

Landscape planning and climate changes: a multidisciplinary approach in São Carlos (SP)

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Abstract: The articulations needed for an adaptation regarding climate changes are also important in medium and small size cities, which reproduce logics similar to those of metropolises. The aim here is to discuss and share the experience of the Work group of the Urban Parks in the medium-sized city of São Carlos, in the state of São Paulo, as an example of the interaction between science and planning practice. The theoretical-methodological approach has a convergence point at landscaping and the system of open spaces. The landscape planning and complex cartography structure the method composed by: urban interpretations; articulation with public policies; local perceptions; collective planning; presentation and sharing of results. It is possible to conclude that the construction of adaptative measures depend on the comprehension of vulnerabilities in each context, the appreciation of public dimension, the scientific and political integration, the inclusion of agents, the articulation with other levels of governance and territory scales.

Keywords: Urbanization; medium-size cities; environment; open spaces system.

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Introduction

The impacts of climate changes caused by production methods and by occupation methods are widely presented and proved by studies and researches. They point out that the increase of urbanization may intensify external events over the cities (CONDON et al., 2009; ETC/CCA, 2019; IPCC, 2019).

In Latin America, this phenomenon is particularly acute. According to what was warned by the Intergovernmental Panel over Climate Changes (IPCC, 2019), 17 out of 50 more vulnerable countries to climate changes are located in Latin America.

In urban contexts, several countries have been developing theoretical and methodological strategies aiming to elaborate a plan which embodies climate changes, including resilience in their local management systems (BEERMANN, 2014; EPCPD, 2014; TCPA, 2018; ETC/CCA, 2019; GIZ, 2019).

A research performed with over 880 European cities has found that 66% of them already own a mitigation plan in progress (RECKIEN et al., 2018).

Studies indicate the existence of 11 cities in Brazil with municipal plans on climate changes (CONSÓRCIO INTERMUNICIPAL GRANDE ABC, 2017). Nevertheless, the subject still moves slowly in the country, without being set as a central issue in public policies, specially at a local scale. The majority of cities are still uninformed about the vulnerability of the places and their populations, not having efficient systems of planning, management, and risks calculation (MARANDOLA JR., 2013).

Thus, the risks management is one severe problem in the country and the disasters are not seen in an articulated way regarding fragilities of the space and urban management. One of the greatest difficulties in this aspect is the ignorance about the vulnerability of people and places, caused by a “scalar unfitness” that does not allow us to see the interactions and their changes (MARANDOLA JR., 2013, p.103).

Some national public policies have been approved aiming at the increase of urban resilience, from which we can highlight the National Policy for Climate Changes (Federal Law 12.187/2009) and the National Policy of Civil Protection and Defense (Federal Law 12.608/2012). Both of them indicate the creation of an information and monitoring system of urban disasters articulated between states and municipalities; systemic and preventive approach of actions; planning based on researches about risk areas in cities and intensification of the participation of the society. However, few instruments and actions were effective in altering the conditions of the communities affected.

A common frailty in Brazilian cities while facing the impacts of climate changes is the technician character of the proposals (BARBIERI; VIANA, 2013). Another difficulty is found in the disarticulation of instruments created for climate changes together with other planning instruments, such as municipalities’ master plans, river basins, sanitation or mobility (BUENO, 2013).

At a state level, the State of São Paulo is the one which has been the most affected by climate changes (IWAAMA et al., 2016). Studies indicate that throughout the last seven decades, there has been an increase of air temperature of 2.1° C, and decrease of

relative humidity of 7%. These changes are mainly associated to the changes in the use of the soil, and the urbanization process (NOBRE, 2011).

Floods represent one main type of natural disaster that afflicts the cities. These phenomena are frequently caused by fast heavy rains, being intensified by the impermeabilization of the soil, adjustments on the course of water, and reduction of water drainage in the canals (IPT, 2015).

Even though metropolitan regions are the object of greater concern while mitigating multiple risks, scales and articulations are needed for an adaptation and mitigation toward climate changes, also being highly important in medium and small size cities which often reproduce production models and logics of the space similar to the metropolises.

As medium-sized cities present problems at a smaller scale, it indicates an opportune condition of integration between the discussions over planning and climate changes (PINHEIRO et al., 2016).

The municipality of São Carlos is located in the central region of the State of São Paulo, owning around 250 thousand inhabitants, and it presents diverse situations of vulnerability, which potentialize the occurrence of risks to the population.

The critical analysis of these phenomena and the attempt of contribution to the turnaround of this scenario instigated the creation of a Multidisciplinary Group (Work group of the Urban Parks – GTPU), composed by universities, government, and social agents.

The objective of GTPU is to propose strategies, settings, measures, and mitigation policies with participative, preventive and systemic approaches which aim to encourage an urban management engaged with the risks, and that present actions and instruments related to the specific problems of each situation.

Considering the articulation of disciplinary fields and topics over urbanization, planning, and climate changes, the objective of this article is to present an initiative of interaction between science and planning practice through the experience of the Work Group of the Urban Parks – GTPU, in the context of the medium-sized city of São Carlos in the State of São Paulo.

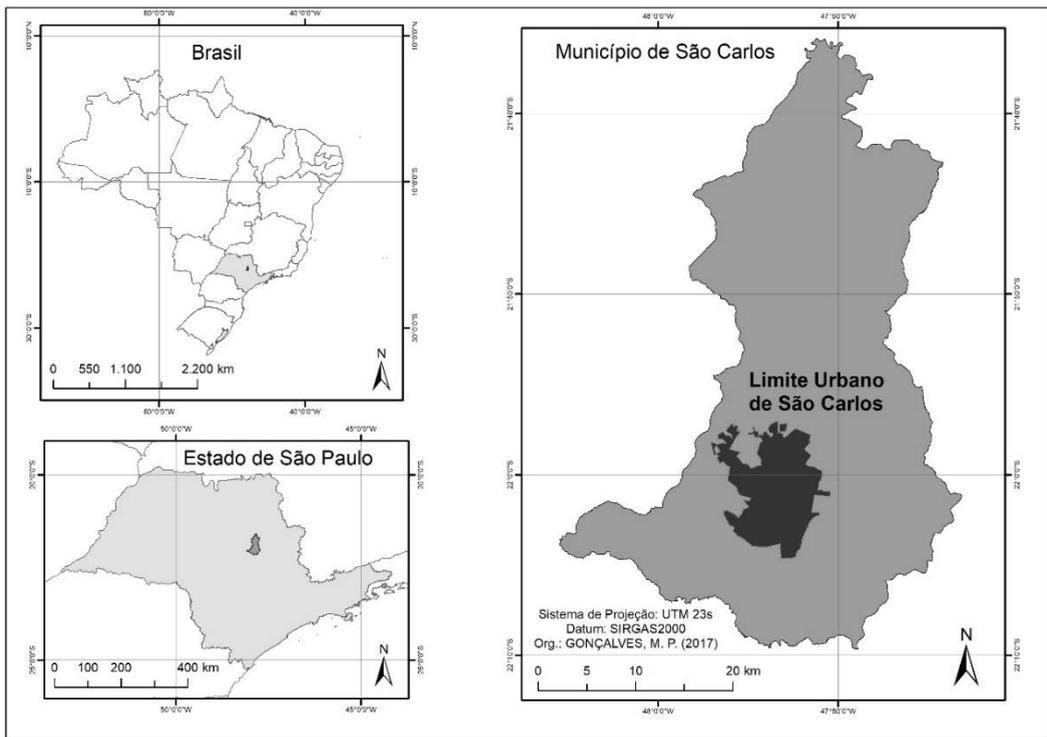
The relation between the themes refers to the mitigation of climate changes through the constitution of an Open Spaces System, parks, and green infrastructure, while promoting methodological advances in agreement with the local public policies.

The article was subdivided in four sets of reflections: the specific context of the municipality of São Carlos covering the history and the effects of climate changes over the socio-spatial dynamics; the presentation of the theoretical-methodological approach of GTPU; the discussion of results obtained, and finally the challenges and perspectives for an articulation between science and planning practices that embody the context of climate changes.

1. The urbanization and planning process, and the impacts of climate changes over the socio-spatial dynamics of medium-sized cities in São Paulo: the context of the municipality of São Carlos (SP)

São Carlos (SP) has an estimated population of 250 thousand inhabitants (IBGE, 2018) and a territory of 1.136,9 km², set as a medium-sized city with regional relevance (Figure 1). Besides the populational criterium, the factors that characterize the city are: its productive role; its articulation within the urban network, its location in development axes; and the intense performance of universities, technological poles and research centers, which makes it a city connected to the global networks of knowledge and innovation (SPOSITO; GÓES, 2013).

Figure 1 – Location of the municipality of São Carlos



Source: Gonçalves, 2018.

This typology of cities where São Carlos is found has presented populational growth rates superior to the others of the State of São Paulo and Brazil. Due to the accelerated populational growth and the territorial planning models, the socio-spatial conflicts and contradictions are also present in its urban, peri-urban, and rural spaces. However, its effects do not configure the dimension of metropolitan agglomerations.

Some biophysical characteristics of São Carlos reveal a landscape with fragments of Cerrado of São Paulo and Seasonal Semidecidual Forest; reload areas of aquifer Guarani;

besides a significant hydric structure (SCHENK; PERES; FANTIN, 2018).

Other characteristics highlight primary elements for the comprehension of the occurrence of disasters, being some of them demonstrated later in this article.

The city is located in the geomorphologic region of Cuestas Basálticas being morphologically characterized by the presence of sharper steep terrains (IPT, 2015). The altimetry ranges from 630 meters in deep valleys to 945 meters in urban area neighborhoods, or even 1015 meters at regions around the city. The declivity presents average percentage between 10 and 30%. At the south edge of the urban area, it reaches indexes greater than 45% (ROSS; MOROZ, 1997).

The geologic contexts also favor the occurrence of land slide risk areas located mainly in sandy soiled regions of Formação Botucatu and Formação Serra Geral (IPT, 2015).

Besides these geoenvironmental characteristics, density, the constructive pattern, the use of soil, and absence of afforestation are factors that enables the generation of higher temperatures, enlarging the risk regions (RAMPAZZO, 2015).

The geologic-geotechnical mapping performed by IPT in São Carlos (IPT, 2015) has identified eight risk areas of floods and one risk area of land slides (highlighted in Figure 2).

Regarding the risk areas of floods, four high risk areas were diagnosed and four of medium risk. All of them are located along the margins of the main urban streams. The first one (Area 1) is located in the channeled part of stream Gregório, in convergence with streams Monjolinho and Mineirinho. The floods are caused by the water flow from these means, and the bottleneck of drainage in the crossing of stream Monjolinho with the railway.

Area 2 is located in the stream Gregorio in the region of Mercado Municipal. The households and commercial center were built in the flooding plains. The flooding process happens since 1905 according to records, and it takes place during heavy concentrated storms (MENDES; MENDIONDO, 2007). Floods taken place in January and November 2020 in this region reached 120 private establishments and 10 public ones, summing social and economic damage of about 40 million reais (CEDEC, 2020).

Area 3, considered at high risk, is also located in the stream Gregório, in a certain part where it is still stilted naturally. Area 4 presents a part of crossing ways along stream Simeão, affluent of stream Gregório. The flooding process reaches many routes, households, and commercial area, elevating the exposure rate to risk.

Area 5 is considered as medium risk, covering the streams Santa Maria do Leme and Tijuco Preto, affluents of the stream Monjolinho in the region of Parque do Kartódromo. These streams present canalized and rectified parts, with undermining and siltation. Area 6 is located in the confluence of stream Gregório with stream Lazarini. Area 7 is also a confluence of stream Gregório with stream Sorrigotti, both naturalized.

Area 8 defines a sector at the Federal University of São Carlos. There is a dam with overtopping bringing high vulnerability situations to pedestrians, local industry workers and vehicles. Recently, this dam has been drained due to the risk of collapsing.

The only urban area considered of high risk of land sliding is located at the South Region (area 9). It is a rocky slope with average inclination of 60° and height of 50 meters.

Figure 2 – Map with highlighted regions and risk situations in the municipality of São Carlos affected by the impact of climate changes



Source: Adapted from IPT, 2015; GLOBO G1 São Carlos and Araraquara, 2020.

The urban drainage profile of São Carlos, added to the silting of rivers, undersizing and precariousness of micro and macro drainage systems, indicate the susceptibility to occurrence of floods. Such process is caused by heavy storms which constantly take place and it has been more evident lately (IPT, 2015).

Lima and Amorim (2014) highlighted that throughout the years there has been a correlation between the increase of these episodes and the elevation of concentration of rain above 60mm in 24 hours, mainly during December and January. Precipitations of 40mm daily already have the potential to bring floods in São Carlos (LIMA; AMORIM, 2014).

In January 2020, there has been three precipitations of great intensity, which reached more than 40mm, and one that reached 167,8mm in three hours. This value is close to the storm that took place in Belo Horizonte in February 2020, with precipitation of 176mm in three hours (LEITE, 2020). In November 2020 there was one of the biggest storms in São Carlos at about 138mm in one hour, with serious social, environmental and economic consequences.

Soares et al. (2012) have checked correlations between the climate and the mortality of elderlies in São Carlos. Rampazzo (2015) has identified regions in the city with formation of heat islands at high intensity with temperature difference superior to 7°C. Such regions are related to densely edified and low wooded locations, such as the region of stream Gregório.

There are several recommendations for the reversion of such problems. Reports from IPT recommend that the city should develop structural and non-structural initiatives of retention by infiltration or reservation, monitoring, and development of tools for guiding the population subject to the impact of these phenomena. It is also recommended the recovery of valleys and green areas as decisive factors for lowering the temperature, while regulating the floods and climate mitigation (IPT, 2015).

2. Mitigation of climate changes through an Open Spaces system, of vegetation and green infrastructure

Several studies conclude that the vegetation and open spaces may have effects on the urban quality and conditions for life in the population, also representing an important measure in climate adaptation in cities.

Urban Open Spaces (streets, sidewalks, squares, parks, etc) constitute a complex and interrelated system with others. Among its multiple roles we can mention leisure, circulation, flood mitigation, environmental preservation, and social living (SCHLEE, et al., 2009). In order to constitute these spaces as a system, they must be qualified, integrated and connected. They must present relations of complementarity even if they had not been planned or implanted as such (MACEDO et al., 2007).

Among its multiple benefits, we can highlight: temperature reduction; improvement in the quality of air; reduction of superficial flow of pluvial water; reduction of energy

expenses; increase of fauna and biodiversity corridors; improvement in landscaping; supply of recreation spaces; encouragement to educational actions; increase of social living; economic benefits in the surrounding regions; appreciation of the memory and cultural patrimony (LEE et al., 2015; ARONSON et al., 2016; FAJERSZTAJN et al., 2016; TAYLOR; HOCHULI, 2017).

Zhang et al. (2015) identified a reduction of 200 km² in urban green areas in ten years in Beijing, China, which has led to a reduction of flow rate from 23% to 17%.

Yu et al. (2017) analyzed the cooling effect of green spaces as an essential service for mitigating the heat island effect, and so increasing the resilience facing climate changes.

Besides the physical and social effects, recent studies have been demonstrating that the increase of vegetation and parks in cities also cause significant reflexes in the health of the population, such as reduction of obesity, psychological disorders, and risk of heart attacks (ELMQVIST et al., 2015; SALDIVA, 2018).

To Franco et al. (2013), the creation of open spaces, parks, green areas, and the plantation of trees are among the main actions while adapting to climate changes. The increase of green areas was considered as one of the actions associated to the contention of climate changes effects over urban spaces in Chile by Monsalves-Gavilan et al. (2013). Nobre (2011) also proposes the preservation of meadows and permanent protection areas through the implantation of linear parks as an adaptation measure in cities.

In order to adapt the urban system to the climate changes, some cities have been using “nature-based solutions” (YOUNG et al., 2019; NATURVATION, 2020). As examples of these solutions, we can mention what we call green infrastructure, such as rain gardens, green roofs, increase of vegetation and parks in the city, which limit the thermal stress while promoting permeable surfaces and storing pluvial water.

The city of São Carlos has a low qualified Open Spaces and Urban Parks system, also fragmented, disconnected and owning low identity by its population (PERES et al., 2019). Many of these spaces face underutilization and degradation problems according to cultural issues, appropriate policies, absence of attractiveness in the surrounding, and increase of insecurity and urban violence.

Aiming to revert part of this historic scenario, some initiatives have started to be traced, mostly coming from organized groups and universities, in order to seek for developing proposals for preserving open spaces and legitimating their potential.

Technical and legal matters of mitigation of problems are the motto for generating these initiatives. Thus, the impermeabilization conditions and the low vegetal coverage were identified as factors to be altered and associated o the network of reservations connected to the streams, so that they constitute a more complex Open Spaces System (SCHENK; PERES; FANTIN, 2018, p.317).

These are the main motivations for the formation of a Work Group of Planning of Urban Parks (GTPU), a collective that is being more and more renowned in the city as a legitime space of production of knowledge and support to the decision making.

3. Presentation of the experience between planning science and practice: the Work Group of Planning of Urban Parks (GTPU) case

By acknowledging the actual scenario of need and low quality of open spaces and green areas of São Carlos, and considering the great mitigation potential of the negative effects of urbanization, the public management has promoted the creation of seven Urban Parks (SÃO CARLOS, 2017a), representing the beginning of the organization of a System of Parks with multiple purposes. These areas are public and own massive vegetation zones, presenting distinct potentials.

In order to continue the process of planning and management, the Work Group of Planning of Urban Parks – GTPU was formed (SÃO CARLOS, 2017b). The university was named for its coordination, together with a collective of representatives related to research institutions, municipal departments, and social groups.

Due to several curricula and disciplinary fields of the participants, the purposes were amplified so that the Open Spaces System (SEL) would be a guideline. Also, the planning perspective linked to the context of climate changes was a motto for the group.

One first movement while elaborating guidelines for an Open Spaces System was concluded in 2019. The action has articulated the Parks defined in a Decree to a greater system, which joins the hydric network, public areas, peri-urban and mobility reservations. The proposal was discussed in public presentations, with the attendance of city office clerks and several other agents.

The theoretical-methodologic approach of GTPU has a fundamental convergence stand in landscaping and the Open Spaces System. The idea of planning based on the landscape and open spaces guided by a systemic approach is being seen as a reference, and as a possible methodologic basis to propose an urban design that can contribute to the contemporaneous perspective for resilience and adaptation. The parameters taken are: connectivity; biodiversity; integration of green infrastructures with the other urban systems; besides the relations between educational aspects, and the health of the population (SCHENK; PERES, 2019).

In GTPU works, the landscape leads the ways for seeing and representing the world, in agreement with the values created by the society (BERQUE, 1994; BESSE, 2014). It has a multidisciplinary and cultural dimension, and it is shaped by a set of elements that witness the relationship between the human being and the nature at several diverse aspects (LIMA, 2019, p.19).

For the landscape to exist, it is fundamental the process of reflection and reconfiguration of what there is in the world, transforming it in knowledge (LIMA, 2019, p.35), having then a political dimension.

The theoretical-conceptual approach of the landscape is based on the concept of Jean Marc-Besse (2014), which presents five “doors”, or articulated ways of understanding the landscape, being: the landscape as a cultural and social representation; as a territory that was made and inhabited; as a living environmental material of human societies; as

a phenomenological experience, and as a project (BESSE, 2014).

Landscape and cartography are topics that articulate each other, relating aspects about the transformation of the world by the man (SCHENK; LIMA, 2019). Thus, a process named complex cartography is developed in GTPU, which understands the phenomena of reality and articulates the ways of seizing different scientific fields. This process is supported by theoretical fundamentals of the cartographic method (MCHARG, 2000; PASSOS et al., 2015) and environmental cartography (MARTINELLI, 2018).

Complex cartography integrates two dimensions. One visual dimension of the landscape that occurs mainly by the vision of an overflight and reading of aerial photographs. The other is an approximation dimension of the researcher with the field, which enables a direct contact with the reality and experiences (PASSOS et al., 2015). It supposes the walk through the city as a means of living in the world, and aesthetic practice (CARERI, 2013). In order to understand the city, it is necessary to live it.

The complex cartography of GTPU can be made by many hands, without a unique perspective in which all voices have opportunities. For that, it is fundamental to listen to the impressions and possibilities, and also observe and invite (CHÁVEZ; DIAS, 2019). The results are sensibilization, synthesis, and prospective cartographies (MARTINELLI, 2018).

As a methodologic strategy, the complex cartography is the basis of planning the landscape and it constitutes an axis for the development of projects of the Open Spaces System, specially because it enables the investigation and the reading of several layers that compose the space, also promoting the discovery and explanation of potentialities, revealing qualities of these spaces (SCHENK; LIMA, 2019, p.29).

All these methodological approaches assume the development of a collective dynamic process, which is continuously fed. Besides that, it seeks for proposing techniques and guidelines for innovative planning to the traditional “gray engineering” which historically sought for controlling and hiding natural flows (SPIRN, 1995; HOUGH, 2004).

4. Discussion of the results reached under the perspective of approximation between planning and climate changes

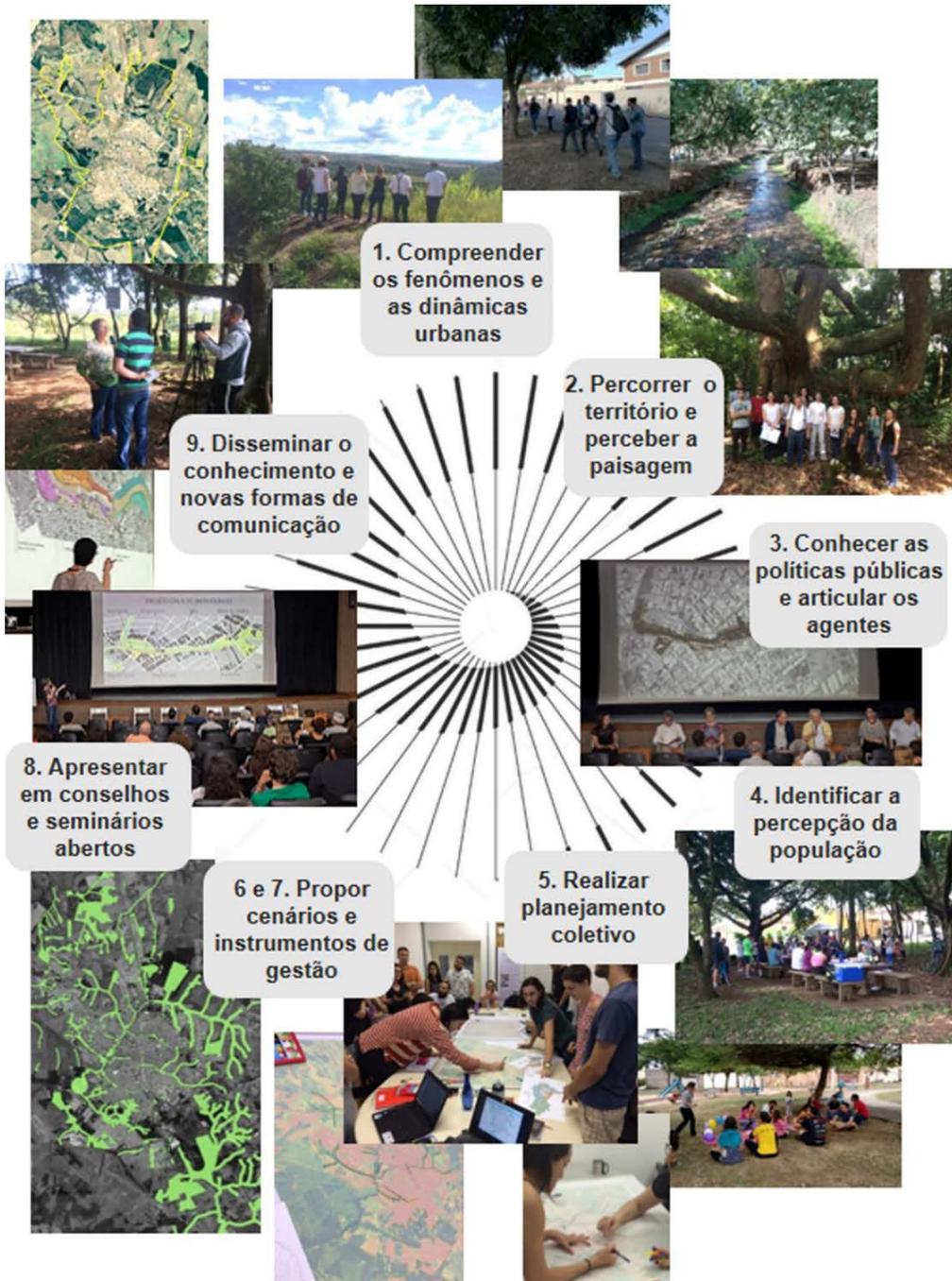
In order to achieve the objectives and theoretical-methodologic approaches, GTPU implements their actions involving periodic formation, planning and practical meetings, considering the development of the following related stages (represented in Figure 3):

1. Understand the phenomena and urban dynamics – deepening the knowledge on the history and occupation process of the territory, identifying biophysical and sociocultural matters.
2. Scan the territory and notice the landscape – performance of urban readings. This stage happens in two movements: while producing cartographies of representation of the landscape, and visiting and registering the places, seeking to make it visible the hidden landscapes and potential spaces for the project.

3. Get to know the public policies and articulate the agents – promotion of encounters with the management and other agents, identifying institutional aspects involved.
4. Identification and perception by the population – raise the demands and relevant uses that are known and reported by residents of the region, and visitors of the open spaces.
5. Development of workshops of collective planning – engagement of the participants of GTPU with educational, research, and extension activities.
6. Propose mitigation and construct scenarios of SEL – definition of categories, functions, and use of the Open Spaces System, in synchrony with the cultural contexts and other urban systems.
7. Incorporate the proposal from SEL with planning and management instruments – proposal of regulation norms that legitimate the creation of open spaces for climate mitigation.
8. Perform public presentations – promotion of debates in seminars and municipal councils for engagement and incorporation of advices.
9. Share the knowledge and new communication means – systematization of information about the city and adaptation to accessible language of new materials produced.

International institutions that produce guides and tools for the adaptation to climate changes to local governments and guide the process of planning must be constituted by phases of preparation, design, and implementation, involving the body of a Work group that promotes the involvement of subjects, performs diagnoses, set objectives, priority actions, and action plans (CONDON et al., 2009; DEFRA, 2010; TCPA, 2018; ETC/CCA, 2019).

Figure 3 – Approach of Landscape Planning and Open Spaces System, and the methodological phases performed by GTPU



Source: GTPU, 2020.

Durban is a coastal city with an estimated population of 3 million inhabitants in South Africa which has its Climate Changes Planning (EPCPD, 2014) proposing an identification of the role of open spaces and natural areas while providing services of protection against floods and storms.

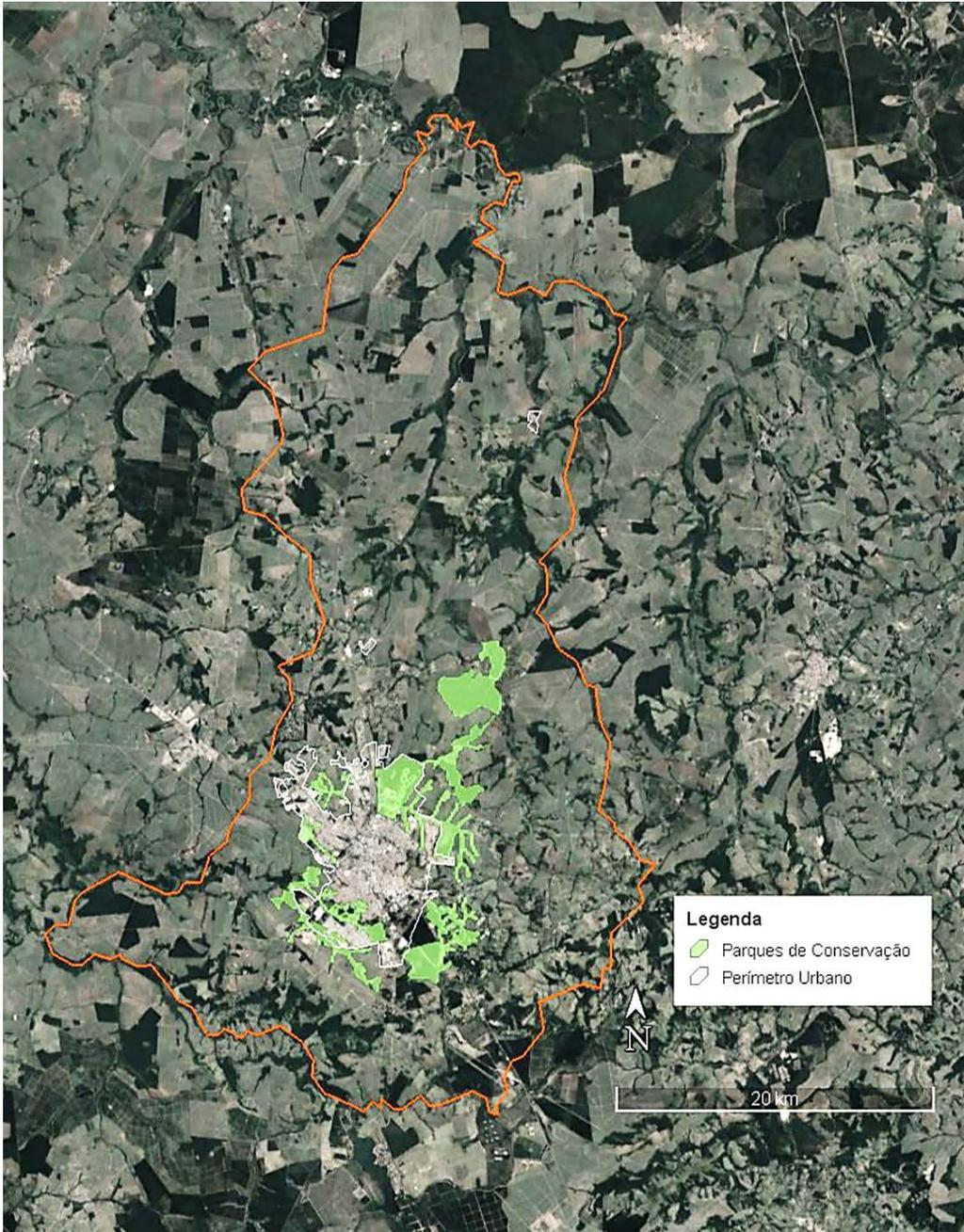
Monteria is a city with a population of 400 thousand inhabitants in Colombia which has its Master Plan on Climate Changes proposing the creation of an Urban Parks System, aiming to promote spaces destined to leisure and sports activities, and also to awaken the feeling of belonging in people in the city (ALCALDÍA DE MONTERÍA, 2011).

With the development and the realization of the stages and actions, the main results reached by GTPU, under the perspective of approach between planning and climate changes, three main axes are presented:

Axis 1. Planning and design of the territory for mitigation

GPTU has elaborated a proposal of Parks and Open Spaces System of São Carlos, considering the elaboration of a green spaces network divided in three categories: Conservation Parks, Linear and Urban Parks, associated to other urban systems (Figures 4 and 5).

Figure 4 – Proposal of the Open Spaces System as a contribution to the planning for climate mitigation: highlights to the Conservation Parks at municipal scale



Source: GTPU, 2020.

Figure 5 – Proposal of the Open Spaces System as a contribution to the planning for climate mitigation: highlights to the Linear and Urban Parks at an urban scale



Source: GTPU, 2020.

The New Urban Agenda, a document resultant from the Habitat III Conference (ONU, 2019) recognizes the central role of cities in efforts for mitigation and adaptation to climate changes, and it recommends the promotion of well-connected and well-distributed networks of open green public spaces, multifunctional, safe, inclusive, accessible, and qualified.

Brown et al. (2015) suggest the development of projects based on “evidences on responses to the climate”, mainly open spaces. According to the authors, urban parks and green spaces have the potential to provide thermally comfortable environments and to help reducing the vulnerability to the thermal stress and threats of heat waves.

The projects of parks developed for the Open Spaces System in São Carlos have promoted knowledge on the real situation of each of these spaces in the city, in which the treatment and qualification can increase the potential for preventing with effective gains while confronting climate changes.

Park Collserola, in Barcelona, has 8.400 hectares, being 2.000 of them located at

the border with the city. This Park is defined as an open space that provides activities that result in benefits such as: accessibility, recreational, agricultural, and ecological connectivity activities (NATURVATION, 2020).

The Master Plan of Climate Changes of Monteria proposed the revitalization of 96 municipal parks (ALCALDÍA DE MONTERIA, 2011).

Yu et al. (2017) have analyzed how the urban green spaces can be planned for the climate changes in cities in China. The results indicate that greater green spaces produce a higher cooling effect, and those green spaces connected to water masses enhance the cooling effects.

Hydrologic studies performed by Oyama (2019) in the river basin of stream Santa Maria do Leme in São Carlos analyzed that, for a period of 100 years, a highly impermeabilized urbanization scenario can reach a peak flow of 134 m³/s, while another considering the implantation of parks and green infrastructures result in a peak flow of 71,3m³/s.

Axis 2. Formulation of planning instruments for public policies at a municipal level

During the revision process of the Master Plan of the Municipality of São Carlos (2016), members of GTPU have proposed the elaboration of two planning instruments that could contribute to the climate mitigations.

The first one is related to the Areas of Environmental Interest (AIA), which define portions of the territory destined to promote the appropriate use of Permanent Preservation Areas (APP), squares, parks, slopes, and valleys.

The second instrument is related to the Complementary Green Tracks (FVC), which are adjacent areas to the APPs, planned for new divisions of the soil with dimensions ranging between 10, 30, and 50 meters. They aim to amplify the protection track of water masses, improve the permeability of the soil, provide support to the implantation of linear parks and green infrastructures, and sustainable drainage systems.

The Department for Environment, Food & Rural Affairs of the United Kingdom (DEFRA, 2010) recommends the elaboration of statutes that create instruments for new parks and open spaces, and it encourages the implantation of Sustainable Drainage Systems (SuDS).

Another local normative advance was the promulgation of the Law 19.260/2019, which created the “Week of Conscientization about Climate Changes”, whose objective is to promote discussions and actions about the topic in the city.

Axis 3. Integration between Science and practice of Planning

GTPU works have boosted the accomplishment of several educational, research, and extension activities in a multidisciplinary and applied way.

Practical tasks in undergraduate and post-graduate disciplines, master’s degree’s

and doctorate's researches, internships in the municipality's departments and extension projects were developed.

This set of scientific and academic activities contribute to the formation of students and researches so they have developed competences and skills needed to think and give support while facing regional and city issues. It has also contributed to enlarge the production of knowledge over climate mitigation, extending the knowledge generated to the community in pedagogical and research practices.

As it is a multidisciplinary field, Taylor e Hochuli (2017) and Iwaama et al. (2016), indicated that researches on planning and climate mitigation will only progress if they consider the results of multiple disciplinary fields, and above all in the cities.

Conclusions

The development of actions and instruments for municipal planning that respond to the problems caused by climate alterations is one of the great challenges of local management in Brazil today. The cities represent a central scale of action for climate changes and the medium-sized cities can construct examples of reference.

The disease disseminated by the virus SARS-CoV-2 (Coronavirus) has shaken the world in 2020, raising questions of principles and urban models, and the most diverse ways of collective living (PERES, 2020). More spaces for pedestrians, bicycle lanes, increase of ventilation and natural illumination, more life in neighborhoods and maximum profit of green and public spaces are being proposed and implemented as "keys" for a new post-pandemic urban design (SHENKER, 2020).

The integrated planning will be the basis for decision making when there is a joint effort between approximation of distinct areas with the scientific knowledge even more applied and closer to the public management.

In the context of São Carlos, the Work Group of Planning of Urban Parks (GTPU) has been advancing in this matter, understanding that the implementation of an Open Spaces System with projects and innovative urbanistic instruments can promote the reduction of floods and landslides, as well as reducing the risks of external factors identified as strong threats in this city typology.

Still under this perspective of enlarging the systemic planning for climate mitigation, sustainable mobility measures, energetic efficiency, food security, circular economy, urban rural articulation among others are also being developed.

There are still some challenges to be overcome. One of them is related to the real institutional capacity of these municipalities and their availability to break market logics, and become a matter of strategic climate changes to the planning. Another challenge consists of promoting the legitimate participation of different social agent while implementing policies and actions for adaptation. It is also fundamental an articulation with other levels of governance and territorial scales.

All these aspects must be part of a new planning culture, in articulation with the

climatic matter involving a set of agents that act and interfere in the production of the city, assuming the facing of conflicts and complexities.

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Landscape planning and climate change: a multidisciplinary approach in São Carlos (SP)

Renata Bovo Peres
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São Paulo. Vol. 24, 2021

Artigo Original

Resumo: The articulations needed for an adaptation regarding climate changes are also important in medium and small size cities, which reproduce logics similar to those of metropolises. The aim here is to discuss and share the experience of the Work group of the Urban Parks in the medium-sized city of São Carlos, in the state of São Paulo, as an example of the interaction between science and planning practice. The theoretical-methodological approach has a convergence point at landscaping and the system of open spaces. The landscape planning and complex cartography structure the method composed by: urban interpretations; articulation with public policies; local perceptions; collective planning; presentation and sharing of results. It is possible to conclude that the construction of adaptative measures depend on the comprehension of vulnerabilities in each context, the appreciation of public dimension, the scientific and political integration, the inclusion of agents, the articulation with other levels of governance and territory scales.

Palavras-chave: Urbanization; medium size cities; environment; free-space system.

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Planificación del paisaje y cambio climático: un enfoque multidisciplinar en São Carlos (SP)

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Artículo original

Resumen: Las articulaciones necesarias para la adaptación al cambio climático, son también importantes en ciudades medianas, ya que responden a lógicas semejantes a las metrópolis. El objetivo es discutir un ejemplo de interacción entre ciencia y planeamiento en una ciudad mediana, realizado por el grupo de trabajo de los Parques Urbanos en São Carlos, São Paulo. La perspectiva teórico metodológica posee un punto de convergencia entre el paisaje y los espacios libres, de esta forma el planeamiento del paisaje y la cartografía compleja estructuran el método, el cual está compuesto por: lecturas urbanas, articulación de políticas públicas, perspectivas locales, planeamiento colectivo, escenarios, instrumentos de planeamiento y divulgación de los resultados. La construcción de medidas de adaptación al cambio climático depende de la comprensión de las vulnerabilidades, de la integración científica y política, de la inclusión de agentes y de la articulación con otros niveles de gobernanza y escalas territoriales.

Palabras-clave: Urbanización, ciudades medianas, ambiente, sistema de espacios libres.

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