

Journal of Agricultural Sciences Research

FROM CITY IN THE FOREST TO A SUSTAINABLE CITY: TRADITION, URBANIZATION, COMPETITIVENESS AND INNOVATION IN THE CAPITAL OF AMAZONAS, MANAUS

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Summary:The capital of Amazonas is an example of a city in the forest that, due to the installation of the Industrial Pole, evolved into a city with urban and industrial characteristics. Its industrial park is renowned for its innovation and competitiveness (industry 4.0), which contributes to an audacious project to transform it into a city prepared for the 21st century. Therefore, we aim to analyze the evolutionary trajectory of the city of Manaus, observing the characteristics of a city in the forest for a smart and sustainable city in compliance with SDG 11. Manaus is an urban-industrial metropolis, which houses a model of regional development with 55 years of uninterrupted activities, responsible for generating more than one hundred thousand jobs, with a productive weight of 15% and 80% of GDP (regional and state, respectively) and which presents peculiarities to become an intelligent and sustainable city in the heart of the largest tropical forest on the planet.

Keywords:Cities in the Forest; Manaus; PIM; Industry 4.0; Smart and Sustainable Cities.

INTRODUCTION

The capital of the State of Amazonas, Manaus is the stage for the installation of the main development model in the North region of Brazil, the Industrial Pole of the Manaus Free Zone, responsible for generating more than 100 thousand jobs (permanent, direct and outsourced) in the year from 2021.

According to economic data and despite the greatest health emergency of the 21st century, the Covid-19 pandemic, which caused the total or partial stoppage of economic activities in the world as a whole, the movement of labor in the Industrial Pole of the Zona Franca de Manaus presented a positive indicator, in the analyzed period, 2020 to 2021, in relation to the other industrial units in the country.

The Industrial Pole of Manaus is responsible for 80% of the GDP of the State

of Amazonas and concentrates more than 600 companies that were classified as level 3 (transition) and the decisive variables for this classification were: Strategy, Manufacturing, Digital Modeling, Logistics, Sharing of Data between the links of the SCM and Security of the IT area. We emphasize that the industry readiness test measures the proximity of the activity to innovation and competitiveness, characteristics of an industry 4.0.

The installation of the PIM was essential for the process of transforming the city of Manaus, which ceased to be a city in the forest, becoming a city in the forest with urban and industrial characteristics and which is currently preparing to become a smart and sustainable city serving to the tripod of sustainability.

Thus, we aim to analyze the evolutionary trajectories of the city of Manaus, observing the characteristics of a city in the forest for a smart and sustainable city. Regarding the methodological path used to achieve the proposed objective, a qualitative method was used, with exploratory and descriptive purposes, through bibliographical and documental research making use of observations and content analysis.

This path to be followed by the capital of Amazonas will also be a challenge for other cities in Brazil and the world, since all will have to prepare for urban spaces that are increasingly inhabited and will have to learn to live with the more intense effects of climate change.

Thus, Manaus, 352 years old and with 2,255,903 inhabitants (2021), has the peculiarities of an urban and industrial metropolis, a forest city that houses a model of regional development with 55 years of uninterrupted activities and is responsible for generating more than one hundred thousand jobs, with the productive weight of 15% of the regional GDP, 80% of the state GDP and

that presents a trajectory that has as its origin and characteristics a city of the forest and that envisages becoming an intelligent and sustainable city to serve its inhabitants and visitors and prepare for the challenges of the near future.

For didactic purposes, this article is divided into: Introduction, Theoretical Reference, Analysis of Data and Results, Conclusion and Considerations and finally, the References used for the construction of the text.

FOREST CITY X FOREST CITY

For Trindade Junior (2010), “forest cities” were, until the 1960s, the most common in the region. Their characteristics of small towns and often associated with fluvial circulation, gave them strong connections with the dynamics of nature, with the non-modern rural life and with the rhythm of the still little explored forest. In addition, such cities have always established a strong relationship with their respective surroundings and with nearby locations (towns, villages, riverside communities, etc.). Although many cities have been losing these characteristics, considered rural, they have not effectively disappeared, and are still strong marks of some sub-regions of the Amazon.

Regarding the conceptual nature, which establishes the meaning, form and content of the Brazilian small town in the past and today, it also inspires us to propose, for the case of the Brazilian Amazon, the distinction between “forest towns” and “towns in the forest”. This is only an inspiration, since the meaning attributed by that author when discussing the process of modernization of the territory and its relation to the dynamics of Brazilian urbanization is not transposed in a literal way to the analysis of the Amazonian small towns treated here. By recognizing the “cities of the forest”, we seek to establish the differentiation in face of another type of city, the “cities in

the forest”, which began to compose, from the more intense process of regional integration to the Brazilian space, the new urban and territorial structure of the Amazon, notably in its eastern portion (TRINDADE JUNIOR, 2010).

For Trindade Junior (2010), the “cities in the forest”, on the other hand, are those that tend to articulate mainly to the external demands of the region, making the forest an element of little integration to the new values of urban life, being its denial seen mainly as a space for economic exploitation (wood, ores, fragrances, animal and plant species, tourism, industrial activity, etc.). Thus, the form of articulation and interaction of the “cities in the forest” takes place, in large part, much more with other realities outside the region than with the internal reality. These are, for the most part, cities that have become logistical bases for economic relations aimed at an extra-regional rationality, such as the company cities (Carajás-PA, Porto Trombetas-PA etc.), that serve to support the large economic projects installed in the region to meet the demand for resources from the foreign market.

PROCESS OF URBANIZATION AND INDUSTRIALIZATION OF AMAZON CITIES

For Trindade Junior (2010), understanding the presence of “cities in the forest” in the current context presupposes considering the process of regionalization that marks the Brazilian regional differentiation and the dynamics that have defined the role of the Amazon in the territorial division of labor. It is in this sense that Santos and Silveira (2001), supported by the understanding of the expansion of the technical-scientific informational environment in the national territory, speak of the presence of “four Brazils”, in order to recognize the new regions of the country, namely: the region Concentrated, the

Midwest, the Northeast and the Amazon.

For the Amazon, some elements are pointed out to characterize it in view of the dynamics of modernization of the territory, such as: low demographic and technical densities; the importance of new technical networks, such as highways and waterways; the weak centrality of transport and communication; the resource inventory to be made; the possibility of knowing its resources and potential, based on modern satellites and radars; the coexistence of modern and fast movement systems with slow and traditional systems; the connections of the most important cities, notably established with extralocal spaces; the frayed relations of these same cities with their respective hinterlands; the presence of globalization nexuses in productive areas geared towards export; the existence of modern cities as support points for these same activities (TRINDADE JUNIOR, 2010).

When referring to Urban Diversity to express about the different Amazons and the different types of cities that make up these countless Amazons, and thus analyze the difference that exists between the urban manifesting itself in the cities and beyond the cities, making a very strong and complex combination of rural and urban that is expressed in different cities of size: medium, small and metropolitan, because when we talk about urban and diversity we are problematizing these different Amazons.

According to Silva (2019), there is no way we can think of a homogeneous Amazon, just as we cannot think of homogeneous public policies for these cities that are diverse and that are totally differentiated, one thing that has become very common for us to talk about is this urbanization of the population that in recent years or decades have become visible, bordering on a percentage, which can be characterized as the Urban Amazon, since more than 70% of the population is living

in cities or towns, however, it is a way of questioning whether this is urban or not. But this represents a concentration of population in certain points of the territory and this, in a certain way, reflects a form of occupation and a logic of occupation that has been represented for the Amazon in recent years.

So let's talk about an urbanization beyond numbers, beyond these populations that the IBGE tells us that is centered in villages or in isolated population clusters, we can think of the idea of "Urban Society" (LEFEBVRE, 1991).

According to Silva (2019), Lefebvre (1991), spoke of "an urban way of life", not necessarily of people living in cities, but this will include the urban way of life, where part of the metropolises of large cities is projected and it has to do with practices, behaviors and values of the modern city that are projected beyond the city and it is at this moment that the difference between the city and the urban is made, the city being the spatial form and the urban the way of life, then in the same way that we can talk about a way of life that expands more and more in this globalized space.

In the Amazon there are also these values and these behaviors that are increasingly observed in social relations, there we have Milton Santos' idea of urbanization, when he writes an "Urbanization in the Territory", referring to the "nexus of modernization of urban society that is projected into the territory", it is not only the urban behavior and values anymore, but it is a logic of infrastructure that gives meaning to these behaviors that are projected from the cities to beyond the cities. He was talking about "the system of action and the system of the object of urbanization of the territory", so we are talking about two combinations, that is: "the system of action and the system of objects". In this case, the system has to do with the

behaviors, the urban way of life and the system of object that in the territory gives sense or logistical support to the means of behavior of urban values, so the idea is to think about the urbanization of the territory to the Amazon and what elements led to this projection and will lead to a diffusion of urban values when thinking about land planning following the example of Lefebvre's (1991) and Milton Santos' (1993) placements.

According to Silva (2019), researcher José Aldemir Oliveira (2016) follows the thinking of Henri Lefebvre (1991), who raises the discussion about the urbanization of society in the Amazon, stating that: "from an urbanization of society it is much more a diffusion of the urban way of life in this Region than the dominance of the landscape in the city". as well as in rural cities through urban values.

According to Souza (2002) the Amazon's vocation for modernity comes from the Portuguese colonial period, where the State of Grão-Pará and Rio Negro, assumes the characteristics of an economy based on the manufacturing industry, especially from the production of latex transformations, which was world-famous raw material for the production of shoes and galoshes, waterproof covers, springs and surgical instruments, intended for export or domestic consumption. Historically, in this period of the 18th century, the naval industry emerged, an agriculture of small producers. The Portuguese interest in the Amazon region was so explicit that the Portuguese Prime Minister Marquis of Pombal appointed his own brother to direct the destinies of the states of Grão Pará and Maranhão, the objective was that products from the Amazon could reduce the impacts of the process of decay of the Portuguese empire, which was in the wake of European capitalist development. This vision of modernity linked to the urban was quite developed in the

Amazon, with Belém, being built to be the administrative capital, or the headquarters of the captaincy of Rio Negro, Barcelos, which experienced an important development before Manaus, concern in offering urban services of quality is born in this era.

While the rest of the Brazilian colony opted for agriculture, based on the slavery regime, in the mid-eighteenth century, the State of Grão-Pará intensified its investments in the shipbuilding industry and in the first processing plants for extractive products, especially tobacco and nuts. -do-pará. Therefore, the Amazon's vocation for urban modernity is older than it appears in history books about Brazil.

Still in relation to cities, Silva (2019) highlights the different types of cities in the Amazon: notable cities (in which the predominant figures are: the judge, the priest and the primary teacher); economic cities (they are linked to the logic of global markets: mining, soy, agribusiness); company-city (large objects implanted in the forest' and which gave a new dynamic to certain spaces where people linked to extractivism and the river lived), road city (it was the local cities that were constituted on the sides of the highways and from the construction of highways) and the traditional city (cities that maintain the form and content of the urban environment prior to the 1960s).

The authors Browder & Godfrey (2006), consider that "urbanization is very complex for the Amazon" and that it is not possible to frame the urbanization of the Amazon in very well-defined and consolidated theories, because the different form of integration of socio-spatial relations and the micro system, with very own dynamics often combining more rural with urban, strong metropolitan ties in relation to the connections they establish. So it is necessary to think a little about this proposed diversity in which there

are several theses of the urbanized Amazon and other counterpoints, but in a way what can be observed in all of them is a concern with the urban phenomenon in the Region and we cannot accept the thesis of the urbanized jungle,

In the western Amazon, for example, where Manaus is the main expression of the urbanization process, the metropolis grows faster than the region, reaffirming a tendency towards urban, population and economic concentration, which differs from the urbanization already mentioned as a trend for the rest of the country. of the Brazilian territory. This is due especially to the implementation of the Industrial Pole of Manaus, which favored economic and demographic concentration. In this particular case, the urbanization of the territory, understood as the diffusion of the nexuses of the modernization of space, does not accompany with the same intensity the urbanization of society, marked by the diffusion of the urban way of life, which is more present throughout the region (TRINDADE JUNIOR, 2010).

About the phenomenon of urbanization and forest cities as well as the impact of industrialization on society and space as a means of occupation. Silva (2015) points out that the role of the city as a result of the relationship between city and nature is interconnected as a place of sophistication, of arts and crafts, of knowledge and technique. This phenomenon, in turn, presents specificities that occur in a context of peripheral or central capitalism or in developing countries. What is common to all contexts is that the city changes during the industrial era and this transformation initiates a process towards urbanization converging on the emergence of an urban society.

For Silva (2015), the debate on development in the Amazon is faced with the contradictory relationships between the use of resources and the conservation of the biome, and it

is not uncommon for it to paralyze there. Development – not without reason – identified with the expansion of industrial society is seen as the necessary denial of the existence of the forest and the webs of natural and social life that make it possible. There is also an identification between the industrial and the urban, between technology and high-tech, between knowledge and scientific knowledge, between economy and markets.

In this way, industry is born producing the urban industrial, which succeeds, modifies and extends its dialectical opposite, the city. The gap between industry and the city could hardly be maintained, since production is not isolated from the economic circuit, circulation and social reproduction of production factors (work, financial capital, etc.) and from the social relations of production (social and technical learning, consumption habits, etc.). A double movement then took place: industry both returns to the cities and produces its own urbanized areas; appropriates the city and recreates it (SILVA, 2015).

For Lefebvre (1975), industrialization and urbanization form a double but interconnected process, being conflicting faces of a joint reality where industry transforms pre-existing urbanity by threatening it, and at the same time recreates it in an unprecedented urban expansion.

The author (1975) argues that the city/industry shock creates and recreates contradictions: city/countryside, nature/human work, among others, and by recreating urbanity, this shock reorganizes social life widely, providing the emergence of another social practice, another relationship with space and nature. Understanding these changes is fundamental for the debate on the city, space, urbanization and on development.

Paulet (2009), recalls that the process of globalization is urban and that Brazil is an urban country, and the North Region also has a

significant urban concentration in its capitals. These, in turn, have the best infrastructure in the region and the greater presence of state institutions, including federal institutions of higher education. There is certainly a major logistical infrastructure problem, accentuating the distance of the Amazon from the main consumer centers in the country. An efficient national integration is still a great challenge to be overcome, like the industrialization in the Amazon, specifically in the Industrial Pole of Manaus.

For Cardoso (2011), unlike the center-south of Brazil, the Brazilian Amazon did not experience a vigorous industrial cycle, having practically maintained its role as a supplier of inputs and raw materials for the large economic centers. More than that, the Brazilian Amazon has barely overcome its cultural, social and economic backwardness over the years that it has experienced great economic growth.

On the future of the industrialization process in the Amazon, Medeiros and Santos (2010), defend the need to intensify competitiveness to minimize political costs of government intervention in order to guarantee the region the ability to absorb the greatest possible part of the effects of growth of the export sectors, multiplying pecuniary and technological externalities on other sectors of the regional economy and generating complementary opportunities, with the contribution of local productive arrangements and systems formed by small and medium-sized companies (clusters) in order to integrate this strategy.

For the authors (2010), we should consider the presence of large companies and their effects of linkages back and forth as positive, as well as the potential of their production chains to mobilize small, medium and large companies in the articulation of a regional industrial policy. In this line of action, they

recommend an industrial policy for the Brazilian Amazon focused on pioneering industries based on natural resources (furniture, food, cosmetics, mining, biofuel, fish farming).

Our reflection on the Cities of the Forest, Cities in the Forest, as well as the Process of Urbanization and Industrialization of Cities in the Amazon has ended. In the next topic, we will present some PIM figures, Industry 4.0 and Regional Development.

MANAUS INDUSTRIAL POLE, INDUSTRY 4.0 AND REGIONAL DEVELOPMENT

The Manaus Free Trade Zone Industrial Pole – PIM, created by law. n. 3,173 of June 6, 1957, as a result of a regional integration policy that aimed to meet two relevant demands: to create regions with infrastructure that would attract people to densely sparsely populated spaces and to decentralize the industrialization process that was centralized in the southeastern region of the country. Thus, the Manaus Free Trade Zone model met both demands and sought to promote and stimulate the productive and social association of the Amazon region.

Ten years after the promulgation of the law, already in 1967, the model was implemented and structured based on three poles: commercial, industrial and agricultural, with the industrial as the pillar of support. Today, with 55 years of uninterrupted activities and after having overcome countless challenges, including crises, changes in economic plans, economic and political restructuring, and more recently the Covid-19 pandemic, it has surprised the market by registering growth and job generation (permanent, temporary and outsourced), totaling 100,747 (an increase of 9.34%), billing was R\$ 158.6 billion (annual growth of 31.9%) (Figure 1), exports totaled R\$ 449. 084 million (an increase of 14.22%),

with the electro-electronic pole standing out (growth of 40.65%, with sales of R\$ 44.4 billion), computer goods (growth of 13.6% and sales of R\$ 33.6 billion) and the two-wheeled pole (growth of 36.39% and sales of R\$ 19.98 billion) (Figure 2). 292 units produced), tablets, (91.29% increase and 1,914,223 units produced), split system air conditioners (12.28% increase and 5,883,771 units produced), wrist and pocket watches (40.54% increase and 7,374,698 units produced), microwave ovens (44.69% increase and 4. 732,095 units produced), motorcycles, scooters, and mopeds (increase of 25.78% and 1,215,775 units produced), and bicycles and electric bicycles (increase of 11.85% and 743,268 units produced), data from December 2021 (SUFRAMA, 2022).

According to the State Secretariat of Economic Development, Science, Technology and Innovation - Sedecti (2022), the Gross Domestic Product (GDP) of Amazonas, for the year 2021 recorded figures of R\$ 126.31 billion and nominal growth of 16.93% compared to the year 2020. In the fourth quarter, the figure was R\$ 32.85 billion, which represents a nominal growth of 12.92% in relation to the fourth quarter of 2020, and real growth of 2.60%. In relation to the third quarter of 2021, the nominal growth was 1.92% and -1.01% for the real. The Industry Sector totaled R\$ 38 billion and a growth of 18.49% compared to the year 2020. The Monthly Industrial Research (PIM), from the Brazilian Institute of Geography and Statistics (IBGE), pointed out that the volume of the Amazonian industry grew 7.38% in the comparison between the years 2021 and 2020. (SEDECTI, 2022).

According to Silva, Lucas and Oliveira (2021, p.15), the Manaus Free Zone model, constitutes a relevant developmental integration policy and one of the main initiatives of the Federal Government in the

Amazon region, its presence has triggered a virtuous productive and competitive connection with the other Brazilian states as well as with countries in the most diverse continents.

Still for the authors (2021), the presence of companies with international capital provides PIM with expressive dynamism, constantly directing it towards a level of modernization and updating in order to guarantee its competitiveness, gains in scale and technological development accompanying companies located in other industrial regions. PIM industries present characteristics of the 4th Industrial Revolution based on the intensive use of digital technology in order to manufacture new products quickly, optimizing time and the supply chain, providing gains in scale, productivity and improving competitiveness. Such industries, through the fusion of digital technology and the internet in their manufacturing routines tend to become more intelligent, flexible, dynamic and agile structures (p. 15 - 16).

The industry 4.0 readiness test, which is essential for future business roadmaps as well as for their perception of the dimension and their positioning in the face of the new concepts of the 4th industrial revolution or industry 4.0, was applied in a pioneering way in the companies installed in the PIM and the result indicated that these fall within level 3 (transition) on a scale ranging from 1 to 4. In the table below, we can observe the main results of the test applied to PIM industries through an innovative methodology developed by Santiago (2019).

The high degree of innovation and competitiveness present in most of the 600 companies located in the Manaus Free Trade Zone industrial park creates a favorable ecosystem for attracting new businesses and constitutes fertile ground for companies in the technological segment, since the

information technology law (Decree No. 10,521, of October 15, 2020, Regulates § 6 of Article 7 of Decree-Law No. 288, of February 28, 1967, and Article 2 of Law No. 8,387, of December 30, 1991) allocates a percentage of the turnover of companies in the IT center to training human capital, investing in innovative companies (startups), fostering business incubators (social, university, business and technology), businesses with social and environmental impact and forest Startups that develop a green economy that make use of forest assets.

Thus, Silva, Lucas and Pinto (2022), point out that the installation of “Forest Startups” is a promising path and that promotes the strengthening of innovative activities, strengthening regional knowledge (knowledge of the forest), the participation of the public sector, from the private sector, businessmen, investors, teaching and research institutions, innovation as well as environmentalists to foster innovative local businesses with the aim of generating jobs and income, strengthening the sustainable exploitation of Amazonian resources and qualifying regional human capital .

The authors (2022) emphasize that this new and popular expansion movement of Startups da Floresta that make use of forest assets and that positively impact societies and the environment contributes to leveraging the local and regional economy, enabling growth and development economic, strengthen environmental preservation, the use of technology, science and innovation by reducing socioeconomic and environmental vulnerabilities in the Amazon region. In addition, they argue that this new exploration, which has a low-carbon economy as a model, presents a high potential to contribute to the Amazon region to increase its participation in the national Gross Domestic Product (GDP), which today is only 8%, very low if we take

into account its area which is 60% of the national territory, and as we know, is home to 74% of non-exhaustive extractive activities (seeds, leaves, oils), which do not require deforestation, that is, it is a region that has a lot of potential based on the supply of forest assets and needs an adequate management to foster a low impact activity, which provides positive social, economic and environmental effects.

Also for the authors (2022, p. 18), according to studies by the European Commission, the exploration of businesses with forest assets has the potential to create one million green jobs by 2030, and Brazil through the Amazon biome has the potential to lead this movement worldwide.

In this same line of reasoning Silva and Oliveira (2021), state that Forest Startups whose activity is based on the use of forest products foster projects developed in partnership with riverside communities, indigenous peoples, quilombolas and family farmers, associating science with technology focused on sustainable exploration from the beginning of the production chain with the aim of increasing the added value of products, benefiting local populations and boosting the regional economy.

Finally, also as benefits of industrialization 4.0 and the modernization and competitiveness of the PIM, a partnership between the Economic, Sustainable and Strategic Development Council of Manaus - CODESE and technology companies with the support of the Municipality of Manaus, we have an advanced articulation about the creation of the Manaus Digital Hub, which will serve as a showcase for the PIM and will enable the training of regional human capital for a new moment of technological innovation and expansion of wages and the establishment of regional labor. In addition, we emphasize that the Digital Hub, in addition to enabling the

revitalization of the historic center of the capital of Amazonas, will contribute to strengthening partnerships between the public and private sectors, the technology companies installed in the PIM and the teaching intuitions present in the region: UFAM, UEA, IFAM, Samsung OCEAN, SIDIA, private institutions, INPA, Amazon Biotechnology Center etc.

To this end, three editions of the Digital Polo Fair have already taken place (2018, 2019 and 2021) and we have progress in terms of legal basis since in 2019 the Municipality of Manaus, through Decree No. regulated Law No. 2,565, of December 26, 2019, which instituted the program of fiscal and extrafiscal incentives (proinfe) for the creation and promotion of the Digital Hub of Manaus (PDM), delimits the area of the initial core of the Innovation District that occupies the space of the centenary Hotel Cassina, symbol of the golden age of accumulated wealth arising from the Rubber Cycle in the region. The Manaus Digital Hub was inaugurated in 2020 and Manaus is the Brazilian capital in sixth place among the most entrepreneurial in the country and 12th in technology and innovation (PMM, 2020).

As we can see, the activity of the PIM as well as the benefits generated by the companies installed there that have a high degree of technology, innovation and competitiveness make it possible for the local business community to implement proposals to transform the capital of Amazonas into a Smart and Sustainable city. Being the first based on the direction and taking advantage of the technology generated by the companies and in compliance with the Law of informatics and sustainability would be in attendance to the new green matrix within the circularity and sustainable management.

POPULATION GROWTH

Manaus, since the implementation of the

Manaus Free Trade Zone Industrial District, has been the capital that most attracts a population in search of employment, education, quality of life and opportunities. This phenomenon is responsible for the disorderly growth and spread of the city to the most peripheral areas. These, in turn, are without adequate infrastructure to receive this population volume, which sometimes negatively impacts the green areas around the capital and close to springs and streams.

Some factors such as migration and natural growth (birth rate x death rate) are determinant for the population increase in cities. The last IBGE census took place in 2010, but there are several projections of estimates for this population, both by the IBGE and by the government agencies of the state of Amazonas.

According to the data presented in Figure 3, the city of Manaus considering the determining factor of population migration, probably encouraged by the Industrial Pole and other opportunities, had an exponential growth of its urban population in the last decades, mainly from the 1990s onwards. In which the urban population jumped from 633,383 thousand to 1,011,501 million inhabitants. In 2018 to 2,145,444 million and from 2020, despite the low population caused by the misfortune of the pandemic, IBGE data, pointed to 2,219,580 million and in 2021 the estimates were for 2,255,903 million inhabitants in the capital Manaus. The population of the state of Amazonas is estimated by the IBGE in 2021 at 4,269,995 million inhabitants.

Having concluded our reflection on the Industrial Pole of Manaus, Industry 4.0, Regional Development and Population Growth, we will move on to our last topic of this analysis: smart cities and sustainable cities.

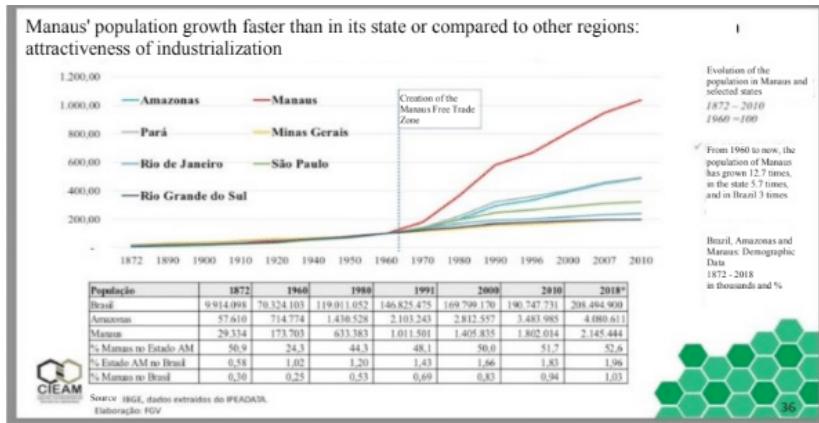


Figure 1: Population Growth (1872-2010)

Source: CIEAM, (2021).

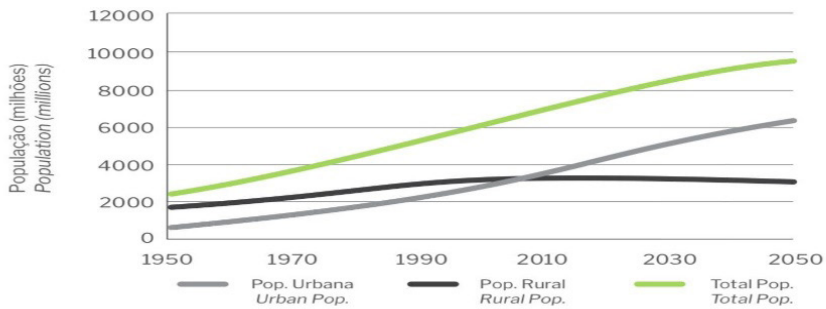


Figure 2: Urban and Rural World Population (1950-2050)

Source: Contardi; Ristuccia and Raccichini, (2018, p. 192) based on UN data, (2016).

SMART CITIES AND SUSTAINABLE CITIES

SecondLazzaretti et al. (2011), a city is considered smart when investments in human and social capital, traditional communication infrastructure (transport) and modernity drive sustainable economic growth and a high quality of life, with an intelligent management of natural resources, through of participatory governance. For Chourabi et al., (2012), most smart city initiatives are driven by governments, and are leveraged by the use of Information and Communication Technologies (ICTs) to better serve citizens. A city in which ICTs merge with traditional infrastructure, coordinate and integrate using new digital technologies is considered smart (Batty et al., 2012).

According to Neirotti et al., (2014), current trends and patterns of smart city evolution depend, to a large extent, on local contextual factors, which concern natural resources and energy, transport and mobility, buildings, life, government, economy and people.

A smart city has some characteristics that differentiate it from others, such as: (i) the use of network infrastructure to improve economic and political efficiency and allow social, cultural and urban development; (ii) has an underlying emphasis on business-led urban development; (iii) a strong focus on the goal of achieving the social inclusion of many urban residents in public services; (iv) emphasis on the crucial role of high-tech and creative industries in long-term urban growth; (v) a deep attention to the role of social and relational capital in urban development; and (vi) social and environmental sustainability as an important strategic component (HOLLANDS, 2008 and CARAGLIU et al., 2011).

The authors Chourabi et al., (2012) suggest a framework that can be used to characterize a smart city and design initiatives that promote

this vision, composed of external factors such as governance, people and communities, natural environment, infrastructure and economy and internal factors such as technology, management and politics. However, technology can be considered as a factor that somehow influences all other success factors in the framework, due to the fact that many smart city initiatives are making intensive use of technology.

For Zanella et al. (2014), an ally in the development of smart cities is the urban Internet of Things (IoT). Urban IoTs are designed to support the smart city vision, which aims to exploit the most advanced communication technologies to support value-added services for city administration and citizens.

For Hammi et al. (2018), the large deployment of IoT is actually enabling smart city projects and initiatives around the world. IoT brings a new concept to smart cities as described by Byun et al. (2016): they are cities that are based on the construction of a communication network between M2M (Machine to Machine), IoT and IoE (Internet of Everything), supported by a creative economy, where its realization by governments is emphasized.

According to Berst (2018), for an effective development of smart cities, there is a need for a more accurate systemic vision and that the lack of it can make those who think about smart cities choose the wrong priorities, create fragmented solutions that are stuck in what he calls departmental silos and fail to capture synergies (opportunities to share infrastructure, costs and data).

The author (2018) even criticizes that many governments still think of citizens as inhabitants and not as customers. In a smart city, the concept of citizen becomes very limited, as cities receive tourists, workers, businessmen, investors, leaders from other

cities and, thus, there is competition for these customers with all other cities that want to attract jobs, talents and tourists.

An important point present in Brazilian studies is the discussion whether smart cities, in the way they are conceived, will in fact bring benefits to the population or will serve to further segregate the population into distinct groups, those who live and those who do not live in cities. intelligent (BRANDÃO, 2016; CAVALHEIRO, 2017; KUHL, 2018).

There is already a lot of discussion about smart cities, but what we know is that a city needs to be smart and sustainable to meet the desires not only of residents, but of everyone who inhabits urban spaces. We will now deal with sustainable cities, which constitute a growth trend that, together with the call for sustainable development (New Urban Agenda and Paris Agreement), makes it essential not only to shape new systems and patterns of production and consumption, but also the solution of global and local issues. This concern is part of the 2030 Agenda, in SDG 11.

For Contardi; Ristuccia and Raccichini (2018, p. 191), in the process of world urban development, cities play a crucial role, as they are socioeconomic centers that contribute to the use and management of natural resources when the production and consumption of goods and services is completed. services. Urban centers generate a wide range of possibilities to boost economies, develop innovative solutions and create conditions to guarantee quality of life for populations.

Also for the authors (2018), there is a window of development opportunity that aims to identify new governance and planning structures, new public policies and business opportunities, in addition to promoting socioeconomic inclusion, stimulating innovation, implementing development projects and of infrastructure improvement.

At the same time, cities generate several social and ecological impacts and imbalances, such as social exclusion, uncontrolled urban growth, pollution of natural resources and their uncontrolled use, low resilience to extreme events, wicked problems and competition for human and natural resources.

Cities become places where heterogeneous dynamics coexist that need to be managed and guided towards sustainable development. These dynamics are gaining more relevance and occupy a prominent role. According to United Nations projections in the report World Urbanization Prospects: The 2014 Revision, considering the period until 2050, the urban population will continue to grow, while the rural one will settle down and decrease (2018), as we can see in the Figure 4.

Another document that according to the authors (2018) corroborates this trend is the New Urban Agenda, formulated at the Third United Nations Conference on Housing and Sustainable Urban Development (Habitat III), which took place in Quito, Ecuador, in 2016. The text asserts that:

Also according to the Energy Technology Perspectives (2016), Towards Sustainable Urban Energy Systems, prepared by the International Energy Agency, cities are at the center of efforts to decarbonize the economy. The study points out that cities are responsible for about two thirds of primary energy demand and for 70% of carbon dioxide emissions in the energy sector (UN, 2016).

Indeed, it is a question of reconfiguring the role of cities in order to be more effectively part of the challenges posed by this paradigm shift. By the way, cities and local authorities are key partners in this transformation process and need to be empowered in the financial, institutional and political aspects, so that there is a reduction of political, social, economic and ecological risks, and it is possible to stimulate growth resilient and inclusive at all levels.

According to the UN (2016), making cities (and everything else possible, whether behaviors, corporations or marketing) sustainable has increasingly become the urban planning ideal of the late 20th century and the current decades. of the dawn of the 21st century, and with this ideal in mind, the Sustainable Cities proposal has been debated and chosen as a solution to the environmental problems of urban development. Today a common part of institutional discourses, environmental discussions from 1960 to the present have been popularizing and following a path aimed at a discourse that stands out since the Brundtland Report (in 1988) and enshrined in the iconic International Conference of the United Nations Eco-92 (convention held in Rio de Janeiro in 1992): sustainable development (ARAÚJO and PESSOA, 2019).

Also for the authors (2019), Sustainable Development is based on the “triple bottom line” (a term known in Portuguese as a “tripod” or “triad” of sustainability), which proposes to align the environmental, social and economic dimensions with the same importance in a development model (SOUZA, 2016, p. 12). However, the convergence of such different dimensions as environment, society and economy, as reported by Prado (2015, p. 88), in the DS proposal “could never be considered an easy effort” and controversy as to its relevance as a valid proposal to solve problems of a society submerged in various crises.

Despite this, the United Nations (UN) makes this effort to reconcile the dimensions of development by using the discourse of Sustainable Development as a framework for guiding various proposals for urban planning and public administration in cities, promoting agreements and partnerships that are in search of a less harmful human existence and survival for the planet. Measuring that more

than half of the world's population lives in urban areas (UN, 2016), urban conflicts and the so-called environmental and climate crises are increasingly impacting the reality of cities. Therefore, the UN argues that thinking about cities in a way to maintain development while taking care of the survival of life on the planet becomes an urgent issue of urban development,

In this way, the UN (2016), which since the Millennium Development Goals (MDGs) and Agenda 21 has been using the SD discourse, developed the current proposal of the Sustainable Development Goals (SDGs) and the 2030 Agenda, adhered to by several countries at the New York Conference in 2015, and the New Urban Agenda (NAU), the latter elaborated in Quito, Ecuador, in 2016 at the Habitat-III Conference – with a direct link and emphasis on SDG 11 – Sustainable Communities and Cities and adherence also from several signatory countries.

Sustainable urban development, guided by the DS and based on concepts such as Urban Resilience and Climate Adaptation, spreads in several proposals for urban models, such as Green Cities, Adaptable Cities, Resilient Cities, among others: however, Sustainable Cities are the proposal resulting directly from this discussion. According to Ferreira (2017), a Sustainable City can be thus defined “as one capable of avoiding degradation and maintaining the health of its environmental system, reducing social inequality and providing its inhabitants with a healthy built environment” (FERREIRA, 2017, p. .09).

In numerous international conferences, such as Habitat – whose focus addresses issues of housing and sustainable urban development – the concept of Sustainable City has gained prominence due to its adoption by the United Nations discourse. Propositions with a large number of adhesions by countries and with ambitious goals for sustainable development

in urban development, the UN describes its “ambitious” proposals for Sustainable Cities in SDG 11 “to make cities and human settlements inclusive, safe, resilient and sustainable” (UN, 2015).

The SDG 11 and NAU Sustainable Cities proposals are based on guiding the management and urban planning of the territories of all signatory States to the SD. However, the adoption of “Sustainable Cities” as a premise to achieve “sustainable urban development”, preached by the United Nations, raises several questions. In addition to the questions about how the implementation of the NAU and SDG 11 would take place to reach the desired levels and principles for Sustainable Cities and whether this would be effective in improving the environmental and socioeconomic conditions in the cities that adopted these guidelines, there are the questions themselves regarding to the discourse of sustainable development as an alternative to solve the inequalities and environmental issues of capitalist development (ARAÚJO and PESSOA, 2019).

RESULTS AND DISCUSSIONS

We started this discussion with the objective of analyzing the evolutionary trajectory of the city of Manaus from a city in the forest to a smart and sustainable city. Therefore, we present a literature review starting with the definition and main characteristics of “forest cities”, a definition inspired by Milton Santos and which was unanimous until 1960. The term city of the forest constitutes and characterizes a small city, with a predominance of fluvial circulation, with a strong connection with the dynamics of nature, non-modern rural life and following the rhythm of the forest, the exploration of these areas takes place in a mild or even non-existent way.

The term “city in the forest” gave rise to the discussion about “cities in the forest”,

which in turn are defined as being those that tend to be articulated mainly to the external demands of the region, making the forest an element of little integration to the new values of urban life, its connection occurs mainly, as a space of economic exploration and with strong interaction and articulation with other realities outside the region in relation to the internal reality. They are, for the most part, cities that have become logistical bases for economic relations aimed at an extra-regional rationality, as is the case of the city of Manaus, capital of Amazonas.

In the case of Manaus, the capital of the state of Amazonas is a city with a high degree of urbanization in the heart of the largest tropical forest on the planet, with an industrial activity that has a relevant weight for the regional GDP. In addition, it is responsible for almost 80% of state revenue.

Manaus, is an example of an urban and industrial city in the middle of the forest, a metropolis that is growing faster than the region and that, since the implementation of the PIM in the military period, 55 years ago, continues to be an object of population attractiveness and an alternative for a healthier life. dignified (health, education, employment). This phenomenon is responsible for the aggravation of urban and social problems given the impossibility of public policies to accompany the daily exodus. As a result, lack of urban infrastructure, basic sanitation, housing deficit and urban violence.

The Industrial Pole of Manaus is among the most modern, technological and competitive industrial parks in the country, today with almost 600 companies installed and with more than 100 thousand jobs generated (direct, effective and temporary) that even in the midst of the pandemic showed growth and demanded productive workforce.

Such positive results are due in part to the readiness technology and the characteristics

of industrial 4.0 that can be measured and that are present in the PIM and that come from the modernization and competitiveness brought by the multinational companies installed in the industrial park. Furthermore, with the adherence of these companies to the information technology law, much progress has been made regarding the formation and qualification of regional human capital. We also highlight that technology companies that adhere to the law have partnerships with research centers and universities, as well as technology institutes focused on training and creating technology-based companies and startups (Sidia, Ocean Institute...)

In relation to technology companies and startups, since 2018, Manaus has been the stage for events related to technology and focused on attracting investors and technology-based companies, with emphasis on the 1st fair of the Manaus Digital Hub. We also highlight that annually such initiatives have been gaining ground and even throughout the pandemic, investments continued to be targeted and strengthened as the adaptation to a digital reality needed to be accelerated.

Another highlight of this trajectory is the conception of the Manaus Digital Hub, which, as in other cities in the country, also has the purpose of preparing human capital for the job market in the technology segment, absorbing regional intellectual capital and revitalizing hitherto abandoned areas. , in the case of Manaus, the historical center of the capital is being prepared to house technology-based companies and startups and already has the 'Casarão da Inovação Cassina', which is a revitalized building arising from the wealth generated in the rubber cycle, being in the a luxury hotel at the time.

Still in relation to startups, in addition to the already traditional technology companies, in a complementary way we have the presence of "forest startups" that aim to

combine technology with a focus on forest assets and with a strong presence of projects and undertakings with social and economic impact. environment, taking advantage of the knowledge of the inhabitants of the forest and adding value to Amazonian products.

Furthermore, this entire ecosystem of innovation, training and competitiveness contributes to strengthening partnerships between the public and private sectors, the technology companies installed in the PIM and the teaching intuitions present in the region: UFAM, UEA, IFAM, private institutions, INPA, Amazon Biotechnology Center, etc., in addition to enabling partnerships with foreign investors and other international research centers.

Manaus, since 2018 has been preparing to become a smart city and investments in human and social capital are already showing a return. With regard to infrastructure and communication with a focus on modernization that drive sustainable growth and an increase in quality of life and social well-being, we still have a long way to go, but the important thing is to seek partnerships so that the process can be gradual and that the impacts on society and the environment are mitigated. Furthermore, another point worth mentioning is the use of technology and the internet of things, since Manaus still needs to improve its infrastructure and prepare for the arrival of the 5G mobile internet network.

In addition to the advances regarding the transition of the capital of Amazonas to a smart and sustainable city, we already have an articulation on the part of CODESE and the Government of Amazonas so that Manaus is closer to a more sustainable smart city, as it meets SDG 11 and Agenda 2030 so that both residents and visitors can have their wishes met and that the space to be shared by all can be adequate, prepared for environmental and climate crises and for urban development.

Furthermore, the 2030 Agenda and the NAU proposal is based on the adaptation of cities to meet the sustainability tripod, giving equal weight and importance to the environmental, social and economic dimensions with a focus on a development model.

Last but not least is the need to have a city that is capable of avoiding degradation and maintaining the health of its environmental system, reducing social vulnerabilities, seeking a solution to infrastructural problems and promoting a healthy and sustainable environment for all.

This trajectory to be followed by the capital of Amazonas joins the challenges that countless other capitals in Brazil and other cities in the world will face, since all of them will face increasingly inhabited urban spaces

and will have to learn to live with the effects of climate change. increasingly intense.

What we do know is that Manaus, 352 years old and with 2,255,903 inhabitants (2021) has the peculiarities of an urban and industrial metropolis, a city in the forest that houses a model of regional development with 55 years of uninterrupted activities and that is responsible for generating more than one hundred thousand jobs, with a productive weight of 15% of the regional GDP and which presents a trajectory that has the origin and characteristics of a city of the forest and which envisages becoming an intelligent and sustainable city to serve its inhabitants and visitors and prepare for the challenges of the near future.

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