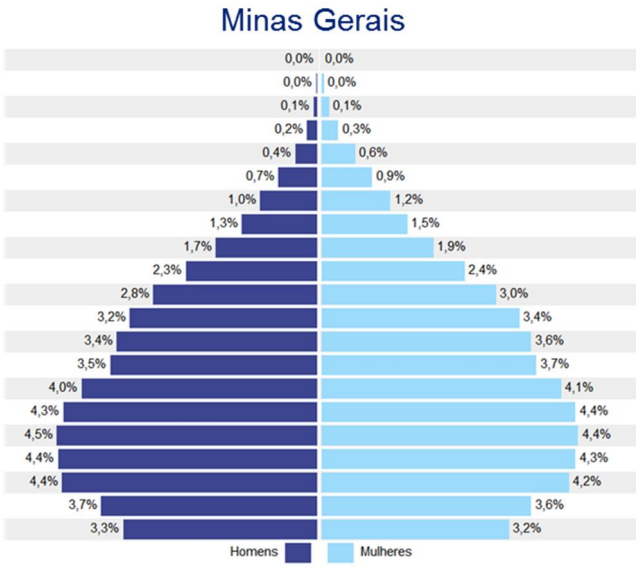


Figure 7 –Minas Gerais Age Pyramid, 2010. Source: IBGE (2018).

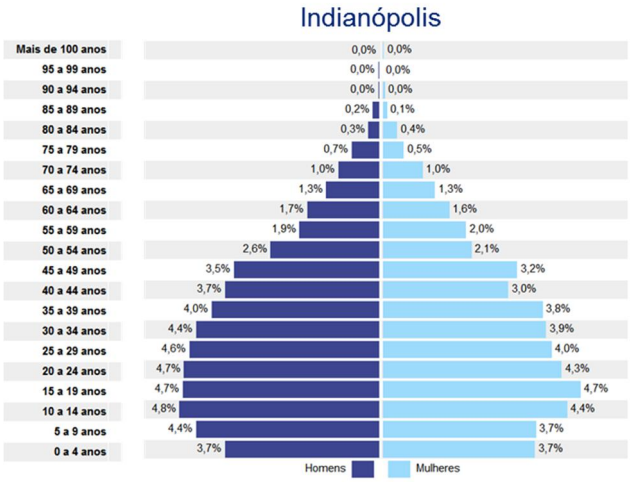


Figure 8 – Indianópolis city Age Pyramid, 2010. Source: IBGE (2018).

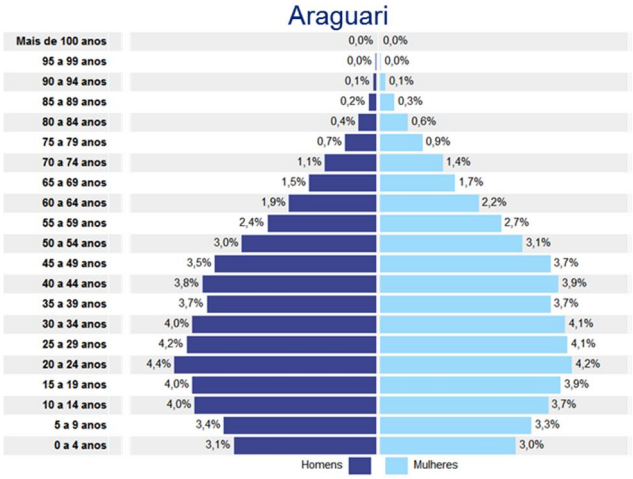


Figure 9 – Araguari city Age Pyramid, 2010. Source: IBGE (2018).

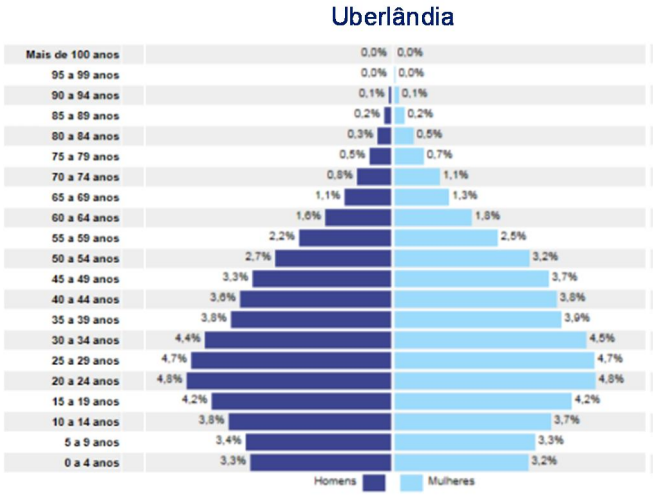


Figure 10 – Uberlândia city Age Pyramid, 2010. Source: IBGE (2018).

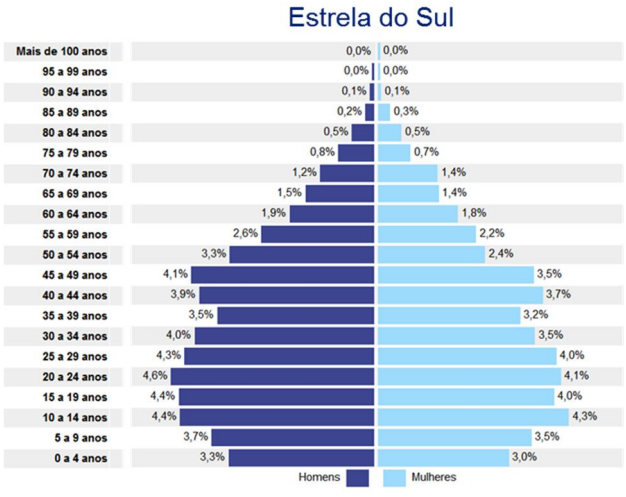


Figure 11 – Estrela do Sul city Age Pyramid, 2010. Source: IBGE (2018).

Minas Gerais State age group presented in the above table, presents most of the population ranging from 15 to 64 years old (69.3%). The basis of the pyramid is wide and the top is narrow, indicating a younger and more economically active population. The elderly population is reduced due to the unfavorable conditions offered as life quality by Minas Gerais and by Brazil.

In the municipalities under study it is noted the Age Pyramid resemblance with the Minas Gerais State. The basis of the pyramid is wide, which indicates that the population is young, and economically active, where in the municipalities average, 66.6% people have between 15 and 64 years old. This characteristic is important for the economy because it reflects the potential of manpower to the productive sector.

People from 50 years old, the pyramid narrows indicating a reduction of population in that age group. The population over 65 years old represents a small portion of the Minas Gerais population, only 8.1%, while the average of the studied cities is represented by 11.5%.

8.3.5.3 Gender Composition

Minas Gerais State and the municipalities under study resident population gender composition was evaluated through IBGE data from 2000 and 2010 and are presented in the following table.

Table 3 – Resident population by gender

State and Municipalities	Gender	Resident population (people)		Resident population (%)	
		2000	2010	2000	2010
Minas Gerais	Male	8.851.587	9.641.877	49,5	49,8
	Female	9.039.907	9.955.453	50,5	50,2
Indianópolis	Male	2.853	3.231	53,0	52,2
	Female	2.534	2.959	47,0	47,8
Araguari	Male	50.766	54.160	49,8	49,3
	Female	51.217	55.641	50,2	50,7
Uberlândia	Male	245.701	294.914	49,0	48,8
	Female	255.513	309.099	51,0	51,2
Estrela do Sul	Male	3.599	3.899	52,3	52,4
	Female	3.284	3.547	47,7	47,6

Source: IBGE (2018).

In the Minas Gerais State, the majority of the population is composed by women with 50.2% (2010). Compared with the year 2000, there was an increase in the percentage of women, who were a minority and became majority in 2010.

Among the studied municipalities, the average majority of the population in 2010 was composed by men, with a ratio close to 51%.

8.3.5.4 Population Distribution

The population of a particular city, State or country is distributed in the territory in urban and rural regions. In Brazil, data from 2015, shows that 84.7% of the population were concentrated in urban areas. There was in the country a great migratory movement from the countryside to cities searching of better work and life conditions. In the following table and figure there are presented the population distribution data of the Minas Gerais State and of the municipalities under study.

Table 4 – Population distribution

State and Municipalities	Type	2000		2010	
		Inhabitants	%	Inhabitants	%
Minas Gerais	Urban	14.671.828	82,0	16.715.216	85,3
	Rural	3.219.666	18,0	2.882.114	14,7
Indianópolis	Urban	3.204	59,5	4.056	65,5
	Rural	2.183	40,5	2.134	34,5
Araguari	Urban	92.748	91,0	102.583	93,4
	Rural	9.226	9,0	7.218	6,6
Uberlândia	Urban	488.982	97,6	587.266	97,2
	Rural	12.232	2,4	16.747	2,8
Estrela do Sul	Urban	5.040	73,2	6.057	81,3
	Rural	1.843	26,8	1.389	18,7

Source: IBGE (2018).

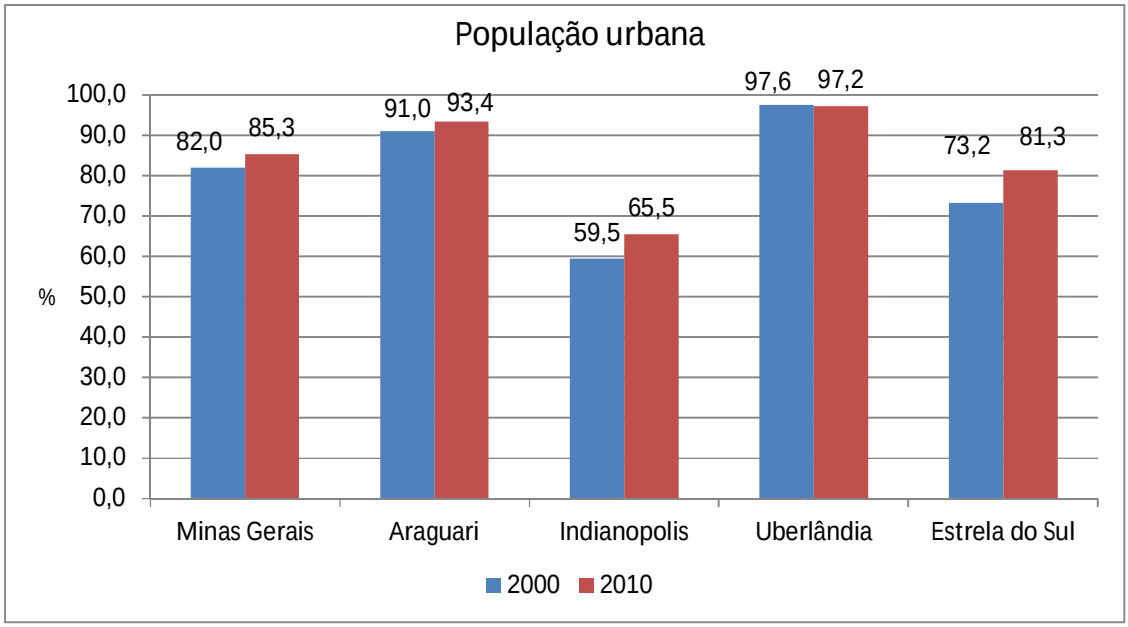


Figure 12 – Urban population. Source: Atlas Brasil (2018).

In 2010, more than 85.3% of the Minas Gerais population lived in urban areas, following the same trend presented in Brazil. Between 2000 and 2010, there was growth of the State urban population from 82.0% to 85.3%.

Among the studied municipalities, in 2010 all presented urban population above 65%. It is observed that Araguari (93.4%) showed the highest degree of urbanization superior even from Minas Gerais State (85.3%).

Indianópolis municipality presented the lowest degree of urbanization (65.5%) among the studied municipalities.

Between 2000 and 2010 there was a slight decrease of the urban population in Uberlândia city, from 97.6% to 97.2%.

8.3.5.5 Demographic Density

The demographic density is expressed by the ratio of the population from a certain area and its total area aiming to demonstrate population concentrations in the territory.

The increase of a municipality population increases the demographic density. The demographic density growth in most populous municipalities can be exemplified by the construction of vertical buildings. In this type of building there is a greater concentration of people per area.

Minas Gerais State and the municipalities under study demographic density is presented in the table and figure below.

Table 5 – Resident population and demographic density

State and Municipalities	Area (km²)	Resident population (inhabitants)			Demographic density (inhab/km²)		
		2000	2010	2017[1]	2000	2010	2017[2]
Minas Gerais	598.519,73	17.891.494	19.597.330	21.119.536	30,46	33,41	35,29
Indianópolis	830,03	5.387	6.190	6.806	6,49	7,46	8,20
Araguari	2.729,5	101.974	109.801	117.445	37,36	40,23	43,03
Uberlândia	4.120,92	501.214	604.013	676.613	122,1	146,7	164,4
Estrela do Sul	822,454	6.883	7.446	7.981	8,37	9,05	9,70

Source: IBGE (2018). [1]IBGE – Population Estimation. [2]Calculated from the population estimation and the area.

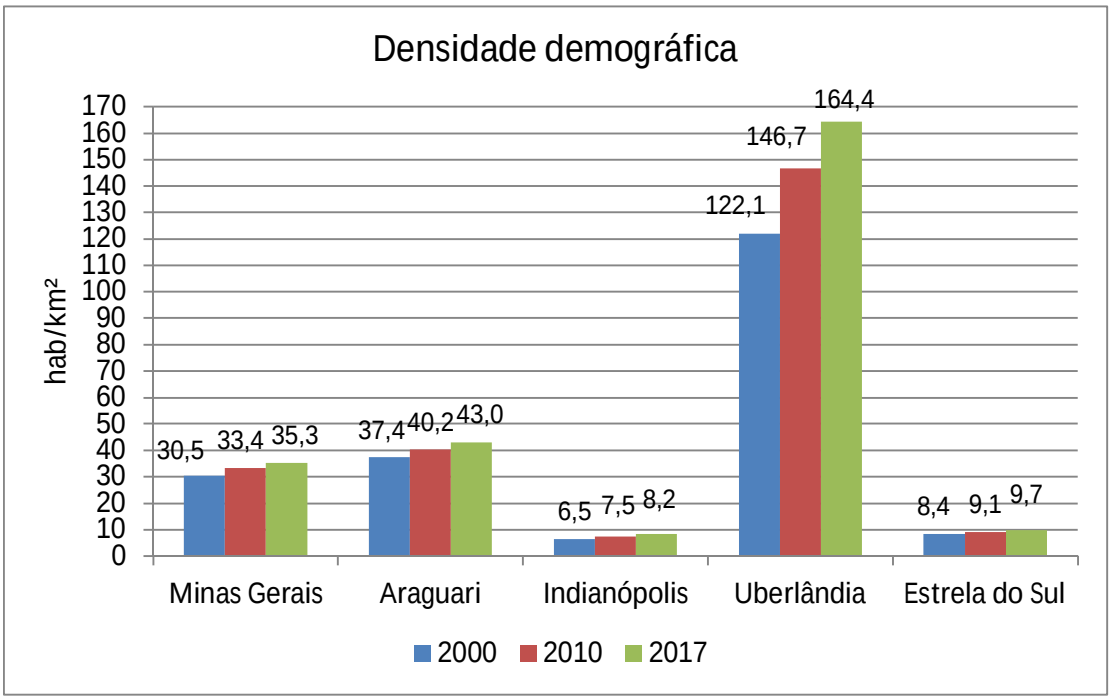


Figure 13 – Demographic density. Source: IBGE (2018).

In the State of Minas Gerais and in all municipalities under study there was growth of demographic density between 2000 and 2017. This fact is due to the higher density of the population in these locations. Consequently, there has also been growth in demographic density.

In 2017, the estimated demographic density of Minas Gerais was 35.29 inhabitants/km². Araguari and Uberlândia municipalities presented 43.04 and 164.4 inhabitants/km^2 of the demographic density respectively, which are greater than the

State value. In the other studied cities, the estimated demographic density was lower than the State value, Indianópolis presents the smallest value with 8.20 hab/km ².

The demographic density is related to the resident population and the area of the city or the State, i.e. the demographic density grows in proportion to population growth.

8.3.5.6 Child Mortality

The child mortality rate is calculated from the number of children in a particular region (city, region, country, continent) who died before completing 1 year old, per thousand baby born alive. The Brazil has advanced in combating child mortality, besides improving the public health system, various public policy was designed for newborns and their mothers contributing to this rate reduction.

The following table and figure presents the child mortality rate data of the studied municipalities.

Table 6 – Child mortality rate

Municipalities	Child mortality rate (deaths per thousand births alive)		
	1991	2000	2010
Indianópolis	29,9	21,8	15,2
Araguari	21,9	18,0	11,7
Uberlândia	23,1	20,0	10,7
Estrela do Sul	27,7	20,5	14,7

Source: PNUD (2018).

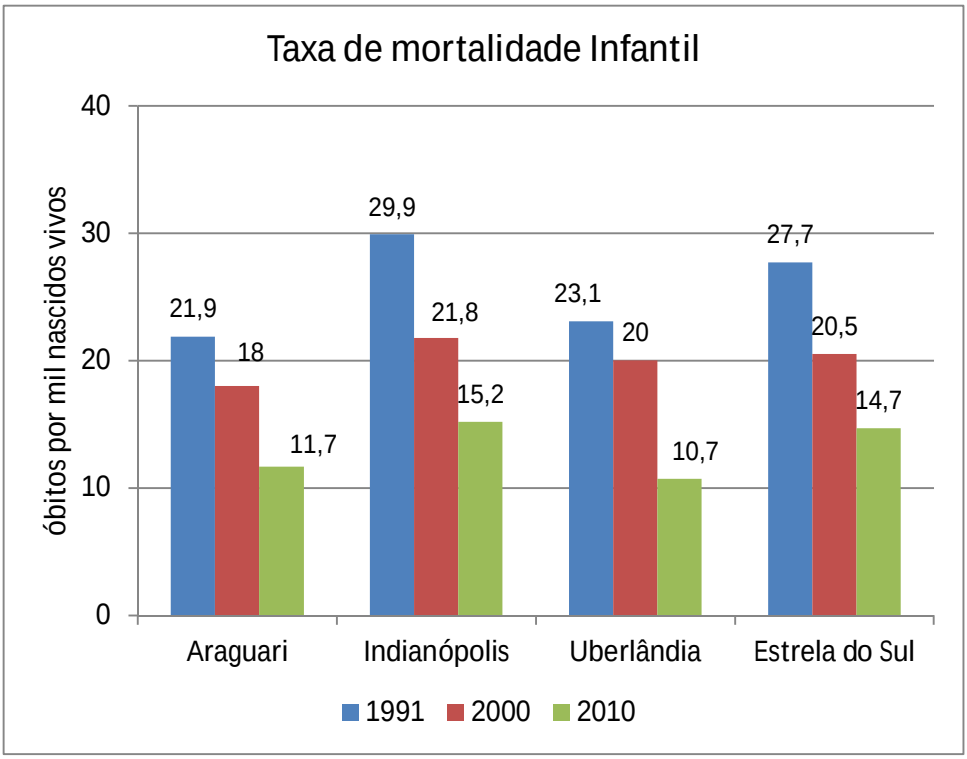


Figure 14 – Child mortality rate. Source: PNUD (2018).

Minas Gerais child mortality rate went from 27.75 deaths per thousand births alive in 2000, to 15.08 deaths per thousand births alive in 2010.

In the studied municipalities, there was a great reduction of the child mortality rate in Araguari, Uberlândia and Estrela do Sul which presented in 2010 rates lower than that of Minas Gerais being 11.7, 10.7 and 14.7 deaths per 1,000 births alive, respectively.

Indianópolis presented 15.20 rate deaths per thousand births alive in 2010, larger than the State of Minas Gerais, however it was also observed great reduction of the child mortality rate from 2000 to 2010.

8.3.5.7 Human Development Index (IDH)

The human development index (IDH) is a measure to summarize the human development in long-term progress within three basic dimensions: income, education and health. The purpose of the IDH creation was to offer a counterpoint measure to another much-used indicator: the gross domestic product (GDP) per capita, which considers only the economic dimension development. Created by Mahbub ul Haq in collaboration with the Indian economist Amartya Sen, winner of the Economics Nobel Prize in 1998, the IDH aims to be a general and synthetic measure that even broadening the perspective on human development, it does not cover neither exhaust all development aspects (PNUD, 2017).

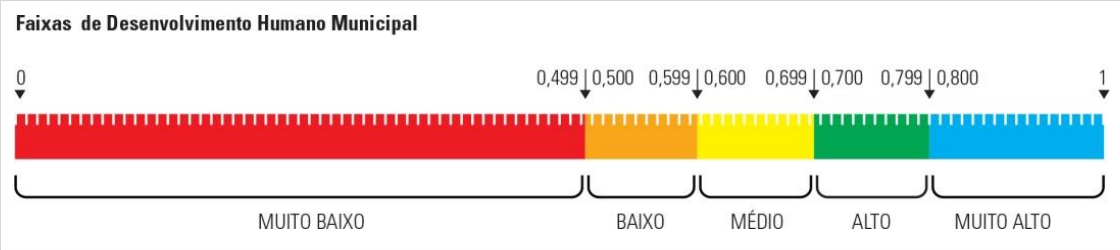
In 2012, PNUD Brazil, IPEA and Fundação João Pinheiro took up the challenge of adapting the Global IDH methodology to calculate the IDH Municipal (IDHM) of the

5,565 municipalities in Brazil. This calculation was performed from the three recent IBGE data Demographic Census (1991, 2000 and 2010) information and according to the existing municipalities in 2010. This was the most difficult requirement for the inter-temporal comparability purpose, thorough compatibility work of the existing municipalities in 1991 and 2000 to the ones in 2010. After the Brazilian municipalities IDHM, all three institutions have taken on a new challenge of calculating IDHM into metropolitan regions level of the country – this time, for the Human Development Unit (UDH).

The Brazilian IDHM considers the same three dimensions of the Global IDH-longevity, education and income, but goes beyond: the global methodology is suited to the Brazilian context and to the national indicators availability. Although they measure the same phenomena, the indicators taken into account IDHM are best suited to assess the cities and metropolitan regions development in Brazil.

The IDHM calculation methodology involves three main themes of long and healthy life, access to knowledge and standard of living, as shown in the following figure.

The IDHM is a number that varies between 0 and 1. The closer it gets to 1, the greater the human development of a federal unit, municipality, region or UDH.



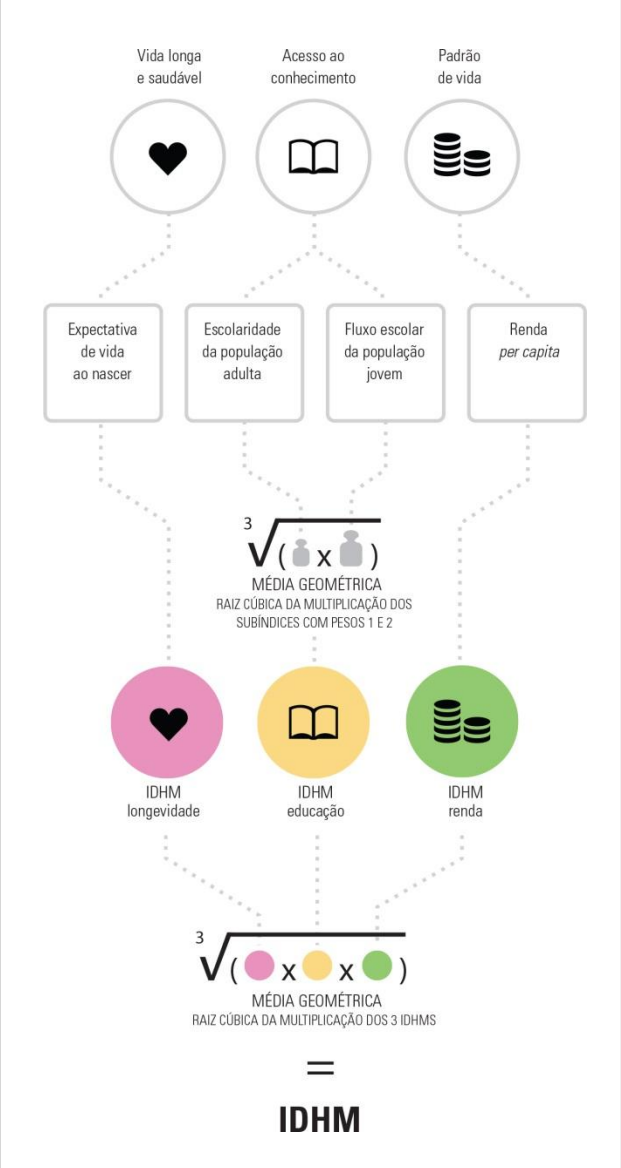


Figure 15 – IDHM calculation methodology scheme.

In the following table and figure are presented the IDH of Minas Gerais State and IDHM Municipal of the studied cities in 2000 and 2010.

Table 7 – Human Development Index

State and Municipalities	2000	2010	IDH classification by range (2010)	Ranking of the MG cities (2010)
Minas Gerais	0,624	0,731	High	-
Indianópolis	0,573	0,674	Medium	400º
Araguari	0,673	0,773	High	13°
Uberlândia	0,702	0,789	High	3°

State and Municipalities	2000	2010	IDH classification by range (2010)	Ranking of the MG cities (2010)
Estrela do Sul	0,581	0,696	Medium	248º

Source: IBGE (2018).

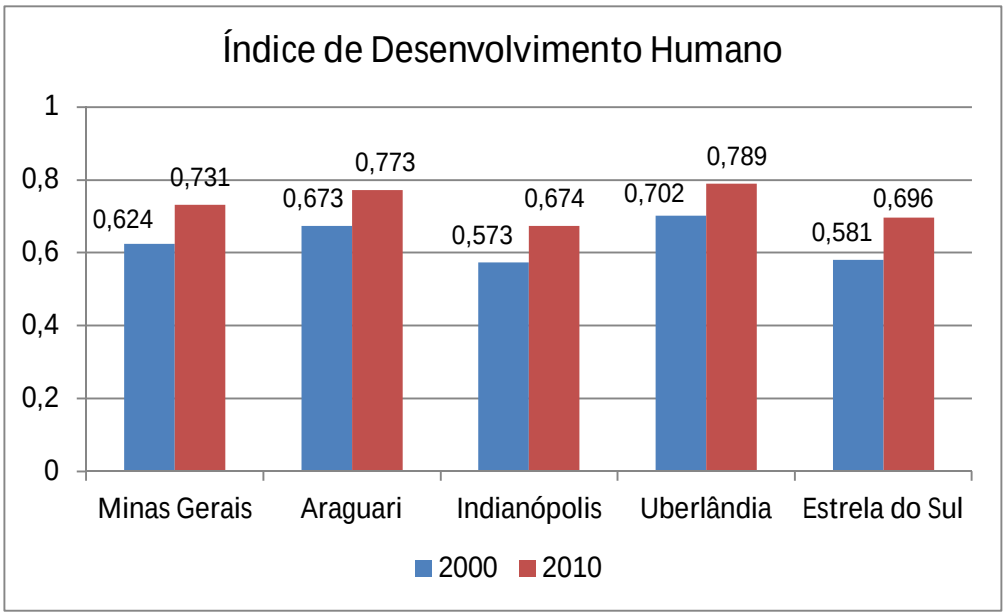


Figure 16 – Human Development Index. Source: IBGE (2018).

Minas Gerais IDH and the IDH-M of the studied municipalities' indexes had growth in the period from 2000 to 2010. The State and Araguari and Uberlândia municipalities presented human development index, in 2010, considered high by ONU. Although Indianópolis and Estrela do Sul municipalities presented an index in 2010, considered medium by ONU.

Araguari and Uberlândia cities presented, in 2010, higher rates than Minas Gerais State.

8.3.5.8 Minas Social Responsibility Index (IMRS)

The Minas Social Responsibility Index (IMRS) was created with the scope of providing the State Government and the Minas municipalities' public policies planning grants and better allocation of financial, material and human resources. The index offers more than 600 indicators in the areas of health, education, public safety, municipal finance, environment, housing, sports, tourism, income, employment, social welfare and culture to all 853 municipalities of the State being calculated with biennial periodicity.

Among the more than 600 indicators that form the basis of this data, only 59 indicators were selected to compose the IMRS.

This selection had to include, for each dimensions, indicators representing three aspects: the situation, the public policy effort to act in front of a certain observed situation and the municipal management characteristics.

Each dimension has its index and the IMRS results from the indexes average of ten balanced dimensions, as shown in the following figure.

IMRS value varies between 0 and 1, being the closer to 1 value, the municipality or the area being evaluated more developed.

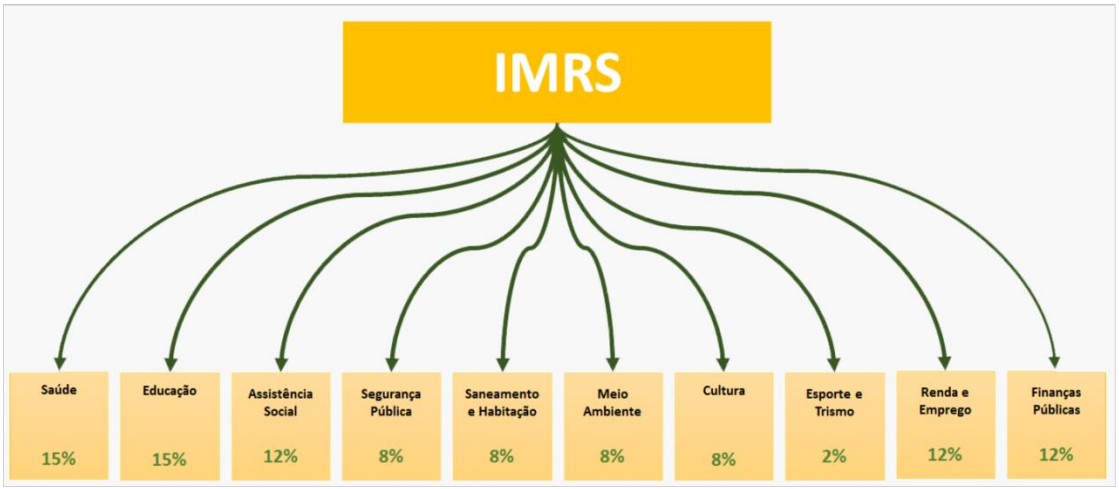


Figure 17 – Minas Social Responsibility Index (IMRS) Composition. Source: Fundação João Pinheiro (2017).

In the following table and figure are presented the IMRS of the municipalities under study in 2012. It is observed that Araguari municipality presents the best IMRS value (0.649), followed by Uberlândia (0.636), Estrela do Sul (0.566) and Indianópolis (0.562).

Table 8 – Minas Social Responsibility Index (IMRS)

Municipalities	2012
Indianópolis	0,562
Araguari	0,649
Uberlândia	0,636
Estrela do Sul	0,566

Source: FJP (2018).

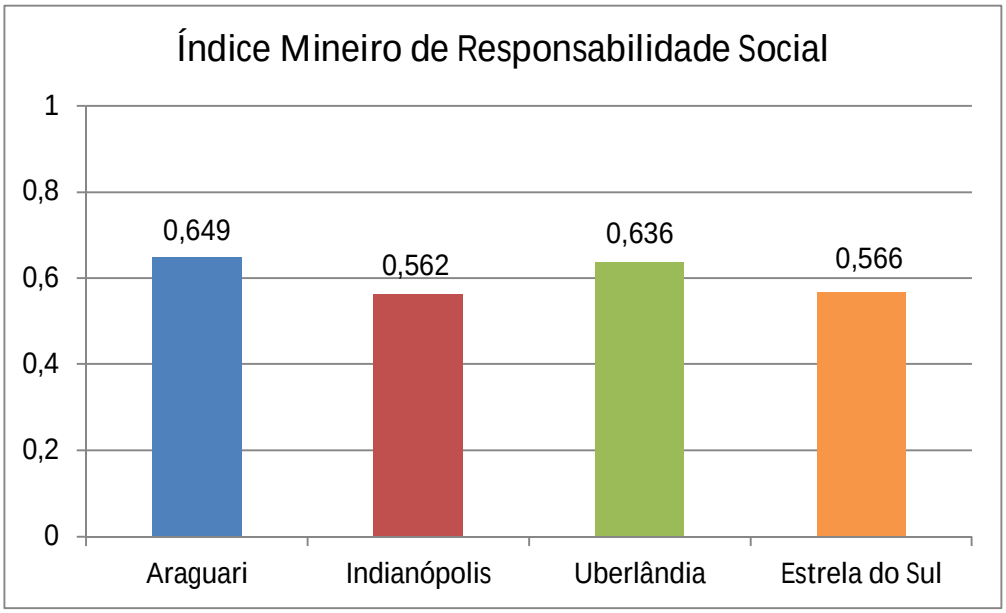


Figure 18 – IMRS of the municipalities under study in 2012. Source: Fundação João Pinheiro (2018).

8.3.6 Education

8.3.6.1 Educational Establishments

The early childhood education or pre-primary education is the education of the children before they entry in compulsory education age. It is normally being conducted for children between 0 and 6 years old.

The elementary school is one of the basic education stages in Brazil. It lasts for 9 years, being compulsory the registration for all children aged between 6 and 14 years old. The compulsory registration at this age implies in joint responsibility: from parents or guardians, for the children registration; and from the State by ensuring vacancies in public schools; from society by enforcing the obligation itself.

Since 1996, in Brazil, the last stage of basic education system corresponds to high school (formerly called second degree), whose purpose is deepening the knowledge acquired in the elementary school, as well as formatting citizens for a social life and for the labor market, offering the basic required knowledge for the students to enter an university.

In the following table there are presented the existing educational establishments data at the studied municipalities and at Minas Gerais.

Table 9 – Educational Establishments Data, in 2017.

State and Municipalities	Early childhood education (pre-primary)		Elementary School		High School	
	Public	Private	Public	Private	Public	Private
Minas Gerais	5.326	2.676	12.086	2.867	2.420	742

State and Municipalities	Early childhood education (pre-primary)		Elementary School		High School	
	Public	Private	Public	Private	Public	Private
Indianópolis	3	0	6	0	1	0
Araguari	28	15	50	18	9	6
Uberlândia	77	98	193	92	34	18
Estrela do Sul	5	0	7	0	2	0

Source: INEP (2018).

In 2017, Araguari had 43 pre-primary schools, being 28 public and 15 private; it had 68 elementary schools, being 50 public and 18 private, and it had 15 high schools, of which 9 were public and 6 were private.

Uberlândia had 175 pre-primary schools, being 77 public and 98 private; it had 285 elementary schools, being 193 public and 92 private; and it had 52 high schools, of which 34 were public and 18 were private.

The other studied municipalities had only public schools. In the following figures there are presented some educational establishments.

Figure 19 – Antônio Nunes State School in Araguari. Source: Pöyry Tecnologia (2018).

Figure 20 – Tupiniquim Municipal School in Indianópolis. Source: Pöyry Tecnologia (2018).

Figure 21 – Colégio Maria de Nazaré (Private School) in Uberlândia. Source: Pöyry Tecnologia (2018).

Figure 22 – Robert Kenedy State School in Estrela do Sul. Source: Pöyry Tecnologia (2018).

The technical education or vocational-technical school is a vocational education mode, quick-oriented for students' integration in the labor market, with specific features. In Brazil, the technical education is for high school students or people who already have this level of education. It can be held in concomitance with the high school.

Araguari also has units of: SESI, SENAI, SENAC and several technical schools, which teaches computers, agriculture methods, mechanics, music and theatre and others, in order to form professionals.

Graduation education, higher education or tertiary education is the highest level of Brazil educational systems, referring usually to an education held in universities, colleges, polytechnics institutions, and other colleges that confer academic degrees or professional qualifications.

Since 2005 it has been observed the higher education growth in Araguari city area. Araguari counts today with the Master Institute of Education, the IMEPAC that offers several graduate and post-graduate degrees, among these the course of Medicine, with half-year entry, offering 60 vacancies per semester.

The main colleges in Araguari are: Faculdade do Trabalho, Objetivo, UNIP.

Figure 23 – IMEPAC College in Araguari. Source: Pöyry Tecnologia (2018).

Figure 24 – SESI SENAI FIEMG in Araguari. Source: Pöyry Tecnologia (2018).

Uberlândia also has several colleges and a Federal university, Universidade Federal de Uberlândia (UFU). This University was initially authorized to work on August 14th 1969 by Decree-Law nº. 762, and became a federal University by law nº 6,532, from May 24th 1978. Uberlândia, in addition to a campus of the Instituto Federal do Triângulo Mineiro (formerly called agro-technical school), situated in the countryside, offers technical and graduate courses every semester. It also has one of the greatest private universities of the State, called Faculdade Pitágoras.

Figure 25 – Universidade Federal de Uberlândia (UFU). Source: Pöyry Tecnologia (2018).

The other municipalities under study don't have higher education schools.

8.3.6.2 Attendance Rate

The attendance rate on basic, elementary and high schools is presented in the table and following figures.

Table 10 – Attendance rate on basic, elementary and high schools (%)

State and Municipalities	2000				2010			
	Basic	Eleme. 11 to 13 years old	Eleme. 15 to 17 years old	High	Basic	Eleme. 11 to 13 years old	Eleme. 15 to 17 years old	High
Minas Gerais	86,69	68,88	92,05	37,27	88,24	87,96	93,21	46,58
Indianópolis	88,62	65,38	95,58	24,77	92,29	88,35	96,18	47,53
Araguari	89,64	74,02	93,21	48,44	86,88	90,6	91,98	52,65
Uberlândia	90,13	77,87	93,82	47,94	88,3	88,24	91,44	51,11
Estrela do Sul	72,32	64,08	81,3	16,62	83,71	82,27	91,09	33,84

Source: ATLAS BRASIL (2018).

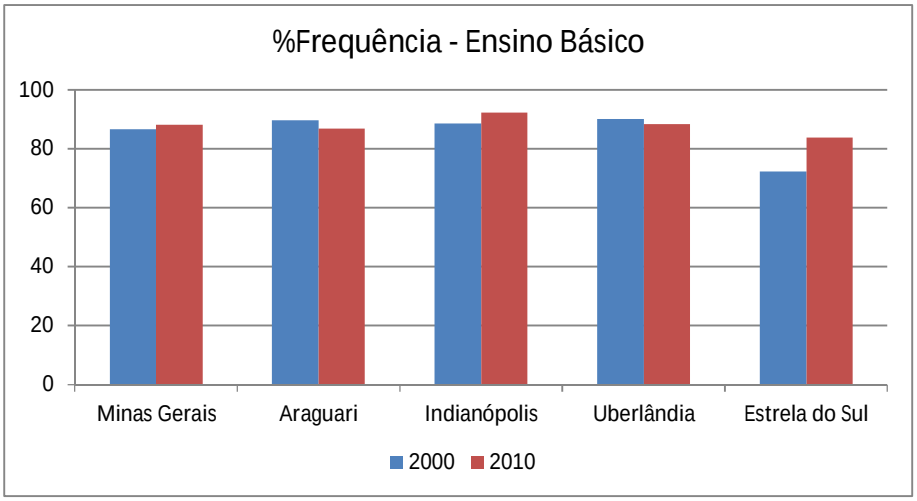


Figure 26 – Attendance rate on basic schools. Source: ATLAS (2018).

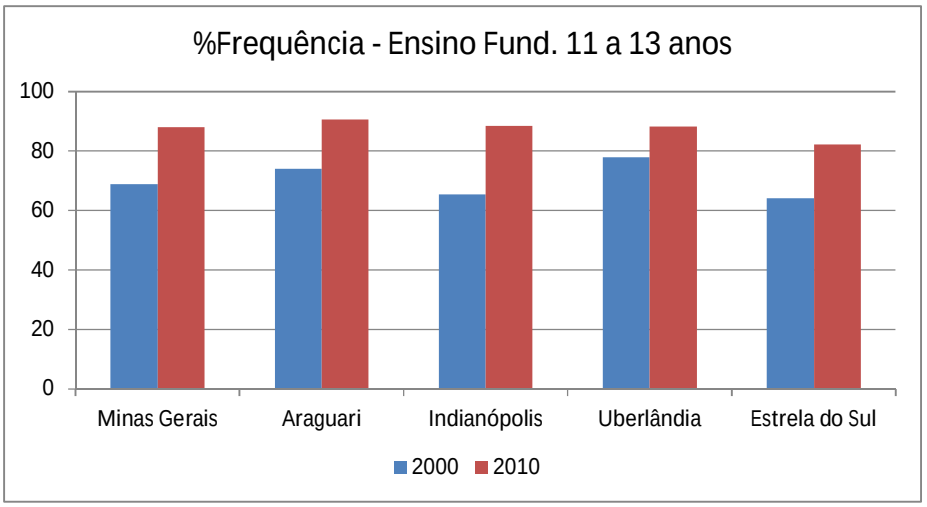


Figure 27 – Attendance rate on elementary schools, children from 11 to 13 years old. Source: ATLAS (2018).

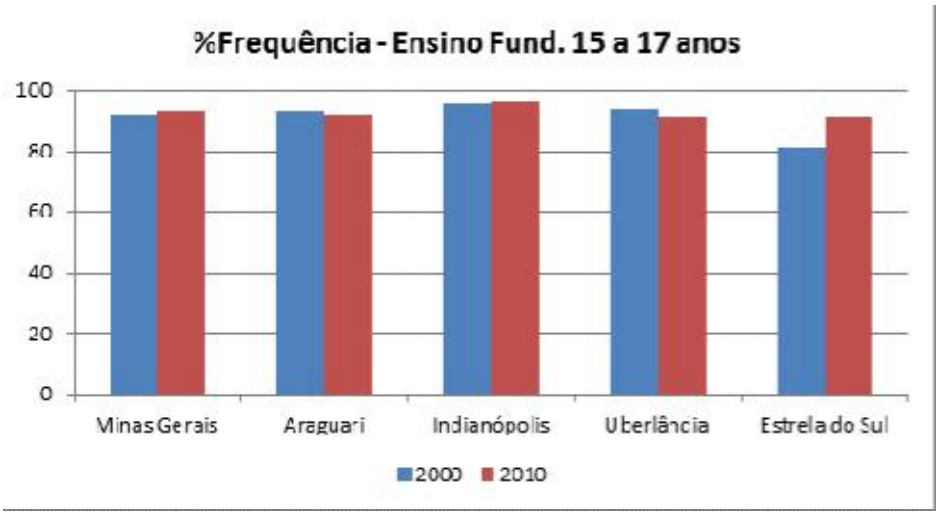


Figure 28 – Attendance rate on elementary schools, Youngers from 15 to 17 years old. Source: ATLAS (2018).

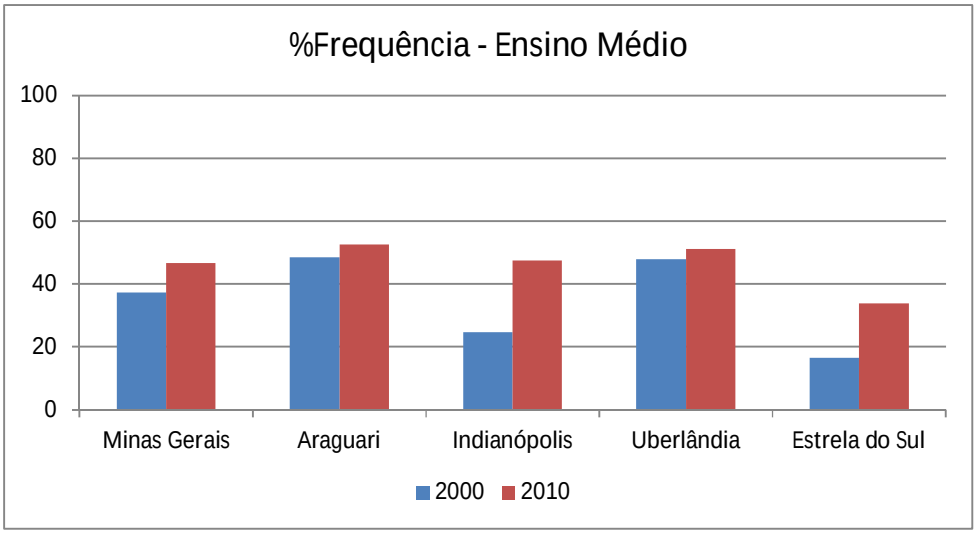


Figure 29 – Attendance rate on high schools. Source: ATLAS (2018).

It is observed that Minas Gerais State and the studied municipalities had an evolution on attendance rates in the period between 2000 and 2010.

The basic and the elementary schools presented the highest attendance rates corresponding to 88.24% and 93.21% respectively for Minas Gerais State, and averaging 87.80% and 92.67% for municipalities under study, in 2010.

High School presents the worst attendance rate, in 2010, with 46.58% in Minas Gerais State and 46.28% average in the municipalities under study.

8.3.6.3 Illiteracy Rate

The illiteracy rate is calculated through literacy rate (total population - literate population = illiterate population). The literacy rate is used by States or institutions (ONU, e.g.) to access the percentage of people with ability to read and write within the total country population. This measurement is one of the country's development indicators, ONU, in fact, uses this factor to calculate the IDH.

In the following table and figure there are presented the illiteracy rate data by age group in 2000 and 2010.

Table 11 – Illiteracy rate in 2000 and 2010.

State and Municipalities	15 years old or more (%)		From 15 to 24 years old (%)		From 25 to 59 years old (%)		60 years old or more (%)	
	2000	2010	2000	2010	2000	2010	2000	2010
Minas Gerais	11,96	8,32	3,23	1,36	10,97	6,41	35,75	26,53
Indianópolis	12,94	10,96	4,84	2,01	12,33	10,41	37,2	29,95
Araguari	6,87	4,88	2,07	0,93	5,33	3,53	23,34	15,04

Uberlândia	5,45	3,74	1,22	0,64	4,41	2,58	23,22	15
Estrela do Sul	14,52	11,34	3,33	2,04	13,53	9,51	38,62	30,98

Source: IBGE (2018).

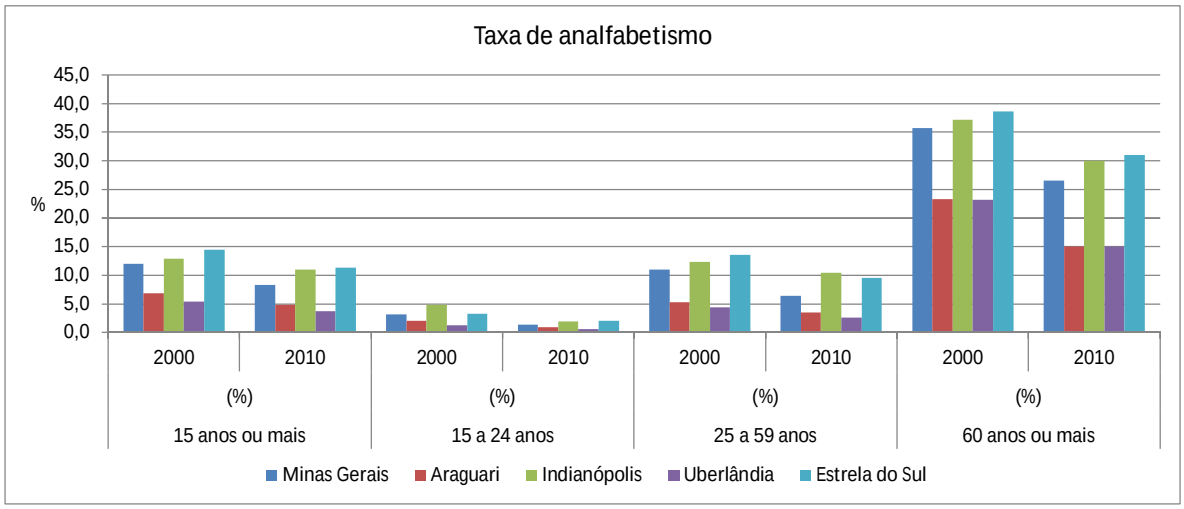


Figure 30 – Illiteracy rate. Source: IBGE (2018).

Overall, in Minas Gerais State, the illiteracy rates are low.

For all municipalities under study, the highest rates are in the age group over 60 years old and the lowest rates are in the range of 15 to 24 years old, which represents a good fact.

Uberlândia presents the lowest illiteracy rates among the studied municipalities, and Estrela do Sul presents the highest rates.

8.3.7 Health

Brazil has one of the leading public health programs in the world, called the Unified Health System (SUS). However, it still has shortcomings and difficulties, such as lack of basic public equipment and lack of professionals.

The private health system in Minas Gerais is greater than the public system. In 2010, there were health 20,792 establishments, 80.73% corresponds to ambulatory services units.

Araguari and Uberlândia cities showed the same trend as the State, with 138 and 1,043 private health establishments and 66 and 206 public health establishments respectively to each city. From the private health establishments 65% and 89% corresponded to ambulatory services in Araguari and Uberlândia cities respectively.

Estrela do Sul and Indianópolis cities have all health establishments only at the public system.

Table 12 – Number of health establishments, by type of service offered both in public and private system, 2010

State and cities	System	Hospitalization	Ambulatory	Emergency	Diagnosis and therapy	Epidemiological and health surveillance	Pharmacy or cooperative	TOTAL
Minas Gerais	Public SUS	587	8.396	777	2.382	484	101	12.727
	Private	500	16.785	469	2.954	-	84	20.792
Indianópolis	Public SUS	-	6	1	2	1	-	10
	Private	-	--	-	-	-	-	-
Araguari	Public SUS	3	37	4	20	1	1	66
	Private	4	90	4	40	-	-	138
Uberlândia	Public SUS	14	128	14	44	4	2	206
	Private	15	930	11	84	-	3	1.043
Estrela do Sul	Public SUS	1	6	1	2	1	-	11
	Private	-	--	-	-	-	-	-

Source: DATASUS. CNES. Situation of national database on 04/10/2010.

In the following table there are presented data from inpatient beds in Minas Gerais and in the studied cities.

Table 13 –Inpatient beds index (beds per 1,000 inhabitants), 2010

	Minas Gerais	Araguari	Indianópolis	Uberlândia	Estrela do Sul
Total existing inpatient beds index	2,20	2,0	-	1,8	2,2
Public existing inpatient beds index	1,61	1,3	-	1,1	2,2

Source: DATASUS. CNES. Situation of national database on 04/10/2010.

At Minas Gerais State, in 2010, there were 2.20 beds for every 1,000 inhabitants in the health system being 1.61 beds belonging to the public SUS system. At Estrela do Sul, this total index is the same as in the State although it is greater than the State in the public SUS system, being 2.2 beds for every 1,000 inhabitants. The index of the other

cities under study is less than that of Minas Gerais in both total and public SUS system.

Figure 31 – Basic health unit in Indianópolis. Source: Pöyry Tecnologia (2018).

Figure 32 – Santa Casa in Araguari. Source: Pöyry Tecnologia (2018).

Figure 33 – Polyclinic Dr Amaury Ferreira da Silva in Estrela do Sul. Source: Pöyry Tecnologia (2018).

In the following table there are shown the health professionals index in Minas Gerais and in the studied cities.

Table 14 – Health professionals' index (professionals by 1,000 inhabitants), 2010

Professional	Minas Gerais		Araguari		Indianópolis		Uberlândia		Estrela do Sul	
	Total	SUS	Total	SUS	Total	SUS	Total	SUS	Total	SUS
Doctors	5,42	3,88	4,70	3,40	2,4	2,4	7,8	4,9	2,0	2,0
Dental surgeon	0,88	0,48	0,60	0,40	0,3	0,3	1,5	0,5	0,3	0,3
Nurse	-	-	0,50	0,50	0,7	0,7	0,7	0,6	0,5	0,5
Physical therapist	0,36	0,22	0,30	0,10	0,3	0,3	0,4	0,2	0,4	0,4
Audiologist	0,12	0,08	0,10	0	-	-	0,1	0	-	-
Nutritionist	0,09	0,07	0,10	0	-	-	0,2	0,2	0,3	0,3
Pharmacist	0,29	0,22	0,20	0,10	0,3	0,3	0,2	0,1	0,3	0,3
Social assistant	0,11	0,11	0,20	0,20	0,1	0,1	0,3	0,3	0,1	0,1
Psychologist	0,26	0,20	0,20	0,20	-	-	0,4	0,4	0,3	0,3

Source: DATASUS. CNES. Situation of national database on 04/10/2010.

The health professionals number by 1,000 inhabitants in Minas Gerais was 5.42 (2010), an index below Uberlândia city with 7.8 health professionals by 1,000 inhabitants compared with all studied cities. In General, with respect to the public SUS system this index was lower for all professionals by 1,000 inhabitants in both the State and in the studied cities.

Figure 34 – 24 hours open UPA in Araguari. Source: Pöyry Tecnologia (2018).

Figure 35 – Triângulo Cancer Centre (COT) in Uberlândia. Source: Pöyry Tecnologia (2018).

8.3.8 Basic Sanitation

8.3.8.1 Water supply

A water supply system is characterized by the withdrawal of water from the nature, fitting its quality, transport to the human clusters and supply it to the population in an amount compatible with their needs.

In Araguari, the SAE (Water and Sewage Systems Superintendence) is the responsible agency for the intake, treatment and water distribution, its attendance index is 100%.

In Estrela do Sul and Indianópolis cities, the COPASA is the responsible agency for the intake, treatment and water distribution. In these cities, the urban service attendance index is 84.9% and 97.0%, respectively.

In Uberlândia, DMAE from the town hall is the responsible agency for the intake, treatment and water distribution, its urban service attendance index is 100%.

In the following table there are presented the water supply data on the studied cities.

Table 15 – Water supply data, in 2016.

Cities	Responsible agency	Average per capita consumption (L/ inhab.day)	Urban service attendance index	Bodies waters supply
Indianópolis	COPASA	150,4	94,8%	Córrego Lava-pés (57%) and Wells in Indianópolis (43%)
Araguari	SAE	356,9	100%	Córrego Brejo Alegre
Uberlândia	DMAE	226,7	100%	Rio Uberabinha and Ribeirão Bom Jardim
Estrela do Sul	COPASA	137,2	84,3%	Ribeirão Bagagem (100%)

Source: SNIS (2018).

Figure 36 – COPASA in Indianópolis. Source: Pöyry Tecnologia (2018).

Figure 37 – SAE water tank in Araguari. Source: Pöyry Tecnologia (2018).

Figure 38 – DMAE office in Uberlândia. Source: Pöyry Tecnologia (2018).

Figure 39 – COPASA agency in Estrela do Sul. Source: Pöyry Tecnologia (2018).

8.3.8.2 Sanitation

Sewage water is the term used for the waters which after the human use have altered their natural characteristics. According to the predominant use: commercial, industrial or domestic use; these waters will present different characteristics and are generically designated as sewage or wastewater.

The return of the sewage to the environment shall be provided, if necessary, with its treatment, followed by its appropriate release at the water body receiver that can be a river, a lake or the sea through a submarine discharge pipeline.

For the sewage water from the general cities sewerage system it is essential to have a sewage treatment of the collected waters into treatment plants to avoid pollution of water bodies. Septic systems are effective for the sewage treatment, as long as they are provided with proper design and that there is constant maintenance.

In Araguari, SAE (Water and Sewage Systems Superintendency) is the responsible agency for the sewage collection and treatment, the sewage collection index is 80% from the total generated sewage, and the sewage treatment index is 3.25% from the total collected sewage. Currently it is under construction, in the city, a wastewater treatment plant which will treat 90% from the total collected sewage, its inauguration should be on September 2018.

In Estrela do Sul and Indianópolis, COPASA is the responsible agency for the sewage collection. In Estrela do Sul city the collection index is 42.85% from the total generated sewage and there is no information about the sewage water treatment. There is no official information of the sewage water collection and treatment in Indianópolis.

In Uberlândia, DMAE from the town hall is the responsible agency for the sewage system collection and treatment, the collection index is 80% from the total generated sewage and sewage treatment index is 100% from the total collected sewage.

Table 16 – Sanitation Data in 2016.

Municipalities	Responsible agency	Sewage collection index	Sewage treatment index from the total collected
Indianópolis	COPASA	Without information	Without information
Araguari	SAE	80%	3,67%
Uberlândia	DMAE	76,44%	100%
Estrela do Sul	COPASA	43,08%	0%

Source: SINIS (2018).

Figure 40 – SAE in Araguari. Source: Pöyry Tecnologia (2018).

Figure 41 – Advertising about the wastewater treatment plant in Araguari. Source: Pöyry Tecnologia (2018).

8.3.8.3 Solid wastes collection and treatment

Solid wastes generally constitute what is called garbage: solid materials considered useless, superfluous or dangerous, generated by human activity, and which should be discarded or eliminated. Although the term garbage applies to solid waste in general, much of what is considered trash can be reused or recycled, if the materials are properly treated. In addition to employment and income generation, recycling provides a reduction of the raw materials and energy demands, it also contributes to increase the landfills lifecycles. Certain wastes, however, cannot be recycled, like medical or nuclear wastes.

An efficient solid waste management of a municipality shall provide, in addition to the traditional collection system, the selective collection and the recycling systems, composting plants, construction wastes reuse plants, medical waste collection and treatment, etc.

In the following table there are shown the data about solid wastes collection in the municipalities under study in 2015.

In 2015, 91.17% of the total Araguari population had wastes collection system, and 95.74% of the population was in the urban area.

In Indianópolis and Uberlândia 100% of the urban population has wastes collection system. In these municipalities the solid waste generation in 2015 was 5,086 t/year and 207,892.8 t/year, respectively in each city.

In Estrela do Sul it does not exist solid waste data information on SNIS (2015).

In the studied municipalities the solid waste collection is done by the City Hall Government, with the exception of Indianópolis and Uberlândia, where part of the solid waste collection is held also by private companies, as detailed in the following table.

Table 17 – Solid waste collection data, in 2015.

Municipalities	Responsible company	Total amount of domestic and public wastes collected (t/ year)	Domestic waste collection rate in relation to the total population	Domestic waste collection rate in relation to the total urban population
Indianópolis	City Hall + private	5.086	87,94%	100%
Araguari	Municipal urban services secretary	37.000	91,17	95,74
Uberlândia	Municipal urban services secretary + Limpebras	207.892,8	97,76%	100%
Estrela do Sul	City Hall	-	-	-

Source: SINIS (2018).

According to the Urban Solid Wastes Disposal Panorama in the State of Minas Gerais in 2015 (FEAM, 2016), the municipalities of Estrela do Sul and Indianópolis had their solid wastes discharged into their cities open dumps. Only Araguari and Uberlândia cities disposed their solid wastes in proper landfills, as shown on the figure below.

Figure 42 – Urban Solid Wastes Disposal Panorama in North Triângulo region. Source: FEAM (2018).

8.3.9 Productive and services structure

8.3.9.1 Gross Domestic Product (GDP)

The Gross Domestic Product (GDP) represents the sum (in monetary values) of all final goods and services produced in a particular region (either, countries, States, cities), during a specified period (month, quarter, year, etc.). GDP is one of the most used macroeconomics indicators in order to measure the economic activity of a region.

In the GDP calculation, only the final goods and services are used, excluding all intermediate consumption goods (inputs). This is done in order to avoid the problem of double counting, when values generated in the production chain appear counted twice in the sum of GDP.

In the following table there are shown the GDP data of the municipalities under study.

Table 18 – Gross Domestic Product (GDP).

Municipalities	Gross Domestic Product (thousand R$)					
	2010	2011	2012	2013	2014	2015
Indianópolis	313.497	496.063	514.110	464.940	393.597	671.454
Araguari	2.147.789	2.214.236	2.825.456	2.823.539	3.309.354	3.696.960
Uberlândia	18.950.577	19.553.210	22.837.278	25.718.586	28.390.937	29.549.557
Estrela do Sul	452.050	447.497	826.992	493.593	413.130	124.387

Source: IBGE (2018).

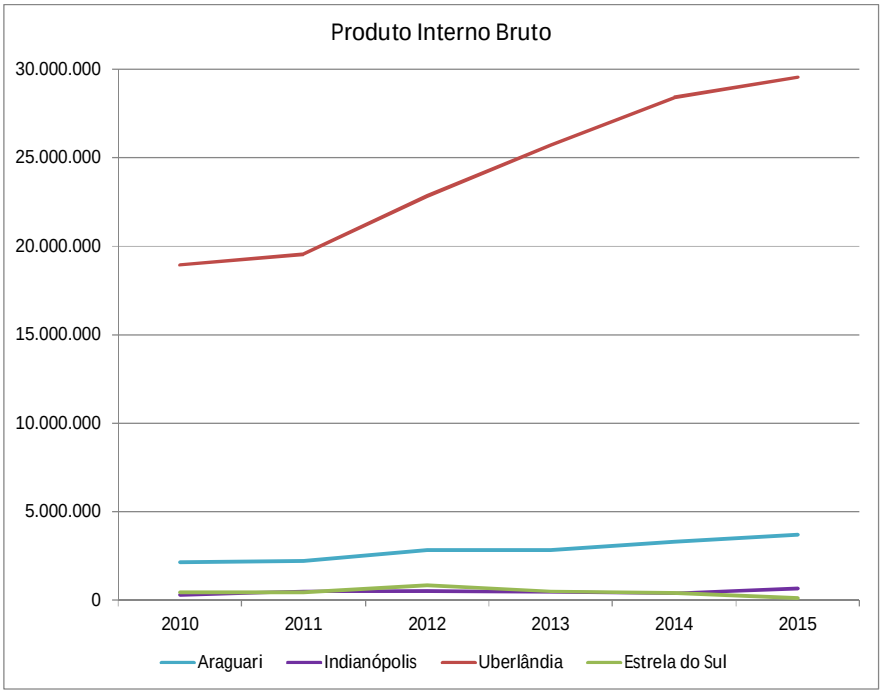


Figure 43 – Gross Domestic Product. Source: IBGE (2018).

Considering the GDP of 2015, the municipality of Uberlândia presented the highest GDP value (R$ 29,549,557.00), followed by Araguari (R$ 3,696,960.00), Indianópolis (R$ 671,454.00) and Estrela do Sul (R$ 124,387.00).

Araguari and Uberlândia had great growth in GDP between 2010 to 2015. In the period between 2010 and 2015, there were developments of the GDP of Indianópolis, also, despite a decrease in 2014. In the case of Estrela do Sul there was a strong GDP growth from 2011 to 2012, but there was a great GDP reduction in 2013, 2014 and 2015, reaching the lowest value in 2015 even lower than the GDP in 2010.

The following table and figure presents the GDP per capita data of the municipalities under study.

Table 19 – GDP *per capita*

Municipalities	GDP *per capita* (R$)					
	2010	2011	2012	2013	2014	2015
Indianópolis	50.719,45	79.344,75	81.449,64	70.788,60	59.348,16	100.321,84
Araguari	19.564,66	20.056,12	25.458,45	24.558,92	28.619,71	31.797,16
Uberlândia	31.569,30	31.954,70	36.861,91	39.770,62	43.366,06	44.612,40
Estrela do Sul	60.620,93	59.745,87	109.797,10	63.248,69	52.621,44	15.751,19

Source: IBGE (2018).

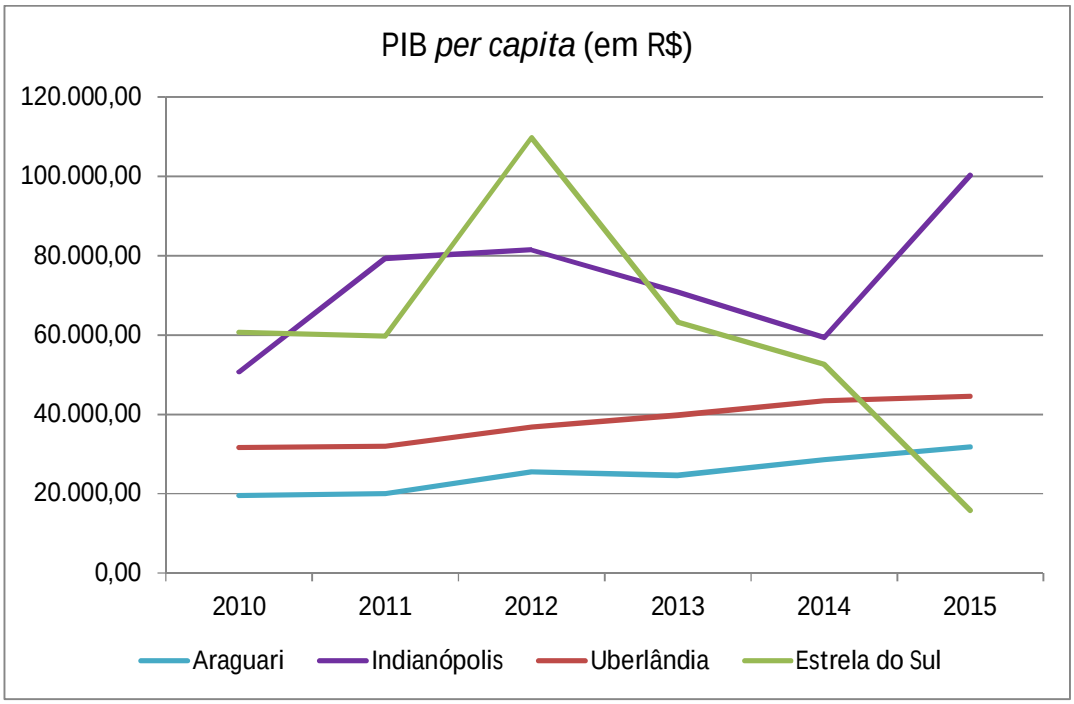


Figure 44 – GDP *per capita*. Source: IBGE (2018).

In 2015, Indianópolis presented the highest GDP per capita value (R$ 100,321.84).

Between 2010 and 2015, with the exception of Estrela do Sul, all municipalities have presented growth in GDP per capita despite the decrease values in Indianópolis during some years of this period.

Estrela do Sul presented a strong decrease in GDP per capita between 2013, 2014 and 2015, reaching the lowest value observed among the studied cities.

8.3.9.2 Productive Sectors

The Gross Domestic Product composition contemplates the participation of the economy, agricultural (primary), industrial (secondary) and services (tertiary) sectors, moreover, added taxes. In the following table and figure there are presented the GDP composition data by sectors of the municipalities under study in 2015.

Table 20 – GDP composition by productive sectors participation in 2015.

Sector	Variable	Araguari	Indianópolis	Uberlândia	Estrela do Sul
Agricultural	**Thousand Reais**	223.544	243.066	463.998	41.668
	%	6,86%	38,04%	1,72%	43,90%
Industrial	**Thousand Reais**	1.430.817	346.570	6.275.658	7.450
	%	43,89%	54,24%	23,30%	7,85%
Services	**Thousand Reais**	1.334.801	42.852	13.662.843	40.649
	%	40,95%	6,71%	50,73%	42,82%
Taxes	**Thousand Reais**	270.533	6.451	6.531.578	5.157
	%	8,30%	1,01%	24,25%	5,43%

Source: IBGE (2018).

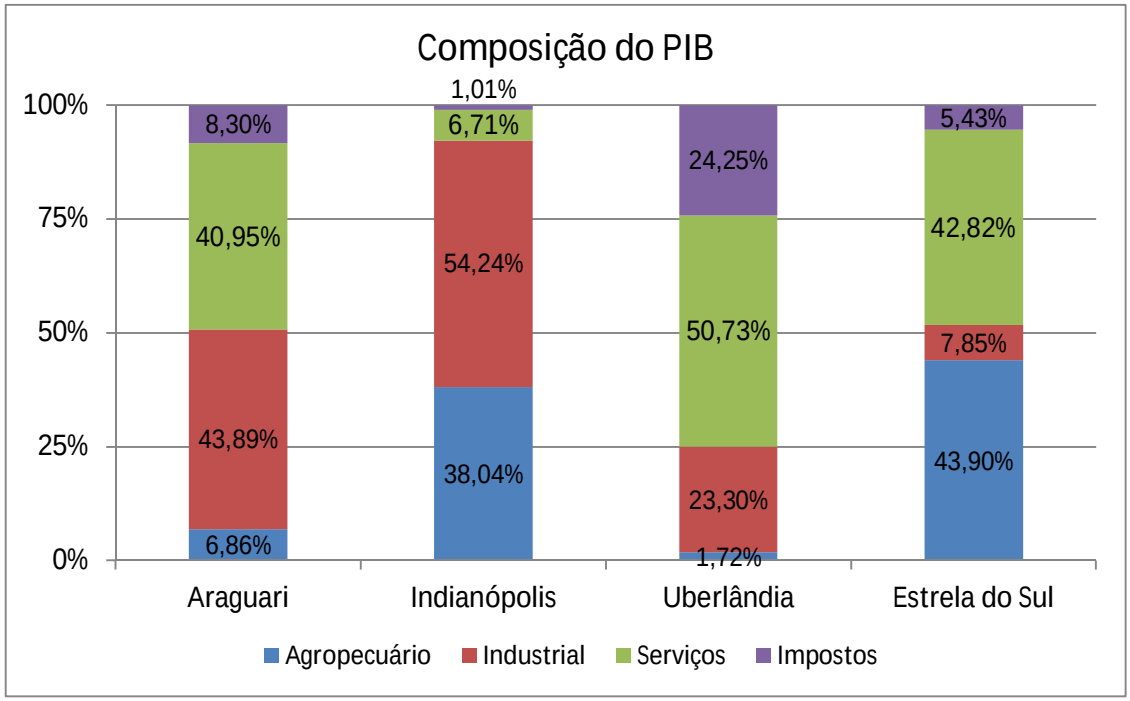


Figure 45 – GDP composition by productive sectors participation. Source: IBGE (2018).

In Estrela do Sul, the agricultural sector (primary sector) presented the greatest participation at the GDP composition, corresponding to 43.90%. In Araguari and Indianópolis, the industrial sector (secondary sector) presented the greatest participation at the GDP composition, corresponding to 43.89 and 54.24% respectively. In Uberlândia the services sector presented the greatest participation in the GDP composition.

Figure 46 – Coffee plantation in Indianópolis. Source: Pöyry Tecnologia (2018).

Figure 47 – ADM mill in Araguari. Source: Pöyry Tecnologia (2018).

Figure 48 – Ebba mill in Araguari. Source: Pöyry Tecnologia (2018).

Figure 49 – Selecta mill in Araguari. Source: Pöyry Tecnologia (2018).

Figure 50 – BRF mill in Uberlândia. Source: Pöyry Tecnologia (2018).

Figure 51 – Itambé mill in Uberlândia. Source: Pöyry Tecnologia (2018).

Figure 52 – Shopping mall in Uberlândia. Source: Pöyry Tecnologia (2018).

8.3.9.3 Busy People and Average Salary

This variable corresponds to the number of employed people record who, at the end of the reference year, effectively exercised an occupation in companies according to the functional categories described by law; including people who were away of work due to vacation, insurance for accidents leaves, etc., since these days have not exceeded 30 days.

The busy people are discriminated according to the following groups: owners or business partners with activities at the company, Presidents and directors; non-construction personnel; and construction staff, such as: top-level staff (managers, leaders and supervisors), masters and workers, shipbuilders, carpenters, bricklayers, maids, etc., with activity in the company.

In table and figure there are presented the busy people data in the municipalities under study.

Table 21 – Number of employed people.

Municipalities	Busy People				
	2011	2012	2013	2014	2015
Indianópolis	1.102	941	1.066	998	845
Araguari	23.728	24.787	25.784	25.500	24.687
Uberlândia	225.253	235.140	245.478	247.538	246.411
Estrela do Sul	1.586	1.267	1.328	1.105	1.112

Source: IBGE (2018).

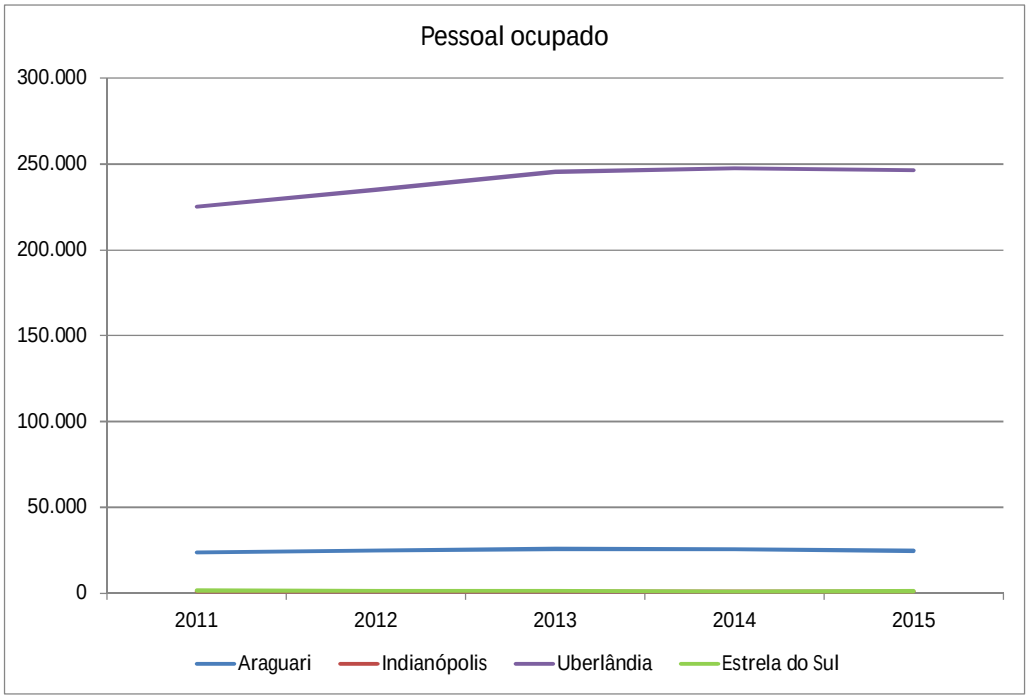


Figure 53 – Busy people. Source: IBGE (2018).

In table and figure there are presented the average salary data of the population in the municipalities under study.

Table 22 – Average salary data.

Municipalities	Average salary (minimum salaries)				
	2011	2012	2013	2014	2015
Indianópolis	2,2	2,3	2,3	2,4	2,3
Araguari	2,1	2,1	2,0	2,1	2,1
Uberlândia	2,8	2,7	2,7	2,8	2,7
Estrela do Sul	1,8	1,8	1,9	1,9	2,0

Source: IBGE (2018).

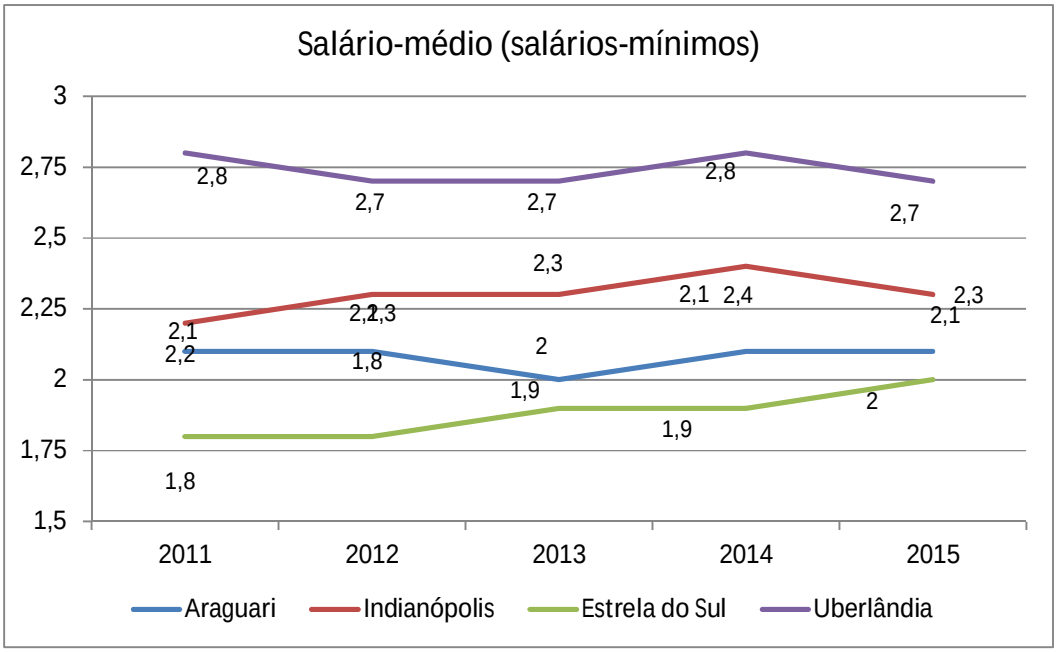


Figure 54 – Average salary data. Source: IBGE (2018).

8.3.9.4 Forestry

Forestry is the science that deals with activities related to the cultivation of trees. It is dedicated to the study of natural and artificial methods to regenerate and improve the forest settlement in order to meet the needs of small farmers to large scale forest-based industry. At the same time, it is used for the maintenance, exploitation and the rational use of forests.

In the following table there are presented forestry data in Minas Gerais and in the studied municipalities.

Table 23 – Forestry produced quantity in Minas Gerais and in the studied municipalities, in 2015.

Types of forestry products	Minas Gerais	Indianópolis	Araguari	Uberlândia	Estrela do Sul
Charcoal (ton)	4.464.782	0	0	0	0
Charcoal from Eucalyptus (ton)	4.464.782	0	0	545	0
Firewood (m³)	573.285	0	10.926	11.850	0

Types of forestry products	Minas Gerais	Indianópolis	Araguari	Uberlândia	Estrela do Sul
Wood logs (m³)	12.924.432	621.420	10.926	0	0
Wood logs for pulp (m³)	8.227.416	0	0	-	0
Wood logs for other purposes (m³)	4.697.016	621.420	30	148.250	0
Total area (ha)	1.881.381	22.516	154	20.900	39.340
Total eucalyptus area (ha)	1.841.943	21.255	154	15.900	38.670
Total pinus area (ha)	37.368	1.261	0	5.000	670

Source: IBGE (2018).

In Minas Gerais State the main forestry product is wood logs with almost 13 million cubic meters, most of which is intended for pulp and paper production. The State has a significant production of charcoal with almost 4.5 million tons. The total area of forestry in the State corresponds to 1,881,381 hectares, of which 97.9% is eucalyptus plantation, 1.99% is pine and 0.11% corresponds to other species plantation.

Indianópolis and Araguari also have wood logs as the main forestry product, but their destinations are for other activities purposes than pulp production.

With respect to the eucalyptus and pinus areas, the municipalities under study have many eucalyptus areas plantations.

Figure 55 – Eucalyptus plantation at Nova Monte Carmelo farm. Source: Pöyry Tecnologia (2018).

8.3.9.5 Public Finances

Among the studied cities, in 2013 Uberlândia presented the highest revenues and committed expenditure, followed by Araguari and Indianópolis. Estrela do Sul didn't present available data in 2013.

In Uberlândia, the tax revenues had 78% growth between 2009 and 2013. The properties and services taxes revenues had 68% and 58% growth, respectively.

In Araguari, the tax revenues had 123% growth between 2009 and 2013. The properties and services taxes revenues had 30% and 71% growth, respectively.

The municipal public finances data of municipalities under study are presented in the following table.

Table 24 – Public finance data of municipalities under study, data from 2009 and 2013 (in thousand R$).

Variables	Year	Indianópolis	Araguari	Uberlândia	Estrela do Sul
Total revenues	2009	-	124.348.073	853.411.000	11.585.435
	2013	28.573.000	208.040.000	1.560.364.000	-
Tributaries Revenues	2009	-	14.610.106	164.636.000	625.660
	2013	1.100.000	32.632.000	293.011.000	-
Properties Revenues - IPTU	2009	-	1.620.727	26.118.000	13.067
	2013	8.000	5.292.000	38.552.000	-

Variables	Year	Indianópolis	Araguari	Uberlândia	Estrela do Sul
Services Revenues - ISS	2009	-	5.908.316	92.159.000	385.271
	2013	350.000	8.309.000	158.606.000	-
Committed Expenditure	2009	-	127.218.718	840.642.000	10.520.589
	2013	24.960.000	196.182.000	1.366.654.000	-
Committed expenditure with investments	2009	-	14.058.764	101.701.000	505.555
	2013	-	8.446.000	77.143.000	-
Committed expenditure on personnel and social charges	2009	-	62.485.811	408.267.000	5.504.622
	2013	11.962	108.737	564.850.000	-
Committed expenditure with civil works and installations	2009	-	0	85.025.000	239.161
	2013	-	5.815.000	62.577.000	-

Source: IBGE (2018).

Figure 56 – Indianópolis City Hall. Source: Pöyry Tecnologia (2018).

8.3.9.6 Imports and exports

The Industry and Foreign Trade Development Ministry, through the Foreign Trade Secretariat (SECEX, 2018), controls the Brazilian trade balance numbers for each Municipalities. Thus, in the following table it is presented the imports, exports and trade balance data of the municipalities under study.

Table 25 – Import and export data (in 2017)

Type	Values in US$ FOB			
	Indianópolis	**Araguari**	**Uberlândia**	**Estrela do Sul**
Import	20.009	23.643.250	140.160.071	-
Export	18	583.757.234	415.976.515	26
Trade balance	-19.991	560.113.984	275.816.444	26

Source: MDIC (2018).

Araguari and Uberlândia presented the highest values of exports, which surpassed the imports that means, the trade balance of these municipalities was positive in 2017.

In Indianópolis, imports exceeded exports, that is, the trade balance of this city was negative in the period. Estrela do Sul had no imports, it had just a small export value.

8.3.10 Infrastructure

The general infrastructure in the influence areas cities is displayed on the map in the following figure.

Figure 57 – Region's infrastructure Map

100000
150000
200000
7950000
7900000
7850000

TUPACIGUARA
ARAGUARI
CASCALHO RICO
MONTE CARMELO
ESTRELA DO SUL
MONTE ALEGRE DE MINAS
UBERLÂNDIA
INDIANÓPOLIS
ROMARIA
MONTE CARMELO
IRAÍ DE MINAS
UBERABA
VERÍSSIMO
SACRAMENTO

BR-050
BR-452
BR-365
GO
MG

0 0,5 1 2 km

LOCALIZAÇÃO NO ESTADO DE MINAS GERAIS

LEGENDA

- Área Diretamente Afetada - ADA - Área de Implantação da Fábrica
- AID para o Meio Socioeconômico - Municipios de Araguari e Indianópolis
- All para o Meio Socioeconômico - Municipios de Araguari, Indianópolis, Estrela do Sul e Uberlândia
- Via Pavimentada
- Área Urbana
- Corpo D'água
- Limite Municipal
- Limite Estadual

Infraestrutura Urbana

- Aeroporto
- Associação/ Sindicato
- Aterro
- Segurança Pública
- Corpo de Bombeiros
- Lazer
- COPASA
- Cemitério
- Sistema de Saúde
- Institucional
- Industrial
- Educação
- Hotel
- Interesse
- Igreja
- Ônibus
- Torre celular

ESCALA GRÁFICA: 0 5 10 20 km

DATUM: SIRGAS 2000 - Fuso 23K
PROJEÇÃO: UTM

REFERÊNCIAS UTILIZADAS:

- Limites Municipais/Estaduais e Hidrografia (IBGE, 2015);
- Área Urbana (IBGE, 2005)

PROJETO AMADEUS

PÖYRY

ESTUDO DE IMPACTO AMBIENTAL

ARAGUARI, ESTRELA DO SUL, INDIANÓPOLIS E UBERLÂNDIA

INFRAESTRUTURA URBANA

ESCALA: 1:350.000		DATA: Junho/2018	
DESENHO Nº: XXX	FOLHA: 1/1	TAMANHO: A2	
RESP. TÉCNICO:	ASSINATURA:		REV: 0

8.3.10.1 Roads

The roads at the studied area are shown in the following figure.

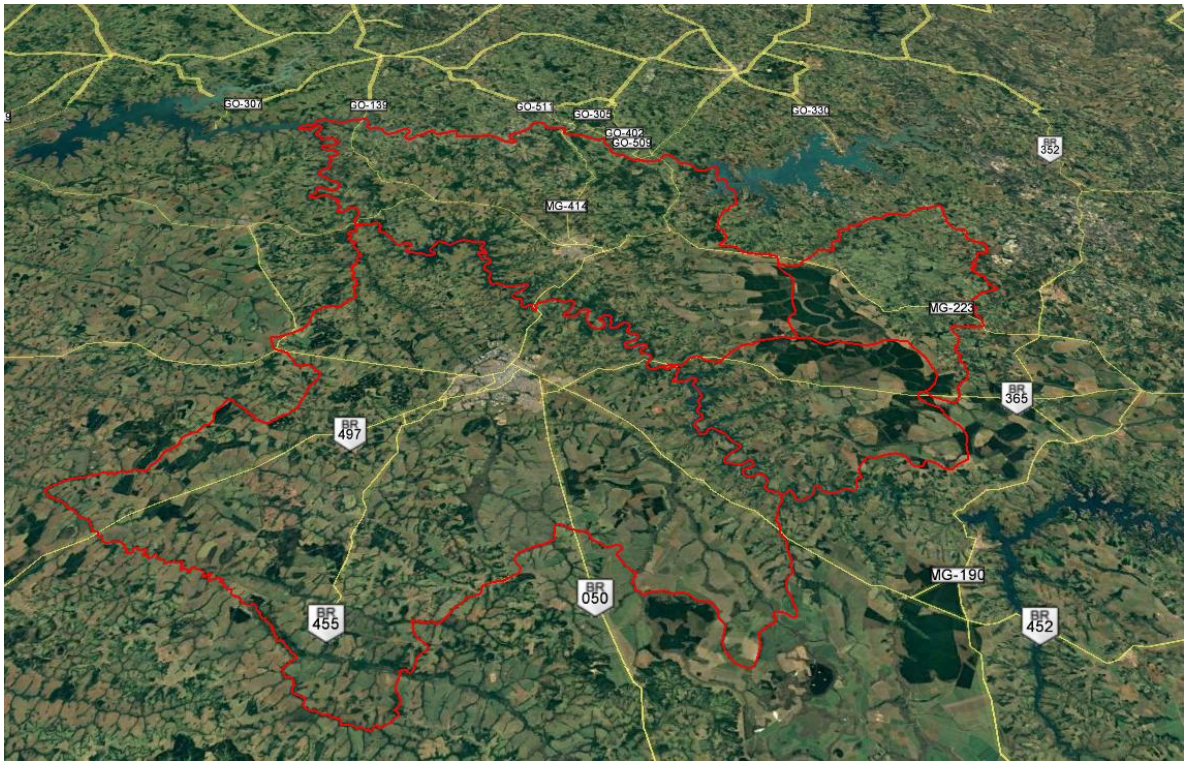


Figure 58 – Roads. Source: Google earth.

BR-365 highway crosses Indianópolis, which links the cities of Romaria to Uberlândia.

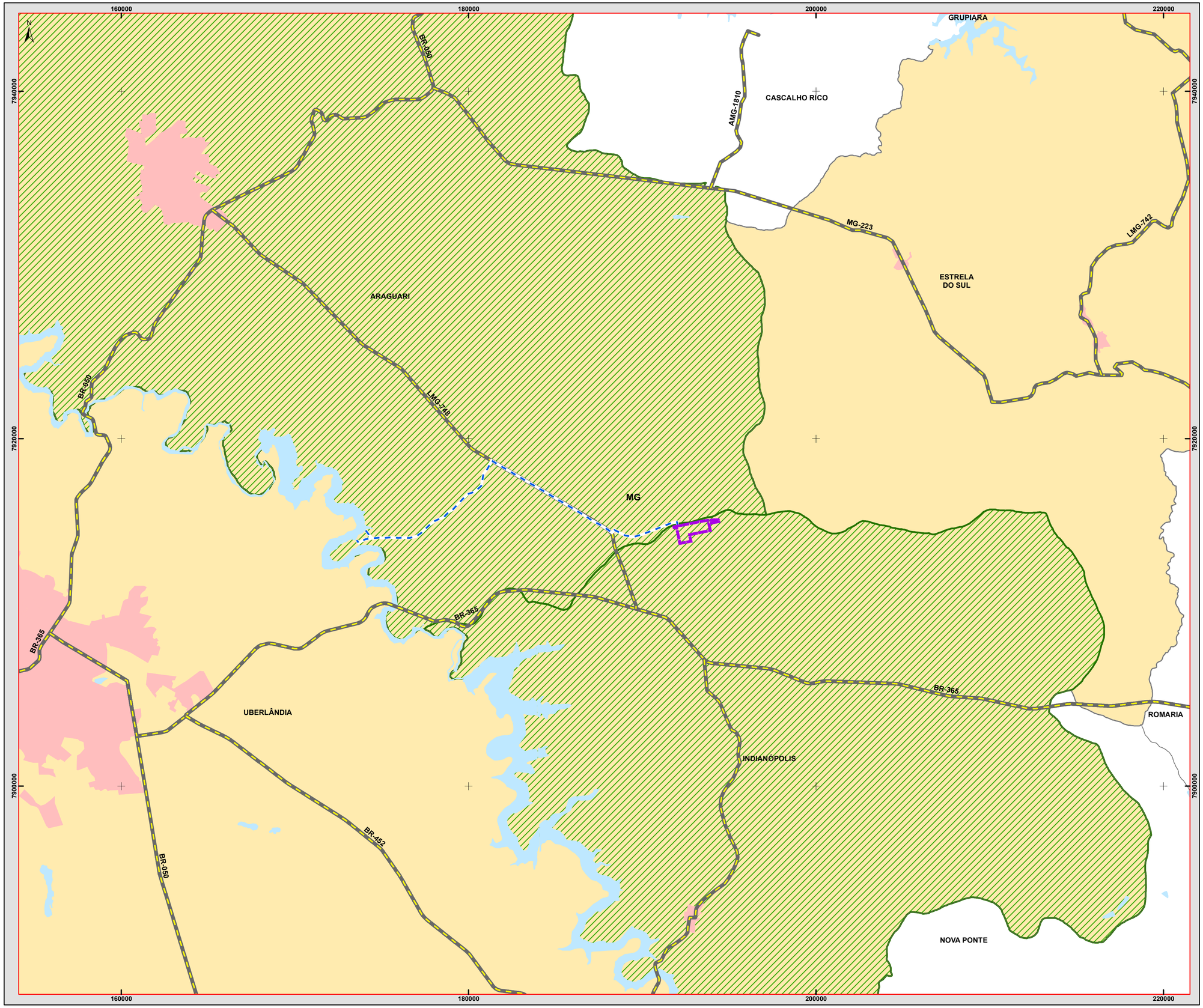
Araguari is surrounded by the following main roads: BR-050 (linking Uberlândia to Goiás), MG-223 (linking to Estrela do Sul), LMG-748 (linking to Indianópolis) and MG-414 (linking to Goiás State).

Uberlândia has easy access to BR-050 road, linking to Uberaba and Southern São Paulo (having doubled lanes till São Paulo), and Araguari, Catalão/GO and North Brasília/DF; BR-267 road linking to Porto Murtinho/MS; BR-365 linking to Ituiutaba, Patrocínio, Patos de Minas and Montes Claros; BR-452 linking to Rio Verde/GO, Itumbiara/GO, Araxá and Belo Horizonte; and BR-497 linking to Prata, Campina Verde and Iturama. Moreover, the city has access to important State and even national highways through paved side roads and with double-lane.

Estrela do Sul is surrounded by MG-742, which crosses from the city to the North, and MG-223 highways, which links to Araguari city.

Figure 59 – Federal highway BR-365. Source: Pöyry Tecnologia (2018).

Figure 60 –Road system map



LOCALIZAÇÃO NO ESTADO DE MINAS GERAIS

LEGENDA

- Área Diretamente Afetada - ADA - Área de Implantação da Fábrica
- Tubulação 22 km
- AID para o Meio Socioeconômico - Municipios de Araguari e Indianópolis
- All para o Meio Socioeconômico - Municipios de Araguari, Indianópolis, Estrela do Sul e Uberlândia
- Via Pavimentada
- Área Urbana
- Corpo D'água
- Limite Municipal
- Limite Estadual

ESCALA GRÁFICA: 0 2,5 5 10 km

DATUM: SIRGAS 2000 - Fuso 23K
PROJEÇÃO: UTM

REFERÊNCIAS UTILIZADAS:
- Limites Municipais/Estaduais e Hidrografia (IBGE, 2015);
- Área Urbana (IBGE, 2005)
- Vias (DENIT, 2017)

PROJETO AMADEUS

PÖYRY

ESTUDO DE IMPACTO AMBIENTAL

ARAGUARI, ESTRELA DO SUL, INDIANÓPOLIS E UBERLÂNDIA

SISTEMAS VIÁRIOS

ESCALA: 1:150.000	DATA: Junho/2018		
DESENHO Nº: XXX	FOLHA: 1/1	TAMANHO: A2	
RESP. TÉCNICO:	ASSINATURA:	REV: 0	

8.3.10.2 Railways

The railway called Ferrovia Centro-Atlântica (FCA), a VLI Group company, crosses the studied region. Since 1996, FCA is the concessionaire of cargo rail transportation that has multimodal terminals in Uberaba. This railway links to a mesh with approximately 8,000 km of rail lines, within 7 States (Minas Gerais, Espírito Santo, Rio de Janeiro, Sergipe, Goiás, Bahia, São Paulo) and also the Federal District.

The main products transported by the FCA are: alcohol and petroleum products, limestone, steel products, soybean, soy bran, cement, bauxite, pig iron, clinker, phosphate, lime and petrochemicals products.

In Araguari there is a railway junction that connects the country's South to the North, through the FCA and the FERROBAN railways, as it can be checked in the following figure.

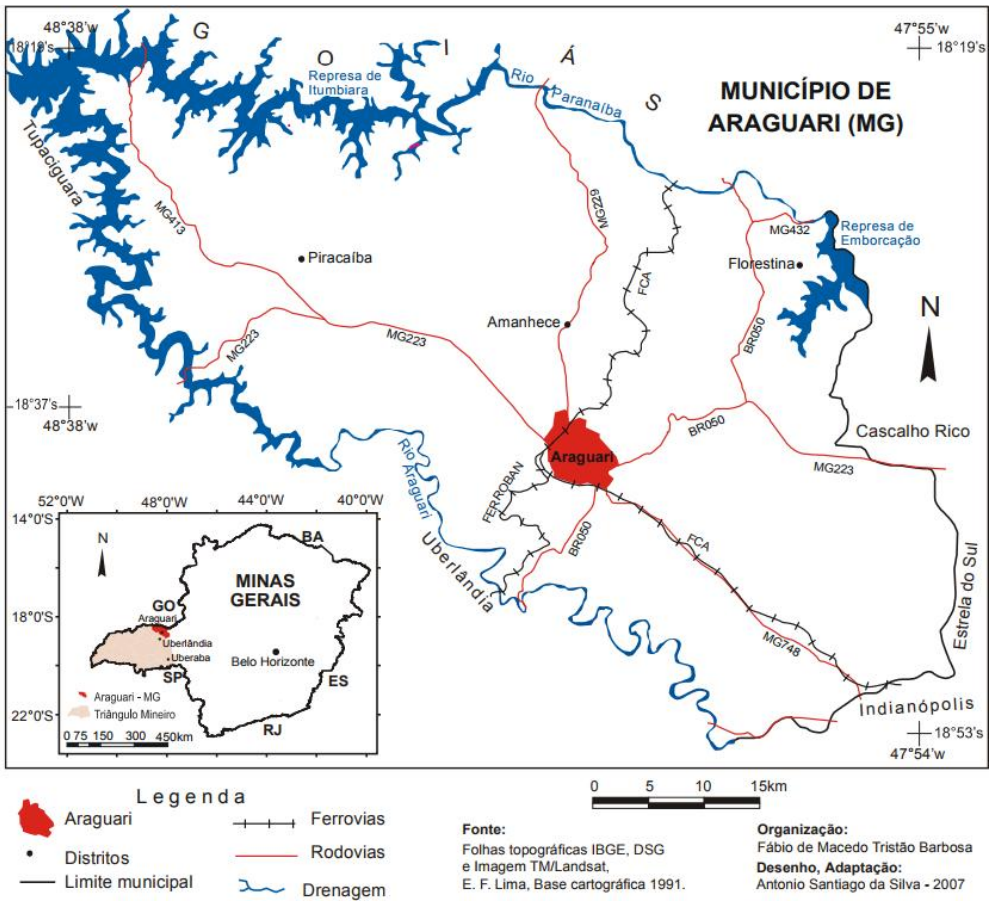


Figure 61 – Railways. Source: IBGE.

In Araguari there is also the Integrator Araguari Terminal (TI Araguari), one of the largest grains and fertilizers transshipment terminals of Latin America. TI Araguari is part of VLI East-Central Corridor and composes the main integrated logistics alternative, being responsible for carrying cargo of the major agricultural country borders, and for supporting the agribusiness products transportation from Complexo de Tubarão, in Espírito Santo State.

Figure 62 – Train set in Araguari. Source: Pöyry Tecnologia (2018).

8.3.10.3 Waterways

There are no waterways in the studied region.

8.3.10.4 Airfields

In the municipalities under study, there is only one public airfield in Araguari and six airfields in Uberlândia, being five privates and one public, as detailed in the following table.

Table 26 – Airfields in the studied cities

Code	Type	Name	Width	Length	Surface
SNAG	Public airfield	Araguari	30 m	1500 m	Asphalt
SIWC	Private airfield	Uberlândia	20 m	750 m	Grass
SWXX	Private airfield	Uberlândia	20 m	1200 m	Grass
SNHD	Private airfield	Uberlândia	25 m	1100 m	Soil
SJHS	Private airfield	Uberlândia	30 m	1200 m	Soil
SJPT	Private airfield	Uberlândia	25 m	1100 m	Soil
SBUL	Public airfield	Uberlândia	45 m	2100 m	Asphalt

Source: ANAC (2018).

Figure 63 – Airport in Araguari. Source: Pöyry Tecnologia (2018).

Figure 64 – Tenente Coronel Aviador César Bombonato Airport in Uberlândia. Source: Pöyry Tecnologia (2018).

8.3.10.5 Electric Energy

In Minas Gerais, the Companhia Energética de Minas Gerais (CEMIG) is responsible for 96% of the concession area, with about 8 million consumers over 774 cities. The Cemig Group is recognized by its great size and technical competence, being the largest integrated company in the electricity sector of Brazil.

All municipalities under study are CEMIG electric energy consumers.

8.3.10.6 Natural gas

The gas company called Companhia de Gás de Minas Gerais (Gasmig) is the exclusive piped natural gas distributor across the Minas Gerais territory, by grants or concession, distributing to industries, houses, automotive and thermoelectric sectors, gases for general use, compressed natural gas and liquefied natural gas. The gas pipelines, with total 805 km length, distribute to 40 municipalities in Minas Gerais.

GASMIG is a business corporation under the indirect control of Minas Gerais State, being its shareholders the Companhia Energética de Minas Gerais – CEMIG (with 99.6%) and the Belo Horizonte municipality – PBH (with 0.4%).

Most of the distributed gas by Gasmig comes from the Bacia de Campos in Rio de Janeiro, through the Gasbel gas pipeline. The remainder gas comes from Bolivia, through the Gasbol gas pipeline.

In the municipalities under study, currently, doesn't exist natural gas distribution. A political stalemate is putting off the construction of the gas pipeline linking Queluzito to Uberaba, passing through Betim, reaching up to Uberlândia.

8.3.10.7 Social Security

Social security is represented by various society's security segments such as the Fire Department, the federal, State and municipal polices, the army, etc.

In Araguari there is the 2nd Railway Brazilian Army Battalion and in Uberlândia there is the 36° Mechanized Infantry Battalion.

Figure 65 – Army Construction Engineering Instruction Center in Araguari. Source: Pöyry Tecnologia (2018).

Figure 66 – Monument related to the 2nd Railway Brazilian Army Battalion in Araguari. Source: Pöyry Tecnologia (2018).

Figure 67 – 36º Mechanized Infantry Battalion in Uberlândia. Fonte: *Google Earth* (2018).

In all four municipalities under study, there are Civil Police districts. The Military Police units of theses municipalities in Minas Gerais are presented in the following table.

Table 27 – Military Police Units in the municipalities under study

Municipality	Military Police Unit
Indianópolis	2 GP/3 PEL/252 CIA PM/53 BPM/9 RPM
Araguari	252 CIA PM/53 BPM/9 RPM 253 CIA PM/53 BPM/9 RPM
Uberlândia	199 CIA TM/17 BPM/9 RPM 170 CIA PM/17 BPM/9 RPM 91 CIA PM/17 BPM/9 RPM 148 CIA PM/17 BPM/9 RPM 158 CIA PM/17 BPM/9 RPM 1 CIA GER/9 BPE/9 RPM 3 CIA CHOQ/9 BPE/9 RPM 2 CIA GER/9 BPE/9 RPM 171 CIA PM/32 BPM/9 RPM 200 CIA TM/32 BPM/9 RPM 109 CIA PM/32 BPM/9 RPM 92 CIA PM/32 BPM/9 RPM 169 CIA PM/32 BPM/9 RPM
Estrela do Sul	4 PEL/252 CIA PM/53 BPM/9 RPM

Source: PM do Estado de Minas Gerais (2018).

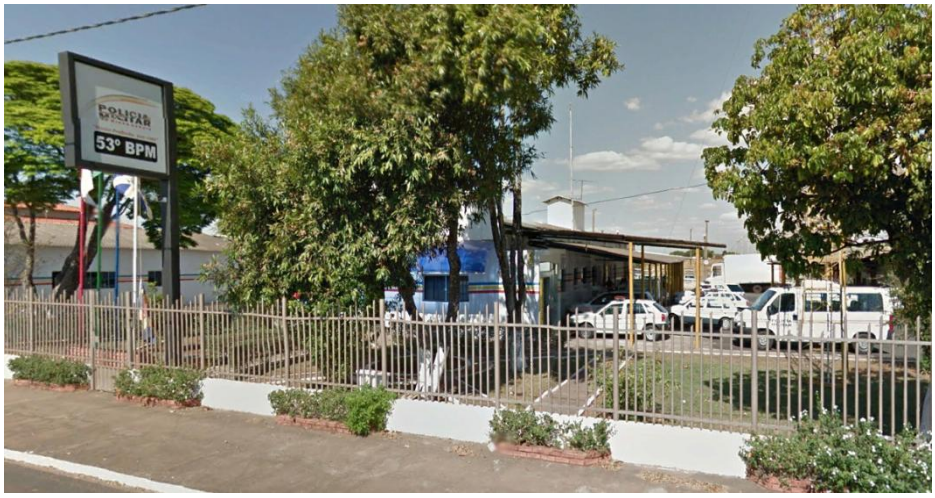


Figure 68 – Military police in Araguari. Source: *Google Earth* (2018).

The Military Fire Department Units of Minas Gerais in the municipalities under study are presented in the following table.

Table 28 – Military Fire Department Units in the municipalities under study

Municipality	Fire Department Units
Indianópolis	1 PEL/3 CIA/5 BBM/2 COB
Araguari	1 PEL/3 CIA/5 BBM/2 COB
Uberlândia	1,2,3,4 PEL/1 CIA/5 BBM/2 COB 1,2,3,4 PEL/2 CIA/5 BBM/2 COB
Estrela do Sul	1 PEL/3 CIA/ 5BBM/2 COB

Source: Corpo de Bombeiros Militar do Estado de Minas Gerais (2018).

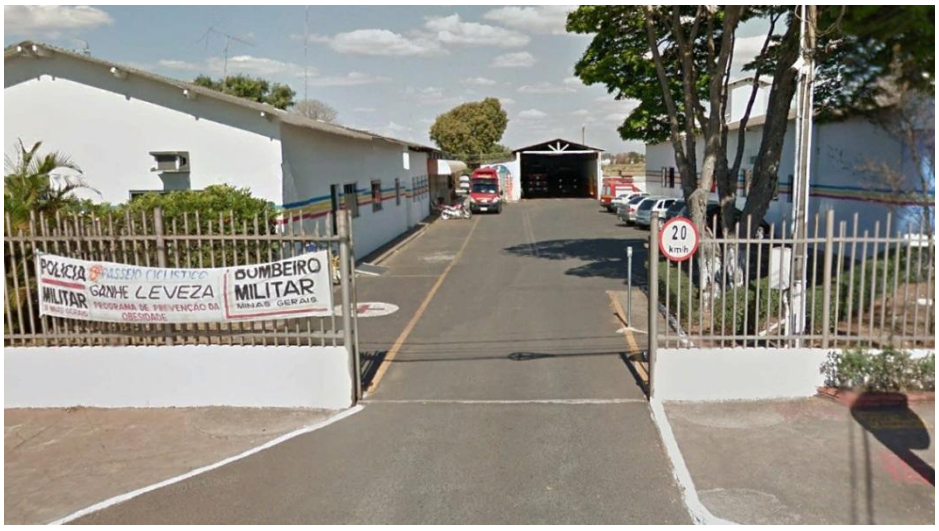


Figure 69 – Fire Department in Araguari. Source: *Google Earth* (2018).

Figure 70 – 5th Military Fire Department Battalion in Uberlândia. Source: PÖYRY (2018).

8.3.11 Social Organization

8.3.11.1 Governmental Institutions

Some Government Institutions in the region under study are presented in the following figures:

Indianópolis

Figure 71 – Indianópolis city hall. Source: Pöyry Tecnologia (2018).

Figure 72 – Social Assistance Reference Centre (CRAS) in Indianópolis. Source: Pöyry Tecnologia (2018).

Araguari

Figure 73 – Araguari city hall. Source: *Google Earth* (2018).

Figure 74 – Labor courts in Araguari. Source: Pöyry Tecnologia (2018).

Uberlândia

Figure 75 – Town council in Uberlândia. Source: Pöyry Tecnologia (2018).

Figure 76 – Uberlândia Forum. Source: Pöyry Tecnologia (2018).

Estrela do Sul

Figure 77 – Estrela do Sul city hall. Source: Pöyry Tecnologia (2018).

Figure 78 – Estrela do Sul Forum. Source: *Google Earth* (2018).

Figure 79 – Social Assistance Reference Centre (CRAS) in Estrela do Sul. Source: *Google Earth* (2018).

8.3.11.2 Business Sector

According to the Enterprises Central Register (IBGE, 2013), the following table presents the number of companies per municipality.

Table 29 – Enterprises Central Register, 2015 data.

Municipalities	Number of operating enterprises	Number of registered local units
Indianópolis	92	92
Araguari	3.214	3.366
Uberlândia	26.751	28.252
Estrela do Sul	151	153

Source: IBGE (2018).

Figure 80 – Geza in Araguari. Source: Pöyry Tecnologia (2018).

Figure 81 – Patrus Transportes in Uberlândia. Source: Pöyry Tecnologia (2018).

8.3.11.3 Civil society organizations

<u>Indianópolis</u>

- Indianópolis Rural Syndicate;
- Indianópolis Public Servers Syndicate;
- Indianópolis Masonic Lodge;
- Municipalities of Vale do Parnaíba microregion Association – AMVAP.

Figure 82 – Indianópolis Rural Syndicate. Source: Pöyry Tecnologia (2018).

Figure 83 – Indianópolis Masonic Lodge. Source: Pöyry Tecnologia (2018).

Araguari

- Araguari Commercial and Industrial Association;
- Araguari Coffee Growers Association;
- Araguari Education and Assistance Association;
- Araguari Disabled People Association;
- Araguari Medical Association;
- Central Brazil Masonic Lodge nº 10;
- Araguari Rural Syndicate;

- Accountants Syndicate;
- Rural Workers Syndicate;
- Araguari Retail and Wholesale Trade Syndicate;
- Araguari Food Industry Workers Syndicate;
- Araguari Public Servers Syndicate;
- Araguari Retirees and Pensioners Union.

Figure 84 – Masonic Lodge in Araguari. Source: Pöyry Tecnologia (2018).

Figure 85 – Araguari Retirees and Pensioners Union. Source: Pöyry Tecnologia (2018).

Figure 86 – Parents and Friends of the Exceptional People Association (APAE) in Araguari. Source: Pöyry Tecnologia (2018).

Figure 87 – Medical Association in Araguari. Source: Pöyry Tecnologia (2018).

Uberlândia

- Leaders for Social Development Organization;
- ABCD – Brazilian Citizenship and Development Association;
- Parents and Friends of the Exceptional People Association (APAE) in Uberlândia;
- AFADA – Assistance to Hearing Impaired Philanthropic Association;
- Social Assistance United Association;
- Communication Community Association in Uberlândia;

- Industrial District Companies Union in Uberlândia;
- Commercial and Industrial Association in Uberlândia;
- Engineers, Architects and Agronomists Engineers Association in Uberlândia;
- Horticulture Producers Regional Association;
- Ceasa Traders Association in Uberlândia;
- Clinics Hospital Voluntary Association in Uberlândia – Avhoc;
- Martins Chapel Folia de Reis Association;
- Non-governmental organization for the citizenship defense;
- Uberlândia Craftsmen Association;
- Uberlândia Lawyers Association;
- Friends of the Uberlândia Municipality Association (Aamu);
- Uberlândia Civil Construction Companies Association;
- Centro dia – Day Centre Care for Elderly People;
- Uberlândia Workers in Roads Transportations Syndicate;
- Uberlândia Metal and Mechanical and Electric Equipment Industries Syndicate – Sindmetal;
- Uberlândia Rural Workers Syndicate;
- SECOVI-TAP Triângulo Mineiro and Alto Paranaíba Housing Syndicate;
- Sinticom-TAP Civil Construction Worker Homologation Syndicate.

Figure 88 – Centro dia – Day Centre Care for Elderly People in Uberlândia. Source: Pöyry Tecnologia (2018).

Estrela do Sul

- Estrela do Sul Rural Syndicate;
- Rural Workers Syndicate;
- AMVAP - Municipalities of Vale do Parnaíba microregion Association;
- APAE - Parents and Friends of the Exceptional People Association.

8.3.11.4 Municipal Councils

Indianópolis

- Social Assistance Municipal Council - CMDCA;
- Elderly People Rights Municipal Council - CMDI;
- Education Municipal Council;
- Guardianship Council.

Araguari

- Health Municipal Council;
- Culture Municipal Council;
- Sports and Leisure Council;
- Guardianship Council;
- Elderly People Municipal Council.

Uberlândia

- Education Municipal Council;
- Health Municipal Council;
- Guardianship Council;
- SEC Municipal Social and Work Development;
- Food and Nutritional Security Municipal Council – COMSEA;
- Children and Teenagers Rights Municipal Council – CMDCA;
- Minas Gerais Medicine Regional Council;
- Uberlândia Regional Police Station;
- Cultural Policy Municipal Council;
- Uberlândia/MG Contributors Municipal Council.

Estrela do Sul

- Social Defense Council;
- Guardianship Council.

8.3.12 Traditional Communities

Traditional communities are social groups who live, for relatively long periods, in a defined geographical area and build their identity from establishing relations with the territory they occupy. The territory (physical and symbolic) is an essential space for them to reproduce and sustain their ways of doing and living in economic, social, cultural, aesthetic, among others points of views (CEDEFES, 2016).

The official recognition of this social condition was established by Decree 6,040, from February 7th 2007, that established the National Policy for the Sustainable Development of Peoples and Traditional Communities. In its 3rd article, the Decree defines that these populations

> are culturally differentiated groups and that they are recognized as such, to have their own forms of social organization, which occupy and use land and natural resources as a condition for their cultural, social, religious, ancestor and economic reproduction, using knowledge, innovations and generated and transmitted practices by tradition (Federal Decree No. 6,040 from 7th February 2007).

In Brazil there are considered traditional peoples and communities the indigenous (according to Decree 1775/96 regularizing the indigenous lands), Quilombola communities (whose State Decree nº 3,572 legitimizes the possession of the remnants of the quilombos lands), artisanal fisher folk, the river bordering residents, the gypsies, the terreiro (meeting places for Umbanda and Candomblé) people, the Pantanal people (from Mato Grosso and Mato Grosso do Sul Pantanal areas).

For the region under study follows the traditional population's description.

8.3.12.1 Indigenous Communities

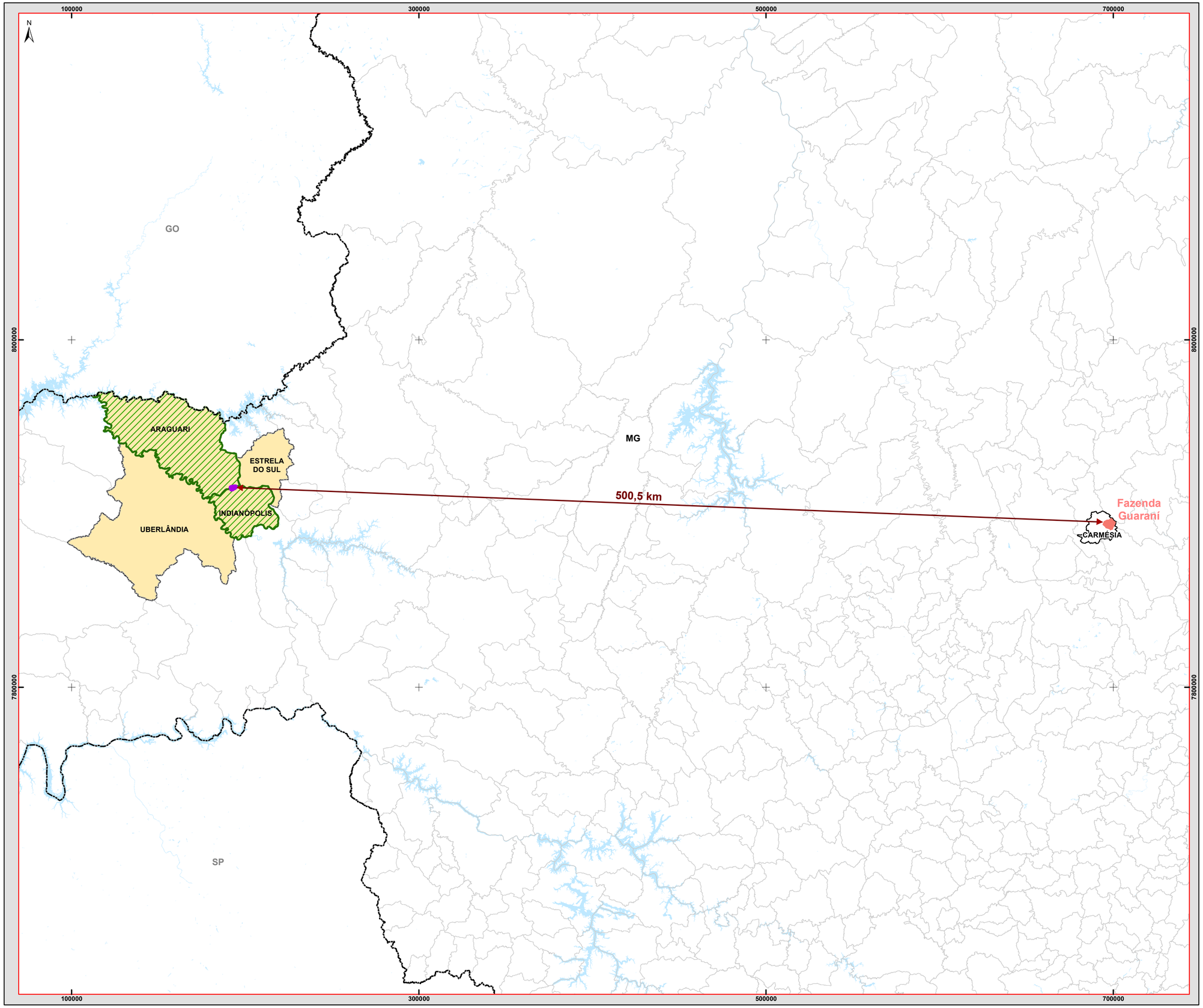
Nowadays, the region has some indigenous nuclei that came from other parts of the country. In Uberlândia there are occupations of the Terena ethnicity, because in 2013 they occupied in interim mode the campus of the Federal University of Uberlândia, when they were waiting for their territory regularization. The closest indigenous regulated community is 500 km away from the enterprise location, which is shown in the following figure.

8.3.12.2 Quilombolas Communities

According to Edson da Silva Filho et al. (2011), the area so called Triângulo Mineiro had some important Quilombola communities since the late 18th century, this information was verified through the historical cartography analysis.

Nowadays, it is possible to verify one Quilombola community in the studied region, which is 206 km away from the enterprise location, as showed in the following figure.

Figure 89 – Map of the traditional populations in the studied region – Indigenous Communities



LOCALIZAÇÃO NO ESTADO DE MINAS GERAIS

LEGENDA

- Área Diretamente Afetada - ADA - Área de Implantação da Fábrica
- AID para o Meio Socioeconômico - Municipios de Araguari e Indianópolis
- AII para o Meio Socioeconômico - Municipios de Araguari, Indianópolis, Estrela do Sul e Uberlândia
- Terra Indígena
- Corpo D'água
- Limite Municipal
- Limite Estadual

ESCALA GRÁFICA: 0 25 50 100 km

DATUM: SIRGAS 2000 - Fuso 23K
PROJEÇÃO: UTM

REFERÊNCIAS UTILIZADAS:
- Limites Municipais/Estaduais e Hidrografia (IBGE, 2015);
- Terra Indígena (CPRM, 2010)

PROJETO AMADEUS

PÖYRY

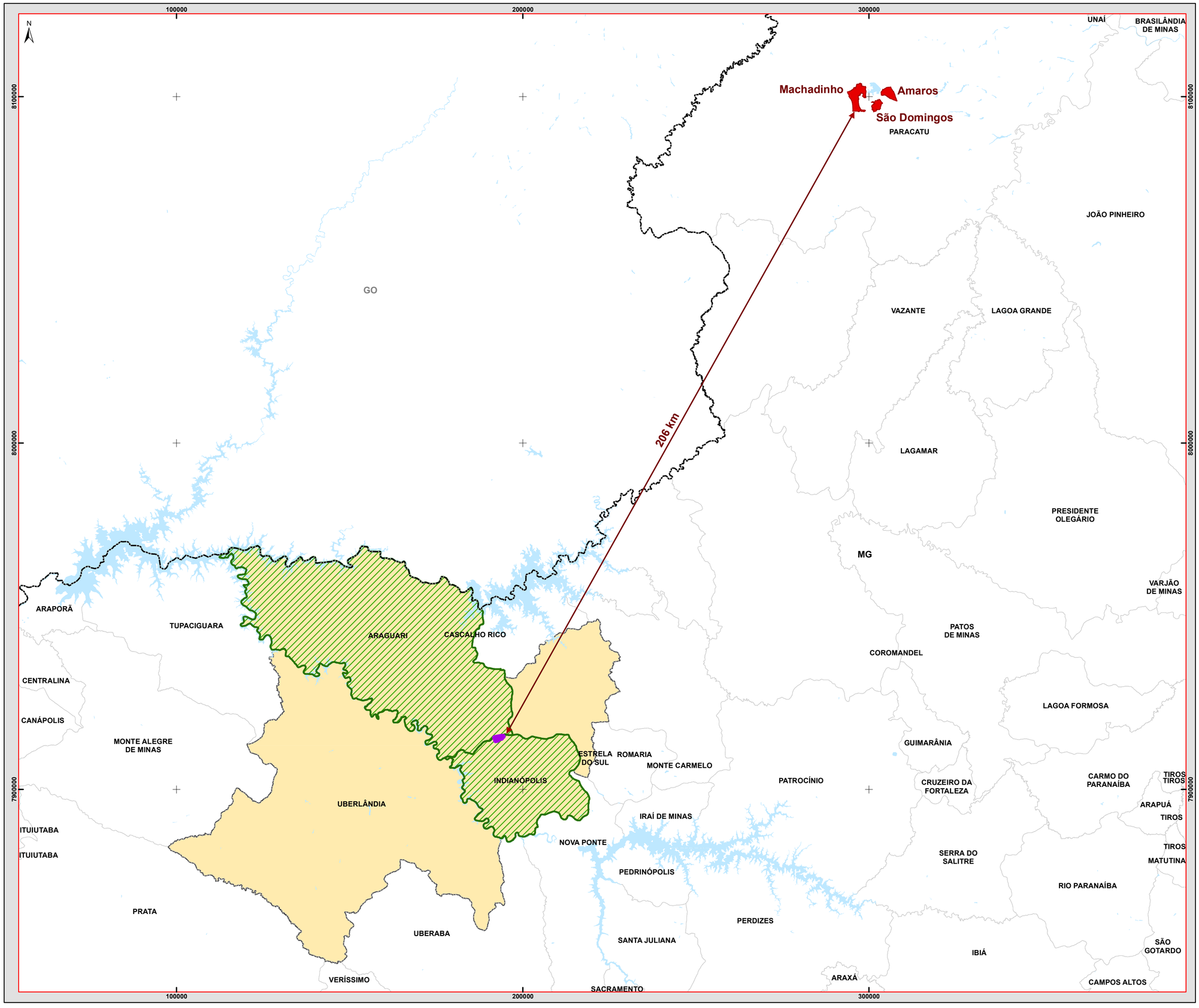
ESTUDO DE IMPACTO AMBIENTAL

ARAGUARI, ESTRELA DO SUL, INDIANÓPOLIS E UBERLÂNDIA

POPULAÇÕES INDÍGENAS

ESCALA: 1:1.500.000	DATA: Junho/2018		
DESENHO Nº: XXX	FOLHA: 1/1	TAMANHO: A2	
RESP. TÉCNICO:	ASSINATURA:	REV: 0	

Figure 90 – Map of the traditional populations in the studied region – Quilombola Communities



LOCALIZAÇÃO NO ESTADO DE MINAS GERAIS

LEGENDA

- Área Diretamente Afetada - ADA - Área de Implantação da Fábrica
- AID para o Meio Socioeconômico - Municipios de Araguari e Indianópolis
- AII para o Meio Socioeconômico - Municipios de Araguari, Indianópolis, Estrela do Sul e Uberlândia
- Comunidade Quilombola
- Corpo D'água
- Limite Municipal
- Limite Estadual

ESCALA GRÁFICA: 0 10 20 40 km

DATUM: SIRGAS 2000 - Fuso 23K
PROJEÇÃO: UTM

REFERÊNCIAS UTILIZADAS:
- Limites Municipais/Estaduais e Hidrografia (IBGE, 2015);
- Comunidades Quilombolas (INCRA, 01/2018)

PROJETO AMADEUS

PÖYRY

ESTUDO DE IMPACTO AMBIENTAL

ARAGUARI, ESTRELA DO SUL, INDIANÓPOLIS E UBERLÂNDIA

POPULAÇÕES INDÍGENAS

ESCALA:	1:750.000	DATA:	Junho/2018
DESENHO Nº	XXX	FOLHA: 1/1	TAMANHO: A2
RESP. TÉCNICO:		ASSINATURA:	REV: 0

8.3.13 Cultural and Archaeological Heritage

This chapter presents an approach on the so-called integrated cultural wealth (heritage sites listed and registered), with the regional archaeological context, ending with a brief approach to current ethno-historical scenarios.

It was used the bibliographic review methodology regarding the regional contexts. In order to do this, it was consulted IPHAN (National Historical and Artistic Heritage Institute) and IEPHA (Historical and Artistic Heritage State Institute) databases, as well as previous studies elaborated in the studied region, such as academic productions and electronic pages publications.

8.3.13.1 Integrated Cultural Wealth

The historical and cultural heritage study in the project area aims to identify the cultural heritage items profile (in its various tangible and intangible forms) presented in the studied region, in order to contemplate not only the heritage items that are already recognized or have some kind of protection by the Government, but also those heritage items that, although they are relevant to the communities and compose their historical and cultural universes references, are not yet recognized.

On the other hand, it was tried to critically observe the relationship established among the various actors of these communities with regard to the cultural heritage treatment and maintenance, such as, the public authorities action, the organized civil society action, and eventually the private sector action with respect to the cultural heritage. These relationships established among the social actors in relation to the heritage involve many dimensions, which reflect broader tensions and social dynamics. They concern about the identification procedures, the incorporation, the denial, the preservation, the destruction, the promotion, the recovery, the historical and cultural landmarks omission, that are presented in the region or that depend on local populations to stay alive (such as intangible culture manifestations such as celebrations, beliefs, techniques, etc.).

That is exactly why, although at the first step of this study, the goal was just to define the general aspects of each heritage, each item of the heritage involves specific issues of societies, thus requiring differentiated and unique treatment. So, along with the applicant and essential bibliography observation related to the general heritage studies aspects and also the area in question, it was essential to study the communities relationships in the region, in order to observe how each social group relates with the heritage (although it not assigned as this name yet) and what each group observes and recognizes as such a heritage (CONVENÇÃO UNESCO, 2003).

This procedure is based on contemporary cultural heritage issues treatment principles: democratizing the practices for the cultural heritage recognition and identification, observing the various possibilities of vision and interpretation regarding this heritage. The morphological possibilities, that guide the heritage recognition, are expanded by respecting the historical experiences peculiarities of each culture and each social group. The heritage identification practices, protection, recovery and promotion development should be shared among the scientific groups and communities, acting in a coordinated and solidarity way.

It is necessary to understand the cultural heritage as something alive and integrated with societies, as some fundamental elements in maintaining social cohesion and in the preservation of cultures. It should be adopted the principle that only with the society involvement, especially the local communities (including their action as partners and observers from other social actors), it is possible to have a heritage policy that is durable and sustainable. So, for this to be real and effective, the heritage must be seen and incorporated as society's component element and not away from them, with recognized functions as a vector for development and for collective wellbeing (HAMAN, 2008, p. 42-48, CONVENTION UNESCO, 1972, 2003).

8.3.13.1.1 Methodology and Concepts

The cultural heritage diagnosis of a certain region deserves a set of preliminary considerations without which the work results may suggest randomness or absence of criteria. Starting with the concept of cultural heritage, formed by two concepts: heritage (the noun) and cultural (the adjective, as unfolding of "culture").

"Heritage" means ownership, property, element of belonging. In Portuguese "heritage" derives from the word "motherland" and that, derives from "father", which leads to a genetic condition that can admit two meanings: the first, related to the 19th century origins of the modern Nations formation, the romanticism period, when the first idea of historical heritage formulation was understood (even with successive enlargements and revisions). The second meaning is from the even more remote word root of one's "homeland" being the land territory, location of the "pater" (not accidentally preserved the English word "pattern" as "standard", mark, hence "discovery pattern" or "standard quality"). The second meaning refers to more physiological genetic condition of heritage, as that which is inherited from the "father", or, generally, from the ancestors.

More than etymological filigree, the word root lead to several points. The first, which is closer to the existing classification and legislation, is the territorial association, but, above all, the institutional heritage: municipal, State, federal humanity heritage. Heritage being: historical or cultural heritage, archaeological or landscape, tangible or intangible. The second deals with the inheritance, the transmission of values.

It was opted to make a cultural drawing of the region that, at the end, would compose a cultural lexicon, a language that, despite specific paradoxes, formed a cohesive and harmonious cultural sense. The transformations which deal with social or regional culture ruptures represent a process that historically always occurred and it is inherent to the culture. What, perhaps, differentiate and cause some awkwardness or perplexity is the speed and the break of cultural transformations - with unlikely associations - within the contemporary context.

8.3.13.1.2 The landscape: Marks and the transformation

It should be distinguished the landscape definitions. Geography has a long discussion about it, so that it adjectived this concept with the goal of distinguishing: "landscape mark", "landscape matrix", etc. In more recent times the Unesco recognized the

existence of a distinct heritage morphology named "cultural landscape", which combines cultural, (sometimes) ethnic elements, natural, space and historical elements.

8.3.13.1.3 The Cities and the Heritage Buildings (Urbanism and Architecture)

Crossing the planned areas in the studied region it is possible to meet some historical-cultural universes, which were marked by a secular history. So many “bandeirantes” territory clearances and other explorers had already recognized these spaces in the 16th and 17th centuries, but the emergence of urban centers (in its various formats: parishes, landings, villages) started only in the XVIII century with the expansion of the gold exploration.

In this territory there are two cities’ orders - that is reflected in their urban and building heritage: the first so called ancient cities, like Araxá, Sacramento, Patrocínio, Corumbá de Goiás, Silvânia and Porangatú. In these cities it can be found remnants of the 18th and 19th centuries, of the first occupation movement of the interior of Sertão da Farinha Podre and its expansion to Goiás (which would culminate in Pirenópolis and Pilar de Goiás).

Many of these cities abandoned their original centers (which were aligned with the creation of cities principles in the 18th century, with central squares, which were rectangular, with churches marks, surrounded by squares, or by the principles popular establishment of Portuguese origin populations townships: centers on top of hills, with irregular streets, cut by narrow streets and alleys, always turned towards a small valley where there was a water course). One way or another, these ancient cities, almost all, preferred to create new centers, sometimes with tens of kilometers away from the originals, as in the case of Sacramento, which established its new center away from Desemboque, a parish which was the starting point for the colonization and expansion for mining on the Sertão da Farinha Podre (today known as Triângulo Mineiro).

In part of these cities – although several changes have occurred – the original urban trace is still well visible (as in Porangatú, Corumbá de Goiás and Desemboque, in Sacramento), which would justify the implementation of protection and presentation measures. It is worth remembering that it was the preservation and evidence of the urban design and the unique architecture that guaranteed Pirenópolis/GO its main source of income today: the historical tourism.

In these old centers it was implanted a vernacular architecture of rammed earth technique, adobe and stone, using apparent timber and subdivision of the building walls, in order to remember the German half-timber. This clay morphology architecture is quite unique when compared to similar architecture in Minas Gerais and São Paulo (with regard, obviously, rammed earth and adobe). Such examples of this technique, distributed at the ancient above mentioned towns centers should also receive greater attention, due to its gradual deterioration and replaced by buildings with contemporary constructive material (ceramic bricks, cement, zinc or industrial ceramics roof tile, etc.).

Corumbá de Goiás, Sacramento (the Desemboque parish) and Silvânia are the cases that inspire greater concern, because they have the most significant architectural and

urbanistic assemblies. It is worth remembering that in these cities there is also the strong influence of afro-descendant population, which is reminiscent of the rapid local gold cycle and that, when they didn't organize into quilombos, they integrated with the local people, giving rise to small rural communities with "caipira" character.

These constructions, with rammed earth and adobe, from the 18th and 19th centuries, are fragile and many of them need restoration and structures consolidation. They don't resist to the heavy vehicles traffics or any form of overload movement, so it is recommended to be established a map of the routes so that the movement of men and materials keep safe distance of them. Similarly it is important to notice that these urban centers make up significant historical landscapes, testifying a long process of occupation, colonization and production in Central Brazil, and that it would be also desirable that the transmission lines were kept away from them.

Advancing in time, there is a second group of cities, which were separated from these pioneers' centers. Both in these new cities, created in the late 19th and early 20th centuries, like in the ancient cities, it was established in the first half of the 20th century an art deco decorative character, with greater or lesser sophistication, but it is present in buildings dedicated to small shops, cinemas, schools. This set of buildings is significant and, although some are already protected, this style is little observed and receives less attention than those from the Colony and Empire ages.

Already constructed with modern material (ceramic bricks, cement, iron, glass, etc.) the art deco style is characterized by the systematic use of the geometries, the use of smaller spaces, the use of external decorative elements in counterpoint to the very simple and functional architecture parts.

According to the prior approach of the general scenarios, there are also the registered and under recognized architectural heritage.

Figure 91 – Milestone on the way to Desemboque entry, mark of Sertão da Farinha Podre occupation, today known as Triângulo Mineiro.

Araguari

Landscape and architectural ensemble of the former Goiás Railroad Station [2]

The buildings belonging to the landscape set of the former Goiás Railroad Station were built in 1920 and the station was built in 1928, the State protected these sites in 2008 with registration in the books of Fine Arts and History Protection, the works of Historic Art and Paleographic or Bibliographic documents.

The State protection of the former Goiás Railroad Station Landscape Set was approved by the IEPHA/MG Board of Trustees on June 30th 2008, entering in the Books of Protected Sites nº II and III, respectively, on the books of Fine Arts and History Protection, the works of Historic Art and Paleographic or Bibliographic documents. The buildings that make up the current landscape set in the former Railway Station, were built around 1920's, after the Goiás Railroad was taken over by Oeste de Minas Railroad. The current Station, and main property of the set buildings, was completed in 1928. In 1957, the entire set was incorporated into the Federal Railway net and in 1973 it was disabled. In 1989, the set was protected by the municipality of Araguari. The following years - in 1999 - the Railroad set was transferred to the municipality domain. The main building has four paved floors by its sides there are large warehouses with metal coverage in sheds and it is opened to a central courtyard (the "carretão"); it has vertical lines and staggered parapets, in art deco. The complex housed yet, large workshops, vocational training center, operator's village, a hospital and a cooperative. Mark of railway conception in Brazil, the Set turned the Araguari municipality into a railway town.

Such historical railroad bed has potential presence of possible components with own conception. Such traces are configured as engineering testimonies domain about the railways, with new solutions related to skills and used materials and, above all, the relationship of this enterprise with the environment. Such heritage category is thus described:

> An industrial monument is any building or other permanent structure that, alone or associated with the primary installation to equipment, illustrates the beginning and development of industrial and technical processes, including the communication media. ***Emphasis added*** (KÜLL, 1998, p. 222)

With regard to this archaeological heritage, this is guided by the present precepts in Industrial Archaeology, as:

> Industrial Archaeology is a study field related to the research, survey, registration and, in some cases, with the industrial monuments preservation. It aims, moreover, to achieve the significance of these monuments in the social history and technique context. For purposes of this definition, an 'industrial

[2] http://www.iepha.mg.gov.br/index.php/programas-e-acoes/patrimonio-cultural-protegido/bens-tombados/details/1/14/bens-tombados-conjunto-paisag%C3%ADstico-e-arquitet%C3%B4nico-da-antiga-esta%C3%A7%C3%A3o-da-estrada-de-ferro-goi%C3%A1s

> monument' is any relic of an obsolete phase of an industry or transportation system. Emphasis added (op. cit, 1998, p. 223).

In this sense, Azevedo (1953, p. 164) observes:

> Since a railroad is considered nothing more than a special type of industry - a creator organization and a transport producer, such should have similar treatment as to other production companies…

8.3.13.1.4 The Intangible Heritage (Celebrations, Beliefs, Habits)

Between Araxá/MG and the Tocantins State border there is a homogeneous cultural universe, in which the dominant are the central elements of Goiás State. It is worthy to remember that both the Triângulo Mineiro as the Tocantins State already belonged to Goiás State in the past and, more importantly, the colonization of these areas is linked to the same process of expansion, started in São Paulo in the 16th century, which entered by Minas Gerais in the 17th century and, finally, arrived into Mato Grosso, Goiás and the current Tocantins State in the 18th century.

Obviously that it deals with the effective colonization and not with the several other expeditions with military or exploration objectives that had already crossed these regions since the early days of colonization. In this way, the intangible heritage of this region is entirely linked to its headquarters in São Paulo and Minas Gerais, although it has taken specific features of the region.

The food, for example, is typically rustic, with the predominance of small animals (pigs, chickens), the omnipresence of corn (which Sérgio Buarque de Holanda called in Caminhos e Fronteiras book as "a civilization of corn") and sugarcane derivatives (molasses, rum, maple syrup) and milk (assorted candies, cheeses). However, in this region it was incorporated typical cerrado elements, as buriti (which turns sweet), the pequi (which generates oil, to aromatize various dishes, which colors the meals), guariroba (a kind of Palm extremely bitter, but an ingredient indispensable the pie called "empadão goiano").

That is how it occurs in almost all culture dimensions of this region: a mixture of elements from São Paulo, Minas Gerais and Goiás, with rustic traces (within the definitions of Antonio Candido in his classic book - Os parceiros do Rio Bonito). But, because Goiás became a livestock area, there are also signs in this scenario: typical elements of herding societies (as parties related to cattle, cowboys' disputes, the committees tradition, etc.).

Although the introduction of a more extensive highway network and more efficient in the last decades has reduced the presence of committees, they still persist, by taking the herds towards greener and more nutritious pastures. Usually the committees are formed by a pointer, the cowboy who is in front of the herd; a group of cowboys around them, preventing the cattle lost, sometimes with dogs used to grazing and, in front of them, always traveling with 3 or 4 hours in advance, there is the ranch wagon, where's the Cook, an Assistant (sometimes) and all the material to prepare the cowboys' meal when they arrive.

It is also significant the presence, especially in Minas Gerais and Goiás (in the studied region), Afro descendant populations. In addition to the existing quilombos in the region – almost all of them from the remnants of gold extraction in the 18th century – this population has joined the cities and, although they share most of the symbolic universe, cultural, religious, from the rest of the population, they also kept their particular secular manifestations connected to slaves period and – later – the afro descendants.

Two of these elements are essential: one of them is the devotion to Nossa Senhora do Rosário dos Pretos and to São Benedito (in several urban centers, those were the first churches to be built and, according to tradition, usually a single church for both

saints), the other manifestation, closely linked to the first one, is the “congada”, which has in Catalão/GO its highest expression.

Congada is a type of dramatic dance that represents the crowning of a King (and sometimes also a Queen) from Congo, consisting of a parade with dancing steps and songs, where the music accompanies the dramatic expression of the texts, and which is characterized by the Embassy , by processions evolutions and symbolic fights with sword [it is a creation of the slaves in Brazil, registered since 1674 in Pernambuco, but its origin may be in the old disputes between rival tribes of Congo and Angola.].

The congada is composed basically by various suits from Congo, it is composed by drum (‘alfaia’) and rattles players (tied at the feet) and dancers. Each Congo suit is dedicated to a Saint and it has its specific "uniform". The suits also have their masters, who command their respective evolution and every step of the route.

Annually it is elected a "party owner", a person who after the Festival of Nossa Senhora do Rosário dos Pretos (i.e., the feast of our Blessed Mother on 12th October), receives the flags from Holy Mother and Saint Benedict. So on the following year it's up to him to organize the party and offer hospitality to suits from Congo into his House. At the entrance of the House there will be an improvised altar in which every suit from Congo will honor the saints. At the end of the all suits passage, the suit to which belongs the party owner will collect all the flags and escort them to the Saints Church, where they will be welcomed by all and suits with Fireworks. It is played a mass and then the profane feasts begin (dances and others) that will last until the morning after.

At dawn it is celebrated another mass, in which the Holy Mother is crowned and next year party owner is indicated. Throughout the week before the October 12th the rosaries go around the city, meeting at the three final days of celebration. Along the party it recovers – also – elements linked to the coronation of the Congo Kings (hence the name "congada") and the Carlos Magno fight against the Moors (that is why there are Christians suits and the "villains" that are represented by the Moors). In addition to the drums (‘alfaia’) and rattles, there are also common in congo suits the accordion, the opossum and the tambourine.

During the week party the Catalão city which lives in function of this feast: a huge fair is erected, with kitchen objects, utilities, clothing, food and beverage, electronics, because it is the occasion in which people from isolated communities go shopping and strengthen their social relationship (always compromised by the distances and by isolation of the rural areas).

All this rustic universe "caipira" – saved by the appropriate calibrations – still is deeply Christian and Catholic, even among the afro descendant population (which follows, in general, the tradition of beliefs in Minas Gerais and Goiás), then – also – the importance of these parties for the local community. Unlike the cities of the Northeast Brazil, in where the movement of neo-Pentecostal and Evangelical churches has advanced profoundly (compromising, the ancient cultural manifestations linked to the Catholic rites) in Minas Gerais and Goiás – although there are certainly many of the new churches – the manifestations related to the Catholic rite remain strong celebrated. Given the fact that this region still retains these manifestations (the

congada, the cavalhadas, folias de rei and visitation of the Nativity scenes), it should be a way as a measure – at least – to safe the memory of this intangible heritage.

Registered Wealth in Minas

Production of artisanal cheese

Just like all artisanal cheese made in Brazil, the original bases of the way to make them in Gerais comes from the Portuguese tradition in Serra da Estrela, in the central region of Portugal. And, like any cultural product, it changes and fits into the local reality, the typological varieties and to the Ways of Making them.

Although the Portuguese tradition uses goat's milk as a raw material, in Brazil the activity suffered adaptation by using the cow's milk. The type of animals' food and farming interferes on milk quality and therefore on the cheese.

The food production processes distinguish identities and are regional and group's heritages, being compensate instrument, whose manufacturing process turns into a cultural wealth. The ways of making vary from region, where the traditional way of manufacturing the cheese from Serro was registered by the State Institute of historical and artistic heritage of Minas Gerais - IEPHA-MG in August 2002, and in June 2008 the Artisanal Way of Making Cheese from Minas in the regions of Serro, the Serra da Canastra and Salitre were inscribed in the book of knowledge. Several countries seek to preserve legally their artisanal cheeses, through formal instruments of recognition and interpretation of ways of doing, as in France, Portugal, Spain, Italy, Switzerland and the Netherlands that have legal registered instruments and artisanal cheese control.

In Brazil, there is the problem of product regulations, due to its animal origin, the food security is regulated by law and follows quality control standards. To ensure continuity of the work, the producers organized into associations and cooperatives and accredit their products in rural extension and organs of sanitary control, defending their rights to produce the cheese with the sanitary laws. However, these laws are too technical and make difficult the continuity of the traditional way of making cheese. During the search for this enterprise impact assess, it was noted the concern of not accredited rural producers to discuss this activity and show the local team the methods of making them.

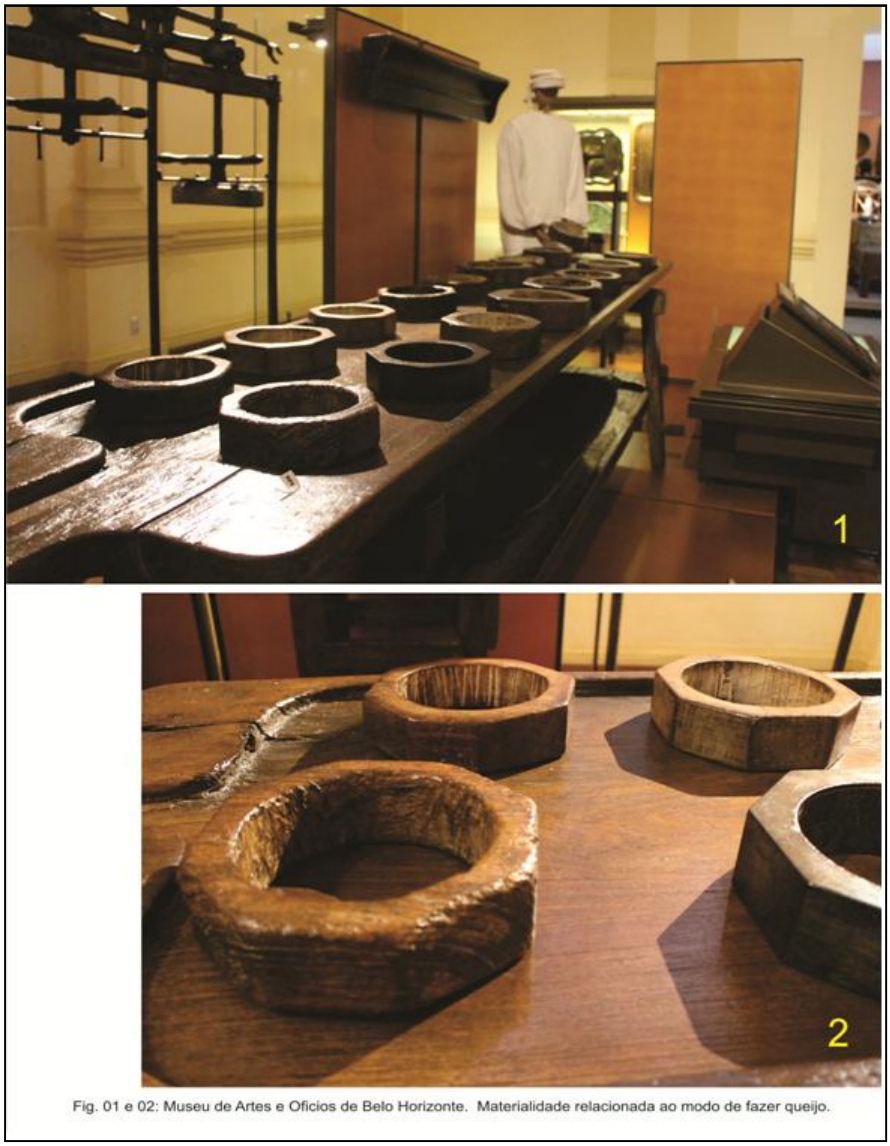


Figure 92 – Mosaic of artisan cheese production artifacts

Capoeira

Capoeira is a manifestation that involves the use of the body as a weapon for self-defense with dancing movements and with proper music. As this it is transferred by orality and by gestures, it depends on the preservation of the Masters knowledge to continue existing as a form of Afro-Brazilian culture representation. In addition to inserting this manifestation in the book of knowledge, the capoeira circle, for allowing learning and game expansion, it also requires recognition and protection, being inserted in the Forms of Expression Book. The researches' inventory process, developed for these recognitions by IPHAN, occurred also thanks to the masters and capoeira groups' mobilization, which brought their musical wealth importance and their connection with the traditional fighting games, preventing it to stay restricted to its martial fight form.

The questions in relation to this art origin are constantly searched, but it is possible that it will never reach a single form of explanation due to its diversity of influences. There are three distinct stories about the origin of this art in Brazil, involving ethnic heritage and territorial origin issues. One of the capoeira origin hypothesis is that claims that capoeira was brought intact to the Brazil by enslaved African ethnic groups. It is proven that there are similar war dances like capoeira, both in Central Africa, and in countries that were part of the African diaspora. However, the mutant culture according to the social and territorial contexts, need to recognize the ruptures and continuities that occurred in Brazilian soil. The intangible culture changes do not necessarily symbolize the loss of a mnemonic link with its matrix origin.

There is also the hypothesis that this manifestation would have arisen in Brazil, independent from African cultures. In the slavery context, where people needed to defend and protect their pairs, this fight development would be associated to the quilombolas territories, Afro descendants' residence. But the oldest records of capoeira in the country, it belonged to the urban centers formation during the colonial period, especially in the port areas of Rio de Janeiro, Salvador and Recife. In these places, large groups of African ethnic people arrived, making it impossible to ignore the present heritages in all the cultural events involving slaves, like the food, the clothes, the sacred rituals or the fights.

There is no written documentation to support the third option hypothesis, which brings the Indian culture as the capoeira origin due to this name issue. Capoeira is a term that is part of the tupi Indians language and it means thin bush "mato ralo", that would be the place where the fugitive slaves surprised their tormentors. Besides not being a claimed culture by indigenous ethnic groups, there is the explanation that this term came from the name given to the basket in which the slaves carried chickens in urban markets during the colonial period (REGO, 1968 apud Dossier IPHAN).

The oldest historiographical record, that mentions capoeira, is a 1789 document referred to the arrest of the slave Adão by the practicing capoeira in Rio de Janeiro (CAVALCANTI apud Dossiê IPHAN). This difficulty in tracing its path until the origin moment is due to the plurality of its representations and territoriality, with specific characteristics according to the context in which it was developed. But it is undeniable the importance to understand it, with the social processes lived by Brazil.

Currently, this manifestation configures as the need of daily fight for survival of a black representation struggle. In the areas crossed by the team to obtain the previous license of this enterprise, it was observed that there are different choices of Masters in relation to art teaching methodology. There are groups who prefer to follow the line of Capoeira Regional, from Mestre Bimba as founder, and the line with lessons that involve martial arts concepts that belongs to the Makulelê, which refers to an Indian influence. And there are also groups that are descended from the line of Pastinha with Capoeira de Angola, with slower movements and unique music. The Masters who don't have Bimba or Pastinha descends, tend to characterize their group within the Contemporary Capoeira, dividing classes between these two methods. Despite these differences, in all surveyed groups, Capoeira is practiced as a form of socialization, teaching citizenship concepts and aborting topics such as sex education and drugs, with the aim of bringing quality of life for children, youth and adults, especially on the major urban centers periphery.

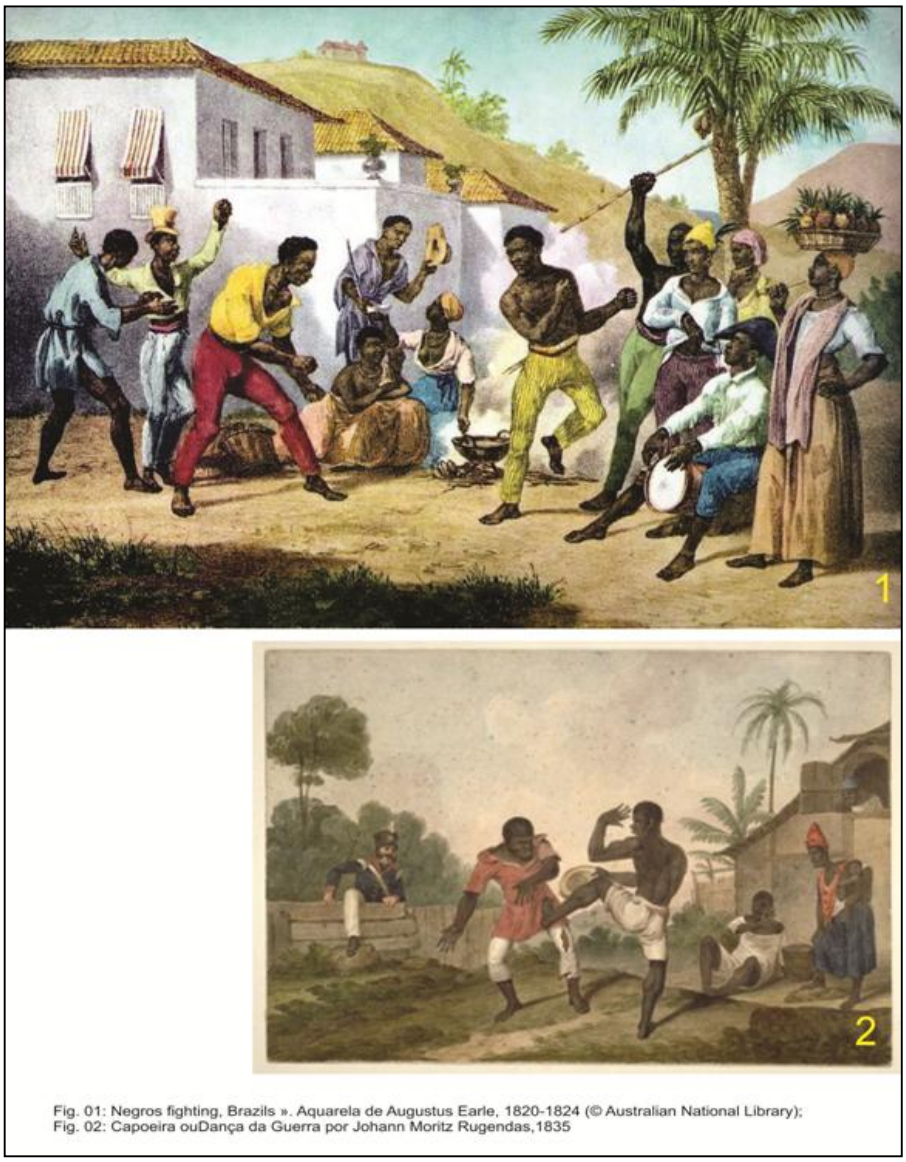


Fig. 01: Negros fighting, Brazils ». Aquarela de Augustus Earle, 1820-1824 (© Australian National Library);
Fig. 02: Capoeira ouDança da Guerra por Johann Moritz Rugendas,1835

Figure 93 – Mosaic with historical illustrations about capoeira

Congados

The congado contexts are distinct both in the nomenclature as in the symbolism of the activities, varying among the municipalities and the groups.

More commonly called as guard, the suit or cutting, it is the typology on which congada group is inserted. Each of them has specific forms of expression, with adornment, clothing, rhythm, choreography and unique cosmology. There are basically these types of congado: moçambique, catopé, caboclo and marujo. The similarity between them is the hierarchy that exists between the groups members during the manifestations. The Regents captains are who command from the rhythm and the singing till the group discipline. After the Regent captain, comes either the first or second captain. Then, forming the basis of the Guard come the dancers,

soldiers or choreographers that act as musicians (SILVA, 1999 apud BRETTAS 2013).

The ceremonial leaders are people crowned as Kings and Queens. The party people Kings and the Queens, who are crowned every year, are responsible for organizing the festivities. The Congos King and Queen symbolize the link with African ancestry, while the Perpetual Kings and Queens represent each Crown related to a Saint of devotion. The Perpetual Kings and Queens have a lifelong position within the guard, being usually replaced by their descendants, keeping the position within the family (MARTINS, 2002apud BRETTAS, 2013). All of these crowned characters, which are conducted to the procession at the parties, and which the guards do homage, are called “reinado”. The reinado procession makes the guards in evidence for the society to enjoy the songs, the dances and the jokes, and can culminate in accession of the new participants to the guards (BRETTAS, 2013).

The search for understanding the origins of this “reinado” may be related to the contact relations between Europeans and Africans on Brazilian’s land. In the context in which the Group of European origin held the power, these demonstrations could function as social life-forming institutions in this new slavery context (SOUZA, 2006 apud BRETTAS, 2013). When the African ethnic groups arrived in a strange land, the choice of a leader was important to re-establish the cohesion between the groups. In this context, the syncretism was important to the acceptance of the demonstrations by Europeans. The evidence of the white people on the demonstration lies in the chosen nomenclature and the elected choice rules, however, all dances, songs and instruments have the African influence.

So the Congado is the manifestation of these “reinados” and guards within the holidays to praise the devoted saints. As this is the time when the guards are showed to the society, the production around them is extreme important. Every little detail is thought with precision, since the instruments tune till the embroidery clothes or the details of each Member rods. The Congado can be represented by the brotherhoods, associations or federations of congado. It can be divided into two agents groups that participate in these celebrations of Congado. There are people responsible for the ritual part of the party, which are the dancers and the captains, and those who invest services and material or financial issues, carrying out the Treasury function and publicize function of the celebration (BRETTAS, 2013).

This Congado characteristic show that such expression can’t belong only to the religious scope within the communities. Within it, there are inserted brotherhoods or associations which seek a form of relationship with the society with ideals that aim to make good and prosper in harmony with the community. In this way, as well as in Brazil colony, it continues as a way to develop rehabilitation to contexts in which the group is inserted, maintaining identity references and of belonging with the Afro descendant culture and the Saints devotions that have symbols referring to that they want to transmit. On behalf of its uniqueness and its rich cosmogony complexity, IPHAN is conducting the National Inventory of Cultural References (INRC) of this cultural manifestation.

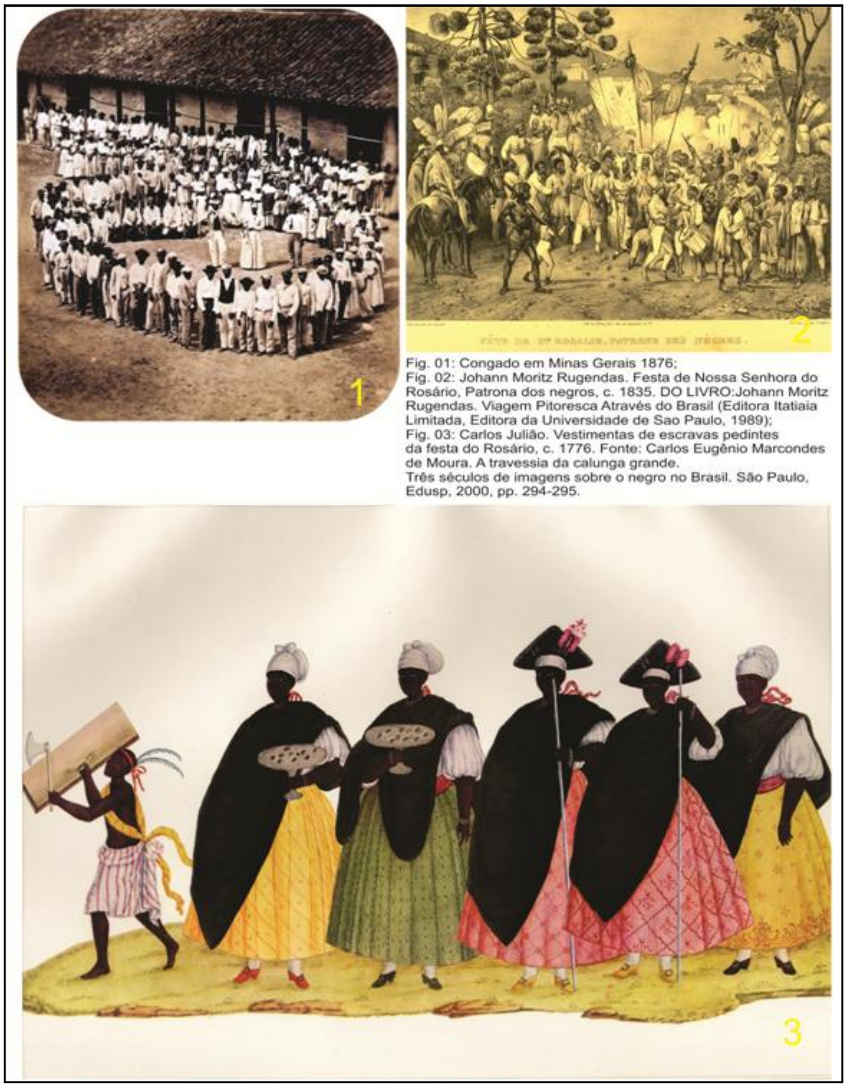


Figure 94 – Mosaic on congados groups

Note: The image shows the slaves dressed with specific clothes to the festivities dedicated to Nossa Senhora do Rosário in Rio de Janeiro in the late 18th century. Highlight the use of heels shoes, something rare among the Afro-America slaves. There are different adornments in their heads, perhaps referring to distinct signs between the different beggars, as well as the use of rods. Two of them carry objects where the alms are deposited.

The quitandeiras work

The quitandeiras emerged in Brazil in the colonial period after slaves' liberation who seek means of obtaining incomes. The term "kitanda" has its origin in Western-Central Africa markets, especially among the Quimbundu ethnic groups, also appearing in all ethnicities of bantu language (GOMES & SOARES, 2002 apud BONOMO, 2014). In Brazil, the term reconfigured to designate the sale of food in trays or small markets (BONOMO, 2014).

In Africa the quitandeiras were linked to the vessels supply that made the slaves trade, constituting a small food trade at ports. In this context, they sold fish, prepared foods, ginger, "cola" (a stimulant fruit), sweet potato, besides other products from the "soil"

like tobacco, hemp and amulets (PANTOJA, 2008 apud BONOMO, 2014). The amulets were found in archaeological excavations at the slave ships arrival ports in Brazil, as in Cais do Valongo/RJ. In Brazil the quitandeiras, because of the shortage of wheat flour and other ingredients in the colony, new recipes were created, they sold products with maize and cassava flours and with starchy tubers used to make breads, cakes and biscuits (FRIEIRO, 1982 apud BONOMO, 2014). Possibly the use of these new ingredients are linked to local indigenous knowledge.

In Brazil, the quitandeiras conquered a space called "retail trade", adapting their products also according to local supply and demand, selling a variety of products, such as fish, meat, flour, fruits, vegetables, sweets, brandies, fabrics, cigars, candles, amulets, coal, firewood, etc. (SHUMAHER & BRAZIL, 2007 apud BONOMO, 2014). The study of the quitandeiras work can bring an opposite image of women in the economy in the context of Brazil colony, which normally shows them with accommodation and passivity in the face of the social reality that surrounded them, dominated by their husband, confined within home or when black slave women suffering oppression. However, the quitandeiras work it is possible to see the rebellion and the female transgression in society (BONOMO, 2014), seeking independence and dominating the streets relations of this period.

The formalization of the quitandeiras work as an intangible heritage is a recent process, started in 2013. From the master's thesis called " O ofício das quitandeiras: tradição e patrimônio cultural de Minas Gerais", from researcher Juliana Bonomo from Minas, together with a group mobilization of quitandeiras from Congonhas and its area, the IPHAN took this process to record in 2015. Currently, the Work is in the research process phase to justify its record, always with the purpose to perpetuate the Way of Doing, to immortalize everyday actions. The expectation is that by 2019 the registration will be approved.

In the survey conducted by the field team, it was covered the practice of artisanal food production. Depending on the city, this term is used to designate both the sale in trays, as the women who make sweets or salted foods to sell door to door. The concern was to register this type of production, because it involves a local way of life, with specific materials and occupation features. In the cities with high level of urbanization this Work is scarce, being more easily found in rural areas or in the outskirts of large cities, in order to serve the local community. In addition, as well as in the colonial period, this is an activity usually performed by women, still symbolizing a struggle for financial independence and feminine positioning.

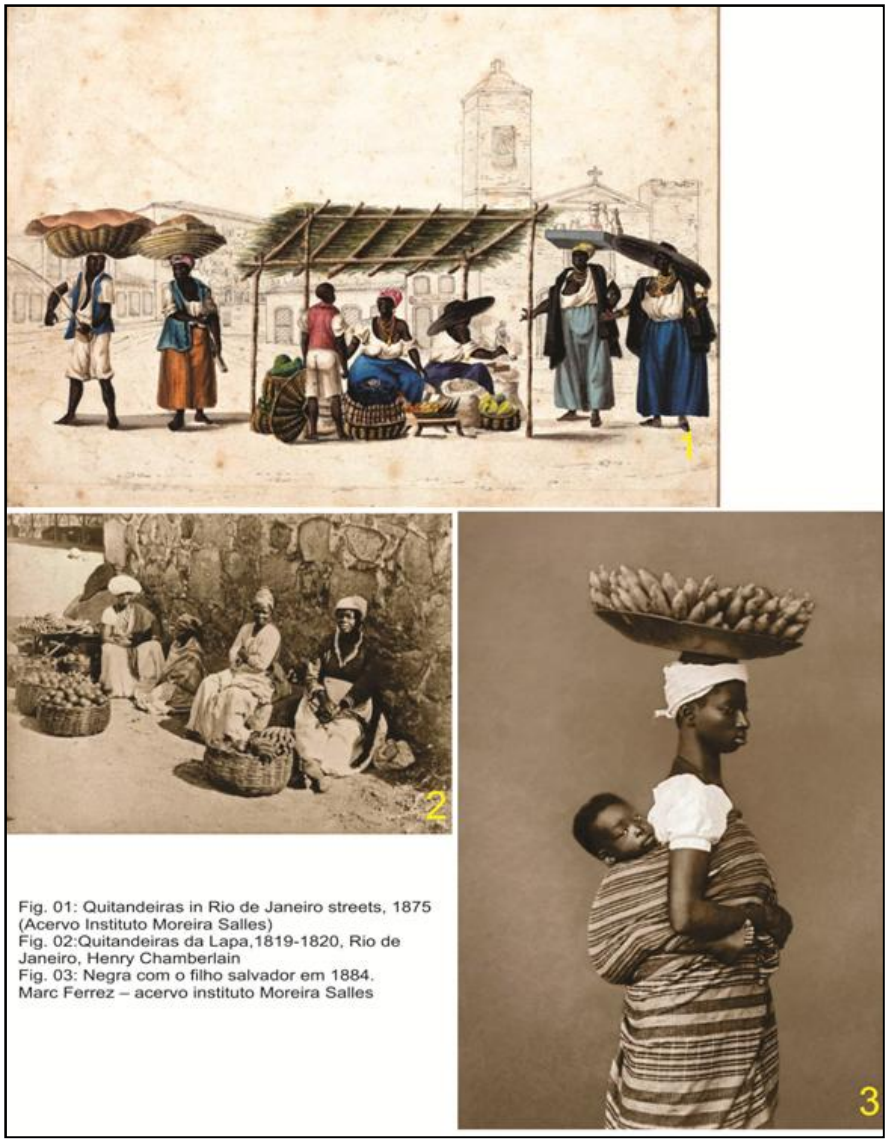


Figure 95 – Mosaic on quitandeiras work

Figure 96 – Mosaic on quitandeiras work

8.3.13.2 Regional Archaeological Context (Synopsis)

Throughout the proposed project area extension, so far the archaeological researches carried out indicates the presence of indigenous groups since at least 12,630 years BP, corresponding to the oldest presence in the State of Tocantins (DE BLASIS & ROBRAHN-GONZÁLEZ, 2003) . This earliest period is characterized by hunters and gatherers groups who occupied extensively all over the Brazilian Planalto Meridional, having as main trace industry pieces in open air places, or in shelters under Rock.

Take as an example the Brazilian Planalto Central, the transition zone between the cerrado and the Amazon area, in general, within this region, the human occupation dates back to the Pleistocene period (more than 10,000 years ago), as researches conducted in sites of Minas Gerais, Goiás and the Federal District, whose dates are associated with a time interval set between 11,000 and 9,000 years AP, hot and humid

climate period that marks the end of the Pleistocene. On the other hand, in not so distant times, there were identified archaeological sites with large amount of ceramic utensils fragments (XAVIER, 2007, p. 23).

In a way, most researchers relate the antiquity of these sites to climate change that occurred between the end of the Pleistocene and early Holocene, which according to AB´Sáber (2003), resulted in the average increase temperature and the rainfall indexes in the Central Brazilian Plateau, resulting the expansion of tropical forests and the decrease of the cerrado and caatinga areas. According to De Blasis and Robrahn-González (2003) the Central Plateau population by groups of hunters and gatherers is associated with the creation of "forest hideaways" arising from such climate change.

Also, it seems to have some territorial approach and a great technological homogeneity to the oldest sites, these aspects may be directly related to these climate changes by setting a lithic industry, known as Tradition Itaparica (MORALES, 2005).

In the following period (Holocene) occurs the formation of a warmer and humid climate, resulting in the expansion of forest areas and apparently a greater quantity of archaeological sites with a lithic industry represented by more simplified artifacts. For some researchers, with this new cultural scenario there would not be needed a lithic technology driven to resource exploitation associated with high mobility for large territories, hence justifying the occurrence of a more "simple" industry (MORALES, 2005; DE BLASIS and ROBRAHN-GONZÁLEZ .2003). However, such a model is currently questioned by other researchers, which defend the human occupation by hunters and gatherers groups in intermittently and discontinuous form due to the cyclical periods of intense dry in the Planalto. (ARAÚJO, NEVES and PILÓ, apud TELLES & CASTRO, 2010).

At the end of the Archaic period, occurs higher frequency sites related to large villages occupying extensive territories, suggesting a reduction in the number of sites associated with hunter-gatherers nomadic groups (ROBRAHN-GONZÁLEZ, 2004). Such villages would be, therefore, associated with groups of gardeners and potters, and may be related to different traditions: Una Aratu, Uru, Tupi-guarani, Bororo and Inciso Ponteada. (OLIVEIRA E VIANA, 2000).

Another scenario which is related to the people occupation in the region by potters and horticulturists within extensive villages dates more recent period, dating back about 2,000 years BP, in this case there is a predominance of sites associated with the affiliated groups the Tupi-Guarani Cultural Tradition, which developed an intensive agriculture with cultivation of various products like cassava, beans, cotton, peanuts, tobacco, among others. Many of these groups have remained in the areas until the arrival of European colonizers, having kept in touch with their occupation fronts. When the colonizers arrived, the region passed through an intense process of space transformation, housing several sites of historical nature and marking a new scenario of occupation, now related to the historical period.

Archaeology in Indianópolis

According to the Archaeological Sites National Register CNSA-IPHAN database, Indianópolis counts with the presence of one archaeological heritage site, thus described:

Site name: Serra Dourada

Other names and code: S-2 CNSA: MG00784

Summary description of the site: Village located in the lower third part of the strand, near the rio Araguari Valley, on a narrow area with slopes between 2 and 5, bounded on the East by a steep slope.

Archaeology in Araguari

According to the Archaeological Sites National Register CNSA-IPHAN database, Araguari counts with the presence of six archaeological heritage sites, described as follows:

Site name: Santo Antônio do Fundão

Other names and code: S-1 CNSA: MG00789

Summary description of the site: Village located in a small valley formed by the confluence of the rivers Santo Antônio and Serragem, rio Araguari tributaries of the right bank.

Site name: Tenda

Other names and code: S-12 CNSA: MG00794

Summary description of the site: Village located in the lower third part of the strand, in place of low slope and limited NE with a steep slope where sandstone rocks come to surface.

Site name: Rodrigues

Other names and code: S-14 CNSA: MG00796

Summary description of the site: Village located in the lower third part of the strand, in place of low slope, 200 m away from the rio Araguari banks, and 400 m West away from farm headquarters.

Site name: Tubertino

Other names and code las: S-15 CNSA: MG00797

Summary description of the site: Lithic workshop located in the lower third part of the strand, in place of low slope and less than 5 m away from the farm dweller House.

Site name: Folha Larga

Other names and code: S-18 CNSA: MG00800

Summary description of the site: Occurrence in the lower third part of the strand, in place of low slope, between the household House and the Araguari River.

Site name: Jeová

Other names and code: S-20 CNSA: MG00802

Summary description of the site: The Indian village is located at the top of the plateau, in almost flat area, next to the farm.

Characterization about archaeology in the studied region

Due to such considerations and on the basis of this macro archaeological context it is possible to infer that projects carried out in the region, may contain archaeological remains related to one or more occupations, indicating the presence of archaeological sites in diverse categories such as small camps, cemetery, extensive residential Indians' villages, among others, representing the various scenarios of human occupation that there was developed there, over time, being one of the reasons by which this project archaeological research is performed within the enterprise area.

Certainly this region may have other archaeological sites that until now have not yet been registered in the IPHAN, but this reinforces the archaeological potential of the region and of the area covered by the project. Surely, as there are held new archaeological researches focused to a greater understanding of the cultural context of these groups, further information may be obtained about the forms of appropriation, use, occupation, and space transformation that are related to Occupation Scenarios to human settlements that occurred in this part of the national territory.

The archaeological sites found within the region map is shown in the following figure.

Figure 97 – Archaeological sites found within the region map

100000
150000
200000
7950000
7900000
7850000
N

GO
MG
TUPACIGUARA
ARAGUARI
CASCALHO RICO
DOURADOQUARA
GRUPIARA
ABADIA D
DOURADO
ESTRELA
DO SUL
MONTE CAR
MONTE ALEGRE
DE MINAS
UBERLÂNDIA
INDIANÓPOLIS
ROMARIA
IRAÍ DE
PEDRINÓPOLIS
NOVA PONTE
SANTA JULIAN
PRATA
UBERABA

MG00802
MG00801
MG00800
MG00799
MG00797
MG00796
MG00794
MG00798
MG00795
MG00793
MG00792
MG00791
MG00790
MG00803
MG00786
MG00787
MG00788
MG00789
MG00784
MG00785
MG02634

LOCALIZAÇÃO NO ESTADO DE MINAS GERAIS

LEGENDA

- Área Diretamente Afetada - ADA - Área de Implantação da Fábrica
- AID para o Meio Socioeconômico - Municipios de Araguari e Indianópolis
- AII para o Meio Socioeconômico - Municipios de Araguari, Indianópolis, Estrela do Sul e Uberlândia
- Sítios Arqueológicos
- Corpo D'água
- Limite Municipal
- Limite Estadual

ESCALA GRÁFICA:
0 5 10 20 km

DATUM: SIRGAS 2000 - Fuso 23K
PROJEÇÃO: UTM

REFERÊNCIAS UTILIZADAS:
- Limites Municipais/Estaduais e Hidrografia (IBGE, 2015);
- Sítios Arqueológicos (IPHAN, 04/2018)

PROJETO AMADEUS

PÖYRY

ESTUDO DE IMPACTO AMBIENTAL

ARAGUARI, ESTRELA DO SUL, INDIANÓPOLIS E UBERLÂNDIA

SÍTIOS ARQUEOLÓGICOS

ESCALA: 1:350.000	DATA: Junho/2018		
DESENHO Nº: XXX	FOLHA: 1/1	TAMANHO: A2	
RESP. TÉCNICO:	ASSINATURA:	REV: 0	

8.3.14 Leisure, Tourism and Culture

Araguari, Estrela do Sul and Uberlândia are part of the Triângulo Mineiro Tourist Circuit. It is part of this business tourism circuit, the farming fairs and exhibitions, the gastronomy, the nightlife, the waterfalls, the lakes and lagoons, the fisheries and the religious tourism.

Araguari presents a high eco-tourism potential, due to its natural beauty, there are more than 100 natural waterfalls, caves, areas with virgin forest and ecological preserved areas and parks distributed across many leisure clubs.

Figure 98 – Cachoeira das Freiras Waterfall. Source: Cidade Araguari (2018).

The Railway Museum of Araguari was created on 23th February 2006, by means of law nº 4,228. It is located in the Palácio dos Ferroviários, the old Goiás Station, where remains opened for public visitation. Its collection is composed by several objects that refer us to the important History of the railway in Araguari, belonging to the Estrada de Ferro Goiás and to the Companhia Mogiana de Estradas de Ferro.

Figure 99 – Railway Museum in Araguari, where is now the town hall of Araguari. Source: Secretaria do Estado de Cultura (2018).

Estrela do Sul has the Nossa Senhora do Rosário and São Benedito Church, built about 200 years ago in the colonial style.

Figure 100 – Nossa Senhora do Rosário and São Benedito Church. Source: (2018).

Uberlândia city organizes various festivals and events, often held in public places.

One of the most traditional events is carnival, which originally was the place where everything could be sung: waltzes, marzurcas, xotes, but the biggest attraction was the Hoedown “catira”. Today, in addition to dances in the clubs, the municipality also has the participation of four samba schools - Tabajara, Academicos do Samba, Garotos do Samba, Unidos do Chatão and block groups of "Axe" and "Unidos de São Gabriel", that carry out the Street Carnival in Uberlândia.

The Juninas parties, which are much celebrated during the month of June and are festivals to honor the three Saints - St. Anthony’s day on June 13th; St. John the Baptist's day on June 24th; and San Peter’s day on June 29th. In the city, the Juninas parties, each year, extended more and more till the month of July, which are called Julinas Parties.

Still in the relation to the traditions festivals in the municipality there is the "Congado de Uberlândia", which, even in the slavery time, a group of black slaves gathered together in the Woods and sang and danced in praise of their protective Saint, Nossa Senhora do Rosário. Around 1874 the movement of Congado in Uberlândia began. Over the years, they felt the need to make the Congado's Party in the city. Black people came in oxcarts and grouped together under a big tree, where today lies the square Praça Tubal Vilela. After that they followed by a path till Nossa Senhora do Rosário chapel, which was built of wood and buriti, where lies today the Praça Doutor Duarte, and there was the party place. This chapel was built around the 1880.

Uberlândia has many tourist attractions, both with architectural as cultural and natural values. There are some of these main points of the city:

- Uberlândia Municipal Market

- Uberlândia Municipal Museum
- Sabiá Park
- Victorio Siquierolli Municipal Park
- Rondon Pacheco Avenue

Besides those, there is the square Praça Tubal Vilela, square Praça Clarimundo Carneiro, square Praça Sergio Pacheco and square Praça da Bicota (square Praça Rui Barbosa), which are important tourist points of the city.

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8.4 Overall Environmental Quality

The environmental quality is a chapter based on the information contained in the environmental diagnosis of the physical, biotic and socioeconomic environments, with the goal to predict the interrelations with the future enterprise, and it was conducted as part of the environmental feasibility analysis process for LD Celulose dissolving pulp mill implementation, located in the municipality of Indianópolis (mill site) and Araguari (water intake and treated effluent disposal pipelines), at Minas Gerais State. The mill will have a production dissolving pulp capacity of 540,000 t/year.

The dissolving pulp is obtained similarly to common pulp (for paper production), however with increased cellulose content in its composition (> 92%). Because it is a high-purity pulp and has lower level of contaminants, it is used for four major product groups: viscose (cut rayon, industrial and textile filaments, cellophanes, etc.), acetates (cigarettes filter, acetate filaments and films), ethers (binders, detergents, glues, foods, pharmaceuticals) and nitrates (explosives, varnishes and celluloid).

The dissolving pulp production process is very similar to the conventional kraft process (for production of papermaking pulp), but with important modifications in cooking, as there is a chips pre-hydrolysis for hemicelluloses removal at wood chips. Hemicellulose needs to be removed, because it may precipitate through the spinners, clogging them. The spinners convert cellulose into small strings, very similar to cotton.

The enterprise contemplates the production areas of: wood preparation, fiberline, drying and baling, chemical recovery (evaporation, recovery boiler, causticizing/lime kiln) and utilities (biomass boiler, Water Treatment Station-ETA, Boiler Water Treatment Station-ETAC and Effluent Treatment Station-ETE), fuel oil system, effluent discharge pipeline, water intake, laboratory and solid waste treatment center.

It will also be implemented an area of chemicals products that includes the unloading, handling and storage of sodium hydroxide, hydrogen peroxide, sulphuric acid and magnesium sulphate, in addition to chemical plants to liquid sulfur dioxide preparation and oxygen and ozone production.

It will also be installed a new energy cogeneration unit with a nominal capacity of 132 MW being consumed 63.5 MW in the pulp mill. There will be, therefore, an excess, that can be sold.

It should be emphasized that in relation to the environmental control systems, the industrial unit will adopt the Best Available Technologies (BAT), in order to reduce, control and monitor the liquid effluents, the atmospheric emissions and the generated solid wastes.

The Triângulo Mineiro region climate, on which the project will be inserted, according to the Köppen classification, it is of Aw type, i.e. it has a dry winter and a rainy summer, predominantly dominated by inter tropical and polar systems (MENDES, 2001). The region is hit by air masses from the South as the Antarctic Polar front (FPA) and the Polar Mass (MP), East (East waves) and West (tropical instability). It also suffers the influence of the South Atlantic Convergence Zone (ZCAS), which are responsible for the heavy and prolonged rains. The FPA influences the ZCAS funneling moisture from the Amazon to the Southeast Brazilian region.

The enterprise will be deployed mainly in the city of Indianópolis and also in Araguari city, although in these cities there are no historical climate and meteorology data. Thus, it was found that at Uberlândia municipality, which is approximately 37 km from the enterprise, it has a weather station with a good historical series data. Therefore, to characterize the climate of the region, it was used the data of meteorological station at Uberlândia.

According to the Brazil macroclimates classification, the city of Uberlândia, situated in the vicinity of the project, as mentioned, is located in a subhot climate region, known as a variety of CWa (with thermal averages) ranging from 19° C to 27° C and average rainfall around 1500 mm/year.

The average winds speed at the Uberlândia weather station (INMET, 2018) from 2002 to 2017 period, was 1.92 m/s being the highest averages presented in August (2.16 m/s) and September (2.28 m/s); while that the lower averages values occurred in the months of February (1.73 m/s) and March (1.71 m/s).

In relation to the preferred wind direction, the winds at the Uberlândia presented a preferred direction to E/NE (East and Northeast), with secondary components to N (North) throughout the year.

At the air quality assessment, as shown in the environmental diagnosis, there was held two monitoring campaigns in a single sampling point in the immediate area of the enterprise. In these campaigns it could be verified that, with regard to the sampled pollutants: total suspended particles-PTS and inhalable particles-PI (PM10), which air quality standards are established by CONAMA Resolution n^{o} 03/1990, taking into account the FEAM and the Ministry of the Cities views, where in this work was considered to be applicable the primary air quality standards, which the results showed compliance. With regard of the sampled pollutants which air quality standards are established by CONAMA Resolution n^{o} 03/1990, the results were in attendance for both the primary and the secondary standards, for: SO2, NO2, O3 and CO.

It should be noted that in the enterprise surrounding area it predominates agricultural activities. The most immediate presence of people agglomeration is approximately 20 km towards South of the future mill, being the urban area of Indianópolis city. In this region, the activities of soil management, crop and machinery and trucks traffic in unpaved roads has direct contribution influence of particles pollutants dispersion to the air.

For noise monitoring it was measured the environment sound pressure level in 8 different points during day and night, at the surrounding area planned for dissolving pulp mill deployment. At all measured points the sound pressure levels were below the environment assessment criteria level (NCA) established by the NBR 10,151/2000 standard for predominantly industrial area (70 dB(A) for daytime and 60 dB (A) for nighttime), and they were also below the maximum limits established by State Law n^{o}. 10,100/1990 (70 dB(a) for daytime and 60 dB (A) for nighttime).

However, if the environment sound pressure levels are compared with the NCA established by the NBR 10,151/2000 standard for farms and ranches (40 dB(A) for daytime and 35 dB (A) for nighttime), it has 1 point during the day that presented the sound level above the NCA and 8 points at night above the NCA standard. In this case, according to NBR 10,151/2000, when environment sound pressure levels are

above the NCA, they remain as the background values to a future sound pressure evaluation criterion, i.e. the levels obtained in the field measurement are considered the new standards.

The AID and ADA of the enterprise present as geological framework basaltic rocks of the Serra Geral formation, which outcrop in a small portion of the AID being superimposed on the Marília formation rocks. At AID and ADA, it can be concluded that the predominate reliefs are related to the Plateaus and Low Plateaus Domain (R2b).

According to the environmental diagnosis, it was found that the main type of soil presented in ADA is called Cambissolo Háplico, with formation of thick and well drained soils, generally with low to moderate erosion susceptibility.

From the soil surveys carried out in the project area, it was possible to observe that the initial layer of the soil is characterized by a dark brown sandy clay, at depths ranging from 6.0 to 15.10 meters. It was also noted that after this first layer, in all soil profiles, there are dominated by layers with clay-sandy compositions and, occasionally, sandy-silt-clay composition. It should be highlighted that all the surveys reached the limit stablished by the NBR 6484 standard (30 meters) and the water level was delimited in depths ranging from 12.7 to 20.59 m.

The area of the enterprise is above areas dominated by porous aquifers, from Bauru Group (Marilia Formation). The good productivity, the low depths and the lithological material nature make it easy to exploit this aquifer at the present time, being elevated the density of wells in some areas which, in the long term, the productivity can be compromised in these areas.

At the groundwater quality campaign most of the monitored parameters at the sampled points showed concentrations below the quality reference values of Normative Deliberation COPAM/CERH nº 02/2010, Normative Deliberation COPAM nº 166/ 2011 and CONAMA Resolution n° 420/2009.

With the aim of defining the surface water quality of the Araguari River before the operation of the mill (as background and reference for future monitoring studies), there were held 2 (two) surface water collection and analysis campaigns, a during the dry season (from 18/07/17 to 11/08/17) and during the rainy season (from 03/04/18 to 26/04/18). The analysis encompassed the main parameters established in the Normative Resolution No. 01/2008 COPAM and CONAMA Resolution n° 357/2005. However, there was also a collection at each campaign to review all parameters listed and established by the Normative Deliberation COPAM nº 01/2008 and CONAMA Resolution n° 357/2005.

The surface water quality results showed that most of the parameters analyzed are within the requirements values for Class 2 water bodies (as Araguari river classification as Class 2) and are in accordance with the current law limits; and it should be highlighted that Araguari river presents homogeneity and good quality.

According to the biotic environment diagnosis field survey, the large number of flora species found coupled with the presence of seven endangered species and two immune to cut, demonstrate the importance in the conservation and preservation of the remaining flora in areas surrounding the project. However at ADA, few species were

recorded, being most of individuals belonging to only two species, in addition there are no endangered flora species.

The sampled amphibians and reptiles are formed mostly by common and widely distributed species throughout the national territory. Some are the most common species found in all biomes (*Dendropsophus minutus, D. nanus, Leptodactylus fuscus, Trachycephalus typhonius* and *Crotalus durissus*). However, the studied region has some endemic species of the Cerrado biome (*Rhinella rubescens, Odontophrynus cultripes, Barycholos ternetzi* and probably *Mesoclemmys* cf. *vanderhaegei*), however, all of them have extensive occurrence within the biome.

According to Silva & Bates (2002), from the recorded bird species, four are classified as endemic to the Cerrado biome, being: *Herpsilochmus longirostris* Pelzeln, 1868 (Brazilian popular name: chorozinho-de-bico-comprido); *Antilophia galeata* (Lichtenstein, 1823) (Brazilian popular name: soldadinho); *Cyanocorax cristatellus* (Temminck, 1823) (Brazilian popular name: gralha-do-campo); and *Myiothlypis leucophrys* (Pelzeln, 1868) (Brazilian popular name: pula-pula-de-sobrancelha). This demonstrates that the fragments presented in the sampled area have sufficient resources to maintain a specific fauna that dependent on them. Because they are linked exclusively to the Cerrado biome, these species suffer with fragmentation and suppression of native vegetation that occurs in the Minas Gerais State. Considering all the species found in the surveys, 95 species have low sensitivity to environmental changes, 39 have average sensitivity, and only *Aramides cajaneus* (Statius Muller, 1776) (Brazilian popular name: saracura-três-potes) has high sensitivity (Stotz et al. 1996).

The most recorded mammals species were the opossum - gambá-de-orelha-branca (*Didelphis albiventris*), the wolf - lobo-guará (*Chrysocyon brachyurus*), and the wild dog - cachorro-do-mato (*Cerdocyon thous*). They are generalist species and are adapted to the man-made environments changes (Rocha et al. 2008; Srbek & Chiarello, 2013). The wolf (lobo-guará) is an animal typical of the Cerrado biome and therefore its registration was expected in the region. There are reports of its adaptation to man-made environments by consuming the remains of organic wastes (Cheida, 2005), however the environmental changes that reduce their prey and predatory hunting of this animal put the species as "near threatened" on the IUCN list and as "Vulnerable" in Brazil and Minas Gerais lists (COPAM 2010, ICMBio 2016 2017, IUCN).

Other mammals species that were also very recorded were: the paca (*Cuniculus paca*) and the anteater tamanduá-bandeira (*Myrmecophaga tridactyla*). The paca is an animal that has been suffering increasingly with habitat fragmentation and, mainly, hunting pressure exerted on this species due to the high appreciation of its meat (Fuccio et al. 2003). The paca species is classified as "Endangered" under the endangered species lists of Rio Grande do Sul and Paraná and as "Vulnerable" in São Paulo and Rio de Janeiro lists (ICMBio, 2016). In Minas Gerais State the species is not on the list. The anteater tamanduá-bandeira (*Myrmecophaga tridactyla*) is listed as Threatened on the global endangered species list (IUCN 2017), and as “Vulnerable” category on the national (ICMBIO 2016) and on the State (COPAM 2010) lists. It is common to find these species in the region. It is a species able to use areas of the agricultural crops surrounding (Miranda et al. 2015).

The studied area is located in a region much men changed areas with predominance of farming activities and it still preserves a considerable number of mammals, which is possible thanks to the remnants of vegetation belonging to the legal reserves of these farms properties. However, it is remarkable the impact that these animals have been suffering due to the roads in the surrounding. A lot of roadkill animals were observed on the banks of the highways and almost all the roads or highways which cut into two pieces of vegetation fragmentation. Finally, only long-term studies may assess the mammalian local dynamics to be better understood.

The synanthrope insect's diagnosis allows us to know and avoid situations that favor the presence, establishment and proliferation of animals that may be harmful to the health of professionals who will work in the studied area, as well as to the population resident and to the people who go to the surrounding areas. The diagnosis also aims to avoid conflicts with the surrounding population, which somehow can be bothered by the presence of dispersed synanthrope animals or from the enterprises. Being said that, it is recommended the inclusion in architectural designs measures to avoid the shelter of vectors in the buildings.

According to the biotic environment diagnosis, in general, the fish fauna community of this study is similar from the expected for this hydrographic basin Neotropical region with predominance of Characiformes and Siluriformes orders (Lowe-Mcconnell, 1987). There were not found benthic macroinvertebrates in endangered species, neither endemic species nor groups, even the sensitive species or groups. The zooplankton species found are not different from species found in secondary data, being registered species of *Daphnia gessneri* (Copepoda), *Notodiaptomus iheringi* (Calanoida) and young forms of Calanoida (Copepodito), found in greater abundance, for being filters and normally associated with oligotrophic waters, which can be infered that the Araguari River offers a good quality, for the water parameters classification. The phytoplankton community group of Cryptophycea was the greatest abundance and are found throughout the year in various aquatic environments, mainly in lakes of tropical regions, organisms belonging to the Cryptophyceae class are opportunists and adapt to the conditions of turbulence (Nabout et al., 2006). The group of Cyanophyceae, which presented one of the greatest richness, in contrast, didn't show any significant values of abundance, something that is positively associated with good water quality.

In socioeconomic studies diagnosis it was noted that the municipalities of Indianópolis and Araguari have predominantly urban population at the age group of 15 to 60 years old. The Araguari is classified as High Human Development index (IDH), while Indianópolis is classified as Medium Human Development index. According to the IBGE, the busy people is categorized according to the following groups: owners or members on company with activity, Presidents and directors; non-construction personnel; and construction staff, such as: top-level staff (managers, leaders and supervisors), masters and workers, shipbuilders, carpenters, bricklayers, maids, etc, with an activity at the company. In 2015, the busy people in Indianopolis corresponded to just 845 people, equivalent to 12.6% of the total population. While in Araguari the busy people in 2015 were 24,687 people, equivalent to 21.2% of the total population. The busy people reflects on the gross domestic product os the cities, so that Araguari has GDP per capita of R$ 31.797,16 while Indianópolis has GDP per capita of R$ 100.321,84.

In Araguari city the private health network is greater than the public, and there are 2 beds for each 1000 inhabitants, whereas in Indianópolis there is no inpatient bed available to the population, being all the existing health establishments only by the public network.

In 2017, the municipality of Araguari had 43 kindergarten schools, being 28 public and 15 private, 68 elementary schools, being 50 public and 18 private; and 15 high schools, of which 9 are public and 6 private. The municipality of Indianópolis had only public schools establishments, being 3 kindergarten schools, 6 elementary schools and 1 high school. In addition, only the municipality of Araguari had technical and university education institutions.

In the municipality of Araguari, the SAE (Superintendency of Water and Sewage Systems) is the responsible organ for the water intake, treatment and water distribution, having 100% attendance of population index. In Indianópolis COPASA is responsible organ for water intake, treatment and water distribution, the urban service index is 94.8% of population attendance. In Araguari, the sewage collection rate is 80%, while in Indianópolis there are no sewage collection rate data. In 2015, the municipality of Araguari had 91.17% of the total population served with waste collection being that 95.74% of this population was from the urban area. In the municipality of Indianópolis 100% of the urban population is served by solid waste collection, which in 2015 had a total generation of 5,086 t/year.

The municipality of Indianópolis is cut by the BR-365, which links Romaria to Uberlândia. The municipality of Araguari is serviced by main roads: BR-050 (from Uberlândia to Goiás), MG-223 (linking Estrela do Sul city), LMG-748 (linking to Indianópolis) and MG-414 (linking Goiás).

The region under study is cut off by the Ferrovia Centro-Atlântica (FCA) railway, a VLI group company. Since 1996, the FCA is concessionaire of loads rail transportation that have multimodal terminals in Uberaba. This railway links to a rail mesh with approximately of 8,000 km of lines, covering 7 Brazilian States (Minas Gerais, Espírito Santo, Rio de Janeiro, Sergipe, Goiás, Bahia, São Paulo) and the Federal District. The main transported products by the FCA are: alcohol and petroleum products, limestone, steel products, soybeans, soybean meal, cement, bauxite, pig iron, clinker, phosphate, lime and petrochemicals. In the municipality of Araguari there is a railway junction that connects the South and North of the country, through the FCA and the FERROBAN railways.

In Araguari there is also the Integrator Araguari Terminal (TI Araguari), one of the largest grains and fertilizers transshipment terminals of Latin America. TI Araguari is part of Corridor East-Central from VLI and composes the main integrated logistics alternative, responsible for attracting loads of major agricultural country borders, and for supporting the disposal of agribusiness through Tubarão Complex, in the Espírito Santo State.

The cities of Araguari, Estrela do Sul and Uberlândia are part of the Triângulo Mineiro Tourist Circuit. They are part of the business tourism, fairs and agricultural exhibitions, gastronomy, nightlife, waterfalls, lakes and lagoons, fisheries and religious tourism circuits.

Araguari presents a high eco-tourism potential, due to its natural beauty, existing more than 100 natural waterfalls, caves, areas of virgin forest and ecological reserves and parks distributed across many clubs.

As for the historical aspects, archaeology and traditional populations, there is 1 registered archaeological site by IPHAN in Indianópolis, while in Araguari there are six (6) registers. In the municipalities there were not found records of indigenous lands at the FUNAI cadaster and there were also not found records of the quilombola community by Palmares Cultural Foundation (FCP).

In general, it was observed a great importance of the LD Celulose dissolving pulp mill implantation at municipalities of Indianópolis (mill site) and Araguari (water intake and treated effluent disposal pipelines) and for the whole region, as a result of the taxes collection and the direct and indirect jobs generation, which influence on the life quality of a significant portion of the population.

Considering the information obtained from the physical, biotic and socioeconomic environments diagnosis, condensed in this overall environmental quality, it was possible to identify the aspects of greater vulnerability of the enterprise in question which are the Araguari river preservation areas, and the surface water and groundwater quality. It is important to highlight that the impact on these aspects may be mitigated and there are environmental control measures, which are described in the chapter of this EIA-RIMA Impact Assessment Study.