


The Interface Between Deforestation and Urbanization in the Brazilian Amazon

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Abstract: The urban becomes fundamental in the reconciliation of environmental issues given the current global urbanization. This study aims to pursue guidelines for developing a methodological approach that enlightens the relations between deforestation and urbanization in the Amazon. Considering the intense urban transition undergoing in the region, a systematic review was conducted to understand the state of knowledge and challenges of this scope. The analysis highlighted four investigative perspectives with relevant contributions, which could be better articulated with adjustments in the analysis system, an urban conceptual reformulation, and also with variables sensitive to socio-spatial dynamics. Approaches to social theory of mobility and risk have supported the design of an urban critical theory in line with the multidimensionality and transscularity of the urban fabric socio-landscapes. By adding analytical perspectives from the spatial demography field, the study presents a theoretical-methodological framework to approach the contemporary interface between deforestation and urbanization.

Keywords: Urban fabric; land use and cover; critical social theory.

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Introduction

The role played by the Amazon in the maintenance of ecological services confers a global relevance to this biome (ALENCAR et al., 2004; BECKER, 2005; RAMOS, 2001). At the national level, its hydrological dynamics influences the rainfall regime in other parts of Brazil, a process described by the theory of flying rivers (VIANA, 2011). At the global level, it assumes a preponderant role in the climate change scenario due to the carbon stock present in its vegetation cover and in the soil (KISSINGER; HEROLD; DE SY, 2012; NOBRE; SAMPAIO; SALAZAR, 2007). Considering these and other environmental and economic reasons, the Amazon awakens diverse interests and gains prominent space in global discussions on the impacts caused by human activities, with emphasis on deforestation.

Deforestation is perhaps the most relevant and complex challenge in the debate on reconciling conservation and regional development in the Amazon. With the implementation of the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm) by the Federal Government¹, in 2004, the deforestation rate in the region significantly dropped, according to data from the System for Monitoring Deforestation in the Legal Amazon (PRODES/INPE). The main reduction occurred in the first phase of the program (2004 – 2008) driven by the creation of Protected Areas and Indigenous Lands. Since 2014, when deforestation reached its lowest value, a resumption of growth in annual rates has been speculated, as indicated by the PRODES/INPE data illustrated in the graph of Figure 1 – and reinforced by the monthly balance of the deforestation alert system of the Brazilian National Institute for Space Research – INPE (Deforestation Detection in Real Time – DETER).

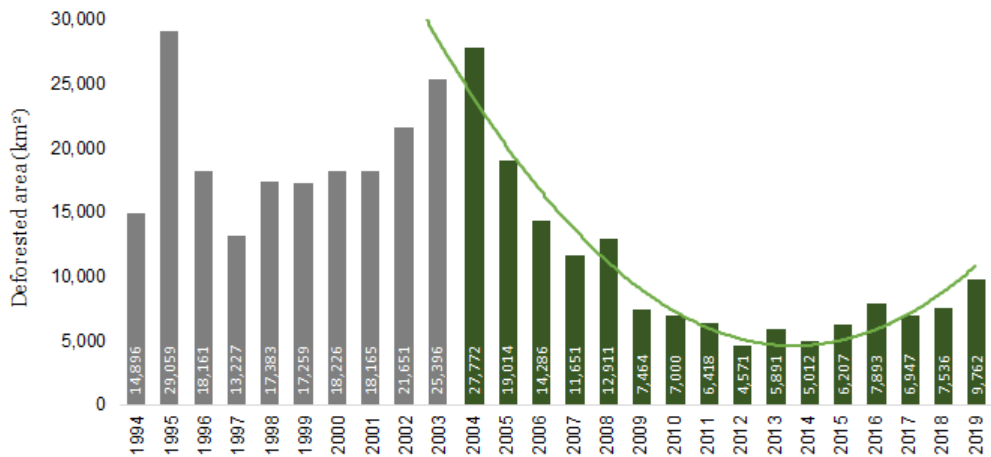
As restraining deforestation required collective actions and involved different spheres of activity, the intensification of deforestation rates results from a wide range of geographic and historical forces and contexts (BARRETO; ARAÚJO, 2012; BRASIL, 2009). The current political-governmental scenario, some legal measures (such as the so-called “land-grabbers” law), the low general economic activity in the country, the prices of commodities (such as soybeans and beef), and the exchange rate of the Brazilian currency against the US dollar were some points suggested by Fearnside (2019) to explain the recent resumption of deforestation.

Understanding the factors and actors involved in deforestation and the ways they synergistically act requires different investigative approaches and disciplinary foundations, considering their transscalarity and interdisciplinarity (GEIST; LAMBIN, 2001; MORAN; BRONDÍZIO, 1998; TURNER; LAMBIN; REENBERG, 2007). Scientific studies tend to focus on regional narratives based on political-economic factors (CÔRTEES; D’ANTONA, 2014), masking inter- and intra-regional differences as well as personal motivations (MORAN; BRONDÍZIO; BATISTELLA, 2008). The promotion of actions toward forest conservation and deforestation control requires a comprehensive look at

1 - Federal Government program that proposes actions mainly concentrated in the region of the Arc of Deforestation and that are articulated in three main thematic cores: Land and Territorial Planning, Environmental Monitoring and Control, and Promotion of Sustainable Productive Activities.

the phenomenon, which is sensitive to sociocultural issues of the involved agents and incorporates the local perception where decisions are materialized, without disregarding the contexts structured by urbanization.

Figure 1 – Time series of annual deforestation rates in the Legal Amazon (1994 – 2019), with emphasis on the period after the PPCDAm* implementation



* PPCDAm - Action Plan for the Prevention and Control of Deforestation in the Legal Amazon

Source: INPE/PRODES, 2020. Prepared by the authors.

Nowadays, the urban condition is a central factor in any environmental discussion (SASSEN, 2009). Observing rural transformative processes from an autonomous conception of rurality is a lagged strategy, considering that they are socio-landscape constructions interconnected to the social and material dynamics located in urban conglomerates (CÔRTEZ et al., 2020; SASSEN, 2009). Despite being considered an urbanized forest (BECKER, 2013), there is little consensus on the interactions between the urbanization process and changes in land use and cover in the Amazon.

By acknowledging this gap, the objective of the study is to seek theoretical-conceptual guidelines that point to the development of a methodological approach capable of explaining the interface between urbanization and deforestation. To do so, a systematic literature review have fostered the discussion about the state of knowledge on the theme. The qualitative analysis showed the advances and agreements between the fields of study, and highlighting the challenges that originate from a still antagonistic rural-urban conception, and from few premises in the analysis system design. Based on a theoretical reflection about the redefinition of these spaces and their relational logics, a set of directions was created, which intertwines dialogues between urban studies and critical social theory, providing guidance for new empirical investigations in the field of changes in the land use and cover.

The urbanized forest: urban transition in the Amazon

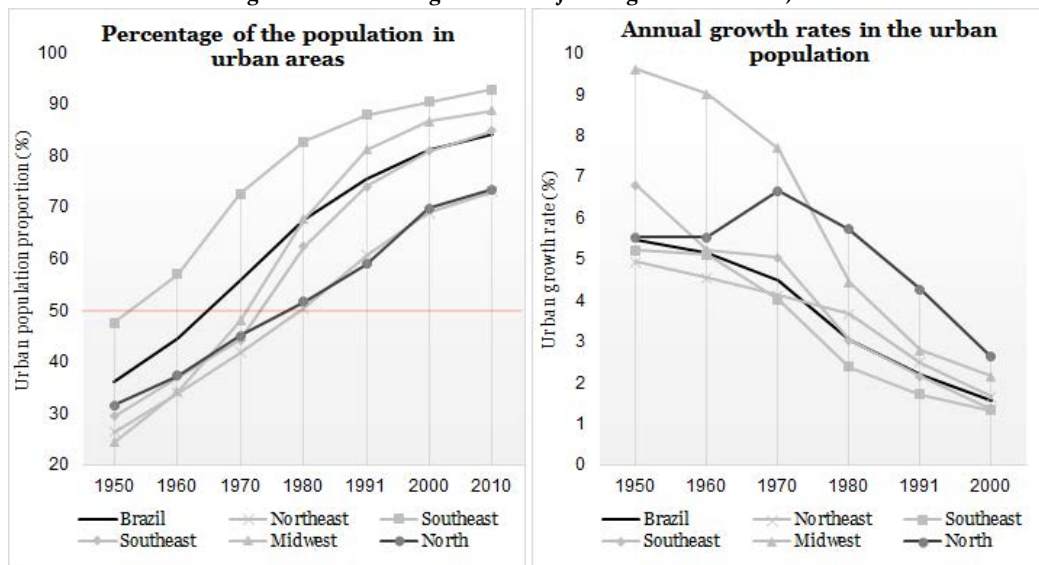
The United Nations Population Fund, the international development agency of the United Nations that deals with population issues, has reinforced that urbanization is the component of greatest influence on the development of countries today (UN, 2014). According to the theory of urban transition (SKELDON, 1990), urbanization proceeds through the gradual transition of the population from predominantly rural to urban, an intrinsic phenomenon of societies in economic development and, therefore, predicted to inexorably occur in a global way (MARTINE; MCGRANAHAN, 2013; MONTGOMERY et al., 2003).

The analysis in different historical and geographical contexts shows that urbanization intensifies over time, shortening the transition period from rural-agricultural to urban-industrial society (ALPHAN, 2003; COHEN, 2004; MARTINE; MCGRANAHAN, 2010a; UN, 2014). Considering the specificities of each country, the world population has been mostly urban since 2007 (MARTINE; MCGRANAHAN, 2010a, 2010b). In Brazil, this transition occurred during the 1960s and, as evidenced by data from 2017, 85% of the Brazilian population lives in urban areas (PNAD, 2017). The country is recognized for an early urban transition and one of the most accelerated in the world's history (MARTINE; MCGRANAHAN, 2010a).

In the northern region of the country, the urban transition started later than the south-southeast part of Brazil. While Brazil reached 50% of total population living in urban areas over the 1960s (driven by the Southeast region), the region in which the Amazon biome is inserted became mostly urban in the late 1970s (Figure 2). In 2010, the urban population in the North region represented 73% of the total, the lowest proportion in the country alongside the Northeast region, though with the highest rate of growth of the urban population (IBGE, 2010). This panorama highlights the intensity of urbanization in the region and suggests there is still a significant path to be followed, strengthening the need for regional urban planning.

For Corrêa (1987), the urban network in the Amazon can be described according to seven moments, having the economic formations of the context as a discriminatory character. They are as follows: 1) the foundation of the city of Belém, state of Pará, in 1616, by the Portuguese as the beginning of the defensive control of the territory; 2) the creation of missionary villages and the extraction of drugs from the backlands with the exploitation of indigenous labor (from 1655 to 1750); 3) the introduction of commercial agriculture and the transformation of hamlets into villages such as Aveiro and Santarém, in the state of Pará (from 1755 to 1778); 4) the economic stagnation of the region and urban life (from 1778 to 1850); 5) the economic boom of rubber and the valorization of the regional economy with the introduction of steam navigation and northeastern migration (from 1850 to 1920); 6) the crisis in rubber production and the consequent economic stagnation in the region (from 1920 to 1960); and 7) the redefinition of the role of the region in the territorial division of labor and its incorporation into the general process of capitalist expansion in the country (from 1960 onward).

Figure 2. Time series of the percentage of total population living in urban areas and the annual rate growth according to the Major Regions of Brazil, 1950 – 2010



Source: Data from the Demographic Census (IBGE). Prepared by the authors.

Until 1960, urbanization was structured in a dendritic network guided by a fluvial logic, with cities strategically located for conquest and defense – referring to the colonization process. In this period, the region contained two important urban references, Manaus (state of Amazonas) and Belém, a high number of small nuclei and the absence of intermediate centers (KAMPEL; CAMARA; MONTEIRO, 2001; PEREIRA, 2006). The transition into a complex regional network occurred after 1960, followed by a change in the nature and meaning of the urban network, being, therefore, a landmark of the Amazon urbanization (BECKER, 1985, 1995; BROWDER, 2003; BROWDER; GODFREY, 1997; HOGAN; D'ANTONA; CARMO, 2008; KAMPEL; CAMARA; MONTEIRO, 2001).

The definitive presence of the State through a set of interventions, institutions, and ideologies shaped migration policies, attracting people mainly from the Northeast region of the country. The colonization projects were intended to promote individual plots to small producers, but also to create agricultural villages considered urban centers (MELLO, 2006) – many which later fulfilled the function of regional centers (HOGAN; D'ANTONA; CARMO, 2008; MELLO, 2006; MORAN, 1981).

Thus, the urban frontier initially promoted the dispersion of small agglomerations and their isolation from urban life in state capitals, and later, throughout the 1970s, the formation of metropolitan regions and the appearance of new population densities (CASTRO, 2006; KAMPEL; CAMARA; MONTEIRO, 2001; MELLO, 2006; PEREIRA, 2006). On the one hand, large old centers, such as Manaus and Belém, grew in terms of population volume due to the density and spreading of the urban center; on the

other hand, small municipalities emerged in areas that previously comprised forests or isolated rural villages such as Brasil Novo and Medicilândia (BECKER, 1985; HOGAN; D'ANTONA; CARMO, 2008).

Currently, the urban structure in the Amazon is characterized by the predominance of medium-sized municipalities, though still maintaining low connectivity and dispersed distribution (PEREIRA, 2006). In a process of convergence in relation to national standards, the Amazon region is increasingly becoming an urban territory with a predominance of the urban-urban migration type (HOGAN; D'ANTONA; CARMO, 2008). Although expressive, the understanding of what urban transition means in the context of deforestation is still poorly clarified (CÔRTEZ; D'ANTONA, 2014; DEFRIES et al., 2010).

Deforestation and urbanization: a systematic literature review

Urban areas are still poorly addressed in studies on land use and land cover change, which contributes to the still limited understanding of the relationship between urbanization and deforestation in discussions concerning the Land Change Science field of study (MORAN, 2010; CÔRTEZ, D'ANTONA, 2014). In order to present the empirical state of knowledge of this scientific scope and to identify the gaps and challenges inherent in these studies, we carried out a qualitative analysis of the subject based on a systematic literature review.

The survey of scientific articles and academic studies was performed using the Google Scholar search tool, considering the time frame from 2000 to 2019. The primary selection criterion was the insertion in the Land Change Science scientific field, which resulted in the inclusion of not only studies on the relationship between urbanization and deforestation, but also others that were included in the scope of land use and cover change and which employed the “urban” term in some analytical component of its methodology. At the end, 20 articles published in indexed scientific journals, four full studies published in annals of scientific events, and two doctoral dissertations were selected, totaling 26 national and international studies.

The search engine for word search was sequential; first, the sequencing of characters “urban*” was used as the root word, alternating the set of additional words, for example, “deforestation,” “forest,” “Amazon,” “land use”; then, the root word consisted in terms from the Land Change Science field, such as “land use” and “deforestation,” having as an additional set words belonging to the field of Urban Studies such as “city,” “urban center,” and “urbanity” – in Portuguese and English languages. In both steps, the definition for inclusion was not restricted to the title of the article, with recurring pre-reading of the studies for assessing eligibility. Systematization of the information resulted from the directed reading of these studies focusing on the following parameters: disciplinary field, research objective, approach to the urban theme, data source, applied variables, and results. The analysis resulted in the categorization into four large study groups.

A first point observed in this exercise was the multiplicity of disciplinary fields. This finding reinforces the complexity of the dynamics of land use and cover, an essentially

interdisciplinary phenomenon. The contribution of these fronts is enormously valuable for exposing the phenomenon under different perspectives, theoretical contributions, and research methods specific to each discipline (URIARTE; SCHNEIDER; RUDEL, 2010). However, there is little integration or dialogue between fields, and even when elements from other disciplines are employed, the hegemony in the composition of authors ultimately limits their potential for understanding or applying such concepts (CÔRTEZ; D'ANTONA, 2014). Moreover, there was a reduced interest in the field of Urban Studies in terms of land use and cover. When dealing with the environmental issue, these scholars generally approach urbanization from the point of view of sustainability and climate change – even though deforestation and land use are directly associated with these dimensions.

The final qualitative analysis of the 26 studies showed two major groups that differ in addressing the urban phenomenon in their research major objectives. The first group studies the effects of demographic changes on land use and cover at the property level, in which urbanization is only a secondary element in the analysis system for adjusting the tested models. Conversely, the second group addresses urbanization as the study object of the research, explicitly seeking to establish the relationship between urbanization and land use and cover in the region under analysis.

Regarding the first group, a striking feature concerns the microscale level of the analysis. These studies result from surveys with the application of questionnaires in the Pan-Amazon Region and are conducted by researchers mainly inserted in the field of demography, with variations in their basic backgrounds. Through sociodemographic surveys, the environmental changes that occur at the level of the rural property are analyzed based on factors related to the personal and household life cycle, which, adjusted to the contextual political-economic factors, allow to approach the decision-making of individuals and their personal and family motivations.

Part of these studies aims to understand how changes in the population composition and structure in the household affect patterns of land use and cover in the property – the Household Life Cycle Model². In order to meet the multiple dimensions that are intertwined in this system, statistical models are composed of endogenous variables (population characteristics of the household) and exogenous variables (political and economic context). One of the exogenous variables applied is the integration with the market, considering that the indicator created for this dimension is “distance from the nearest urban center.” The findings are quite consistent: all the studies that applied this variable showed that the proportion of forest on the property increases the farther they are from the urban center. Other classes of land use also indicated a significant relationship: positive, with annual crops; and negative, with perennial crops and pasture (CALDAS et al., 2003; CÔRTEZ, 2017; GUEDES, 2010; GUEDES et al., 2011; PERZ, 2003; PERZ; WALKER; CALDAS, 2006; WALKER et al., 2002)

2 - The theoretical basis of the model is the labor x consumption relationship and its variation over time in response to the number of children, adults, and older people. Each stage of the family trajectory would have an availability of labor force and a demand for consumption influencing the property and type of crop cultivated on the area (WALKER et al., 2002)

The other segment of microscale studies seeks to understand the effects of migrations on the landscape configuration of the property – for the purpose of this research, the results presented were related to the rural-urban migration type. In these investigative approaches, urbanization is a narrative that gives rise to personal and family motivations; hence, it is treated as an area of population absorption where individuals or groups are enticed by the set of factors of migration attractiveness such as the labor market, access to education and services, among others.

A study on the Peruvian Amazon showed that female migration to urban centers would be associated with the reduction of forest on the property, whereas for men this type of migration would be related to the expansion of pasture (BARBIERI; CARR, 2004). In the Brazilian Amazon, in turn, the study found a significant relationship between rural-urban migration and the high-value production system such as perennial crops and pasture (VANWEY; GUEDES; D'ANTONA, 2011). In both studies, there are hypotheses regarding the forces of causality and their explanations, but which reinforce the existence of a relationship between migration decisions and landscape patterns of the property. Other studies, which have a greater interface with the Natural Sciences field, investigate the capacity for forest regeneration after abandoning the property or activities at the expense of the migration of the family group to urban centers. Having as theoretical framework the Forest Transition Theory³, forest regeneration was not associated with rural-urban migration, but rather with the sociodemographic and environmental characteristics of the property itself (BARBIERI; CARR; BILSBORROW, 2009; GRAY; BILSBORROW, 2014; PERZ; SKOLE, 2003; RUDEL et al., 2005; RUDEL; BATES; MACHINGUIASHI, 2002).

Regarding the second type of investigative approach, which seeks to understand the effects of urbanization on forests, the data sources are secondary and aggregated at the municipal, regional, or continental level. With greater interface with Natural Sciences, correlational studies work on the association between deforestation and some synthetic indicators of urbanization such as percentage of total population living in urban areas and annual growth rate of population. The findings are not general due to variations in the regional context, in addition to being statistically weak, which demonstrates the imminent complexity of this relationship (ALPHAN, 2003; DAL'ASTA et al., 2012; DEFRIES et al., 2010; DENG et al., 2009; HIRYE; DAL'ASTA; MOREIRA, 2013; JORGENSON; BURNS, 2007; KALNAY; CAI, 2003).

DeFries and colleagues (2010) analyzed the effect of the growth of the urban population on continental blocks of developing countries. Although they found a positive association between the rate of urban population growth and annual deforestation, there is significant variation between the regions under analysis. Specifically, in Latin American countries, the association shows that the group of countries that grew in the range of 2 to 3.5% per year had a variation of 85% in the annual deforestation values.

3 - The theory predicts the recovery of forest cover as societies undergo an economic development characterized by industrialization and urbanization – an economic transition based on the primary sector (extraction, agriculture, and mining) to the industrial sector, with a predominance of the service sector (RUDEL et al., 2005).

In the conclusive discussion, they suggest that deforestation would be more associated with the demands for agriculture in the urban space and international markets than with dynamics of the urban population.

Particularly for the Brazilian Amazon, an interdisciplinary study confirmed that the relationship between deforestation and urbanization is not well established (KAMPEL; CAMARA; MONTEIRO, 2001). Deforestation analysis of the municipalities of the Sustainable Forests District of BR-163⁴ showed that urban dynamics directly reflects in deforestation rates, but considering the heterogeneity of the study area, it is not possible to establish a causal relationship (DAL´ASTA et al., 2012). Seeking space-time patterns of urbanization and deforestation in the state of Pará, a multiscale study reaffirmed the complexity of establishing conclusive relationships between these two phenomena (RIBEIRO et al., 2019).

While correlational studies with emphasis on aggregate indicators seek the causal relationship between urbanization and deforestation, geospatial studies use computational tools to analyze the spatial dynamics of urban sprawl, therefore, focusing on the physical attributes of the urban space characterization. In the remote sensing community, most urban approaches focus on a discussion of urban planning, abstaining from the debate on deforestation itself (MORAN, 2010). One of the points brought up for discussion is the finding that urban areas advance in priority areas for food production (ALPHAN, 2003; DENG et al., 2009; HEROLD; GOLDSTEIN; CLARKE, 2003; TANG; WANG; YAO, 2007). There is an association between increasing the urban area and reducing the areas of agriculture and pasture in its surroundings (HEROLD; GOLDSTEIN; CLARKE, 2003).

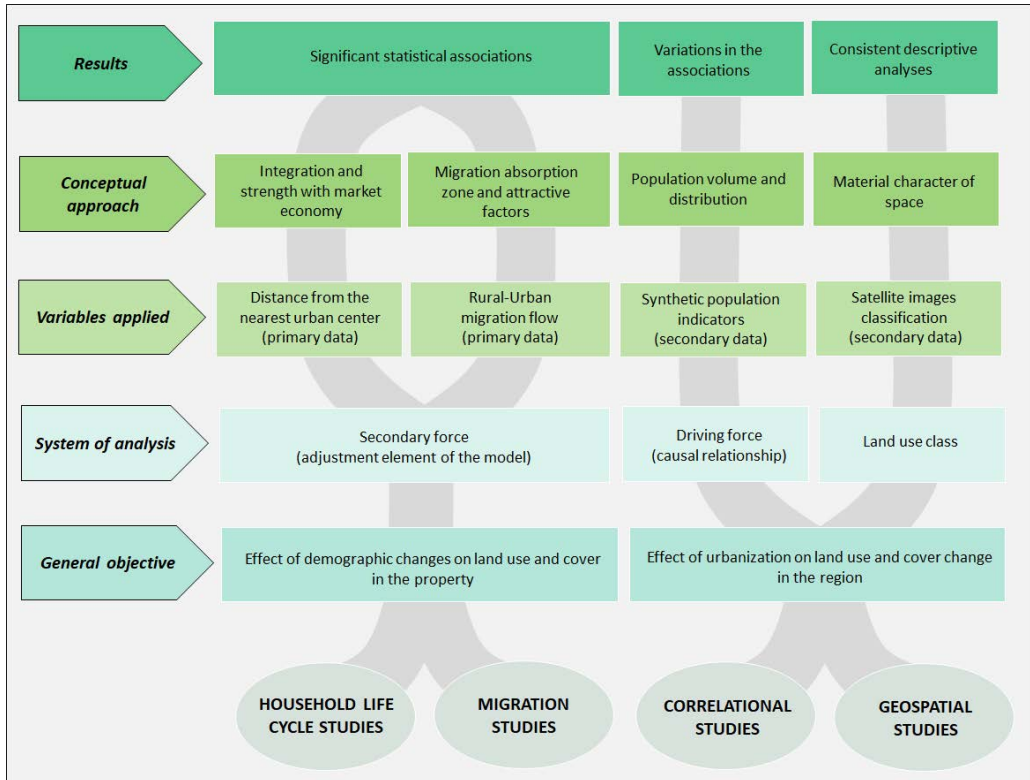
In the Brazilian Amazon, geospatial studies reinforce that urban sprawl does not have a significant effect on forest cover – but rather on other land uses. In Altamira, a municipality in the state of Pará, urban sprawl promoted forest fragmentation and defined the spatial pattern of the remnants along the highways. In Santarém, another city in the state of Pará, where urbanization is more consolidated and old, the increase in the urban area occurred due to the appearance of population densities associated with the expansion of soy in other locations of the municipality – due to the internal spatial rearrangement of the population (CÔRTEZ, 2012; DAL´ASTA et al., 2013; HIRYE; DAL´ASTA; MOREIRA, 2013). Another analysis carried out in the western region of Pará reinforced that the proportion of forest converted to an urban area is low, and that the expansion of urbanization mainly occurs in pasture areas (CÔRTEZ, 2017).

Figure 3 summarizes how the urban is treated in the theoretical and analytical components of the studies considered in the systematic review. Geospatial studies are important for highlighting the urban as a class of land use, therefore, placing urbanization also as a product in the system of land use and cover change. Similarly, such studies show that the advancement of this class does not explain deforestation, considering that urbanization is mainly advancing in areas already deforested. These findings demon-

4 - Geo-economic and social complex determined in 2006 by the Federal Government with the purpose of implementing public policies to encourage development integrated with forest-based activity. The area, located in the west of the State of Pará, covers 190 thousand km², fully or partially comprising 13 municipalities.

strated how the relationship between the two phenomena is complex and impractical to understand by the causal link. Hence the difficulty in obtaining satisfactory results in correlational studies, which seek to answer how the population dynamics of urbanization promotes deforestation, instead of conceiving them as resulting from a single demographic panorama, sharing the same factors and processes.

Figure 3. Analysis of the systematic review of studies on urbanization in the context of Land Change Science, highlighting the urban components of the researches and its findings.



Source: Prepared by the authors, 2021.

The immediate and majority causes⁵ of deforestation are related to agricultural activities – and not to the increase in the urban class. The interface between urbanization and deforestation comprises this plan, in such a way that the degree of connection with the urban space is the guiding element in the expansion of agricultural activities – the type of agricultural crop, the cultivated area, the intensity of development. Studies of the family life cycle prove that this association occurs in a spatial manner, noting that the

5 - In the analysis system of the *Land Change Science* field, the immediate causes correspond to local actions that change the physical environment, being concrete conditions for transformation (GEIST; LAMBIN, 2001).

proximity of the rural property to the urban center reduces the forest area and increases the agricultural parcels. In turn, migration studies complement this scenario by explaining how these flows of information, capital, and material occur. This panorama suggests that the urban space has been spreading in rural areas through a broad and flexible urbanization process capable of perpetuating values and practices, with the migration flows of the population as the connecting thread.

From this perspective, the urban space ceases to be an abstract agglomeration of people in a delimited territory in order to be understood as a referential space of social and material circulation that connects ruralities in urban contexts in a single socio-landscape plan. Concerning deforestation, urbanization acts by spreading the underlying factors⁶, reproducing driving forces that synergistically act in decision-making and, subsequently, in the materialization of action, which in the medium- to long-term may become an urban class of land use. The connections and dynamisms of this integral fabric of urbanities are managed by population mobility and social ties, thus highlighting the importance of the socio-spatial dimension of urbanization in the context of land use and cover change.

The systematic literature review highlighted the contribution of the investigative approaches and identified three main methodological weaknesses. As for the analysis system, urbanization and deforestation are treated based on the cause-and-effect relationship, which seems to be inconsistent considering that the urban space is both a driving force and a product of the land use and cover change. Concerning urban-reference variables, data and indicators used in the studies are expressions that exclude spaces, reproducing the antagonistic view of the rural and the urban spaces. Finally, as for the conceptual context of urbanization, they are descriptions that reproduce the urban space in a one-dimensional way, emphasizing the political-economic aspects or the physical attributes of the space. In order to face these problems, we proposed to revisit classical and contemporary theoretical foundations about the production of urban space in order to support a reconstruction of urbanization as an object of empirical analysis.

Theoretical and methodological reflections: urban space as an object of analysis

The theoretical framework of the Urban Transition offers numerous advantages for measuring urbanization due to the ease of calculation and its comparability in time and space. The analyses are based on the population size of the municipalities, the urban population growth, and the percentage of total population living in urban areas, providing a valuable panorama to understand urban evolution, the differentials between regions, and to design scenarios within the scope of the urban transition (MARTINE; MCGRANAHAN, 2014). However, its analytical instruments consider the population in a one-dimensional way and are based on zoning defined by administrative requirements.

6 - In the analysis system of the *Land Change Science* field, the underlying factors that operate at different scales are the contextual forces that determine the direction and intensity of land use (GEIST; LAMBIN, 2001).

Thus, the conception of urban space becomes a derivation of political and economic interests.

In Brazil, urban perimeters are defined by municipal laws and singular parameters. The demarcation of these spaces are fiscal instruments that are guided by political-administrative issues aiming, for instance, at determining property tax rates and parameters for building construction (MOURA; OLIVEIRA; PÊGO, 2018). These criteria reduce urban and rural to territorial adjectives (ENDLICH, 2006) and simplify the multidimensionality of the phenomenon by adopting only macro-structural elements – denying other aspects of the urban space (CÔRTEZ, 2017). This construction, in addition to being artificial, fosters the antagonistic perception of rural versus urban, reinforcing the lagged perception between rural-countryside and urban-city (CÔRTEZ et al., 2020). The criticisms against this dichotomous model are vast and from different disciplinary fields, with broad scientific consensus of its limitation in representing the complexity of spaces (CAIADO; SANTOS, 2003; CASTRO, 2006; CHAMPION; HUGO, 2003; SILVA, 2003; WANDERLEY, 2000; UNFPA, 2007).

The production of urban space results from social processes, from forms of social and economic organization, and different cultural patterns. The concepts, rural and urban, carry meanings that go beyond a spatial differentiation of the population, they indicate distinct ways of life intertwined by identity relations with space (“the place where one lives”) and with the broader spheres of society (“the place where one sees and lives the world”) (LEFEBVRE, 1999; WIRTH, 1997). The representation of the urban concept expresses a particular way of using space and social life (KAYSER, 1990) and, therefore, the urban space is not uniform due to the different possibilities of interactions, choices, contexts, and intensities. Nor is it a fixed piece, well delimited and with constant typologies, but rather a space that is constantly moving, in continuous transformation (MOURA; OLIVEIRA; PÊGO, 2018).

The process of urbanization is caused by a set of vectors that condition a transitional zone between the urban and the rural with physical and social transformation – dissolving the clarity of its limits (SPOSITO, 2006). From the combination of material morphology (in terms of the city) and social morphology (in terms of the urban), emerges a new socio-spatial configuration of the population (LEFEBVRE, 1999). Thus, the concepts of “rural” and “urban” are merged in a process of convergence of lifestyles, which marks a gradual passage, without rupture, but rather continuous (CHAMPION; HUGO, 2003; WANDERLEY, 2000). This idea is also expressed in the concept of urban-rural continuum, in which the urban pole assumes the role of dissipating values and practices, integrating and connecting the extremes through a scale of intensities instead of contrasts (MARQUES, 2002; WANDERLEY, 2003).

The distinction between rural and urban spaces must not be eliminated, but their functions and content are no longer contradictory, but rather constituents of an urban fabric (LEFEBVRE, 1999). Hence, the urban space takes on an extensive character, resulting from the explosion/implosion dynamics of the city – concerning itself and its immediate surroundings, though also distant (BRENNER; SCHMID, 2015; MONTE-MÓR, 2005).

Urbanization goes beyond cities, spreading in networks that virtually penetrate spaces and constituting the urban fabric (BRENNER; SCHMID, 2015; MONTE-MÓR, 1994). The so-called extended urbanization (MONTE-MÓR, 1994) enables a productive return to debate on urbanization that transcends the dichotomous perspective and resumes the relevance of the spatial component in urban studies (SILVA; MONTE-MÓR, 2016)

From the perspective of extended urbanization, the urban space emerges as a synthesis of both, rural and urban, redefined by the new determinations of society in the global era, of fast and networked information, of compressed space/time (MONTE-MÓR, 2005). There is no linear and general urbanization trajectory, each stage corresponds instead to a specificity of the whole process. (MOURA; OLIVEIRA; PÊGO, 2018). From this perspective, urbanization is not a phenomenon of spatial and social homogenization, but a process that triggers new and distinct urban contexts (CÔRTEZ et al., 2020; MARQUES, 2002; WANDERLEY, 2000). These perceptions reinforce that urbanization is expressively complex and uneven (SANTOS, 2012), with no partial determinism or disciplinary knowledge that exhaust its definition, the urban context is at the same time historical, demographic, geographical, economic, sociological, psychological, semiological (LEFEBVRE, 1999).

In this sense, it is necessary to create a new framework for understanding the relationship between urbanization and deforestation. This scope also includes a reabsorption of modern theoretical and social guidelines, in order to achieve methodological approaches that are appropriate to the challenge. From the theoretical-conceptual point of view of the urban discussion, we propose to work on the articulation between urban studies with critical social theory by developing a critical urban theory, as suggested by Brenner (2009). The urban-rural space must be understood under the relation between risk and mobility of the contemporary society, considering that the multidimensional processes for effecting globalization have started to interconnect and rule social dynamics due to the complex socio-material conditions situated based on urban conglomerates (SASSEN, 2009).

From this perspective, both the different dimensions of mobility (URRY, 2012) exercised in global dynamics (time-space compression, conformation of transnational policies, economic flows, interconnected material structures, among others), as well as the production, recognition and treatment of contemporary risks (BECK, 2011), are linked to urban socio-spatial flows. Therefore, when seeking to elucidate the relationship between urbanization and deforestation within the Amazon context, it would be necessary to think and measure the contexts of urbanities associated with the local processes that combine and materialize the concrete expressions of urban production. Considering also that they are connected not only to the broad dynamics of urbanization, but also to the degree of articulation of these dynamics with globalizing forces.

Conclusions

The relevance of clarifying the relationship between urbanization and change land use and cover change in the Amazon occurs in a moment of resumption of deforestation rates under a regional scenario of intense urbanization. The systematic literature review

regarding this subject showed the different disciplinary efforts, the scope of investigative inquiries, and the varied methodological approaches conducted in recent years. There are important contributions and progress in the knowledge of this topic that manages to elucidate certain processes. Although there is still a weak integration between the study groups and a limited capacity to generalize the findings, leading to the need for new guidelines for full understanding of the interface between urbanization and deforestation.

The analyzed studies showed that urban sprawl mainly occurs in areas already deforested, specifically in crop areas. Not being an immediate cause of change in forest cover, hence having no causal link, urbanization is at the same time a class of land use and a driving force of underlying factors that shape decision-making. This involves creating a multiscale dynamics that are structured in a cyclical and retroactive system. Urban driving forces are somehow guided by a spatial relationship, decreasing the intensity and impact with the distance from urban centers. When that expansiveness is laid out, it is clear that the effect of urbanization is not limited to the urban center. The urban values and practices are propagated in rural spaces through population flows, establishing virtual bridges in the rural-urban spectra and promoting the circulation of capital, material, knowledge and cultural aspects.

The exercise of establishing a dialogue and developing an integrated panorama from the analyzed results exposed the complexity of the theme. We identified three main methodological efforts necessary to advance this scope, namely the reformulation of the analysis system as the bottom of the investigative process, the conceptual re-signification of the urban space, and the adoption of variables sensitive to socio-spatial processes. The theoretical framework for facing these challenges was proposed based on the articulation of urban studies with critical social theory aiming at developing a critical urban theory.

Critical urban theory equates the distinction between the real and the possible, guaranteeing epistemological reflexivity by shaping a transdisciplinary theory guided by specific historical conditions (BRENNER, 2009; BRENNER; SCHMID, 2015). Based on approaches from the social theory of mobility and risk (BECK, 2011; URRY, 2012), the urbanization process is conceived as an articulation between global and local elements, which are composed of a set of redefining components of the urban-rural logic of these scale connections. In this theoretical framework, five fundamental propositions were presented to reason on the methodological guidelines capable of sustaining the relations between deforestation and urbanization in the contemporary Amazon.

Firstly, the refusal of any and every approach that considers “urban” and “rural” concepts with autonomous socio-spatial dimensions or in a dichotomous perspective. Secondly, to think about the problem of deforestation under a single socio-landscape configuration articulated between ruralities and urbanities – the constitution of the urban fabric. Thirdly, the urban transition framework must continue as a conceptual element, though reconsidering its linear vector sense (from rural to urban) in order to make room for multivectoriality - in the sense of conceiving mobility as susceptible to dynamics of translocality between urban and rural spaces. In this sense, fourthly, an explanatory deepening that seeks a multidimensional and cross-scale character of research in the socially

established options between deforestation and conservation. In other words, taking into account the local processes of stimulus and responses to the risks and vulnerabilities provided by the dynamics of deforestation. And finally, fifthly, this articulation must be put into perspective from the set of economic, technological, and national and global political forces that these socio-landscape configurations present.

From these theoretical backgrounds emerge the analytical challenges to become feasible the empirical approach of the urbanization and deforestation relationship. Recognizing that the urban fabric is determined by a spatial restructuring and enabled by the processes of population mobility, one resorts to the incursions into Space Demography (VOSS, 2007; VOSS; WHITE; HAMMER, 2006; WACHTER, 2005) to consolidate an adequate research method with the questions and challenges presented in this article. When considering population mobility as a complex social phenomenon that goes beyond physical and economic dimensions to involve cultural, affective, imaginary, and individual dimensions (URRY, 2007), looking at spatial configurations of the population becomes a multidimensional perspective of the urban phenomenon. Thus, the approach involving the socio-spatial dimension can be a promising methodological strategy for the analytical framework, fully supporting the theoretical foundations of the critical urban theory.

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A Interface entre Desmatamento e Urbanização na Amazônia Brasileira

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São Paulo. Vol. 24, 2021

Artigo Original

Resumo: No atual processo global de urbanização, o urbano torna-se elemento central na reconciliação das questões ambientais. Neste estudo, objetivou-se trabalhar diretrizes para subsidiar uma abordagem metodológica que explicita as relações entre desmatamento e urbanização na Amazônia. Considerando intensa transição urbana na região, realizou-se uma revisão sistemática da literatura para compreender o estado de conhecimento e desafios deste escopo. Destacou-se quatro frentes investigativas com relevantes contribuições, mas que poderiam ser melhor articuladas entre si com ajustes no sistema de análise, reformulação conceitual de urbano e indicadores sensíveis às dinâmicas socioespaciais. Através das abordagens da teoria social das mobilidades e do risco refletiu-se sobre a concepção de uma teoria crítica urbana condizente com a multidimensionalidade e transescalaridade das configurações sociopaisagísticas do tecido urbano. Com a incorporação dos enquadramentos analíticos da demografia espacial, o artigo propõe um conjunto de direcionamentos teórico-metodológicos para abordar a contemporânea interface entre desmatamento e urbanização.

Palavras-chave: Tecido urbano; uso e cobertura da terra; teoria social crítica.

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La Interfaz entre Deforestación y Urbanización en la Amazonía Brasileña

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Artículo original

Resumen: Lo urbano se vuelve fundamental en la reconciliación de los problemas ambientales dada la actual urbanización global. Este estudio tiene como objetivo buscar un enfoque metodológico que ilumine las relaciones entre la deforestación y urbanización en la Amazonía. Se realizó una revisión sistemática para comprender el estado del conocimiento y los desafíos de este alcance. El análisis destacó cuatro perspectivas de investigación con contribuciones relevantes, que podrían articularse mejor con ajustes en el sistema de análisis, una reformulación conceptual de lo urbano y con variables sensibles a la dinámica socioespacial. Los enfoques de la teoría social de la movilidad y el riesgo apoyan la concepción de una teoría crítica urbana consistente con la multidimensionalidad y transescalaridad de las configuraciones socio-paisajísticas del tejido urbano. Se presenta un marco teórico-metodológico con la perspectiva analítica de la demografía espacial para comprender la interfaz contemporánea entre la deforestación y la urbanización.

Palabras-clave: Tejido urbano; uso y cobertura del suelo; teoría social crítica.

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