

## A Light in South America: The Impact of the International Research Network on Climate Resilience

Harrysson Luis Silva - *Federal University of Santa Catarina (UFSC), Florianópolis, Santa Catarina, Brazil*  
Gustavo Biasoli Alves, Irene Carniatto - *Western Paraná State University, Cascavel, Paraná, Brazil*  
*gustavo.alves@unioeste.br*

UCCRN Case Study Docking Station (2026)  
DOI: 10.7916/w1gh-0b71

This means that the RIPEDRC Network project intends to organize actions that favor the protagonism of social groups, provide the organization of communities, having as a reference the knowledge that Ecological Epistemology claims transdisciplinary perspectives for this environment, not in the reductionist sense of environment, but environment in its broad sense, integrating the most diverse and different types of environments (Carniatto et al., 2021, p.7).

**Study Area.** The State University of Western Paraná (UNIOESTE), headquarters and coordinator of RIPERC, together with RIPERC partner universities, work with the aim of raising social, economic, and environmental indicators by creating a database of free access to public managers and the scientific community, aiming to contribute to improving the quality of life, education, health, and housing in the territories studied.

Although RIPERC's headquarters is located in one of the Brazilian regions with a high human development index compared to the national average, the territory contains a significant population contingent living in conditions of social and environmental vulnerability (IBGE, 2022). Considering the political, social, geographic, historical, and environmental similarities with adjacent territories in Paraguay and Argentina, studies and interventions carried out in Western Paraná, Brazil, have the potential for dissemination and propagation in the Trinational region (Brazil, Paraguay, and Argentina) (Cidade Brasil, 2022; IBGE, 2022).

**Regional Environmental Challenges.** The research proposed in Foz do Iguaçu and Cascavel, conceived as a pilot project, was designed based on an assessment of key social, economic, and environmental indicators. In Foz do Iguaçu, tourism is the predominant economic activity, while in Cascavel the economy is largely driven by animal protein production—both sectors with significant economic and environmental impacts. Similar dynamics are observed in Ciudad del Este (Paraguay) and Puerto Iguazú (Argentina).

The municipality of Cascavel has an area of 2,091,199 km<sup>2</sup> with an estimated population of 331,200 people (IBGE, 2022). Around 98.01% of the population between 6 and 14 years of age is in school and the HDMI is 0.782 (IBGE, 2010). According to the Climate Action Plan of the Government of the State of Paraná (PARANÁ, 2023), Cascavel is the municipality in Paraná that emitted the most greenhouse gases, in 2019 197 Gg CO<sub>2</sub>eq. In 2017, the State of Paraná was the third largest consumer of pesticides in Brazil. The total volume of pesticides used was 97,714,800 kilos in 2014 and 100,122,700 kilos in 2015 (Paraná, 2018), with the municipality of Cascavel being the largest consumer in the State.

<b>Keywords</b>	international resilience network; climate impacts; trinational region
<b>City Population</b>	Foz do Iguaçu: 259,300 [2025] Cascavel: 331,200 [2025]
<b>City Area</b>	Foz do Iguaçu: 617,700 km <sup>2</sup> Cascavel: 2,091 km <sup>2</sup>
<b>City GDP</b>	Foz do Iguaçu: \$3.5 billion [2023] Cascavel: \$2.09 billion [2022]
<b>Climate Zone</b>	Foz do Iguaçu: Cfa (humid subtropical) Cascavel: Cfa (humid subtropical)

**Introduction.** Born in a university, in the west of Paraná in the south of Brazil, the International Climate Resilience Research Network (RIPERC) agribusiness hub aims to be a paradiplomatic and consultative agent for different target audiences (public sectors, third sector, science, technology and innovation and strategic sectors) (Carniatto et al., 2021).

RIPERC was born in 2019, from the “Brazil-United Kingdom Workshop: Financing climate-resilient urban development” partnership between the State Universities of Western Paraná (Brazil), Leeds, and York (United Kingdom), financed by Fundação Araucária (Brazil) and Fundo Newton (United Kingdom) (Carniatto et al., 2019). From this perspective, RIPERC was structured into thematic nodes with researchers from universities in Latin America, Europe, and the African Continent, seeking rural/urban development in a sustainable way and in line with the UN Sustainable Development Goals (Carniatto et al., 2021).

Through its universities and research centers, the Network is tasked with addressing questions such as the need for data and information that support understanding real-world conditions and informed decision-making. In a study carried out by Carniatto, Sato and Pereira (2021, p.4), the authors provide a profile of this network and a scope of its objectives and proposals:

Thus, it aims at proposing alternatives that facilitate the articulation between Municipal Public Policies that articulate socio-environmental actions, in order to seek alternatives for collective construction that involve actions that ensure the sustainability of ecosystems, improvement of the quality of life, empowerment of actors and social justice.



**Figure 1.** State of Paraná, Brazil and its Watersheds. Highlight for the Iguaçu Basin and Paraná Basin. Source: Sanepar, 2011

One third of the food consumed daily by Brazilians is contaminated by pesticides, according to an analysis of samples collected in all 26 states of Brazil, carried out by ANVISA's Pesticide Residue Analysis Program (Agência Nacional De Vigilância Sanitária, 2020).

Foz do Iguaçu – Paraná – Brazil, is located on the Triple Border (Brazil, Argentina, and Paraguay), has an area of 617,700 km<sup>2</sup>, a population of 259,300 people (IBGE, 2022 Census), 96.4% schooling of children aged 6 to 14 years (IBGE, 2010) and an HDI of 0.751 (2010).

Although the city's main economic activity is tourism, its geographic location exposes it to challenges associated with smuggling, particularly of pesticides and cigarettes. These activities contribute to public health and safety problems affecting municipalities across the region where agriculture is the primary economic activity, as well as the country more broadly. It is important to highlight that Foz do Iguaçu and Cascavel are located in the Paraná III Basin, an essential part of the Paraná River Basin in Brazil and the Rio da Prata Basin on the South American Continent, with a large network of tributaries.

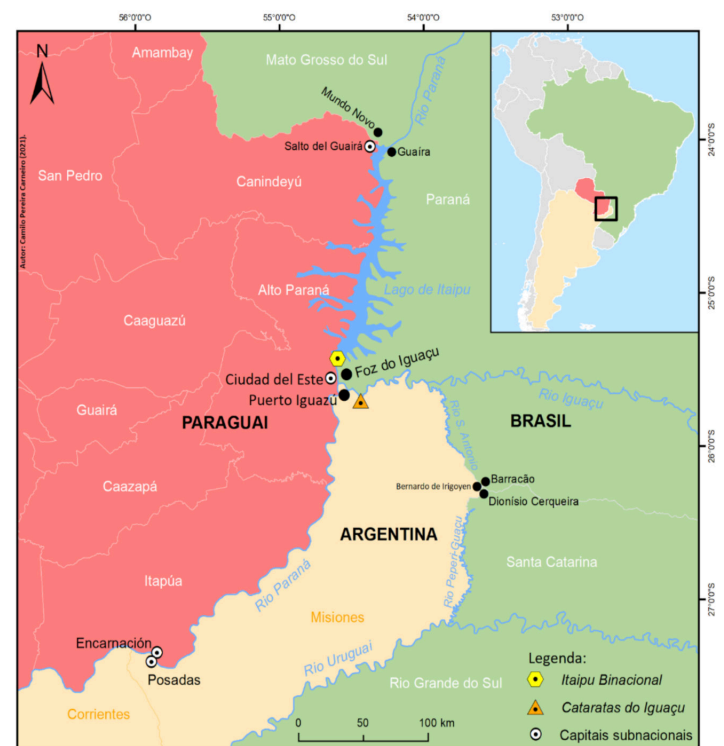
In 2019, the Paraná Institute for Economic and Social Development (IPARDES) published a report presenting Sustainable Development Indicators by river basin in the State of Paraná. The data indicate that the most pressing environmental issue in the surveyed regions is the use of pesticides in agriculture. Supporting this, research by Panis et al. (2022) found high concentrations of these chemicals in water and food, frequently approaching or exceeding the limits established by Brazilian legislation.

It should be noted that in many cases, Brazilian legislation is more lenient than European and North American legislation, and there is inadequate data surrounding exact atmospheric and soil pollution levels.

**RIPERC'S Approach.** As the global climate emergency exacerbates extreme weather events and socio-environmental issues, RIPERC studies gain significance in their potential to fill critical knowledge gaps.

It is essential that governments and civil society develop strategies to maintain the positive aspects of environmental actions that have already been developed (e.g., using renewable matrices to generate electricity), and above all, take a closer look at indicators that go against the Sustainable Development Goals. Given the shared nature of water, soil and air across Brazil, Argentina, and Paraguay, a trans-national survey of reliable indicators is fundamental to achieving these objectives, which is one of RIPERC's major goals.

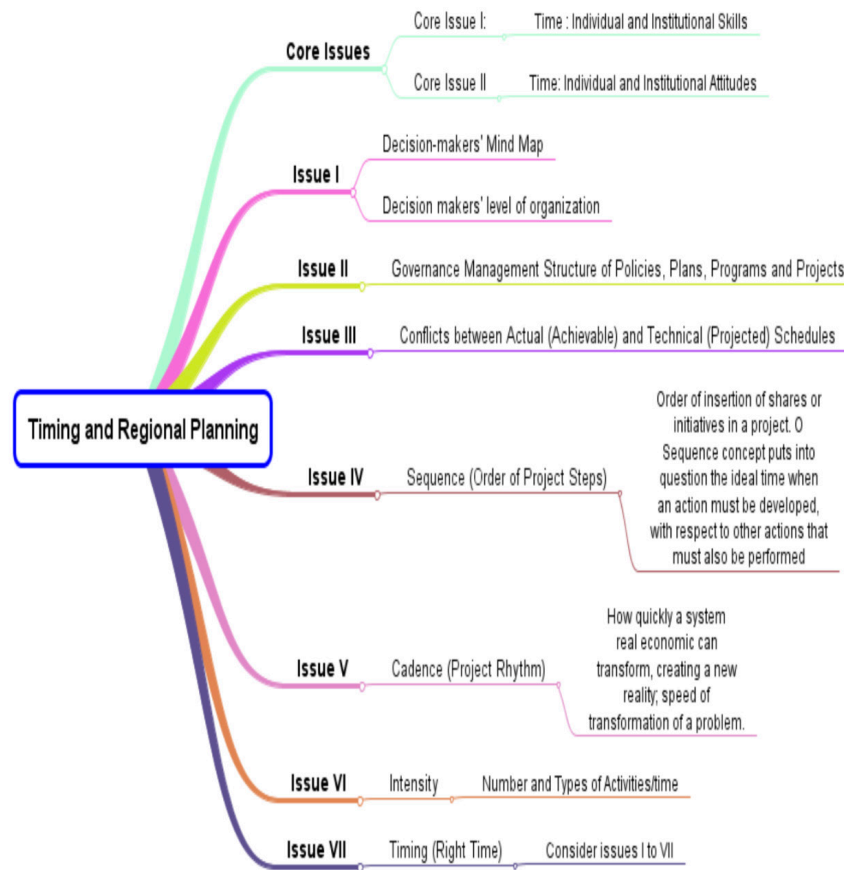
RIPERC's work is to provide solid knowledge about the region's environmental reality in order to train social and political actors. Monitoring of the positioning of these actors and the results of their actions is also ongoing, in a process of continuous feedback. RIPERC also provides Environmental Education through the implementation of an Environmental Education center at the State University of Western Paraná.



**Figure 2.** Map of the Triple Border Brazil, Paraguay and Argentina.

The first result of the RIPERC Network's work is the integration of the triple border (Brazil, Paraguay and Argentina) and its researchers, which gives the project cross-border dimensions of public policies. In order to implement the international project, it is necessary to develop pilot programs that serve as proposals wherever they are implemented, informed by the characteristics of the territory and adaptable to local needs rather than logistics alone, as systematized in Figure 1.

More recently, RIPERC has been participating in the New Climate Emergency Research and Innovation Arrangement, developing research and outreach activities on the Basket of Territorial Goods and Services, sustainable territorial development, and the surveying and monitoring of the State's



**Figure 3.** Cognitive Map developed. Source: Cognitive Map developed by Harrysson Luiz da Silva (2017). Adapted from Caporali & Volker (2004)

environmental indicators and environmental education.

### International Collaboration and Network Expansion.

Among the issues described above, timing is related to issues IV to VII and must be considered so that the life cycle of all projects, as well as the different stages of development and organization of communities, are considered for full compliance.

Since then, the Network's activities have expanded and today it has researchers from 15 countries: Brazil, United Kingdom, Paraguay, Argentina, Guatemala, Chile, Mexico, Spain, Italy, Cuba, Bolivia, Venezuela, Colombia, Angola and Ghana. RIPERC is present in 13 Brazilian states: Paraná, Santa Catarina, Rio Grande do Sul, São Paulo, Rio de Janeiro, Minas Gerais, Mato Grosso, Mato Grosso do Sul, Rondônia, Ceará, Pará, Paraíba, and Rio Grande do Norte. It has also created a scientific journal, the International Journal of Environmental Resilience Research and Science (IJERRS), where the Network's researchers and partners from the academic community publish their studies and interventions.

Another strategy adopted by the Network is the definition of a long-term Work Program, which enables robust scientific production and continues to strengthen intervention in territories and greater sharing of knowledge produced, through publications, congresses, and workshops.

RIPERC was planned and has the conditions to be a global incubator for territorial development projects, based on a matrix structure for integrated project management, both for international

### References

- Agência Nacional de Vigilância Sanitária. (2020). *Programa de análise de resíduos de agrotóxicos em alimentos*. Retrieved November 23, 2023, from <https://www.gov.br/anvisa/pt-br/assuntos/agrotoxicos/programa-de-analise-de-residuos-em-alimentos>
- Caporali, R., & Volker, P. (Eds.). (2004). *Metodologia de desenvolvimento de arranjos produtivos locais: Projeto Promos-Sebrae-BID*. SEBRAE.
- Carniatio, I., Sato, M., & Pereira, V. A. (2021). Network learning: Interinstitutional cooperation in the performance of the International Climate Resilience Research Network – RIPPEDRC. *Research, Society and Development, 10(9)*. <https://doi.org/10.33448/rsd-v10i9.18018>
- Carniatio, I., Sakai, M., & Sakai, P. (2019). Climate resilient development: United Kingdom – Brazil - Workshop contributions financing climate resilient development. *International Journal of Environmental Resilience Research and Science, 1(1)*. ISSN 2675-3456
- Cidade Brasil. (n.d.). *Mesorregião do Oeste Paranaense*. Retrieved December 30, 2022, from <https://www.cidade-brasil.com.br/mesorregiao-do-oeste-paranaense.html>
- Instituto Brasileiro de Geografia e Estatística. (n.d.). *Pesquisa nacional por amostra de domicílios contínua*. Retrieved December 30, 2022, from <https://www.ibge.gov.br/estatisticas/sociais/rendimento-despesa-e-consumo/9171-pesquisa-nacional-por-amostra-de-domicilios-continua-mensal.html>

Instituto Brasileiro de Geografia e Estatística. (n.d.). *IBGE Cidades: Cascavel*. Retrieved November 15, 2022, from <https://cidades.ibge.gov.br/brasil/pr/cascavel/panorama>

Instituto Brasileiro de Geografia e Estatística. (n.d.). *IBGE Cidades: Foz do Iguaçu*. Retrieved November 15, 2023, from <https://cidades.ibge.gov.br/brasil/pr/foz-do-iguacu/panorama>

Instituto Paranaense de Desenvolvimento Econômico e Social (IPARDES). (2019). *Indicadores do desenvolvimento sustentável por bacias hidrográficas do Estado do Paraná*. Retrieved December 28, 2022, from [https://www.ipardes.pr.gov.br/sites/ipardes/arquivos\\_restritos/files/documento/2019-09/Revista%20Indicadores%20de%20Desenvolvimento%20Sustent%20C3%A1vel.pdf](https://www.ipardes.pr.gov.br/sites/ipardes/arquivos_restritos/files/documento/2019-09/Revista%20Indicadores%20de%20Desenvolvimento%20Sustent%20C3%A1vel.pdf)

Panis, C., Canidiotto, L. Z. P., Gaboardi, S. C., et al. (2022). Widespread pesticide contamination of drinking water and impact on cancer risk in Brazil. *PubMed*. Retrieved December 28, 2022, from <https://pubmed.ncbi.nlm.nih.gov/35691095/>

Paraná. (2018). *Plano de vigilância e atenção à saúde de populações expostas aos agrotóxicos do Estado do Paraná 2017 a 2019*. Retrieved November 23, 2023, from [https://www.saude.pr.gov.br/sites/default/arquivos\\_restritos/files/documento/2020-05/agrotoxicos\\_cib\\_fev\\_2018\\_revisada\\_2.pdf](https://www.saude.pr.gov.br/sites/default/arquivos_restritos/files/documento/2020-05/agrotoxicos_cib_fev_2018_revisada_2.pdf)

Paraná. (2023). *Plano estadual de ação climática 2024–2050: Inventário de emissões de gases de efeito estufa 2005 a 2019*. Retrieved November 23, 2023, from [https://www.aen.pr.gov.br/sites/default/arquivos\\_restritos/files/documento/2023-08/pac-pr\\_-\\_inventario\\_de\\_emissoes\\_1.pdf](https://www.aen.pr.gov.br/sites/default/arquivos_restritos/files/documento/2023-08/pac-pr_-_inventario_de_emissoes_1.pdf)

Panis, C., Kawasaki, A. C. B., Crestani, A. P. J., et al. (2022). Evidence on human exposure to pesticides and the occurrence of health hazards in the Brazilian population: A systematic review. *PubMed*. Retrieved December 28, 2022, from <https://pubmed.ncbi.nlm.nih.gov/35071167/>

Sanepar. (2011, September 16). *Lançado hoje o mapa de recursos hídricos do Paraná*. <https://www.sanepar.com.br/noticias/lancado-hoje-o-mapa-de-recursos-hidricos-do-parana>

---

## Acknowledgments

We thank Jaad Benhallam for reviewing this case study.

---

## Additional Data

- **Population Density:** Cascavel: 91.71 people/km<sup>2</sup>  
Foz do Iguaçu: 1,811 people/km<sup>2</sup>
- **Per Capita Gross National Income (GNI):** 9,950 USD (Upper-Middle Income) [2024]
- **Gini Coefficient:** 52 [2022]
- **Human Development Index (HDI):** 0.786 (High) [2023]
- **Type of Climate Intervention:** Hybrid (Adaptation and Mitigation)