INTERACT-Bio
Integrated action on biodiversity

ICLEI Local Governments for Sustainability | CBC Cities Biodiversity Center

MAPPING THE CAMPINAS CONNECTIVITY AREA

A CASE OF POLICY AND PLANNING INTEGRATION FOR BIODIVERSITY CONSERVATION IN BRAZIL

The Metropolitan Region of Campinas (MRC) is a center of growth and innovation in the State of São Paulo in Brazil. Home to the State University of Campinas, one of the most important research centers in the country, the region has been investing in biodiversity conservation. Through integrated initiatives, the MRC has engaged with decentralized management and developed policies and actions as a part of the proposal for the Connectivity Area, a buffer zone that prioritizes ecological corridors that bridge environmentally relevant areas throughout the region. MRC also conducted an ecosystem mapping exercise that identified the pressures being but on critical ecosystem services. This process, supported and facilitated by ICLEI South America through the INTERACT-Bio project, resulted in coordinated decision-making and capacity building processes. To reinforce this initiative, a Local Biodiversity Strategy and Action Plan LBSAP is under development and will further identify roles and responsibilities. This case study aims to showcase the development of the Connectivity Area and how integrating ecosystem services into regional planning enabled cooperation mechanisms.

The need for regional biodiversity action in Brazil

Degradation and loss of natural resources are nationwide subjects of attention in Brazil, especially due to its position as the most biodiverse country in the world and second most diverse in terms of species endemism [4]. The resources and services provided by biodiversity in Brazil fundamentally support the country's cultural, social and economic development - livelihoods of traditional communities, agriculture and tourism [5] - and therefore call for priority action. This call for action is expressed through scientific research, national commitments [6[1], 6[2]] and by the international community through the Aichi Targets. For example, the Brazilian Assessment on Biodiversity and Ecosystem Services states the following:

"Land use changes and climate changes have been - and will continue to be throughout this century - the main drivers that result in the loss of biodiversity and ecosystem services in the country" [5].

This is a clear call for regional land use planning. The Metropolitan Region of Campinas (MRC) was identified as a priority area for conservation as it houses remnants of the Atlantic Forest and Cerrado biomes in the region of São Paulo [7], two of the most diverse biomes in Brazil. Due to urban and industrial growth, the region has been experiencing increased environmental challenges and green areas are becoming increasingly vulnerable, negatively impacting the provision of ecosystem services (ES). Increased greenhouse gas (GHG) emissions, vegetation suppression, water shortages as well as soil and air contamination are issues with increased importance and relevance for MRC [8]. These are issues that cross state lines and urgently demand a regional action

plan to protect and conserve vulnerable areas and establish adequate land use policy.

Mainstreaming ecosystem services and Nature Based Solutions (NBS) as frameworks is key to analyze these regional challenges and map alternative solutions with local authorities. Establishing a collaborative environment and reinforcing municipal and regional compromise are also critical to collectively integrate nature into regional planning. Capacity building conducted through INTERACT-Bio with support from the Helmholtz Centre for Environmental Research – (UFZ) on these themes enabled decision makers to comprehend the innumerous co-benefits of implementing green infrastructure and having ecosystem services as the foundation for development.

Nature-based solutions harness the power and sophistication of nature to turn environmental, social and economic challenges into innovation opportunities. They can address a variety of societal challenges in sustainable ways, with the potential to contribute to green growth, 'future-proofing' society, fostering citizen well-being, providing business opportunities and positioning Europe as a leader in world markets" [10]

Figure 1: Mata de Santa Genebra, the largest remnant fragment of Atlantic Forest in Campinas, is a 241 hectares Federal Conservation Unit that houses immense biodiversity and that is open to the public via guided trails and other interactive activities in the area [9].

THE METROPOLITAN REGION OF CAMPINAS IN CONTEXT

The Metropolitan Region of Campinas (MRC) is composed of twenty municipalities located on the southeast portion of Brazil, in the State of São Paulo. The region is the second most populous area in the State, with 3.2 million inhabitants, and in 2016, MRC was responsible for almost nine percent of the State of São Paulo's Gross Domestic Product (GDP) [1]. Due to its geographical continuity with the Metropolitan Region of São Paulo, the MRC became a productive industrial center and the main gate for imported goods through the Viracopos airport, distributing services to the State and the country.

The industrial, economic and population growth in the region has put increased pressure on the systems that provide essential goods and services such as water, food and energy. Many of these systems operate at a regional scale and are already saturated by the demands of the Metropolitan Region of São Paulo [9]. This requires adequate planning and action at a regional scale in order to properly manage and distribute resources in a fair and sustainable way.

Another fundamental regional matter is green area connectivity and conservation. Numerous studies [12 and 13] site the importance of biodiversity conservation and the need to prioritize conservation in

Facts and figures

Local government name

Metropolitan Region of Campinas

Country and province

Brazil, São Paulo

Population (2018)

3.2 billion, annual growth - 1.74 % [1]

Total area

3.791,79 km^2 [1]

Municipal Budget

178.316.589 million (2016) [1]

GHG inventory available since:

2018 [2]

GHG emissions indicator:

3,59 tCO_2e/hab [3]

Figure 2: Map of São Paulo and of the Metropolitan Region of Campinas

local policies [14]. The MRC was classified predominantly as a "very high" priority region for restoration of the native vegetation in the State of São Paulo according to the Forest Inventory of Native Vegetation of the State of São Paulo [15], reinforcing the call for regional action and integration of strategy and planning.

The MRC was officially recognized as an administrative region in 2000 in an effort to develop regional integration and planning. The support of the São Paulo State Urban Planning Company[1] (*Empresa Paulista de Planejamento Urbano* - EMPLASA) and the Metropolitan Agency of Campinas[2] (*Agência Metropolitana de Campinas* - AGEMCAMP) have been essential for developing plans and policies for the region, such as the Integrated Urban Development Plan[3] (*Plano de Desenvolvimento Urbano Integrado* - PDUI). In December 2017, the twenty municipalities from the MRC signed a cooperation agreement with RECONECTA RMC and INTERACT-Bio, promising their cooperation in the development of the Connectivity Area and committing to participate in the political alliance that enabled this initiative to take place.

Overview of Enabling Initiatives

The RECONECTA RMC program was presented to the MRC's Development Council (composed by the mayors of the 20 cities of the region) in 2017 and developed by the SVDS. The program aims at integrate, identify and discuss relevant actions to support regional preservation of fauna and flora.

INTERACT-Bio, a four-year global project, aims to mainstream biodiversity and Nature Based Solutions at the regional scale, integrating these into planning policies and improving the management of natural resources in the urban context. Implemented in Brazil by ICLEI South America, the project supports three Brazilian metropolitan regions – Campinas, São Paulo; Londrina, Paraná and Belo Horizonte, Minas Gerais - to build capacity, articulate stakeholders and facilitate cooperation towards greener, more resilient regions.

Figure 3: Signature of the Technical Cooperation Term between the 20 municipalities of the MRC at Campinas, December 2017, establishing a long-term pact, supporting concrete involvement of the participants and longevity to the compromise with the goals and objectives of the initiative.

1 EMPLASA was a public institution created in 1974 and linked to the State Government Secretariat, responsible for the regional and metropolitan planning of the State of São Paulo. It provided technical support, elaborated and subsidized the Government of the State of São Paulo in the implementation of public policies and integrated regional development projects. It also conducted various studies and produced cartographic products, geospatial information systems and technical knowledge about metropolitan planning to be made available to public and private managers and citizens.

2 AGEMCAMP, a state agency linked to the Regional Development Secretariat, aims to integrate the planning and execution of public functions of common interest in the Metropolitan Region of Campinas, inspecting the execution of metropolitan laws, establishing goals, plans, programs and projects of common interest and prioritizing decentralized execution of works and services.

3 PDUI was a regional effort that aimed to advance the development of the metropolis, in an inter-federative dialogue to assess, harmonize and reflect on metropolitan guidelines and plans, endorsing projects and actions organized with an integrated view, unifying the interests and policies of the cities on the region.

CREATING THE CONNECTIVITY AREA

The specific goal of mapping the Connectivity Area was to identify a priority buffer zone to connect fragmented natural areas throughout the MRC (Figure 4). Through this assessment, MRC aimed to improve management of natural resources, as well as the incorporation of nature and ecosystem services into urban planning. The assessment also aimed to raise awareness about the provision of ecosystem services across the mapped priority areas (Figure 5), promote technical capacity building, develop a strategy and action plan, and anchor these efforts through regional planning policies.

The initiative was conducted in three main phases: stakeholder mobilization, a two-part technical analysis, and an effort to drive uptake in regional policy and planning.

Stakeholder mobilization

Identifying and mobilizing stakeholders was the first course of action - collaboration and partnerships were at the core of the initiative. Through the INTERACT-Bio project, ICLEI South America facilitated and mediated the contact between the municipalities in the MRC, offered visibility and multi-level integration opportunities at the national and international levels, aligned the work of the MRC with global agendas, and brought technical capacity-building opportunities to the participants on the subject of ecosystem services through the Helmholtz Centre for Environmental Research (UFZ).

The support from the Ministry of the Environment and of the Ministry of Science, Technology, Innovation and Communications from the Brazilian Federal Government was also critical to the success of the assessment. The presence of and support of these actors throughout the project promoted the multilevel integration of the initiative, enhancing the possibilities for the goals to be reached.

Clarity regarding the call for integrated management of resources was a central pillar of the initiative. Understanding integration between levels of government and policies was a gap that inhibited adequate action. Identifying the connections between levels instead of particularities within municipal, regional and national spheres was a new approach to the matter and facilitated accomplishing more practical policies and cooperation mechanisms.

Representatives from the 20 cooperating municipalities throughout the region also established a series of multi-disciplinary and multi-sectoral forums with working groups to thoroughly discuss the six pillars that sustain the implementation of the connectivity area. These forumsfocused on the themes of urban trees, ecological corridors, regional wild fauna, linear parks, inspection, compensation and regulation, and communication and articulation. The technical guidelines that came out of these working groups define the specific processes required for the implementation of each theme. Currently, the results from these efforts and additional inputs are being compiled and will feed into the development of the LBSAP for the MRC.

Technical analysis

The methodology for mapping the Connectivity Area proposal can be described in two main categories:

1. Geo-processing and drafting of the Connectivity Area

The draft was elaborated by the SVDS of Campinas utilizing the Quantum GIS software (version 2.14.16) and data compiled from satellite images from Google Earth, Hidrography, Conservation Units, Roadway and Water Basin maps, as well as areas of environmental interest defined by the technical team. This information was provided by regional and municipal institutional partners such as *Fundação Florestal* and the *Comitê das Bacias do PCJ*.

The draft for the Connectivity Area was proposed based on an analysis of land use that considered priority areas for conservation and reforestation, water provision, and the connection of forest fragments. Roads, urban sprawl and agricultural land were taken into account in the drawing of the proposed area.

International Agenda and National Guidelines

Brazil has been a signatory to the Aichi Targets since 2010 when these were proposed at CBD COP-10 in Japan. This political committment led to the development of the National Biodiversity Strategy and Action Plan (NBSAP) in 2017, establishing goals and strategic pathways to be followed until 2020. The New Urban Agenda, adopted at Habitat-III in 2016 was also central for national strategies towards biodiversity conservation was. These national committments are fundamental to promoting the biodiversity conservation agenda in Brazilian municipalities, encouraging new policies, and endorsing previously established initiatives.

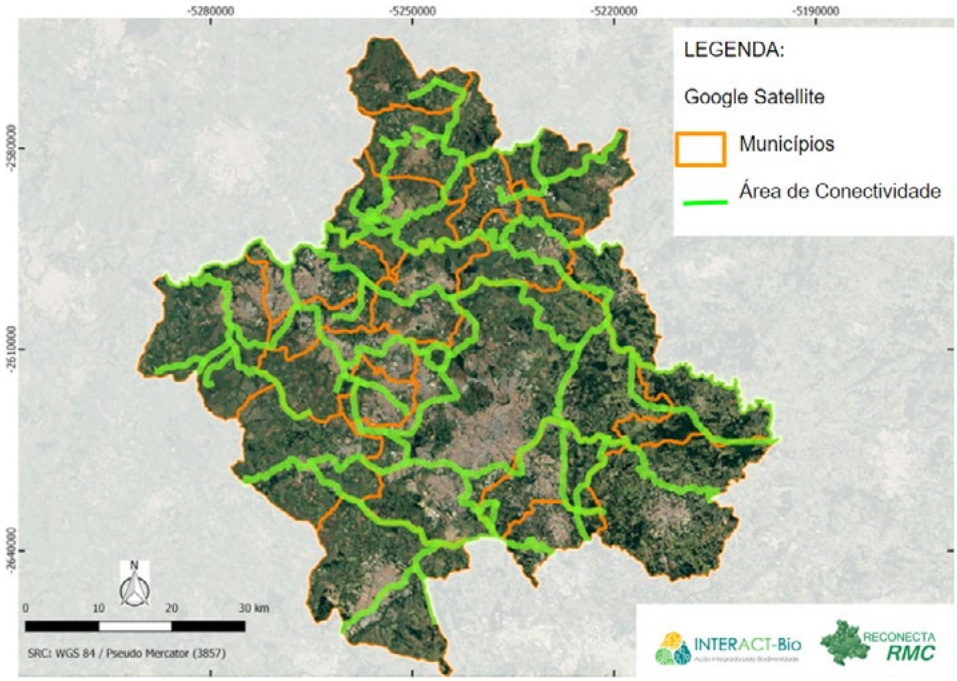


Figure 4: Proposal of the Connectivity Area, in green, resulting from the Geo-processing of data. The tracing of this buffer zone allows for municipalities to have a buffer zone that can be further detailed and refined at the local level.

The accessibility of various data and mapping tools varied across the municipalities of the MRC, presenting a technical challenge to the consistency of the analysis. In order to address this issue, physical maps were printed and taken to every municipality of the region and relevant data and inputs regarding ecosystem services were collected directly from city staff and technical experts. This shift in methodology enabled greater participation and more information to be transferred to virtual platforms and translated into an illustrated map (Figure 6).

The draft of the Connectivity Area was also influenced by existing national conservation policies, such as the guidelines for ecological corridors from the National System for Conservation Units (Sistema Nacional de Unidades de Conservação - SNUC), the National program for Landscape Connectivity (Programa Nacional de Conectividade de Paisagens - Conecta) and the National Plan for the Recovery of Native Vegetation (Plano Nacional de Recuperação da Vegetação Nativa - Planaveg), along with other state and municipal guidelines.

2. Mapping of Ecosystem Services Provision

Once the draft of the Connectivity Area was in place, the second stage mapped the provision of ecosystem services across the region. This second stage was important for better deliniation of the buffer zone. Technical experts then had the opportunity to closely evaluate the map and identify any areas with conflicting priorities. The methodology used for mapping the ecosystem services was based on the proposal of Burkhard et al. (2012) and by the Economical & Ecological Zoning (Zoneamento Ecológico-Econômico) supported by the Fundação Florestal. This methodology consists of the analysis of land use categories and attribution of value corresponding to the services provided. The main goal was to assess the current capacity of ecosystem service provision per land use category. The results of this analysis can be seen on the next page.

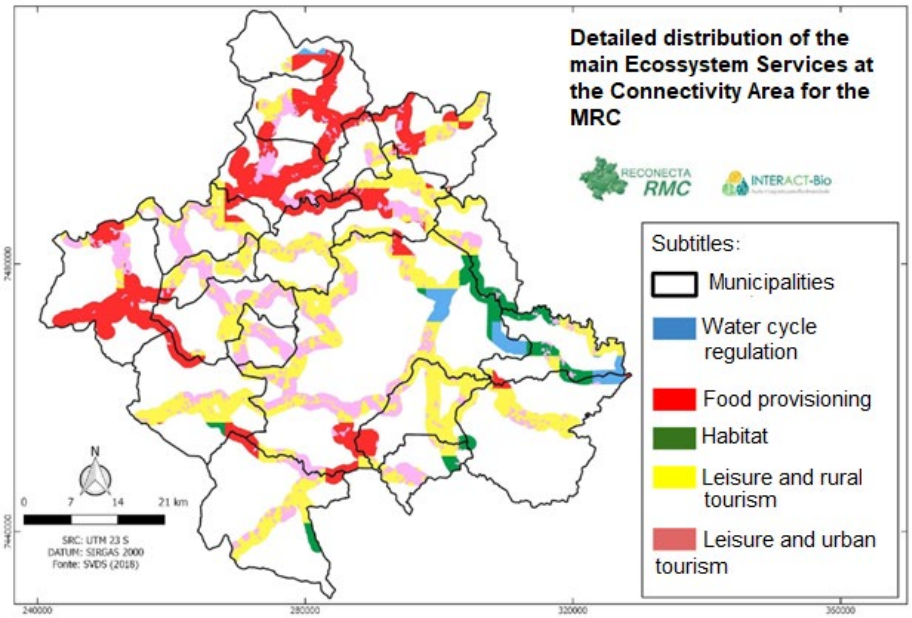


Figure 5: Over the tracing of the Connectivity Area, the mapping of the five categories of ES was made. In blue, regulation of the hydrologic cycle; In red, food provision; In green Habitat; In yellow, rural leisure and tourism and in pink, urban leisure and tourism

Ecosystem Service provision per land use category

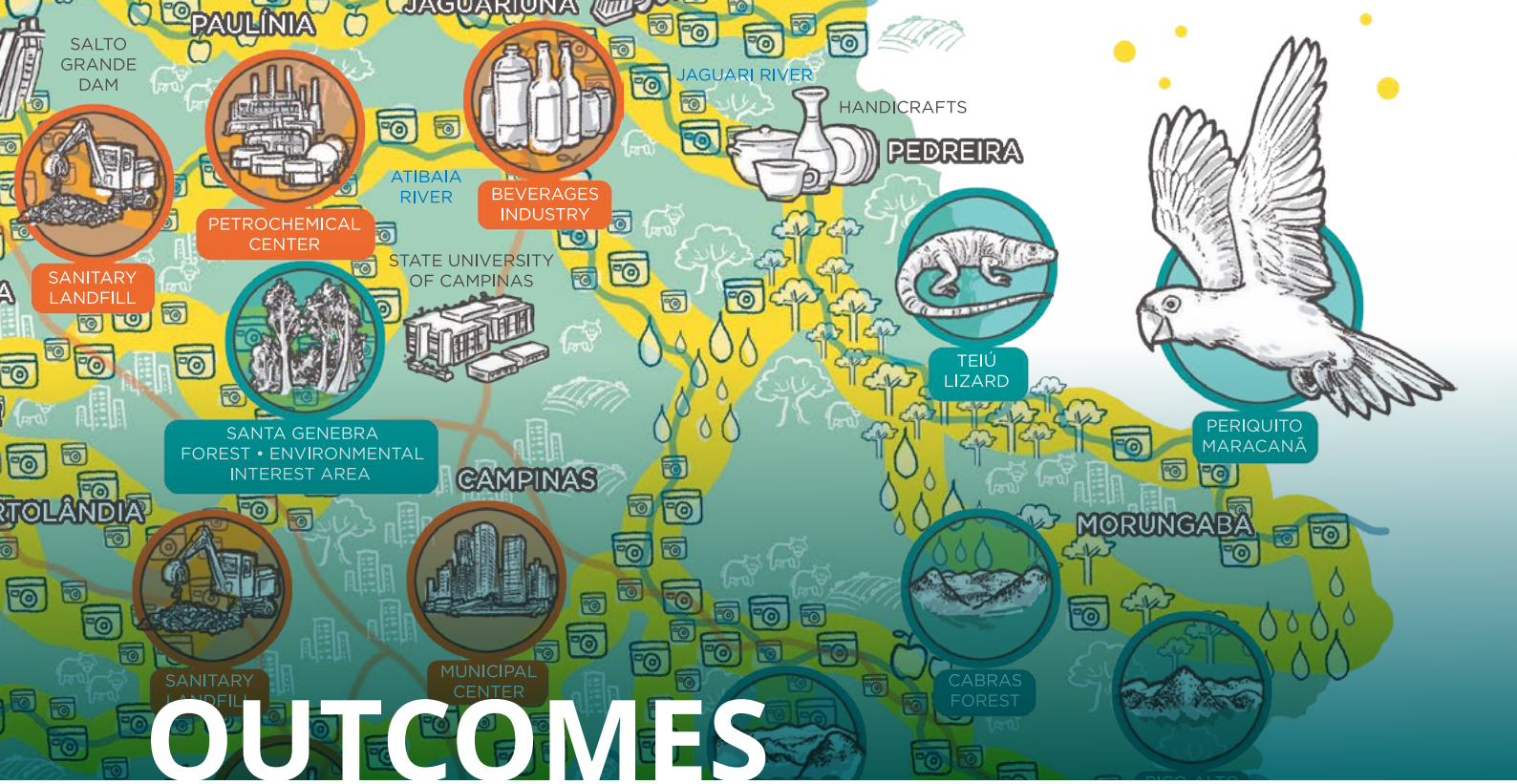
For scoring the capacity of ecosystem services, a scale of 0 to 3 was used, encompassing zero (0), low (1), medium (2) and high (3) capacity. This score generates a data matrix that is later spatialized in maps. For the exercise, the following ecosystem services were considered: natural habitat support; regulation of the local climate; pollination regulation; hydrogeological process regulation; potential carbon stock; food provision; regulation of the water cycle; provision of timber products; culture leisure and tourism. The land use map was provided by the PCJ Basin Committee (Aerial Image2010) as the basis for the classes of land use adopted in the methodology.

Driving uptake in regional policy and action

With the mapping of the Connectivity Area completed, the initiative faced the challenge of effectively embedding the proposal of the Connectivity Area into regional policy planning.

The "Strategic Areas for Metropolitan Action (AEAM)" proposal developed as a part of the initiative was also approved at the PDUI's Technical Chambers (Câmaras Técnicas), composed by technical representatives from the twenty municipalities and from the state of São Paulo.

AGEMCAP – the agency which replaced EMPLASA - was entrusted with the responsibilities for regional planning and the Technical Chambers within the organization are continuing to work towards implementation of the Connectivity Area. Additionally, UNICAMP, the State University of Campinas and other research centers have been called into action to support in the development of regional plans.



OUTCOMES

Assessment of the potential and the pressures operating on ecosystem services within the territory of the MRC was an important result of the project. Collaboration between the municipalities enabled specific and reliable information on the priority areas where conservation and restoration efforts should be made. By identifying the main pressures operating on these services, the assessment paves the way for clearer and more adequate policy to be elaborated in order to mitigate the impacts of such activities. The valuable content has been edited and made available through the Ecosystem Services Map, an accessible tool that visualizes these results.

The Connectivity Area proposal drafted by ICLEI South America and the RECONECTA-RMC program , was incorporated into the "Strategic Areas for Metropolitan Action (AEAM)" section of the Document of Preliminary Proposals for the PDUI. The prioritized corridors identified through this proposal cross municipal lines and geo-political limits and offer a consolidated strategy for enhancing more efficient and integrated conservation efforts in the region. It offers possibilities for inter-federative initiatives, such as environmental compensation and water basin management.

"Considering the case at the MRC, the path we took included a political and legal commitment through a Cooperation Agreement, bilateral meetings with thematic teams, meetings with actors from all cities, dissemination and engagement of different levels of management (state, federal, etc) and partnerships with institutions like ICLEI and the result was the design of a Connectivity Area integrating the environmentally important and relevant areas for each city, consolidated in a metropolitan political plan."

Dr. Ângela Cruz Guirao Director at the Secretariat of Green, Environment and Sustainable Development of Campinas (SVDS)

Local authorities were enabled to increase their understanding of the territory and policies that regulate nature in their cities. Representatives from the region presented the results and highlights of the mapping and assessment process at international conferences such as the 14th Convention on Biological Diversity Conference of the Parties in 2018, the event "Unlocking the power of metropolises to mainstream biodiversity and ecosystem services for nature and people" at Medellín in 2019, and at the "BIO2020:

Brazilian Perspectives on the post-2020 Biodiversity Framework" in 2020 (São Paulo, Brazil). These opportunities, facilitated by ICLEI South America and partners, offer valuable visibility for local initiatives and feature the important results achieved through the initiative. The presentation of results on the international stage also increased the potential for peer learning and replication of this process within other local and regional governments.

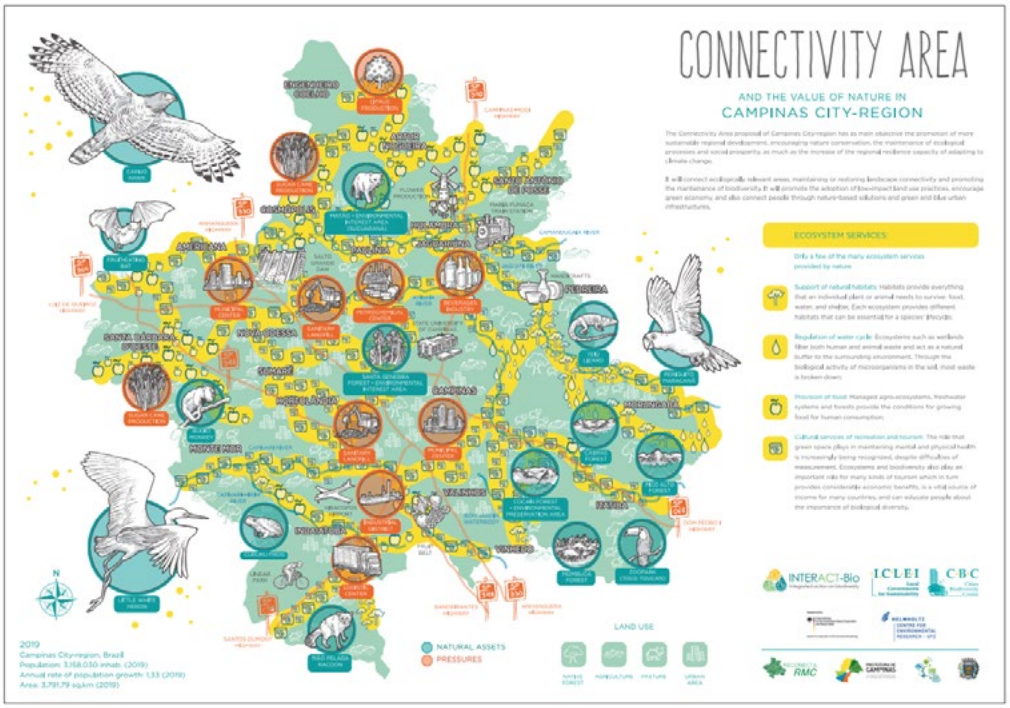


Figure 6: Illustrated Map of the Connectivity Area in Campinas and the mapped Ecosystem Services provision areas in the metropolitan region of Campinas.

Lessons Learned

- **An accurate ecosystem services evaluation methodology is critical.** The methodology used for this initiative - based on the set of activities proposed by Burkhard et.al. (2012) and by the Economical & Ecological Zoning (Zoneamento Ecológico-Econômico) supported by the Fundação Florestal - allowed greater specificity in detailing of the Connectivity Area and the different typologies of land use in the region. This methodology clearly demonstrates the benefits that people obtain from nature and also supported the metropolitan agenda, as it reinforced that connectivity is a key strategy for managing inter-federative resources.

- **Multi-actor engagement is key.** During the process of establishing the connectivity area, multi-actor engagement helped ensure the long-term success of this effort. By involving regional agencies and state institutions, such as the Comitê de Bacias do PCJ, Fundação Florestal (and the São Paulo State Secretariat for Infrastructure and Environment), the Public Ministry's Special Action Group for the Defense of the Environment (Grupo de Atuação Especial de Defesa do Meio Ambiente - GAEMA) and others in the planning process, the resulting Connectivity Area already had the support of these actors which subsequently facilitated the implementation of the initiative.

- **Collaboration between existing projects was fundamental for the success of this initiative.** INTERACT-Bio and RECONECTA RMC had aligned goals and visions and were able to complement efforts, bringing the required technical expertise, financial support, actors and workforce to make the initiative a success. Understanding the agency of each partner organization and setting clear collaboration mechanisms, as well as operational roles and demands was fundamental to the efficient and effective development of the proposal.

- **Communicating information through accessible materials, such as the illustrated maps, can help raise awareness for many stakeholders.** Propagating user-friendly materials is important for increased support and better understanding of the importance of ecosystem services,. Moreover, the process of communicating the results of the project is also empowering for the actors involved, allowing them the opportunity to know other initiatives with similar goals, to share lessons learned and to give their efforts more visibility. Therefore, investing in communication material and participation in events was beneficial for internal and external actors.

- **Integrating the biodiversity and climate agendas reinforces the strength of initiatives.** Integrating ecosystem services and nature-based solutions not only as strategies for protecting biodiversity but also as important mitigation and adaptation efforts increases the benefits of these actions. This initiative contributes to a greater path towards a more resilient region, as the MRC already developed its GHG inventory in 2018. Acknowledging and investigating how this takes place in the region will allow better integration of these agendas and, as a consequence, more impactful initiatives.

- **Institutionalization is important to ensure long-term success.** This is important for ensuring the implementation of the long-term goals despite political scenario changes (such as municipal elections). In this initiative, it was necessary to engage stakeholders, increase awareness of the importance of these goals, establish long-term cooperation agreements and anchor the initiative within regional policies, while also engaging state authorities and encouraging multilevel cooperation

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Appendix

Related actions and initiatives

Type of action	Description
Policies / Strategies / Plans	**Local Biodiversity Strategy and Action Plan |** The engagement with metropolitan articulation at the MRC has unfolded on the call for establishing integrated Strategies and Action Plans to set clear goals and paths of action, as well as identifying actors and agreeing on responsibilities. Through technical support provided by ICLEI South America, the LBSAP is now under development for the region. **Investment Case |** In order to further understand and specify the benefits provided when investing on Natural Infrastructure, especially regarding the water cycle in the Region, an investment case will be developed on the region, identifying and articulating actors as well as empirically demonstrating the benefits of such initiatives.
Regulation	**Interfederative Environmental Compensation Mechanisms |** ICLEI South America hired two consultancies in order to further comprehend and propose mechanisms for implementing interfederative environmental compensation. This effort was made both on a national and regional scale, clarifying the possibilities described on Brazilian law to establish inter-city cooperation and shared Environmental Compensation efforts. Locally, the consultancy further researched how each metropolitan region could establish these arrangements and proposed specific guidelines to do so.
Governance / Organizational	**Vertical integration |** Guidelines for multilevel integration were produced by ICLEI Cities Biodiversity Cities compiling experiences from the three regions of the project INTERACT-Bio. Campinas' experiences were described as a case study especially focused on regional, intercity integration. endorsing this process, two consultancies have been hired, exploring aspects of Intercity Environmental Compensation.
Capacity building	**Workshops |** Were made possible by the Helmholtz Centre for Environmental Research (UFZ) specialists that developed activities to develop the understanding of local thechnition of the Metropolitan Region regarding ecosystem services and practically demonstrating through activities how to map and identify the provision of ecosystem services and how to develop adequate indicators in order to monitor and evaluate services provided in the territory.

Type of action	Description
Stakeholder engagement	**Cities With Nature |** Campinas, one of the pioneers and references for Brazilian cities, became a signatory to CitiesWithNature, a shared online platform for cities to connect and have access to experiences around the world regarding nature integration to cities.
Technical and technological measures	**Demonstration Projects |** Wildlife Air Passages will be installed on three regions of the city to practically demonstrate the viability of installing and promoting the implementation of urban infrastructure to integrate fauna to the planning of the roads of the city, endorsing the wider goal for connectivity in the region.
Awareness-raising	**Illustrated Maps |** Were produced as an illustrative format for the ecosystem services assessment made on the MRC, describing the different categories services on the region, the main threats to the provision of those services, along with regional wildlife fauna and the proposed buffer zone for the connectivity area. This allowed broad dissemination of the content to different audiences and is available at the online platform of INTERACT-Bio and was also physically distributed at events and meetings. **Events and meetings |** The Connectivity Area proposal for Campinas was presented at international conferences such as the CBD Conference of the Parties, 2018 in Egypt, and the BIO2020: Brazilian Perspectives on the post-2020 Biodiversity Framework, in 2020 at São Paulo, Brazil, fundamental events for inputs and contributions of local governments to international policy planning.

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The SVDS, representing the city of Campinas, and the twenty municipalities that signed the cooperation agreement to implement INTERACT-Bio and RECONECTA RMC is a fundamental actor in the success of this initiative. ICLEI South America also provided technical support and expertise on the integration of sustainability to the urban agenda, promoting and developing the project's activities. To provide legal anchorage and longevity to the project, it was fundamental to have the involvement of regional agencies such as EMPLASA and AGEMCAMP.

National, state and regional institutions were also fundamental for technically and politically supporting the initiative. The Comitê de Bacias do PCJ (committee responsible for managing the Water Basin of the Piracicaba, Capivari and Jundiaí rivers, where the MRC is situated) and the Fundação Florestal (state association that promotes forest conservation) provided data and information for the establishment of the first version of the Connectivity Area such as maps of the hydrography, conservation units and roads on the region.

This project was made possible by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) through the International Climate Initiative (IKI), financier of INTERACT-Bio. Support from the Helmholtz Centre for Environmental Research (UFZ) was also essential, mainly on the technical aspects of the project, such as the development of the workshops and capacity building meetings. Human resources from ICLEI South America and from the twenty the municipalities, as well as mobilization for the meetings (travels and events), were key financial categories in the process. Support was also provided by the German Agency for International Cooperation (GIZ), mainly through the Local Protected Areas project.

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ICLEI – Local Governments for Sustainability is a global network of more than 2500 local and regional governments committed to sustainable urban development. Active in 125+ countries, we influence sustainability policy and drive local action for low emission, nature-based, equitable, resilient and circular development. Our Members and team of experts work together through peer exchange, partnerships and capacity building to create systemic change for urban sustainability.

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