



SUSTAINABILITY IN DEBATE

SUSTENTABILIDADE EM DEBATE



EDITORIAL

End of imagination and the misuse of knowledge: a dystopian scenario of Artificial Intelligence

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Tribute to Prof. Emer. Julie Thompson Klein (1944-2023)

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Dismantling of the Brazilian environmental policy

Policy change, dismantling and environmental protection in Brazil

The active dismantling of environmental policy in Brazil: paralysis and setbacks of the deforestation inspection and control

Building and dismantling organisational capacity and bureaucratic identity: an analysis of Ibama's civil service examinations (1989 – 2022)

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ARTICLES VARIA

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A soft systems approach for innovation in the fruits and vegetables market in Uruguay

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Editorial

End of imagination and the misuse of knowledge: a dystopian scenario of Artificial Intelligence

Marcel Bursztyn, Carlos Hiroo Saito, Gabriela Litre, Patrícia Mesquita

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According to this Einstein's affirmation:

"Imagination is more important than knowledge. For knowledge is limited to all we now know and understand, while imagination embraces the entire world, and all there ever will be to know and understand."

It is a warning about the relevance of creativity, the ability to ask questions and seek answers, where knowledge is necessary but insufficient.

Einstein himself left us an example of the role of scientists in leading the course of humanity beyond scientific work. Faced with the risk of an eventual Nazi victory in World War II, he was one of the signatories of the letter to the then US president, Franklin D. Roosevelt, suggesting a program for the development of the atomic bomb. As a pacifist aware of the risks of that technology, Einstein bowed before the greater risk of Hitler winning the war race. In 1942 Roosevelt started the Manhattan Project. What came after is well known.

Ten years after the end of the war, in 1955, based on a manifesto launched by Bertrand Russell and Albert Einstein, the Pugwash Conferences on Science and World Affairs was created, with Joseph Rotblat as its first president. A Polish Jew who fled Nazism and settled in the United Kingdom, physicist Rotblat was one of the scientists who participated in the Manhattan Project, in the Los Alamos desert, in the USA. However, in 1944, a year before the explosion in Hiroshima, he realized the Germans could not develop such an artefact, so he left the project. He was one of the few to have this attitude, becoming a reference in the responsibility of scientists regarding the uses of science they produce. In 1995 he was awarded, along with the Pugwash Conference, the Nobel Peace Prize for their efforts to diminish the part played by nuclear arms in international politics and, in the longer run, to eliminate such arms.

Another researcher who participated in the Manhattan Project was mathematician Jacob Bronowski. He was also a Polish Jew who fled Nazism and settled in the United Kingdom. Nevertheless, unlike Rotblat, he worked at Los Alamos until the project was completed. A few days after the explosion of the second artefact, he visited Nagasaki and was shocked by the scene of destruction he saw: "The god-man usurped God's role as master of nature, with the power to dominate and destroy." His scientific career took a turn, and he began to act as a disseminator of thought on the responsibility of scientists regarding the use of the science they produce: "We have no right to cause such a transformation in nature; ethics must regulate science"¹.

The examples of Einstein, Rotblat and Bronowski are relevant for a reflection on the current moment, which places us in front of (un)certainties about the consequences of the rapid advance of artificial intelligence - AI. It is no longer just about the prosaic application of such tools, as in

the recovery and retouching of photographs. AI is now capable of acting as a scientist simulator! Full texts, in the format of academic works, can already be generated from a few commands and keywords. In arts, it is possible to generate paintings with the style of renowned artists but not produced by the supposed authors.

Many questions arise when we reflect on the dystopic future of the indiscriminate generalization of AI use, which can have “natural stupidity” as a side effect.

- How to assign responsibility to a robot?
- How to encourage diversity and originality when more and more young people and children trust the ready-made answers of an application that reproduces what “the majority” (at the moment, white, English-speaking, and, obviously, from developed countries) disseminates on the Internet?
- How to manage authorship credits when freely accessible texts on the Internet are used in mosaics of new writings?
- How to detect plagiarism in the face of cunning algorithms assembling mosaics of ideas’ expression?
- What are the rights of Picasso’s heirs over a new painting attributed to him that he did not paint?
- What are the effects of artificial AI on employment?
- Where will the imagination remain after knowledge becomes a free territory for use (and abuse) without criteria, shame, and commitment to human values?

It is worth remembering this poem by Bertolt Brecht², referring to the Germans’ complacency in observing Nazism advance:

First of all, they came to take the gipsies
and I was happy because they pilfered.
Then they came to take the Jews and I said nothing,
because they were unpleasant to me.
Then they came to take homosexuals,
and I was relieved, because they were annoying me.
Then they came to take the Communists,
and I said nothing because I was not a Communist.
One day they came to take me,
and there was nobody left to protest.

Furthermore, we shall ask ourselves: what happens after AI steals the jobs of those who develop AI? Even technology tycoon Elon Musk, who is not precisely known for his prudence (one of his futuristic cars exploded in the middle of the product’s public presentation) nor for his sensitivity towards others (he massively fired employees via email when he bought Twitter), was concerned about the direction taken by the AI. In February of this year, the CEO of Tesla, SpaceX and Twitter warned guests at the World Government Summit in Dubai, United Arab Emirates: “AI is one of the greatest risks to the future of civilization”. Musk is a co-founder of OpenAI, the company that created ChatGPT. Can these be crocodile tears, or is he a sorcerer’s apprentice?

The atomic bomb and several other applications of scientific knowledge in technological arrangements remind us precisely of the image of the sorcerer's apprentice, who produces the spell but does not know how to undo it.

Other issues arise from this: the separation of scientific and technological activities, enhancing labour division and causing the loss of a whole-picture perception. For the atomic bomb, there are still doubts concerning the nuclear research for peaceful purposes, bomb production or the decision to launch the war device. The same goes for the scientist working on laser research for medicinal purposes and the appropriation of that scientific knowledge by the military sector and its later use in the North American Strategic Defense Initiative (SDI) program, also known as the Star Wars project, which aimed to create a network of satellites equipped with laser beam devices to destroy possible missiles from space.

It is possible that many scientists who worked on the development of AI dreamed of its benefits for humanity and did not even envision the current applications. Others, however, continue to think that the applications, despite current criticism, are essential and valid.

Here we highlight the warning from the precautionary principle (*vorsorgeprinzip*) evoked by Hans Jonas³: better safe than sorry.

Other questions arise:

- Should prudence also apply to basic research or only to applied research?
- Are scientists responsible for the technological derivations of their research?

There is an illusion that by applying them to everyday products (contrary to war artefacts), neutrality and the well-being of humanity and the planet are ensured.

Just as Jonas asserts that humans, as part of nature, are not ethically allowed to cause environmental disruptions, it is time to extend his precautionary principle to other disruptive topics.

If we do not know how to undo or control the spell, we better not do it.

In its first issue of 2023, SiD publishes a *Dossier* on "Dismantling of the Brazilian Environmental Policy" with six articles and a *Varia* section with three other articles. In addition, a tribute note is published to Julie Thompson-Klein, who died recently and left us a strong legacy on transdisciplinarity.

In the *Dossier*, Neves begins by assessing the construction of Brazilian environmental policies and the recent abrupt changes under the Bolsonaro administration. Next, Bonelli *et al.* examine the effects of President Bolsonaro's administration on environmental analysts involved in conducting policies to prevent and control deforestation in the Brazilian Legal Amazon. Next, Moulin discusses the capacity and bureaucratic identity of the Brazilian Institute of Environment and Renewable Natural Resources – Ibama through a qualitative analysis of its civil service exams in recent years. Coudel *et al.*, on the other hand, discuss the dismantling of the pesticide control policy, and Silva, through the Biofin methodology (Biodiversity Finance Plan), presents the political and institutional aspects that contributed or did not to the financing of biodiversity policies within the federal government. Finally, Canal and Verдум discuss the various difficulties in implementing environmental health actions in the perception of a multidisciplinary environmental health team in a municipality in southern Brazil.

In the *Varia* section, Cecato and Magri evaluate the potential use of treated sewage in the irrigation of seven crops produced in Santa Catarina, considering the current demand for irrigation water in the study area and the future production of treated sewage. Next, Oliveira *et al.* present a sustainability

index (SI) of rural properties using the SAFA tool in Santa Catarina. Finally, Berrutti *et al.*, in the context of the fruit and vegetable sector in Uruguay, discuss how "soft system methodologies" contribute to building a representation that considers different perspectives, focussing on the particularities and opportunities for technological innovation and collaborative management in the chain.

We hope you enjoy the reading!

NOTES

1| Bronowski, Jacob. **The common sense of science**. Cambridge, MA.: Harvard University Press. 1978

2| Inspired by a poem by Pastor Gustav Niemöller

3| Jonas, Hans. **The Imperative of Responsibility**: in search of ethics for the technological age. Chicago: University of Chicago Press. 1984.

Editorial

Fim da imaginação e mau uso do conhecimento: um cenário distópico da Inteligência Artificial

Marcel Bursztyn, Carlos Hiroo Saito, Gabriela Litre, Patrícia Mesquita

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De acordo com a assertiva atribuída a Einstein:

“Imagination is more important than knowledge. For knowledge is limited to all we now know and understand, while imagination embraces the entire world, and all there ever will be to know and understand.”

Trata-se de uma advertência sobre a relevância da criatividade, da capacidade de fazer perguntas e buscar respostas, algo para o qual o conhecimento é necessário, mas não suficiente.

O mesmo Einstein nos deixou o exemplo do papel dos cientistas na condução dos rumos da humanidade, para além de seu trabalho estritamente científico. Diante do risco de uma eventual vitória do nazismo na Segunda Guerra Mundial, ele foi um dos signatários da carta ao então presidente dos EUA, Franklin D. Roosevelt, onde foi sugerido que se criasse um programa para o desenvolvimento da bomba atômica. Pacifista e sabedor dos riscos daquela tecnologia, Einstein se curvou diante do risco maior que representava Hitler vencer aquela corrida bélica. Em 1942 Roosevelt deu início ao Projeto Manhattan. O que veio depois é conhecido.

Dez anos depois do final da guerra, em 1955, a partir de um manifesto lançado por Bertrand Russel e Albert Einstein, foi criada a *Pugwash Conferences on Science and World Affairs*, que teve como seu primeiro presidente Joseph Rotblat. Judeu polonês que fugiu do nazismo e se radicou no Reino Unido, o físico Rotblat foi um dos cientistas que participaram do Projeto Manhattan, no deserto de Los Alamos, nos EUA. Mas em 1944, um ano antes da explosão em Hiroshima, ele percebera que os alemães não conseguiram desenvolver um artefato como aquele e então se desligou do projeto. Foi um dos poucos a ter essa atitude, que lhe valeu notoriedade como referência sobre a responsabilidade dos cientistas diante dos usos da ciência que produzem. Em 1995 ele foi laureado, juntamente com a Conferência Pugwash, com o Prêmio Nobel da Paz *for their efforts to diminish the part played by nuclear arms in international politics and, in the longer run, to eliminate such arms*.

Outro pesquisador que participou do Projeto Manhattan foi o matemático Jacob Bronowski. Era, também, um judeu polonês fugido do nazismo e radicado no Reino Unido. Mas, diferentemente de Rotblat, trabalhou em Los Alamos até a conclusão do projeto. Alguns dias depois da explosão do segundo artefato, visitou Nagasaki e ficou chocado diante da cena de destruição que viu: *“O homem-deus usurpou o papel de Deus como mestre da natureza, com poder de dominar e de destruir”*. Sua carreira científica sofreu uma guinada e passou a atuar como divulgador do pensamento sobre a responsabilidade dos cientistas sobre o uso da ciência que produzem: *Não temos o direito de provocar tamanha transformação da natureza; é preciso que a ética regule a ciência*¹.

Os exemplos de Einstein, Rotblat e Bronowski são relevantes para uma reflexão sobre o momento atual, que nos coloca diante de (in)certezas sobre as consequências do rápido avanço no campo

da inteligência artificial - IA. Já não se trata apenas do uso prosaico de tais ferramentas, como na recuperação e retoque de fotografias. Agora, a IA já é capaz de agir como simulacro de cientista! Textos integrais, em formato de trabalhos acadêmicos, já podem ser gerados, a partir de poucos comandos e palavras-chave. No campo das artes, é possível gerar pinturas com o estilo de artistas consagrados, mas que não foram produzidas pelos supostos autores.

Muitas questões se apresentam quando refletimos sobre o futuro (distópico) da generalização indiscriminada do uso da IA, que pode trazer como efeito colateral uma espécie de “burrice natural”.

- Como atribuir responsabilidade a um robô?
- Como alentar a diversidade e a originalidade de olhares quando cada vez mais jovens e crianças confiam nas respostas prontas de um aplicativo que reproduz o que “a maioria” (de momento branca, anglófona, e, obviamente, de países desenvolvidos) dissemina na internet?
- Como gerir os créditos de autoria, quando textos de livre acesso na internet são usados em mosaicos de novos escritos?
- Como detectar plágio, diante de ardilosos algoritmos de montagem de mosaicos de expressões de ideias?
- Quais são os direitos dos herdeiros de Picasso sobre um novo quadro atribuído a ele, mas que ele não pintou?
- Quais os efeitos da IA sobre o emprego?
- Onde ficará a imaginação, depois que o conhecimento se tornar um território livre para o uso (e o abuso), sem critério, sem pudor e sem compromisso com valores humanos?

Vale lembrar o poema de Bertolt Brecht², se referindo à complacência dos alemães diante do avanço do nazismo:

Primeiro levaram os negros
 Mas não me importei com isso
 Eu não era negro
 Em seguida levaram alguns operários
 Mas não me importei com isso
 Eu também não era operário
 Depois prenderam os miseráveis
 Mas não me importei com isso
 Porque eu não sou miserável
 Depois agarraram uns desempregados
 Mas como tenho meu emprego
 Também não me importei
 Agora estão me levando
 Mas já é tarde.
 Como eu não me importei com ninguém
 Ninguém se importa comigo.

E cabe aqui a questão: o que acontecerá depois que a IA roubar o emprego daqueles que desenvolvem a IA? Até o magnata da tecnologia Elon Musk, que não é precisamente conhecido pela sua prudência (um dos seus carros futuristas explodiu em plena apresentação pública do produto) nem pela sua

sensibilidade para com o próximo (demitiu massivamente funcionários por e-mail quando comprou o Twitter), se mostrou preocupado pelo rumo tomado pela IA. Em fevereiro deste ano, o CEO da Tesla, SpaceX e Twitter alertou os convidados da Cúpula do Governo Mundial em Dubai, Emirados Árabes Unidos: “A IA é um dos maiores riscos para o futuro da civilização”. Musk é cofundador da OpenAI, empresa que criou o ChatGPT. Lágrimas de crocodilo ou aprendiz de feiticeiro?

A bomba atômica e várias outras aplicações de conhecimento científico em arranjos tecnológicos nos remetem precisamente à imagem do aprendiz de feiticeiro, que produz o feitiço, mas não sabe como desfazê-lo.

Essa problemática remete a uma outra: a separação entre o fazer científico e o fazer tecnológico, consagrando a divisão do trabalho, e a perda da percepção do todo. No caso da produção da bomba atômica, ainda resta a questão sobre a pesquisa nuclear para fins pacíficos e a produção da bomba, e a decisão de ordenar o lançamento do artefato bélico. O mesmo pode-se dizer do cientista que trabalha em pesquisa sobre o *laser* para fins medicinais e a apropriação daquele conhecimento científico pelo setor militar e seu uso posterior no programa norte-americano *Strategic Defense Initiative* (SDI), conhecido também como projeto *Star Wars*, que visava criar uma rede de satélites equipados com dispositivos de raio *laser* para destruir eventuais mísseis a partir do espaço.

É possível que muitos cientistas que trabalharam no desenvolvimento da IA sonhassem com os benefícios para a humanidade e sequer vislumbravam as aplicações atuais. Outros, entretanto, continuam achando que as aplicações, mesmo com as críticas atuais, são importantes e válidas.

Ressalta-se aqui a advertência, que emana do *princípio da precaução* (*vorsorgeprinzip*) evocado por Hans Jonas³: na dúvida, é melhor não avançar.

Outras questões se apresentam:

- A prudência deve se aplicar também à pesquisa básica ou apenas à pesquisa aplicada?
- Os cientistas são responsáveis pelas derivações tecnológicas de sua pesquisa?

De modo geral, tem prevalecido a ilusão de que por serem aplicáveis em produtos do cotidiano (em oposição a artefatos bélicos) fica assegurada a neutralidade e a certeza do bem-estar da humanidade e do planeta.

Assim como Jonas afirma que os humanos, como parte da natureza, não têm a permissão ética para provocar perturbações no meio ambiente, é hora de estender o seu *princípio da precaução* para outros temas perturbadores.

Ou seja: se não sabemos como desfazer ou controlar o feitiço, melhor não fazer.

Em seu primeiro número de 2023, SiD publica um Dossiê sobre o “Desmantelamento da Política Ambiental Brasileira” com seis artigos e uma seção *Varia* com três artigos adicionais. Além disso, é publicada uma nota de homenagem a Julie Thompson-Klein, falecida recentemente e que nos deixa um forte legado sobre o tema de transdisciplinaridade.

No Dossiê, Neves inicia apresentando uma avaliação sobre a construção das políticas ambientais brasileiras e as mudanças abruptas recentes ocorridas sob a gestão do governo Bolsonaro. Na sequência, Bonelli *et al.* examinam os efeitos da administração do presidente Bolsonaro sobre os analistas ambientais envolvidos com a condução de políticas de prevenção e controle do desmatamento na Amazônia Legal; e Moulin debate sobre a capacidade e a identidade burocrática do Instituto Brasileiro de Meio Ambiente e Recursos Naturais – Ibama, por meio da análise qualitativa dos

concursos realizados pelo órgão nos últimos anos. Já Coudel *et al* debatem sobre o desmantelamento da política de controle de agrotóxicos, e Silva, por meio da metodologia Biofin (*Biodiversity Finance Plan*), apresenta os aspectos políticos e institucionais que contribuíram ou não para o financiamento de políticas de biodiversidade no âmbito do governo federal. Por fim, Canal e Verdum apresentam uma discussão sobre as diversas dificuldades de implementação de ações de saúde ambiental na percepção de uma equipe multiprofissional de saúde ambiental de um município do Sul do Brasil.

Na seção *Varia*, Cecato e Magri avaliam o potencial de utilização de esgoto tratado na irrigação de sete culturas produzidas no estado de Santa Catarina, considerando a demanda atual de água para irrigação na área de estudo e a produção futura de esgoto tratado. A seguir, Oliveira *et al.* apresentam um índice de sustentabilidade (IS) de propriedades rurais utilizando a ferramenta SAFA também no estado de Santa Catarina. E, por fim, Berrutti *et al.* no âmbito do setor de frutas e hortaliças no Uruguai, discutem como as “metodologias de sistemas flexíveis” contribuem para construir uma representação que considera diferentes perspectivas, aprofundando-se nas particularidades e oportunidades de inovação tecnológica e gestão colaborativa da cadeia.

Desejamos uma ótima leitura a todos(as)!

NOTAS

1| Bronowski, Jacob. **The common sense of science**. Cambridge, MA.: Harvard University Press. 1978.

2| Inspirado em poema do pastor Gustav Niemöller

3| Jonas, Hans. **The Imperative of Responsibility**: in search of ethics for the technological age. Chicago: University of Chicago Press. 1984.

Memorial

Tribute to Prof. Emer. Julie Thompson Klein (1944-2023)

Pioneer in Interdisciplinary and Transdisciplinary Studies

For more than five decades, Professor Emer. Julie Thompson Klein, a world reference in interdisciplinary and transdisciplinary studies, questioned and pushed forward the boundaries of scholarly research in a variety of sectors, including higher education, digital humanities, team science, and many more. Klein's pioneer publications contributed to the development of best practices for interdisciplinary and transdisciplinary work in education and research. Her influential research on the integration process as the distinctive aspect of interdisciplinarity was a significant contribution to convergence in interdisciplinarity. She understood that one of the fundamental challenges to integrative interdisciplinarity was the growing participation of non-academic stakeholders in transdisciplinary research. Her talent and charisma facilitated the connection between academics and stakeholders from many fields, communities, and countries. She was also a positive role model and a strong advocate for young women in various professional positions. Professor Klein passed away in Ypsilanti, MI on Sunday, January 15, 2023. She was 78 years old.

We present two tributes by Latin American scholars who have worked closely with Julie Thompson Klein: Bianca Vienni-Baptista, lecturer and researcher at the Cultural Studies of Science Group - Transdisciplinarity Lab, Swiss Federal Institute of Technology, Switzerland, and Luis Carrizo, the Coordinator of the Chair on Complexity and Human Condition University CLAEH, Uruguay.

“JULIE HAD INEXHAUSTIBLE ENERGY AND AN AVID CURIOSITY TO LEARN”

Bianca Vienni-Baptista

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Julie had an unwavering enthusiasm and energy that inspired all of us who had the privilege of knowing her. She was always ready to take on new challenges and explore new horizons. I still remember when I decided to approach Julie at an International Transdisciplinary Conference (ITD Conference) in Basel to kindly ask her for a few minutes to share my ideas. She immediately encouraged me to follow up, and we both embarked on rethinking what the processes of institutionalisation of inter- and transdisciplinarity entail and how to foster them. After that first conversation and other shared publications and conferences, we started designing a book we published together in 2022¹. Over the years, I have had the privilege of working with Julie, and I am honoured to have had her warm friendship and mentorship.

This shows how informal conversations and academic generosity can make a difference in the struggle to transform our institutions. Julie had inexhaustible energy and an avid curiosity to learn. In this tribute, I can only account for a small part of the enormous impact of her work in many sectors

and fields, showing Julie's versatility, changing with the times and integrating new knowledge and perspectives into her academic work.

She was a professor and scholar in interdisciplinary studies at Wayne State University for 40 years. Her work was pioneering in interdisciplinary teaching and research, with a solid link to transdisciplinarity and other communities, such as the "science of team science". Together with William Newell, Julie founded the Association for Interdisciplinary Studies (AIS) in the 1970s, now established as an international professional organisation dedicated to interdisciplinary education and research. Since then, Julie has tirelessly brought together individuals, networks and generations, demonstrating her commitment to the advancement of the field.

Her research and teaching were dedicated to crossing borders and mapping what she called "interdisciplinary cultures". In her latest book, "Beyond Interdisciplinarity", Julie highlighted her deep understanding of current inter- and transdisciplinary challenges, redefining collaboration between different sectors.

Despite limitations in institutional support for interdisciplinarity, she gave countless keynote lectures and workshops on inter- and transdisciplinarity in many countries, supporting teams and institutions in Japan, Brazil, Mexico, Uruguay, Australia, Finland and Iceland, among others. In Latin America, his talks were a milestone in pushing the field forward and rethinking the transformation of inter- and transdisciplinary institutions.

A few months before the sad news of her death, still ill, Julie took the time to support me in an academic conflict that was troubling me. She had the courage to stand up for what she felt was right. It is now my turn to pay it forward and honour her memory by strengthening, as a lecturer and researcher, the values that Julie shared and promoted in those who had the great privilege of knowing her.

"JULIE WAS NEVER AN ACADEMIC LOCKED IN HER IVORY TOWER"

Luis Carrizo

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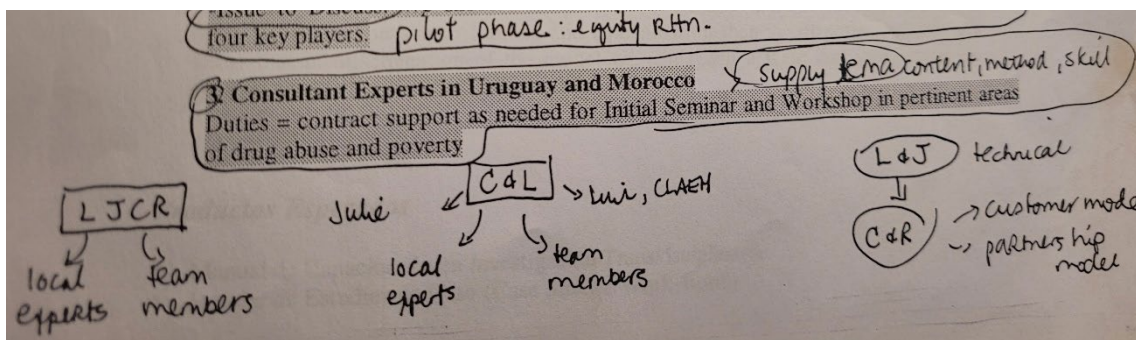
When, in the late 1990s, I sent an introductory email to Prof. Julie T. Klein, sharing the impact of my reading of her "Interdisciplinarity. History, Theory and Practice", I did not expect a response from this distinguished Professor at Wayne State University. A few days later, however, a kind email arrived in my inbox with a personal message from Prof. Klein, thanking me for my note and making herself available for a conversation on interdisciplinarity. I do not forget that inaugural moment of exchange with someone who has become a reference for me over the last 25 years. She was like that: close and authentic, wise and generous, intelligent in her work and humour, sensitive to all the arts and cultures, always building bridges and crossing borders to learn.

My need and vocation for interdisciplinarity and knowledge integration were forged in my academic and personal life from an early age. The world of encyclopaedias, which my father used to sell door-to-door in the 1960s, had nurtured my curiosity for the different fields of knowledge, cultural diversity and the necessary dialogues in a turbulent era. From there, my university passage through law, then anthropology, psychology and the field of social development challenged frontiers and paradigms, building bridges and overcoming gaps. Julie nurtured that personal empirical experience of wild interdisciplinarity with a theoretical framework, history and perspectives, systematisation of

challenges, proposals for models, trials of processes and institutional cultures. She gave understanding to my experience and light to the path, nourishing my vocation to this day.

Julie was easy to talk to: she was never an academic locked in her ivory tower. She knew how to reach everyone with affection and understanding without losing rigour or argumentative quality, singularly combining ethics and aesthetics. Julie always showed a sensitive spirit, an overflowing curiosity, fine humour, lucidity and independence of thought - without decoration or glitter. "My weapons", she would say with a smile, referring to her pencils.

He was a bulwark for many projects we carried out in Latin America. In the framework of Unesco, with Julie and our dear Mayra Espina (from the Centro de Investigaciones Psicológicas y Sociales, Cuba), we wrote a Discussion Paper on "Transdisciplinarity and Complexity in Social Analysis"². Julie was our special guest in Uruguay for the 1st Regional Summer School of Unesco's Management of Social Transformations Programme (Most), organised by the Latin American Centre for Human Economy (CLAEH), in 2003. Later, in a relevant experience with Latin American impact, the International Observatory of University Reforms and the Iteso University of Guadalajara organised a seminar, "Dialogues on Interdisciplinarity", where Julie presented the state of the theoretical and methodological discussion in the field of interdisciplinarity. Well into the new century, Julie joined us in an international capacity-building project for transdisciplinary research designed by CLAEH for the Social Development Agency of Morocco (see image with Julie's notes).



Her works have been the source of countless papers and presentations in Latin America and the Caribbean. Her trajectory has been an inspiration to cultivate transdisciplinary institutional environments with solid criteria and a transformative spirit for education and research.

With her beloved husband George, she loved Jazz as she loved the human condition, and in all forums, she put her knowledge and sensitivity on behalf of the people. Science loses a bastion; humanity gains a legend. Julie lives on in the ideas she bequeathed to us and which we honour in action.

NOTES

1| VIENNI-BAPTISTA, B.; KLEIN, J. T. **Institutionalizing Interdisciplinarity and Transdisciplinarity**. Collaboration across Cultures and Communities. Routledge. 2022.

2| CARRIZO, L.; PRIETO, M. E.; KLEIN, J. T. **Transdisciplinarietà y complejidad en el análisis social**. Unesco, 2004.

Memorial

Homenaje a la Profesora Em. Julie Thompson Klein (1944-2023)

Pionera en estudios Interdisciplinarios y Transdisciplinarios

Durante más de cinco décadas, Julie Thompson Klein, profesora emérita de la Wayne State University y una referencia internacional en estudios interdisciplinarios y transdisciplinarios, cuestionó y amplió las fronteras de la investigación académica en una variedad de campos, incluida la educación superior, las humanidades digitales, la ciencia en equipo (o “*team science*”) y muchos más. Las publicaciones pioneras de Klein contribuyeron al desarrollo de mejores prácticas para el trabajo interdisciplinario y transdisciplinario tanto en educación como en investigación. Su influyente investigación sobre el proceso de integración como el aspecto distintivo de la interdisciplinariedad fue una contribución significativa a la convergencia en la interdisciplinariedad. Entendió que uno de los desafíos fundamentales para la interdisciplinariedad integradora era precisamente la creciente participación de grupos no académicos en la investigación transdisciplinar. Su talento y carisma facilitaron la conexión entre académicos y no académicos de muchos campos, comunidades y países diferentes. También fue un modelo positivo y una fuerte defensora de las mujeres jóvenes en varios puestos profesionales. La profesora Klein falleció en Ypsilanti, MI el domingo 15 de enero de 2023. Tenía 78 años.

Presentamos dos tributos de académicos latinoamericanos que han trabajado en estrecha colaboración con Julie Thompson Klein: Bianca Vienni-Baptista, profesora e investigadora del Cultural Studies of Science Group del Transdisciplinarity Lab, Swiss Federal Institute of Technology, Suiza, y Luis Carrizo, Coordinador de la Cátedra Complejidad y Condición Humana de la Universidad CLAEH, Uruguay.

“UNA ENERGÍA INAGOTABLE Y UNA ÁVIDA CURIOSIDAD POR APRENDER”

Bianca Vienni-Baptista

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Julie poseía un entusiasmo y energía inquebrantables que inspiraron a todos quienes tuvimos el privilegio de conocerla. Siempre estaba dispuesta a asumir nuevos retos y explorar nuevos horizontes. Aún recuerdo el momento en que decidí acercarme a Julie en una conferencia sobre transdisciplina en Basilea para pedirle amablemente unos minutos para compartir mis ideas. Ella me animó inmediatamente a seguir y ambas nos embarcamos en repensar qué implican los procesos de institucionalización de la inter- y la transdisciplina y cómo fomentarlos. Tras esa primera conversación, y algunas otras publicaciones y conferencias compartidas, empezamos a diseñar un libro que editamos juntas en el año 2022¹. A lo largo de los años, he tenido el privilegio de trabajar con Julie y me siento honrada por haber contado con su calurosa amistad y su mentoría.

Este breve recuerdo demuestra que las conversaciones informales y la generosidad académica son fuerzas que pueden marcar la diferencia en la lucha por transformar nuestras instituciones. Julie era eso: una energía inagotable y una ávida curiosidad por aprender. En este tributo, solo puedo dar

cuenta de una pequeña parte de la enorme repercusión de su trabajo en muchos sectores y ámbitos, mostrando la versatilidad que Julie poseía, que cambiaba al ritmo de los tiempos e integraba nuevos conocimientos y perspectivas en su labor académica.

Fue profesora y erudita en el campo de los estudios interdisciplinarios en la Wayne State University durante 40 años. Su trabajo fue pionero en la enseñanza y la investigación interdisciplinarias, con un fuerte vínculo con la transdisciplinariedad y otras comunidades como “*science of team science*”. Junto con William Newell, Julie fundó en los años 70 la Asociación de Estudios Interdisciplinarios (AIS), actualmente consolidada como organización profesional internacional dedicada a la educación y la investigación interdisciplinarias. Desde entonces, Julie reunió incansablemente a individuos, redes y generaciones, demostrando su compromiso con el avance de este campo.

Su investigación y su docencia se dedicaron a cruzar fronteras y a trazar lo que ella llamaba “culturas interdisciplinarias”. En su último libro, “*Beyond interdisciplinarity*” (“Más allá de la interdisciplina”), Julie puso de manifiesto su profundo conocimiento sobre los retos inter- y transdisciplinarios actuales, resignificando la colaboración entre distintos sectores.

A pesar de las limitaciones en el apoyo institucional a la interdisciplinariedad, ofreció innumerables conferencias magistrales y talleres sobre interdisciplina y transdisciplina en muchos países, apoyando a equipos e instituciones en Japón, Brasil, México, Uruguay, Australia, Finlandia e Islandia, entre otros. En América Latina, sus charlas constituyeron un hito para impulsar el campo y repensar la transformación de las instituciones dedicadas a la inter- y la transdisciplina.

Algunos meses antes de la triste noticia de su muerte, aún enferma, Julie dedicó su tiempo a apoyarme en un conflicto que me aquejaba. No le faltó valor para enfrentar lo que consideraba justo. Me toca ahora honrar su memoria y fortalecer, como docente e investigadora, los valores que Julie compartió e impulsó con todos quienes tuvimos el enorme privilegio de conocerla.

“NO FUE NUNCA UNA ACADÉMICA ENCERRADA EN SU TORRE DE MARFIL”

Luis Carrizo

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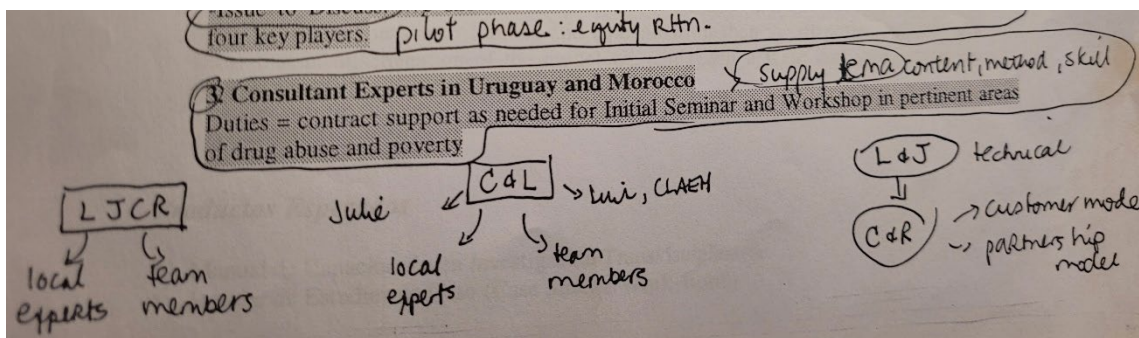
Cuando, a finales de los años '90, envié un correo electrónico de presentación a la Prof. Julie T. Klein, compartiendo el impacto que me había producido la lectura de su “*Interdisciplinarity. History, Theory and Practice*”, no abrigaba expectativa de respuesta por parte de esta tan destacada Profesora de Wayne State University. Días después, sin embargo, un amable correo llega a mi bandeja con un mensaje personal de la Prof. Klein, agradeciendo mi nota y poniéndose a disposición para conversar sobre interdisciplinariedad. No olvido ese momento inaugural de intercambio con alguien que se transformó en una referencia permanente para mí en los últimos 25 años. Así era ella: cercana y auténtica, sabia y generosa, inteligente en el trabajo y en el humor, sensible a todas las artes y culturas, siempre creando puentes y cruzando fronteras para conocer.

Mi necesidad y vocación por la interdisciplinariedad y la integración de saberes fue forjada en mi trayectoria académica y en mi vida personal desde temprano. El mundo de las enciclopedias, que mi padre solía vender puerta a puerta en la década del '60, había nutrido mi curiosidad por los distintos campos de saber, la diversidad cultural y los diálogos necesarios en una época convulsa. Desde allí, mi pasaje universitario por las leyes, luego la antropología, la psicología y el campo del desarrollo social fueron desafiando fronteras y paradigmas, tendiendo puentes, superando brechas. A esa personal experiencia empírica, la de la interdisciplinariedad salvaje, Julie la nutrió de marco teórico, historia

y perspectivas, sistematización de desafíos, propuestas de modelos, ensayos de procesos y culturas institucionales... Le puso comprensión a mi experiencia y luces al camino, nutriendo mi vocación hasta el día de hoy.

Con Julie era fácil conversar: no fue nunca una académica encerrada en su torre de marfil. Sabía llegar a todos con afecto y comprensión, sin perder rigor ni calidad argumental, conjugando ética y estética de manera singular. Julie mostró siempre un espíritu sensible, una curiosidad desbordante, el humor fino, la lucidez e independencia de pensamiento -sin decorados ni brillantina. “My weapons” (mis armas), decía con una sonrisa, al referirse a sus lápices.

Fue un baluarte para muchos proyectos que llevamos adelante en América Latina. En el marco de la Unesco, con Julie y con la querida Mayra Espina (del Centro de Investigaciones Psicológicas y Sociales de Cuba), escribimos un Cuaderno de Debate sobre “Transdisciplinariedad y Complejidad en el Análisis Social”². Julie fue nuestra invitada de lujo, en Uruguay, para la I Escuela Regional de Verano del Programa de Gestión de las Transformaciones Sociales (Most) de Unesco, organizado por el CLAEH en 2003. Más adelante, en una experiencia internacional con impacto latinoamericano, desde el Observatorio Internacional de Reformas Universitarias, organizamos junto con la Universidad Iteco de Guadalajara, un Seminario internacional “Diálogos sobre la interdisciplina”, en donde Julie expuso el estado de la discusión teórica y metodológica en el campo de la interdisciplina. Ya bien entrado el nuevo siglo, Julie nos acompañó en un proyecto internacional de formación de capacidades para la investigación transdisciplinaria, diseñado por el Centro Latinoamericano de Economía Humana para la Agencia de Desarrollo Social de Marruecos (ver imagen con notas de Julie).



Sus obras han sido fuente de innumerables trabajos y presentaciones en América Latina y el Caribe. Su trayectoria ha sido referencia para cultivar entornos institucionales transdisciplinarios, con criterios sólidos y espíritu transformador para la educación y la investigación.

Junto a su querido esposo George, amó el Jazz como amó la condición humana, y en todos los foros puso su conocimiento y su sensibilidad a favor de la gente. La ciencia pierde un baluarte, la humanidad gana una leyenda. Julie vive en las ideas que nos legó, y a las que honramos en la acción.

NOTAS

1| VIENNI-BAPTISTA, B.; KLEIN, J. T. **Institutionalizing Interdisciplinarity and Transdisciplinarity**. Collaboration across Cultures and Communities. Routledge. 2022.

2| CARRIZO, L.; PRIETO, M. E.; KLEIN, J. T. **Transdisciplinariedad y complejidad en el análisis social**. Unesco, 2004.

Dismantling of the Brazilian environmental policy

Desmantelamento da política ambiental brasileira

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ARTICLE – DOSSIER

Brazilian socio-environmental policy has advanced considerably in the last 30 years. Since the 1970s, legislation and frameworks for the forest (DRUMMOND *et al.*, 2009), water resources (PAGNOCCHESCHI, 2016), climate (BURSZTYN, M.; BURSZTYN, M. A., 2016), indigenous peoples (MARÉS, 2018), family farming (SABOURIN *et al.*, 2020), and for a structuring environmental agenda in the country (FELDMANN, 2018), have been observed.

Around the world, environmental policy is characterized by inherent conflict with economic sectors over access to natural resources (DRYZEK, 1992; SHAHAR, 2019). In Brazil, the trajectory of socio-environmental policies has also been marked by conflicts with political and economic groups (DRUMMOND *et al.*, 2022) that influence their formulation, consolidation, and change.

During the 2010s, Brazil underwent major political and economic transformations that culminated in the rise of conservative groups and the impeachment of Dilma Rousseff in 2016. In 2018 this swing of the country to the right reached its peak with the election of candidate Jair Bolsonaro. These governmental changes paved the way for the weakening or dismantling of several social, rural, health, education, and environmental policies. A common characteristic of most of the policies targeted by this process was their creation during the democratization period of the country and their consolidation during the governments of the Workers' Party, particularly during the terms of Lula da Silva (2003-2006; 2007-2010).

Conceived as a type of change that reduces the number of policies or policy instruments and/or decreases their intensity, policy dismantling can modify fundamental elements of a policy or the capacity to implement and oversee it (BAUER *et al.*, 2012). Based on a cost-benefit approach,

most case studies that applied Bauer's analytical framework showed discrete dismantling forms. This framework assumes that the political costs of dismantling are inherently unpopular; therefore, these costs can be reduced if policymakers can avoid, divert, or reduce their responsibility for a given policy change. In the Brazilian case, instead of discrete strategies, the dismantling process has taken place in an open manner and has become a particularity of the Bolsonaro government. Moreover, populist delegitimization narratives have been important factors in this large-scale dismantling process (MILHORANCE, 2022).

In this context, this special issue sought to update the literature on dismantling from a focus on the Brazilian case and analyzed empirical cases of environmental policy at both national and territorial levels.

Six papers will be presented: Neves produced the opening paper of the Dossier. It aims to analyze, from a historical perspective, the construction of Brazilian environmental policies and the recent abrupt changes that occurred under the management of the Bolsonaro government. It presented an important reflection on how these changes can be interpreted as deliberate strategies to dismantle public policies. In a panoramic way, the article helps us understand the extent and how the dismantling of Brazilian environmental policy is operationalized.

The second article, produced by Bonelli *et al.*, examined, from the perception of street-level bureaucrats, the effects of President Bolsonaro's administration on the environmental analysts who conduct the policy of prevention and control of deforestation in the Legal Amazon. The article is an important contribution to understanding the patterns of conduct and the effects of dismantling on the public agents who formulate and implement socio-environmental policies in Brazil.

Along the same lines as the previous article, the one produced by Moulin reflected on the bureaucratic capacity and identity of the Brazilian Institute of Environment and Natural Resources - Ibama through a qualitative analysis of the public tenders by the agency in the years 2002, 2005, 2009, 2013, and 2021. The article concludes that the radical change in the profile of the environmental agents recruited in the agency's last civil service exam held in 2021 represented an attempt by the Bolsonaro government to hire environmental analysts who are more aligned with the expectations of its agenda and with competencies that are largely different from those outlined for the previous exams.

The article by Coudel *et al.* brings up a debate about dismantling the pesticide control policy. Based on data from interviews, participant observation and focus groups, it was demonstrated how the conduction of a favourable position for the use of pesticides by the federal government reached the local scale being highly disseminated and collaborating to produce the invisibility of the negative impacts of its use. The dismantling of democratic spaces and the intimidation of small farmers were the strategies discussed in the article.

The article by Silva aims to present the political and institutional aspects that contribute or do not contribute to the funding of biodiversity policies under the federal government from 2000 to 2019. They apply the Biofin - Biodiversity Finance Plan methodology in the political and institutional dimensions. They demonstrate the complexity of the production of biodiversity policy in Brazil. In the end, they bring an interesting conclusion. In 2019 with signs of continuity in the Brazilian biodiversity policy, the participation reduction and social engagement, the loss of participation of the Ministry of Environment in conducting this policy and a loosening of the command and control instruments were linked to it.

The article by Canal and Verдум, which concludes this Dossier, aims to report and explore the various difficulties of implementing environmental health actions in the perception of a multidisciplinary environmental health team from a municipality in southern Brazil. They highlighted, through interviews, the loss of professional knowledge conducted by environmental health surveillance agents.

Such lost knowledge was configured as an element that composed the dismantling of environmental policies in the Bolsonaro government.

We hope this Dossier can contribute to deepening the theoretical, methodological and empirical debate of dismantling environmental policies in Brazil.

Enjoy your reading!

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Desmantelamento da política ambiental brasileira

Dismantling of the Brazilian environmental policy

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ARTICLE – DOSSIER

A política socioambiental brasileira avançou consideravelmente nos últimos 30 anos. Desde os anos 1970, legislações e estruturas para a floresta (DRUMMOND *et al.*, 2009), para os recursos hídricos (PAGNOCCHESCHI, 2016), para o clima (BURSZTYN, M.; BURSZTYN, M. A., 2016), para os povos indígenas (MARÉS, 2018), para a agricultura familiar (SABOURIN *et al.*, 2020) e para uma agenda estruturante de meio ambiente no país (FELDMANN, 2018) foram observadas.

Em todo o mundo a política ambiental é caracterizada pelo inerente conflito com setores econômicos pelo acesso aos recursos naturais (DRYZEK, 1992; SHAHAR, 2019). No Brasil, a trajetória das políticas socioambientais também foi marcada por conflitos com grupos políticos e econômicos (DRUMMOND *et al.*, 2022) que influenciam sua formulação, consolidação e mudança.

Durante a década de 2010, o Brasil passou por grandes transformações políticas e econômicas que culminaram na ascensão de grupos conservadores e no *impeachment* de Dilma Rousseff em 2016. Em 2018 essa guinada do país à direita atingiu seu ápice com a eleição do candidato Jair Bolsonaro. Essas mudanças governamentais abriram caminho para a fragilização ou o desmantelamento de diversas políticas sociais e rurais, de saúde, de educação e das ambientais. Uma característica comum da maioria das políticas visadas por esse processo foi sua criação durante o período de democratização do país e sua consolidação durante os governos do Partido dos Trabalhadores, particularmente durante os mandatos de Lula da Silva (2003-2006; 2007-2010).

Concebido como um tipo de mudança que reduz o número de políticas ou instrumentos de política e/ou diminui sua intensidade, o desmantelamento de políticas pode modificar elementos fundamentais de uma política ou as capacidades de implementá-la e supervisioná-la (BAUER *et al.*, 2012). Com base em

uma abordagem de custo-benefício, a maioria dos estudos de caso que aplicou o quadro analítico de Bauer mostrou formas discretas de desmantelamento. Esse quadro pressupõe que os custos políticos do desmantelamento são inerentemente impopulares; portanto, esses custos podem ser reduzidos se os formuladores de políticas forem capazes de evitar, desviar ou reduzir sua responsabilidade por uma determinada mudança política. No caso brasileiro, em vez de estratégias discretas, o processo de desmantelamento se deu de forma aberta e tornou-se uma particularidade do governo Bolsonaro. Além disso, narrativas de deslegitimação populista têm sido fatores importantes nesse processo de desmantelamento em larga escala (MILHORANCE, 2022).

Nesse contexto, esta edição especial buscou atualizar a literatura sobre o desmantelamento a partir do foco no caso brasileiro e analisou casos empíricos da política ambiental tanto em nível nacional quanto territorial.

Seis trabalhos serão apresentados: O artigo de abertura do Dossiê foi produzido por Silva. Tem como objetivo analisar, numa perspectiva histórica, a construção das políticas ambientais brasileiras e as mudanças abruptas recentes ocorridas sob a gestão do governo Bolsonaro. Apresentou uma importante reflexão sobre como essas mudanças podem ser interpretadas como estratégias deliberadas de desmantelamento de políticas públicas. De maneira panorâmica, o artigo nos ajuda a compreender a extensão e a forma de operacionalização do desmantelamento da política ambiental brasileira.

O segundo artigo, produzido por Bonelli *et al*, examinou, a partir da percepção de burocratas de nível de rua, os efeitos da administração do presidente Bolsonaro sob os analistas ambientais que conduzem a política de prevenção e controle do desmatamento na Amazônia Legal. O artigo é uma importante contribuição para compreendermos os padrões de condução e os efeitos do desmantelamento junto aos agentes públicos que formulam e implementam as políticas socioambientais no Brasil.

Na mesma linha do artigo anterior, o produzido por Moulin refletiu sobre a capacidade e identidade burocrática do Instituto Brasileiro de Meio Ambiente e Recursos Naturais – Ibama, por meio da análise qualitativa dos concursos realizados pelo órgão nos anos de 2002, 2005, 2009, 2013 e 2021. A conclusão do artigo é que a mudança radical no perfil dos agentes ambientais recrutados no último concurso público do órgão datado de 2021 representou uma tentativa do governo Bolsonaro de contratar analistas ambientais mais alinhados às expectativas de sua agenda e com competências, em grande medida, distintas das que foram traçadas para os concursos anteriores.

O artigo de Coudel *et al*. traz um debate sobre desmantelamento da política de controle de agrotóxicos. A partir de dados oriundos de entrevistas, observação participante e grupos de reflexão, foi demonstrado como a condução de um posicionamento favorável ao uso de agrotóxicos pelo governo federal alcançou a escala local, sendo altamente disseminado e colaborando para produção da invisibilidade dos impactos negativos de seu uso. O desmantelamento de espaços democráticos e a intimidação a pequenos agricultores foram as estratégias de desestruturação debatidas no artigo.

O artigo de Silva objetiva apresentar os aspectos políticos e institucionais que contribuem ou não para o financiamento de políticas de biodiversidade no âmbito do governo federal de 2000 até 2019. Aplica a metodologia Biofin (*Biodiversity Finance Plan*) nas dimensões política e institucional. Demonstra a complexidade na produção da política de biodiversidade no Brasil. Ao final, aponta para uma interessante conclusão de que houve, em 2019, e com sinais de continuidade, na política de biodiversidade brasileira, uma redução da participação e engajamento social, uma perda de participação do Ministério do Meio Ambiente na condução dessa política e um afrouxamento dos instrumentos de comando e controle ligados a ela.

O artigo de Canal e Verdum, que finaliza este Dossiê, tem como proposta relatar e explorar as diversas dificuldades de implementação de ações de saúde ambiental na percepção de uma equipe multiprofissional de saúde ambiental de um município do Sul do Brasil. Destacou, por meio de

entrevistas, a perda dos saberes profissionais conduzidos pelos agentes de vigilância de saúde ambiental. Tais saberes perdidos ficaram configurados como elemento que compôs o desmantelamento de políticas ambientais no governo Bolsonaro.

Esperamos que este Dossiê possa contribuir para o aprofundamento do debate teórico, metodológico e empírico do desmantelamento das políticas ambientais no Brasil.

Boa leitura!

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Policy change, dismantling and environmental protection in Brazil

Mudança, desmonte de políticas e defesa do meio ambiente no Brasil

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ABSTRACT

This article investigates recent changes in the field of Brazilian environmental policy, exploring contributions from the international literature on policy dismantling as applicable to the Brazilian case. Federal environmental policy is analysed over four decades (1981-2021) in light of the structural characteristics of environmental policy from the perspective of dismantling as a process involving relative change, focusing on the trajectory of a specific policy. The systematic direction of the changes made to paralyse key activities and environmental legal enforcement, jeopardising areas and topics across the agenda during the 2016-2022 period, allows the characterisation of that ongoing process as the dismantling of environmental policy, extending to the entire environmental stewardship framework. There is a need to deepen investigations to understand the still-undetermined effects of this dismantling, such as their impact, the permanence of its effects in the medium term, and the spread of consequences beyond the environmental area, as well as its possible long-term impact on the democratic regime.

Keywords: Environmental policy. Policy dismantling. Brazil. Environmental stewardship.

RESUMO

Este artigo explora as mudanças ocorridas recentemente no campo da política ambiental no Brasil, testando contribuições da literatura internacional do desmonte de políticas ao caso brasileiro. A política ambiental, na esfera federal, é analisada ao longo de quatro décadas (1981-2021), à luz de características estruturantes do campo da política ambiental e, segundo a perspectiva do desmonte como um processo de mudança relativo, será analisada diante da trajetória de uma determinada política. A direção uníssona das mudanças e a paralisação de atividade-chave e do poder de polícia ambiental, que atingiu todas as áreas e temas da agenda no período 2016-2022, permitem a caracterização do processo como desmonte da política ambiental em curso, estendido a todo o campo da política ambiental. Há necessidade de aprofundamento da investigação para conhecer efeitos ainda indeterminados do desmonte, tais como permanência de efeitos em horizonte

temporal de médio prazo e irradiação de consequências para além da área ambiental, assim como suas relações com o regime democrático.

Palavras-chave: Política ambiental. Desmonte de políticas. Brasil. Controle ambiental.

1 INTRODUCTION

Throughout the 21st century, political changes motivated by economic crises and political inflexions in democratic regimes have revitalised the interest of researchers from different disciplines on policy change. One of the lines of research sought support in the literature on dismantling public policies, in which Bauer and Knill (2012) are one of the primary references.

In Brazil, several policy areas have been reconfigured by changes since 2010, driven by a complex combination of factors. In Brazil, several policy areas have been reconfigured by changes since 2010, driven by a complex combination of factors. This article aims to advance knowledge on recent changes in environmental policy by exploring contributions from the international literature on policy dismantling that may apply to the Brazilian case. To what extent do the changes that have occurred in Brazil's recent trajectory of environmental policy fit into the definitions of international academic literature on policy dismantling? What are their implications for environmental policies?

To answer these questions, we examined the structural characteristics of the environmental agenda, selected representative indicators of variations of these characteristics over time, and reviewed the trajectory of Brazilian environmental policy from 1981 to 2022.

We present the results in three sections in addition to this introduction. The second section reviews concepts and theoretical references from the international literature on policy dismantling, with an emphasis on the environmental area, and discusses specificities of the field of environmental policy that condition the qualification of policy changes. The third section presents the methodology used in the research. An analysis of the trajectory of the construction of environmental institutions and policy in Brazil is summarised in the fourth section. The fifth section presents an overview of these changes in light of the analytical categories related to the literature on policy dismantling and the variables adopted, conclusions and suggestions for further investigation.

2 THEORETICAL REFERENCES

2.1 DISMANTLING OF PUBLIC POLICIES AND ENVIRONMENTAL POLICY

According to Bauer and Knill (2012, 2014), *policy dismantling* corresponds to a particular type of change in the government's commitment to a specific policy sector, causing its reduction rather than expansion. To identify policy dismantling, it is necessary to consider wide sectors and the field as a whole of a specific policy, understood as the universe of legal and administrative activities related to a specific field of policy (BAUER; KNILL, 2014).

Dismantling is achieved through cuts, reduction, and removal of existing policy arrangements, as well as manipulation of implementation and supervisory capacities. (BAUER; KNILL, 2014; JORDAN *et al.*, 2013). Bauer and Knill (2012) identify four dismantling strategies: passive dismantling by inertia (by default), dismantling by symbolic action, arena shifting, and active dismantling. With regard to metrics, policy dismantling can be measured, according to these authors, through a reduction in the number of policy actions and instruments and a reduction in their substantial intensity, measured by policy output indicators.

Gravey and Jordan (2016) emphasise the importance of contextualising the study of dismantling a particular policy within a specific time perspective as a relative category in light of the trajectory of the policy and its possible directions: reduction, expansion, or continuation of the status quo.

Originating from the context of changes determined by economic and austerity political crises, only recently have studies on dismantling processes focused on those provoked by authoritarian dynamics (SÁ; SILVA, 2021). Bauer, Peters, and Pierre (2021) bring to the reflection on the bureaucratic systems of democratic regimes the emergence of illiberal populism and its radical reforms, offering a taxonomy of strategies for illiberal attacks on administration - structural transformations, resource redistribution, “purging” of personnel, passing illiberal legislation, and dismantling of accountability - and emphasising the importance of state capabilities, both from the perspectives of dismantling and of its resistance.

Environmental policy studies on policy dismantling can be found in international literature since around 2010. These studies address changes in the US under the Reagan and Bush Administrations associated with fiscal austerity and economic crises in the European Union or its members (KNILL *et al.*, 2009; KNILL *et al.*, 2011, 2012; KORTE and JORGENS, 2010) - sometimes focusing on a specific country or arrangement (in the case of GRAVEY and JORDAN, 2016, the European Union), or developing comparative studies involving several countries (such as in KNILL *et al.*, 2014).

The international literature on environmental policy dismantling highlights the importance of the regulatory nature of this policy and its vulnerability to change under circumstances where their benefits are difficult to quantify and diffuse to appropriate, facing off with vested groups with significant pressure power and an interest in reducing quality standards. Analyses were made of processes where the dismantling trend occurs through stasis and civil society organisations’ role in resisting environmental dismantling (BURNS *et al.*, 2019; KNILL *et al.*, 2016).

Pollex and Lenschow (2020) point out the possibility that environmental dismantling may occur even without changing regulations through biased or apathetic enforcement of established regulations, hiding the dismantling initiative from public view.

Regarding the metrics of environmental policy dismantling, relevant contributions include Knill *et al.* (2012) and Steinebach and Knill (2016), who propose a hierarchy of variables for analysing environmental policy dismantling, consisting of policy items, policy instruments, and policy settings. These authors reinforce the argument, already present in Bauer and Knill (2012), that analysis of environmental dismantling processes should cover the entire field of the policy or at least large sub-fields, as dismantling initiatives can occur simultaneously with both expansion and contraction movements.

2.2 ENVIRONMENTAL POLICY IN BRAZIL: CHARACTERISTICS

The particularities of environmental policy have been scrutinised in international literature since the 1990s, accompanying the worldwide expansion of this new policy established throughout the 1960s-1970s.

Environmental policy has several structuring characteristics¹. Amongst these, the variables with the most significant potential for trajectory analysis are the principles of environmental law as operationalised in policy instruments; the number of actors; the role of scientific knowledge and complexity; the environmental bureaucracy; the environmental agenda; and environmental control.

As an object of state protection, the environment is understood as a transindividual good, which corresponds to a new generation of rights (SILVA-SANCHEZ, 2000), bringing internationally-adopted

ordering principles, including the principles of sustainability, precaution, prevention, environmental damage, participation, polluter-pays, and non-regression or prohibition of retrogression (MACHADO, 2022). In particular, the prohibition of retrogression, considered a general principle of Environmental Law, is pertinent in evaluating the legality of legislative initiatives aimed at reducing the scope of environmental protection, especially of essential ecological processes, fragile ecosystems, and endangered species (BENJAMIN, 2012).

The actors involved in environmental policy are manifold and distinct according to the agenda theme, requiring the construction of participatory instances for designing and implementing environmental policies (CONNELY; SMITH, 2003; LAFFERTY; MEADOWCROFT, 1996).

Complexity and uncertainty are inherent characteristics of environmental processes (LAFFERTY; MEADOWCROFT, 1996) that highlight the role of accurate scientific knowledge and environmental bureaucracy. Environmental bureaucracy comprises the public officials responsible for formulating and implementing programs, projects, and environmental control. In addition to the ever-present complexity of administrative activities, several additional factors require environmental staff to develop diversified skills. The indeterminacy of environmental laws (AZUELA DE LA CUEVA, 2006) needs sophisticated capabilities for interpreting the norms and implementing decisions, content, and routines. Thus, environmental bureaucracy is responsible for analysing the content of a rule in each concrete circumstance (KRELL, 2004), highlighting critical discretionary powers to perform (among others) environmental risk assessment, expert appraisal, and applying the law to specific cases. Environmental policy depends on a qualified bureaucracy for its operationalisation.

Regarding the environmental agenda, the content of State action in the environmental defence could be more precise: the objects under its responsibility are not immediately identifiable. In Brazil, the definition of the environment as the object of State tutelage, formalised in 1981, refers to “the set of conditions, laws, influences, and interactions of physical, chemical, and biological nature that allows shelters and regulates life in all its forms” (Law 6938/1981, art. 3, I). In this formulation, the *relationships* factor is qualified as essential in its constitution, and as Silva (2009) points out: the object of State protection in the environmental field is the *quality* of the environment - understood as relations between environmental assets, sectoral elements, and systemic processes that determine the quality of life. This definition corresponds to a broad institutional agenda that, until the 1960s-1970s, involved only the preservation of untouched areas, conservation, and protection of natural resources.

From then on, the environmental agenda began to incorporate new themes, such as controlling air, water and soil pollution, regulating industrial activities, and establishing energy production and consumption standards. In the 1980s, control of potentially harmful activities was included in the legal framework. In the early 1990s, the so-called global environmental problems were enshrined in the second United Nations Conference on Environment and Development. At the same time, old themes were reconfigured, including sanitation and urban regulation (MEADOWCROFT, 2012). Currently, the environmental agenda is broader than ever, encompassing action in health and safety, energy, transportation, agriculture, food production, hazardous and radioactive waste, genetic heritage, the safeguard of ecological, geochemical, and geophysical systems responsible for providing ecosystemic services, patterns of production and consumption, and the multiple connections between local, national, and global issues - amongst which the protection of the ozone layer, climatic change, conservation of biodiversity, desertification control, biosafety, and protection of genetic heritage (VIG; KRAFT, 2019).

This broad collection of topics has at least one aspect in common: it is the responsibility of the State to establish the necessary conditions for environmental protection and management through public policies supported by legal enforcement. Environmental police power is defined as

the public administration activity that limits or disciplines rights, interests or freedoms, in sight of the public interest as regards the health of the population, the conservation of ecosystems, the regulation of economic production and trade, the enforcement of economic activities, and others activities dependent on concession, authorisation, permission or license from the Public Power for activities from which pollution or aggression of nature may ensue (MACHADO, 2022, p. 398).

Its enforcement comprises a broad and interconnected set of procedures known as “environmental control” which includes requirements, bans, limiting and sanctioning regulations, police orders and oversight, inspection, and sanctions.

The best-known environmental control activities are environmental licensing and oversight, established in Brazil in the 1980s. However, it is not limited to these activities. The enforcement of environmental policing requires several additional instruments, including registries of potentially harmful companies and activities and their controlling parties; the definition of environmental standards; the elaboration and publication of environmental impact assessment; the monitoring of environmental processes and assets; supervisory oversight – both for licensing and otherwise – the application of administrative sanctions, and the publication and divulging of this information. Environmental police power is needed in all policy strategies for control, inspection, and administrative sanctioning. (MACHADO, 2022).

The competent environmental authority carries out licensing in a process that includes several licenses corresponding to phases in a project, dependent on case-by-case assessments of the environmental impacts, the public divulgation of these reports (Rimas – *Relatório de Impacto Ambiental*, Environmental Impact Reports), and the holding of open public hearings. Environmental licenses are, by definition, temporary and regularly renewed. Benchmarks and requirement levels are established for the implementation and operation of projects, which requires the building of State capacities to provide such monitoring, parameter-compliance enforcement, and levying of sanctions (MACHADO, 2022).

Environmental quality standards are established in resolutions issued by the National Council for the Environment (Conama – *Conselho Nacional do Meio Ambiente*), which regulates acceptable emission levels of pollutants and contaminants in the atmosphere, soil, and bodies of water employing emission standards (which establish values for the maximum allowed discharge levels), quality standards (which define conditions for an environment’s normality), and performance standards.

The first mandatory registration of impactful activities, created in 1981, was the Federal Technical Register of Activities, under the responsibility of the Brazilian Institute for the Environment and Renewable Natural Resources (Ibama – *Instituto Brasileiro de Meio Ambiente e Recursos Naturais Renováveis*). Currently, there are other types of registry and licensing, such as the Rural Environmental Registry (CAR – *Cadastro Ambiental Rural*), which is considered a key instrument for controlling and monitoring forestry resources (PIRES, 2014).

Disciplinary or compensatory penalties for non-compliance with these measures aim to regulate and ensure the enforcement of the established environmental protection standards. Where impacts cannot be mitigated, compensatory measures aim to repair environmental damages.

3 METHODOLOGICAL REFERENCES

The approach adopted in the present research is qualitative and exploratory. The focus of the investigation is the evolution of environmental policy in Brazil at the federal government level in the 1981-2022 period.

Information was collected through a bibliographic review of international academic literature on policy dismantling, a normative summary of Brazilian environmental regulation, and a review of documents produced by government agencies and think tanks of civil society organisations on changes in Brazilian environmental policy.

The environmental policy's trajectory was analysed through the federal regulations established over the period - considering that regulations are representative of policy outputs. Constitution articles, complementary constitutional laws, ordinary laws, and administrative acts (decrees, ordinances, and resolutions) were examined. The regulations were classified as *systemic* regulations, which deal with the environment as an object of State protection, and *sectoral* regulations, which affect Federal environmental protection organisations, environmental components, activities that affect the environment, and environmental policy instruments. The systems and organisations considered in detail were the National Environmental System (Sisnama – *Sistema Nacional de Meio Ambiente*), the Federal District Attorney (MPF – *Ministério Público Federal*), the Brazilian Institute of Environment and Renewable Natural Resources (Ibama – *Instituto Brasileiro de Meio Ambiente e Recursos Naturais Renováveis*), the Ministry of the Environment (MMA – *Ministério do Meio Ambiente*), and its agencies, in particular the Brazilian Forest Service (SFB – *Serviço Florestal Brasileiro*), the National Council for the Environment (Conama – *Conselho Nacional de Meio Ambiente*), the National Water Resources Council (CNRH – *Conselho Nacional de Recursos Hídricos*), the Deliberative Council of the National Environment Fund (FNMA – *Fundo Nacional do Meio Ambiente*), the Chico Mendes Institute for Biodiversity Conservation (ICMBio – *Instituto Chico Mendes de Conservação da Biodiversidade*), and the National Water Agency (ANA – *Agência Nacional de Águas*).

Regarding the environmental components, activities, and policy instruments, the examined regulations comprised those for the protection and management of forests, air, and water, protection of biomes, water resources, cities, dam safety, pesticide use, mining, the national system of conservation units, coastal zones, energy, environmental impact prior studies, environmental licensing, environmental zoning, administrative violations, civil liability and damage remedies, environmental crime, pollution control, and oversight of potentially impactful activities.

The regulations were manually sorted into three analytical profiles. The first are the constitutional and infra-constitutional provisions, considered structural– providing the framework of Federal environmental stewardship policy and governing institutional arrangements - and sectoral provisions. The second profile included regulations representing milestones in policy trajectory, whether advancing and consolidating a particular direction or representing a turning point, as per Gravey and Jordan (2016), who propose analysing dismantling processes through inflexions in policy trajectories (expansions, continuations, or contractions). In the third profile, changes were organised according to seven variables corresponding to structural characteristics in the environmental policy. These are: (i) policy principles and objectives, in particular the prohibition of retrogression; (ii) federal organisations, as indicators of the status of institutional arrangements; (iii) social participation and transparency instruments, as indicators of public participation and adequate information publication; (iv) status of the environmental bureaucracy, a sensitive variable when exercising environmental control and defining dismantling (JORDAN *et al.*, 2013); (v) implementation instruments, focusing on environmental control; (vi) legal instruments, and (vii) policy financing, a variable here treated exploratorily.

It was assumed in this study that the *environmental* control variable represents the ability to enforce environmental law simultaneously across all thematic areas. Thus, environmental control variations were considered to affect the field of environmental policy as a whole to analyse changes.

4 RESULTS: ENVIRONMENTAL POLICY IN BRAZIL, FROM EXPANSION TO DISMANTLING

4.1 INSTITUTIONS AND THE EXPANSION OF ENVIRONMENTAL POLICY

In Brazil, institutional factors have combined to generate a unique profile in the field of environmental policy as an area for State action. Among these factors are the ordering principles of environmental law, understood as structuring norms within a system of norms (SILVA, 2009). Within a short period, over the 1980s, three essential qualifications were established for delimiting the state's role in environmental protection, formalising environmental assets as public goods, and therefore subject to State action and protection. These are the qualifications of the environment being a *common good of the people*, a *public heritage*, and a *diffuse interest asset*, establishing the foundations for protecting the environment as a *stricto sensu* object of State protection (NEVES, 2015).

In 1981, the institution of the National Environmental Policy (PNMA – *Política Nacional de Meio Ambiente*) - Law 6938/1981 - inaugurated this new policy area. The environment was recognised as a *diffuse interest* asset under the protection of the Public Ministry (public prosecution service) in 1985 (the Public Civil Action Law 7347/1985), these norms being raised to Constitutional articles in the 1988 Federal Constitution (in articles 23, 24, 30, 129, 149 and 225). The control of polluting and potentially damaging activities is structured in a system that integrates oversight and inspection, application of administrative sanctions, and the registry and licensing of potentially polluting activities. Conama regulates environmental policy instruments, including the licensing system for all potentially harmful activities and setting air quality standards and freshwater classification levels.

In this new public policy field, the systemic environmental norms that began being created in the 1980s were articulated with prior legal structures that focus on environmental assets, individually considered, corresponding to different political and philosophical frameworks, such as the Freshwater Code (1934) and the second Forestry Code (1965, substituted in 2012). Thus, a unique combination of legal and institutional regimes was built for the several environmental assets within the new policy field.

In the late 1980s, Ibama was created to enforce environmental law, and finally, the Ministry of the Environment was established in 1992. In the following decade, Ibama would be subdivided into two more environmental agencies, SFB, responsible for public forestry, and ICMBio, to run conservation units and oversee policies for the sustainable use of renewable natural resources.

Throughout the 1990s and 2000s, environmental policy expanded, consolidating the environmental licensing system and expanding its agenda through the establishment of the freshwater resource management system (1997), the regulation of environmental infractions in the penal code (1998), and the systematisation of categories of protected areas under the National System of Conservation Units (Snuc) in 2000. In the first decade of the 21st century, the arsenal of environmental policy instruments was strengthened by the Statute of the Cities (Law 10.257/2001), and successful strategies such as those consolidated in the Plan for Prevention and Control of Deforestation in the Amazon (PPCDAm) in 2004. The public forest management policy regulated private concessions for economic production in 2006. Conservation units were created and biome protection instruments implemented - Atlantic Rainforest and the Amazon - and initiatives to depollute and revitalise river basins multiplied. The provisions in international conventions which Brazil joined, such as climate conventions (2009), desertification prevention, and biodiversity conservations (2015), were enshrined in national law.

More pronouncedly, from 2010 onwards, vested interests in the National Congress started to interfere with this expansion trajectory, promoting initiatives to destabilise the institutional architecture through the reform of environmental regulations (NEVES, 2016). Examples of this reaction, which would

become notably more robust in the following years, were the revocation of the 1965 Forestry Code in 2012, the weakening of the PPCDAm after 2013, the construction of the Belo Monte Hydroelectric Plant, and Amendment PEC proposal 65/2012 (sponsored by senator Acir Gurgacz, PDT-RO) the first initiative in environmental licensing dismantling at the constitutional level.

In 2015, the package of measures known as *Agenda Brazil* proposed to simplify environmental licensing and expedite the issuance of licenses through the flexibilisation of environmental regulations, and Senate bill PLS 654/2015 (authored by former senator Romero Jucá (PMDB-RR)) proposed flexibilisation through the creation of a ‘special environmental licensing’ for projects considered strategic (BARCELOS, 2020).

4.2 ENVIRONMENTAL POLICY 2016-2021: THE DECONSTRUCTION OF ENVIRONMENTAL INSTITUTIONALISM AS A GOVERNMENT POLICY²

From 2016 onwards, the destabilisation of the environmental area was deepened through the reduction of federal spending, especially on environmental control, the abandonment of the PPCDAm, and the advancement of proposals to loosen even further the environmental licensing system. In 2017 two provisional measures strove to reduce conservation areas, presidential executive orders MP 756 and 758. Several other initiatives were articulated in the National Congress to allow resource exploitation and mining on indigenous lands, which are essential protected areas. Proposals for weakening environmental licensing gained traction in the Legislative. In 2018, candidate Jair Bolsonaro included the deconstruction of environmental policy among his campaign promises.

In January 2019, President Bolsonaro made the environmental policy a top priority following his electoral promises, promoting drastic changes from the first days of the new Administration.

The organisational arrangement for the environment was disfigured by eliminating several federal agencies and transferring attributes and duties to unrelated departments, effectively reducing the operational competencies of the environmental area. In the Ministry of the Environment, administrative units responsible for promoting environmental education and fighting deforestation, such as the Secretary for Climate Change and Forests, were eliminated. The entire freshwater resource management system was also lost - including ANA, CNRH, and the National Secretary for Freshwater Resources and Water Quality (SRHQ), reassigned to the Ministry of Regional Development (MDR). At the Ministry of Foreign Affairs (MRE), the instance responsible for climate policy was eliminated. The Brazilian Forestry Service (SFB) and the Rural Environmental Registry (CAR) were reassigned to the agricultural sector, losing the duty to manage public forests. The National Environment Council (Conama) had its composition and size reduced³. In May 2020, Ibama’s enforcement actions in the Amazon started being coordinated by the Ministry of Defense.

Regarding instances of Civil Society participation, and public transparency, the “great revocation” started in April 2019 affected all federal public administration advisory boards, restructured or eliminated over half of the 22 national advisory boards associated with socio-environmental policies (IMAFLORE *et al.*, 2021). In May 2019, Conama was restructured, reducing the number of civil society representatives⁴. Civil society representatives were excluded from CNRH, the National Biodiversity Commission (Conabio), and the Deliberative Council of the National Environment Fund (FNMA).

Transparency of information on the status of the environment and government action was eliminated: information on programs and projects was removed from the MMA website; censorship was imposed on the institutional communication by Ibama and ICMBio⁵. Pressure to interfere with environmental information disclosure, such as the traditional publication of deforestation rates by the National Institute for Space Research (Inpe), increased. In 2020, the government centralised communication from environmental agencies and decreed that all processes were henceforth confidential. This

strategy combining censorship, intimidation, and discrediting, initially focused on environmental authorities, civil society organisations, and subsequently, the mainstream media.

Regarding implementing activities, environmental controls were drastically reduced by inhibiting oversight inspections, stopping the collection of fines by creating a ‘conciliation’ instance, and disorganising the environmental bureaucracy with the competence to enforce the law. The fines levied for crimes against the flora applied by Ibama in the Amazon in 2019 (2,534) was the lowest in two decades - a 40% drop from 2017-2018. Environmental fines applied after October 2019 stopped being collected after an executive order mandated the so-called “conciliation” of fines (OBSERVATÓRIO DO CLIMA, 2022). Ibama and ICMBio were practically paralysed across the country from the new Administration’s first year: State superintendencies were kept vacant, as were agency director positions; oversight inspection teams were decimated; managers lacking any technical qualifications whatsoever or previous experience in the area, such as military staff.

The remaining environmental bureaucracy responsible for critical activities, including licensing, and monitoring programs such as deforestation control and conservation unit management, fell victim to harassment and intimidation. Proposed reforms were put forward to nullify the environmental licensing system (Bill 3729/2004 and its appendices and substitutes). According to both researchers and civil organisation experts, this bill annihilates the current licensing system by dispensing licenses for several impactful projects indiscriminately; delegating regulation to subnational entities - including dispensing with licensing inspections to enable simple self-disclosure in license applications; limitations on environmental requirements, exemptions from compliance with subnational legislation, restrictions on the application of freshwater resource regulations; elimination of impact assessments on Indigenous lands that were still not fully demarcated and *Quilombola* lands that were still not fully titled, and in Conservation Units; elimination of Impact Analyses on human health; elimination of Strategic Environmental Assessments, amongst others (OBSERVATÓRIO DO CLIMA *et al.*, 2021).

The allocation of expenses and management of resources for the environmental sector deepened the paralysis of environmental control and environmental planning activities. From 2019 to 2021, expenses for personnel and “on-the-ground” direct discretionary spending were reduced. In 2021, personnel expenses in the environment sector summed R\$ 1.99 billion, representing 71% of the total executed (compared to 65% in 2019), while direct discretionary spending was around R\$ 620 million, only 25% of the allocable (INESC, 2022)⁶. In 2021, the executed budget for the environment represented less than 25% of the total allocated funds in the so-called Congress “Secret Budget” (INESC, 2022). International funding, such as from the Amazon Fund, was paralysed due to the extinction of the Amazon Fund Steering Committee (Cofa – *Comitê Orientador do Fundo Amazônia*) and the Amazon Fund Technical Committee (CTFA, *Comitê Técnico do Fundo Amazônia*) in April 2019. The National Fund for Climate Change steering committee was also dissolved in the so-called “great revocation” of 2019.

As for the legal instruments used to effect these changes, during the first two years of the Administration, the relaxation of norms and standards for the environmental policy was promoted through infra-legal orders issued by the Executive coupled with the disruption of programs and suspension of funds, such as in the climatic area (the Climate Fund and the Amazon Fund). In 2021, an alliance between the Executive and the Congress Speaker exponentiated the promotion of these changes through law bills, giving new impetus to even more disruptive change beyond the already ongoing process of licensing deregulation. That year, deregulation advanced on Permanent Preservation Areas (APPs) in urban areas, allowing municipal executives to dispose of APPs in sensitive areas, including riverbanks, hilltops, sandbanks, and mangroves in urban areas⁷.

The aforementioned measures expressed the abandonment, by the then ongoing federal Administration, of the principles and objectives of the environmental policy until then systematically established in the constitutional sphere. In response, numerous actions questioning the Breach of

Fundamental Precept (ADPF) were sued in the Federal Supreme Court (STF) (such as ADPF # 651, 708, and 760) and direct Actions of Unconstitutionality by Omission (ADO) (such as ADO # 54 and 59).

5 CONCLUSIONS AND EXPLORATORY CLUES

The research analysed the trajectory of Brazilian environmental policy to test the contribution of analytical categories from the literature on dismantling policies to the Brazilian case. The results presented in the previous section reveal that the theoretical contributions of the literature on dismantling, including dismantling in the environmental field, are useful for interpreting the process experienced in Brazil.

The trajectory of expansion of the environmental policy and consolidation of its instruments and programs thrived unabated for three decades until the beginning of the 2010s. From then on, changes promoted the destabilisation of important sectors of the environmental policy agenda and institutional framework, paving the way for the drastic inflections that occurred from 2019 on, which imposed a rupture in the identifiable trajectory.

The environmental policy dismantling process is expressed in the coordinated direction of changes to reduce and extinguish policies and capacities, withdrawing from the State the guardianship of the environment. The same sense of reduction and extinction is found in all seven environmental policy variables analysed. The principles and objectives of policy were disregarded, particularly the principles of non-regression, public participation, and information transparency. State organisations were destabilised. Social participation was inhibited by the exclusion of civil organisations from advisory committees. The environmental control sector was distorted: some regulations were simply disregarded, while others were interpreted deviantly in opposition to the constitutional provisions regarding the environment. Harassment of environmental officers and bureaucratic organisations has at least partially inhibited the enforcement of regulations by remaining staff, directly affecting policing capabilities. The suspension of funding deepened the challenges of maintaining operational environmental policy enforcement.

According to Gravey and Jordan (2016), understanding policy dismantling as a process, part of the undertaken actions effectively corresponded to neutralising State guardianship of most areas of the environmental agenda, at least temporarily, including climate change and biodiversity protection. Other actions significantly reduced the scope of protection and disorganised State action, however without achieving its definitive extinction in this period.

At least two factors are outstanding among the causes of the government's failure to annihilate the instruments of environmental defense. The first is the systemic character of the institutional architecture of environmental policy in Brazil, grounded in the Federal Constitution, which allows the intervention of the Federal Supreme Court. The second factor is the crucial role played by civil society organisations, which played an invaluable role in resisting harmful changes to environmental protection, acting on several fronts, such as registration and documentation of the dismantling, public civil actions against the damage resulting from the dismantling, mobilisation of national and international public opinion.

Not all aspects of the process experienced in Brazilian environmental policy find references in the international literature on policy dismantling. The process experienced in Brazilian environmental policy has singularities that distinguish it from some theoretical propositions in the international literature, such as the hypothesis that dismantling in the environmental area would occur disguisedly (POLLEX, LENSCHOW, 2020). During the Bolsonaro Administration, dismantling was widely publicised as a political objective, corresponding to the government's intention, as repeatedly expressed: to deregulate, weaken, and eliminate policy instruments; to reduce the scope and competencies of

environmental policy. Additional theoretical contributions are necessary to analyse the motivations of environmental dismantling in environments of reactionary populism and authoritarianism, considering the hypothesis that the dismantling of the environmental area can be associated with the erosion of democracy, as studied by Britto *et al.* (2022) among others.

The frontal disregard for constitutional provisions regarding the environment reveals an unprecedented pattern of behavior by the federal Executive, expressed in initiatives tentatively grouped into three categories: the perverted enforcement of environmental duty; incentive of perverse behavior; and dissemination of misinformation to justify environmental misrule. Under the scope of this research, it was only possible to exploratory recognise and describe this pattern, whose systematic study should be developed in further detail in future studies.

The first aspect, the perverted enforcement of environmental duty, can be exemplified by the intentional reduction of inspection and oversight activities and the cessation of the collection of levied fines. On the legislative level, this aspect was expressed as executive order MP 1040/2021, which authorised automatic permits for medium-risk enterprises, and the order that changed the composition of the Deliberative Council of the National Environment Fund (FNMA) - both declared unconstitutional by the Supreme Court in 2022.

The second aspect, the encouragement of perverse behavior, is evident in statements of vocal support for the invasion of Indigenous Lands and the practice of mining in protected areas, publicly disavowing environmental officers attempting to perform their duties, such as lead oversight inspectors being fired after operations against gold mining on indigenous lands in Pará that resulted in the destruction of scores of units of heavy equipment used by criminals. Within the State apparatus, this attitude caused fatigue among the oversight bodies. Among the population, this behavior undermined trust in environmental law and environmental enforcement agents and officers, fostering disrespect for these agents and institutions, incentivising environmental crime by third parties, and approaching incitement to crime.

The third aspect, the dissemination of misinformation, may be illustrated by the president's statements about threats to national sovereignty in the Amazon region, initiatives to discredit INPE, and physicist Ricardo Galvão its director, responsible for monitoring and publishing deforestation data, stating that the agency was "serving some NGO" (OBSERVATÓRIO DO CLIMA, 2020), and also promoting biased indicators to justify forestry policy decisions (RAJÃO *et al.*, 2021); vocally disparaging and disqualifying scientific knowledge, qualified technicians, and experts of recognised international expertise.

Noting the environmental dismantling process raises several questions about its implications, which are becoming increasingly important in the research agenda. To what extent has environmental policy been dismantled? At what stage in the dismantling process do environmental institutions find themselves? Which parties benefited most from these dismantling initiatives? What was the importance of resistance processes in this environmental dismantling? How are the actors who support the environmental dismantling project organised? What are the conditions for a change toward reconstruction? Are all negative changes reversible? Were there any irreversible changes? What are the effects and costs of this dismantling? Research on the Brazilian case will provide valuable contributions to these questions.

The impact of the dismantling initiatives implemented to date is yet to be quantified, even though some consequences are already clearly observable and easily quantifiable. Little is as yet known about the duration of the impacts of dismantling. Even if the new Administration inaugurated in January 2023 suspends the dismantling process and dedicates itself entirely to the reconstruction of environmental policy, there are consequences of this period capable of reverberating beyond when the dismantling experience was in effect. By intentionally transgressing the constitutional boundaries that underpin policy, trying to delegitimise the environmental constitutional order and its infra-constitutional

architecture, that government behavior - temporarily qualified in this research as a perverse pattern of exercise of duty/power - seems to have harmed the democratic regime itself, eroding the credibility of State action in the environment among the population. The erosion of credibility with the population and the recovery of its confidence in the normative power deserve a thorough investigation of effects, mechanisms, and prospects.

The behavior of certain protagonists deserves in-depth analysis. From one aspect, the environmental bureaucracy (exponents in the scientific community and organised civil society) played an invaluable role in resisting dismantling. From another perspective, without parliamentary support, it would be impossible to destabilise and change the regulations enshrined in federal laws, as was the case as regards the use of hazardous pesticides. A coalition intent on environmental dismantling is well structured in Congress - and intends to continue to actively participate in the environmental arena.

Finally, it is essential to investigate the role of subnational administrations in the process of dismantling and resistance, an aspect not addressed in this research. It should be noted that, according to the federative structure and constitutional attributions, the actions of subnational administrations are relevant and indispensable; they certainly played an important role in resisting dismantling, at least in some areas of the environmental agenda, such as climate change.

NOTES

1| The characterisation of environmental policy uses contributions by Azuela de la Cueva (2006), Connelly e Smith (2003), Dobson (1996), Downs (1978), Durant (2004), Fiorino (1995), Frey (2000), Janicke (1996), Kraft (2001), Ostrom (1994), Paehlke (1996, 2002, 2004), Steel, Clinton and Lovrich (2003), Sterner (2003), Vig and Kraft (2003).

2| This section elaborates on the bibliography from academia, and civil organisation think tanks, which performed extraordinary work to monitor environmental actions during the period studied. Worthy on note was the work by Araújo (2020); Araújo and Herschman (2021); Capelari (2020); Greenpeace, Brazil (2021); Greenpeace, Brazil (2022); Imaflora, Article 19 and Socio-Environmental Institute (2021); Institute of Socioeconomic Studies - Inesc (2021 and 2022); Greenpeace, Democracy and Sustainability Institute and Society Institute, Population and Nature (2020); Minc, C. *et al.* (2021); Observatório do Clima (2020, 2021, 2022); SOS Mata Atlântica, WWF Brazil (2021); Talanoa Institute (2022); Observatory of the Forest Code and Institute for Research on the Amazon - Ipam (2021).

3| This measure, promoted by Decree 9759 of 11/04/2019, was later reversed by the Supreme Court.

4| In December 2021, the Supreme Court suspended this measure, within the scope of the ADPF 623, valid until the STF plenary of 2022.

5| Executive Order 560/2020 determined that any contact with the press needs to be mediated by the communication advisory and that the leads needed to report any attempt to contact journalists directly.

6| Values corrected by the IPCA December 2021.

7| Preservation Areas (APPs) in urban areas, allowing municipal executives to dispose of APPs in sensitive areas, including riverbanks, hilltops, sandbanks, and mangroves in urban areas

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Mudança, desmonte de políticas e defesa do meio ambiente no Brasil

Policy change, dismantling and environmental protection in Brazil

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ARTICLE- DOSSIER

RESUMO

Este artigo explora as mudanças ocorridas recentemente no campo da política ambiental no Brasil, testando contribuições da literatura internacional do desmonte de políticas ao caso brasileiro. A política ambiental, na esfera federal, é analisada ao longo de quatro décadas (1981-2021), à luz de características estruturantes do campo da política ambiental e, segundo a perspectiva do desmonte como um processo de mudança relativo, será analisada diante da trajetória de uma determinada política. A direção uníssona das mudanças, a paralisação de atividade-chave e o poder de polícia ambiental, que atingiu todas as áreas e temas da agenda no período 2016-2022, permitem a caracterização do processo como desmonte da política ambiental em curso, estendido a todo o campo da política ambiental. Há necessidade de aprofundamento da investigação para conhecer efeitos ainda indeterminados do desmonte, tais como permanência de efeitos em horizonte temporal de médio prazo e irradiação de consequências para além da área ambiental, assim como suas relações com o regime democrático.

Palavras-chave: Política ambiental. Desmonte de políticas. Brasil. Controle ambiental.

ABSTRACT

This article investigates recent changes in the field of Brazilian environmental policy, exploring contributions from the international literature on policy dismantling as applicable to the Brazilian case. Federal environmental policy is analyzed over four decades (1981-2021) in light of the structural characteristics of environmental policy from the perspective of dismantling as a process involving relative change, focusing on the trajectory of a specific policy. The systematic direction of the changes made to paralyze key activities and environmental legal enforcement, jeopardizing areas and topics across the agenda during the 2016-2022 period, allows the characterization of that ongoing process as the dismantling of environmental policy, extending to the entire environmental stewardship framework. There is a need to deepen investigations to understand the still-undetermined effects of this dismantling, such as their impact, the permanence of its effects in the medium term, and the

spread of consequences beyond the environmental area, as well as its possible long-term impact on the democratic regime.

Keywords: Environmental policy. Policy dismantling. Brazil. Environmental stewardship.

1 INTRODUÇÃO

Ao longo do século XXI, mudanças políticas motivadas por crises econômicas e inflexões no cenário político em regimes democráticos revitalizaram o interesse de pesquisadores de diferentes disciplinas sobre o tema da mudança de política. Parte dessas pesquisas buscou apoio na literatura sobre desmonte de políticas públicas, na qual Bauer e Knill (2012) é uma das principais referências.

No Brasil, diversas áreas de política foram reconfiguradas por mudanças a partir de 2010, impulsionadas por uma complexa combinação de fatores. Este artigo se propõe a contribuir para o avanço do conhecimento sobre as mudanças ocorridas recentemente no campo da política ambiental no Brasil, testando contribuições da literatura internacional sobre desmonte de política ao caso brasileiro no campo ambiental. Em que medida as mudanças ocorridas na trajetória recente da política ambiental no Brasil se enquadram nas definições da literatura acadêmica internacional sobre desmonte de políticas? Quais seriam as implicações para as políticas públicas ambientais?

Para obter respostas a essas perguntas, foram analisadas características estruturantes da agenda ambiental, indicadores representativos das variações dessas características ao longo do tempo e promovida uma revisão da trajetória da política ambiental brasileira no período 1981-2022.

Os resultados são apresentados em três seções, além desta introdução. Na segunda seção, são revistos conceitos e referências teóricas da literatura internacional sobre desmonte, com ênfase na área ambiental, e discutidas especificidades do campo da política pública de defesa ambiental que condicionam a qualificação das mudanças de política. Na terceira seção é apresentada a metodologia utilizada na pesquisa. A análise da trajetória da construção da institucionalidade ambiental no Brasil está sintetizada na quarta seção. Na quinta seção é apresentado um balanço das mudanças à luz das categorias analíticas da literatura sobre desmonte e das variáveis adotadas, conclusões e pistas para o aprofundamento da investigação.

2 REFERÊNCIAS TEÓRICAS

2.1 DESMONTE DE POLÍTICAS PÚBLICAS E POLÍTICA AMBIENTAL

Segundo Bauer e Knill (2012, 2014), o desmonte de política corresponde a um tipo particular de mudança no comprometimento governamental em um determinado setor de política, cuja direção aponta para a redução e não para a expansão. Para efeitos de identificação de desmonte, há que se considerar grandes setores e também todo o campo de uma determinada política, assim entendido como todo o universo das atividades legais e administrativas que estão relacionadas a um determinado campo de política (BAUER; KNILL, 2014).

O desmonte se concretiza por meio de cortes, redução e remoção de arranjos das políticas existentes, além de manipulação das capacidades de implementação e supervisão (BAUER; KNILL, 2014; JORDAN *et al.*, 2013). São identificadas por Bauer e Knill (2012) quatro estratégias de desmonte: desmonte passivo por inércia (*default*), desmonte simbólico, transferência de área e desmonte ativo. No que diz respeito à métrica, o desmonte de políticas pode ser expresso, segundo esses autores, por redução do

número das ações e de instrumentos da política e redução de sua intensidade, medida por meio de indicadores de resultados (*outputs*) de políticas.

Gravey e Jordan (2016) destacam a importância da contextualização do estudo do desmonte de uma determinada política em perspectiva temporal, como uma categoria relativa à luz da trajetória da política e das suas possíveis direções: redução, expansão ou continuação do *status quo*.

Nascidas no contexto de mudanças provocadas por crises econômicas e políticas de austeridade, apenas recentemente as pesquisas sobre desmonte se debruçaram sobre processos provocados por dinâmicas autoritárias (SÁ; SILVA, 2021). Bauer, Peters e Pierre (2021) trazem para a reflexão sobre sistemas burocráticos de regimes democráticos a emergência de populismo iliberal e suas reformas radicais, oferecendo uma taxonomia de estratégias de ataques iliberais à administração – transformações estruturais, redistribuição de recursos, “domesticação” de pessoal, edição de normas iliberais e desmantelamento da capacidade de prestação de contas (*accountability*) – e sublinhando a importância das capacidades estatais, tanto na ótica do desmonte quanto na da resistência.

Desde 2010 são encontradas pesquisas no campo da política ambiental na literatura internacional sobre desmonte de políticas. Trabalhos abordam as mudanças nos EUA nos governos Reagan e Bush, processos associados a austeridade fiscal e a crises econômicas na União Europeia e nos países a ela pertencentes (KNILL *et al.*, 2009; KNILL *et al.*, 2011, 2012; KORTE; JORGENS, 2010), em pesquisas que ora se debruçam sobre um determinado país ou arranjo (no caso de GRAVEY; JORDAN, 2016, a União Europeia) ora desenvolvem estudos comparativos envolvendo diversos países (tais como em KNILL *et al.*, 2014).

A literatura internacional sobre desmonte de política ambiental destaca a importância do caráter regulatório da política e sua vulnerabilidade à mudança em circunstâncias nas quais benefícios são de difícil quantificação e apropriação difusa, face a interesses de grupos com grande poder de pressão e interesse em reduzir padrões de qualidade. São analisados processos em que a tendência ao desmonte ocorre via estagnação (*stasis*) e o papel das organizações da sociedade civil na resistência contra desmontes na área ambiental (BURNS *et al.*, 2019; KNILL *et al.*, 2016).

Pollex e Lenschow (2020) apontam a possibilidade de que o desmonte na área ambiental pode ocorrer sem mudança de regulações, por meio da implementação tendenciosa de regulações já estabelecidas, escamoteando do público a iniciativa de desmonte.

Quanto a métricas de desmonte na área ambiental, contribuições relevantes, como Knill *et al.* (2012) e Steinebach e Knill (2016), propõem uma hierarquia de variáveis de análise do desmonte de políticas ambientais, composta por itens de políticas, instrumentos de política e configurações de política (*policy settings*). Esses autores reforçam o argumento, já presente em Bauer e Knill (2012), segundo o qual a análise de processos de desmonte na área ambiental deve abranger todo o campo da política ou grandes subcampos, uma vez que iniciativas de desmonte podem ocorrer simultaneamente a movimentos de expansão e contração.

2.2 POLÍTICA AMBIENTAL NO BRASIL: CARACTERÍSTICAS

As particularidades da política ambiental têm sido exploradas na literatura internacional desde os anos 1990, acompanhando a expansão da nova política surgida ao longo das décadas de 1960-1970 em todo o mundo.

São diversas as características estruturantes da política ambiental¹. Entre elas, são potencialmente úteis, para análise de trajetória, variáveis sobre os princípios do direito ambiental operacionalizados em

instrumentos de política, a quantidade de atores, o papel do conhecimento científico e a complexidade, além da burocracia, agenda e controle ambientais.

O objeto de tutela estatal, o meio ambiente, é entendido como um bem transindividual, que corresponde a uma nova geração de direitos (SILVA-SANCHEZ, 2000), correspondente a princípios ordenadores adotados internacionalmente, tais como os princípios da sustentabilidade, da precaução, da prevenção, da reparação, da participação, do poluidor-pagador e o da não regressão ou proibição de retrocesso (MACHADO, 2022). Em particular, a proibição de retrocesso, considerado princípio geral do Direito Ambiental, é pertinente na avaliação da juridicidade de iniciativas legislativas destinadas a reduzir o patamar de tutela legal do meio ambiente, especialmente para processos ecológicos essenciais, ecossistemas frágeis ou à beira de colapso e espécies ameaçadas de extinção (BENJAMIN, 2012).

Os atores envolvidos no campo da política ambiental são numerosos e distintos segundo o tema da agenda, exigindo a construção de instâncias participativas na formulação e implementação das políticas ambientais (CONNELY; SMITH, 2003; LAFFERTY; MEADOWCROFT, 1996).

A complexidade e a incerteza são características dos processos ambientais (LAFFERTY; MEADOWCROFT, 1996) que dão relevância ao papel do conhecimento científico e da burocracia ambiental. A burocracia abrange os funcionários públicos responsáveis pela formulação e implementação de programas, projetos e pelo controle ambiental. Além da complexidade sempre presente das atividades administrativas, mais fatores exigem que o corpo de funcionários ambientais tenha habilidades diversificadas. A indeterminação da norma ambiental (AZUELA DE LA CUEVA, 2006) exige sofisticadas capacidades para sua interpretação e transformação em decisões, conteúdos e rotinas. Assim, a burocracia ambiental é responsável por interpretar, em cada circunstância concreta, o conteúdo da norma e exigir capacidades complexas (KRELL, 2004), destacando-se importante poder discricionário para (entre outros) avaliação de riscos ambientais, apreciação pericial e adaptação da lei a casos concretos. A política ambiental depende dessa burocracia qualificada para sua operacionalização.

Quanto à agenda ambiental, à primeira vista o conteúdo da ação estatal na defesa ambiental é impreciso: não são claramente identificáveis os objetos sob sua responsabilidade. No Brasil, a definição de meio ambiente como objeto da tutela do Estado, formalizada em 1981, refere-se ao *“conjunto de condições, leis, influências e interações de ordem física, química e biológica que permite, abriga e rege a vida em todas as suas formas”* (Lei n. 6938/1981, art. 3º, I).

Nessa formulação, o fator *relações* é qualificado como essencial na sua constituição e, como aponta Silva (2009): o objeto de tutela estatal no campo ambiental é a qualidade do meio ambiente, entendido como relações entre bens, elementos setoriais e processos que determinam a qualidade da vida.

Essa definição corresponde a uma ampla agenda institucional que, até os anos 1960-1970, envolvia essencialmente a preservação de áreas intocadas, a conservação e proteção dos recursos naturais. A partir de então, a agenda ambiental passa a agregar novos temas, como controle da poluição do ar, da água e do solo, controle das atividades industriais e estabelecimento de padrões de produção e consumo de energia.

Nos anos 1980, é incorporado o controle das atividades potencialmente impactantes e, no início dos anos 1990, os chamados problemas ambientais globais consagrados na Segunda Conferência das Nações Unidas sobre Meio Ambiente e Desenvolvimento. Ao mesmo tempo, antigos temas são reconfigurados, como o saneamento e a regulação urbana (MEADOWCROFT, 2012).

Atualmente, a agenda ambiental é mais ampla do que nunca, compreendendo também ações nos campos da saúde e segurança, energia, transporte, agricultura e na produção de alimentos, rejeitos perigosos e radiativos, no patrimônio genético, proteção dos sistemas ecológicos, geoquímicos

e geofísicos responsáveis pela prestação de serviços ecossistêmicos, nos padrões de produção e consumo, em múltiplas conexões entre questões locais, nacionais e as chamadas questões globais – entre as quais estão a proteção da camada de ozônio, as mudanças climáticas, a conservação da biodiversidade, o combate à desertificação, a biossegurança e a proteção do patrimônio genético (VIG; KRAFT, 2019).

Essa ampla coleção de temas tem pelo menos um aspecto em comum: cabe ao Estado estabelecer as condições de proteção e manejo necessários à sua qualidade ambiental, mediante políticas públicas amparadas no exercício do poder de polícia sobre o meio ambiente. O poder de polícia ambiental é definido como

[...] a atividade da administração pública que limita ou disciplina direito, interesse ou liberdade em função do interesse público concernente à saúde da população, à conservação de ecossistemas, à disciplina da produção e do mercado, ao exercício de atividades econômicas ou de outras dependentes de concessão, autorização/permissão ou licença do poder público de cujas atividades possam decorrer poluição ou agressão à natureza (MACHADO, 2022, p. 398).

O seu exercício abrange um amplo e interligado conjunto de procedimentos conhecidos pela expressão “controle ambiental”, que inclui ordens, proibições, normas limitadoras e sancionadoras, ordens e consentimento de polícia, fiscalização e sanção.

As atividades mais conhecidas de controle ambiental são o licenciamento ambiental e a fiscalização, os primeiros instituídos no Brasil na década de 1980. Entretanto, o controle não se resume a eles. O exercício do poder de polícia ambiental requer mais instrumentos, tais como o registro em cadastros dos empreendimentos potencialmente impactantes e seus responsáveis, o estabelecimento de padrões ambientais, a realização de estudos de impacto ambiental e relatórios de impacto sobre o meio ambiente, o monitoramento de processos e bens ambientais, a fiscalização – associada a licenciamento ou não, a aplicação de sanções administrativas e ampla publicização dessas informações. O exercício do poder de polícia também é requerido em todas as demais estratégias de política que requerem controle, fiscalização e sanções administrativas (MACHADO, 2022).

O licenciamento é feito pelo órgão ambiental competente em processo que contempla várias licenças, correspondentes a fases do empreendimento, articuladas à avaliação dos impactos ambientais e à sua ampla publicidade, por meio de relatórios (Rimas) e audiências públicas. Licenças ambientais são por definição precárias, sempre periodicamente renovadas. São estabelecidas – e periodicamente revistas – balizas e condicionalidades para a implantação e operação de empreendimentos, exigindo a construção de capacidades estatais para promover monitoramento, fiscalizar o cumprimento dos parâmetros e aplicar sanções (MACHADO, 2022).

Padrões de qualidade ambiental são estabelecidos por resoluções do Conselho Nacional de Meio Ambiente (Conama), disciplinando emissões de poluentes e contaminantes na atmosfera, no solo e em corpos hídricos por meio de padrões de emissão (que estabelecem valores para níveis máximos de lançamentos permitidos), padrões de qualidade (que indicam as condições de normalidade do ambiente) e padrões de desempenho.

O primeiro registro obrigatório de atividades impactantes, criado em 1981, é o Cadastro Técnico Federal de Atividades, sob responsabilidade do Instituto Brasileiro de Meio Ambiente e Recursos Naturais Renováveis (Ibama). Atualmente, há outros tipos de registro, como o Cadastro Ambiental Rural (CAR) – considerado um instrumento-chave para o controle e monitoramento dos recursos florestais (PIRES, 2014).

Penalidades disciplinares ou compensatórias ao não cumprimento das medidas visam regular e garantir a implementação das normas estabelecidas para a defesa ambiental. Quando os danos ambientais não puderem ser mitigados, as medidas compensatórias visam à reparação destes.

3 REFERÊNCIAS METODOLÓGICAS

A abordagem adotada para a pesquisa é de ordem qualitativa e exploratória. O foco da investigação é a evolução da política ambiental na esfera federal de governo no período 1981-2022.

Informações foram coletadas por meio de revisão bibliográfica na literatura acadêmica internacional sobre desmonte de políticas, revisão normativa de normas ambientais brasileiras, levantamento de documentos produzidos por órgãos governamentais e por organizações da sociedade civil sobre mudanças na política ambiental brasileira.

A trajetória da política ambiental foi analisada por meio das normas federais instituídas no período estabelecido, considerando-se que as normas são representativas de resultados de política (*outputs*). Foram consideradas as disposições constitucionais, leis complementares à Constituição Federal, leis ordinárias e atos administrativos (decretos, portarias e resoluções).

As normas foram classificadas em normas sistêmicas, que tratam do meio ambiente como objeto de tutela estatal, e normas setoriais, que incidem sobre organizações federais de defesa ambiental, componentes do meio ambiente, atividades interferentes sobre o meio ambiente e sobre instrumentos de política ambiental.

Os sistemas e organizações considerados são o Sistema Nacional de Meio Ambiente (Sisnama), o Ministério Público Federal (MPF), o Instituto Brasileiro de Meio Ambiente e Recursos Renováveis (Ibama), o Ministério do Meio Ambiente (MMA) e seus órgãos, em particular o Serviço Florestal Brasileiro (SFB), o Conselho Nacional de Meio Ambiente (Conama), o Conselho Nacional de Recursos Hídricos (CNRH), o Conselho Deliberativo do Fundo Nacional do Meio Ambiente (FNMA), o Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio) e a Agência Nacional de Águas (ANA).

No que diz respeito a componentes do meio ambiente, atividades e instrumentos de política ambiental, foram abrangidas normas de proteção e gestão de florestas, ar e água, proteção de biomas, recursos hídricos, cidades, segurança de barragens, agrotóxicos, exploração mineral, sistema nacional de unidades de conservação da natureza, zona costeira, energia, estudo prévio de impacto ambiental, licenciamento ambiental, zoneamento ambiental, infrações administrativas, responsabilidade civil e reparação de dano, crimes ambientais, controle da poluição e de atividades potencialmente impactantes.

As normas foram organizadas, manualmente, por meio de três recortes analíticos. No primeiro recorte foram identificadas as disposições constitucionais e infraconstitucionais consideradas estruturantes – as que emolduram as políticas federais de defesa ambiental e regem seus arranjos institucionais – e as disposições consideradas setoriais.

No segundo recorte, foram selecionadas as normas que representam marcos na trajetória da política, seja avanço/consolidação de uma determinada direção, seja as que representam inflexão de direção, apoiado em Gravey e Jordan (2016), que propõem analisar processos de desmonte por meio das inflexões na trajetória da política (expansão, continuação ou contração).

No terceiro recorte, as mudanças foram agrupadas segundo sete variáveis, correspondentes a características estruturantes da política ambiental. São elas (i) os princípios e objetivos de política, especialmente da proibição de retrocesso; (ii) organizações federais, como indicadores do estado

dos arranjos institucionais; (iii) instrumentos de participação social e transparência, indicadores dos princípios de participação e publicização de informação ambiental; (iv) *status* da burocracia, variável sensível para o exercício do controle ambiental e para a própria definição de desmonte (JORDAN *et al.*, 2013); (v) instrumentos de implementação, focalizando o controle ambiental; (vi) instrumentos legais; e (vii) o financiamento da política, variável aqui tratada de forma exploratória.

Assumiu-se nesta pesquisa que a variável controle ambiental representa a capacidade de exercício do poder de polícia ambiental simultaneamente em todas as áreas temáticas. Assim, variações no controle ambiental foram consideradas como variações incidentes todo o campo da política ambiental, para fins de análise de mudanças.

4 RESULTADOS: A POLÍTICA AMBIENTAL NO BRASIL, DA EXPANSÃO AO DESMONTE

4.1 INSTITUIÇÃO E EXPANSÃO DA POLÍTICA AMBIENTAL

No Brasil, foram combinados fatores de natureza institucional que conferem um perfil singular ao campo da política ambiental como campo de ação estatal. Entre eles, estão os já mencionados princípios ordenadores do direito ambiental, entendidos como normas estruturantes dentro de um sistema de normas (SILVA, 2009). Em curto espaço de tempo, ao longo da década de 1980, foram normalizadas três qualificações definitivas para a delimitação do papel do Estado na defesa ambiental que formalizam o atributo da publicidade dos bens ambientais e por isso mesmo objeto da ação e tutela do Estado. São elas: as qualificações de *bem de uso comum do povo*, de *patrimônio público* e de *bem de interesse difuso*, estabelecendo os fundamentos para proteção do meio ambiente como objeto da tutela estatal *stricto sensu* (NEVES, 2015).

Em 1981, a instituição da política nacional de meio ambiente (PNMA) – Lei 6938/1981 – inaugura o novo campo de política pública. O meio ambiente é reconhecido como bem de interesse difuso e o Ministério Público guardião desses interesses, em 1985 (Lei n. 7.347/1985), normas alçadas a disposições constitucionais em 1988 (Constituição Federal art. 23, 24, 30, 129, 149 e 225). O controle das atividades poluidoras e potencialmente degradadoras do meio ambiente é estruturado em sistema que integra fiscalização, aplicação de sanções administrativas, cadastro e licenciamento de atividades potencialmente poluidoras. Cabe ao Conama a regulamentação de instrumentos de política ambiental, tais como o sistema de licenciamento de atividades potencialmente poluidoras, padrões de qualidade do ar e classificação de águas doces.

Nesse novo campo de política pública, as normas ambientais sistêmicas criadas a partir da década de 1980 são articuladas a outras anteriormente estabelecidas, que incidem sobre bens ambientais tomados isoladamente, correspondentes a distintos marcos políticos e filosóficos – como o Código de Águas (1934) e o Código Florestal (1965). Assim, é construída uma combinação singular de regimes jurídico-institucionais para distintos bens ambientais dentro do novo campo de política.

Ao final da década de 1980, é criado o Ibama, com a finalidade de exercer o poder de polícia ambiental e, em 1992, o Ministério do Meio Ambiente. Na década seguinte o Ibama seria desmembrado dando origem a mais dois órgãos ambientais, o SFB, responsável pelas florestas públicas, e o ICMBio, órgão executor das políticas de unidades de conservação e de uso sustentável de recursos naturais renováveis.

Ao longo das décadas de 1990 e 2000, a política ambiental se expande, consolidando o sistema de licenciamento ambiental e ampliando sua agenda por meio da instituição do sistema de gestão dos recursos hídricos (1997), da regulação das infrações ambientais na esfera criminal (1998) e da

sistematização de categorias de áreas especialmente protegidas no Sistema Nacional de Unidades de Conservação (Snuc) – 2000.

Na primeira década do século XXI, o arsenal de instrumentos de política ambiental se fortalece com o Estatuto das Cidades (Lei n. 10.257/2001) e com estratégias integradas, tais como as consolidadas no Plano de Proteção e Controle do Desmatamento da Amazônia (PPCDAm) – 2004. A política de gestão de florestas públicas regula a concessão privada da exploração (2006). São implantadas Unidades de Conservação da Natureza e instrumentos de proteção de biomas – Mata Atlântica e a Amazônia –, multiplicam-se as iniciativas de despoluição e revitalização de bacias hidrográficas. Foram transformadas em políticas nacionais as disposições de convenções internacionais às quais o Brasil aderiu, como as convenções do clima (2009), o combate à desertificação e a conservação da biodiversidade (2015).

Mais nítidos a partir de 2010, interesses representados no Congresso Nacional interferem nessa trajetória de expansão, promovendo iniciativas para instabilização da arquitetura institucional por meio de reforma de normas de defesa do meio ambiente (NEVES, 2016). São exemplos dessa reação, que se fortaleceria notavelmente ao longo dos anos seguintes, a revogação do Código Florestal de 1965 em 2012, o enfraquecimento do PPCDAm a partir de 2013, a construção da Usina Hidrelétrica de Belo Monte e a PEC 65/2012 de autoria do senador Acir Gurgacz (PDT-RO), a primeira iniciativa de desmonte do licenciamento ambiental na esfera constitucional. Em 2015, o pacote de medidas conhecido como *Agenda Brasil* propôs simplificar o licenciamento ambiental e agilizar a emissão de licenças mediante a flexibilização de normas ambientais, e o Projeto de Lei do Senado PLS 654/2015 de autoria do ex-senador Romero Jucá (PMDB-RR) propôs flexibilização por meio da criação do licenciamento ambiental especial para empreendimentos considerados estratégicos (BARCELOS, 2020).

4.2 A POLÍTICA AMBIENTAL, 2016-2021: A DESCONSTRUÇÃO DA INSTITUCIONALIDADE AMBIENTAL COMO POLÍTICA DE GOVERNO²

De 2016 em diante, aprofundou-se a instabilização da área ambiental, por meio da redução do gasto federal, especialmente no controle ambiental, do abandono do PPCDAm e do avanço de propostas de flexibilização do sistema de licenciamento ambiental. Em 2017, duas medidas provisórias visaram reduzir as áreas protegidas: Medidas Provisórias/MP 756 e 758. Mais iniciativas foram articuladas no Congresso Nacional para liberar a exploração de recursos e a mineração em terras indígenas, uma categoria-chave de área protegida. As propostas de reforma do licenciamento ambiental se fortaleceram no Legislativo. Em 2018, o candidato Jair Bolsonaro incluiu, entre suas promessas de campanha, a desconstrução da política ambiental.

Em janeiro de 2019, o presidente Bolsonaro incluiu a política ambiental no centro das prioridades governamentais em conformidade com as promessas eleitorais, promovendo desde os primeiros dias de governo drásticas mudanças.

O arranjo organizacional ambiental foi desfigurado pela supressão de diversos órgãos federais e pelo traslado de outros a pastas alheias ao tema, reduzindo na prática as competências operacionais da área ambiental. No MMA foram extintas a Secretaria de Mudanças do Clima e Florestas – unidade administrativa responsável pelo combate ao desmatamento – e as unidades de educação ambiental. Também perdeu todo o sistema de recursos hídricos, incluindo a ANA, o CNRH e a Secretaria Nacional de Recursos Hídricos e Qualidade da Água (SRHQ), trasladados para o Ministério do Desenvolvimento Regional (MDR). No Ministério das Relações Exteriores (MRE), foi extinta a instância responsável pela política climática. O SFB e o CAR foram transferidos para a área de agricultura, perdendo a gestão das florestas públicas. O Conama teve sua composição e seu tamanho reduzidos.³ Em maio de 2020, as ações de fiscalização do Ibama na Amazônia passaram a ser coordenadas pelo Ministério da Defesa.

No que diz respeito às instâncias de participação da sociedade civil e de transparência, o “revogaço” promovido em abril 2019, que atingiu colegas da administração pública federal, reestruturou ou extinguiu mais da metade de 22 colegas nacionais associados às políticas socioambientais (IMAFLORE *et al.*, 2021). Em maio de 2019, o Conama foi reformulado, tendo diminuído o número de representantes da sociedade civil⁴. A exclusão de representantes da sociedade civil ocorreu também no CNRH, na Comissão Nacional da Biodiversidade (Conabio) e no Conselho Deliberativo do FNMA.

Foi extinta a transparência das informações sobre o estado do meio ambiente e as ações governamentais: informações sobre programas e projetos foram suprimidas do site do MMA, censura foi imposta à comunicação institucional do Ibama e do ICMBio⁵. Aumentaram as pressões para interferência na divulgação de informações ambientais, como a tradicional publicação da taxa de desmatamento pelo Instituto Nacional de Pesquisas Espaciais (Inpe). Em 2020 o governo passou a centralizar a comunicação dos órgãos ambientais e tornou processos sigilosos. A estratégia de censura, intimidação e descrédito focalizou primeiramente gestores ambientais e organizações da sociedade civil, em seguida a mídia.

Quanto à implementação de atividades, o exercício do controle ambiental foi drasticamente reduzido por meio da inibição da fiscalização e cobrança de multas, pela criação de uma instância de conciliação, e pela desestruturação da burocracia ambiental com competência para exercer o poder de polícia. O número de autos de infração por crimes contra a flora aplicados pelo Ibama em 2019 na Amazônia (2.534) foi o menor em duas décadas, queda de 40% em relação a 2017-2018. Multas ambientais aplicadas desde outubro de 2019 não foram mais cobradas a partir da edição do decreto que criou a chamada “conciliação” de multas (OBSERVATÓRIO DO CLIMA, 2022).

O Ibama e o ICMBio foram praticamente paralisados em quase todo o país desde o primeiro ano do novo governo: superintendências estaduais foram mantidas vacantes, assim como cargos de direção; esvaziadas equipes de fiscalização; nomeados gestores carentes de qualificações técnicas e experiência prévia na área (em boa parte militares). A burocracia ambiental remanescente, responsável por atividades-chave como o licenciamento e fiscalização de programas, tais como programa de controle do desmatamento e gestão de áreas protegidas, foi vítima de assédio e de intimidação. Foram propostas, por meio de projetos de lei, reformas para aprofundar a desorganização do sistema de licenciamento ambiental (PL 3729/2004 com seus apensos e substitutivos). Segundo pesquisadores e especialistas de organizações civis, esse PL aniquila o sistema de licenciamento vigente, por meio de (entre outros) dispensa de licença para vários tipos de empreendimentos impactantes, delegação indiscriminada a entes subnacionais da regulamentação, inclusive dispensa de licenciamento, licenças autodeclaratórias, limitações aos condicionantes ambientais, dispensa de conformidade com legislação subnacional, restrições à aplicação da regulação dos recursos hídricos, exclusão de análise de impactos em Terras Indígenas ainda não demarcadas e em Territórios Quilombolas não titulados, exclusão de análise de impactos em Unidades de Conservação, eliminação da avaliação de impactos sobre a saúde humana, exclusão da Avaliação Ambiental Estratégica, entre outros (OBSERVATÓRIO DO CLIMA *et al.*, 2021).

A alocação de despesa e a gestão de fontes de recursos no setor ambiental aprofundaram a paralisia dos órgãos de controle e planejamento ambiental. No período 2019-2021, foram reduzidos os gastos com pessoal e os gastos “na ponta” – as despesas primárias discricionárias. Em 2021, os gastos com pessoal em meio ambiente somaram 1,99 bilhão de reais, representando 71% do total executado (contra 65% em 2019), enquanto as despesas primárias discricionárias foram da ordem de 620 milhões de reais, representando apenas 25% do total (INESC, 2022).⁶ Ainda em 2021, o orçamento executado para o meio ambiente representou menos de 25% do valor total destinado às emendas do chamado “orçamento secreto” do Congresso (INESC, 2022). Foram paralisados órgãos de financiamento, como o Fundo Amazônia, por conta da extinção do Comitê Orientador do Fundo Amazônia (Cofa) e do Comitê Técnico do Fundo Amazônia (CTFA) em abril 2019. O comitê gestor do Fundo Nacional sobre Mudança do Clima foi dissolvido no chamado “revogaço” de 2019.

Quanto aos instrumentos legais adotados para as mudanças, durante os dois primeiros anos de governo a flexibilização de normas relacionadas à política ambiental foi promovida por meio de normas infralegais cuja edição é de responsabilidade do Executivo, aliadas à interrupção de programas e paralisação de fundos, como na área climática (Fundo Clima e o Fundo Amazônia). Em 2021, a aliança entre o Executivo e a presidência da Câmara Federal potencializou a promoção de mudanças via projetos de lei, dando novo fôlego a mais mudanças disruptivas para além das propostas de desregulação do licenciamento já mencionadas. Naquele ano, a desregulação avançou sobre as Áreas de Preservação Permanente (APPs) em espaços urbanos, sendo permitido aos executivos municipais dispor sobre as APPs em áreas sensíveis tais como nas margens de rios, topos de morro, restingas e mangues em zona urbana⁷.

As medidas mencionadas anteriormente expressam o abandono dos princípios e objetivos da política ambiental estabelecidos de forma sistêmica na esfera constitucional no período 2019-2022. Em reação, foram apresentadas ao Supremo Tribunal Federal (STF) numerosas ações de arguição de descumprimento de preceito fundamental (ADPF), (por exemplo as ADPF n. 651, 708 e 760) e ações diretas de inconstitucionalidade por omissão (ADO) (como, por exemplo, as ADO n. 54 e 59).

5 CONCLUSÕES E PISTAS EXPLORATÓRIAS

A pesquisa analisou a trajetória da política ambiental brasileira para testar a contribuição das categorias analíticas da literatura sobre desmonte de políticas ao caso brasileiro. Os resultados apresentados na seção anterior revelam que os aportes teóricos da literatura sobre desmonte, inclusive sobre desmonte no campo ambiental, têm significativa contribuição para a interpretação do processo vivido no Brasil.

A trajetória de expansão da política ambiental e de consolidação de seus instrumentos e programas se estendeu continuamente por três décadas até o início da década de 2010. A partir de então mudanças promovem a instabilização de setores importantes da agenda e da moldura institucional da política ambiental, abrindo caminho para as inflexões drásticas ocorridas a partir de 2019, que impõem ruptura na trajetória identificável ao processo de desmonte, tal como caracterizado por Bauer e Knill (2012).

O desmonte da política ambiental no Brasil se revela na direção uníssona das mudanças rumo à redução e extinção de políticas e de capacidades, retirando do Estado a responsabilidade da tutela do meio ambiente. Em todas as sete variáveis de política ambiental analisadas, encontra-se o mesmo sentido de redução e extinção. Foram desconsiderados os princípios e objetivos da política, em particular os princípios da não regressão, participação e informação. Organizações estatais foram desestruturadas. A participação social foi inibida mediante a exclusão de organizações civis em colegiados. O setor de controle ambiental foi desfigurado, algumas normas foram desconsideradas e outras foram interpretadas de forma desviante em arrepio às disposições constitucionais sobre meio ambiente. O assédio à burocracia ambiental logrou, pelo menos parcialmente, inibir a interpretação e aplicação das normas pelos quadros remanescentes, atingindo frontalmente a capacidade de exercício do poder de polícia – alcançando assim todo o campo da política. A paralisação de fontes de financiamento aprofundou os desafios para manter operacionais ações de política ambiental.

Entendendo-se, conforme Gravey e Jordan (2016), que o desmonte de política é um processo, pode-se afirmar que parte das ações empreendidas correspondeu efetivamente à aniquilação da tutela estatal em várias áreas da agenda ambiental, ao menos temporariamente, tais como a mudança de clima e proteção da biodiversidade. Outras ações reduziram significativamente o alcance da tutela e desorganizaram a ação estatal, sem conseguir nesse prazo sua extinção definitiva.

Devem ser considerados, entre as causas do insucesso governamental em aniquilar os instrumentos de defesa ambiental, pelo menos dois fatores. O primeiro é o caráter sistêmico da arquitetura jurídico-institucional da política ambiental, ancorada na Constituição federal, que permitiu a interveniência do Supremo Tribunal Federal. O segundo fator é o papel crucial exercido pelas organizações da sociedade

civil na resistência às mudanças nocivas à proteção ambiental, agindo em diversas frentes, tais como registro e documentação do desmonte, ações civis públicas contra os danos decorrentes do desmonte e mobilização da opinião pública nacional e internacional.

Nem todos os aspectos do processo vivido na política ambiental brasileira encontram referências na literatura internacional sobre desmonte de política. O processo vivido na política ambiental brasileira tem singularidades que o distanciam de algumas proposições teóricas da literatura internacional, tais como a hipótese de que desmontes na área ambiental ocorreriam de forma dissimulada (POLLEX; LENSCHOW, 2020). No governo Bolsonaro, o desmonte foi amplamente divulgado como objetivo daquele governo, correspondendo à intenção governamental, explicitada por reiteradas vezes: desregular, enfraquecer e eliminar instrumentos de política, reduzir o escopo e as competências de política ambiental. É preciso lançar mão de mais vertentes e contribuições teóricas para analisar motivações do desmonte ambiental em ambientes de populismo reacionário e autoritarismo, considerando-se a hipótese de que o desmonte da área ambiental pode ser associado ao processo de erosão da democracia, tal como estudado em Britto *et al.* (2022), entre outros.

A desconsideração frontal às disposições constitucionais sobre meio ambiente revela padrão de comportamento inédito do Executivo federal, expresso em iniciativas provisoriamente agrupadas em três vertentes: exercício perverso do poder-dever ambiental, incentivo ao comportamento perverso e disseminação de desinformação para justificar decisões de política ambiental. No âmbito desta pesquisa, coube apenas reconhecer e enunciar exploratoriamente esse padrão, cujo estudo sistemático deverá ser desenvolvido em pesquisas futuras.

A primeira vertente, exercício perverso do poder-dever ambiental, pode ser exemplificada pela redução intencional das atividades de fiscalização e cessação da cobrança de multas, não mais cobradas a partir da edição do decreto que criou a chamada “conciliação” de multas (OBSERVATÓRIO DO CLIMA, 2022). No plano legislativo, essa vertente se expressa em normas tais como a Medida Provisória (MP) 1.040/2021, que autorizou alvarás automáticos para empreendimentos de médio risco, e o decreto que alterou a composição do Conselho Deliberativo do Fundo Nacional de Meio Ambiente (FNMA), ambos declarados inconstitucionais pelo STF em 2022.

A segunda vertente, incentivo ao comportamento perverso, é verificável nos pronunciamentos de apoio à invasão de terras indígenas e ao exercício do garimpo em terras protegidas, e em atos de desautorização de gestores ambientais no exercício de suas funções, como os chefes da fiscalização exonerados após operação contra garimpos em terras indígenas do Pará que resultou na destruição de dezenas de equipamentos usados por criminosos. Dentro do aparelho estatal, essa atitude provoca fadiga dos órgãos de controle. Perante a população, esse comportamento mina a confiança na norma ambiental e nos agentes que exercem o poder de polícia ambiental, alimentando o descrédito dos agentes e das instituições, e provoca o desrespeito à ordem ambiental por terceiros, aproximando-se da incitação a crimes de dano.

A terceira vertente, disseminação de desinformação, pode ser ilustrada pelas declarações do presidente sobre as ameaças à soberania nacional na região amazônica, pela iniciativa de desqualificação do Inpe e do físico Ricardo Galvão, diretor responsável pelo monitoramento e divulgação das informações sobre desmatamento, afirmando que o órgão estaria agindo “a serviço de alguma ONG” (OBSERVATÓRIO DO CLIMA, 2020), além da promoção de indicadores enviesados para justificar decisões de política florestal (RAJÃO *et al.*, 2021), promovendo a desqualificação do conhecimento científico, de técnicos e especialistas de notório saber e reconhecimento internacional.

Constatar o processo de desmonte ambiental provoca o enunciado de diversas questões sobre suas implicações, que passam a se impor na agenda de pesquisa. Em que extensão a política ambiental está desmontada? Em que estágio do processo de desmonte se encontra a institucionalidade ambiental? A quem beneficiaram as iniciativas de desmonte? Qual a trajetória e a importância dos processos de

resistência ao desmonte ambiental? Como se organizam os atores que apoiam o projeto de desmonte ambiental? Quais os condicionantes para uma nova mudança de rumo em direção à reconstrução? Todas as mudanças são passíveis de reversão? Quais seriam consideradas mudanças irreversíveis? Quais são os efeitos (*outcomes*) do desmonte e quais são seus custos? As pesquisas sobre o caso brasileiro apontarão contribuições valiosas para essas perguntas.

O impacto das iniciativas de desmonte concretizadas até o presente ainda está por ser quantificado, embora algumas consequências já sejam nitidamente observáveis e facilmente quantificáveis. Pouco se conhece ainda sobre a duração dos impactos do desmonte. Ainda que o novo governo, inaugurado em janeiro de 2023, suspenda o processo de desmonte e se dedique à reconstrução da política ambiental, há consequências desse período capazes de repercutir mais além do tempo em que terá vigido a experiência de desmantelamento. Ao transgredir intencionalmente as balizas constitucionais que lastreiam a política, tentando deslegitimar a ordem constitucional ambiental e sua arquitetura infraconstitucional, o comportamento governamental – provisoriamente qualificado nesta pesquisa como um padrão perverso de exercício do poder-dever – parece ter ferido o próprio regime democrático, erodindo a credibilidade da ação estatal no meio ambiente junto à população. A erosão de credibilidade entre a população e a recuperação de sua confiança no poder impositivo da norma merecem uma investigação minuciosa sobre efeitos, mecanismos e perspectivas.

O comportamento de alguns atores protagonistas merece análise aprofundada. Em um recorte, a burocracia ambiental (expoentes da comunidade científica e organizações da sociedade civil) cumpriu um papel inestimável de resistência ao desmonte. Em outra perspectiva, sem apoio parlamentar, seria impossível instabilizar e mudar a regulação estabelecida em leis federais, como ocorreu com os agrotóxicos. Tudo indica que está estruturada no Congresso uma coalizão pró-desmonte do meio ambiente que deverá participar ativamente da arena ambiental.

Finalmente, é essencial investigar o papel dos governos subnacionais no processo de desmonte e resistência, aspecto não contemplado nesta pesquisa. Mantendo-se presente que, de acordo com a estrutura federativa e as atribuições constitucionais, a atuação dos governos subnacionais é relevante e imprescindível e, certamente, pelo menos em algumas áreas da agenda ambiental (como a mudança climática), teve papel importante na resistência ao desmonte.

NOTAS

1| Foram utilizadas, para a caracterização da política ambiental, as contribuições de Azuela de la Cueva (2006), Connelly e Smith (2003), Dobson (1996), Downs (1978), Durant (2004), Fiorino (1995), Frey (2000), Janicke (1996), Kraft (2001), Ostrom (1994), Paehlke (1996, 2002, 2004), Steel, Clinton e Lovrich (2003), Sterner (2003), Vig e Kraft (2003).

2| Esta seção foi elaborada sobre bibliografia acadêmica e de organizações civis think-tanks, que fizeram extraordinário trabalho de monitoramento das ações ambientais no período estudado. Foram consultados em particular os trabalhos de Araújo (2020); Araújo e Herschman (2021); Capelari (2020); Greenpeace, Brasil (2021); Greenpeace, Brasil (2022); Imaflores, Artigo 19 e Instituto Socioambiental (2021); Instituto de Estudos Socioeconômicos – Inesc (2021, 2022); Greenpeace, Instituto Democracia e Sustentabilidade e Instituto Sociedade, População e Natureza (2020); Minc, C. *et al.* (2021); Observatório do Clima (2020, 2021, 2022); SOS Mata Atlântica e WWF Brasil (2021); Instituto Talanoa (2022); Observatório do Código Floresta e Instituto de Pesquisas sobre a Amazônia – Ipam (2021).

3| Esta medida, promovida pelo Decreto n. 9.759, de 11/04/2019, foi posteriormente revertida pelo STF por meio da suspensão do Decreto.

4| Em dezembro 2021, o STF suspendeu esta medida, no âmbito da Arguição de Descumprimento de Preceito Fundamental (ADPF) 623, a liminar vale até o tema ser discutido pelo plenário do STF em 2022.

5| Portaria n. 560/2020 determina que qualquer contato com a imprensa deve ser mediado pela Assessoria de Comunicação e que as chefias precisam reportar qualquer tentativa de contato direto dos jornalistas.

6| Valores corrigidos pelo IPCA dezembro 2021.

7| Lei n. 14.285/2021.

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The active dismantling of environmental policy in Brazil: paralysis and setbacks of the deforestation inspection and control

*O desmantelamento ativo da política ambiental no Brasil:
paralisa e retrocessos da fiscalização e controle
do desmatamento*

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ARTICLE- DOSSIER

ABSTRACT

The paper aims to analyse the street-level bureaucrats' (SLBs) perception of President Bolsonaro's administration's effects on Brazilian environmental policy, emphasising deforestation prevention and control in the Legal Amazon¹. Besides the policy dismantling concepts, a theoretical model integrating three complementary analytical dimensions of SLBs' action – institutional, individual, and relational – was employed in a case-oriented investigation of environmental bureaucrats – Ibama Inspectors and ICMBio Agents. The inquiry used Systematic Content Analysis on interviews with these agents involved in deforestation inspection and control activities. The empirical results confirm the hypotheses that an active dismantling process has been ongoing since the beginning of Bolsonaro's administration; however, the perceptions of Ibama inspectors seem more intense, especially regarding the institutional dimension. The research illustrates the adverse effects of this process on the agencies and bureaucratic capacities, generating paralysis and setbacks in deforestation inspection and control policies and posing serious risks to the environmental protection in the country. This article contributes to the advancement of knowledge about the strategies that a far-right populist government deliberately adopted to reduce the role of the State, weaken professional bureaucracy, dismantle policies and favour particular interests of groups.

Keywords: Policy dismantling. Environmental policy. Street-level bureaucrats. Deforestation inspection and control. Far-right populism. Brazil.

RESUMO

O objetivo do artigo é analisar a percepção dos burocratas de nível de rua (BNRs) sobre os efeitos da administração do presidente Bolsonaro na política ambiental brasileira, com ênfase na prevenção e controle do desmatamento na Amazônia Legal. Além dos conceitos de desmantelamento da política, foi empregado um modelo teórico que integra três dimensões analíticas complementares da atuação dos BNRs – institucional, individual e relacional –, em uma investigação “case-oriented” sobre burocratas ambientais – fiscais do Ibama e agentes do ICMBio. A pesquisa utilizou a Análise Sistemática de Conteúdo de entrevistas com esses agentes envolvidos em atividades de fiscalização e controle do desmatamento. Os resultados empíricos confirmam as hipóteses de que um processo de desmantelamento ativo está em andamento desde o início da administração de Bolsonaro; entretanto, as percepções dos fiscais do Ibama parecem mais intensas, especialmente no que diz respeito à dimensão institucional. A investigação ilustra os efeitos adversos desse processo sobre as agências e as capacidades burocráticas, gerando paralisias e retrocessos nas políticas de fiscalização e controle do desmatamento e trazendo sérios riscos à proteção do meio ambiente no país. Este artigo contribui para o avanço do conhecimento sobre as estratégias que um governo populista de extrema direita adotou deliberadamente para reduzir o papel do Estado, enfraquecer a burocracia profissional, dismantlar políticas e favorecer interesses particulares de grupos.

Palavras-chave: Desmonte de políticas. Política ambiental. Burocratas de nível de rua. Fiscalização e controle do desmatamento. Populismo de extrema direita. Brasil.

1 INTRODUCTION

The paper’s primary goal is to analyse the street-level bureaucrats’ (SLBs) perception of the effects of President Bolsonaro’s administration on the environmental policy implementation in Brazil, with an emphasis on deforestation prevention and control in the Legal Amazon(1). Did the notorious public position of the former government affect this policy implementation? Did the dismantling process impact deforestation inspection and control activities? How have the key agencies, the Brazilian Institute of the Environment and Renewable Natural Resources (Ibama) and the Chico Mendes Institute for Biodiversity Conservation (ICMBio), and their street-level bureaucrats been affected by the active policy dismantling?

The analysis of frontline environmental agents’ perception of the dramatic institutional changes that have occurred in Brazil represents a necessary contribution to advancing knowledge about the strategies that a far-right populist government, such as Bolsonaro’s, deliberately adopted to favour its ideological agenda and the interests of private groups that formed its political support base. The research goal is likewise justified by the need to understand how these strategies were conducted in countries affected by democratic backsliding that was also in progress in Brazil.

To address these research questions, the inquiry applies the analytical approach to the implementing agent of the Brazilian environmental policy in the Amazon region, emphasising deforestation prevention and control plans. The primary information source comes from twenty-eight interviews with the SLBs working in the two main federal environmental public institutions: Ibama and ICMBio.

The unit of analysis is the Brazilian environmental policy implementation within the scope of federal competence, focusing on the prevention and control of deforestation (Ibama Inspector) and the management of Federal Conservation Units (ICMBio Agent). In both cases, the emphasis is on the Amazon region. This territory requires the greatest concentration of efforts by Brazilian environmental institutions due to its enormous wealth of biodiversity and the country’s highest deforestation rates.

The Ibama Inspector and the ICMBio Agent are SLBs active in defence of the environment with similarities in terms of skills, training, and modalities of entry into public service. Nonetheless, they have differences concerning the main routines, modes of operation, and territorial delimitation. The Ibama Inspector acts as an environmental police officer, directing their action to repress crimes and other environmental illegalities. The ICMBio Agent is focused on managing the federal Conservation Units (UCs), caring for relations with traditional populations, and the sustainable use of natural resources.

In the policy implementation process, environmental SLBs, like other frontline agents, need to acquire specific capacities – both technical-administrative and relational – to deal with uncertainties and occurrences not formally established in regulations (PIRES; GOMIDE, 2016). Going deeper into the latter aspect, public policy field research demonstrates the problem of incomplete regulations: legal standards, as the result of political negotiation, often contain an amount of vagueness, indeterminacy, and ambiguity in language and goal definition (MATLAND, 1995). An unresolved problem at the policy formulation stage is then transferred to the implementation stage, leaving street-level bureaucrats a margin for interpretation and discretion (LIPSKY, 1980; LOTTA, 2018). This issue becomes even more critical in a complicated area such as the environment, where the public servant acts as State enforcement agents defending a collective and public good. For this reason, ambiguous and complex rules tend to provoke flexibility and discretion in their application, leaving space for opportunistic or illegal behaviours that threaten collective rights. In this sense, well-designed rules are the necessary tools to dissuade behaviours contrary to the interests of the collectivity through the adoption of inspections, preventive measures, and sanctions (SCHMITT, 2015).

In Brazil, the SLBs involved with environmental policy and their agencies have undergone intense formal and informal changes in the last years. Capelari *et al.* (2020) state that, under the Bolsonaro government, institutional layering, a process of gradual institutional change in layers, was broken, as there was an evident discontinuity in the implementation of environmental policy with a movement of abrupt deconstruction. In Araújo's study (2022), the reports of the respondents – all of them environmental public agents from Ibama – show the interruption of the gradual policy-building process that occurred primarily since the beginning of the Bolsonaro administration in 2019 due also to the breakdown of the mechanisms of production and transmission of technical information necessary to support the decision-making process (ARAÚJO, 2022; DONADELLI, 2020). In this sense, the Brazilian institutional context during the Bolsonaro administration, globally known for features of populism with democratic setbacks (BAUER *et al.*, 2021), inspired by an extreme right-wing political ideology (FERNANDES *et al.*, 2022; MENEZES; BARBOSA JR., 2021), as well as the intense dismantling process (BAUER; KNILL, 2014), led to constraints and tensions affecting the street-level bureaucrats' activities in relation to the implementation of Brazilian environmental policy, especially in the Amazon region.

Therefore, to analyse this relevant policy and public administration puzzle, this article has six other sections in addition to this one. The following section presents an overview of the evolution of Brazilian environmental policy, focusing on the inspection and control of deforestation in the Amazon region. The third section outlines the analytical model of the SLBs' action in the environmental area and the paper's hypotheses. In the fourth section, the methodological procedures are described. The fifth and sixth sections discuss the research results, showing the comparative analysis between bureaucrats from Ibama and ICMBio and their perceptions of the active dismantling of Brazilian environmental policy during Bolsonaro's administration. The last section weaves the final remarks, highlighting the research limitations and the risks and damages that these policy changes can lead to the environment policy subsystem and, more broadly, to the role of the Brazilian State.

2 THE CONSTRUCTION AND DISMANTLING OF BRAZILIAN ENVIRONMENTAL POLICY

The institutionalisation of Brazilian environmental policy is articulated on multiple fronts, such as ecological licensing, combating deforestation, preservation of native vegetation, fish and water resources, conservation units, and climate change mitigation efforts. During the last thirty years since the promulgation of the Federal Constitution, new dimensions and actors, collegiate bodies, independent agencies, and informal institutional arrangements were structured in the path of the environmental governance's building process (SEIXAS *et al.*, 2020).

Brazil had already committed to environmental preservation before the international community since the 1970s. A few years later, the 1988 Federal Constitution represented the main milestone in strengthening the institutions of Brazilian environmental policy, as it gave an even greater impetus to creating new laws, regulations, and regulatory agencies. From the constitutional recognition of the environment as an asset for everyday use by the people to be defended and preserved by the State and the community, the path of environmental laws and regulations has been consolidated in line with the international agreements stipulated by Brazil.

It is worth mentioning those related to the inspection and control of deforestation, such as:

- Law No. 7,735/1989, which created the Ibama;
- Law No. 9,605/1998 (Environmental Crimes Law), which represents the primary legal reference in the federal sphere about environmental inspection, inhibiting environmental crimes, and infractions;
- Law 9,985/2000, which creates the National System of Nature Conservation Units;
- Law 11,516/2007 creates the ICMBio, which assumes part of the assets, resources, personnel, positions, and functions linked initially to Ibama; and
- Law 12,187/2009, which defines the National Policy on Climate Change, containing both the consolidation of protected areas and the plans to combat deforestation, under the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon, approved by Presidential Decree in 2003.

It is necessary to characterise the two Brazilian federal institutions better. The main executors of environmental policy are the object of this study, Ibama and ICMBio. It requires providing some essential elements about their trajectory and functions, and bureaucratic structure in the context of Brazilian environmental governance. Part of this will be placed below, in this item, and part in the item on data and method.

Ibama was created in 1989, by Law No. 7,735/1989 (BRASIL, 1989), from the merger of four different institutions: the Special Secretariat of the Environment (Sema), with an important political role in the formulation of the National Environmental Policy (PNMA); and three other bodies more focused on fostering economic development, namely, the Brazilian Institute of Forest Development - IBDF, the Superintendence of Fisheries - Sudepe, and the Superintendence of Rubber - Sudhevea (ARAÚJO, 2022; IBAMA, 2018). Before the establishment of Ibama, the four institutions already active in the environmental area had limited role in environmental preservation, adopted different approaches, and sometimes pursued contradictory agendas. Thus, since its origin, Ibama has faced the challenges of overcoming internal conflicts among the various working groups and implementing Brazilian environmental policy in an integrated manner (IBAMA, 2018). For this reason, the constitution of

Ibama represents a milestone in the strengthening of Brazilian environmental governance. It is a tangible result of a long cooperation process between different social actors (IBAMA, 2018).

According to Law No. 11,516/2007 (ARAÚJO, 2022; BRASIL, 2007), Ibama holds the following attributions: a) to enforce the environmental police power; b) to execute, at the federal level, national environmental policy actions related to environmental licensing, environmental quality control, natural resources use authorisation, and environmental inspection, monitoring and control; c) to execute the supplementary actions of the Union's competence.

The Chico Mendes Institute for Biodiversity Conservation - ICMBio was created in 2007, from the dismemberment of the Ibama, through Law No. 11,516/2007 (BRASIL, 2007). The ICMBio is the federal entity responsible for implementing the National Policy of Nature Conservation Units, with the institutional mission of protecting the natural heritage and promoting socio-environmental development through the proposition, implementation, management, protection, inspection, and monitoring of the Conservation Units instituted by the Union - UCs (BRASIL, 2007; O ECO, 2013).

The ICMBio exerts the environmental police power to protect biodiversity in federal Conservation Units, inspecting and enforcing the appropriate penalties on violators, and is responsible for contributing to the recovery of degraded areas (ICMBIO, 2009; O ECO, 2013). Another important duty of ICMBio is to generate and disseminate information, knowledge, and technology through its research, protection, and biodiversity conservation programs throughout the country (O ECO, 2013). Therefore, the Chico Mendes Institute supports the implementation of the National System of Conservation Units (Snuc), which already existed before the ICMBio, due to Law No. 9,985/2000 (BRASIL, 2000).

Despite all these advances made incrementally in the legal framework since the promulgation of the Brazilian Federal Constitution and the commitments assumed by Brazil before the international community, in the Amazon region, pressure has persisted from political and economic agents who understand the protection of Indigenous and public lands as an obstacle to economic growth (ABRAMOVAY, 2010). These agents, in opposition to the principles of sustainable development and the more rational positioning of the exporting agribusiness, are carriers of a mercantilist logic, which exalts the economic exploitation of the abundant mineral and vegetal wealth existing in the Amazon region and uses, as an argument, the alleged desire of the Indigenous peoples to exploit their lands (VILANI; FERRANTE; FEARNESIDE, 2022). This logic can be considered consistent with neoliberalism, which, according to Castree (2008), involves the privatisation and commodification of nature since the market is understood as the best mechanism for allocating resources, even if they are public goods. Thus, nature becomes a means to the end of capital accumulation, where accumulation is accomplished by dispossessing other individuals, entire communities, and/or society (CASTREE, 2008).

In Brazil, democratic setbacks have intensified, especially from 2019, coinciding with the beginning of President Bolsonaro's mandate (SEIXAS *et al.*, 2020), whose political ideology managed to agglutinate as an electoral support base private economic groups interested in the deprecation of the Amazon's natural resources – especially illegal logging and mineral extraction (VILANI; FERRANTE; FEARNESIDE, 2022). The signs of the crisis of Brazilian democracy, which had already revealed themselves in the 2013 protests and the fierce dispute between supporters and opponents of the Workers' Party in the 2014 presidential elections, and even more clearly in 2016, in the impeachment process of President Dilma, showed all their forcefulness in the campaign for the 2018 presidential elections. In this opportunity, it was possible to observe a growing distrust by part of society towards institutions (FERNANDES; TEIXEIRA; PALMEIRA, 2020).

Once elected president of the Republic, Jair Bolsonaro, in their first two years in office, accelerated the process of eroding the State from within, weakening institutions – especially those linked to the executive branch – and dismantling public policies in the areas of education, culture, citizenship, human rights, and the environment (AVRITZER, 2020). Since his election, Bolsonaro has demonstrated

explicit denial of scientific evidence in several areas of public policy (DONADELLI, 2020), adopting negationism on climate change and, later on, the health emergency of the Covid-19 pandemic, during which he repeatedly accentuated his anti-scientific attitude (AVRITZER, 2020).

According to Capelari *et al.* (2020), Bolsonaro's ascension allowed representatives of the so-called Traditional Developmentalists coalition to assume strategic positions within the government to explicitly push for the dismantling of the environmental governance system, making unilateral decisions aimed at accelerating liberalisation and privatisation processes in the areas of the economy and the environment, for example, the concession of national parks to private companies and the issuing of decrees aimed at encouraging mining on Indigenous lands or expanding permits for the use of pesticides by agribusiness, in clear conflict with public opinion, scientists, and sectors of organised civil society, especially environmentalists. The professional bureaucracy also received attacks during this process, as, in key areas such as the environment, it was removed from leadership positions without the possibility of opposing the process of erosion of public policies (CAPELARI *et al.*, 2020). To put it another way, the strategy undertaken in the environmental area by Bolsonaro's administration consisted of implementing a developmentalist agenda grounded in the market interests of allies in the extractivist sector, such as loggers, miners, cattle ranching, large-scale monoculture, and others, such as financial power players, regardless of environmental costs (MENEZES; BARBOSA JR., 2021). The indiscriminate and predatory extraction of natural resources to favour private interests can be associated with the concept of "total extractivism", which exceeds the idea of capitalist primitive accumulation. (MENEZES; BARBOSA JR., 2021, p. 241-242). According to Castree (2008), a possible reason that would explain the commodification of nature from the perspective of capital is that the degradation of natural resources produces profits. In the Bolsonaro era, this phenomenon became even more severe since the Brazilian government did not even bother to make any opposition to companies and groups seen as profit generators with absolutely no regard for the environment and other public goods, such as public health; quite the contrary, the Bolsonaro administration encouraged this kind of behaviour (MENEZES; BARBOSA JR., 2021).

As this process deepened, the negationist strategy in addressing environmental problems ensured State inaction (CAPELARI *et al.*, 2020) or the maintenance of a programmed inefficiency, which – through the centralisation of power in the federal government – limited the supervision and regulatory powers of the state bureaucracy (MENEZES; BARBOSA JR., 2021), allowed the distorted use of technical information and scientific data, and increased the space for environmental deregulatory forces to advance (CAPELARI *et al.*, 2020). According to Araújo (2020), another aspect of the calculated and ideological form of inaction in implementing the environmental policy was the alteration of non-statutory rules and the reduction of the budget.

The international literature on policy dismantling describes this process as a set of changes resulting in cuts, reductions, or even abolishing the budget, rules, laws, organisational structures, capabilities, and instruments of a policy or government sector (BAUER; KNILL, 2014). It is depicted, therefore, as an institutional change that affects the State's degree of commitment to a particular policy subsystem. According to Bauer and Knill (2014), policy dismantling, however, is not homogeneous and can occur in two dimensions of the policy mix: i) density, i.e., quantitative modifications of the policies and instruments, such as the reduction or the extinction of public programs effectively implemented in a certain period; ii) intensity - qualitative modifications in the policy mix by the degree of prioritisation granted to a sector in the governmental agenda or the decrease of operational resources, budget, and staff.

In Brazil, the environmental policies dismantling seems to have been intensified in both dimensions since 2019, when the Ministry of Environment, consistent with President Bolsonaro's denialist ideology on climate change and environment protection, began working in this direction. Among the most memorable events, the following are worth mentioning:

1. Extinction of the Secretariat of Climate Change and Forests;
2. Disqualification of the data provided by the National Institute for Space Research (Inpe) on deforestation and the exoneration of the president of this institute by the government, still in 2019;
3. The stimulus for wildfires, deforestation, illegal logging, occupation of Indigenous lands and Conservation Units, and clandestine mining;
4. Attacks on international agreements on climate change;
5. Flexibilisation of environmental norms using infra-legal acts and the presentation of bills that are harmful to the environment, such as Bill No. 3,729/2004, to simplify the procedures for granting environmental licenses, and Bill No. 2,633/2020, the so-called land-grabbing bill, on regularisation of improper occupation of public lands;
6. Release of native timber exports without the required export license, despite the contrary opinion signed by Ibama's career civil servants (Administrative Act No. 7036900, of February 25, 2020, issued by the president of Ibama, Eduardo Bim);
7. Removal of civil servants who held senior positions, especially in Ibama and ICMBio, replaced by political allies – mainly military agents – aligned with the government ideology, regardless of the lack of the necessary technical and relational skills (SEIXAS *et al.*, 2020);
8. Centralisation of decision-making on environmental policy issues in the federal government, with reduced autonomy of Ibama and ICMBio, and withdrawal of civil society representatives from spaces of discussion about environmental norms, as occurred with the alteration in the membership of the National Environmental Council - Conama and the National Council of the Legal Amazon - Cnal (MENEZES; BARBOSA JR., 2021).

The government's intention to proceed with deregulation was evident during the ministerial meeting of April 22, 2020, when the Minister of the Environment at that time, Ricardo Salles, defended the need to take advantage of the involvement of public opinion in the Covid-19 pandemic crisis to "to let the herd of oxen pass", i.e., to relax regulations that govern the implementation of public policies in Brazil (SUPREMO TRIBUNAL FEDERAL, 2021).

These events indicate that the process in motion is quite similar to the strategy of *Active Dismantling*, which focuses on high visibility with a strong and clear preference for dismantling in terms of density (abolition of policies or instruments) as well as intensity - reducing of funding and deregulation (BAUER; KNILL, 2014). Moreover, it is also embedded in a major worldwide tendency of populism with growing concerns about its impacts on the weakening of state capabilities and liberal-democratic backlash. In this particular case, the populist government undertakes this set of initiatives to reform or extinct the policy organisation, resources, rules, accountability basis, and, primarily, the bureaucracy values, goals, and means (BAUER *et al.*, 2021), with the effect of taking on the hallmarks of an authoritarian, anti-democratic regime (MENEZES; BARBOSA JR., 2021).

The first evidence of the paralysis of deforestation inspection under the Bolsonaro administration can be found by analysing the data on the notifications issued by Ibama for violations against the flora. The average number of fines issued in the 2018-2021 period was 2,943, which, compared to the 2008-2018 period (5,018), is equivalent to a drop of 41.3% (OBSERVATÓRIO DO CLIMA, 2022). As a result of this process, Brazil has registered an increase in the deforestation rate in the Legal Amazon of more than 75.6% during the period 2018 to 2021 (INPE, 2021), and, in the environmental area, has progressively lost its role as a protagonist in relations with the most influential countries on the world political stage.

3 ANALYSIS MODEL AND RESEARCH HYPOTHESES

To advance on the SLBs' perception of the dismantling impact on their behaviour and performance, the paper relies on an analytical model of the implementation process that combines different approaches based on the distinct positions found in the literature. Therefore, the institutional, individual, and relational dimensions were placed in a dialectic relation, which provided a view beyond the limitations of each one and their contribution toward an advance in knowledge on the topic (BONELLI *et al.*, 2019).

In this regard, D'Ascenzi and Lima (2013) propose a more fluid understanding of the concept of implementation, which could be understood as the result of the interaction between the set of guidelines expressed in a plan and the elements that define the actual context, including power relations established in the workplace. Plans and regulations can be conceived more flexibly as socially constructed objects and potentialities of intentions to be tested, continually interpreted, adapted, and improved by the actors involved in the implementation process (LIMA; D'ASCENZI, 2013). The individual action can be understood as an agency, explained by incentives, values, and beliefs (MAYNARD-MOODY; MUSHENO, 2015); the interactions can be conceived as cooperative or confrontational relations among different actors whose interests may not be aligned (LOTTA, 2018).

All this makes it possible to understand how, within a complex system such as the implementation of environmental policy, the institutional dimension is confronted and renewed in a dialectical tension with the agency and the multiple relationships established inside and outside a given organisation. Therefore, in the analysis, we include the agency of individuals and networks of organisations and agents that make up the system from the point of view of their interactions.

All these elements are covered in the analysis model, elaborated from the theoretical construct presented in the article by Bonelli *et al.* (2019). The model comprises three dimensions and their respective indicators, as Figure 1 shows below.

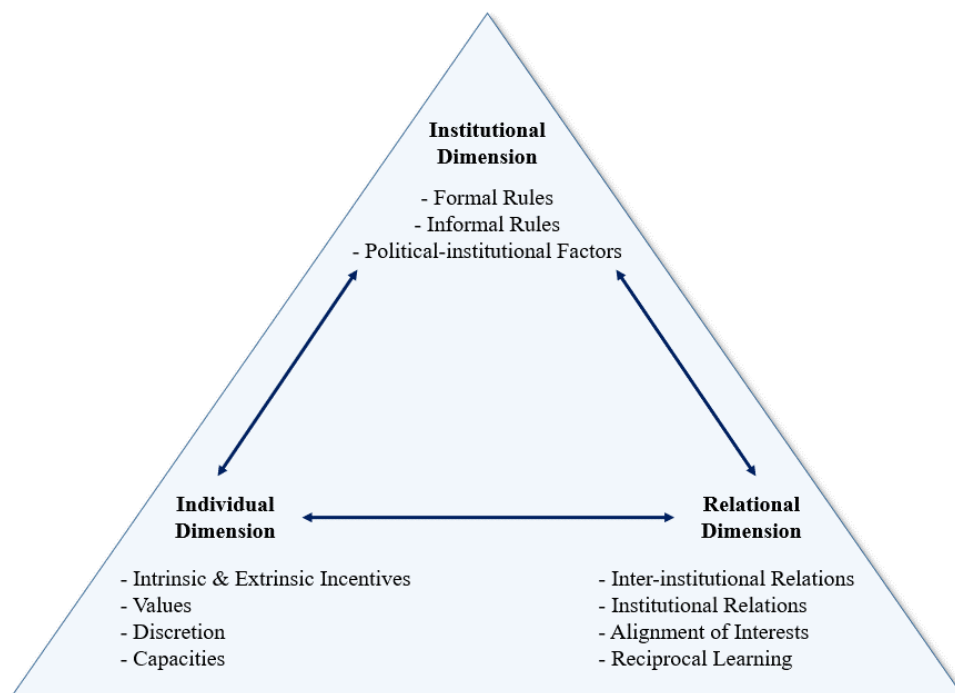


Figure 1 | Analysis model of environmental street-level bureaucrats' action

Source: authors' elaboration.

Below is a brief explanation of the composition of the analysis model, highlighting the indicators that make up each of the dimensions:

- **Institutional dimension.** Besides the formal rules, related to a Weberian view of institutional structures, the existence and influence of informal rules in the agents' actions were considered. It is understood that informal and formal rules are fundamental for regulating the interactions between different social actors. They must be included to understand the nature and functioning of institutions fully. Political-institutional factors have also been added, as they have been shown to influence policy implementation. In Brazil, supplementary action by the Union is necessary, mainly through the federal autarchies, in those states that cannot adequately confront environmental crimes resulting from collusion between offenders and local politicians. For instance, in Brazil, additional action by the Union, mainly through the federal autarchies, is needed in states that cannot adequately address environmental crimes resulting from collusion between offenders and local politicians.
- **Individual dimension.** We simultaneously contemplate incentives (intrinsic and extrinsic) and values because we understand that agents' behaviours are not necessarily motivated by cost-benefit calculations, as pointed out by the Agency Theory). We believe that the same agents, depending on contingencies, may adopt, in a given circumstance, opportunistic behaviours and, in another case, cooperative behaviours, without necessarily being altruistic. It should be noted that despite developing the dialectic tension between structure and agency (BARRETT, 2004), discretion is also understood as an indicator of the individual dimension. As for capacities, we consider that, in addition to technical-administrative capacities, public agents must also have political-relational capacities, which relate to the skills of interlocution, conflict negotiation, and consensus building (PIRES; GOMIDE, 2016).
- **Relational dimension.** Compared to the theoretical construct presented in the article by Bonelli *et al.* (2019), indicators of institutional and inter-institutional relations and alignment of interests were inserted; on the other hand, the indicator of reciprocal learning was maintained. In this sense, it is understood that learning can be developed from the interaction of different social actors, who, even if they have other interests, may feel encouraged to experiment with new methods and techniques jointly and, in this way, obtain more satisfactory results.

Thus, we adopted the analytical model to investigate, based on the SLBs' perception, the impact of Bolsonaro's administration's dismantling strategy on the enforcement of norms and structures defined in the environmental policy, as well as on informal rules, political-institutional factors, individual agents' conducts, and their mutual interactions, and to assess its effects, especially on the implementation of inspection and control of deforestation plans in the Amazon region. This leads to the first hypothesis of this article:

Hypothesis 1: The changes undertaken by President Bolsonaro's administration on the environmental policy implementation affect the adherence to formal and informal rules and the containment of political-institutional factors (institutional dimension), the conducts of SLBs (individual dimension), and their interactions (relational dimension), undermining the functioning of Brazilian deforestation inspection and control system.

On the other hand, it is also necessary to understand the dynamics of disruptive change that lead to institutional weakening and dismantling of the environmental policy after a certain degree of erosion of the founding dimensions of the SLBs' action. This process, despite the possible resistance from the agents (BAUER *et al.*, 2021), is translated, in fact, into the disabling of programs and management

instruments, the dismantling of institutions (MENEZES; BARBOSA JR., 2021), the reduction of budget and organisational structures (ARAÚJO, 2022), the loss of individual and institutional capacities, and the emptying of partnership relationships (BAUER; BECKER, 2020; BAUER; KNILL, 2014). In the case of inspection and control of deforestation plans, the empirical investigation conducted in this paper allowed us to map the perception of the SLBs about the erosion of institutional structures and mechanisms and their deviation from the mission of preserving the Amazon.

Therefore, from the understanding of the constitution of the founding elements of Brazilian environmental policy, with a focus on the inspection and control of deforestation, the model needs to be dynamically directed to understand, also, the active dismantling process, which corresponds, in our model, to the corrosion of the institutional, individual and relational dimensions.

Thus, by identifying the distortions of the foundational elements of the SLBs' daily actions and their effects, the model we adopt in this work allows us to understand how the process of disruptive change takes place (BAUER; BECKER, 2020), which, in the context proposed for this article, leads to the hypothesis of the active dismantling of the Brazilian inspection and control of deforestation system.

According to Bauer and Becker (2020), the definition of the goals of populist public administration policy depends on the different possible combinations between administrative order, that is, the embeddedness of the professional bureaucracy in the structure of public administration (fragile or robust), and the view of the state by the government in power (positive or negative). In a situation in which a negative view of the state is combined with a fragile administrative order, as in the Brazilian case, it is plausible that a populist government, such as the previous one, pursues a strategy of dismantling rather than one of sabotage, which would occur if Brazilian environmental bureaucratic structures were more consolidated.

From the point of view of the frontline agents, it is possible to relate the types of behaviours identified from the primary data extracted from the interviews conducted with Ibama and ICMBio SLBs with the categories defined by Bauer *et al.* (2021) on the reaction of the bureaucracy when faced with an active dismantling strategy conducted by populist governments (BAUER; KNILL, 2014), a process that, in the case of Brazil, was characterised by abrupt changes undertaken by an extreme right-wing populist government (MENEZES; BARBOSA JR., 2021). As stated by Bauer *et al.* (2021), civil servants confronted with this situation can react in three ways: working, shirking, and sabotaging. In the first case, agents, more politically aligned to the government, follow the orders received by their superiors; on the other hand, in the second and third cases, respectively, they avoid confrontation, seek exit strategies (shirking), or resist attacks (sabotage) aimed at dismantling structures, resources, personnel, norms, and accountability relationships of public institutions (BAUER *et al.*, 2021).

Therefore, the theoretical argumentation developed so far allows the construction of the second research hypothesis, presented below:

Hypothesis 2: The active dismantling of the deforestation inspection and control system in Brazil consists of the corrosion of the institutional dimension due to the deregulation and weakening of formal and informal institutional arrangements, the paralysis of bureaucratic capacities (individual dimension), and the disarticulation of partnership networks (relational dimension).

4 DATA AND METHODS

The research strategy was case-oriented, aimed at deepening the underlying relationships among cases selected for their significance in understanding the phenomenon (RAGIN, 2008).

A cross-case analysis was performed to examine the action of two different profiles of SLBs operating in the context of Brazilian environmental policy: the Ibama Inspector and the ICMBio Agent. These two categories of agents were deliberately selected because they differ in the role, activities, *modus operandi*, and territorial delimitation of their function.

In order to better characterise and size the two institutions, here are some data about their respective structures and workforces.

Ibama, besides the headquarters in Brasilia, has 27 Superintendencies that operate in their respective Federation Units (UFs), developing an inspection activity that complements that of the States (IBAMA, 2023; PINHEIRO *et al.*, 2022). With regards to the number of Ibama professionals, the data collected in this research allowed us to estimate that the institution had less than 3,000 employees (2,784 at the end of 2022, according to data from the *Portal da Transparência - Controladoria-Geral da União* [Office of the Comptroller General of the Union's Transparency Portal] (BRASIL, 2023), of which 1,200 were located at the headquarters, and the rest spread throughout the country, against the 5,000 positions available. According to the reports from our interviews, as a consequence of the general decrease in the number of Ibama's public servants, the number of Inspectors – agents designated for environmental inspection by administrative order – fell abruptly from 1,680, accounting in 2008 to about 700, estimated in early 2020. Of this number, only over 400 agents were working in the field, while the other half were performing administrative activities.

As for ICMBio, our research found that the institute manages 334 Conservation Units (UCs) scattered from north to south of the country, whose combined areas correspond to almost 10% of the entire national territory, equivalent to 171,424,192 hectares (ICMBIO, 2021). The federal Conservation Units located in the Amazon total 125, occupying a surface area of 63,504,455 hectares, equivalent to 15% of the Brazilian Amazon territory (ICMBIO, 2021). According to updated data from ICMBio (2023), the institute counts 1,705 public servants (including 66 nominated to commissioned positions), of which 971 are Environmental Analysts (almost 57% of the total), 237 Administrative Technicians (14%), 222 Environmental Technicians (13%), 36 Administrative Assistants (2%), and 26 Administrative Analysts (1.5%). Note that these estimates do not include outsourced employees who work in the field, as, for example, fire brigades. As for the number of ICMBio's agents responsible for environmental inspection (Federal Environmental Agents), the data obtained in the interviews allowed us to estimate that, of the approximately 1,700 public servants, around 900 would be Inspectors nominated using an administrative order and that, of this total, around 600 would work in Conservation Units located in the Amazon region. However, it is estimated that only about fifty are dedicated to environmental enforcement actions in the field.

In this article, the environmental policy analysis implemented by ICMBio's agents is limited to the federal Conservation Units (UCs) located in the Legal Amazon. According to Law No. 9,985/2000, which institutes the National System of Conservation Units, the Conservation Units are subdivided into two large groups according to their different purposes, namely: Integral Protection, whose purpose is to preserve nature, allowing only the indirect use of its natural resources; and Sustainable Use, whose purpose is to make nature conservation compatible with the sustainable use of part of the natural resources (BRASIL, 2000).

The research time frame was from 2004 to 2021 for Ibama, and 2007 to 2021, for ICMBio, focusing on comparing the first three years of the Bolsonaro administration and previous mandates. The techniques used for data collection were semi-structured and in-depth interviews and documentary research. The script, built from the analysis model, was adapted according to the two different interviewee profiles and was used as a guide to let the field speak and to orient the researchers' work. Considering the extensive time frame adopted, the questions addressed to the interviewees from both institutions were aimed at comparatively examining how the three different dimensions of the SLBs'

action and their respective indicators have evolved throughout the different administrations of the Brazilian federal government and, especially, how they were affected during the last mandate.

Documents such as laws, decrees, regulations, reports, and other relevant files were used throughout the document analysis to corroborate the primary data obtained in the interviews using the triangulation technique (DENZIN; LINCOLN, 2005).

The texts of the interview transcripts were examined using Systematic Content Analysis (SCA), based on the procedures described by Hall and Wright (2008) and Salehijam (2018), with adaptations depending on the research objective and data available.

The SCA was articulated in the following steps: a) selection of cases by convenience, using the “snowball” technique; b) coding of texts, adopting consistent criteria to ensure reproducibility; c) analysis of coded contents, with the help of a field diary and memos to deepen the understanding of the statements and place the evidence correctly on the timeline throughout the period considered, constantly triangulating with data from secondary sources; d) analysis of coding frequencies using descriptive statistics. NVivo 12 Plus software was used to streamline the procedures of archiving, systematising, and processing the information.

The method adopted, expensive in terms of time spent to conduct the interviews, interpret and codify the texts obtained from them, led the authors not to employ techniques that would allow a more accurate description and a broader graphic and tabular expression of the phenomenon, as would be possible if, for example, the survey method was used. Thus, simple descriptive statistical techniques, such as average and standard deviation, were applied only to analyse the frequencies of the indicators of the analysis model, to represent, in a more objective way, the interviewees’ statements, and to favour the understanding of comparisons between the agents of the two institutions.

Twenty-eight interviews were conducted from March 2019 to September 2020, fourteen for each institution. The interviewees were chosen, adopting the “snowball” method (SIERRA, 1998), among street-level bureaucrats at Ibama and ICMBio. Thus, from a preliminary list of participants made available by the agents contacted intentionally at the beginning of the field research, the remaining interviewees were selected based on the indications obtained as the empirical work advanced (SIERRA, 1998). In the case of Ibama, the unit of assignment of the Inspector was not a criterion used for the interviewee’s choice since the Federal Environmental Agents are assigned, on a shift basis, to work in the Legal Amazon, regardless of their state of origin. In the case of ICMBio, twelve different Conservation Units located in the Amazon region were selected by convenience.

Considering that a qualitative technique was adopted, the number of interviewees was not calculated a priori according to sampling criteria, based on the logic of proportionality and statistical representativeness (SIERRA, 1998; VALLES, 1997), but as many individuals as necessary participated until the theoretical saturation of the indicators was reached. The participants freely made their statements so that their identities and personal data would be kept confidential. Considering the small number of Ibama inspectors (700 individuals) and ICMBio agents working in Conservation Units of the Legal Amazon (600 individuals), as well as the high number of variables (twelve in total) included in the three dimensions of the analysis model, we decided not to conduct a survey, as it would be unfeasible to reach a sufficiently representative sample size for the validation of the factor analysis. Assuming a tolerable sample error of 4%, it would be necessary to reach a percentage of respondents close to 47% and 51% of the population of Ibama and ICMBio agents, respectively.

Given the scale design with a high number of questions (close to 100) and the historically proven difficulty in achieving a response rate higher than 25%, especially in surveys conducted online and without prior contact with the potential respondent (HIEBL; RICHTER, 2018), the format would tend to leave the two samples underrepresented and would not allow, in any way, the generalisation of the

results. Based on this, we prioritised semi-structured and in-depth interviews rather than a survey. Experts in the field, who were explicitly consulted on this matter, corroborated this decision.

5 THE SLBS' PERCEPTION ABOUT DEFORESTATION INSPECTION AND CONTROL IN BRAZIL: COMPARATIVE ANALYSIS IBAMA VERSUS ICMBIO

To show more objectively the results of the comparative analysis between the cases of Ibama Inspectors and ICMBio Agents, we counted the frequencies, in absolute value, of each indicator in each of the statements collected with the civil servants of the two institutions. Subsequently, the percentage frequencies of these indicators were obtained for each of the two organisations by dividing each case's absolute frequencies by the indicator's total frequency and adding the values assigned to each case to compose the aggregate percentage value, respectively, for Ibama and ICMBio. Thus, Figure 2 below briefly shows how the percentage frequencies of each indicator of the analysis model are distributed among the set of cases of the two institutions. The spheres are drawn in proportion to the total percentage value of each indicator. For comparative purposes, the overlapping sphere is associated with a higher percentage frequency in observing each indicator between the two institutions.

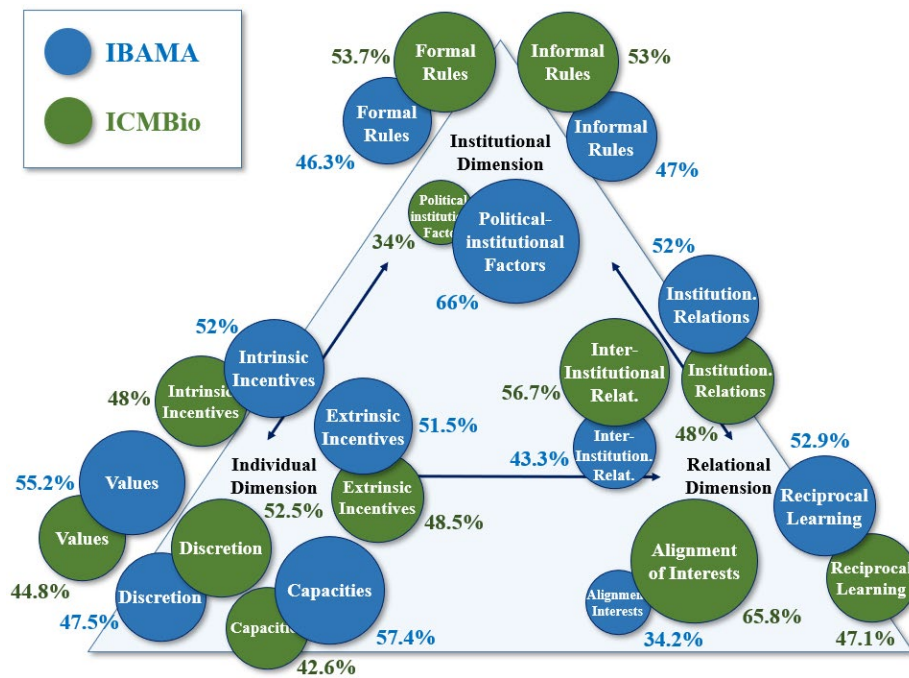


Figure 2 | Distribution of indicators frequencies comparing the cases of Ibama and ICMBio

Source: authors' elaboration.

Observing the aggregated data of the indicators of the **institutional dimension**, it is worth noting the concentration of “political-institutional factors” in Ibama (66%) compared to ICMBio (34%). The Inspectors of Ibama emphasised, in their statements, the impact of political pressures internal and external to the entity on enforcement actions, as is reflected in the following testimony about the actions of public managers appointed by the government:

Now, it is impossible for us to stand here and watch environmental public managers who are doing nothing in areas that Ibama has embargoed, where the white man enticed the Indians, went inside the indigenous land, mechanised the soybeans, exploited the soybeans there, against the Constitution,

against the Indigenous Statute, against the Biosecurity Law, totally outside the law and still internalised this production in the market. And today's public managers are so there, you know, demeaning the legislation. It's sad, isn't it? (Interview No. 2, authors' translation).

On the other hand, the performance of ICMBio Agents – characterised by more heterogeneous activities – does not seem to be so affected by the behaviours of political agents, according to the interviewees.

In the **individual dimension**, the elements that show the most significant discrepancies between the cases of Ibama Inspectors and ICMBio Agents are “capacities” and “values” since the former is distributed in the proportions of about 57% for Ibama and 43% for ICMBio; and the latter reach, respectively, around 55% and 45%. In Ibama Inspectors' statements, greater emphasis was placed on the importance of capacities (technical-administrative and political-relational), the role of values, and the influence of both categories on their actions, especially during inspection operations. In the case of ICMBio Agents, it results that, due to the nature of their work – which includes socio-environmental management as a fundamental component, in addition to other quite heterogeneous tasks –, on the one hand, the baggage of capacities does not need to reach the same level of specialisation as that of Ibama Inspectors; on the other hand, the set of individual values are less predominant, mainly because the Conservation Unit managers are socially embedded in the community where they work and, therefore, by the need to put collective interests before individual ideals and beliefs.

The “intrinsic” and “extrinsic incentives” show a slight predominance of the concentration of these indicators in Ibama (around 52%) compared with the Chico Mendes Institute (about 48%). The data also show that ICMBio's public servants resort more to using discretionary power (52.5%) than Ibama's Inspectors (47.5%). The Chico Mendes Institute's Agents, in their daily activities, need to resort to dialogue, negotiations, consensus building, and reaching agreements among the various stakeholders due to their functions related not only to the protection of biodiversity but mainly to environmental education and socio-environmental management in collaboration with other social players.

As for the evaluation of the results of the **relational dimension**, the results show, in general, the highest concentration of indicators in the cases of the ICMBio, because the action of its agents, compared to Ibama's Inspectors, is less focused on enforcement and more prone to weaving inter-institutional relationships. The two indicators, “alignment of interests” and “inter-institutional relations”, reveal this characterisation since, for the ICMBio, the percentages reach almost 66% and 57% against 34% and 43%, approximately registered in the cases of Ibama. On the other hand, in the latter institution, there is a prevalence of relationships established with professionals from the same institution (52% versus 48% for ICMBio). This aspect is quite characteristic of the work of Ibama Inspectors. When working in teams composed of SLBs from different states, they need to develop strong cohesion within the team and promote intense knowledge exchange. Finally, the “reciprocal learning” indicator, which in the case of Ibama reaches a percentage of almost 53% (about 47% in the case of ICMBio), is due precisely to the greater intensity that the inspection work of the first institution requires in terms of the exchange of experiences and technical knowledge within their teams.

The analysis of the opinions collected in the interviews allowed us to understand, at the micro level, how perceptions vary among the agents of the two institutions studied about the main elements that characterise their actions in implementing environmental policy. The synthesis of the main aspects identified in the statements, with the peculiarities that distinguish each one of the two organisations, is displayed in Table 1 below:

Table 1 | Summary of the comparative analysis between the Ibama and ICMBio cases

IBAMA	ICMBIO
The political-institutional factors have a greater influence on the actions of Ibama SLBs	Formal rules, informal rules, and discretionary power have a similar weight between the two institutions, with a slight predominance at the ICMBio
The capacities, values, and, to a lesser extent, the incentives show a greater incidence from the point of view of Ibama Inspectors	At the ICMBio, inter-institutional relations have a greater influence compared to institutional relations, as its Agents are socially embedded (their actions require building consensus with other public entities, communities, local producers, and other socio-economic actors)
Institutional relationships prevail due to the relevance of knowledge exchange between the Federal Environmental Agents coming from different regions of Brazil for the execution of environmental inspections	The work inside the institution is developed in a more individualised way and seems less permeated by team spirit
Ibama Inspectors more often use the institutional doctrine, the baggage of skills, and the guidance of the team coordinators	

Source: authors' elaboration.

From the primary data analysis, it is also worth noting that, in both entities, the “intrinsic incentives” are strictly linked to the set of “values” of the environmental agents (identification of the individual ideal of defending nature with the institutional mission); the degree of “discretion” adopted in environmental enforcement correlates with the technical and relational “capacities” of the agents (knowledge of the legislation and ability to apply the rule to the factual situation). The environmental policy enforcement benefits from applying “informal rules” and routines that favour the adaptation of “formal rules” to the specific situation and/or the local context, as long as the principle of legality is not contradicted.

The empirical evidence shows that, despite the specificities of Ibama and ICMBio, the institutional, individual, and relational dimensions and their respective indicators are compatible with each other, defined concomitantly, and ground the action of the bureaucrats who implement inspection and control of deforestation plans in both institutions, confirming the first research hypothesis, based on the SLBs perception.

6 DEFORESTATION INSPECTION AND CONTROL AFTER THE BEGINNING OF THE BOLSONARO ADMINISTRATION

In addition to comparing the performance of frontline agents working in the two institutions studied, this research also observed elements that allowed us to evaluate the environmental policy transformations that occurred after the beginning of Bolsonaro’s term. This aspect is related to the changes implemented by this government regarding the institutional dimension, with repercussions on the individual and relational dimensions, such as changes in infra-legal norms, attempts to reform legislation, political pressure on public agents, dismissals of public servants trained in the fight against deforestation and environmental preservation, and the appointment of military personnel without the necessary expertise. This is clear evidence of strategies of populist public administration policy, whose goals are oriented towards dismantling, coherently with what was pointed out by Bauer and Becker (2020) about democratic backsliding caused by populist governments.

In most interviews, two conceptual categories emerged without being directly asked of the participants: “environmental policy dismantling” and “institutional weakening” of the leading entities responsible for implementing the environmental agenda. Therefore, we decided to return to the text of each interview, and we verified the presence/absence of these variables and the temporal marker associated with their occurrence – whether before or after the beginning of the Bolsonaro government’s mandate. We also checked the condition of each respondent regarding the continuity, or not, in the exercise of the respective senior position, if any. Considering that fourteen Ibama

Inspectors and fourteen ICMBio Agents were interviewed, it was possible to calculate the incidence of each variable over the total of each group of interviewees and thus calculate (and compare) the percentage frequencies between the two institutions (Ibama Frequency versus ICMBio Frequency), as well as obtain the total percentage of all twenty-eight respondents (Overall Frequency). It is also worth noting that the variables “environmental policy dismantling” and “institutional weakening” are not mutually exclusive. Thus, it was possible to verify, in most cases, that the same interviewee stated that, at the same time, both policy dismantling and institutional weakening occurred in the respective institution. Thus, Table 2 reports the frequencies of the variables described above.

Table 2 | Poll on institutional changes in environmental policy “after Bolsonaro”

	<i>Environmental policy dismantling</i>	<i>Institutional weakening</i>	<i>Removal from senior position</i>	<i>After Bolsonaro</i>
Ibama Total	13	14	6	13
Ibama Frequency	93%	100%	43%	93%
ICMBio Total	6	12	2	7
ICMBio Frequency	43%	86%	14%	50%
Overall Total	19	26	8	20
Overall Frequency	68%	93%	29%	71%

Source: authors' elaboration.

Table 2 shows that in Ibama, there is a strong alignment between the Inspectors who evaluate that there is a process of environmental policy dismantling and those who state that this process began with the advent of Bolsonaro’s term, as the respective variables both show the same value (around 93%). It is possible to observe the exact alignment in the ICMBio Agents, but to a much lower degree, with the importance of the variables “environmental policy dismantling” and “after Bolsonaro” corresponding, respectively, to about 43% and 50%. Thus, it is possible to state that almost all the Ibama Federal Environmental Agents perceive the profound institutional changes undertaken by the previous government in environmental policy and its deleterious effects; on the other hand, in the Chico Mendes Institute, the SLBs are quite divided on this issue.

Regarding institutional weakening, it can be argued that Ibama Inspectors are unanimous about the occurrence of this phenomenon in the Brazilian environmental area (100%) and that the vast majority of ICMBio Agents have a similar position (around 86%), but without necessarily linking this process to the actions of the Bolsonaro government.

According to the results of the cross-time poll conducted in this research, there has been a strong impact of the Bolsonaro government on the removal of civil servants with senior positions, as Bauer *et al.* (2021) indicate. The results show that this effect has been greater in Ibama than in ICMBio (about 43% and 14% of respondents, respectively). This may have affected the participants’ opinions regarding evaluating the institutional changes and their effects.

As for the aggregated data, it is relevant to note that, according to almost 93% of the respondents, there is an ongoing process of institutional weakening in the environmental area, which, for most of these respondents (about 71%), can be attributed to the actions of the Bolsonaro government.

Similarly to what was put about the data from the Ibama cases, there is also an alignment, at the aggregate level, between the SLBs who believe in the dismantling process of environmental policy and those who understand that this process began after the start of the Bolsonaro administration, as the variables present, respectively, the values of around 68% and 71%. The testimonies of the environmental agents show their bewilderment in the face of the deconstruction of the environmental policy pursued by the Bolsonaro administration, as is clear from the following excerpt:

The government has messed with this [the regulations] a lot. It leaves you a little bit, in my opinion... a little bit perplexed. You don't really know what course the government wants to take, the strategic direction of the public policies. [...] All the time, we see that there are modifications in the regulations, but they are due to the interest of some groups (Interview No. 9, authors' translation).

In sum, according to the respondents' opinions, after three decades of incremental progress, Brazilian environmental policy was the object of a dismantling process by the former government through the corrosion of the founding dimensions of the action of its SLBs, among which stand out the loss of bureaucratic capacities and decision making guided by opportunism rather than technical criteria, as can be observed in the following statements:

Staff replacements compromise too much the management of the work, the management of the institution... it compromises too much because the whole direction that would be on a line of conduct is changed by people who don't know the house, don't know the institution and will create their own rules [...] (Interview No. 6, authors' translation).

So these people come – right? – that I call aliens, and they simply come to do things that only interest that politician, that businessperson who managed to get them appointed to office. (Interview No. 14, authors' translation).

This result coincides with what is pointed out in recent research about the weakening of democratic institutions and the active dismantling of public policies (BAUER; BECKER, 2020; BAUER; KNILL, 2014), especially in institutional contexts shaped by changes promoted by far-right populist governments (CAPELARI *et al.*, 2020; LEVITSKY; ZIBLATT, 2018; MENEZES; BARBOSA JR., 2021). In effect, the bureaucratic overhaul, whereby career civil servants are removed from their senior positions by political will or for choosing the exit for fear of persecution, is illustrated in studies on the impacts of policy dismantling produced, in various countries around the world, by extreme right-wing populist governments on the professional bureaucracy.

We witnessed in Brazil under Bolsonaro a process of undoing public policies (not only in the environmental area) by a government that, apparently acting within the framework of legality, combined a strategy of inaction (ARAÚJO, 2020; CAPELARI *et al.*, 2020) with an ongoing work of dismantling already consolidated policies and deteriorating its own institutions (BAUER; KNILL, 2014; MENEZES; BARBOSA JR., 2021).

The active dismantling of the Brazilian environmental policy, with a focus on the inspection and control of the deforestation system, is represented through a version of the model capable of capturing the distortions that occurred after the advent of the Bolsonaro administration (Figure 3 below).

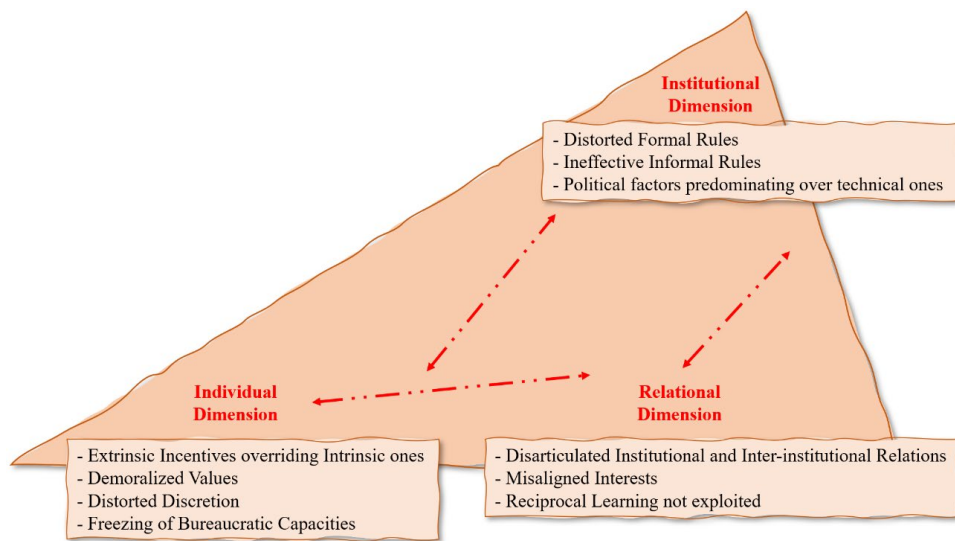


Figure 3 | Active dismantling of Brazilian deforestation inspection and control system

Source: authors' elaboration.

The information collected in the interviews shows that the weakening of Ibama and ICMBio was perpetrated through deregulation at the infra-legal level, removals of experienced Inspectors from senior positions, and President Bolsonaro's attacks on environmental agents that, far from being mere rhetoric, was an expression of a political tactic to legitimise environmental violations (MENEZES; BARBOSA JR., 2021). This conduct of the previous federal government undermined the daily activities of the frontline agents, whose response in the field mainly expresses resistance to abuses and interference in a context of growing conflicts with violators, but that is not without a general feeling of discouragement, as is evident in the following excerpts:

The agent, poor fellow here on the frontline, can't enforce the law when there is an example from the *Planalto* that speaks against it, right? This attitude puts the public agent, instead of the criminal, as a bandit, which is the situation that all inspectors live today, right? (Interview No. 17, authors' translation).

The removal of experienced agents from leadership positions is our big concern, you know? Because they are people who work well, who know what they are doing, who have experience. We are kind of devastated to see a situation like this. We see the dismantling of a structure that was already working! (Interview No. 10, authors' translation).

Thus, the institutional changes have affected the individual dimension – with the removal of historical leaders and the appointment of chiefs without the necessary skills – and the relational dimension – with the loss of inter-institutional partnerships established over the past decades. According to Donadelli (2020), consensus building and interdependence among different stakeholders are necessary for scientific evidence to be used productively in policymaking. From this, we understand that demobilising these institutional and inter-institutional relationships is another aspect that confirms the intentional dismantling of environmental policy. The acceleration of the increase in deforestation rates in the Legal Amazon observed mainly from 2018 to 2021 is the most tangible consequence of this phenomenon.

In short, the result of the deconstruction of the fundamental dimensions of the SLBs' action was the progressive corrosion of the two main Brazilian environmental entities and the active dismantling

of the inspection and control of the deforestation system, which presented itself with its deformed structure, confirming the second research hypothesis.

7 FINAL REMARKS

The paper investigates how Bolsonaro's administration has affected the environmental policy implementation in Brazil, especially by the street-level bureaucrats' (SLBs) perception. As a result, the findings confirm that an active dismantling process is in motion and undertaken in different forms, such as deregulation, weakening of federal environmental institutions, disconnection of public servants from motivations, values, and principles, paralysis of individual and organisational capacities, distortion of the SLBs' discretionary power, and emptying networks of institutional and inter-institutional relations.

Different trajectories of institutional structures, individual action, and interpersonal relationships coexist in the performance of frontline bureaucrats who implement Brazilian environmental policy. Thus, depending on the level of development and strengthening of these dimensions, the action of federal environmental agents oscillates between the fulfilment of the institutional mission, resistance in maintaining operations – despite contradictory orders – and, at the other extreme, weakening that leads to conducting operations of limited impact or even inaction.

The changes undertaken by the Bolsonaro administration produced, in three years, the weakening of the agencies, with the paralysis of bureaucratic capacities and setbacks in inspection and control of the deforestation system in Brazil.

More specifically, the results point out that the Bolsonaro government ruptured the balance between the founding elements of Brazilian environmental policy. In effect, the institutional dimension, acting as an activating element, affected both the individual dimension, through the removal of experienced agents from senior positions, and the relational dimension, with the disarticulation of the relationships established in the policy community.

Despite the dismantling process, the pillars of the SLBs' actions continue to resist, even if hidden or latent. However, the bureaucratic capacities, as well as institutional and inter-institutional relations, have the potential to be reactivated. This question will be addressed in future research: how and under what conditions will it be possible to put the structures and mechanisms of Brazilian environmental governance back into the entire operation? Another critical focus is to explore the reactions expressed by the environmental agents in the face of the active dismantling promoted by the Bolsonaro government, whether it fits as shirking, sabotage, or working (BAUER *et al.*, 2021), or other categories emerging from the fieldwork.

The main limitations of this study are related to the methodological procedures and the operationalisation of the empirical research.

First, it is worth considering that the analysis strategy adopted involved a certain margin of subjectivity in interpreting the interviews. Even so, efforts were made to ensure reliability and reproducibility in coding the statements and to maintain the necessary distance from the participants' opinions.

Second, there are some limitations related to choosing a case-oriented research strategy. The present work did not aim to measure variables based on data extracted from a representative sample so that the results could be considered statistically significant, nor to study the cause-effect relationships between the SLBs' action indicators and a dependent variable. Therefore, the research results, although indicative of the understanding of the phenomenon, cannot be generalised.

However, considering the scope defined for this research and the limitations of time and resources, it is evaluated that the objective of this work was achieved.

In short, this paper has shed light on how important it is for Brazilian environmental policy to keep solid institutions, bureaucratic capacities, and partnership networks functioning. Integrating all these elements allowed significant advances in the incremental building of this governance arrangement.

Conversely, it took only three years of the Bolsonaro government to undermine a considerable part of the progress made in the three decades after the country's re-democratisation.

From the results presented, it is understood that although the diffuse right to preserve the environment is constitutionally recognised, the Brazilian environmental policy still needs stricter regulation. In this sense, consolidating the professional bureaucracy's role, guaranteeing substantive autonomy of the agencies, and establishing mechanisms to encourage territorial planning and sustainable, productive activities become imperative. Thus, although this research agenda needs to be further explored, we believe that our article contributes to the advancement of knowledge about the strategies that a far-right populist government can deliberately adopt to dismantle already consolidated public policies and favour particular interests of groups that benefit from reducing the roles of the State and professional bureaucracy.

NOTE

1| According to Law No. 12,651/2012, known as the 'New Forest Code', Legal Amazon is defined as "the States of Acre, Pará, Amazonas, Roraima, Rondônia, Amapá and Mato Grosso and the regions situated north of the 13° S parallel, in the States of Tocantins and Goiás, and west of the 44° W meridian, in the State of Maranhão." (BRASIL, 2012, Art. 3, I, our translation). This area is estimated to occupy 59% of the Brazilian territory (O ECO, 2014).

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Building and dismantling organisational capacity and bureaucratic identity: an analysis of Ibama's civil service examinations (1989 – 2022)

Construção e desmantelamento de capacidade organizacional e identidade burocrática: análise dos concursos públicos do Ibama (1989 – 2022)

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ARTICLE- DOSSIER

ABSTRACT

This article investigates how the recruitment procedures for the selection of environmental inspectors in Ibama, Brazil's leading federal environmental agency, have varied since the institution's creation in 1989 until 2022. To explain the identified changes, the study considers the organisation's accumulated experience and political context. It draws on 44 semi-structured interviews and analyses the content of all five examination booklets (*caderno de questões*) and their corresponding calls (*editais*) for the position of environmental analyst organised during Ibama's history, with a focus on the subtopic "Regulation, Control, and Environmental Inspection". For interpreting this data, I mainly used qualitative content analysis. I coded the data based on the following categories: eligibility requirements, regional allocation criteria, programmatic content, general structure of the exam, individual motivation to become an Ibama servant, impact of public exams on inspection activities, and impact of the political context on inspection activities. Exam booklets went through an additional quantitative analysis on the number of references to "deforestation", "Amazon", and "inspection". My findings suggest that Ibama's examinations between 2002 and 2013 reflect an incremental process of specialisation and technicalisation. This process enhanced the agency's capacity to inspect deforestation and strengthened its identity around the ideal of environmental stewardship. In an attempt to fracture Ibama's capacity and identity, the 2021 examination prompted a deliberate shift in selected candidates' profiles.

Keywords: Recruitment examinations. Organisational capacity. Bureaucratic identity. Deforestation inspection. Policy dismantling.

RESUMO

O artigo investiga de que maneira as inflexões nos concursos públicos para admissão de agentes ambientais federais do Ibama, o maior órgão ambiental federal brasileiro, variaram de acordo com a

experiência acumulada pela organização e o contexto político desde a criação da instituição em 1989 até 2022. Foram realizadas 44 entrevistas semiestruturadas e analisados os conteúdos de todos os cinco cadernos de questões e editais de concurso público para o cargo de analista ambiental organizados na história do Ibama, com foco na subárea “Regulação, Controle e Fiscalização Ambiental”. A análise de conteúdo, primordialmente qualitativa, foi estruturada em torno das seguintes categorias: condições de elegibilidade, critérios para distribuição regional de vagas, conteúdo programático, estrutura geral do certame, motivação individual para ingresso na carreira e impactos dos concursos públicos e do contexto político nas atividades de fiscalização. Os cadernos de questões foram adicionalmente submetidos a análise quantitativa quanto ao número de referências aos termos “desmatamento”, “Amazônia” e “fiscalização”. Os achados sugerem que enquanto os concursos de 2002 a 2013 refletem um processo incremental de especialização e tecnicização que aprimorou a capacidade do órgão de fiscalizar o desmatamento e fortaleceu a identidade dos servidores em torno do ideal de proteção ambiental, o concurso de 2021 representou uma tentativa deliberada de alterar o perfil dos candidatos selecionados, com o propósito de fraturar a capacidade e identidade do Ibama.

Palavras-chave: Concurso público. Capacidade organizacional. Identidade burocrática. Fiscalização do desmatamento. Desmantelamento de políticas públicas.

1 INTRODUCTION

Recruitment procedures of civil servants are fundamental tools in the repertoire of instruments available to elected politicians and their cabinets to influence the articulation, upholding, and monitoring of socio-environmental policies. The rules and methods for hiring employees directly impact the profile of selected candidates and can imprint long-term consequences on government agencies' organisational capacity and identity in several fields, including environmental policymaking.

Political appointments or approval in public examinations are the only two ways to be admitted into the Brazilian environmental bureaucracy. However, whereas the appointment of ministers, directors, and secretaries almost instantaneously becomes a hot topic in the media, manoeuvres that seek to change an agency through examinations hardly make headlines. Hidden amidst pages of technical jargon in lengthy public announcements, changes in eligibility criteria or programmatic content can easily go unnoticed. While the recent process of militarisation of environmental agencies through the appointment of police and army officers to leadership positions is documented in the literature (ARAÚJO, 2020, p. 3; MENEZES; BARBOSA JR., 2021, p. 237), the impact of Jair Bolsonaro's administration (2019-2022) on the recruitment of new environmental inspectors through public examinations has not yet received scholarly attention.

This article focuses on Ibama, acronym for *Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis* (Brazilian Institute of Environment and Renewable Natural Resources), a federal environmental agency with multiple competencies, such as environmental licensing and inspections. Importantly, this agency has also been increasingly recognised for its central role in anti-deforestation operations in the Amazon region. I analyse changes made in Ibama's recruitment procedures since the agency's creation in 1989 until 2022, inquiring how such changes reflect the organisation's accumulated experience and the political context in which it is embedded. This study draws on semi-structured interviews and assesses the content of all examination booklets (*caderno de questões*) and their corresponding calls (*editais*) used in tests for selecting Ibama's environmental analysts.

The article contributes to the literature in two ways. First, at a theoretical level, it connects concepts traditionally employed in organisational studies to insights from the subfield of policy dismantling. Second, this study offers the first empirical analysis of the transformations in Ibama's recruitment procedures, covering a 33-year time span that allows for comparison between different governments during Brazil's New Republic. My findings also contribute to the broader literature on policy

dismantling by revealing how authoritarian governments can use public examinations to fracture bureaucratic identity and dismantle agencies from within.

2 THEORETICAL FRAMEWORK

2.1 LITERATURE REVIEW

The early origins of policy dismantling as an academic subfield go back to the experience of deregulation and welfare retrenchment in Europe and the United States in the 1970s and 1980s (JORDAN *et al.*, 2013, p. 796-800) in the wake of neoliberal reforms prescribed by the Washington Consensus. At that point, scholars reflected on the strategies used by governments to conciliate cuts in social spending with a vote-seeking logic (BONOLI, 2012, p. 102). In this initial approach, explicitly focused on the Global North political landscape, dismantling would thus be a type of policy change seeking to reduce “traditional social democratic pro-welfare policies, [...] because of the overall context of permanent austerity” (BONOLI, 2012, p. 105).

Later attempts to render the concept applicable to different political realities, usually accompanied by calls for “a more general theory of policy change” (BAUER; KNILL, 2014, p. 42) and “more solid comparisons across countries” (JORDAN *et al.*, 2013, p. 797), resorted to quantitative approaches that presuppose the possibility of establishing a *measurement scale* of change. Along this line, Bauer and Knill (2014, p. 33-34) propose a distinction between policy density and policy intensity. Another typology by Bauer and Knill (2014, p. 39-40) situates dismantling in contexts of liberal democratic backsliding and suggests that authoritarian leaders can either side-line, use or ignore bureaucrats (BAUER *et al.*, 2021, p. 8).

The call for comparison and generalisation has been answered. Empirical cases from the Global South have increasingly been interpreted under the rubrics of dismantling in a literature strand that has attached new meanings to the concept. For example, Grisa and Niedeke (2021, p. 257-259) connect the dismantling of the Mercosur Specialized Meeting on Family Farming with the end of Brazilian leadership in the Brasília Consensus, “whose bases were the promotion of macroeconomic stability, raising the minimum wage, income transfer programs and social inclusion.” They emphasise how a focus on costs and benefits must be complemented with an account of the “ideas and norms that guide interpretations about the nature and configuration of public problems.” Similarly, Sabourin *et al.* (2020, p. 62-63) underscore how the perception of costs and benefits varies across jurisdictions, as the dismantling of family farming policies in Brazil occurred in a context of political changes “linked to the extra-national interests of international financial capitalism”.

Within Brazilian environmental policy, scholars and non-governmental organisations have shed light on different methods and consequences of dismantling. Reports by the Climate Observatory (2021, 2022) and Fonseca *et al.* (2022) describe how, via nearly two thousand executive orders, Bolsonaro’s government weakened legislation, restricted participatory forums, subordinated environmental agencies to the Armed Forces, centralised decision-making, and reduced budget for environmental policies. Scantimburgo (2020) registered successive administrative reshufflings whereby agencies responsible for water and forestry policies were transferred from the Ministry of Environment to other ministries. Barcelos (2020) compiled legislative proposals to reform environmental licensing rules, showing how these draft bills endorsed by Bolsonaro’s coalition seek to implement a self-regulatory model that can amplify environmental damage. Fearnside (2019) documented several normative changes at the legislative and administrative levels during the first year of Bolsonaro’s term, concluding that even though he stepped back on the promise to abolish the Ministry of the Environment, he achieved the same effect by other means, in particular by appointing loyalists to top-level positions in environmental agencies.

A parallel venue of theoretical development in Brazil has connected dismantling to the emergent notion of “institutional harassment”. Stressing how the tryptic “side-line, use and ignore” is insufficient to grasp the Brazilian case, Aguiar (2022, p. 56) argues that, under the administration of Jair Bolsonaro, “[civil servants] are not only shunned or frowned upon but many are treated as enemies who should be eliminated”. Institutional harassment, therefore, has been understood as “practices directed toward the deconstruction of the state”, with clearly defined goals: “to disorganise the state – redirecting it for and by the market; delegitimising public policies under the Constitution of 1988; and disqualifying the servants” (SILVA *et al.*, 2022, p. 122). The imposed atmosphere of fear, collectively experienced by government workers across different areas and careers, is a useful heuristic tool to distinguish between democratic policy change and authoritarian policy dismantling (SILVA, 2022). This text draws on this debate and pivots upon the distinction between organisation and order to flesh out the tension.

2.2 ANALYTICAL FRAMEWORK: DISMANTLING, CONSTITUTIONAL HARDBALL AND PUBLIC SERVICE BARGAINS IN RECRUITMENT PROCEDURES

Organisation and order relate to each other not so much in the quantitative terms evoked by the synecdoche of part and whole but rather in a more metonymical way, as substituting one word for another brings forth an addition of meaning. *To order* more immediately recalls setting a configuration, while *to organise* evokes the idea of arranging something under this configuration. Organisational changes under times of political continuity seek to realise the standing order; organisational transformations in moments of political disruption seek to subvert the standing order and replace it with another. However, the lines separating continuity from disruption and realisation from subversion are rarely unambiguous.

Two consecrated concepts that make sense of this ambiguity are “constitutional hardball” and “public service bargains”. The first was coined by Mark Tushnet (2004) and later popularised outside the legal domain by Levitsky and Ziblatt (2018, p. 109-112)¹. In Tushnet’s (2004, p. 523) initial formulation, constitutional hardball designates “political claims and practices – legislative and executive initiatives – that are without much question within the bounds of existing constitutional doctrine and practice but that are nonetheless in some tension with existing pre-constitutional understandings”. Pre-constitutional understandings consist in “the presuppositions accepted by all politically significant actors” about “the nation’s fundamental institutional arrangements – the relations between President and Congress, the mechanisms by which politicians organise support among the public, and the principles that politicians take to guide the development of public policy”.

During periods of ordinary politics, pre-constitutional understandings are taken for granted; during periods of subversion, they are brought into question by political actors who want to replace them with others, thus extending their positions “on the meaning of the Constitution” over a much longer period than their own terms (TUSHNET, 2004, p. 532). If politicians’ attempt to gain permanent control over components of government fails, that does not de-characterise the initiative as constitutional hardball. In Tushnet’s (2004, p. 544) account, the practice depends on whether political actors believe they are in a position to shift from one constitutional order to another and not on whether this belief turns out to be true or not.

The author mentions changes in civil service regulations that aim “to eliminate partisan influence on the lower levels of the executive bureaucracy so that lower-level bureaucrats are in fact committed to a particular partisan program” as explicit examples of constitutional hardball (TUSHNET, 2004, p. 530). Considering the relevance of recruitment procedures for the construction of organisational capacity and the forging of bureaucratic identity, changes in public exams for the selection of civil servants which purport radical shifts in the profile of approved candidates without evidence that these shifts are motivated by policy concerns about the agency’s performance can be deemed as an attempt to transfigure shared pre-constitutional understandings of what the agency’s purpose ought to be about.

Another way of articulating the oblique relation between order and organisation in policy dismantling vis-à-vis policy change is through the contrasting notion of public service bargains, proposed by Hood and Lodge (2006). The authors argue that workers and politicians exchange competence and loyalty for reward and responsibility at any governmental agency's core. They call these arrangements *public service bargains*, meaning any agreement, explicit or implicit, written or unwritten, expressed in convention, formal law or a mixture of both, which "can be understood as the product of some sort of equilibrium" between the forces or interests of servants and elected politicians (HOOD; LODGE, 2006, p. 12).

The existence of such negotiations does not imply bureaucratic insulation from politics. On the contrary, any autonomy conquered by servants is always relative, provisional and contingent. The concept of public service bargains indicates that, under conditions of continuity, politicians will strive to agree with bureaucrats on the principles and conditions of policy development. An adjustment of interests (even if conflictual), rather than a unilateral offence to ascertain full control, is the outcome of the brush between political actors and civil servants.

During periods of ordinary politics, public service exams are usually considered valuable bargaining chips that politically appointed officials can rely on to placate the discontentment of bureaucracies with what is often framed as chronic understaffing. Likewise, when there is fierce competition for a limited budget, announcing new positions for a certain agency is typically framed as a concession by the government and a victory for bureaucracy. At times of disruption of the established order, however, new hires cease to be employed as negotiable resources in a continuous reciprocal relationship and begin to be used unilaterally by political actors as a means (not necessarily successful) to gain control over the organisation by undermining its capacity and erasing its identity.

We understand capacity as the complex apparatus of tools governmental agencies use to intervene in reality, encompassing four basic instruments: Authority, nodality, treasure, and knowledge (HOOD; MARGETTS, 2007). Authority corresponds to a set of rules that concurs with the agency's purpose; nodality refers to channels through which an agency can obtain or send information; treasure denotes any material resources such as budget, infrastructure, or access to alternative funding. Most importantly for this piece, knowledge means "the possession of a stock of people with whatever skills they may have" (HOOD; MARGETTS, 2007, p. 5-6). It includes the variable repertoire of practices and abilities shared by the agency's staff in the form of technical know-how (LINDAHL, 2018, p. 52-53).

Bureaucratic identity, in turn, can be understood as the set of common interests and values in which the agency's staff members are socialised (LINDAHL, 2018, p. 52-53). This set of interests and values has "differentiating and enabling properties", as it "demarcate[s] bureaucracies from one another and from other organisations in their policy domain", as well as fosters "cohesion, coordination, and commitment" among the agency's participants (CARPENTER, 2001, p. 27). Identity can also be broken into four elements: Schemes, assumptions, events, and individual background. In a nutshell, schemes refer to symbols that agents deem ideal, either positively or negatively; assumptions mean the underlying presuppositions and frames of thought informing the use of schemes; events account for the landmarks that chronicle the organisation's history, as narrated by the agents themselves. Individual background, most relevant to this contribution, relates to staff members' socioeconomic origin, as well as their educational and professional trajectory. This encompasses the skills and knowledge individually held by each organisation member.

In Brazil, bureaucratic recruitment through standardised exams has long been considered an antidote against the patrimonialistic and clientelistic practice of political appointments that favour kinship and personal ties (GRAHAM, 1968, p. 26), a mechanism to elevate meritocracy of effort and talent above the "aristocracy of blood" and the "plutocracy of money" (FONTAINHA *et al.*, 2016, p. 674). Assumedly guided by the principles of formality, objectivity and neutrality, exams would safeguard the bureaucracy against patronage and arbitrary dismissals, cushioning the impact of "pure politics" on

the structure of bureaucracy and allowing for the emergence of “islands of bureaucratic excellence” (KLÜGER, 2015a, p. 106). Such islands would be agencies with a guaranteed space for technique, understood as the performance of specialised, though never neutral, skills (KLÜGER, 2015b, p. 78).

Critical accounts of the Brazilian exam system denounce how its current model became “absolutely self-referenced” and detached from society’s needs (FONTAINHA *et al.*, 2015, p. 682), driving a million-dollar coaching industry of preparatory courses that reproduce socioeconomic inequalities (MEDEIROS, 2021, p. 314). This model fails to include the public service as a component of the *ethos* of candidates for public positions (MAIA, 2019, p. 216). Candidates value job security and higher salaries compared to wage jobs in the private sector as the main representations of privileges attached to public positions. They often have a vague notion of the activities they will perform, but they enter exams with encyclopedic knowledge about the positions’ remuneration, workload, and benefits. They often perceive the activity as a burden to be borne, a “necessary evil” to secure personal achievements, expressed as maintenance or elevation of individual and family consumption standards (MAIA, 2019, p. 216).

In such a scenario, the legitimacy of examinations as a superior recruitment method in Brazil would historically rest upon two pillars (FONTAINHA *et al.*, 2015, p. 673): A “republican ideology”, which sees political appointments as an aristocratic remnant, and a logic of “school meritocracy”, which privileges evaluation methods similar to those used in schools instead of evaluation methods that simulate future work routines. This logic also leads to inviting professors instead of professionals to exam committees and to providing professional training only after the exam instead of including training as a phase in the selection process itself.

The validity of these critiques concerning elite careers such as diplomacy or magistracy is beyond doubt. Their applicability to middle-level positions also seems unquestionable in the cases of bureaucratic identities, which relate only loosely to agencies’ core activities, such as tax auditors and retirement analysts, to mention examples analysed in the literature cited above. However, to what extent these criticisms hold water regarding Ibama’s selection processes is still an open question.

3 DATA COLLECTION AND SYSTEMATISATION

Exams for recruiting new Ibama staff members happened only five times in the agency’s history: 2002, 2005, 2009, 2013, and 2021, all organised by committees affiliated with UnB/Cespe. Committees were composed of anonymous experts with academic but not necessarily professional experience in environmental policy. My dataset comprises all exam booklets used for the admission of Ibama environmental analysts and their corresponding public announcements. Content analysis was restricted to the subfield “Regulation, Control, and Environmental Inspection”. Due to this study’s focus on anti-deforestation policies, I intentionally omitted licensing activities. This methodological choice is justified because there is a strong distinction between staff members assigned to inspection and those working with licensing. From October 2021 to May 2022, I conducted 44 semi-structured interviews with current or former Ibama employees and executive leaders, tenured servants and politically appointed officials of other agencies, federal prosecutors, NGO representatives, and agribusiness actors. All interviews were fully anonymised to ensure confidentiality. Finally, I collected data on Ibama’s internal training courses during archival research conducted in Ibama’s central library in Brasília in April 2022.

The selection of interviewees followed a non-probabilistic sampling. This was mainly motivated by the difficulty in accessing the nucleus of agents responsible for inspection operations in the Amazon, considering the overall atmosphere of fear that prevailed in federal agencies during Bolsonaro’s government. In such a scenario, more probabilistic approaches, such as sending standardised forms to the servants’ internal mailing lists – as done by Albertini (2013) – were not a possibility. Reaching the

agents was only possible through what Klüger (2017) calls “weak links”: indications by acquaintances located in the periphery of the researcher’s social network. Only two former servants were approached per email.

When analysing public announcements, I sought to identify qualitative changes in (i) eligibility requirements; (ii) criteria for regional allocation of approved candidates; (iii) programmatic content; and (iv) general structure of the exam (e.g. thematic areas and sub-areas, number of objective and discursive questions, presence or absence of quotas to minority groups). Exam booklets first went through a quantitative analysis on the number of questions mentioning the words “deforestation”, “Amazon”, and “inspection”. A second analysis sought to identify qualitative evolutionary patterns in the content and skills required by exam questions. Interviews provided information about (i) individual motivation to apply for a career in Ibama; (ii) perception of intergenerational differences in the social and technical profile of approved candidates; (iii) impact of public exams on the agency’s activities; and (iv) impact of the political context on the agency’s activities. Pedagogical plans and handouts used in training new servants were also qualitatively analysed. Data extracted from these documents concerned the structure and syllabus of internal training courses, including workload, learning modules, reading materials, and interactive exercises.

In April 2022, I requested data on the socioeconomic characteristics of environmental inspectors (such as gender, race, and educational level) under the Information Access Act to Ibama’s Citizen Information Service. The institution pointed to available databases that lack the requested information, containing only the longitudinal total number of servants. As my current data on the average socioeconomic profile of approved candidates is restricted to the sample of respondents, I draw limited conclusions regarding the servants’ trajectory of social mobility and motivation to apply for the career. Further research based on quantitative databases can complement the findings presented in this study.

In the next section, I present and discuss data on the changes made in Ibama’s recruitment procedures since the agency’s creation in 1989 until 2022, inquiring how such changes reflect both the organisation’s accumulated experience and the political context in which it is embedded. The analysis is divided into four historical moments: a first period that goes from Ibama’s foundation until its first public exam (1989-2001); a second period characterised by the organisation of four public exams (2002-2013); a third period in which Ibama conducted no exams (2014-2018); and a fourth period marked by the organisation of one exam (2019-2022).

4 DATA ANALYSIS

4.1 AN AMBIGUOUS INHERITANCE (1989 – 2001)

Ibama, acronym for *Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis* (Brazilian Institute of Environment and Renewable Natural Resources), was created in 1989. The motivation for the creation of Ibama can be primarily attributed to an international “post-Stockholm pressure” and the need of the Brazilian government to create a good image during the United Nations Conference on Environment and Development (Unced) that was held in Rio de Janeiro in 1992. In the words of an interviewee: “When Brazil got the authorisation to host the UN Conference in 92, the first thing that must have occurred was ‘look, everyone is coming here, and we don’t have environmental agencies’! They rushed, put together what we had, and created Ibama in 1989” (Interview 1). “What we had” meant the four agencies that were fused to form Ibama: the Special Secretariat for the Environment (Sema), the Agency for Fisheries Development (Sudepe), the Agency for Rubber (Sudhevea), and the Brazilian Institute of Forest Development (IBDF).

The opening of 2,000 new positions was authorised along with the founding of Ibama (Interview 17). Nevertheless, the agency's first examination only occurred in 2002. Until then, its staff was comprised of the staff inherited from the four merged agencies, who had been hired mostly, if not completely, through political appointment. The entry process into public service at that time was, as one agent put it, "very fragile". Some of Ibama's first environmental technicians had been hired initially as security guards at IBDF and changed functions after the merger (Interview 29). Others worked in federal agencies unrelated to environmental policy and were recommended by acquaintances to positions in Ibama. This was the case of one respondent, who left a public job in strategic planning for a post in Ibama on a "friend's invitation" in 1992, motivated by a desire to break out of the inertia that pervaded his previous professional environment and the "prospective of developing interesting work" (Interview 2).

These older servants are often described by Ibama staff members of more recent cohorts as lacking formal training, but endowed with valuable practical abilities, such as identifying types of wood based on appearance, smell and texture (RAJÃO; VURDUBAKIS, 2013, p. 10) and discovering signs of illegal boating activities from traces left on riverbanks (Interview 2). This prevalence of analogical skills among the servants mirrored the low degree of technological development with which Ibama operated at the time. Orbital data had low resolution and a one-year time lag; infrastructure was precarious; inspection was centered on volume and physical presence; and operations lacked strategic planning, media communication plans, and intelligence support (Interview 2). Throughout the agency's first decade, its efforts to halt the destruction of the Amazon forest remained highly ineffective. In 1995, deforestation reached the historical peak of 29,059 km² (Interview 18).

4.2 FIRST FOUR PUBLIC EXAMINATIONS (2002, 2005, 2009, AND 2013): INCREMENTAL SPECIALISATION AND TECHNICALISATION

In Fernando Henrique Cardoso's last year in office (2002), a public announcement opened 610 positions for Ibama environmental analysts. Recruitment procedures amounted to two exams. The first had 20 "true or false" questions on topics of "basic knowledge" (Portuguese language, basic administrative law, math and informatics). The second exam had 20 objective "true or false" questions on topics of "specific knowledge", encompassing notions of ecology, geology, chemistry, biology, geography/cartography, hydrology, limnology, meteorology/climatology, natural resources management, policy instruments, national and international environmental regulations). The announcement did not include a recommended reading list. It mentioned that a mandatory training course would be held for all approved candidates to introduce them to the agency's activities, but the course was not part of the selection process itself.

The newly filled positions were distributed across Ibama offices located in all Brazilian regions. According to their classification, the approved candidates could choose their preferred work location. Five per cent of the vacancies were reserved for people with disabilities. There was no affirmative action provision regarding race, class or gender. A college degree in any area was a mandatory requirement, but advanced academic titles (M. Sc., Ph. D. etc.) did not count extra points. The programmatic content of "specific knowledge" topics was not yet broken into subfields.

In the 2002 exam booklet, seven questions referred to "Amazon," three used the word "deforestation," and two mentioned "inspection." None of them, though, specifically addressed deforestation inspection. The issue of deforestation was framed generically with a more economic emphasis, as in the question reproduced below, which required the candidate to evaluate statements in connection with a text and a graph about the extractive economy model of Alfredo Homma, a Brazilian environmental economist:

About the subject matter of the text and the figure above, please evaluate the following items.

- I. Public policy that creates subsidies - such as a subsidy for rubber – could displace the stretch of the graphic to the left.
- II. When the relative prices of extractive products are higher than those of agricultural products, there is a tendency to increase deforestation and to abandon extractivism.
- III. The figure shows that the ability to increase supply reaches its limits due to the stocks available and the increasing cost of extraction (with the increase of the collection area).
- IV. Extractivism can be carried out in areas of Legal Reserve in the form of sustainable forest management.

Candidates approved in the first exam participated in a 320-hour training course, whose expenses were partially covered by the registration fees paid by exam applicants. 60% of the course workload was designed as distance learning and 40% as in-person activities. Its pedagogical proposal was divided into six modules of 60 hours each. Modules I to IV were grouped as “propaedeutic” and addressed topics such as environmental history, onto-epistemological foundations of the environmental crisis, characteristics of Brazilian ecosystems, environmental policy instruments, and principles of public administration. Reading materials favoured but were not limited to texts produced by the agency’s own staff and those resulting from research funded by Ibama. They included legal norms, editions of the journal *The Ecologist*, a manifesto by Via Campesina, and academic book chapters. Modules V and VI were praxis-oriented and encompassed case studies, simulations, and field exercises related to conservation unit licensing, inspection, or management.

The arrival of the first staff members approved through the 2002 exam was, and still is, widely regarded as a watershed event in Ibama’s history. Even old-school workers inherited from previous agencies celebrate the boom of creativity that emerged from that “generational clash.” Newcomers are described as “young”, lacking “professional and fieldwork experience” but possessing “updated academic and theoretical knowledge” (Interviews 1 and 2). This first cohort included former United Nations Development Programme (UNDP) consultants who had experience with Ibama’s previous projects (Interview 18). The 2002 entrants quickly climbed up to leadership positions within Ibama, as Lula’s government preferred to rely on “fresh blood” to structure new offices and initiatives (Interview 1). Two interviewees pointed to the media coverage due to the 1992 Unced and its impact on the national imaginary as factors that motivated them to take Ibama’s 2002 exam (Interviews 1 and 2).

Three years later, a second exam was organised to fill another 610 vacancies. The number of objective questions on topics of “basic knowledge” and “specific knowledge” increased to respectively 50 and 70. A written essay was included. The topics of specific knowledge were subdivided into six main areas (1- regulation, control, inspection, licensing and audit; 2- monitoring; 3- environmental quality; 4- forest and fishery resources; 5- ecosystem conservation; and 6- environmental education). Although the training course was no longer mentioned in the exam announcement, it continued to be carried out and underwent significant improvements. The part devoted to inspection that was previously only a 60-hour module turned into a 400-hour semi-immersive course. The main purpose of this change was to transmit Ibama’s “doctrinal elements” more coherently and to create “Esprit de corps” (Interview 8).

In the 2005 exam, the allocation logic of positions changed to a “regionalised system” to reduce geographic turnover, as first-cohort candidates from the Center-South assigned to the Amazon massively requested transfers to their places of origin after a short time of service (Interview 17). Positions were now distributed to all 27 Brazilian states according to the six thematic areas: before the exam, the candidates had to indicate to which state they were applying.

In the 2005 exam booklet for area 1, three questions referred to “Amazon,” two to “deforestation,” and three to “inspection.” The essay required the candidate to explain, in 30 lines, the sequential phases of a study on the impact of a small hydroelectric power plant on terrestrial biodiversity conservation. Both the essay and the questions of specific knowledge emphasised the activity of licensing, as in the question below, which was contextualised in the booklet by a text and a map:

Based on the information above, judge the following items.

95 When elaborating the term of reference in an environmental impact study, the licensing agency may include the need to assess the project's impact on the conservation of regional biodiversity.

96 The map can be used to predict a future scenario, considering the highway as a new trafficking route and the spatial reordering of the traffic chain, with the emergence of new harvesting sites.

97 Concerning landscape, the highway articulates new spatial relationships and is a vector of dynamisation of environmental impacts, especially deforestation.

99 If the undertaking tampered with cartographic data to favour a projection of desirable scenarios and trends, once the license was granted the licensing agency could not suspend it, even if it detected fraud and assessed that this procedure was relevant for the conclusions of the study, in compliance with the provisions of Conama Resolution No. 237/1997.

Interviewees noticed no significant difference between the profile of the 2002 cohort and the 2005 cohort, except for a reduction in former UNDP consultants. The second batch of approved candidates would have, thus, even less experience than the first (Interview 18), a characteristic that was not framed as negative. Of all Ibama servants I interviewed, four had entered the agency in the 2005 exam. When asked about the motivations that led them to apply for the environmental analyst career, three alluded to family influences (childhood in rural setting, uprising in an Amazonian extractivist community, involvement of older siblings with social land movements) that nurtured in them a particular connection with nature. Unlike the others, the fourth interviewee did not attribute his motivation for working in Ibama to family experiences; his sensitivity to environmental protection and the desire to engage with it professionally was rather mediated by photojournalistic works about the Amazon. One of them also referred to the momentum generated by the 1992 Unced as a factor contributing to the decision to enter Ibama.

The third examination was held in 2009 when 225 new positions were offered. Already signalling internal specialisation, this announcement subdivided area 1 into 1.1 (licensing and audit) and 1.2 (regulation, control and inspection). The regional system for the allocation of positions was maintained. The booklet for area 1.2 included seven questions with references to the word “Amazon,” six to “deforestation”, and five to “inspection.” Besides the increased frequency of deforestation in the questions of specific knowledge, it is clear that the exam's approach to the topic became, on the one hand, more focused on inspection instruments and tactics and, on the other hand, politically oriented more to the South region. Consider the question below, which was preceded by statements on the Amazon's geopolitical strategic relevance made by the renowned scholar Bertha Becker and colonel Paulo Esteves, at the time the spokesperson of Sistema de Vigilância da Amazônia (Sivam), a military project aimed at defending Brazilian sovereignty in the region:

Having as reference the text above and based on public policies formulated to the Amazon, judge the items below.

81 The presence of the State in the Amazon can be more effective by means of better instrumentalisation, supported by digital cartography and remote sensing, to integrate deforestation monitoring systems and approval of forest management plans.

82 Harvesting managed timber means cutting, at a single time, trees as small as 10 cm in diameter and setting up multiple trails for dragging logs, an activity that does not require planning.

83 From a geopolitical point of view, the Amazon should be thought of on a South American scale, being paramount in the formulation of joint development strategies between the region's countries.

84 Despite holding 63.7% of the total Amazon area, Brazil should recognise and consider its fragile position in some aspects in relation to the other countries of the Amazon region.

85 The presence of the State in the Amazon region can materialise, for example, by identifying the origin of the energy supply of steel mills.

Interviewees did not identify differences in profile between the 2009 cohort and its predecessors, except for one praising mention of the enhanced “digital literacy” of the newcomers, who, after entering the agency, learned much faster to master geoprocessing tools (Interview 6). Two interviewees entered Ibama through the 2009 exam. One mentioned family ethic lessons about caring for the collective as a decisive factor in shaping his understanding of the environment and directing his career choices towards Ibama. The other enriched his answer with a personal experience that illuminates the emergence of a virtuous circle between recruitment and performance in Ibama. He grew up inside a conservation unit in a house next to Ibama’s operational base. This allowed him to observe the servants’ daily activity and their impact on the region. Observation gradually gave place to admiration as he watched the agents working late, in far from optimal conditions, and really changing the behaviour of economic actors considered powerful in the region.

My house was behind Ibama. At that time, I already found it awesome to see those Ibama people coming, with their cars full of mud, full of game, things they had seized, weapons, fishing nets, and hunting traps. I found that job awesome. I saw them arrive at dawn and wondered: are these guys working until now? I found it pretty cool. A job that has no routine, no fixed working hours. I was looking at those who would later become my future colleagues, watching them work, seeing how they moved every day. I started to have a great admiration. I used to live inside a national forest and realised how important their work was. People had a real fear of doing something wrong because Ibama could punish them or do something. Even the [large mining] company that operated there had this fear. Then I saw that Ibama’s work had results. And I started to admire this profession (Interview 17) greatly.

One can notice, therefore, that in 2009 a positive feedback effect had already been triggered by Ibama’s first exams. With better technical qualifications and a profile more committed to environmental protection, the servants recruited in the first two exams managed to promote positive changes in the agency’s performance and deliver results that started to be perceived by society. Ibama’s increased prestige, in turn, aroused the interest of more young people to work at the agency. This led to subsequent announcements to attract candidates with profiles even more aligned with Ibama and made exams even more competitive, reinforcing the virtuous circle within the agency.

The next exam occurred during Dilma Rousseff’s term. It was announced at the end of 2012, a few months before the protests of June 2013 plunged the country into a spiral of political instability. The announcement offered 108 positions, whose allocation would now occur according to Ibama’s “need and convenience”, though the candidates still had to define a specific area beforehand. The subdivision of areas also reflected the transfer of Ibama’s jurisdiction over conservation units to ICMBio, a new agency created in 2007: Area 1.2 became area 2, and areas 4, 5, and 6 were removed from the announcement. Topics on basic knowledge started to include ethics in public service and deeper notions of constitutional and administrative law.

In the booklet for area 2, “Amazon” was mentioned in two questions, “inspection” in six, and “deforestation” in two, plus the essay. The approach to deforestation was now more focused on

inspection, and it required specific knowledge about Ibama's geomonitoring tools. To answer the questions correctly and write a satisfactory essay, candidates should have acquaintance with orbital data produced by satellite systems operated by the National Institute for Space Research (Inpe), to the point of being able to discern advantages and disadvantages in their technical configurations.

The annual deforestation monitoring system of the National Institute for Space Research (Inpe) uses images from the Landsat satellite to map deforested areas in the Legal Amazon. About this mapping, judge the following items.

106 There would be a greater probability of obtaining more images without cloud cover if images from the RAPIDEYE satellite were used.

107 If TERRA MODIS satellite images were used, deforestation monitoring in this region would be more detailed.

108 Brazil's official system that annually maps and quantifies burnt areas in the entire national territory is based on the analysis of NOAA AVHRR satellite images.

109 It is possible to distinguish fire severity in satellite images.

110 Knowing that an area with forest fire emits a maximum amount of electromagnetic radiation in the wavelength (λ) of around $3 \mu\text{m}$, it is correct to conclude that images obtained in this λ will show areas with fire in light tones.

Write an essay addressing the following: possible additional difficulties presented by the Cerrado biome in relation to the monitoring of deforestation in the Legal Amazon; advantages and disadvantages of using images from the RapidEye satellite instead of images from the Landsat satellite; procedures and steps related to checking the accuracy of the mapping.

Ten years separate the fourth cohort of Ibama's workers from the first. However, the interviewees still could not identify substantial differences in the entrants' average profile, except for an increased number of graduates in social sciences (Interview 17), a fact framed positively. One respondent who entered the 2013 exam attributed his motivation to join the agency to sensitivity to environmental protection cultivated from childhood memories of weekends spent in the countryside. He also saw working in Ibama as a way to conciliate an interest in academic knowledge with practical action (Interview 41).

Ibama workers' interpretation of how recruitment processes from 2002 to 2013 unfolded is undoubtedly one of incrementalism and continuity. A large majority of approved candidates graduated from public universities in courses such as biology, geography, engineering, and agronomy, a small part of them in law. They stem predominantly from middle and upper-middle classes, having attended private high and elementary schools. There are, however, cases in which approval in Ibama's exams represented not simply stability and reproduction of family consumption standards but true upward socioeconomic mobility. Especially in the cohorts of 2009 and 2013, one can find, for instance, sons and daughters of journeymen and seamstresses who had access to public universities due to the democratisation of higher education carried out under Lula and Dilma Rousseff's administrations but who still had to juggle their studies with full-time jobs (as chauffeurs, for example) and had little or no income to pay for preparatory courses (Interview 17).

Comparing the examinations of 2002, 2005, 2009 and 2013, we can observe two major changes in the set of skills measured as meritorious in Ibama's recruitment process. First, there was a gradual increase in the number of questions addressing deforestation inspection and a progressive shift of focus from licensing to monitoring, which reflects specialisation in Ibama's capacity and identity.

Second, the emphasis given in exams to remote sensing and interpretation of orbital data mirrored the process of technicalisation of deforestation detection experienced by the agency (NAVARRO, 2016, p. 24). Both transformations indicate strong responsiveness between Ibama's recruitment channels and the incremental knowledge built by the agency. In 2012, deforestation in the Amazon reached the lowest historical rate, 4,571 km², partially due to the implementation of an integrated inspection strategy by Ibama (MELLO; ARTAXO, 2017, p. 126).

4.3 CRISIS, BUT NOT PARALYSIS: A TURBULENT YET CREATIVE INTERLUDE WITHOUT EXAMINATIONS (2014 – 2018)

During the first half of Dilma Rousseff's second term (2015 - August 2016) and the two years of Michel Temer's interim government (September 2016 - 2018), Ibama conducted no exams for admitting new staff members. In 2017, Ibama's budget suffered severe cuts resulting from a constitutional amendment that imposed spending caps and budget cuts, which hit social and environmental policies more intensively (MENEZES; BARBOSA JR., 2021). When a window of opportunity for the authorisation of an extra budget to recruit new workers was skillfully opened by Ibama's presidency, a lack of coordination within the Ministry of Environment nullified the efforts of Ibama's leaders to organise a new selection announcement.

This was, I think, our greatest defeat. We tried [to organise] an emergency examination to [hire] 800 people. We got approval from the Ministry of Planning in all instances. All that was missing was the minister's signature. However, then the Ministry of the Environment itself started asking for 800 positions for ICMBio. So, they did not give them to us... I was very upset at the time because Ibama had a much more serious personnel deficiency. [...] There was maladjustment (Interview 8).

Notwithstanding budget cuts and the consequent depletion of the agency's workforce, Ibama continued to plan and execute anti-deforestation operations in the Amazon region regularly. There was no paralysis in Ibama's core competencies; on the contrary, it was in this period that the agency went through major innovations in its *modus operandi*: The destruction of equipment caught being used in environmental wrongdoings during inspections began to be published in the media to amplify deterrence; alternative funding from the Amazon Fund was secured to finance the lease of trucks and helicopters used in inspections; a new mode of enforcement, the indirect conversion of fines, was created; and operations started targeting financial institutions and upstream/downstream supply chain actors involved in deforestation. Under the leadership of a competent president, Ibama was partially spared from the widespread slowdown of environmental policies imposed by Temer's austerity model.

4.4 RADICAL PROFILE SHIFTS: THE ATTEMPT TO FRACTURE IBAMA'S TENURED BUREAUCRACY (2019 – 2022)

Pressured by national and international public opinion to respond to increasing deforestation in the Amazon – in April 2022, there were only around 250 inspection agents for the whole country, down from around 1,300 in 2010 (Interview 9); – Jair Bolsonaro's team made a new examination announcement. This provided the government not only an easy argument against domestic and foreign critique but also, and most significantly, a unique opportunity to make a long-term strike on the agency's most solid core, its tenured staff.

For the first time, the exam's eligibility criteria for environmental specialists did not include the requirement of a university degree: for 432 of the 528 positions offered, a high school certificate sufficed. The immediate reason for this is deemed to be purely financial, as positions with lower requirements are paid half the salary of positions with higher requirements. Hiring more people while disbursing less also allowed the government to frame the recruitment procedure positively, as a "result

delivered” to society. All positions for holders of college degrees were assigned to Brasília, while the high school level positions were distributed among the states. The regionalised allocation system was adopted once again. For the first time, 20% of the vacancies were reserved for black candidates; it is important to stress that this advancement was due to a law promulgated in 2014 by Rousseff.

Area 2 was renamed “Environmental recovery, monitoring and sustainable use of biodiversity, control and inspection” in an attempt to dissolve its previous emphasis on enforcement and deterrence into milder notions of “recovery” and “sustainable use”. The most astonishing change, however, was the inclusion of notions of criminal law in the programmatic content of specific knowledge topics. This happened despite Ibama having no criminal enforcement role; its whole sphere of action lies at the administrative level. In the college-level exam booklet, while there was no reference to “Amazon”, only one to “inspection”, and none to deforestation, no less than 30 questions were about criminal law.

Questions that require nothing more than memorising and repeating maxims, doctrines and formulas of criminal law are traditionally asked in examinations for police positions in Brazil. The complete disconnection of this type of exercise with the analytical skills needed for the adequate execution of anti-deforestation operations is blatant. Consider, for instance, the question below, which was part of the 2021 Ibama exam. Besides addressing an issue unrelated to environmental policy – abortion –, it simply demanded the memorisation of hypotheses of qualified criminal immunity:

In relation to unlawfulness and its justification causes, judge the following items.

103 Consider that a criminally liable woman has induced an abortion, being objectively characterised, at the time of her conduct, by the conditions of the state of necessity, which were totally unknown to her. In this hypothetical situation, the lack of subjective elements of justification leads to the conduct’s illicit nature and the woman’s punishment for the corresponding crime.

104 Unlike the state of necessity in which those in need can act against an unrelated third party, in self-defence, the victim must direct their defensive behaviour against the aggressor.

105 Self-defense is admitted against those who practice physical or moral aggression, even if a cause of exclusion from culpability covers the aggressor.

Questions like this require no deep understanding of the multifactorial causes and effects of environmental destruction and no command of the diverse repertoire of policy instruments available to environmental agents. The essay entailed a similar cultural screening, as all the candidate had to do was to copy down the opinion of the Federal Supreme Court on the statute of limitations of environmental damage:

Five years have passed since the occurrence of environmental damage; public power was inert to inspect it. There is an internal divergence between units in Ibama: one understands the statute of limitations expired; the other understands there is no statute of limitations for environmental damage. Considering the hypothetical situation above, write a dissertation explaining, in a justified manner, which of the cited units of Ibama is right, according to the understanding of the Federal Supreme Court on the subject.

The two major differences identified between the fifth exam and the previous ones – waiving the college degree and overemphasising the loosely related topic of criminal law – impacted the profile of approved candidates and their interaction with the agency. The consequence of withdrawing the need for a university degree was not a massive entry of high school graduates but a distortion between the approved candidates’ qualifications and their positions. Experience with previous examinations for administrative positions in Ibama demonstrates that most of the candidates approved for the high school level are overqualified; they often have college degrees, even master’s and PhD titles. Their turnover rates, thus, are the highest in the institution: Discouraged by the mismatch between low pay

and high qualification, many servants apply and are approved in exams for more attractive careers. This labour exodus hinders a more effective allocation of resources for recruiting and training new cadres. Huge salary disparities for exercising the same activities and possessing equivalent academic qualifications also tend to generate resentment between workers, hampering the formation of institutional solidarity ties (Interview 17).

The second change in the exam – a shift of focus from deforestation inspection and satellite-based technology to criminal law – resulted in an unprecedented increase in the number of lawyers approved to roughly 50% of the new positions. This precluded the selection of candidates with more environmentally-oriented educational and professional backgrounds. Moreover, many of the approved lawyers had no particular interest in environmental protection but were actually preparing themselves to become police officers (Interview 17). The table below summarises the main changes identified in Ibama’s recruitment exams (Table 1).

Table 1 | Changes in Ibama’s recruitment exams

	2002	2005	2009	2013	2021
Quantity of positions initially offered	610	610	225	108	528
Minimum educational level required	College degree	College degree	College degree	College degree	High school (for most positions)
Allocation system	According to ranking; selected candidates can choose preferred work location	Candidates must indicate work location prior to the exam	Candidates must indicate work location prior to the exam	According to Ibama’s “need and convenience”; candidates must indicate work location prior to exam	According to Ibama’s “need and convenience”; candidates must indicate work location prior to exam
Essay topic	No essay required	Explain phases of a licensing study on the impact of a hydroelectric plant on terrestrial biodiversity	Dissertate on the negotiated allocation of water under the framework of the national water policy	Explain advantages and disadvantages of determined satellite-based systems to monitor deforestation	Write the opinion of the Federal Supreme Court on the status of limitation of environmental damage
Questions on “deforestation”	3	2	6	2	0
Questions on “Amazon”	7	3	7	2	0
Questions on “inspection”	2	3	5	6	1
Approach to deforestation	No particular focus on inspection or licensing	Focus on licensing	Focus on inspection; Politically more South-oriented	Focus on inspection and satellite-based technology	No mention of deforestation; Emphasis on criminal law

Source: author based on exam booklets, public announcements, and interview transcripts.

5 CONCLUSIONS

During times of policy continuity, organisational transformations aim at the realisation of the standing order. Ibama's exams in 2002, 2005, 2009, and 2013 were characterised by incremental specialisation and technicalisation, which sought to enhance the agency's capacity to inspect deforestation and strengthen its identity around the ideal of environmental stewardship. Bargains between politicians and bureaucrats over budgets have always played a decisive role in the frequency of exams and the number of positions offered. That notwithstanding, one could say that, in hindsight – for pre-constitutional understandings cannot but be retrospectively enunciated – there was a shared, taken-for-granted consensus around the idea that environmental agencies should recruit candidates whose professional and educational profile reveals a calling to engage in environmental protection.

In contexts of policy dismantling, organisational transformations seek to subvert the standing order and replace it with a new order. Bolsonaro's administration seized the opportunity, on the one hand, to fulfil Ibama's cadres with newcomers they thought most likely to embrace the *bolsonarista* anti-environmental agenda and, on the other, to create conditions for internal instability and grievances among the staff. The premeditated and radical shift in the profile of selected candidates – from biologists and sociologists to lawyers and would-be police officers – can be deemed as an attempt to subvert shared pre-constitutional understandings of what the agency's purpose ought to be about: Not a specialised technical institution dedicated to the protection of the environment, but a “green” version of the police, a falsified version of the agency so that it may deceive national and international public opinion and proceed with the dismantling of the anti-deforestation policies carried out by Bolsonaro's government. The future of Ibama's capacity and identity depends on how successful its more experienced staff will be in gradually socialising the 2021 cohort in Ibama's ideals of environmental protection and stewardship, a challenge in which internal training courses play a key role.

NOTE

1| The idea of connecting constitutional hardball and authoritarian policy dismantling emerged in discussions during the 3rd International Workshops on Public Policy in the panel “Policy and capacity dismantling in the context of democratic backsliding”, which took place in 2022 in Budapest. On this connection see also Silva and Gomide (forthcoming).

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Backlash of policy dismantling in the production of invisibility: when pesticides cease to be a public problem

Repercussão do desmantelamento de políticas na produção de invisibilidade: quando os agrotóxicos deixam de ser um problema público

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ARTICLE-DOSSIER

ABSTRACT

Brazil is one of the world's largest consumers of pesticides, but their impacts on the population are still rarely recognised as a public problem. During the governments of Lula and Dilma, several social participation spaces were created to discuss this issue. In this article, we discuss how dismantling these spaces has contributed to producing invisibility regarding the impacts of pesticides. We were confronted with this issue when building a citizen observatory in the metropolitan region of Santarém, Pará, in partnership with family farmer unions. Based on interviews, participant observation, and focus groups, we analyse how the dismantling of pesticide regulation has occurred nationally and how it influenced the territorial level. Despite research showing the impacts of pesticides, the progressive dismantling of social participation spaces, such as the Regional Forum to Combat the Impacts of Pesticides in Santarém, has led to the invisibility of the impacts caused by their use.

Keywords: Family Agriculture. Social Participation. Brazil. Amazon. Citizen Observatory.

RESUMO

O Brasil é um dos maiores consumidores mundiais de agrotóxicos, mas seus impactos sobre a população ainda são pouco reconhecidos como um problema público. Durante os governos trabalhistas (2003-2016), vários espaços de participação social foram criados para debater esse tema. Neste artigo, discutimos como o desmantelamento desses espaços vem contribuindo para uma produção de invisibilidade dos impactos dos agrotóxicos. Fomos confrontados com essa questão ao construir um observatório cidadão na região metropolitana de Santarém, Pará, em parceria com sindicatos de agricultores familiares. A partir de entrevistas, observação participante e grupos de reflexão, analisamos como o desmantelamento da regulação de agrotóxicos aconteceu em nível nacional e como repercutiu em âmbito territorial. Mostramos que, apesar de pesquisas evidenciarem os impactos dos agrotóxicos, a desarticulação progressiva dos espaços de participação social, como a do Fórum Regional de Combate aos Impactos de Agrotóxicos em Santarém, leva à invisibilização dos impactos causados por seu uso.

Palavras-chave: Agricultura Familiar. Participação social. Brasil. Amazônia. Observatório cidadão.

1 INTRODUCTION

While at the international level the health risks of pesticides for farmers and rural populations are increasingly highlighted in the scientific literature (FLEMING *et al.*, 2003; SARKAR *et al.*, 2021), leading decision-makers to consider the withdrawal from the market of molecules widely used in agriculture such as glyphosate (MAHÉ *et al.*, 2020), these warnings are obscured in conservative policy contexts.

In Brazil, pesticide spraying levels are among the highest in the world, with approximately 6 litres per hectare compared to 2 litres per hectare in Europe, reaching 19 litres per hectare for soy in the Amazon (PIGNATI *et al.*, 2017)¹. In addition, current regulatory limits for environmental contamination and human exposure are much more permissive than in Europe², and little research has measured the health impact of this exposure on Brazilian rural and urban populations (PIGNATI *et al.*, 2017; SCHWAMBORN, 2019). This is favoured mainly by a context strongly dominated by an agribusiness based on agrochemicals.

Although several spaces for social participation emerged during the governments of Lula and Dilma, these spaces have not been without tensions between actors advocating different models of agriculture. These tensions were exacerbated during the Bolsonaro government, as it promoted an ultraliberal development and dismantled all policies supporting family farming and the environment, with the unconditional support of agribusiness (NIEDERLE *et al.*, 2019). In this article, we focus on the relationship between dismantling public policies, disrupting social participation spaces and the effect on the public debate about pesticides.

Bauer and Knill (2012, p. 35) define policy dismantling as “a change of direct, indirect, hidden, or symbolic nature that may decrease the number of policies in a particular area, reduce the number of instruments used, or reduce their intensity.” Grisa and Niederle (2021) point out that new governments generally avoid extinguishing policies, as this strategy can generate great opposition and potentially high political costs. Instead, they prefer to opt for replacement, change in objectives, or ineffectiveness. When extinction is the chosen path, there is usually a prior process of delegitimation.

Niederle *et al.* (2022) point out that dismantling affects not only the policy instruments - which are generally more analysed - but also the networks and social relations between state and non-state actors. However, the debate on dismantling (BAUER; KNILL, 2012) has paid little attention to the various strategies that can disrupt these relations or limit social participation and the consequences of such disruption.

Dedieu and Jouzel studied in France the effects of the institutional lack of coordination in the case of pesticides, showing how it contributed to maintaining a public “ignorance” (DEDIEU; JOUZEL, 2015), that is, of invisibility regarding the harmfulness of products within the public sphere. While invisibility can be defined as a simple absence of knowledge, studies increasingly consider it a social construction (DEDIEU; JOUZEL, 2015; SANTOS; ARAÚJO; BAUMGARTEN, 2016). Some studies even highlight conscious strategies, such as those of the tobacco industry’s “doubt merchants” (ORESQUES; CONWAY, 2010), who keep tobacco consumption controversies open to fuel doubt. Other works focus on the unintended dimension of invisibility production, inscribed in disciplinary and fragmented systems of knowledge production that prevent a problem from becoming visible (DEDIEU; JOUZEL, 2015).

Faced with this production of invisibility, social actors have developed various strategies to build evidence and set political agendas. Fillion and Torny (2015) report how victims of destilbene brought together their cases, creating a collective, and show how the three successive operations of claiming - “naming” the harm suffered, “blaming” those responsible, and “claiming” for a compensation - enabled the collectivisation and publicising of a problem. Gudowsky (2021) shows how establishing participatory research agendas can support policymaking by engaging contrasted opinions, improving the effectiveness of decisions in controversial situations, and ensuring engagement on issues of public interest. Thus, in the field of pesticides, several participatory initiatives have sought to empower farmers, such as farmer field schools (VAN DEN BERG; JIGGINS, 2007) or actor-schools (TONNEAU *et al.*, 2021) to discuss the effects of pesticides and develop alternative practices to their use.

As part of the project named Observatory of the Dynamics of Societies and their Environments in the Amazon - Odisseia³, we initiated, in 2016, a research process in the region of Santarém, in western Pará state, to collaborate to strengthen family farming in a region faced with rapid change (COUDEL *et al.*, 2022). Socioecological observatories are framed as platforms that engage diverse researchers, decision-makers, and social actors to bring together various types of academic and non-academic knowledge related to socioecological systems and inform public policymaking (BOURGERON *et al.*, 2018). The Odisseia observatory was inspired by a new generation of observatories that promotes a more active role of citizens in knowledge coproduction processes to encourage environmental governance involving society (LIU *et al.*, 2014). As Liu *et al.* (2014) state, raising awareness of a problem should not be limited to alerting the public about it but requires involving citizens in understanding it so that they can make informed decisions for themselves.

Thus, since the beginning of the Odisseia Observatory, we established a partnership with the Family Farmers and Rural Workers Unions (*Sindicato dos Trabalhadores e Trabalhadoras Rurais* - STTR) of the municipalities of Santarém, Belterra and Mojuí dos Campos to co-construct the themes to be investigated. Contamination by pesticides emerged as one of the priority research axes. In 2019, the observatory launched a data collection campaign on Family Farming in the region, encompassing, among other questions, questions regarding respondents’ perception of the impact of soy advance on their families and the use of pesticides by family farmers (COUDEL *et al.*, 2022). Parallel to conducting interviews through questionnaires, researchers associated with the project investigated environmental and human exposure to pesticides in the Santarém Plateau region. Both research processes raised worrying data regarding the impacts of pesticides on the environment and family farmer communities.

Given the scope of the research, we were invited to present the results at the Regional Forum to Combat the Impacts Caused by Pesticides. When this forum was created in 2017, its promoters wanted to transform it into a space for debate and action proposals. However, in a territory where agribusiness is predominant, the discussion about the impact of pesticides faces many obstacles. This experience made us question how the political dismantling and disarticulation of social participation spaces have contributed to the production of invisibility regarding pesticides. In order to understand this question, we conducted an analysis at two levels: we examined the emergence of pesticides as a public issue and the dismantling of public policies and participation spaces regarding this issue in Brazil; and in the territory of the metropolitan region of Santarém (which also includes the municipalities of Belterra

and Mojuí dos Campos), we studied the creation and then the dismantlement of the Regional Forum to Combat the Impacts Caused by Pesticides in the Lower Amazon.

Our analyses and reflections were based on the process of co-construction of the Odisseia Observatory (see COUDEL *et al.*, 2022). During this process, we mobilised different research methods and several materials in this engaged reflection (MARTINEZ-ALIER *et al.*, 2011), such as organising workshops with researchers and local actors to interpret the results of the data collection campaign and identify the factors that influenced the (in)visibility of pesticides in the Santarém region. We also interviewed actors in the territory, such as farmers, union representatives and public institutions, to understand their involvement in the debates about pesticides in the territory of Santarém. Finally, we conducted participant observation through the involvement of some authors in local institutions, participating in meetings, in particular, the Regional Forum to Combat the Impacts of Pesticides.

2 EMERGENCE, INSTITUTIONALISATION AND INVISIBILIZATION OF PESTICIDES AS A PUBLIC PROBLEM

2.1 THE EMERGENCE OF PESTICIDES AS A PUBLIC PROBLEM

Pesticides were first mentioned in Brazilian legislation in 1934, through the decree 24.114/1934, in the first government of Getúlio Vargas (1930-1945). However, this presidential decree did not include any classification for toxicological inspection of these products. This decree remained in force until 1980 and encouraged multinationals such as Bayer or Ciba-Geigy, through reduced taxation, to import and manufacture pesticides in Brazil, including molecules that were already controversial and obsolete in other countries (FRANCO; PELAEZ, 2016; TERRA; PELAEZ, 2008).

From the 1960s, the agricultural sector in Brazil underwent significant changes due to the adoption of technological packages of the Green Revolution (TERRA; PELAEZ, 2008); the industry and government were presenting agrochemicals as beneficial “medicines” for rural populations and crops (FIRPO PORTO *et al.*, 2015). This greatly favoured large-scale industrial agriculture, promoted by the government and the agrarian elites as a synonym of development, while peasant family farming was considered a backward movement (BERTRAND, 1973).

As a counterpoint, since the 1980s, different social movements, in particular the Pastoral Land Commission (CPT), have been warning against the problems of environmental pollution and risks of exposure of workers and residents of rural areas to agrochemicals, framing the issue of pesticides for the first time as a public health problem (FIRPO PORTO; ROCHA; PACHECO, 2015). They also denounced the strategies of large landowners, who use pesticides as a “*weapon of chemical and criminal warfare*” to expel rural populations from their lands (FIRPO PORTO; ROCHA; PACHECO, 2015, p. 136). Thus, along with the struggle for agrarian reform, social movements have gradually integrated actions to eliminate pesticides as an integral part of their demands in land defence (FIRPO PORTO; ROCHA; PACHECO, 2015).

However, this new agenda of social movements found little echo in the scientific community at the time. The literature on the subject often attributes the possible problems related to pesticides to the misuse of these products by rural workers and ignores their broader impacts on rural populations caused by spraying in large-scale agriculture. Only a few researchers from Fiocruz, the Brazilian health research centre (GURGEL; FRIEDRICH, 2020; PERES; MOREIRA; DUBOIS, 2003), and some faculty members from public universities (BOMBARDI, 2017; MORGADO; PASSOS, 2018; PIGNATI *et al.*, 2017; PIRES *et al.*, 2020; SOUSA PASSOS, 2006) conduct work on this topic but find little funding for their research, besides running the risk of being subjected to harsh criticism (and even threats⁴) from the scientific community and agribusiness.

In the case of the Amazon region, this theme has been gradually included in research agendas associated mainly with the advance of soy. This highly mechanised crop pressures family farmers to sell their land to more capitalised owners (BARBOSA; FERRER, 2015; FEARNSSIDE, 2006). Although several studies have highlighted the impoverishment of populations and land exclusion (FAVARETO *et al.*, 2019; SAUER, 2018), the impact of pesticide spraying on populations around soybean fields still receives little attention.

2.2 CONSOLIDATION OF PESTICIDES AS A POLITICAL AGENDA

With Brazil's democratic transition after the military regime (1964-1984), the public space opened up to different social movements, and family farming became an important category within Brazil's food security and nutrition policy (PINTON; SENCÉBÉ, 2019). However, at the same time, the latifundia system was being transformed into an increasingly organised agribusiness (LACERDA, 2011; POMPEIA, 2021), receiving significant support from the state in order to secure Brazil's position as a leader in the international commodities market.

With the rapid expansion of grain monoculture, especially soy⁵, Brazil became the world's largest consumer of pesticides in 2008 (FROTA; SIQUEIRA, 2021). Soon after, it became the world's largest importer of pesticides, while China became the largest exporter. In 2015, soybean crops alone accounted for 63% of pesticides used in the country (PIGNATI *et al.*, 2017).

The 1988 Constitution, which emerged from a constituent assembly involving a wide diversity of sectors of society, represented a milestone for Brazilian politics, affirming environmental protection as a national value and institutionalising social participation. This allowed social movements to rapidly approve the "Law of Pesticides" (n° 7.802/ 1989) (FRANCO; PELAEZ, 2016; PELAEZ *et al.*, 2015; PERES; MOREIRA; DUBOIS, 2003). At the time, this legislation was considered cutting edge compared to European legislation⁶, as it was based on the concept of "evidence of dangerousness," allowing the prohibition of the sale of considered dangerous products.

Gradually, several institutions were created to support family farming. In 1999, under Fernando Henrique Cardoso's government (1998-2002), the Ministry of Agrarian Development (MDA) was established and became responsible for formulating specific policies for family farming. As the Workers' Party came to govern (2003-2016), different channels of participation set the issue of pesticide impacts on the political agenda. However, these advances continue to coexist in unequal terms, regarding the capacity of political influence and funding, with agribusiness, which also has its ministry (Ministry of Agriculture, Livestock and Supply - Mapa). The agribusiness sector promotes itself as a guarantor of food security in Brazil and the world, despite data showing that family farming is responsible for providing most of the food consumed by the Brazilian population. In this sense, movements supporting family farming defend food sovereignty and the recognition of the right of people to define their food policies and practices and to enjoy healthy and pesticide-free food (PINTON; SENCÉBÉ, 2019).

Although three successive governments of the Workers' Party have been insufficient to reverse the power asymmetries between agribusiness and family farming, important advances were made to strengthen the latter, particularly around the concept of agroecology (FLEXOR; GRISA, 2016). The "Permanent Campaign Against Pesticides and for Life", launched in 2011, is a good example of the mobilisation of social movements (TYGEL *et al.*, 2014). From 2011 to 2015, 278 demonstrations against pesticides were registered, with the participation of more than 150,000 people (FIRPO PORTO; ROCHA; PACHECO, 2015).

In the context of increased consumption of pesticides, this political articulation of civil society received new impetus with the promulgation, in 2012, of the National Policy on Agroecology and Organic

Production (Pnapo), intending to integrate, articulate and adapt public policies that contribute to the sustainable production of healthy food free of chemical contaminants. In 2013, the National Commission on Agroecology and Organic Production (Cnapo), created to bring Pnapo to life, promoted social participation in elaborating the National Plan to Reduce Pesticide Use (Pronara). However, the policy instruments needed to implement Pnapo, including Pronara, were never implemented due to the impeachment of President Dilma Rousseff in 2016 (SABOURIN *et al.*, 2020).

2.3 BRUTAL DISMANTLING AND RETURN TO INVISIBILITY OF THE EFFECTS OF PESTICIDES

After 2015, with the political and economic crisis that shook Brazil, resulting in the impeachment of President Dilma Rousseff, the advocates of industrial agriculture and chemical industry lobbies returned with more force. This led to the gradual dismantling of public policies supporting family farming and agroecology (NIEDERLE *et al.*, 2019, 2022) and the removal from the agenda of issues related to the socio-environmental impacts of pesticides (SOUZA *et al.*, 2020). This deconstruction is accompanied by a rhetorical shift: using a neoliberal argument in favour of large private groups, agribusiness representatives support the use of pesticides in the name of progress and modernisation of agriculture (VOLLMER; TONDATO, 2020), blaming social movements for opposing the country's development (CARNEIRO, 2015).

The influence of agribusiness was particularly exacerbated during Jair Bolsonaro's government after the sector played an important role in the 2018 presidential elections (POMPEIA, 2021; VOLLMER; TONDATO, 2020). The Parliamentary Front for Agriculture and Livestock (FPA), which brings together representatives of the agribusiness agendas also present in other governments, represented almost half of the National Congress (parliament and senate). This new power structure established a series of measures favouring large-scale monoculture, pesticide use, land concentration, and the predatory exploitation of natural resources while dismantling the advances of the previous decade in favour of family farming and agroecological transitions (NIEDERLE *et al.*, 2022). The most symbolic example was the extinction of the Ministry of Agrarian Development and several of its policies and management instruments. The spaces for social participation in policymaking were completely closed (SABOURIN *et al.*, 2020).

Environmental regulation has been progressively aligned with agribusiness interests, and the Bolsonaro government promoted, through an alliance between the Ministries of Environment and Agriculture, an invisibilisation of the effects of pesticides. The annual average of new commercial formulations of pesticides approved by the government increased from 140 to 443 between 2017 and 2019 thanks to the simplification of the registration process of these compounds (SOUZA *et al.*, 2020). In parallel, the toxicological classification of products already on the market was simplified, reclassifying 90% of products previously considered as "extremely toxic" into classes of "slightly toxic" or "unlikely to cause acute harm." The requirement to have the pictogram of a skull as a symbol of a threat to life is excluded from Class 4 and 5 labels (GURGEL; FRIEDRICH, 2020), which severely limits the knowledge of the dangerousness of these products by a significant portion of rural workers who have a low level of education (SOUZA *et al.*, 2020).

Since 2002, a bill proposed by then Deputy Blairo Maggi, who served as Minister of Agriculture from 2016 to 2019, has been moving through the legislative institutions. Called by pesticide advocates as the "Safer Food Law" and by critics as the "Poison Package," this bill aims to institutionalise these simplifications in the registration, circulation, inspection, and storage of pesticides, among others. At the end of 2022, an important mobilisation of social movements prevented this bill from being included in the last legislative session of the Bolsonaro government (GREENPEACE, 2022). However, the vote in the congress's plenary should take place during 2023, where the rural caucus is still very strong.

3. PROGRESSIVE CONSTRUCTION OF EVIDENCE IN THE SANTARÉM REGION

3.1 SANTARÉM, A FRONT FOR SOY AND AGROCHEMICAL EXPANSION

Due to its location at the intersection between the Amazon River and the federal highway BR-163, the Santarém region has become, since the early 2000s, a strategic front for soybean monoculture expansion (SAUER, 2018). After the construction of a grain export port in 2003 by Cargill⁷, in less than 20 years, 80,000 hectares of monocultures (soy, corn, sorghum) were established, now representing 60% of the territory's non-forest areas (CORTES *et al.*, 2020), as represented in figure 1.

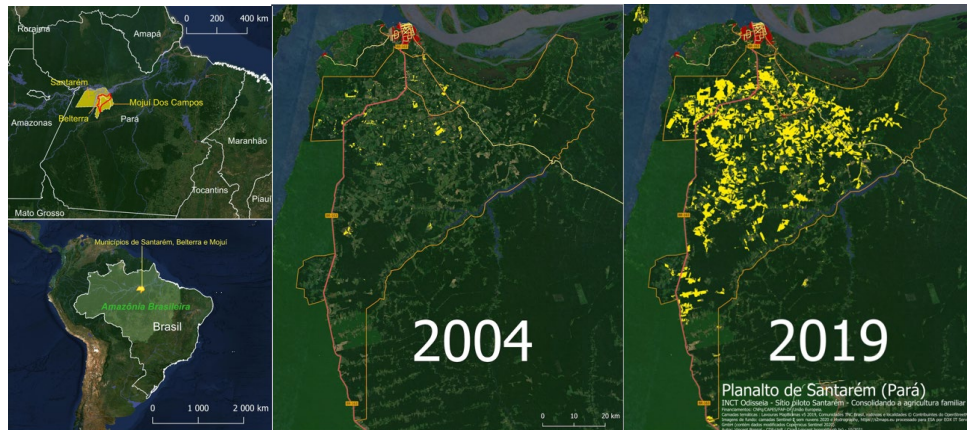


Figure 1 | Soybean expansion in the territory of the Santarém Plateau (including part of the municipalities of Santarém, Mojuí dos Campos and Belterra) between 2004 and 2019.

Source: Vincent Bonnal (INCT Odisseia)

Violent conflicts arose, caused by land speculation and the progressive concentration of land, leading to the expropriation of traditional populations and family farmers who had been present in the territory for several generations, pressuring them to migrate from rural areas to urban centres (CÔRTEZ; D'ANTONA, 2016), even causing the extinction of entire communities (SAUER, 2018), see figure 2. These effects, along with a rapid growth in the use of pesticides in soybean plantations, have been ignored by public authorities, lured by the progress that agribusiness promised to bring to the region (GAYOSO DA COSTA, 2012).



Figure 2 | Cemetery in the middle of the soybean fields in Belterra, illustrating the extinction of rural communities

Source: Image by Vincent Bonnal, November, 2021

Since the 1970s, the STTRs have been organising collective actions to defend the territorial rights of the populations. However, only since 2010 has the issue of pesticides become the object of strategic actions, based on the observation of the increase in cancer cases in communities surrounded by soybean cultivation. A working group was created to address this issue, involving municipal health authorities, the Regional Hospital of Western Pará, the Municipal Department of Agriculture, and the association of residents of the most affected community. At the time, of the 200 families living in this community, at least 12 people were oncology patients being treated at the regional hospital. However, the residents' association ended its participation in the working group in 2014. The union representatives cite pressure exerted on the residents by soybean farmers in the community. No clinical effects studies have been conducted since then, although several research groups have begun exploratory investigations, often with little or no funding.

3.2 PRODUCING SOME FIRST DATA ON THE IMPACT OF PESTICIDES

Given the difficulties in quantifying the impacts of pesticides on family farmers, the STTRs raised this issue when we started the Odisseia Project activities. The data we collected with the unions show that 76 per cent of the family farmers interviewed consider soybean expansion negatively impacting them and their families (for more detailed results, see COUDEL *et al.*, 2021; COUDEL; PASSOS; SCHWAMBORN, 2020). They do not produce soybeans, but they have farms near soybean fields. About 6,000 family farming families still live in the rural communities of the Planalto Santareno, compared to 89 soybean entrepreneurs identified in 2017 (IBGE, 2018).

According to the families interviewed, several health problems arose after the arrival of soy. Of the farmers who live within 100 meters of a soybean field, 60% report discomfort when neighbouring crops are sprayed. Chronic illnesses appear gradually, and their effects persist over the long term. One hundred and three (103) families out of 544 report suffering from serious health problems (19%), and of these, 70% of families report suffering from acute and constant headaches, 23% report having chronic lung diseases (asthma, tuberculosis, bronchitis, pneumonia) and 6% report having had a case of cancer in the family.

Other effects concern the production of family farmers. Among farmers who live less than 500 m from a soybean field, 47% report having lost production, mainly because of pests (e.g., locusts, whiteflies) that take refuge on their plots due to pesticide spraying in their surroundings. Faced with the loss of production due to pests, farmers report that they have also started using pesticides. Almost half (48%) of the farmers interviewed use pesticides, and the proximity of soybeans significantly influences this use. Farmers speak of a “vicious circle of poison”. The sprayings of pesticides on soybean plantations affect family farmers in such a way that it practically makes it impossible for them to stay in the area, leading them to sell their land to the soybean growers. These, in turn, expand the borders of their properties to other farmers, who suffer the same impacts as their former neighbours and eventually sell their land.

The productive dimensions of pesticide impacts, little discussed in the scientific literature, are emphasised by family farmers not so much for economic reasons but because they affect their survival as farmers in the short term. The loss of production challenges their food sovereignty, both the ability to produce enough food to feed their families and to sell and also the ability to have access to healthy food.

A study conducted by biologists of the team confirmed the presence of glyphosate residues in 72% of water and sediment samples taken from different streams in Santarém and Mojuí dos Campos (MORGADO, 2019). The values were below the limits of Brazilian legislation and above other countries’ legislation, such as Canada and the European Union. Another study detected glyphosate presence, at high limits, in all 27 human urine samples from residents of rural communities (SCHWAMBORN, 2019). These studies reinforce the credibility of farmers’ perceptions.

Epidemiological studies of clinical effects have not been conducted, as these are particularly difficult and especially financially costly to conduct, and community health units are unaware of the diversity of symptoms that can occur due to pesticide spraying. Furthermore, political pressure constraints, and it ends up preventing and silencing the reporting of poisoning cases; according to several interviewees, a nurse at a health unit was dismissed by the municipality of Belterra in 2019 because she reported a case of pesticide contamination. The regional hospitals, enquired by some fellow researchers to provide data on chronic respiratory diseases or cancers, did not respond to these requests.

The community researchers who collected the data reported that they were taken aback by the number of people who, although probably affected by the pesticides, did not dare to say that they perceived a negative impact. The community researchers observed families who had to close the windows of their homes and did not go outside when spraying occurred, yet responded negatively to the question about whether they felt affected by soybean crops. The community researchers could not tell if this was because of fear of opposing soy, presented by local governments as “progress,” or because they lacked information about the dangers of pesticides. Many families have little access to information and do not necessarily understand the symptoms when they occur, and feel unaffected. It is very likely, therefore, that the survey results underestimate the problem. As pointed out by Dedieu and Jouzel (2015) and Fillion and Torny (2015), when a society does not recognise a public health problem, victims tend to minimise the problem or consider it “inevitable”.

Even so, the interviews and the biophysical analyses confirm the experiences the farmers’ unions reported, validating that they are not “isolated cases” (FILLION; TORNLY, 2015). During the meetings held to present the research results in the communities, this result was one of the most commented on by the community participants. Seeing that this is a reality shared by most farmers, they begin to understand that they are not the only ones with these difficulties.

3.3 THE FORUM TO COMBAT THE USE AND LIMIT THE IMPACTS OF PESTICIDES, A SPACE FOR VISIBILITY?

Impulsed by the STTR of Santarém and with the coordination of the Public Prosecutor's Office of the State of Pará, a Regional Forum to Combat the Use and Limit the Impacts of Pesticides in the Lower Amazon was created in 2017, motivated by national initiatives such as the national Permanent Campaign mentioned earlier and other regional initiatives⁸. In the Santarém region, the Forum has 29 members, including civil society, research and extension institutions, and public agencies. The objective of the Forum is to build a public agenda on the issue of pesticides, still marginal in the region, and to raise awareness around these products' risks and impacts.

Through regular meetings and events, this Forum has become a space for debate and inter-institutional relations to promote research and collective action to address the impacts of pesticide use. For example, the Forum promotes debates on various topics, such as human exposure to pesticides, the impact of pesticides on bee populations, and the illegal sales of pesticides. Through the Forum, negotiations have been initiated between institutions and pesticide salespeople for the construction of a deposit to collect used containers (required by law) since many farmers reuse pesticide containers for water storage, for the sale of food, or discard them in nature.

Faced with several complaints from rural community residents and leaders about the possible impacts and indiscriminate use of pesticides on the Santarém plateau, the public prosecutor who chaired the Forum in the first years insisted on the importance of having scientific information in order to qualify the court cases better. This request led to the signing of a technical cooperation agreement between Forum member institutions and local research institutions, particularly the Federal University of Western Pará (Ufopa).

In 2019, as Odisseia, we were invited by the Forum to present some first results of our studies on pesticides, and the participants underlined the importance of making the results available. In the seminar for the official presentation of the results, organised by the STTRs together with the Odisseia project team in December 2020, one of the public prosecutors present stressed: "this data should be in the hands of the communities, to put people in the social control of public power.

In August 2021, the Forum organised an extraordinary meeting to discuss the previously published results. Approximately twenty people attended this meeting, which was divided into two sessions. After a general presentation of the results during the first session, the participants agreed to continue the discussions with a second session two weeks later to define, by working groups, the concrete actions to be taken. Different proposals were made, such as presenting the results to policymakers, preparing pedagogical material for schools, and seeking international media for dissemination. One of the main ideas that emerged during the debates was to draft a bill to be presented at the municipal level to establish a pesticide-free zone, inspired by other experiences in Brazil or the world⁹. At the end of the second event, one of the actors said: "Finally, we have hope that things will change". However, this dynamic did not follow, and the Forum was progressively dismantled.

3.4 DISMANTLING, DISARTICULATION AND INVISIBILISATION OF THE PESTICIDE AGENDA

During 2019, before the presentation of our results, political friction arose within the Forum. The representatives of the soy producers¹⁰, together with the representatives of the pesticide trade, defended a position in favour of controlling spraying and residue treatment and stated that the indiscriminate use of pesticides is not the fault of large producers who follow the recommendations, but of family farmers who do not know the application protocols. These actors repeated this narrative in another Forum meeting in 2022. This discrediting strategy, often used by companies selling

pesticides (DEDIEU; JOUZEL, 2015; FILLION; TORNY, 2015), seeks to individualise and blame the victims, thus rejecting their responsibility.

In contrast, the actors representing social movements, including the Pastoral Land Commission, are against any pesticide use, including by family farmers themselves, because they consider it an illusion to think that pesticides can be used in a controlled way. In addition, they relate the use of pesticides in soy farming to cancer cases and waterways pollution throughout the territory. They defend an agroecological agenda and the implementation of alternatives to agrochemicals, using research results to support their arguments.

Gradually, groups of soy producers and traders began to oppose the Forum systematically, sending letters to the Public Prosecutor's Office, questioning the data presented and disrupting the Forum's plenary meetings. Both the public prosecutor's office and the STTR of Santarém consider dialogue with agribusiness about pesticides necessary, but they have noticed that in the Forum, the debate has become a "war of narratives" (a term used in an interview), where the parties no longer want to hear each other.

In addition, the dismantling of national family farming policies as of 2019 impacted the local level. Technical assistance institutions (e.g., Emater, the agricultural extension agency) and agencies linked to the Ministry of Agriculture, which supported the implementation of alternatives to pesticides, saw their funding reduced. National support to combat the impacts of pesticides and promote agroecology was drastically reduced as the National Campaign against Pesticides ran out of resources. The Santarém Regional Forum had no means to continue its activities except for the motivation of its members. With the Covid-19 pandemic, it ceased to function. Its activities resumed with the extraordinary meeting held to discuss the results of the Odisseia Project (with selected guests, we learned later).

In October 2021, the public prosecutor in charge of the Forum was removed and transferred to another agrarian court in Pará. In 2022, a few meetings were held with the Forum members to reorganise their actions and define their strategies for action, but tensions remained visible. With the change of the person responsible for the Forum in the Public Prosecutor's Office, and considering the increase in political tension, a strategic shift was taken, from a focus on combating pesticides to a reflection more focused on agro-ecology and organic production, aiming at actions to strengthen these forms of production without pesticides.

Farmers in the communities we work with also reported that, in the Bolsonaro political context, tension and fear of confronting soy farmers increased, as they felt they would no longer have support from the state in case of disputes. The new president of the Santarém family farmer union, elected in October 2021, received death threats soon after her election¹¹. This situation raises questions about the risks related to the information we co-produced, potentially increasing conflicts between farmers, union leaders and local elites in a context of invisibilisation and discrediting of science by the Bolsonaro government and society.

With the change of federal government in the elections of 2022, the previous articulations are progressively being resumed, and the federal actors can defend public rights again. In March 2023, a soy producer was fined more than 1 million reais by Ibama, the National Institution for the Environment, for having caused the intoxication of students and teachers of a public school in the municipality of Belterra. This case had been notorious for years, with repeated reports of intoxication of students, and the population had complained many times without receiving any response from the public authorities. They finally received the visibility they deserved.

Faced with the failure of public authorities to guarantee the rights of rural populations, organised civil society has been developing its own strategies to defend territories in the face of concrete advances in sectors linked to agribusiness, illegal logging and mining, among other threats. The NGO

Terra de Direitos¹² compiled a report based on evidence collected in the territory of Santarém to demonstrate how Cargill, a multinational company that owns the Santarém soy export port, is directly responsible for the negative impacts caused by soy in the Santarém region, especially those linked to pesticides (TERRA DE DIREITOS, 2021). Thus, in a strategy of *claiming* collective reparation (FILLION; TORNY, 2015), the responsibility of industries is being questioned, in this case, that of Cargill as the representative and main promoter of the soy production sector.

4 CONCLUSION

In Brazil, the issue of pesticide impacts became a public issue thanks to the social participation spaces that emerged in the 2000s. However, with the return of conservative elites to power and the dismantling of public policies favouring family farming, they became invisibilised from the national political agenda. In a context open to collaboration, we started the construction of a citizen observatory in the region of Santarém, together with the STTRs, to investigate, among other issues, the effects of pesticides on family farmers.

Institutional recognition of the social and environmental impacts of pesticides in the Santarém region is almost non-existent, although family farmers have reported being affected by them since the arrival of soy in the region in the late 1990s. This recognition has faced many obstacles due to pressure from soy producers and their political allies. To this end, they use several methods, such as intimidating family farmers in their communities, using discursive elements to convince society that large-scale agriculture is synonymous with progress, and protesting in the spaces created to discuss limiting the impacts of pesticides, among others.

Although the results of the Odisseia observatory are preliminary, some articulation processes are emerging to bring visibility to the issue of pesticides. Using Pillon and Torny's (2015) concepts, the results presented at community and union meetings have allowed the region's farmers to perform a *naming* action, beginning to recognise themselves as common victims of a phenomenon that goes beyond isolated testimonies. However, although soy farming is generally largely responsible, family farmers do not wish to create direct conflicts with neighbouring soybean farmers and instead propose conciliatory solutions, for example, discussing spraying hours. Some NGOs are proposing to support *collective claiming* actions holding Cargill accountable, blaming the company for expanding the soy industry in the Santarém region. However, the outcome of such action in a context dominated by a strong agribusiness lobby remains unlikely.

Faced with the dismantling of democratic spaces, in which social organisations had the strength and articulated proposals, social movements are reorganising to prepare new strategies and modes of political action. In this context, the defence of food sovereignty and agroecology prove particularly aggregative and promising (PINTON; SENCÉBÉ, 2019), allowing the promotion of positive alternatives, as shown in France by Aulagnier and Goulet (2017). Thus, the family farmer unions argue that while it is critical to continue awareness-raising work to reduce pesticide use, having a positive agenda is more mobilising with decision-makers who, for the most part, consider soy to bring development. The unions wish to evidence that the consolidation of family farming is also fundamental for the future of the region, whether to ensure food sovereignty, preserve the environment, empower women, or guarantee decent work in rural communities, as many authors have shown (ALTIERI; TOLEDO, 2011; PRÉVOST; ESMEALDO; GUETAT-BERNARD, 2014). This opens important avenues of collaboration for us within the Odisseia observatory to better understand ongoing agroecological experiments (PIVA et al., 2022) and what conditions would allow farming communities to consolidate from these initiatives.

NOTES

1| Since 2008 Brazil has been among the top three pesticide consumers per capita, ahead of China and the United States (FAO, 2021).

2| For example, the maximum residue limit of glyphosate in drinking water is 5000 times higher (500 µg/L) in Brazil than allowed in the European Union (0.1 µg/L). Regarding the effects on human health, studies point out that between 2007 and 2014 there were approximately 18,000 acute poisonings by pesticides; however, it is estimated that for every recorded case of poisoning, there would be approximately 50 unreported cases (BOMBARDI, 2017).

3| Although in this article we refer to Odisseia, it is actually a double project, combining the European H2020 Odyssey project and the Brazilian INCT Odisseia project. Both stand for: Observatory of the Dynamics of Interactions between Societies and their Environments. The institutions coordinating the project are the University of Brasília (UNB), the Research Institute for Development (IRD) and the International Center for Agricultural Research for Development (Cirad), with the collaboration of many other Brazilian and European institutions, including the Federal University of Pará (based in Belém) and the Federal University of West Pará (based in Santarém). These projects are presented on the following websites: <https://www.odyssea-amazonia.org/> and <http://odisseia.unb.br/>.

4| We will return to this point when we discuss the dismantling of policies under the Bolsonaro government. Researcher Larissa Bombardi, for example, had to go into exile in 2021 after receiving death threats (REDE BRASIL ATUAL, 2021).

5| Soy is the large-area crop for which the most pesticides are used, reaching 19 kilograms per hectare in the Amazon, where heat and humidity favor fungi, while in the rest of Brazil it is 8 kilograms per hectare and in Europe 2 kilograms per hectare (PIGNATI *et al.*, 2017).

6| In Europe, this “evidence of dangerousness” criterion was incorporated into the regulation in 2009 and implemented in 2011 (FRANCO; PELAEZ, 2016).

7| A multinational company specializing in the trade of raw materials, particularly soybeans, Cargill is the world's largest agribusiness in terms of capital, with \$113.5 billion (AGROMEDIA, 2020).

8| Other Forums exist in Brazil, such as the Tocantinense Forum to Combat the Impacts of Pesticides, the Bahia Forum to Combat the Impacts of Pesticides (FBCA), the Goiás Forum to Combat the Impacts of Pesticides, the Espírito Santo Forum, the Rio Grande do Sul Forum.

9| In particular the experience of Florianópolis, capital of the state of Santa Catarina in southern Brazil.

10| Represented by SIRSAN, Sindicato dos Produtores Rurais de Santarém.

11| This type of threat is not insignificant in Brazil, which is one of the countries with the highest levels of rural violence. The state of Pará is the one where the most murders of peasant leaders occur, with more than 1,200 death threats and 320 murders since 1996. This violence has increased since the return to power of the land elites in 2016 (REDE BRASIL ATUAL, 2021).

12| Founded in 2002 in Curitiba, this Brazilian organization of “popular defense (...) works with collective and community demands, in partnership with popular social movements, recognizing them as active subjects of the social process and of the fights for rights.”

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Repercussão do desmantelamento de políticas na produção de invisibilidade: quando os agrotóxicos deixam de ser um problema público

Backlash of policy dismantling in the production of invisibility: when pesticides cease to be a public problem

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ARTICLE- DOSSIER

RESUMO

O Brasil é um dos maiores consumidores mundiais de agrotóxicos, mas seus impactos sobre a população ainda são pouco reconhecidos como um problema público. Durante os governos trabalhistas (2003-2016), vários espaços de participação social foram criados para debater esse tema. Neste artigo, discutimos como o desmantelamento desses espaços vem contribuindo para uma produção de invisibilidade dos impactos dos agrotóxicos. Fomos confrontados com essa questão ao construir um observatório cidadão na região metropolitana de Santarém, Pará, em parceria com sindicatos de agricultores familiares. A partir de entrevistas, observação participante e grupos de reflexão, analisamos como o desmantelamento da regulação de agrotóxicos aconteceu em nível nacional e como repercutiu em âmbito territorial. Mostramos que, apesar de pesquisas evidenciarem os impactos dos agrotóxicos, a desarticulação progressiva dos espaços de participação social, como a do Fórum Regional de Combate aos Impactos de Agrotóxicos em Santarém, leva à invisibilização dos impactos causados por seu uso.

Palavras-chave: Agricultura Familiar. Participação social. Brasil. Amazônia. Observatório cidadão.

ABSTRACT

Brazil is one of the world's largest consumers of pesticides, but their impacts on the population are still rarely recognised as a public problem. During the governments of Lula and Dilma, several social participation spaces were created to discuss this issue. In this article, we discuss how dismantling these spaces has contributed to producing invisibility regarding the impacts of pesticides. We were confronted with this issue when building a citizen observatory in the metropolitan region of Santarém, Pará, in partnership with family farmer unions. Based on interviews, participant observation, and focus groups, we analyse how the dismantling of pesticide regulation has occurred nationally and how it influenced the territorial level. Despite research showing the impacts of pesticides, the progressive dismantling of social participation spaces, such as the Regional Forum to Combat the Impacts of Pesticides in Santarém, has led to the invisibility of the impacts caused by their use.

Keywords: Family Agriculture. Social Participation. Brazil. Amazon. Citizen Observatory.

1 INTRODUÇÃO

Enquanto em nível internacional os riscos dos agrotóxicos para a saúde dos agricultores e das populações rurais são cada vez mais destacados na literatura científica (FLEMING *et al.*, 2003; SARKAR *et al.*, 2021), levando os tomadores de decisão a considerar a retirada do mercado de moléculas amplamente utilizadas na agricultura como o glifosato (MAHÉ *et al.*, 2020), essas advertências são obscurecidas em contextos políticos conservadores.

No Brasil, os níveis de pulverização de agrotóxicos estão entre os mais altos do mundo, com cerca de 6 litros por hectare em comparação com 2 litros por hectare na Europa, atingindo 19 litros por hectare para soja na Amazônia (PIGNATI *et al.*, 2017). Além disso, os atuais limites normativos de contaminação ambiental e de exposição humana são muito mais permissivos do que na Europa e poucas pesquisas mediram o impacto dessa exposição na saúde das populações rurais e urbanas brasileiras (PIGNATI *et al.*, 2017; SCHWAMBORN, 2019). Isso é amplamente favorecido por um contexto fortemente dominado por um agronegócio baseado no uso de agrotóxicos.

Apesar de vários espaços de participação social terem emergido durante os governos de Luiz Inácio Lula da Silva (2003-2010) e Dilma Rousseff (2011-2016), esses espaços não deixaram de ser permeados por tensões entre atores defensores de modelos diferentes de agricultura. Essas tensões foram exacerbadas durante o governo Bolsonaro, ao promover um desenvolvimento ultraliberal e o desmantelamento de todas as políticas de apoio à agricultura familiar e ao meio ambiente, com a aprovação incondicional do agronegócio (NIEDERLE *et al.*, 2019). Neste artigo, nos debruçamos sobre a relação entre desmantelamento de políticas públicas, desarticulação de espaços de participação social e o efeito sobre o debate público referente aos agrotóxicos.

Bauer e Knill (2012, p. 35) definem o desmantelamento político como “uma mudança de natureza direta, indireta, oculta ou simbólica que pode diminuir o número de políticas em uma área particular, reduzir o número de instrumentos usados ou reduzir sua intensidade”. Grisa e Niederle (2021) apontam que, em geral, novos governos evitam extinguir políticas, pois essa estratégia pode gerar grande oposição e custos políticos potencialmente elevados. Preferem optar pela substituição, pela mudança nos objetivos ou pela inefetividade. Quando a extinção é o caminho escolhido, geralmente há um processo prévio de deslegitimação.

Niederle *et al.* (2022) ressaltam que o efeito do desmantelamento não é apenas com relação à operação dos instrumentos da política – que é geralmente mais analisada –, mas à própria teia de relações sociais constituída entre os atores estatais e não estatais. No entanto, o debate sobre

desmantelamento (BAUER; KNILL, 2012) tem dado pouca atenção às várias estratégias que podem ser utilizadas para interromper essas relações ou limitar a participação social e as consequências dessa interrupção.

Dedieu e Jouzel (2015) estudaram na França os efeitos da desarticulação institucional no caso dos agrotóxicos, mostrando como isso contribuiu para a manutenção de uma “ignorância” pública (DEDIEU; JOUZEL, 2015), ou seja, de uma invisibilidade da nocividade dos produtos no debate público. Enquanto a invisibilidade pode ser definida como uma simples ausência de conhecimento, cada vez mais estudos a consideram como uma construção social (DEDIEU; JOUZEL, 2015; SANTOS; ARAÚJO; BAUMGARTEN, 2016). Assim, alguns trabalhos destacam estratégias conscientes, tais como, as dos “comerciantes de dúvida” da indústria do tabaco (ORESQUES; CONWAY, 2010), que mantêm as controvérsias sobre o consumo de tabaco abertas para alimentar a dúvida. Outros trabalhos enfocam a dimensão involuntária da produção de invisibilidade, inscrita em sistemas disciplinares e fragmentados de produção de conhecimento que impedem um problema de se tornar visível (DEDIEU; JOUZEL, 2015).

Diante dessa produção de invisibilidade, várias estratégias têm sido desenvolvidas por atores sociais para constituir evidências e pautá-las nas agendas políticas. Fillion e Torny (2015) relatam como vítimas de destilbene uniram seus casos singulares criando um coletivo e mostram como as três operações sucessivas de reclamação – a “nomeação” do dano sofrido, a “culpabilização” dos responsáveis e a “reclamação” de uma compensação – permitiram a coletivização e a divulgação de um problema. Gudowsky (2021) mostra como o estabelecimento de agendas de pesquisa participativa pode apoiar a elaboração de políticas, envolvendo opiniões contrastadas, melhorando a eficácia das decisões em situações controversas e garantindo o engajamento em questões de interesse público. Assim, no campo dos agrotóxicos, várias iniciativas participativas buscam empoderar os próprios agricultores, tais como farmer field schools (VAN DEN BERG; JIGGINS, 2007) ou escolas-atores (TONNEAU *et al.*, 2021) para discutir os efeitos dos agrotóxicos e desenvolver práticas alternativas ao seu uso.

No âmbito do projeto intitulado Observatório das Dinâmicas Socioambientais na Amazônia – Odisseia, iniciamos em 2016 um processo de pesquisa na região de Santarém, no oeste do estado do Pará, para colaborar para o fortalecimento da agricultura familiar numa região de grandes mudanças (COUDEL *et al.*, 2022). Observatórios socioecológicos são enquadrados como plataformas que envolvem diversos pesquisadores, tomadores de decisão e atores sociais, a fim de reunir vários tipos de conhecimento acadêmicos e não acadêmicos relacionados com os sistemas socioecológicos e informar a elaboração de políticas públicas (BOURGERON *et al.*, 2018). O observatório Odisseia se inspirou em uma nova geração de observatórios que promove um papel mais ativo dos cidadãos nos processos de coprodução de conhecimento, a fim de incentivar uma governança ambiental envolvendo a sociedade (LIU *et al.*, 2014). Como Liu *et al.* (2014) afirmam, a conscientização de um problema não se limita a alertar o público sobre ele, mas requer envolver os cidadãos na sua compreensão para que possam tomar decisões informadas por eles mesmos.

Assim, desde o início do observatório Odisseia, estabelecemos parceria com os Sindicatos de Agricultoras, Agricultores Familiares e Trabalhadores Rurais (STTR) dos municípios de Santarém, Belterra e Mojuí dos Campos para coconstruirmos os temas a investigar. Contaminação por agrotóxicos emergiu como um dos eixos prioritários de pesquisa. Em 2019, o observatório lançou uma campanha de coleta de dados sobre a agricultura familiar da região, englobando, entre outras questões, perguntas referentes à percepção dos entrevistados sobre o impacto do avanço da soja sobre suas famílias e sobre o uso de agrotóxicos pelos agricultores familiares (COUDEL *et al.*, 2022). Paralelo à realização de entrevistas realizadas por questionários, pesquisadores do projeto investigaram sobre a exposição ambiental e humana a agrotóxicos na região do planalto santareno. Ambos os processos de pesquisa levantaram dados preocupantes em relação ao impacto dos agrotóxicos sobre o meio ambiente e as comunidades de agricultores familiares.

Devido ao escopo da pesquisa, fomos convidados para apresentar os resultados no Fórum Regional de Combate aos Impactos Causados pelos Agrotóxicos. Quando esse fórum foi criado, em 2017, seus promotores quiseram fazer dele um espaço de debate e propostas de ação. Entretanto, num território onde o agronegócio é predominante, a discussão sobre o impacto dos agrotóxicos enfrenta muitos entraves. Essa experiência nos levou a questionar de que forma o desmantelamento político e a desarticulação dos espaços de participação social vêm contribuindo para a produção da invisibilidade em relação aos agrotóxicos? A fim de entender essa questão, realizamos uma análise em dois níveis: examinamos o surgimento dos agrotóxicos como problema público e o desmantelamento de políticas públicas e espaços de participação sobre esse tema no Brasil; e no território da região metropolitana de Santarém (que inclui os municípios de Belterra e Mojuí dos Campos), estudamos a criação e, em seguida, a desarticulação do Fórum Regional de Combate aos Impactos Causados pelos Agrotóxicos do Baixo Amazonas.

Nossas análises e reflexões foram feitas com base no processo de coconstrução do observatório Odisseia (ver COUDEL *et al.*, 2022). Durante esse processo, mobilizamos diferentes métodos de pesquisa e vários materiais nessa reflexão engajada (MARTINEZ-ALIER *et al.*, 2011), como a realização de oficinas com pesquisadores e atores locais para interpretar os resultados da campanha de coleta de dados e identificar os fatores que influenciaram a (in)visibilização dos agrotóxicos na região de Santarém. Também foram realizadas entrevistas com atores do território, como agricultores, representantes sindicais e instituições públicas, para entender o envolvimento que tiveram em relação aos debates sobre agrotóxicos no território de Santarém. Enfim, conduzimos uma observação participante por meio do envolvimento de alguns dos atores em instituições locais, participando de reuniões, em particular do Fórum Regional de Combate aos Impactos dos Agrotóxicos, e em outros ambientes de encontro com vários atores locais.

2 EMERGÊNCIA, INSTITUCIONALIZAÇÃO E INVISIBILIZAÇÃO DOS AGROTÓXICOS COMO UM PROBLEMA PÚBLICO

2.1 O SURGIMENTO DOS AGROTÓXICOS COMO UM PROBLEMA PÚBLICO

A primeira menção de agrotóxicos na legislação brasileira aconteceu em 1934, por meio do Decreto 24.114/1934, no primeiro governo de Getúlio Vargas (1930-1945). No entanto, esse decreto presidencial não incluiu nenhuma classificação ou estrutura de inspeção toxicológica desses produtos. Dito decreto permaneceu em vigor até 1980 e incentivou multinacionais, como a Bayer ou a Ciba-Geigy, através da redução da tributação, a importar e fabricar agrotóxicos no Brasil, incluindo moléculas que já eram controversas e obsoletas em outros países (FRANCO; PELAEZ, 2016; TERRA; PELAEZ, 2008).

A partir dos anos 1960, o setor agrícola no Brasil passou por mudanças significativas devido à adoção de pacotes tecnológicos da Revolução Verde (TERRA; PELAEZ, 2008); os agroquímicos foram sendo apresentados pela indústria e pelo governo como “medicamentos” benéficos para as populações e culturas rurais (FIRPO PORTO *et al.*, 2015). Isso favoreceu enormemente a agricultura industrial de larga escala, sendo promovido pelo governo e elites agrárias como sinônimo de desenvolvimento, ao passo que se associava agricultura familiar camponesa ao atraso (BERTRAND, 1973).

Como contraponto, desde os anos 1980, diferentes movimentos sociais, em particular a Comissão Pastoral da Terra (CPT), vêm emitindo alertas contra os problemas de poluição ambiental e riscos de exposição dos trabalhadores e moradores das áreas rurais aos agroquímicos, formulando pela primeira vez a questão dos agrotóxicos como um problema de saúde pública (FIRPO PORTO; ROCHA; PACHECO, 2015). Eles também denunciam as estratégias dos grandes produtores rurais, que utilizam agrotóxicos como “*arma de guerra química e criminoso*” para expulsar as populações rurais de suas terras (FIRPO PORTO; ROCHA; PACHECO, 2015, p. 136). Assim, junto com a luta pela reforma agrária, os movimentos

sociais têm gradualmente integrado ações para a eliminação de agrotóxicos como parte integrante de suas demandas em defesa da terra (FIRPO PORTO; ROCHA; PACHECO, 2015).

Essa nova pauta dos movimentos sociais, no entanto, encontra pouco eco na comunidade científica. A literatura sobre o tema frequentemente atribui os possíveis problemas relacionados aos agrotóxicos ao uso indevido desses produtos pelos próprios trabalhadores rurais e ignora seus impactos mais amplos, causados por grandes pulverizações na agricultura de larga escala, sobre as populações rurais. Apenas poucos pesquisadores da Fiocruz (GURGEL; FRIEDRICH, 2020; PERES; MOREIRA; DUBOIS, 2003) e alguns docentes de universidades públicas (BOMBARDI, 2017; MORGADO; PASSOS, 2018; PIGNATI *et al.*, 2017; PIRES *et al.*, 2020; SOUSA PASSOS, 2006) conduzem trabalhos sobre esse tema, mas encontram pouco financiamento para suas pesquisas, além de correrem o risco de serem sujeitos a duras críticas (e até ameaças) por parte da comunidade científica e do agronegócio.

No caso da região amazônica, esse tema vem paulatinamente sendo incluído em agendas de pesquisa associadas principalmente ao avanço do cultivo da soja. Esse cultivo altamente mecanizado pressiona os agricultores familiares a venderem suas terras para proprietários mais capitalizados (BARBOSA; FERRER, 2015; FEARNSIDE, 2006). Embora o empobrecimento das populações e a exclusão da terra tenham sido destacados por vários estudos (FAVARETO *et al.*, 2019; SAUER, 2018), o impacto da pulverização de agrotóxicos sobre as populações ao redor das lavouras de soja ainda recebe pouca atenção.

2.2 CONSOLIDAÇÃO DOS AGROTÓXICOS COMO UMA AGENDA POLÍTICA

Com a transição democrática do Brasil após o regime militar (1964-1984), o espaço público se abriu a diferentes movimentos sociais, e a agricultura familiar tornou-se uma categoria importante dentro da política nacional de segurança alimentar e nutricional do Brasil (PINTON; SENCÉBÉ, 2019). Entretanto, ao mesmo tempo, o sistema de latifúndio foi sendo transformado em um agronegócio cada vez mais organizado (LACERDA, 2011; POMPEIA, 2021), recebendo apoio significativo do Estado, com o objetivo de assegurar a posição do Brasil como líder no mercado internacional de *commodities*.

Com a rápida expansão das áreas de monocultura de grãos, especialmente de soja, o Brasil torna-se o maior consumidor mundial de agrotóxicos em 2008 (FROTA; SIQUEIRA, 2021). Logo depois, passou a ser o maior importador mundial de agrotóxicos, enquanto a China se torna o maior exportador. Em 2015, as culturas de soja representaram sozinhas 63% dos agrotóxicos utilizados no país (PIGNATI *et al.*, 2017).

A Constituição de 1988, que surge a partir de uma assembleia constituinte envolvendo uma ampla diversidade de setores da sociedade, representa um marco para a política brasileira, afirmando a proteção ambiental como um valor nacional e institucionalizando a participação social. Isso permite aos movimentos sociais aprovarem rapidamente a “Lei dos Agrotóxicos” (N. 7.802 de 1989) (FRANCO; PELAEZ, 2016; PELAEZ *et al.*, 2015; PERES; MOREIRA; DUBOIS, 2003). Na época, essa legislação foi considerada de vanguarda em comparação com a legislação europeia, pois se baseava no conceito de “evidência de perigosidade”, permitindo a proibição da venda de produtos que fossem considerados perigosos.

Gradualmente, várias instituições foram criadas para apoiar a agricultura familiar. Em 1999, sob o governo de Fernando Henrique Cardoso (1998-2002), foi instituído o Ministério do Desenvolvimento Agrário (MDA), que era responsável pela formulação de políticas específicas para a agricultura familiar. Com a chegada ao poder do Partido dos Trabalhadores (2003-2016), diferentes canais de participação pautaram a questão dos impactos dos agrotóxicos na agenda política. No entanto, esses avanços sempre coexistiram, em situação desigual, em termos de capacidade de influência política e financiamento, com o agronegócio, o qual também conta com ministério próprio (Ministério da Agricultura, Pecuária e

Abastecimento – Mapa) e se promove como garantidor da segurança alimentar no Brasil e do mundo, apesar de dados mostrarem que é a agricultura familiar a responsável por fornecer a maior parte dos alimentos consumidos pela população brasileira. Nesse sentido, movimentos de apoio à agricultura familiar defendem a soberania alimentar e o reconhecimento do direito dos povos de definir suas políticas e práticas alimentares e de desfrutar de alimentos saudáveis e livres de agrotóxicos (PINTON; SENCÉBÉ, 2019).

Embora três governos sucessivos do Partido dos Trabalhadores tenham sido insuficientes para reverter as assimetrias de poder entre a agricultura industrial patronal e a agricultura familiar, houve avanços importantes no fortalecimento desta última, particularmente em torno do conceito de agroecologia (FLEXOR; GRISA, 2016). A “Campanha Permanente Contra os Agrotóxicos e pela Vida”, lançada em 2011, é um bom exemplo da mobilização dos movimentos sociais (TYGEL *et al.*, 2014). De 2011 a 2015, foram registradas 278 manifestações contra os agrotóxicos, com a participação de mais de 150.000 pessoas (FIRPO PORTO; ROCHA; PACHECO, 2015).

Em um contexto de aumento do consumo de agrotóxicos, essa articulação política da sociedade civil recebeu novo impulso com a promulgação, em 2012, da Política Nacional de Agroecologia e Produção Orgânica (Pnapo) com o objetivo de integrar, articular e adaptar políticas públicas que contribuam para a produção sustentável de alimentos saudáveis e livres de contaminantes químicos. Em 2013, a Comissão Nacional de Agroecologia e Produção Orgânica (Cnapo), criada para dar vida à Pnapo, promoveu a participação social na elaboração do Plano Nacional de Redução do Uso de Agrotóxicos (Pronara). Entretanto, os instrumentos políticos necessários para implementar a Pnapo, incluindo o Pronara, nunca foram implementados devido ao *impeachment* da presidente Dilma Roussef em 2016 (SABOURIN *et al.*, 2020).

2.3 DESMANTELAMENTO BRUTAL E VOLTA À INVISIBILIDADE DOS EFEITOS DOS AGROTÓXICOS

A partir de 2015, com a crise política e econômica que abalou o Brasil, resultando no *impeachment* da presidente Dilma Roussef, os proponentes da agricultura industrial e dos *lobbies* da indústria química retornam com mais força. Isso se reflete no desmantelamento gradual das políticas públicas de apoio à agricultura familiar e à agroecologia (NIEDERLE *et al.*, 2019, 2022), e na retirada da agenda de questões relacionadas aos impactos socioambientais dos agrotóxicos (SOUZA *et al.*, 2020). Essa desconstrução é acompanhada por uma mudança retórica: utilizando um argumento neoliberal a favor de grandes grupos privados, representantes do agronegócio reivindicam o uso de agrotóxicos em nome do progresso e da modernização da agricultura (VOLLMER; TONDATO, 2020), acusando os movimentos sociais de se oporem ao desenvolvimento do país (CARNEIRO, 2015).

A influência do agronegócio foi particularmente exacerbada no governo de Jair Bolsonaro, após o setor ter desempenhado um papel importante nas eleições presidenciais de 2018 (POMPEIA, 2021; VOLLMER; TONDATO, 2020). A Frente Parlamentar da Agricultura e Pecuária (FPA), que reúne representantes das agendas do agronegócio, também presentes em outros governos, cresceu para quase metade do Congresso Nacional (Parlamento e Senado). Essa nova estrutura de poder estabeleceu uma série de medidas que favoreceu a monocultura em larga escala, o uso de agrotóxicos, a concentração da terra e a exploração predatória dos recursos naturais, enquanto desmantelava os avanços da década anterior em favor da agricultura familiar e de uma transição agroecológica (NIEDERLE *et al.*, 2022). O exemplo mais simbólico foi a extinção do Ministério do Desenvolvimento Agrário e de várias de suas políticas e instrumentos de gestão. Os espaços para os movimentos sociais participarem da elaboração de políticas foram completamente fechados (SABOURIN *et al.*, 2020).

A regulamentação ambiental foi progressivamente alinhada aos interesses do agronegócio, e o governo de Bolsonaro promoveu, através de uma aliança entre os Ministérios do Meio Ambiente e

da Agricultura, uma invisibilização dos efeitos dos agrotóxicos. A média anual de novas formulações comerciais de agrotóxicos aprovadas pelo governo aumentou de 140 para 443 entre 2017 e 2019, graças à simplificação do processo de registro desses compostos (SOUZA *et al.*, 2020). Paralelamente, a classificação toxicológica dos produtos já existentes no mercado foi simplificada, reclassificando 90% dos produtos anteriormente considerados “extremamente tóxicos” em classes de “pouco tóxico” ou “improvável de causar danos agudos”. A exigência de ter o pictograma de uma caveira, como símbolo de ameaça à vida, é excluída dos rótulos das classes 4 e 5 (GURGEL; FRIEDRICH, 2020), o que limita gravemente o conhecimento da periculosidade desses produtos por uma parcela significativa de trabalhadores rurais que tem um baixo nível de escolaridade (SOUZA *et al.*, 2020).

Desde 2002, um projeto de lei proposto pelo então deputado Blairo Maggi, que foi ministro da Agricultura de 2016 a 2019, tramita pelas instituições legislativas. Chamado pelos defensores dos agrotóxicos como “Lei do Alimento Mais Seguro” e pelos críticos, como “Pacote do Veneno”, esse projeto visa institucionalizar essas simplificações no registro, na circulação, na fiscalização e no armazenamento, entre outros. No fim de 2022, uma mobilização importante dos movimentos sociais conseguiu fazer com que esse projeto de lei não fosse pautado na última sessão legislativa do governo Bolsonaro (GREENPEACE, 2022). No entanto, a votação no plenário do Congresso deve acontecer em 2023, numa configuração em que a bancada ruralista ainda tem muita força.

3 CONSTRUÇÃO PROGRESSIVA DE EVIDÊNCIAS NA REGIÃO DE SANTARÉM

3.1 SANTARÉM, UMA FRENTE DE EXPANSÃO DA SOJA E DOS AGROTÓXICOS

Devido à sua localização na intersecção entre o Rio Amazonas e a rodovia federal BR-163, a região de Santarém tornou-se, desde o início dos anos 2000, uma frente estratégica para a expansão da monocultura da soja (SAUER, 2018). Após a construção de um porto de exportação de grãos em 2003 pela Cargill, em menos de 20 anos foram implantados 80.000 hectares de monoculturas (soja, milho e sorgo), representando agora 60% das áreas não florestais do território (CORTES *et al.*, 2020).

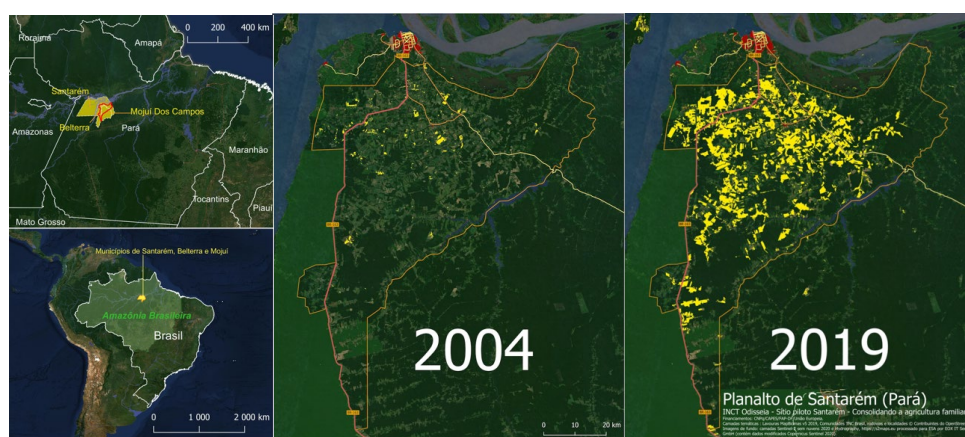


Figura 1 | Expansão da soja no território do planalto de Santarém (incluindo parte dos municípios de Santarém, Mojuí dos Campos e Belterra), entre 2004 e 2019.

Fonte: Mapas produzidos por Vincent Bonnal (INCT Odisseia)

Conflitos violentos surgiram, causados pela especulação fundiária e pela progressiva concentração de terra, levando à expropriação de populações tradicionais e agricultores familiares que estavam presentes no território há várias gerações, pressionando-os a migrar das áreas rurais para os centros urbanos (CÔRTEIS; D'ANTONA, 2016), causando, até mesmo, a extinção de comunidades inteiras

(SAUER, 2018). Esses efeitos, juntamente com um rápido crescimento no uso de agrotóxicos nas plantações de soja, têm sido ignorados pelo poder público diante dos elogios ao progresso que o agronegócio promete trazer à região (GAYOSO DA COSTA, 2012).



Figura 2 | Cemitério no meio dos campos de soja, em Belterra, ilustrando a disparição das comunidades rurais

Fonte: imagem de drone por Vincent Bonal em novembro de 2021

Desde os anos 1970, os STTRs vêm organizando ações coletivas para defender os direitos territoriais das populações. Mas foi a partir de 2010 que a questão dos agrotóxicos se tornou objeto de ações estratégicas, baseadas na observação do aumento dos casos de câncer nas comunidades cercadas pelo cultivo de soja. Um grupo de trabalho foi criado para tratar desse assunto, envolvendo as autoridades sanitárias municipais, o Hospital Regional do Oeste do Pará, a Secretaria Municipal de Agricultura e a associação de moradores da comunidade mais afetada. À época, das 200 famílias que viviam nessa comunidade, pelo menos 12 pessoas eram pacientes oncológicos que estavam sendo tratados no hospital regional. Entretanto, a associação de moradores encerrou sua participação no grupo de trabalho em 2014; os representantes sindicais citam a pressão exercida sobre os moradores pelos produtores de soja da comunidade. Nenhum estudo de efeitos clínicos foi realizado desde então, embora vários grupos de pesquisa tenham começado investigações, muitas vezes com pouco ou nenhum financiamento, que permanecem exploratórios.

3.2 PRODUÇÃO DE ALGUNS PRIMEIROS DADOS SOBRE O IMPACTO DOS AGROTÓXICOS

Diante das dificuldades de quantificar os impactos dos agrotóxicos sobre os agricultores familiares, os STTRs levantaram essa problemática quando iniciamos as atividades do Projeto Odisseia.

De fato, os dados que coletamos junto com os sindicatos mostram que 76% dos agricultores familiares entrevistados consideram que a expansão da soja tem causado impactos negativos sobre eles e suas famílias (para resultados mais detalhados, ver COUDEL *et al.*, 2021; COUDEL; PASSOS; SCHWAMBORN, 2020). Eles mesmos não produzem soja, mas têm suas propriedades agrícolas perto dos campos da leguminosa. Cerca de 6.000 famílias de agricultores familiares ainda vivem nas comunidades rurais do planalto santareno, comparado a 89 empresários de soja identificados em 2017 (IBGE, 2018).

Segundo as famílias entrevistadas, vários problemas de saúde surgiram depois da chegada da soja. Dos agricultores que vivem a menos de 100 metros de um campo de soja, 60% relatam desconforto quando as culturas vizinhas são pulverizadas. Mais graves são as doenças crônicas, que podem aparecer gradualmente, mas cujos efeitos persistem em longo prazo. Cento e três (103) famílias de 544 relatam sofrer de graves problemas de saúde (19%) e destas, 70% das famílias relatam sofrer de dores de cabeça agudas e constantes, 23% relatam ter doenças pulmonares crônicas (asma, tuberculose, bronquite e pneumonia) e 6% relatam ter tido caso de câncer na família.

Outros efeitos mencionados afetam a produção dos agricultores familiares. Entre os agricultores que moram a menos de 500 m de um campo de soja, 47% relatam ter perdido produção, principalmente por causa de pragas (*e.g.*, gafanhotos, moscas brancas) que se refugiam em seus lotes devido às pulverizações de agrotóxicos no seu entorno. Diante da perda de produção por pragas, os agricultores relatam que também passaram a usar agrotóxicos. Quase metade (48%) dos agricultores entrevistados usa defensivos, sendo que a proximidade da soja influencia significativamente esse uso. Os agricultores falam de um “círculo vicioso do veneno”. As pulverizações de agrotóxicos nos plantios de soja afetam tanto os agricultores familiares do seu entorno, que praticamente inviabiliza sua permanência no local, levando-os a vender suas terras para os sojeiros. Estes, por sua vez, ampliam as fronteiras de suas propriedades para perto de outros agricultores, que sofrem os mesmos impactos dos seus ex-vizinhos e eventualmente também vendem suas terras, e, assim, os empresários da soja vão concentrando terra e reduzindo as comunidades.

As dimensões produtivas do impacto dos agrotóxicos, que são pouco discutidas na literatura científica, são enfatizadas pelos agricultores familiares não tanto por razões econômicas, mas porque afetam sua sobrevivência como agricultores em curto prazo. A perda da produção desafia sua soberania alimentar, tanto a capacidade de produzir alimentos suficientes para alimentar suas famílias e para vender, como também a capacidade de ter acesso a alimentos saudáveis.

Um estudo realizado por biólogos da equipe confirmou a presença de resíduos de glifosato em 72% das amostras de água e sedimentos retirados de diferentes córregos em Santarém e Mojuí dos Campos (MORGADO, 2019). Os valores estavam abaixo dos limites da legislação brasileira, mas acima da legislação de outros países, como o Canadá e a União Europeia. Outro estudo detectou presença de glifosato, em limites altos, em todas as 27 amostras de urina humana de residentes de comunidades rurais (SCHWAMBORN, 2019). Esses estudos reforçam a credibilidade das percepções dos agricultores.

Não foram realizados estudos epidemiológicos de efeitos clínicos, pois esses são particularmente difíceis e sobretudo financeiramente custosos de realizar, e as unidades comunitárias de saúde não se atentam à possibilidade de diversos sintomas poderem ocorrer como resultado da pulverização de agrotóxico. Ademais, a pressão política constrange e acaba por impedir e silenciar o relato de casos de envenenamento; segundo vários entrevistados, uma enfermeira de um posto de saúde foi demitida pelo município de Belterra em 2019 porque relatou um caso de contaminação por agrotóxico. Os hospitais da região, solicitados por alguns colegas pesquisadores para fornecer dados sobre doenças respiratórias crônicas ou cânceres, não responderam a esses pedidos.

Os pesquisadores comunitários que coletaram os dados relataram que ficaram impressionados com o número de pessoas que, embora provavelmente afetadas pelos agrotóxicos, não ousaram dizer que percebiam um impacto negativo. Os pesquisadores comunitários observaram famílias que tinham que fechar as janelas de suas casas e não saíam quando havia pulverização, porém, responderam negativamente à questão sobre se sentiam-se afetados pelas plantações de soja. Os pesquisadores comunitários não sabiam dizer se isso se devia ao medo de se oporem à soja, apresentada pelos governos locais como “progresso”, ou porque lhes faltavam informações sobre os perigos dos agrotóxicos. Muitas famílias têm pouco acesso à informação e não necessariamente compreendem os sintomas quando eles ocorrem, não se sentindo afetadas. É muito provável, portanto, que os resultados da pesquisa subestimem o problema. Como apontado por Dedieu e Jouzel (2015) e Fillion e Torny

(2015), quando uma sociedade não reconhece um problema de saúde pública, as vítimas tendem a minimizar o problema ou o considerarem “inevitável”.

Mesmo assim, tanto as entrevistas quanto as análises biofísicas confirmam as experiências relatadas pelos sindicatos de agricultores, validando que não são “casos isolados” (FILLION; TORNBY, 2015). Durante as reuniões realizadas para apresentar os resultados da pesquisa nas comunidades, esse resultado foi um dos mais comentados pelos comunitários participantes. Vendo que essa é uma realidade compartilhada por uma maioria de agricultores, estes passam a entender que eles não são os únicos a ter essas dificuldades.

3.3 FÓRUM DE COMBATE AO USO E CONTRA OS IMPACTOS DE AGROTÓXICOS, UM ESPAÇO DE VISIBILIDADE?

Sob o impulso do STTR de Santarém e a coordenação do Ministério Público do Estado do Pará, foi criado em 2017 um Fórum Regional de Combate ao Uso e Contra os Impactos dos Agrotóxicos do Baixo Amazonas, motivado por iniciativas nacionais como a Campanha Permanente nacional mencionada acima e outras iniciativas regionais. Na região de Santarém, o Fórum é composto por 29 membros, entre eles a sociedade civil, instituições de pesquisa e apoio técnico, e órgãos públicos. O objetivo do Fórum é de construir uma agenda pública em torno da questão dos agrotóxicos, que ainda é marginal na região, e aumentar a conscientização sobre os riscos e impactos do uso desses produtos.

Através de reuniões e eventos regulares, esse Fórum se tornou um espaço de debate e articulação interinstitucional para promover a pesquisa e a ação coletiva para enfrentar os impactos gerados pelo uso de agrotóxicos. Por exemplo, o Fórum promove debates sobre temas diversos, como exposição humana a agrotóxicos, impacto dos agrotóxicos sobre as populações de abelhas e venda ilegal de agrotóxicos. Por meio do Fórum foram iniciadas negociações entre instituições e comerciantes de agrotóxicos para construção de um depósito de coleta de recipientes usados (exigido por lei), já que muitos agricultores reutilizam recipientes de agrotóxicos para armazenamento de água, para a venda de alimentos ou simplesmente os despejam na natureza.

Diante de várias queixas de moradores de comunidades rurais e líderes sobre os possíveis impactos e o uso indiscriminado de agrotóxicos no planalto de Santarém, a promotora pública que presidia o Fórum nos primeiros anos insistia na importância de ter informações científicas a fim de melhor qualificar os processos no tribunal. Esse pedido levou à assinatura de um acordo de cooperação técnica entre as instituições membros do Fórum e instituições locais de pesquisa, em particular a Universidade Federal do Oeste do Pará (Ufopa).

Em 2019, fomos convidados pelo Fórum a apresentar alguns primeiros resultados de nossos estudos sobre agrotóxicos, e os participantes presentes afirmaram a importância da disponibilização dos resultados. No seminário de apresentação oficial dos resultados, organizado pelos STTRs junto com a equipe do projeto Odisseia, em dezembro de 2020, uma das promotoras públicas presentes ressaltou: “esses dados devem estar nas mãos das comunidades para colocar as pessoas no controle social do poder público”.

Em agosto de 2021, o Fórum organizou uma reunião extraordinária para discutir os resultados anteriormente publicizados. Cerca de 20 pessoas participaram dessa reunião, que se dividiu em duas sessões. Após uma apresentação geral dos resultados durante uma primeira sessão, foi acordado continuar as discussões com uma segunda sessão duas semanas depois para definir, por grupos de trabalho, as ações concretas a serem realizadas. Foram feitas diferentes propostas, como, por exemplo, apresentar os resultados aos formuladores de políticas públicas, preparar material pedagógico para as escolas e buscar canais de mídia internacional para divulgação. Uma das principais ideias que surgiu durante os debates foi a de elaborar um projeto de lei a ser apresentado em nível municipal

para estabelecer uma zona livre de agrotóxicos, inspirando-se em outras experiências no Brasil ou no mundo. Ao final do segundo evento, um dos atores se despediu dizendo: “Finalmente, temos esperança de que as coisas vão mudar”. No entanto, essa dinâmica não seguiu, o Fórum foi sendo progressivamente desarticulado.

3.4 DESMANTELAMENTO, DESARTICULAÇÃO E INVISIBILIZAÇÃO DA PAUTA DOS AGROTÓXICOS

No decorrer de 2019, antes da apresentação de nossos resultados, surgiram atritos políticos no âmbito do Fórum. Os representantes dos produtores de soja, juntamente com os representantes do comércio de produtos fitossanitários, defenderam uma posição a favor do controle da pulverização e do tratamento de resíduos, e afirmaram que o uso indiscriminado de agrotóxicos não é culpa dos grandes produtores que seguem as recomendações, mas dos agricultores familiares que não conhecem os protocolos de aplicação. Essa narrativa foi repetida por esses atores em outra reunião do Fórum que ocorrera em 2022. Essa estratégia de descrédito, frequentemente utilizada pelas empresas vendedoras de agrotóxicos (DEDIEU; JOUZEL, 2015; FILLION; TORNBY, 2015), procura individualizar e responsabilizar as vítimas, rejeitando assim sua própria responsabilidade.

Em contraste, os atores que representam os movimentos sociais, incluindo a Comissão Pastoral da Terra, são contra qualquer modalidade de uso de agrotóxicos, inclusive pelos próprios agricultores familiares, pois consideram uma ilusão pensar que os agrotóxicos podem ser usados de forma controlada. Além disso, relacionam o uso de agrotóxicos nas lavouras de soja aos casos de câncer e à poluição dos cursos de água em todo o território. Eles defendem uma agenda agroecológica e a implementação de alternativas ao uso de agrotóxicos, recorrendo a resultados de pesquisas que possam subsidiar suas argumentações.

Gradualmente, grupos de produtores e comerciantes de soja começaram a se opor ao Fórum de forma sistemática, enviando cartas ao Ministério Público, questionando os dados apresentados e tumultuando as reuniões plenárias do Fórum. Tanto a promotoria pública quanto o STTR de Santarém consideraram necessário o diálogo com o agronegócio sobre agrotóxicos, mas perceberam que no Fórum o debate se tornou uma “guerra de narrativas” (termo usado numa entrevista), onde as partes não querem mais se ouvir.

Além disso, os impactos do desmantelamento das políticas nacionais de agricultura familiar a partir de 2019 foram rapidamente sentidos em âmbito local. As instituições de assistência técnica (*e.g.*, Emater) e instâncias do Mapa, que procuraram apoiar a implementação de alternativas aos agrotóxicos, viram seus financiamentos serem reduzidos. O apoio nacional para combater os impactos dos agrotóxicos e promover a agroecologia foi drasticamente diminuído, pois a Campanha Nacional contra os agrotóxicos ficou sem recursos. O Fórum Regional de Santarém não teve meios para continuar suas atividades, exceto pela motivação de seus membros. Com a pandemia da Covid-19 ele deixou de funcionar, sendo suas atividades retomadas por meio da reunião extraordinária realizada para debater os resultados do Projeto Odisseia (com convidados selecionados, soubemos depois).

Em outubro de 2021, a promotora pública foi removida, sendo transferida para atuar em outra vara agrária do Pará. Em 2022, algumas reuniões foram realizadas entre os membros do Fórum, no sentido de reordenar suas ações e repensar suas estratégias de atuação, mas as tensões restam visíveis. Com a mudança da responsável pelo Fórum no Ministério Público Estadual, e considerando o aumento da tensão política, nota-se uma mudança estratégica do foco no combate aos agrotóxicos para a reflexão mais voltada à agroecologia e à produção orgânica, visando ações para o fortalecimento dessas formas de produção sem agrotóxicos.

Os agricultores das comunidades com quem continuamos trabalhando relataram também que, no contexto político dos últimos anos, aumentou a tensão e o medo de enfrentamento aos empresários da soja, sentindo que não tinham mais apoio do Estado em caso de disputa. A nova presidente do sindicato de Santarém, eleita em outubro de 2021, recebeu ameaças de morte logo após sua eleição. Essa situação levanta questões sobre o risco das informações geradas acirrare os conflitos entre agricultores, lideranças sindicais e as elites locais, em um contexto de invisibilização e descredibilização da ciência pelo governo Bolsonaro e pela sociedade.

Com a mudança de governo federal nas últimas eleições de 2022, as articulações prévias estão voltando aos poucos e os atores federais conseguem voltar a defender os direitos públicos. Em março de 2023, um produtor de soja foi multado em mais de 1 milhão de reais pelo Ibama, por ter provocado a intoxicação de alunos e professores da rede pública no município de Belterra. Esse caso era notório há anos, com relatos repetidos de intoxicação de alunos, e a população se queixava sem receber retorno do poder público. Conseguiram finalmente a visibilidade merecida.

Diante do fracasso do poder público em garantir os direitos das populações rurais, a sociedade civil organizada desenvolve suas próprias estratégias para defender os territórios, diante de avanços concretos em setores ligados ao agronegócio, ao corte ilegal de madeira e à mineração, entre outras ameaças. A ONG Terra de Direitos compilou um relatório, baseado em evidências coletadas no território de Santarém, para demonstrar como a Cargill, empresa multinacional comodataria do porto de exportação de soja de Santarém, tem responsabilidade direta nos impactos negativos causados pelas lavouras de soja na região de Santarém, especialmente aqueles ligados aos agrotóxicos (TERRA DE DIREITOS, 2021). Assim, em uma estratégia de reivindicação de reparação coletiva (FILLION; TORNBY, 2015), é a responsabilidade das indústrias que está sendo questionada, nesse caso a da Cargill como representante e principal promotora do setor de produção da soja.

4 CONCLUSÃO

No Brasil, a questão do impacto dos agrotóxicos tornou-se um problema público graças aos espaços de participação social que surgiram nos anos 2000, mas, com a volta das elites conservadoras ao poder e o desmantelamento das políticas públicas a favor da agricultura familiar, foi invisibilizada na agenda política nacional. Em um contexto aberto à colaboração, iniciamos a construção de um observatório cidadão na região de Santarém, junto com os STTRs, para investigar, entre outros temas, os efeitos dos agrotóxicos para os agricultores familiares.

O reconhecimento institucional dos impactos sociais e ambientais dos agrotóxicos na região de Santarém é quase inexistente, embora os agricultores familiares tenham relatado ser afetados por eles desde a chegada da cultura da soja na região, no final dos anos 1990. Esse reconhecimento tem enfrentado muitos obstáculos devido à pressão dos produtores de soja e seus aliados políticos. Para isso, utilizam diversos métodos, como intimidar os agricultores familiares em suas comunidades, utilizando elementos discursivos para convencer a sociedade de que a agricultura em larga escala é sinônimo de progresso, e protestando nos espaços criados para discutir a limitação dos impactos dos agrotóxicos, entre outros.

Apesar de os resultados do observatório Odisseia serem iniciais, alguns processos de articulação estão emergindo para trazer visibilidade à questão dos agrotóxicos. Usando os conceitos de Pillon e Torny (2015), os resultados apresentados nas reuniões comunitárias e sindicais permitiram aos agricultores da região realizar uma ação de *nomeação*, começando a se reconhecer como vítimas comuns de um fenômeno que vai além de testemunhos isolados. Entretanto, embora a cultura da soja em geral seja considerada em grande parte responsável, os agricultores familiares não desejam criar conflitos diretos

com os produtores de soja vizinhos e, em vez disso, propõem soluções conciliadoras, por exemplo como discutir os horários de pulverização. Algumas ONGs estão propondo apoiar ações de *reparação coletiva* responsabilizando a Cargill, empresa que pode ser imputada culpada pela expansão da indústria da soja na região de Santarém, mas o resultado de tal ação, num contexto que continua dominado por um forte *lobby* do agronegócio, segue improvável.

Diante do desmantelamento dos espaços democráticos, onde as organizações sociais tinham força e articulavam propostas, a coordenação entre movimentos sociais está se reorganizando para preparar novas estratégias e modos de ação política. Nesse contexto, a defesa da soberania alimentar e da agroecologia se revela particularmente agregadora e promissora (PINTON; SENCÉBÉ, 2019), permitindo a promoção de alternativas positivas, como mostrado na França por Aulagnier e Goulet (2017). Assim, os STTRs argumentam que, embora seja fundamental continuar o trabalho de conscientização para reduzir o uso de agrotóxicos, ter uma agenda positiva é mais mobilizador com os tomadores de decisão que, em sua maioria, consideram que a cultura de soja traz desenvolvimento. Os STTRs procuram evidenciar que a consolidação da agricultura familiar também é fundamental para o futuro da região, seja para garantir a soberania alimentar, preservar o meio ambiente, o empoderamento das mulheres, ou garantir trabalho decente nas comunidades rurais, como muitos autores têm demonstrado (ALTIERI; TOLEDO, 2011; PRÉVOST; ESMERALDO; GUETAT-BERNARD, 2014). Isso abre importantes caminhos de colaboração, para nós no âmbito do observatório Odisseia, para compreender melhor os experimentos agroecológicos em andamento (PIVA *et al.*, 2022) e quais condições permitiriam às comunidades agrícolas consolidarem-se a partir dessas iniciativas.

NOTAS

1| Desde 2008 o Brasil está entre os três maiores consumidores de agrotóxicos per capita, à frente da China e dos Estados Unidos (FAO, 2021).

2| Por exemplo, o limite máximo de resíduos de glifosato na água potável é 5000 vezes maior (500 µg/L) do que o permitido na União Europeia (0,1 µg/L). Com relação aos efeitos na saúde humana, estudos apontam que entre 2007 e 2014 houve aproximadamente 18.000 intoxicações agudas por agrotóxicos; entretanto, estima-se que para cada caso registrado de intoxicação, haveria aproximadamente 50 casos não relatados (BOMBARDI, 2017).

3| Embora neste artigo nos referimos ao Odisseia, na verdade é um projeto duplo, combinando o projeto europeu H2020 Odissea e o projeto brasileiro INCT Odisseia. Ambos significam: Observatório das Dinâmicas Socioambientais. As instituições que coordenam o projeto são a Universidade de Brasília (UNB), o Instituto de Pesquisa para o Desenvolvimento (IRD) e o Centro Internacional de Pesquisa Agrícola para o Desenvolvimento (Cirad), com a colaboração de muitas outras instituições brasileiras e europeias, incluindo a Universidade Federal do Pará (com sede em Belém) e a Universidade Federal do Oeste do Pará (com sede em Santarém). Esses projetos são apresentados nos seguintes sites: <https://www.odyssea-amazonia.org/> e <http://odisseia.unb.br/>.

4| Voltaremos a esse ponto quando discutirmos o desmantelamento das políticas sob o governo bolsonarista. A pesquisadora Larissa Bombardi, por exemplo, teve que se exilar em 2021 após receber ameaças de morte (REDE BRASIL ATUAL, 2021).

5| A soja é umacultura de grande área para a qual mais agrotóxicos são utilizados, atingindo 19 quilos por hectare na Amazônia, onde o calor e a umidade favorecem os fungos, enquanto no resto do Brasil é de 8 quilos por hectare e na Europa de 2 quilos por hectare (PIGNATI *et al.*, 2017).

6| Na Europa, esse critério de "evidência de perigosidade" foi incorporado ao regulamento em 2009 e implementado em 2011 (FRANCO; PELAEZ, 2016).

7| Empresa multinacional especializada no comércio de matérias-primas, particularmente soja, a Cargill é a maior agroindústria do mundo em termos de capital, com \$113,5 bilhões (AGROMEDIA, 2020).

8| Outros Fóruns existem no Brasil, como o Fórum Tocantinense de Combate aos Impactos dos Agrotóxicos, o Fórum Baiano de Combate aos Impactos dos Agrotóxicos (FBCA), o Fórum Goiano de Combate aos Impactos dos Agrotóxicos, Fórum no Espírito Santo, Fórum Gaúcho e em outros territórios.

9| Em particular a experiência de Florianópolis, capital do estado de Santa Catarina, no Sul do Brasil.

10| Representado pelo Sindicato dos Produtores Rurais de Santarém (Sirsan).

11| Esse tipo de ameaça não é insignificante no Brasil, que é um dos países com os mais altos níveis de violência rural. O estado do Pará é aquele onde ocorrem mais assassinatos de líderes camponeses, com mais de 1.200 ameaças de morte e 320 assassinatos desde 1996. Essa violência tem aumentado desde o retorno ao poder das elites terrestres em 2016 (REDE BRASIL ATUAL, 2021).

12| Fundada em 2002 em Curitiba, essa organização brasileira de "defesa popular [...] trabalha com demandas coletivas e comunitárias, em parceria com movimentos sociais populares, reconhecendo-os como sujeitos ativos do processo social e das lutas por direitos".

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Political and institutional review for biodiversity financing in Brazil: a Biofin approach for the federal government

Revisão política e institucional para o financiamento da biodiversidade no Brasil: uma abordagem Biofin para o governo federal

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ABSTRACT

Institutions and their different management and governance configurations are increasingly related to the environmental changes experienced on the planet. Therefore, this study aims to conduct a political and institutional review of biodiversity within the Brazilian federal government. To do so, we use the Political and Institutional Review - PIR to assess the strengths and weaknesses of biodiversity-related policies and institutions as part of the Biofin methodology. The study raised the main elements of the normative and institutional landscape that guided biodiversity conservation actions at the federal level between 2000 and 2019. The results showed that in this period, at least 21 norms and about 195 instruments were provided in federal legislation to meet the National Biodiversity Strategy and Action Plan – NBSAP. However, most of the budgetary actions carried out by the management bodies of biodiversity policies at the federal level distort the guidelines in these listed norms, along with the observed reduction in budget allocation for the Ministry of the Environment and biodiversity actions in other ministries. These elements seem to point to reduced prioritisation for biodiversity conservation at the federal level in Brazil over the 20 years analysed.

Keywords: Biofin. NBSAP. Environmental Legislation.

RESUMO

As instituições e suas diferentes configurações de gestão e governança estão cada dia mais relacionadas com as alterações ambientais vivenciadas no planeta. Por isso, o objetivo deste estudo é realizar uma revisão política e institucional relativa à biodiversidade no âmbito do governo federal do Brasil. Para tanto utilizamos a Revisão Política e Institucional – PIR (Political and Institutional Review) como abordagem para avaliar os pontos fortes e fracos de políticas e instituições relacionadas à biodiversidade, como parte da metodologia Biofin. O estudo levantou os principais elementos da paisagem normativa e institucional que direcionaram as ações de conservação da biodiversidade em nível federal entre os anos de 2000 e 2019. Os resultados demonstraram que nesse período havia ao menos 21 normas e cerca de 195 instrumentos previstos na legislação federal para atender à Estratégia e Plano de Ações Nacionais para a Biodiversidade – EPANB. Porém, a maior parte das ações

orçamentárias realizadas pelos órgãos de gestão das políticas de biodiversidade em nível federal distorce as diretrizes previstas nessas normas elencadas. Juntamente com a observada redução da alocação orçamentária para o Ministério do Meio Ambiente e para ações de biodiversidade em outros ministérios. Esses elementos parecem apontar para um quadro de redução da priorização para o tema da conservação da biodiversidade em nível federal no Brasil ao longo dos 20 anos analisados.

Palavras-chave: Biofin. EPANB. Legislação ambiental.

1 INTRODUCTION

Institutional analysis has gained prominence in studying environmental problems (ROGGERO; BISARO; VILLAMAYOR-TOMAS, 2018). Human societies interact with the environment through institutions that are artefacts of social and political history. Variations of these interactions over time affect institutional performance with implications for the quantity and quality of available environmental resources and, consequently, for social well-being (VEEMAN; POLITYLO, 2003).

These institutions are the social decision-making systems that provide rules for the use of resources and for the distribution of resulting benefit flows (CIRIACY-WANTRUP, 1968). In other words, institutions are also considered the game's rules in our society (NORTH, 1990). Therefore, it is necessary to consider the preferences of individuals shaped by these institutions in the economic analysis of environmental issues. Institutions affect the choices and strategies in various social dimensions (TISDELL, 2005). It also affects the choices about biodiversity conservation strategies since the design of policies that effectively implement the provisions of the Convention on Biodiversity (CBD) requires: 1 - a clear understanding of the institutional economics of biodiversity; and 2 - knowledge about the research and development of processes related to its use, conservation and benefit sharing (POLSKI, 2005).

Within this scope, two necessary research focuses on institutions that govern the use and conservation of biodiversity have emerged. The first is that the governance of biodiversity involves a wide range of institutions that restrict and motivate interactions between human and ecological systems at different scales: from a gene to entire ecosystems. The second focus developed from the fact that these institutions often comprise several different governance structures, such as mechanisms based on incentives and reciprocal relationships that regulate different aspects of the human-ecosystem interface (PADMANABHAN; JUNG CURT, 2012).

These studies are essential because it is increasingly evident that institutions and governance systems are indirect causes of environmental changes. Due to their power to influence man's relationship with the natural environment, they are considered fundamental levers for decision-making. They establish, to varying degrees, access and control, allocation and distribution of components of nature and anthropogenic assets and their benefits to people (JOLY *et al.*, 2019).

In this sense, many governments today implement policies aimed explicitly at biodiversity conservation, which suggests some level of concern with this agenda (VYRASTEKOVA; SOEST, 2007). These policies and concerns are not necessarily sufficient or efficient, even in developed countries.

Political and Institutional Review (PIR) is an approach used to assess the strengths and weaknesses of policies and institutions in a given sector. They focus on adapting existing policies, identifying gaps, translating policies into practice, and examining the functionality of existing institutional structures (UNDP, 2018). PIRs are practical systems analyses applied in many different industries. They seek to understand better the complexity of the factors causing biodiversity loss and their connection with financial flows. As nature interacts with so many economic sectors, a diverse set of factors must be analysed to understand and influence the current development trajectory to improve its biodiversity outcomes (UNDP, 2016).

The PIR analyses the relationship between the state of nature and a country's fiscal, economic, legal, political, and institutional framework to identify: 1) A better understanding of how managing biodiversity and ecosystem services support national goals and visions of sustainable development; 2) An understanding of the central policy and institutional drivers of biodiversity change; 3) A catalogue of existing biodiversity finance, listing and analysing its mechanisms, incentives, subsidies and other instruments, including sources of biodiversity revenue (UNDP, 2018).

More specifically, the institutional review examines the links between three dimensions: 1) policy; 2) institutional structures which execute policies; 3) The resource allocation processes by which public funding is made available for the implementation of relevant projects, programs, and policies (DENDURA; LE, 2015).

Although there is a large field of studies related to environmental legislation, there is only sometimes a connection between the evaluated norms and their relationship with the practical actions of governments. The relevant contextual and institutional factors that determine the State's responses still need to be studied (DUGGAN; CARR; YAN, 2022).

Analysing institutional issues related to climate change is gaining space in the economic and environmental literature (ROGGERO; BISARO; VILLAMAYOR-TOMAS, 2018). However, analysing institutional issues related to biodiversity conservation still needs to be explored. For this reason, it is necessary to highlight the current role of normative and institutional aspects in conserving biodiversity and Brazilian ecosystems. Therefore, in this article, we assess whether the normative and institutional arrangement at the federal level has undergone changes that may have contributed to reducing the effectiveness of biodiversity conservation policies in Brazil.

Thus, the present study carries out a political and institutional review related to biodiversity within the scope of the Brazilian federal government. It highlighted the main elements of the normative and institutional landscape that guided biodiversity conservation actions at the federal level between 2000 and 2019.

2 METHODS

For the elaboration of this study, we use the PIR execution framework. The cutout established for the evaluation was Brazil's federal level of government. The collection of information followed three stages (Figure 1) suggested in the Biofin manual (UNDP, 2016):

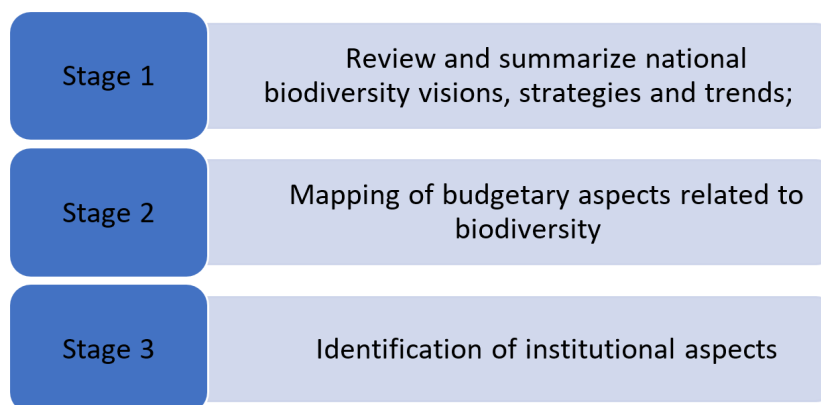


Figure 1 | Execution stages of the Institutional Review and Policies for the Financing of Biodiversity (PIR) in the federal government of Brazil

Source: Prepared by the author based on (UNDP, 2016).

We reviewed national policy and strategy documents to identify these three sets of objective elements of a PIR and if biodiversity is a fundamental part of sustainable development. In the case of Brazil, which has a legally endorsed National Strategy and Action Plan for Biodiversity - NBSAP, this was used as the basis for the analyses, as recommended by the Biofin methodology (UNDP, 2018).

The NBSAP is the document that brings together proposals for Brazilian contributions to international conservation agreements. NBSAP expresses the commitment of the Brazilian government, as a signatory to the CBD, to develop and adopt political instruments at the national level for the conservation of biodiversity that are effective, participatory, and up-to-date (BRASIL, 2017a).

Thus, 21 laws, rules, and regulations responsible at the federal level for meeting the objectives and goals established by NBSAP were listed. It was possible to map the main normative instruments responsible for implementing the 20 goals established related to the five strategic objectives (Table 1).

The identification of these norms was carried out in a non-exhaustive way, listing, in particular, those related to the creation of policies that met the objectives of the NBSAP.

For each of the listed norms, were analysed all of their instruments and action guidelines. Finally, we classified the instruments and guidelines into four categories: use of markets, creation of markets, environmental regulation, and social participation (WORLD BANK, 1997).

Table 1 | List of NBSAP's strategic objectives and goals with the main legal instruments responsible for its execution at the federal level

<i>Objectives of the NBSAP</i>	<i>National Biodiversity Targets</i>	<i>Policies/Instruments</i>
Strategic Objective A – Address the root causes of biodiversity loss by making biodiversity concerns permeate government and society	National Goal 1: By 2020, at the latest, the Brazilian population will be aware of the values of biodiversity and the measures they can take to conserve and use it sustainably.	National Environmental Education Policy. LAW No. 9795, OF APRIL 27, 1999. LAW No. 6,938, OF AUGUST 31, 1981. Provides for the National Environmental Policy (BRASIL, 1981).
	National Target 2: By 2020, at the latest, the values of biodiversity, geodiversity and sociodiversity will be integrated into national and local development strategies and poverty eradication and inequality reduction, being incorporated into national accounts, as appropriate, and into procedures planning and reporting systems.	DECREE No. 4339, OF AUGUST 22, 2002. Institutes principles and guidelines for implementing the National Biodiversity Policy. LAW No. 6,938, OF AUGUST 31, 1981. Provides for the National Environmental Policy (BRASIL, 1981).
	National Target 3: By 2020, at the latest, incentives that may affect biodiversity, including so-called perverse subsidies, will have been reduced or reformed to minimise negative impacts. Positive incentives for the conservation and sustainable use of biodiversity will have been designed and applied consistently and in accordance with the CBD, considering national and regional socioeconomic conditions.	DECREE No. 4339, OF AUGUST 22, 2002. Institutes principles and guidelines for implementing the National Biodiversity Policy. LAW No. 6,938, OF AUGUST 31, 1981. Provides for the National Environmental Policy, its purposes and mechanisms for formulating and applying it, and makes other provisions (BRASIL, 1981).
	National Target 4: By 2020, at the latest, governments, the private sector and interest groups at all levels will have adopted measures or implemented sustainable production and consumption plans to mitigate or avoid the negative impacts of using natural resources.	DECREE No. 7794, OF AUGUST 20, 2012. Institutes the National Policy on Agroecology and Organic Production.

Objectives of the NBSAP	National Biodiversity Targets	Policies/Instruments
<p>Strategic Objective B – Reduce direct pressures on biodiversity and promote sustainable use</p>	<p>National Target 5: By 2020, the loss rate of native environments will be reduced by at least 50% (compared to 2009 rates) and, as far as possible, brought close to zero, and degradation and fragmentation will have been significantly reduced by all biomes.</p>	<p>LAW No. 12,651, OF MAY 25, 2012. Provides for the protection of native vegetation. LAW No. 6,938, OF AUGUST 31, 1981. Provides for the National Environmental Policy, its purposes and mechanisms for its formulation and application, and other measures.</p>
	<p>National Target 6: By 2020, the management and capture of any stocks of aquatic organisms will be sustainable, legal and done with the application of ecosystem approaches in order to avoid over-exploitation, put in place recovery plans and measures for depleted species, ensuring that fisheries do not have significant adverse impacts on endangered species and vulnerable ecosystems, and ensuring that fisheries impacts on stocks, species and ecosystems remain within safe ecological limits, where scientifically established.</p>	<p>LAW No. 11,959, OF JUNE 29, 2009. Provides for the National Policy for the Sustainable Development of Aquaculture and Fisheries. LAW No. 6,938, OF AUGUST 31, 1981. Provides for the National Environmental Policy.</p>
	<p>Incorporating sustainable management practices in agriculture, livestock, aquaculture, forestry, extractivism, forestry and fauna management will be disseminated and encouraged, ensuring biodiversity conservation.</p>	<p>DECREE No. 7794, OF AUGUST 20, 2012. Institutes the National Policy on Agroecology and Organic Production. DECREE No. 7,390/2010 ABC PLAN LAW No. 12,805, OF APRIL 29, 2013. Establishes the National Crop-Livestock-Forest Integration Policy. DECREE No. 8,375, OF DECEMBER 11, 2014. Defines the Agricultural Policy for Planted Forests (BRASIL, 2014). DECREE No. 3,420, OF APRIL 20, 2000. Provides for creating the National Forestry Program - PNF.</p>
	<p>National Target 8: By 2020, pollution, including those resulting from excess nutrients, will have been reduced to levels that are not harmful to the functioning of ecosystems and biodiversity.</p>	<p>LAW No. 11,445, OF JANUARY 5, 2007. Establishes national guidelines for basic sanitation. LAW No. 12,305/10. Establishes the National Solid Waste Policy (PNRS) (BRASIL, 2010).</p>
	<p>National Target 9: By 2020, the National Strategy on Invasive Alien Species should be fully implemented, with the participation and commitment of the states and with the formulation of a National Policy, guaranteeing the continued and updated diagnosis of the species and the effectiveness of the Action Plans for Prevention, Containment and Control</p>	<p>DECREE No. 4339, OF AUGUST 22, 2002. Establishes principles and guidelines for implementing the National Biodiversity Policy. ORDINANCE No. 3, OF AUGUST 16, 2018. Establishes the Implementation Plan of the National Strategy for Invasive Exotic Species.</p>
	<p>National Target 10: By 2015, the multiple anthropogenic pressures on coral reefs and other marine and coastal ecosystems impacted by climate change or ocean acidification will have been minimised so that their integrity and functioning are maintained.</p>	<p>LAW No. 7661, OF MAY 16, 1988. Establishes the National Coastal Management Plan (BRASIL, 1988).</p>

Objectives of the NBSAP	National Biodiversity Targets	Policies/Instruments
<p>Strategic Objective C: Improve the status of biodiversity by protecting ecosystems, species and genetic diversity.</p>	<p>National Target 11: By 2020, through systems of conservation units provided for in the SNUC Law and other categories of officially protected areas, such as APPs, legal reserves and indigenous lands with native vegetation, at least 30% of the Amazon, 17% of each of the other terrestrial biomes and 10% of marine and coastal areas, mainly areas of special importance for biodiversity and ecosystem services, ensuring and respecting the demarcation, regularisation and effective and equitable management, aiming to guarantee interconnection, ecological integration and representation in broader land and seascapes</p>	<p>LAW No. 9985, OF JULY 18, 2000. Establishes the National System of Nature Conservation Units and other measures. LAW No. 12,651, OF MAY 25, 2012. Provides for the protection of native vegetation.</p>
	<p>National Target 12: By 2020, the risk of extinction of endangered species will have been significantly reduced, tending to zero, and their conservation situation, especially those undergoing a greater decline, will have been improved.</p>	<p>DECREE No. 4339, OF AUGUST 22, 2002. Establishes principles and guidelines for implementing the National Biodiversity Policy.</p>
	<p>National Target 13: By 2020, the genetic diversity of microorganisms, cultivated plants, bred and domesticated animals and wild varieties, including species of socioeconomic and/or cultural value, will have been maintained, and strategies will have been designed and implemented to minimise the loss of genetic variability.</p>	<p>DECREE No. 4,339, OF AUGUST 22, 2002. National Biodiversity Policy. LAW No. 13,123, OF MAY 20, 2015. Provides for access to genetic heritage.</p>
	<p>National Target 14: By 2020, ecosystems that provide essential services, including services related to water and that contribute to health, livelihoods and well-being, will have been restored and preserved, taking into account the needs of women, peoples and traditional communities, indigenous peoples and local communities, and the poor and vulnerable.</p>	<p>DECREE No. 8.972, OF JANUARY 23, 2017. National Policy for the Recovery of Native Vegetation (BRASIL, 2017). National Plan for the Recovery of Native Vegetation (Planaveg), Interministerial wOrdinance No. 230, of November 14, 2017.</p>
<p>Strategic Objective D: Increase the benefits of biodiversity and ecosystem services for all</p>	<p>National Target 15: By 2020, the resilience of ecosystems and the contribution of biodiversity to carbon stocks will have been increased through conservation and recovery actions, including through the recovery of at least 15% of degraded ecosystems, prioritising biomes, watersheds and more devastated ecoregions, contributing to the mitigation and adaptation to climate change and to combating desertification.</p>	<p>MMA Ordinance No. 370, of December 2, 2015, established the National Strategy for REDD+ in Brazil (ENREDD+).</p>
	<p>Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Derived from Their Use will have entered into force and will be operational in accordance with national legislation</p>	<p>DECREE No. 4339, OF AUGUST 22, 2002. Establishes principles and guidelines for the implementation of the National Biodiversity Policy. LAW No. 13,123, OF MAY 20, 2015. Provides for access to genetic heritage.</p>

Objectives of the NBSAP	National Biodiversity Targets	Policies/Instruments
<p>Strategic Objective E: Increase implementation through participatory planning, knowledge management and capacity building.</p>	<p>National Target 17: By 2014, the national biodiversity strategy will be updated and adopted as a policy instrument with effective, participatory and up-to-date action plans, which should provide for periodic monitoring and evaluations. 1981 Provides for the National Environmental Policy, its purposes and mechanisms for formulating and applying it, and makes other provisions.</p>	<p>DECREE No. 4339, OF AUGUST 22, 2002. Establishes principles and guidelines for the implementation of the National Biodiversity Policy.</p>
	<p>National Target 18: By 2020, traditional knowledge, innovations and practices of indigenous peoples, family farmers and traditional communities relevant to the conservation and sustainable use of biodiversity and the customary use of biological resources will have been respected, according to their uses, customs and traditions, national legislation and relevant international commitments, and fully integrated and reflected in the implementation of the CBD with the full and effective participation of indigenous peoples, family farmers and traditional communities at all relevant levels.</p>	<p>LAW No. 13,123, OF MAY 20, 2015. Provides for access to genetic heritage, protection and access to associated traditional knowledge and benefit sharing.</p>
	<p>National Target 19: By 2020, the scientific bases and technologies necessary for knowledge about biodiversity, its values, functioning and trends and the consequences of its loss will have been expanded and shared, and sustainable use, generation of technology and innovation based on biodiversity will be supported, duly transferred and applied. By 2017, the complete compilation of existing records of fauna, flora and microbiota, aquatic and terrestrial, will be finalised and made available in permanent and freely accessible databases, safeguarding the specificities to identify gaps in knowledge in biomes and groups taxonomic.</p>	<p>DECREE No. 4,339, OF AUGUST 22, 2002. National Biodiversity Policy. LAW No. 6,938, OF AUGUST 31, 1981. Provides for the National Environmental Policy.</p>
	<p>National Target 20: Immediately upon approval of the Brazilian targets, assessments of the need for resources for their implementation will be carried out, followed by the mobilisation and allocation of financial resources to enable, from 2015 onwards, the implementation and monitoring of the Strategic Plan for Biodiversity 2011- 2020, as well as the fulfilment of its goals</p>	<p>DECREE No. 4,339, OF AUGUST 22, 2002. National Biodiversity Policy. LAW No. 6.938, OF AUGUST 31, 1981. Provides for the National Environmental Policy.</p>

Source: Prepared by the author.

At the end of the first stage, we mapped the budgetary aspects of biodiversity. We carried out the second stage by analysing the Multiannual Plans - PPA.

In order to select federal public expenditures, we first carried out an analysis of Multiannual Plans - PPA. In the PPA, we selected programs related to environmental conservation. Subsequently, the budget worksheets were analysed through the SIOP to determine which programs foresaw in the

PPAs were in the budget. We carried out the mapping of programs and budgetary actions related to biodiversity in two rounds:

Round 1 – Selection in the database of the - Integrated Planning and Public Budget System - Siop¹ Of all programs and actions by the executive branch from 2000 to 2019. At this time, we filtered environmental programs;

Round 2 – From the filtered data, considering only programs related to the environment, new filtering was performed at the level of budgetary action. It was necessary due to broad programs that present actions related to the environment and others that are not.

Round 3 – Union of all selected actions to create a single database. We used the OpenRefine software to organise, clean, and help classify the generated database.

Finally, for stage 3 of identifying the institutional aspects of biodiversity conservation financing, the following were considered: a) The legal norms associated with NBSAP; b) The budgetary units and bodies related to the programs and actions identified in the PPAs and the budget. These three steps allowed for characterising the structures of the federal government responsible for implementing these policies (Figure 2).

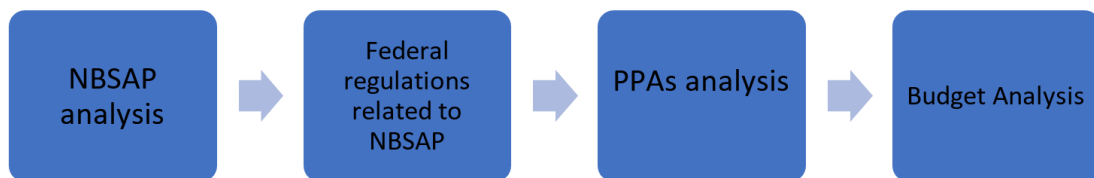


Figure 2 | Diagram of the steps for analysing stage 3 of the PIR.

Source: Elaborated by the author

It is essential to highlight the challenge of working with a database related to public expenditures over more than 20 years. Large databases like this bring challenges to the development of this work. First, as the vast majority are textual data, the classification of these data according to the Biofin definition of spending on biodiversity is still subject to much subjectivity. Thus, it is essential to highlight that it is predictable that there are inaccuracies in the results presented. In addition, there may be divergences regarding understanding specific government programs and actions as being or not directed toward biodiversity conservation. Finally, it is essential to highlight that this research is limited to the scope of the federal government. However, states and municipalities also have roles in biodiversity conservation.

Even so, these data allow an assessment of the institutional aspects responsible for biodiversity conservation in the federal government of Brazil. They serve as a first approximation for understanding the government's conservation efforts and a possible indicator for the correlation with the results observed over that period.

3 RESULTS AND DISCUSSION

3.1 STAGE 1 – ANALYSIS OF THE NATIONAL STRATEGY AND ACTION PLAN FOR BIODIVERSITY – NBSAP

For this stage of the PIR, it was possible to identify at least 21 laws, decrees, and federal ordinances that would be the basis for the execution of actions to achieve the goals established in the NBSAP. These 21 norms present around 195 instruments and guidelines foreseen to execute the National Biodiversity Strategy and Action Plan - NBSAP. The analysis, according to the nature of the type of public policy instrument, showed that around 69% of the analysed instruments and guidelines fit the typologies of direct regulation and social participation. The other 31% could be broadly classified as economic instruments, with 23% classified under the market use typology and only 8% under the market creation typology.

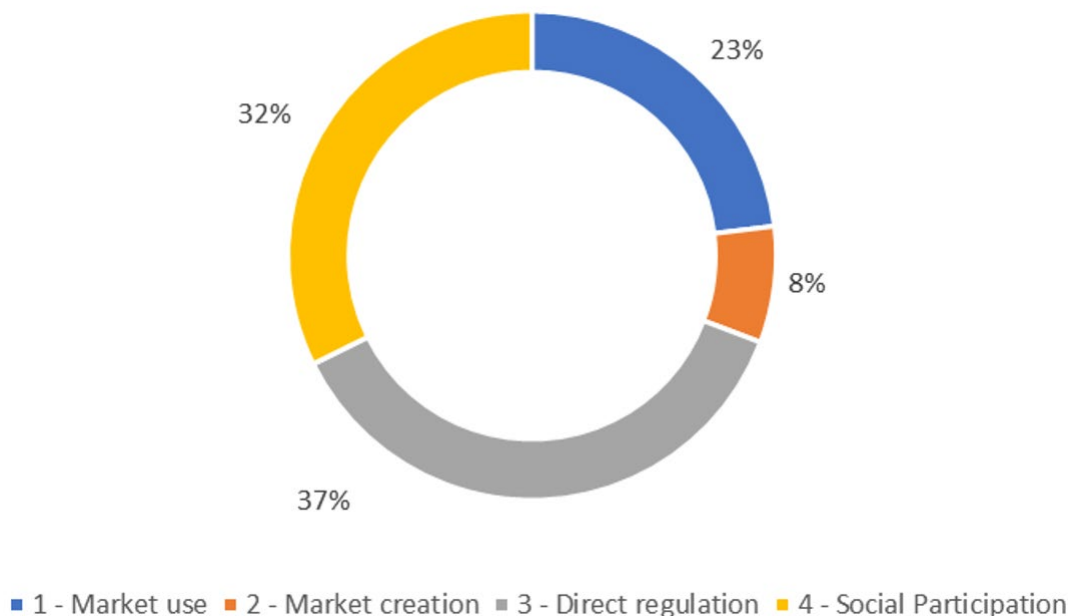


Figure 3 | Distribution of classes of public policy instruments related to NBSAP.

Source: Prepared by the author.

As is known, the typical approach to environmental policy suggested by economic theory has been the adoption of means to internalise externalities in the decision-making process of degrading agents. However, we understand that other market failures may originate from environmental degradation. What is sought, in general, is the most efficient means of correcting degradation. The debate on the most appropriate instruments for this purpose often refers to the option between mechanisms of: a) direct regulation by government authorities; b) economic incentives to induce the action of the degrading agent (ALMEIDA, 1998).

This debate over policy instruments often classified only as “market-based” versus “command and control” is not very enriching. Markets involve prices and quantities, economic sanctions usually support regulations, and economic theory suggests that quantitative instruments such as standards, emission targets, or permits can be efficient in many cases (STERNER; CORIA, 2012). Furthermore, we observed more recently that, in implementing environmental policies, the instruments could

evolve from their original design, depending on the actors and specific contexts in which they are implemented, in a process called institutional crafting crafting (BLACKSTOCK *et al.*, 2021).

Still, some insist that there are only three basic categories of policy instruments, aptly dubbed "carrots, whips, and sermons" to symbolise economic incentives, legal instruments, and informational instruments, respectively (BEMELMANS-VIDEC; RIST; VEDUNG, 2010). Isolated taxonomy is necessarily preferable, but each one can be useful in a different context (STERNER; CORIA, 2012).

Several arguments indicate the preference for economic instruments instead of direct regulation mechanisms. However, the environmental policy, in general, seems like it could be more permeable to these suggestions (ALMEIDA, 1998). This preference is also within the scope of the NBSAP and the federal policies that form the legal framework to support it since, as noted, the instruments of direct regulation are predominant.

Also noteworthy is the large percentage of instruments for public engagement or social participation, within includes many instruments for producing information. Information plays a unique role in policymaking, and indeed provision can be considered an instrument in its own right. Generally, all policy depends on information; that is, policymakers must understand the technology and ecology of the issues under consideration (STERNER; CORIA, 2012).

Despite being criticised, the concentration of direct regulation instruments is the apparent strategy for policymakers aiming to regulate the use of natural resources with a centralised intervention (VYRASTEKOVA; SOEST, 2007).

Considering these aspects, we analysed the general framework of instruments and guidelines related to the NBSAP, arriving at 30 suggested changes. We can divide these changes into four different groups: a) Specify the Economic Instruments already provided for in the standard; b) Transform the nature of the existing instrument so that it becomes an Economic Instrument; c) Link biodiversity conservation criteria to existing financial instruments; d) Creation of new non-existing instruments or guidelines (Table 2).

Table 2 | Example of the instruments and guidelines of the norms related to the NBSAP with some suggestions for modification concerning the nature of the instrument.

<i>Standard</i>	<i>Instruments</i>	<i>Category</i>	<i>New Category</i>	<i>Justification</i>
National Biodiversity Policy	11.2. Second guideline: Conservation of ecosystems in protected areas. Promotion of in situ conservation actions for the biodiversity of ecosystems in conservation units, maintaining ecological and evolutionary processes, the sustainable supply of environmental services, and the integrity of ecosystems.	Direct Regulation	Market Creation	The objective here is clearly to maintain ecosystem services - public good; applying subsidies in the form of PES would make sense.
National Biodiversity Policy	13.3. Third guideline: Recovery of degraded ecosystems and overexploited components of biodiversity. Establishment of instruments that promote the recovery of degraded ecosystems and overexploited components of biodiversity	Direct Regulation	Market Creation	Once again dealing with public goods, progressive IPTU - style taxes could be established for landowners with degraded areas and incentives for the recovery of these areas to the detriment of the opening of new agricultural frontiers

<i>Standard</i>	<i>Instruments</i>	<i>Category</i>	<i>New Category</i>	<i>Justification</i>
Forest Code	II - the transformation of Legal Reserves into green areas in urban expansions	Direct Regulation	Market Usage	With a progressive impact on the reduction of the ITR - IPTU tax, given the greater need for green areas in urban environments
National Policy for Planted Forests	XIV - taxation and fiscal incentives;	Market Usage	Market Usage	Link to environmentally non-damaging conditions
National Policy for Planted Forests	XIX - land credit.	Market Usage	Market Usage	Link to environmentally non-damaging conditions
National Biodiversity Policy	16.4. Fourth guideline: Financing mechanisms. Integration, development, and strengthening of financing mechanisms for biodiversity management.	Market Usage	Market Usage	Specify, including defining what is considered an investment in biodiversity.
National Policy for the Recovery of Native Vegetation	7.2.2 Strategic Initiative: Markets – Fostering markets for ecosystem products and services generated during the recovery process	Market Creation	Market Creation	Specify standards such as estimates of forest carbon capture in areas under restoration in different biomes
National Solid Waste Policy	Create economic instruments that reach producers, trade, and end users, such as SDR and incentives to reduce plastics and use of biodegradable products and with a focus on public authorities by conditioning an increase or reduction in federal transfers to meeting performance indicators compliance with a policy such as closing landfills and taxes on the use of easy-to-dispose products.		Market Creation	Creating a new instrument
Implementation Plan of the National Strategy for Exotic Species	Collection of taxes for import, commercialisation, and creation of species with potential invasive impact		Market Usage	Creating a new instrument

Source: Prepared by the author.

Several factors are related to the predominance of a particular type of instrument. We can cite the nature of the final object of the law, as is the case of the National Environmental Education Policy - Pnea of 1999, which presents a predominance of social participation instruments, also including information instruments. On the other hand, the National Organic Production Policies - Pnapo, the National Agricultural Policy for Planted Forests, and the new Forest Code (National Policy for the Protection of Native Vegetation) present a more significant proportion of instruments for market use and market creation. This is expected given the object to be regulated by the laws, which are more related to productive activities.

It is also possible to note that policies that have a broader approach present a greater balance of different types of instruments, as is the case of the National Policy and Plan for Native Vegetation - Planaveg; National Policy on Climate Change - PNMC; National Strategy for Reducing Emissions from Deforestation and Forest Degradation - ENREDD and the National Environmental Policy itself. Concerning these norms, it is worth mentioning that they deal with more recent issues and that the academic and non-governmental sectors actively participated in their elaboration process.

Other aspects may be related to the historical period in which the policies were elaborated and the aspect of the division of competencies between the spheres of power. These characteristics are because specific policies expected to be complemented by states and municipalities may reserve a predominant regulatory role for the federal government.

Although the federal government plays a predominant regulatory role in some policies or defines general guidelines, some aspects drew attention, as noted in the suggestions for changes. The first aspect is the ambiguity and needs for explicit definition in some instruments, which may delay their realisation, waiting for regulations. The second aspect is the non-observance of criteria, such as reducing administrative costs, with the determination of regulatory instruments that could be substituted, transferring the costs to private agents.

On the other hand, some of the suggestions go in the direction of assuming subsidies as necessary, which could burden the State, and the creation of taxes that do not have good public acceptance. That is, we need a balance by combining a system of fines and monitoring activities that seek optimal levels of conservation, at least in theory.

However, in practice, centralised enforcement may not be very effective in developing countries (which are, after all, the richest in biodiversity). Moral hazard problems play an essential role in those government institutions responsible for conservation that do not always receive adequate incentives to actively prevent the over-exploitation of resources (VYRASTEKOVA; SOEST, 2007).

We must remember that we design policy instruments to achieve political objectives (MUKHERJEE; COBAN; BALI, 2021). That is, we also consider that the choice of types of instruments is related to the guidelines of governments and legislators prevailing in the analysed period.

We recognised that the definition of instruments plays an essential role in determining the overall success of a policy. However, the instrument selection process is not linear, as a logic of effectiveness and adequacy can drive it. The first is based on a relationship between means and objectives, and the latter is based on shared values and ideas of legitimacy (CAPANO; LIPPI, 2017).

However, reconciling these logics takes place in a complex and inherently political environment, in which the definition of instruments and the allocation of efforts for their execution reflect power relations and ideas about the social "value" of different groups (KRAUSE *et al.*, 2019). Therefore, mapping budgetary expenditures complementary to mapping instruments can offer a better understanding of government actions.

3.2 STEP 2 – MAPPING BUDGETARY ASPECTS

The analysis of budgetary actions related to biodiversity between 2000 and 2019 also showed a predominance of command-and-control instruments (57%), while 24% of budgetary actions can be classified as social participation, 17% as market use, and 2% as market creation (Figure 4).

2000 to 2019

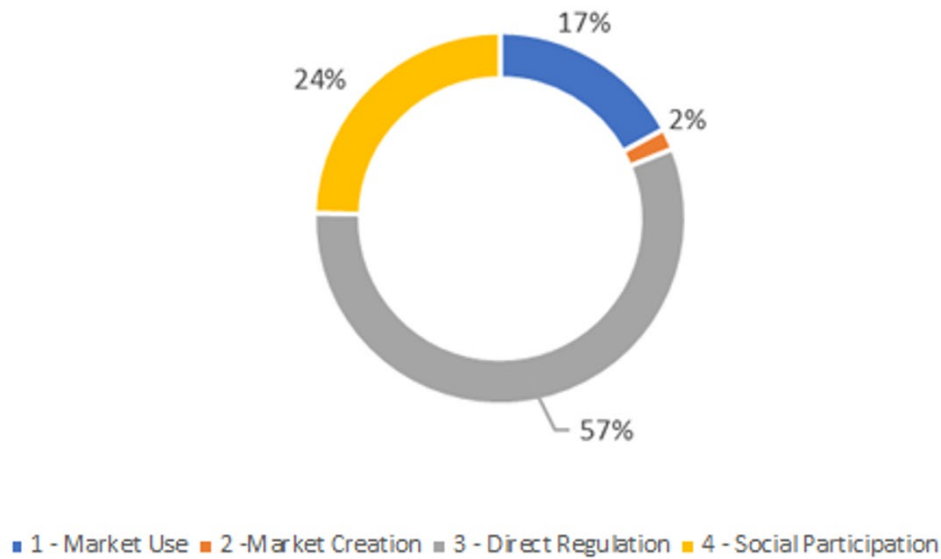


Figure 4 | Classification of budgetary actions according to the nature of the instrument between 2000 and 2019.

Source: Prepared by the author based on data from Siop

We observed that in budgetary actions, regulatory instruments are predominant (57%). This predominance is even greater than in standards related to the NBSAP (37%). These results also underscore the apparent predilection for instruments of this nature in actions carried out by the government.

The disparity between the plan at the policy level and the execution by the government stands out. That is, even presenting broader legislation to regulate the use of natural capital, government actions partially differ from what norms established.

Another possibility is that some of these other strategies have been taken over by other federal entities (states and municipalities) or non-governmental and supranational institutions. The federal budget does not consider those actions.

These aspects show that setting up the government budget is a complex technical and political exercise, which depends on both macroeconomic indicators and political interest disputes. Moreover, as a consequence, the actions foreseen in the budget are expected to keep disparities in relation to the nature of the instruments foreseen in the institutional framework.

The analysis also showed an evolution in the increased participation of economic instruments (especially those for market use) in actions carried out by the federal government related to biodiversity. At the same time, there was a reduction in the percentage of social participation instruments (Table 3).

Table 3 | Number of existing budgetary actions in the multi-year Plans – PPA's from 2000 to 2019 of the federal government related to spending on biodiversity according to the classification of the type of instrument in which they fit.

Number of budget actions related to biodiversity per PPA					
Classification	2000-2003	2004-2007	2008-2011	2012-2015	2016-2019
1 - Market Use	1057	927	677	1338	1323

<i>Number of budget actions related to biodiversity per PPA</i>					
<i>Classification</i>	<i>2000-2003</i>	<i>2004-2007</i>	<i>2008-2011</i>	<i>2012-2015</i>	<i>2016-2019</i>
2 - Market Creation	118	158	62	128	109
3 - Direct regulation	5286	5562	3052	2610	1141
4 - Social Participation	3051	2001	1380	665	551
Total	9512	8648	5171	4741	3124

Source: Prepared by the author based on Siop data.

It is possible to observe that the number of budgetary actions was significantly reduced, which may indicate a greater concentration of resources in fewer activities. However, it also reflects the reduced financial resources available for biodiversity conservation actions. What most calls attention is the considerable reduction in social participation actions, which may reflect the execution of more centralised actions by the government and the reduction of space for society to participate in the governance of biodiversity.

In addition, this reduction in actions aimed at conservation ran together a significant reduction in the participation of the Ministry of the Environment. As of 2019, the number of budget actions earmarked for biodiversity conservation in the MMA became smaller than those earmarked for the same purpose in other federal government agencies (Figure 5). This reduction may be directly related to the restructuring of MMA and its previously highlighted associated areas. This restructuring is worrying since the responsibility for implementing conservation policies went to departments whose primary purpose is to develop productive activities and not conservation. Without adequate environmental funding, legislative and programmatic goals are obstructed, and research shows that fiscal measures reflect states' commitment to environmental protection and the quality of their environmental programs (DUGGAN; CARR; YAN, 2022). That is, this reduction in budgetary actions means a reduction in funding for conservation. In particular, a reduction for those bodies with more direct responsibility for carrying out conservation policies.

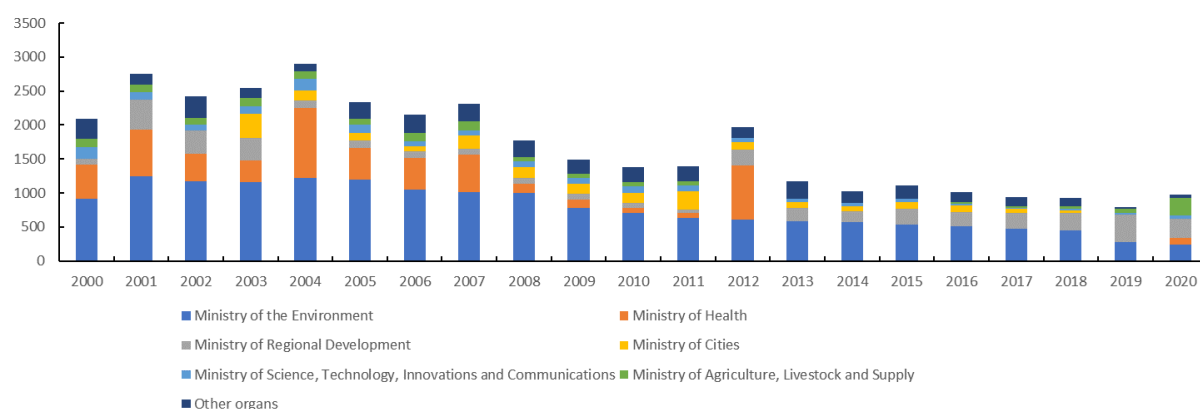


Figure 5 | Number of executed/planned budgetary actions related to biodiversity management in the federal budget by the budgetary agency between 2000 and 2020

Source: Prepared by the author based on Siop data.

Political scientists have studied policy instruments better to understand the links between policymaking and policy implementation and gain insights into public policy decision-making. The evolution of these data over time and from different governments demonstrates that the political process of choosing

public policy instruments is a form of adaptation and search for answers to problems shaped by restrictions and political assumptions existing in its context. Thus, different governments prefer specific instruments based on their state-society relationships (HOWLETT, 1991).

We observed that the influence of the political context for selecting a public policy instrument occurs from the policy formulation process. In this phase, a set of instructions is transmitted from policymakers to implementers explaining the policy's intention, objectives, desired effects, and the means to achieve them (BEMELMANS-VIDEC; RIST; VEDUNG, 2010).

We also observed from the collected data that there is a disparity between the formulators of biodiversity policies and their executors, which can happen due to several factors:

1. In many cases, public policies and the instruments provided are designed as responses to society's demands, not rarely with the participation of various actors, often specialists in the sector. One example is Proveg, conceived due to strong pressure from organised civil society for a regulatory framework for ecological restoration in Brazil.
2. The policy proposal can be modified within the scope of Congress with the addition and removal of instruments that better represent the interests of parliamentarians (e.g.: Forestry Code²);
3. Or, even if the instruments are provided for by law, there may not be their regulation (e.g.: articles 45 and 46 of the Snuc³);
4. In addition, even if the instruments are foreseen and regulated, there may not be the technical capacity to operationalise the instruments, especially in relation to those that need trained personnel also in states and municipalities.

Another possible observation to be made about biodiversity conservation actions carried out by the government during these 20 years is that there was a reduction in direct regulation actions (command and control), on the one hand. Moreover, on the other hand, there was also a reduction in social engagement actions (social participation).

Concerning economic instruments, there was an increase over the years analysed. The increase was most evident for instruments that fall into the market use class. Do these elements raise questions about whether the actions carried out by the government in the analysed period do not lack a basis of information? Furthermore, if the economic instruments used because they are for market use (e.g.: subsidies and support for projects) not burdening the budget too much in a period of scarce resources?

Although the budget data surveyed need a qualitative complement in their analysis to represent reality better, environmental budgets reflect the effort that governments intend to dedicate to environmental protection, and the allocations are indicative of the viability and influence of these efforts. Examining appropriations of general funds can reveal the influence of budget determinants in the context and the general budget process (DUGGAN; CARR; YAN, 2022).

In addition to budgetary aspects, the formulation of state policies is usually explained by variations in the responsiveness of state policies and by the influence of actors, policy subsystems, and institutions involved in the budget process. Within the environmental policy literature, specific influences on state policymaking include environmental and economic conditions, interest groups that make demands on the government, and party preferences (KIM; VERWEIJ, 2016). Thus, in a complementary way, we evaluate the evolution of institutional aspects at the federal level.

3.3 STEP 3 – IDENTIFICATION OF INSTITUTIONAL STRUCTURES

The analysis of norms and budgetary actions related to implementing NBSAP's objectives and targets in Brazil demonstrated that the basic structure of biodiversity management is linked to the Ministry of the Environment – MMA, its affiliates, and associated councils (Figure 6).

Even so, it is essential to point out the linkage between environmental policies whose execution or coordination with the MMA foresee the participation of other federal bodies and entities. One example is the PNMA, which provides for the participation of bodies from specific sectors as executors of its actions. In other cases, such as the Pnea, joint action between the MMA and the Ministry of Education is necessary due to the very nature of the instruments. In other cases, like the National Coastal Management Policy, its highest body is the Interministerial Committee for Sea Resources, chaired by the Brazilian Navy.

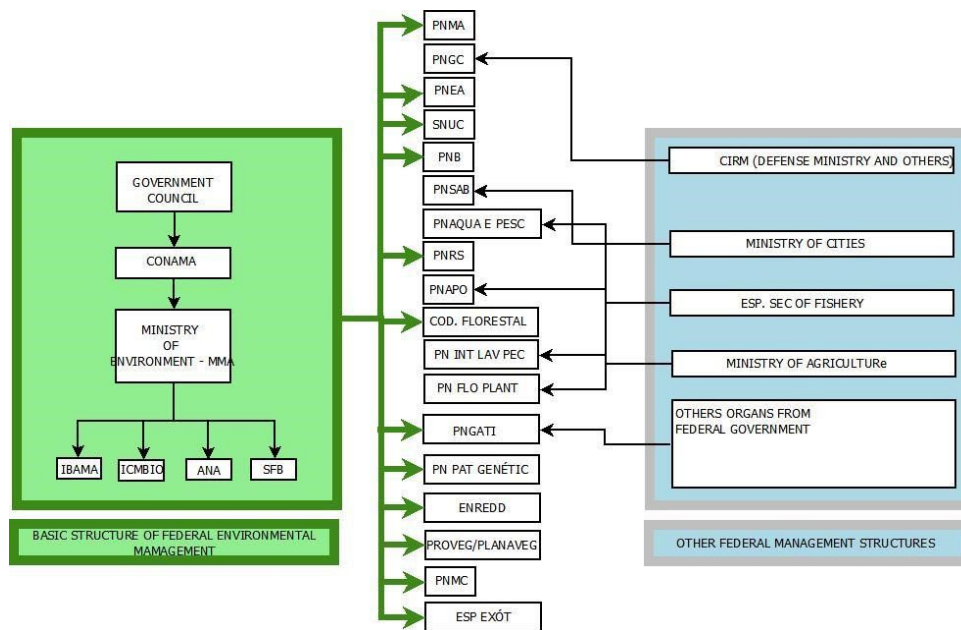


Figure 6 | Institutional structures responsible for executing or coordinating federal policies related to the NBSAP.

Source: Prepared by the author.

Observing this arrangement shows potential trade-offs in the execution of some of the policies related to the NBSAP. An example is the National Basic Sanitation Policy, linked (during most of the analysed period) to the Ministry of Cities, whose actions often promote changes in the natural environment due to the many civil construction works related to its execution. Another of these potential trade-offs is the responsibility for Planted Forest Policies, Integration of Lavoura Pasto Floresta, and Organic Production, which are under the umbrella of the Ministry of Agriculture - Mapa.

In the first case, we drew attention to the need for a well-aligned forestry code under the supervision of the Ministry of the Environment. In the other two cases, there is a potential conflict with the profile⁴ The Ministry is directed more towards conventional agriculture. At the same time, the two policies propose to develop alternative forms of production and, consequently, may need to be addressed in relation to the attention and allocation of resources by the executing agency.

In addition to these examples, several other policies affect or are affected by environmental policies at the federal level in Brazil. However, concerning biodiversity conservation policies, these are more concentrated in the MMA and its affiliates.

It is also important to point out that other structures are part of elaborating norms related to biodiversity conservation, such as the National Council for the Environment – Conama. However, we carried out an analysis restricted to those government structures responsible for implementing the policies, analysed through the actions in the budget.

We need to highlight that the structuring of these bodies took place over time. We portrayed the predominant structure between 2008 and 2018 here. During this period, we can highlight some significant changes, such as the creation of the Chico Mendes Institute for Biodiversity Conservation – ICMBio (Protected Areas Agency), by law nº 11.516, de 28 de August de 2007, to execute actions of the national policy of nature conservation units, among others (BRASIL, 2007), and the Brazilian Forestry Service – SFB, focusing on the management of public forests, created by law nº 11.284, of March 2, 2006 (BRASIL, 2006).

This organisational structure changed over the analysed period. We highlighted here the most recent changes: the departure of the Brazilian Forest Service - SFB and the National Water Agency - ANA from the structure of the Ministry of the Environment through decree 9672/19 (BRASIL, 2019a). In addition, the main biodiversity management body, ICMBio, underwent restructuring, in which six of the 11 regional coordination offices were extinguished, and the heads of Conservation Units were reduced from 204 to 182 through Decree No. 10,234/2020 (BRASIL, 2020a).

The National Biodiversity Commission was also restructuring, excluding indigenous members and social movements from its composition through Decree No. 10,235, of February 11, 2020 (BRASIL, 2020b). These changes reinforce the trend of reduced social participation, a situation also observed in the modification of the National Council for the Environment - Conama, through Decree No. 9,806 of May 28, 2019 (BRASIL, 2019b). This type of restructuring goes against good governance practices since the involvement of citizens and Civil Society Organizations in the elaboration of environmental policies is widely recognised as an essential way to improve the effectiveness and quality of these policies and is a principle of good governance (MAO *et al.*, 2020; VINOGRADOVA, 2022).

These highlighted institutional change events demonstrate that, after a period of relative stability, the institutions responsible for biodiversity conservation at the federal level have undergone significant changes. However, these changes do not indicate increased performance or effectiveness. On the contrary, the changes point to a purposeful disarticulation in managing biodiversity conservation at the federal level in Brazil.

All these institutional modifications reinforce the importance of understanding the situation and changes in the institutional landscape related to biodiversity conservation in Brazil. This portrait of the institutional landscape of the last 20 years allows us to demonstrate that recent changes indicate a commitment to actions for the conservation of biodiversity.

Finally, it is important to highlight that, to understand the institutional framework designed for implementing environmental policies in general and, specifically, biodiversity policies in Brazil, it is crucial to understand the country's federative structure, broken down into its three levels of government.

In this organisation, the Federation Units and municipal governments have the autonomy to establish policies according to their priorities, within their areas of competence, and within the limits set by their territories (IPEA, 2016). This organisation was established by Complementary Law 140 (LC-140), which established the norms for cooperation between the Union, the States, the Federal District, and the Municipalities in administrative actions resulting from the exercise of joint competence related to the protection of remarkable natural landscapes, the protection of the environment, the fight against pollution in any form, and the preservation of forests, fauna, and flora (ANTUNES, 2015).

Understanding this decentralisation aspect is important, as political, fiscal, and administrative decentralisation differs in their impacts on environmental policy performance. High environmental policy performance occurs more often when a country is fiscally and administratively decentralised, and its context is favourable, i.e., advanced economy, good governance, and strict environmental regulations (MAO, 2018).

It is essential to highlight this, as the institutional organisation at the federal level took place at times from the extinction and merger of some bodies (as in the creation of Ibama – Brazilian Federal Environmental Agency), at times from the dismemberment of others (as in the case of ICMBio - Federal environmental agency responsible for Protected Areas, which emerged from a division of Ibama). New bodies were also created to fill gaps yet to be met by existing institutions, such as the National Water Agency - ANA, created to implement the instruments of the National Water Resources Policy and act in the National Sanitation Policy. These structuring movements, sometimes conflicting, always demanded a new accommodation for the newly created functions and the development work (hiring and training of personnel, physical structure, equipment logistics, among others) that continues until today (IPEA, 2016).

In this way, we can understand that the most recent dismantling of the budgetary and institutional structures responsible for biodiversity conservation was not balanced with an increase in the responsibilities of the other federative entities in Brazil. Moreover, the institutional landscape shown here demonstrates a recent loss of capacity to promote biodiversity conservation at the federal level in Brazil.

4 CONCLUSIONS

Considering, on the one hand, the growing crisis of biodiversity loss on the planet and, on the other hand, the increasing need to seek efficiency in government actions, this work stands out for the scope of data collected on government action related explicitly to biodiversity in federal level in Brazil.

The main result of this study demonstrates the mismatch between the objectives and instruments for the conservation of biodiversity foreseen in the laws and the government actions carried out in the federal budget. These results demonstrate that the actions carried out by the federal government over these 20 years are partially disconnected from the guidelines provided for facing the loss of biodiversity.

The results demonstrate how complex the biodiversity management structure is in Brazil. Even considering only the federal government level, the study demonstrates how, over the 20 years analysed, significant changes in management arrangements can hinder the lasting implementation of conservation actions.

These changes have been especially noticeable in recent years. Changes in budgetary, regulatory, and institutional aspects were deliberately adopted. The changes were contrary to what is known in the literature and empirical knowledge that promote the effectiveness of biodiversity conservation instruments.

Other results of this study seem to demonstrate a lack of theoretical foundation in elaborating guidelines and instruments for the conservation of biodiversity, both in the norms and in the budgetary actions analysed.

In the analysed data, it was still possible to observe a progressive reduction of budgetary actions, which may indicate a reduction in the allocation of resources for conservation in the last 20 years.

The reduction of the Ministry of the Environment's participation in biodiversity conservation actions stands out.

These elements point to a scenario of reduced prioritisation of biodiversity conservation at the federal level in Brazil. However, it is important to emphasise the subjective character of the analyses carried out in this work since it deals with the qualitative analysis of textual documents and a large volume of data, for which there is not necessarily a guideline for analysis.

Therefore, it is necessary to deepen the theme in future research concerning the analysis of the legal framework and the administrative structures and budgetary actions. In addition, it is necessary to cross-check the data and analyses carried out in this work with data from the impact assessment of related public policies.

Despite the shortcomings of this work, the results show a first contribution to the necessary detailing of government actions, especially in the environmental area. This contribution is particularly significant for developing the policy and institutional review (PIR) approach envisaged in the Biofin initiative.

This is important because, although well-established guidelines exist, the PIR must present methodological details to follow. Thus, this work contributes with a first proposal detailing the execution of a review of this nature. In this way, a milestone is established for future research, mainly at the state and municipal levels. The development of future research with the elaboration of PIRs at different federal levels can contribute to a better definition of divisions of responsibility and greater effectiveness of conservation policies.

Data collection on how governments act in the face of the biodiversity loss crisis is essential for social control in favour of effective changes for better management of natural capital.

NOTES

1| The Siop can be accessed at: https://www1.siop.planejamento.gov.br/QvAJAXZfc/opendoc.htm?document=IAS%2FExecucaO_Orcamentaria.qvw&host=QVS%40pqlk04&anonymous=true

2| Law No. 12,651, of May 25, 2012, which provides for the protection of native vegetation, known generically as the New Forest Code, replaced the previous law of 1965, and was the target of a major clash in the national Congress, being approved with a large number of vetoes, and with important criticism from civil society and the academic sector, in relation to points considered as environmental setbacks, and approved in Congress by the interest of parliamentarians

3| Articles 45 and 46 of the Law creating the National System of Conservation Units deal with the possibility of payment for environmental services in federally protected areas. However, to date, they have yet to be regulated, generating legal uncertainty and difficulties in implementing such mechanisms.

4| of the Mapa. During most of the period analyzed in this work, Mapa was responsible for conventional agriculture, while the Ministry of Agrarian Development was responsible for developing family agriculture.

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Revisão política e institucional para o financiamento da biodiversidade no Brasil: uma abordagem Biofin para o governo federal

Political and institutional review for biodiversity financing in Brazil: a Biofin approach for the federal government

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ARTICLE- DOSSIER

RESUMO

As instituições e suas diferentes configurações de gestão e governança estão cada dia mais relacionadas com as alterações ambientais vivenciadas no planeta. Por isso, o objetivo deste estudo é realizar uma revisão política e institucional relativa à biodiversidade no âmbito do governo federal do Brasil. Para tanto utilizamos a Revisão Política e Institucional – PIR (*Political and Institutional Review*) como abordagem para avaliar os pontos fortes e fracos de políticas e instituições relacionadas à biodiversidade, como parte da metodologia Biofin. O estudo levantou os principais elementos da paisagem normativa e institucional que direcionaram as ações de conservação da biodiversidade em nível federal entre os anos de 2000 e 2019. Os resultados demonstraram que nesse período havia ao menos 21 normas e cerca de 195 instrumentos previstos na legislação federal para atender à Estratégia e Plano de Ações Nacionais para a Biodiversidade – EPANB. Porém, a maior parte das ações orçamentárias realizadas pelos órgãos de gestão das políticas de biodiversidade em nível federal distorcem as diretrizes previstas nessas normas elencadas. Juntamente com a observada redução da alocação orçamentária para o Ministério do Meio Ambiente e para ações de biodiversidade em outros ministérios. Esses elementos parecem apontar para um quadro de redução da priorização para o tema da conservação da biodiversidade em nível federal no Brasil ao longo dos 20 anos analisados.

Palavras-chave: Biofin. EPANB. Legislação Ambiental.

ABSTRACT

Institutions and their different management and governance configurations are increasingly related to the environmental changes experienced on the planet. Therefore, this study aims to carry out a political and institutional review related to biodiversity within the Brazilian federal government. To do so, we use the Political and Institutional Review – PIR to assess the strengths and weaknesses of policies and institutions related to biodiversity as part of the Biofin methodology. The study raised the main elements of the normative and institutional landscape that guided biodiversity conservation actions at the federal

level between 2000 and 2019. The results showed that in this period, there were at least 21 norms and about 195 instruments provided in federal legislation to meet the National Biodiversity Strategy and Action Plan – NBSAP. However, most of the budgetary actions carried out by the management bodies of biodiversity policies at the federal level distort the guidelines in these listed norms, along with the observed reduction in budget allocation for the Ministry of the Environment and biodiversity actions in other ministries. These elements seem to point to a picture of reduced prioritization for the topic of biodiversity conservation at the federal level in Brazil over the 20 years analyzed.

Keywords: Biofin. NBSAP. Environmental Legislation.

1 INTRODUÇÃO

A análise institucional tem ganhado destaque no estudo dos problemas ambientais (ROGGERO; BISARO; VILLAMAYOR-TOMAS, 2018). As sociedades humanas interagem com o meio ambiente por meio de instituições que são artefatos da história social e política. As variações dessas interações ao longo do tempo afetam o desempenho institucional com implicações na quantidade e qualidade dos recursos ambientais disponíveis e, conseqüentemente, no bem-estar social (VEEMAN; POLITYLO, 2003).

Essas instituições são os sistemas de decisão social que fornecem regras para o uso de recursos e para a distribuição de fluxos de benefícios resultantes (CIRIACY-WANTRUP, 1968). Dito de outra forma, as instituições também são consideradas como sendo as regras do jogo na nossa sociedade (NORTH, 1990). Por isso, é preciso considerar, na análise econômica das questões ambientais, as preferências dos indivíduos moldadas por essas instituições, ou seja, as escolhas e estratégias que afetam as várias dimensões sociais são indiretamente restringidas por tais instituições (TISDELL, 2005). Isso também se aplica às estratégias de conservação da biodiversidade, uma vez que o desenho de políticas que efetivamente implementem as disposições da Convenção sobre Biodiversidade (CDB) requer: 1 – uma compreensão clara da economia institucional da biodiversidade; e 2 – conhecimento sobre a pesquisa e desenvolvimento dos processos relativos ao seu uso, conservação e repartição de benefícios (POLSKI, 2005).

Dentro desse escopo, surgiram dois focos importantes de pesquisas sobre instituições que governam o uso e a conservação da biodiversidade. O primeiro, a partir do fato de que a governança da biodiversidade envolve uma ampla gama de instituições que restringem e motivam as interações entre os sistemas humano e ecológico em diversas escalas: de um gene a ecossistemas inteiros. O segundo foco se desenvolveu a partir do fato de que essas instituições frequentemente compreendem várias estruturas de governança diferentes, como mecanismos baseados em incentivos e relações recíprocas que regulam diferentes aspectos da interface humano-ecossistema (PADMANABHAN; JUNGCURT, 2012).

Isso é importante porque é cada dia mais evidente que as instituições e seus sistemas de governança são causas indiretas das alterações ambientais que, por seu poder de influência nas relações do homem com o meio natural, são consideradas alavancas fundamentais para a tomada de decisões. Elas estabelecem, em vários graus, o acesso e o controle, a alocação e a distribuição de componentes da natureza e ativos antropogênicos e seus benefícios para as pessoas (JOLY *et al.*, 2019)

Nesse sentido, muitos governos hoje em dia implementam políticas especificamente voltadas à conservação da biodiversidade, o que sugere que há algum nível de preocupação com essa agenda (VYRASTEKOVA; SOEST, 2007). Não sendo necessariamente essas políticas e preocupações suficientes ou eficientes, mesmo em países desenvolvidos.

A Revisão Política e Institucional – PIR (*Political and Institutional Review*) é uma abordagem usada para avaliar os pontos fortes e fracos de políticas e instituições em um determinado setor. Ela se

concentra na adequação das políticas existentes, identificando lacunas, traduzindo políticas em prática e examinando a funcionalidade das estruturas institucionais existentes (UNDP, 2018). As PIRs são efetivamente análises de sistemas e foram aplicadas em muitos setores diferentes. Buscam entender melhor a complexidade dos fatores causadores da perda de biodiversidade e sua conexão com os fluxos financeiros. Como a natureza interage com tantos setores econômicos, deve-se analisar um conjunto diversificado de fatores para entender e influenciar a atual trajetória de desenvolvimento, a fim de melhorar seus resultados para a biodiversidade (UNDP, 2016).

A PIR analisa a relação entre o estado de natureza e a estrutura fiscal, econômica, jurídica, política e institucional de um país para identificar: 1) Uma melhor compreensão de como o gerenciamento da biodiversidade e dos serviços ecossistêmicos apoia as metas e visões nacionais de desenvolvimento sustentável; 2) Uma compreensão das principais políticas e fatores institucionais da mudança da biodiversidade; 3) Um catálogo do financiamento da biodiversidade existente, enumerando e analisando seus mecanismos, incentivos, subsídios e outros instrumentos, incluindo fontes de receita da biodiversidade (UNDP, 2018).

De maneira mais específica, a revisão institucional examina as ligações entre três dimensões: 1) a das políticas; 2) a das estruturas institucionais por meio das quais as políticas são canalizadas; 3) a dos processos de alocação de recursos pelos quais o financiamento público é disponibilizado para a implementação de projetos, programas e políticas relevantes (DENDURA; LE, 2015).

Ainda que exista um grande campo de estudos relacionados à legislação ambiental, nem sempre há uma ligação entre as normas avaliadas e sua relação com as ações efetivas dos governos. Os fatores contextuais e institucionais pertinentes que determinam as respostas do Estado permanecem pouco estudados (DUGGAN; CARR; YAN, 2022).

A análise das questões institucionais relacionadas às mudanças climáticas está ganhando espaço na literatura econômica e ambiental (ROGGERO; BISARO; VILLAMAYOR-TOMAS, 2018). Porém, a análise de questões institucionais relativas à conservação da biodiversidade e não destinadas à gestão ambiental de maneira genérica ainda é escassa. Por isso se faz necessário evidenciar o papel atual dos aspectos normativos e institucionais na conservação da biodiversidade e dos ecossistemas brasileiros. Para tanto o que se busca neste artigo é avaliar se o arranjo normativo e institucional em nível federal sofreu modificações que possam ter contribuído para a redução da efetividade das políticas de conservação da biodiversidade no Brasil.

Assim, o presente estudo realiza uma revisão política e institucional relativa à biodiversidade no âmbito do governo federal do Brasil, destacando os principais elementos da paisagem normativa e institucional que direcionaram as ações de conservação da biodiversidade em nível federal entre os anos de 2000 e 2019.

2 MÉTODOS

Para a elaboração deste estudo, utilizou-se o arcabouço de execução da PIR. O recorte estabelecido para a avaliação foi o nível federal de governo no Brasil. O levantamento de informações seguiu três etapas (Figura 1) sugeridas no manual Biofin (UNDP, 2016):

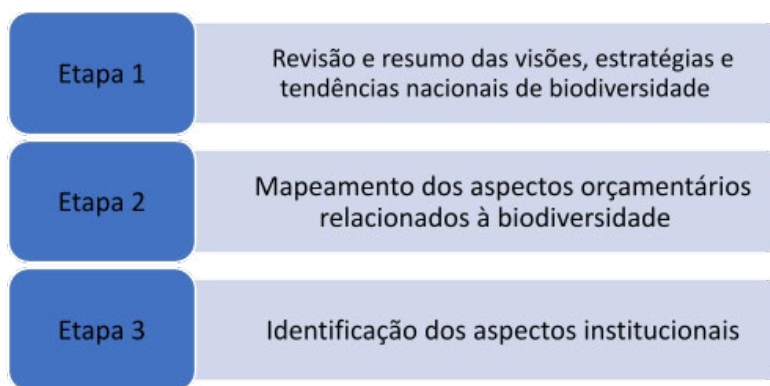


Figura 1 | Etapas de execução da Revisão Institucional e das Políticas para o Financiamento da Biodiversidade (PIR) no governo federal do Brasil

Fonte: Elaborado pelo autor com base em (UNDP, 2016).

Para identificar esses três conjuntos de elementos objetivos de uma PIR, foram revisados os principais documentos de políticas e estratégias nacionais para identificar como se entende a biodiversidade como parte fundamental do desenvolvimento sustentável. No caso do Brasil, que possui uma Estratégia e Plano de Ação Nacionais para Biodiversidade – EPANB (NBSAP – sigla em inglês) referendada legalmente, partiu-se desta como base das análises, como recomenda a metodologia Biofin (UNDP, 2018).

A EPANB é o documento que reúne as propostas de contribuição brasileira para acordos internacionais de conservação. A EPANB manifesta o compromisso do governo brasileiro, enquanto signatário da Convenção sobre Diversidade Biológica (CDB), em desenvolver e adotar instrumentos políticos em nível nacional para a conservação da biodiversidade que sejam efetivos, participativos e atualizados (BRASIL, 2017a).

Dessa forma, foram listadas 21 leis, normas e regulamentos responsáveis em nível federal por atender os objetivos e metas estabelecidos pela EPANB. Foi possível mapear os principais instrumentos normativos responsáveis por implementar as 20 metas estabelecidas, relacionadas com os cinco objetivos estratégicos (Quadro 1). A identificação dessas normas foi feita de maneira não exaustiva, elencando-se em especial aquelas relacionadas à criação de políticas que atendessem aos objetivos da EPANB.

Para cada uma das normas listadas foram analisados todos os seus instrumentos e ou diretrizes de ação. Por fim, os instrumentos e diretrizes foram classificados em quatro categorias: uso de mercados, criação de mercados, regulamentação ambiental e participação social (WORLD BANK, 1997).

Quadro 1 | Relação dos objetivos estratégicos e metas da EPANB com os principais instrumentos legais responsáveis por sua execução em nível federal

<i>Objetivos da EPANB</i>	<i>Metas Nacionais de Biodiversidade</i>	<i>Políticas/Instrumentos</i>
Objetivo Estratégico A – Tratar das causas fundamentais de perda de biodiversidade fazendo com que preocupações com esta permeiem governo e sociedade	Meta Nacional 1: Até 2020, no mais tardar, a população brasileira terá conhecimento dos valores da biodiversidade e das medidas que poderá tomar para conservá-la e utilizá-la de forma sustentável.	Política Nacional de Educação Ambiental. LEI N. 9.795, DE 27 DE ABRIL DE 1999 (BRASIL, 1999). LEI Nº 6.938, DE 31 DE AGOSTO DE 1981. Dispõe sobre a Política Nacional do Meio Ambiente (BRASIL, 1981).
	Meta Nacional 2: Até 2020, no mais tardar, os valores da biodiversidade, geodiversidade e sociodiversidade serão integrados em estratégias nacionais e locais de desenvolvimento, erradicação da pobreza e redução da desigualdade, sendo incorporados em contas nacionais, conforme o caso, e em procedimentos de planejamento e sistemas de relatoria.	DECRETO Nº 4.339, DE 22 DE AGOSTO DE 2002. Institui princípios e diretrizes para a implementação da Política Nacional da Biodiversidade (BRASIL, 2002). LEI Nº 6.938, DE 31 DE AGOSTO DE 1981. Dispõe sobre a Política Nacional do Meio Ambiente (BRASIL, 1981).
	Meta Nacional 3: Até 2020, no mais tardar, incentivos que possam afetar a biodiversidade, inclusive os chamados subsídios perversos, terão sido reduzidos ou reformados, visando minimizar os impactos negativos. Incentivos positivos para a conservação e uso sustentável de biodiversidade terão sido elaborados e aplicados, de forma consistente e em conformidade com a CDB, levando em conta as condições socioeconômicas nacionais e regionais.	DECRETO Nº 4.339, DE 22 DE AGOSTO DE 2002. Institui princípios e diretrizes para a implementação da Política Nacional da Biodiversidade (BRASIL, 2002). LEI Nº 6.938, DE 31 DE AGOSTO DE 1981. Dispõe sobre a Política Nacional do Meio Ambiente, seus fins e mecanismos de formulação e aplicação, e dá outras providências (BRASIL, 1981).
	Meta Nacional 4: Até 2020, no mais tardar, governos, setor privado e grupos de interesse em todos os níveis terão adotado medidas ou implementado planos de produção e consumo sustentáveis para mitigar ou evitar os impactos negativos da utilização de recursos naturais.	DECRETO Nº 7.794, DE 20 DE AGOSTO DE 2012. Institui a Política Nacional de Agroecologia e Produção Orgânica (BRASIL, 2012a).

Objetivos da EPANB	Metas Nacionais de Biodiversidade	Políticas/Instrumentos
Objetivo Estratégico B – Reduzir as pressões diretas sobre a biodiversidade e promover o uso sustentável	<p>Meta Nacional 5: Até 2020 a taxa de perda de ambientes nativos será reduzida em pelo menos 50% (em relação às taxas de 2009) e, na medida do possível, levada a perto de zero, e a degradação e fragmentação terão sido reduzidas significativamente em todos os biomas.</p>	<p>LEI Nº 12.651, DE 25 DE MAIO DE 2012. Dispõe sobre a proteção da vegetação nativa (BRASIL, 2012b). LEI Nº 6.938, DE 31 DE AGOSTO DE 1981. Dispõe sobre a Política Nacional do Meio Ambiente, seus fins e mecanismos de formulação e aplicação, e dá outras providências (BRASIL, 1981).</p>
	<p>Meta Nacional 6: Até 2020, o manejo e captura de quaisquer estoques de organismos aquáticos serão sustentáveis, legais e feitos com aplicação de abordagens ecossistêmicas, de modo a evitar a sobre-exploração, colocar em prática planos e medidas de recuperação para espécies exauridas, fazer com que a pesca não tenha impactos adversos significativos sobre espécies ameaçadas e ecossistemas vulneráveis, e que os impactos da pesca sobre estoques, espécies e ecossistemas permaneçam dentro de limites ecológicos seguros, quando estabelecidos cientificamente.</p>	<p>LEI Nº 11.959, DE 29 DE JUNHO DE 2009. Dispõe sobre a Política Nacional de Desenvolvimento Sustentável da Aquicultura e da Pesca (BRASIL, 2009). LEI Nº 6.938, DE 31 DE AGOSTO DE 1981. Dispõe sobre a Política Nacional do Meio Ambiente (BRASIL, 1981).</p>
	<p>Meta Nacional 7: Até 2020, estará disseminada e fomentada a incorporação de práticas de manejo sustentáveis na agricultura, pecuária, aquicultura, silvicultura, extrativismo, manejo florestal e da fauna, assegurando a conservação da biodiversidade.</p>	<p>DECRETO Nº 7.794, DE 20 DE AGOSTO DE 2012. Institui a Política Nacional de Agroecologia e Produção Orgânica (BRASIL, 2012a). DECRETO Nº 7.390/2010. PLANO ABC. LEI Nº 12.805, DE 29 DE ABRIL DE 2013. Institui a Política Nacional de Integração Lavoura-Pecuária-Floresta (BRASIL, 2013). DECRETO Nº 8.375, DE 11 DE DEZEMBRO DE 2014. Define a Política Agrícola para Florestas Plantadas (BRASIL, 2014). DECRETO Nº 3.420, DE 20 DE ABRIL DE 2000. Dispõe sobre a criação do Programa Nacional de Florestas – PNF (BRASIL, 2000a).</p>
	<p>Meta Nacional 8: Até 2020, a poluição, inclusive resultante de excesso de nutrientes, terá sido reduzida a níveis não prejudiciais ao funcionamento de ecossistemas e da biodiversidade.</p>	<p>LEI Nº 11.445, DE 5 DE JANEIRO DE 2007. Estabelece diretrizes nacionais para o saneamento básico. LEI Nº 12.305/10, que institui a Política Nacional de Resíduos Sólidos – PNRS (BRASIL, 2010).</p>
	<p>Meta Nacional 9: Até 2020, a Estratégia Nacional sobre Espécies Exóticas Invasoras deverá estar totalmente implementada, com participação e comprometimento dos estados e com a formulação de uma Política Nacional, garantindo o diagnóstico continuado e atualizado das espécies e a efetividade dos Planos de Ação de Prevenção, Contenção e Controle.</p>	<p>DECRETO Nº 4.339, DE 22 DE AGOSTO DE 2002. Institui princípios e diretrizes para a implementação da Política Nacional da Biodiversidade. PORTARIA Nº 3, DE 16 DE AGOSTO DE 2018. Institui o Plano de Implementação da Estratégia Nacional para Espécies Exóticas Invasoras (BRASIL, 2018).</p>
	<p>Meta Nacional 10: Até 2015, as múltiplas pressões antropogênicas sobre recifes de coral e demais ecossistemas marinhos e costeiros impactados por mudanças de clima ou acidificação oceânica terão sido minimizadas para que sua integridade e funcionamento sejam mantidos.</p>	<p>LEI Nº 7.661, DE 16 DE MAIO DE 1988. Institui o Plano Nacional de Gerenciamento Costeiro (BRASIL, 1988).</p>

Objetivos da EPANB	Metas Nacionais de Biodiversidade	Políticas/Instrumentos
<p>Objetivo Estratégico C: Melhorar a situação da biodiversidade protegendo ecossistemas, espécies e diversidade genética.</p>	<p>Meta Nacional 11: Até 2020, serão conservadas, por meio de sistemas de unidades de conservação previstas na Lei do Snuc e outras categorias de áreas oficialmente protegidas, como APPs, reservas legais e terras indígenas com vegetação nativa, pelo menos 30% da Amazônia, 17% de cada um dos demais biomas terrestres e 10% de áreas marinhas e costeiras, principalmente áreas de especial importância para biodiversidade e serviços ecossistêmicos, assegurada e respeitada a demarcação, regularização e a gestão efetiva e equitativa, visando garantir a interligação, integração e representação ecológica em paisagens terrestres e marinhas mais amplas.</p>	<p>LEI No 9.985, DE 18 DE JULHO DE 2000. Institui o Sistema Nacional de Unidades de Conservação da Natureza e dá outras providências (BRASIL, 2000b). LEI Nº 12.651, DE 25 DE MAIO DE 2012. Dispõe sobre a proteção da vegetação nativa.</p>
	<p>Meta Nacional 12: Até 2020, o risco de extinção de espécies ameaçadas terá sido reduzido significativamente, tendendo a zero, e sua situação de conservação, em especial daquelas sofrendo maior declínio, terá sido melhorada.</p>	<p>DECRETO Nº 4.339, DE 22 DE AGOSTO DE 2002. Institui princípios e diretrizes para a implementação da Política Nacional da Biodiversidade.</p>
	<p>Meta Nacional 13: Até 2020, a diversidade genética de microrganismos, de plantas cultivadas, de animais criados e domesticados e de variedades silvestres, inclusive de espécies de valor socioeconômico e/ou cultural, terá sido mantida e estratégias terão sido elaboradas e implementadas para minimizar a perda de variabilidade genética.</p>	<p>DECRETO Nº 4.339, DE 22 DE AGOSTO DE 2002. Política Nacional da Biodiversidade. LEI Nº 13.123, DE 20 DE MAIO DE 2015. Dispõe sobre o acesso ao patrimônio genético.</p>
	<p>Meta Nacional 14: Até 2020, ecossistemas provedores de serviços essenciais, inclusive serviços relativos à água e que contribuem para a saúde, meios de vida e bem-estar, terão sido restaurados e preservados, levando em conta as necessidades das mulheres, povos e comunidades tradicionais, povos indígenas e comunidades locais, e de pobres e vulneráveis.</p>	<p>DECRETO Nº 8.972, DE 23 DE JANEIRO DE 2017. Política Nacional para Recuperação da Vegetação Nativa (BRASIL, 2017). Plano Nacional de Recuperação da Vegetação Nativa (Planaveg), Portaria Interministerial nº 230, de 14 de novembro de 2017.</p>
<p>Objetivo Estratégico D: Aumentar os benefícios da biodiversidade e serviços ecossistêmicos para todos</p>	<p>Meta Nacional 15: Até 2020, a resiliência de ecossistemas e a contribuição da biodiversidade para estoques de carbono terão sido aumentadas através de ações de conservação e recuperação, inclusive por meio da recuperação de pelo menos 15% dos ecossistemas degradados, priorizando biomas, bacias hidrográficas e ecorregiões mais devastados, contribuindo para mitigação e adaptação à mudança climática e para o combate à desertificação.</p>	<p>Portaria MMA nº 370, de 2 de dezembro de 2015, estabeleceu a Estratégia Nacional para REDD+ do Brasil (ENREDD+).</p>
	<p>Meta Nacional 16: Até 2015, o Protocolo de Nagoya sobre Acesso a Recursos Genéticos e a Repartição Justa e Equitativa dos Benefícios Derivados de sua Utilização terá entrado em vigor e estará operacionalizado, em conformidade com a legislação nacional.</p>	<p>DECRETO Nº 4.339, DE 22 DE AGOSTO DE 2002. Institui princípios e diretrizes para a implementação da Política Nacional da Biodiversidade. LEI Nº 13.123, DE 20 DE MAIO DE 2015. Dispõe sobre o acesso ao patrimônio genético.</p>

Objetivos da EPANB	Metas Nacionais de Biodiversidade	Políticas/Instrumentos
Objetivo Estratégico E: Aumentar a implementação por meio de planejamento participativo, gestão de conhecimento e capacitação.	<p>Meta Nacional 17: Até 2014, a estratégia nacional de biodiversidade será atualizada e adotada como instrumento de política, com planos de ação efetivos, participativos e atualizados, que deverão prever monitoramento e avaliações periódicas. LEI Nº 6.938, DE 31 DE AGOSTO DE 1981. Dispõe sobre a Política Nacional do Meio Ambiente, seus fins e mecanismos de formulação e aplicação, e dá outras providências.</p>	<p>DECRETO Nº 4.339, DE 22 DE AGOSTO DE 2002. Institui princípios e diretrizes para a implementação da Política Nacional da Biodiversidade.</p>
	<p>Meta Nacional 18: Até 2020, os conhecimentos tradicionais, inovações e práticas de povos indígenas, agricultores familiares e comunidades tradicionais relevantes à conservação e uso sustentável da biodiversidade, e a utilização consuetudinária de recursos biológicos terão sido respeitados, de acordo com seus usos, costumes e tradições, com a legislação nacional e os compromissos internacionais relevantes, e plenamente integrados e refletidos na implementação da CDB com a participação plena e efetiva de povos indígenas, agricultores familiares e comunidades tradicionais em todos os níveis relevantes.</p>	<p>LEI Nº 13.123, DE 20 DE MAIO DE 2015. Dispõe sobre o acesso ao patrimônio genético, sobre a proteção e o acesso ao conhecimento tradicional associado e sobre a repartição de benefícios.</p>
	<p>Meta Nacional 19: Até 2020 as bases científicas e as tecnologias necessárias para o conhecimento sobre a biodiversidade, seus valores, funcionamento e tendências e sobre as consequências de sua perda terão sido ampliadas e compartilhadas, e o uso sustentável, a geração de tecnologia e inovação a partir da biodiversidade estarão apoiados, devidamente transferidos e aplicados. Até 2017 a compilação completa dos registros já existentes da fauna, flora e microbiota, aquáticas e terrestres, estará finalizada e disponibilizada em bases de dados permanentes e de livre acesso, resguardadas as especificidades, com vistas à identificação das lacunas do conhecimento nos biomas e grupos taxonômicos.</p>	<p>DECRETO Nº 4.339, DE 22 DE AGOSTO DE 2002. Política Nacional da Biodiversidade. LEI Nº 6.938, DE 31 DE AGOSTO DE 1981. Dispõe sobre a Política Nacional do Meio Ambiente.</p>
	<p>Meta Nacional 20: Imediatamente à aprovação das metas brasileiras, serão realizadas avaliações da necessidade de recursos para sua implementação, seguidas de mobilização e alocação dos recursos financeiros para viabilizar, a partir de 2015, a implementação, o monitoramento do Plano Estratégico da Biodiversidade 2011-2020, bem como o cumprimento de suas metas.</p>	<p>DECRETO Nº 4.339, DE 22 DE AGOSTO DE 2002. Política Nacional da Biodiversidade. LEI Nº 6.938, DE 31 DE AGOSTO DE 1981. Dispõe sobre a Política Nacional do Meio Ambiente.</p>

Fonte: Elaboração própria.

Ao fim da primeira etapa, realizamos o mapeamento dos aspectos orçamentários da biodiversidade. Essa segunda etapa foi realizada primeiramente a partir da análise dos Planos Plurianuais – PPAs.

Para selecionar os gastos públicos federais, primeiramente realizamos uma análise dos Planos Plurianuais – PPAs. Nestes, foram selecionados os programas relacionados à conservação ambiental. Posteriormente, foram analisadas as planilhas do orçamento através do Siop para averiguar quais

programas previstos nos PPAs estavam presentes no orçamento. O mapeamento dos programas e ações orçamentárias relacionados à biodiversidade foi feito em duas rodadas:

Rodada 1 – Seleção no banco de dados do Sistema Integrado de Planejamento e Orçamento Público – Siop¹ de todos os programas e ações por órgão do Poder Executivo para os anos de 2000 a 2019. Neste momento foram filtrados os programas com alguma relação com a gestão ambiental;

Rodada 2 – A partir dos dados filtrados, considerando só programas relacionados com meio ambiente, foi feita uma nova filtragem em nível de ação orçamentária. Isso foi necessário pela existência de programas amplos que apresentam ações que se relacionam com meio ambiente e outras que não.

Rodada 3 – União de todas as ações selecionadas para elaborar um único banco de dados. Para organizar, limpar e auxiliar na classificação desse banco gerado, foi utilizado o *software OpenRefine*.

Por fim, para a etapa 3 de identificação dos aspectos institucionais relacionados ao financiamento da conservação da biodiversidade foram considerados: a) As normas legais identificadas associadas à EPANB; b) As unidades e órgãos orçamentários relacionados com os programas e ações identificados nos PPAs e no orçamento. Isso permitiu caracterizar as estruturas do governo federal responsáveis pela execução dessas políticas (Figura 2).

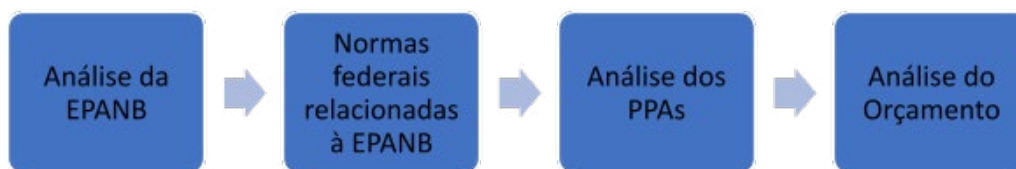


Figura 2 | Esquema dos passos para análise da etapa 3 da PIR

Fonte: Elaboração própria.

É importante destacar o desafio de trabalhar com um banco de dados relacionado a gastos públicos em um horizonte de mais de 20 anos. Bancos de dados grandes como esse trazem desafios que foram sentidos no desenvolvimento deste trabalho. Primeiramente, por se tratar na maioria de dados textuais, a classificação desses dados de acordo com a definição Biofin de gastos em biodiversidade ainda é sujeita a muita subjetividade. Dessa forma, é importante destacar que é previsível que existam imprecisões nos resultados apresentados. Além disso, pode haver divergências quanto ao entendimento de determinados programas e ações governamentais como sendo ou não direcionados à conservação da biodiversidade. E, por fim, é importante destacar que essa pesquisa se limita ao escopo do governo federal. No entanto, estados e municípios também têm suas atribuições na conservação da biodiversidade.

Ainda assim, esses dados permitem uma avaliação dos aspectos institucionais responsáveis pela conservação da biodiversidade no governo federal do Brasil. Eles podem servir como uma primeira aproximação para o entendimento dos esforços governamentais para a conservação e como possível indicativo para a correlação com os resultados observados ao longo desse período.

3 RESULTADOS E DISCUSSÃO

3.1 ETAPA 1 – ANÁLISE DA ESTRATÉGIA E PLANO DE AÇÃO NACIONAIS PARA A BIODIVERSIDADE – EPANB.

Para esta etapa da PIR, foi possível identificar pelo menos 21 leis, decretos e portarias federais que seriam as bases para a execução das ações para alcançar as metas estabelecidas na EPANB. Essas 21 normas apresentam cerca de 195 instrumentos e diretrizes previstos para executar a Estratégia e Plano de Ações Nacionais para a Biodiversidade – EPANB. A análise de acordo com a natureza do tipo de instrumento de política pública demonstrou que cerca de 69% dos instrumentos e diretrizes analisados se enquadram nas tipologias de regulação direta e participação social. Os outros 31% poderiam ser classificados de maneira geral como instrumentos econômicos, sendo 23% classificados na tipologia de uso do mercado e apenas 8% na tipologia de criação de mercado.

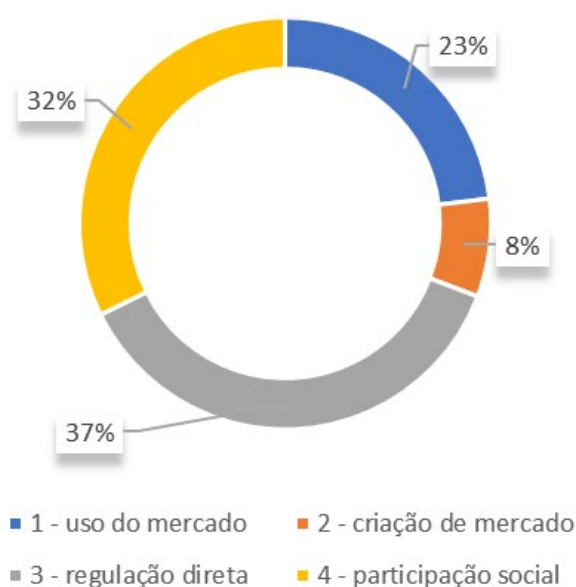


Figura 3 | Distribuição das classes de instrumentos de políticas públicas relacionados à EPANB.

Fonte: Elaboração própria.

Como se sabe, o enfoque típico de política ambiental sugerido pela teoria econômica tem sido a adoção de meios para internalizar as externalidades no processo de decisão dos agentes degradadores. Ainda que se entenda que outras falhas de mercado possam estar na origem da degradação ambiental, o que se busca, de maneira geral, é o meio mais eficiente para corrigir a degradação. O debate sobre os instrumentos mais adequados a esse propósito frequentemente remete à opção entre mecanismos de: a) regulação direta por parte de autoridades governamentais; b) incentivos econômicos para induzir a ação do agente degradador (ALMEIDA, 1998).

Esse debate sobre os instrumentos de política frequentemente classificados apenas como “baseados no mercado” versus “comando e controle” não é muito enriquecedor. Os mercados envolvem preços e quantidades, as regulamentações geralmente são apoiadas por sanções econômicas e até a teoria econômica sugere que instrumentos quantitativos, como padrões, metas de emissões ou permissões, podem ser eficientes em muitos casos (STERNER; CORIA, 2012). E o que se observa mais recentemente é que, na implementação de políticas ambientais, os instrumentos podem evoluir de seu design original, a depender dos atores e contextos específicos nos quais são implementados, em um processo chamado de elaboração institucional (BLACKSTOCK *et al.*, 2021).

Ainda assim, alguns insistem que existem apenas três categorias básicas de instrumentos de política, apropriadamente apelidadas de "cenouras, chicotes e sermões" para simbolizar incentivos econômicos, instrumentos legais e instrumentos informativos, respectivamente (BEMELMANS-VIDEC; RIST; VEDUNG, 2010). Nenhuma taxonomia isolada é necessariamente preferível, mas cada uma pode ser útil em um contexto diferente (STERNER; CORIA, 2012).

Vários argumentos são apresentados para indicar a preferência pelos instrumentos econômicos em lugar dos mecanismos de regulação direta. No entanto, a política ambiental, de maneira geral, parece pouco permeável a essas sugestões (ALMEIDA, 1998). Isso pode ser a realidade também no âmbito da EPANB e das políticas federais que formam o arcabouço legal de suporte a ela, pois, como observado, os instrumentos de regulação direta são predominantes.

Destaca-se também o grande percentual de instrumentos de engajamento público ou participação social, dentro dos quais podem ser identificados muitos instrumentos de produção de informação. É importante ressaltar que as informações desempenham um papel especial na formulação de políticas e, de fato, o fornecimento pode ser considerado um instrumento por si só. Em um nível geral, toda política depende de informações, isto é, os formuladores de políticas devem entender a tecnologia e a ecologia das questões em consideração (STERNER; CORIA, 2012).

Apesar de criticada, a concentração de instrumentos de regulação direta parece ser a estratégia óbvia para os formuladores de políticas com o objetivo de regular o uso de recursos naturais com uma intervenção centralizada (VYRASTEKOVA; SOEST, 2007).

Considerando-se esses aspectos, analisamos o quadro geral de instrumentos e diretrizes relacionados à EPANB, chegamos a um total de 30 alterações sugeridas. Essas alterações podem ser divididas em quatro grupos diferentes: a) Especificar os Instrumentos Econômicos já previstos na norma; b) Transformar a natureza do instrumento existente para que se torne um Instrumento Econômico; c) Atrair critérios de conservação da biodiversidade aos instrumentos financeiros já existentes; d) Criação de novos instrumentos ou diretrizes não existentes (Quadro 2).

Quadro 2 | Exemplo dos instrumentos e diretrizes das normas relacionadas à EPANB com alguma sugestão de modificação em relação à natureza do instrumento.

<i>Norma</i>	<i>Instrumentos</i>	<i>Categoria</i>	<i>Categoria Nova</i>	<i>Justificativa</i>
Política Nacional de Biodiversidade	11.2. Segunda diretriz: Conservação de ecossistemas em unidades de conservação. Promoção de ações de conservação in situ da biodiversidade dos ecossistemas nas unidades de conservação, mantendo os processos ecológicos e evolutivos, a oferta sustentável dos serviços ambientais e a integridade dos ecossistemas.	Regulação Direta	Criação de Mercado	Como o objetivo aqui é claramente manter serviços ecossistêmicos – bem público faria sentido a aplicação de subsídios em forma de PSA

<i>Norma</i>	<i>Instrumentos</i>	<i>Categoria</i>	<i>Categoria Nova</i>	<i>Justificativa</i>
Política Nacional de Biodiversidade	13.3. Terceira diretriz: Recuperação de ecossistemas degradados e dos componentes da biodiversidade sobrexplorados. Estabelecimento de instrumentos que promovam a recuperação de ecossistemas degradados e de componentes da biodiversidade sobre-explotados	Regulação Direta	Criação de Mercado	Em se tratando mais uma vez de bens públicos, poderiam ser estabelecidos impostos no estilo do IPTU progressivo a proprietários com áreas degradadas e/ou o incentivo à recuperação dessas áreas em detrimento da abertura de novas fronteiras agrícolas
Código Florestal	II - a transformação das Reservas Legais em áreas verdes nas expansões urbanas	Regulação Direta	Uso de Mercado	Com progressivo impacto na redução do imposto ITR - IPTU visto a maior necessidade de áreas verdes em ambientes urbanos
Política Nacional de Florestas Plantadas	XIV - tributação e incentivos fiscais;	Uso de Mercado	Uso de Mercado	Atrair a condições ambientalmente não danosas
Política Nacional de Florestas Plantadas	XIX - crédito fundiário.	Uso de Mercado	Uso de Mercado	Atrair a condições ambientalmente não danosas
Política Nacional de Biodiversidade	16.4. Quarta diretriz: Mecanismos de financiamento. Integração, desenvolvimento e fortalecimento de mecanismos de financiamento da gestão da biodiversidade.	Uso de Mercado	Uso de Mercado	Especificar, incluindo a necessidade de definição, o que se considera investimento em biodiversidade
Política Nacional de Recuperação da vegetação Nativa	7.2.2 Iniciativa Estratégica: Mercados – Fomentar mercados para os produtos e serviços ecossistêmicos gerados durante o processo de recuperação	Criação de Mercado	Criação de Mercado	Especificar normas como, por exemplo, estimativas de captura de carbono florestal em áreas em restauração em diferentes biomas
Política Nacional de Resíduos Sólidos	Criar instrumentos econômicos que atingem desde os produtores, o comércio e usuário final, como SDR e incentivos à redução de plásticos e/ou uso de produtos biodegradáveis e com o foco no poder público ao condicionar aumento ou redução de repasses federais ao atendimento de indicadores de cumprimento da política como fechamento de lixões e impostos sobre uso de produtos de fácil descarte		Criação de Mercado	Criação de novo instrumento
Plano de Implementação da Estratégia Nacional para Espécies Exóticas	Cobrança de impostos para importação, comercialização e criação de espécies com potencial impacto invasor		Uso de Mercado	Criação de novo instrumento

Fonte: Elaboração própria.

Vários fatores parecem estar relacionados com a predominância de determinado tipo de instrumento. Podemos citar a natureza do objeto final da lei, como é o caso da Política Nacional de Educação Ambiental – Pnea de 1999, que apresenta uma predominância de instrumentos de participação social, incluindo também os instrumentos de informação. Por outro lado, a Política Nacional de Produção Orgânica – Pnapo, Política Nacional Agrícola de Florestas Plantadas e o novo Código Florestal (Política Nacional de Proteção da Vegetação Nativa) apresentam uma proporção maior de instrumentos de uso de mercado e criação de mercado. O que é de se esperar dado o objeto a ser regulamentado pelas leis, que se relacionam mais com atividades produtivas.

Também é possível notar que políticas que têm uma abordagem mais ampla apresentam um maior equilíbrio de tipos diferentes de instrumentos, como é o caso da Política e Plano Nacionais da Vegetação Nativa – Planaveg; Política Nacional de Mudança Climática – PNMC; Estratégia Nacional de Redução de Emissões por Desmatamento e Degradação florestal – Enredd e a própria Política Nacional de Meio Ambiente. Em relação a essas normas, vale salientar que tratam de temas mais recentes e que tiveram uma participação ativa do setor acadêmico e não governamental em seu processo de elaboração.

Outros aspectos podem estar relacionados ao período histórico no qual as políticas foram elaboradas e ao aspecto da divisão de competências entre as esferas de poder. Isso porque determinadas políticas das quais se espera uma complementação por parte de estados e municípios podem reservar ao governo federal um papel predominante de regulador.

Ainda que caiba ao governo federal, em algumas políticas, um papel predominante de regulador ou de definir diretrizes gerais, alguns aspectos chamaram atenção, como observamos nas sugestões de modificações. O primeiro aspecto é a ambiguidade e falta de clara definição em alguns instrumentos, que podem atrasar a sua realização, à espera de regulamentações. O segundo aspecto é a não observância de critérios, como a redução de custos administrativos, com a determinação de instrumentos de regulação que poderiam ser substituídos, repassando os custos para os agentes privados.

Por outro lado, algumas das sugestões vão na direção de assumir como necessários os subsídios, que poderiam onerar o Estado, e a criação de impostos que não apresentam boa aceitação pública, ou seja, é necessário um equilíbrio combinando um sistema de multas e atividades de monitoramento que busquem níveis ótimos de conservação, pelo menos em teoria.

Mas, na prática, nos países em desenvolvimento (que são, afinal, os mais ricos em biodiversidade), a aplicação centralizada pode não ser muito eficaz. Os problemas de risco moral desempenham um papel importante no sentido de que as instituições governamentais responsáveis pela conservação nem sempre recebem incentivos adequados para impedir ativamente a sobre-exploração dos recursos (VYRASTEKOVA; SOEST, 2007).

Temos que lembrar que os instrumentos de política são desenhados de forma a alcançar objetivos políticos (MUKHERJEE; COBAN; BALI, 2021), ou seja, também há que se considerar que a escolha dos tipos de instrumentos está relacionada com as diretrizes dos governos e legisladores predominantes no período analisado.

É reconhecido que a definição dos instrumentos desempenha um papel essencial na determinação do sucesso geral de uma política. No entanto, o processo de seleção de instrumentos não é linear, pois pode ser conduzido por uma lógica de eficácia e uma lógica de adequação. A primeira é baseada em uma relação entre meios e objetivos; e a última baseada em valores compartilhados e ideias de legitimidade (CAPANO; LIPPI, 2017).

No entanto, o processo de conciliação dessas lógicas ocorre em um ambiente complexo e inerentemente político, no qual a definição dos instrumentos e alocação de esforços para sua execução refletem relações de poder e ideias sobre o “valor” social de diferentes grupos (KRAUSE *et al.*, 2019). Por isso,

o mapeamento dos gastos orçamentários de forma complementar ao mapeamento dos instrumentos pode oferecer uma melhor compreensão das ações dos governos.

3.2 ETAPA 2 – MAPEAMENTO DE ASPECTOS ORÇAMENTÁRIOS

A análise das ações orçamentárias relacionadas à biodiversidade entre os anos de 2000 e 2019 demonstrou também uma predominância dos instrumentos de comando e controle (57%), enquanto 24% das ações orçamentárias podem ser classificadas como participação social, 17% de uso de mercado e 2% de criação de mercado (Figura 4).

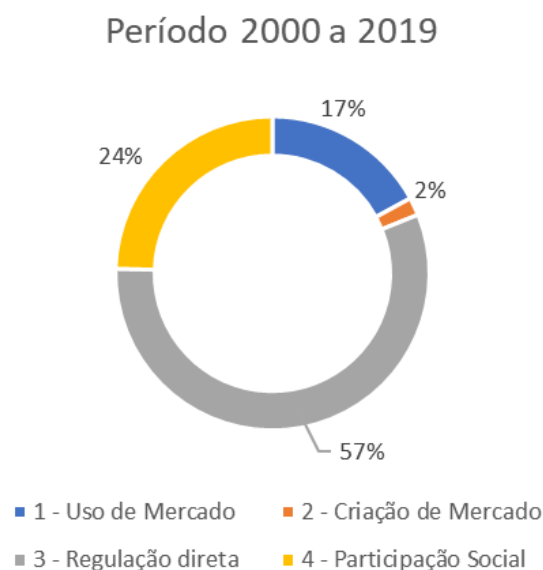


Figura 4| Classificação das ações orçamentárias de acordo com a natureza do instrumento entre 2000 e 2019

Fonte: Elaborado pelo autor com base em dados do Siop.

Observamos que nas ações orçamentárias há uma predominância de instrumentos de regulação (57%), ou seja, essa predominância é ainda maior do que nas normas relacionadas à EPANB (37%). Isso ressalta a aparente predileção por instrumentos dessa natureza também nas ações executadas pelo governo.

Destaca-se a disparidade entre o que é planejado em nível de política e aquilo que é executado pelo governo, isto é, mesmo apresentando uma legislação mais ampla para regular o uso do capital natural, as ações do governo diferem parcialmente do que foi estabelecido nas normas.

Outra possibilidade é que algumas dessas estratégias tenham sido assumidas por outros entes federados (estados e municípios) ou ainda por instituições não governamentais e supranacionais, cujas ações não são necessariamente contabilizadas no planejamento e orçamento do governo federal.

Esses aspectos levantados demonstram que a montagem do orçamento governamental é um exercício técnico e político complexo, cujo resultado depende tanto de indicadores macroeconômicos quanto de disputas de interesse político. E, em consequência disso, é de se esperar que as ações previstas no orçamento guardem disparidades em relação à natureza dos instrumentos previstos no arcabouço institucional.

A análise demonstrou também que houve uma evolução no aumento da participação de instrumentos econômicos (em especial os de uso de mercado) nas ações executadas pelo governo federal

relacionadas à biodiversidade. Ao passo que houve uma redução no percentual dos instrumentos de participação social (Tabela 1).

Tabela 1 | Número de ações orçamentárias existentes nos Planos Plurianuais – PPAs de 2000 a 2019 do governo federal relacionadas com gastos em biodiversidade de acordo com a classificação do tipo de instrumento nas quais se enquadram.

Classificação	Número de ações orçamentárias relacionadas à biodiversidade por PPA				
	2000-2003	2004-2007	2008-2011	2012-2015	2016-2019
1 - Uso de Mercado	1057	927	677	1338	1323
2 - Criação de Mercado	118	158	62	128	109
3 - Regulação direta	5286	5562	3052	2610	1141
4 - Participação Social	3051	2001	1380	665	551
Total	9512	8648	5171	4741	3124

Fonte: Elaborado pelo autor com base nos dados do Siop.

É possível observar que o número de ações orçamentárias foi significativamente reduzido, o que pode indicar uma maior concentração de recursos em menos atividades. No entanto, também é reflexo da redução de recursos financeiros disponíveis para ações de conservação da biodiversidade. O que mais chama atenção é a grande redução de ações de participação social, o que pode ser reflexo da execução de ações mais centralizadas por parte do governo e da redução do espaço para a sociedade participar da governança da biodiversidade.

Além disso, essa redução de ações destinadas à conservação é acompanhada por uma redução significativa da participação do Ministério do Meio Ambiente. A partir de 2019, o número de ações orçamentárias destinadas à conservação da biodiversidade no MMA passou a ser menor do que as ações orçamentárias destinadas ao mesmo fim em outros órgãos do governo federal (Figura 5). Essa redução pode estar diretamente relacionada à reestruturação do MMA e suas áreas associadas anteriormente destacadas. Essa reestruturação é preocupante, uma vez que a responsabilidade pela execução de políticas de conservação acabou indo para departamentos cuja finalidade principal está relacionada ao desenvolvimento de atividades produtivas e não à conservação.

Sem um financiamento ambiental adequado, as metas legislativas e programáticas são obstruídas, e pesquisas mostram que medidas fiscais refletem o compromisso que os estados têm com a proteção ambiental e a qualidade de seus programas ambientais (DUGGAN; CARR; YAN, 2022), ou seja, essa redução de ações orçamentárias parece significar uma redução do financiamento para a conservação. Em especial uma redução para aqueles órgãos que têm uma responsabilidade mais direta na execução de políticas de conservação.

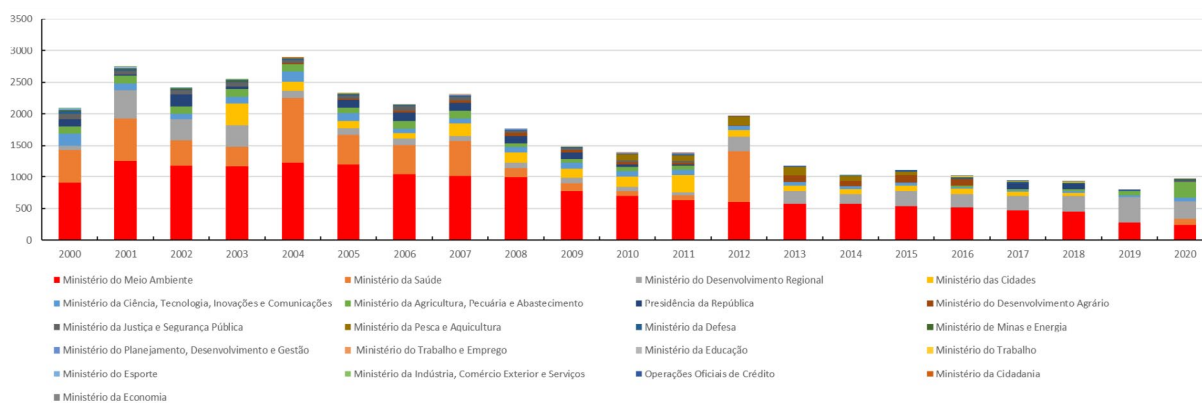


Figura 5 | Número de ações orçamentárias executadas/previstas relacionadas com a gestão da biodiversidade no orçamento federal por órgão orçamentário entre os anos de 2000 e 2020

Fonte: Elaborado pelo autor com base nos dados do Siop.

Cientistas políticos estudaram instrumentos de políticas para entender melhor as ligações entre a formulação de políticas e a implementação delas e obter insights sobre o processo de tomada de decisões sobre políticas públicas. A evolução desses dados ao longo do tempo e de diferentes governos demonstra que o processo político de escolha de instrumentos de políticas públicas é uma forma de adaptação e busca de respostas a problemas que é moldada por restrições e suposições políticas existentes em seu contexto. Assim, diferentes governos têm preferências por certos tipos de instrumentos, com base em suas relações individuais Estado-sociedade (HOWLETT, 1991).

Observa-se que a influência do contexto político para a seleção de um instrumento de política pública ocorre desde o processo de formulação das políticas. Nessa fase, um conjunto de instruções é transmitido dos formuladores das políticas aos implementadores que explicitam a intenção da política, seus objetivos, efeitos desejados e os meios para alcançá-las (BEMELMANS-VIDEC; RIST; VEDUNG, 2010).

Tomando essas considerações, pode-se observar a partir dos dados levantados que há uma disparidade entre os formuladores das políticas de biodiversidade e os executores delas. Isso pode ocorrer por alguns fatores:

1. Em muitos casos, as políticas públicas e os instrumentos previstos nelas são elaborados como respostas a demandas da sociedade, não raramente com participação de vários atores, muitas vezes especialistas do setor. Um exemplo é a Proveg, concebida como consequência de uma forte pressão da sociedade civil organizada por um marco regulatório para restauração ecológica no Brasil.
2. A proposta da política pode ser modificada no âmbito do Congresso com adição e/ou retirada de instrumentos que representem de melhor maneira os interesses dos parlamentares (ex.: Código Florestal²).
3. Ou ainda, mesmo que os instrumentos estejam previstos em lei, pode não haver a sua regulamentação (ex.: artigos 45 e 46 do Snuc³).
4. Além disso, ainda que os instrumentos estejam previstos e regulamentados, pode não haver capacidade técnica para operacionalizá-los, sobretudo em relação àqueles que necessitam de pessoal capacitado também nos estados e municípios.

Outra observação possível de se fazer sobre ações de conservação da biodiversidade realizadas pelo governo durante esses 20 anos é que houve uma redução de ações de regulação direta (comando e controle), por um lado. E, por outro, houve também uma redução das ações de engajamento social (participação social).

Já em relação aos instrumentos econômicos, houve um aumento ao longo dos anos analisados. O aumento foi mais evidente nos instrumentos que se enquadram na classe de uso de mercado. A quantidade de instrumentos de criação de mercado foi mais limitada. Esses elementos levantam algumas questões. As ações realizadas pelo governo no período analisado não carecem de um embasamento de informações? Os instrumentos econômicos utilizados, por serem de uso de mercado (ex.: subsídios e apoio a projetos), não estão onerando demais o orçamento em um período de recursos escassos?

Embora os dados orçamentários levantados careçam de uma complementação qualitativa em sua análise para representar melhor a realidade, os orçamentos ambientais refletem o esforço que governos pretendem dedicar à proteção ambiental, e as dotações são indicativas da viabilidade e influência desses esforços. Examinar as apropriações de fundos gerais pode revelar a influência dos determinantes orçamentários no contexto e no processo orçamentário geral (DUGGAN; CARR; YAN, 2022).

Além dos aspectos orçamentários, a formulação de políticas estatais geralmente é explicada por variações na capacidade de resposta dessas políticas e pela influência de atores, subsistemas de políticas e instituições envolvidas no processo orçamentário. Dentro da literatura de política ambiental, as influências específicas sobre a formulação de políticas estatais incluem condições ambientais e econômicas, grupos de interesse que fazem exigências ao governo e preferências partidárias (KIM; VERWEIJ, 2016). Assim, de maneira complementar, avaliamos a evolução dos aspectos institucionais em nível federal.

3.3 ETAPA 3 – IDENTIFICAÇÃO DAS ESTRUTURAS INSTITUCIONAIS

A análise das normas e das ações orçamentárias relacionadas à execução dos objetivos e metas da EPANB no Brasil demonstrou que a estrutura básica da gestão da biodiversidade está ligada ao Ministério do Meio Ambiente – MMA, seus vinculados e conselhos associados (Figura 6).

Ainda assim, é importante ressaltar que mesmo políticas ambientais que têm sua execução ou coordenação vinculadas ao MMA preveem a participação de outros órgãos e entes federais. Esse é o caso da PNMA, que prevê a participação de órgãos de setores específicos como executores de suas ações. Em outros casos, como o da Pnea, pela própria natureza dos instrumentos, se faz necessária a ação conjunta entre o MMA e o Ministério da Educação. Em outros casos, como a Política Nacional de Gerenciamento Costeiro, o seu órgão máximo é o Comitê Interministerial dos Recursos do Mar, presidido pela Marinha do Brasil.

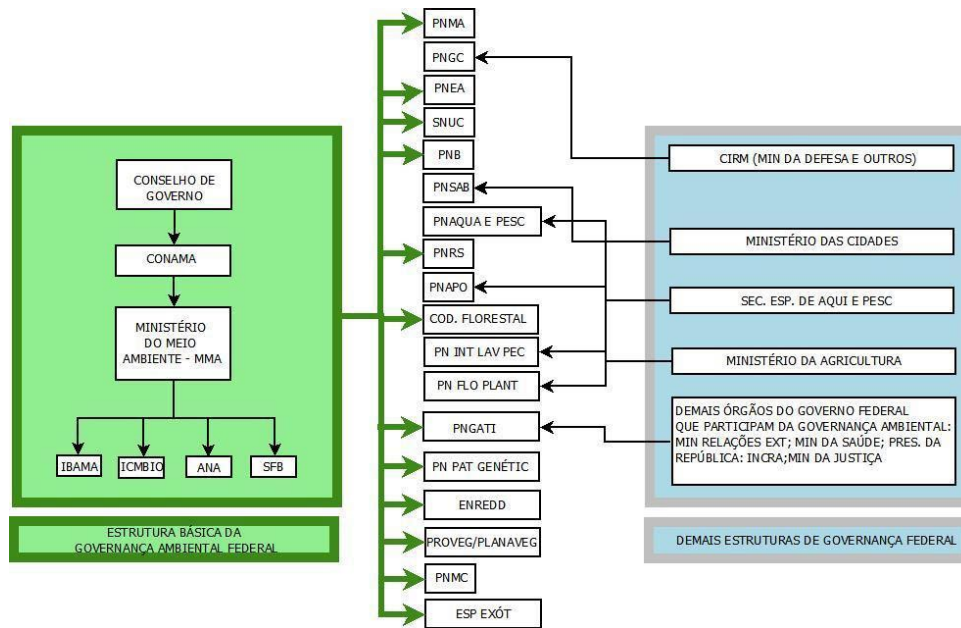


Figura 6 | Estruturas institucionais responsáveis por executar ou coordenar as políticas federais relacionadas com a EPANB

Fonte: Elaboração própria.

A observação desse arranjo parece evidenciar potenciais *trade-offs* na execução de algumas das políticas relacionadas à EPANB. Um exemplo é a Política Nacional de Saneamento Básico, ligada (durante a maior parte do período analisado) ao Ministério das Cidades, cujas ações muitas vezes são promotoras de modificação no ambiente natural, em função das muitas obras de construção civil relacionadas à sua execução. Outros desses potenciais *trade-offs* estão ligados às Políticas de Florestas Plantadas; Integração Lavoura-Pecuária-Floresta e a de Produção Orgânica, que estão sob o guarda-chuva do Ministério da Agricultura – Mapa.

No primeiro caso, chama atenção a necessidade de que esta esteja bem alinhada com o Código Florestal, sob tutela do Ministério do Meio Ambiente. Nos outros dois casos, o potencial de conflito está associado ao perfil corrente do Mapa⁴. O ministério é direcionado mais para agropecuária convencional, enquanto as duas políticas têm a proposta de desenvolver formas alternativas de produção e, conseqüentemente, possam ser preteridas em relação à atenção e alocação de recursos por parte do órgão executor.

Além desses exemplos, uma série de outras políticas afetam ou são afetadas pelas políticas ambientais no nível federal no Brasil. Porém, no que diz respeito especificamente às políticas de conservação da biodiversidade, estas estão realmente mais concentradas no MMA e seus vinculados.

É importante destacar também que outras estruturas fazem parte da elaboração de normas relacionadas à conservação da biodiversidade, como o Conselho Nacional do Meio Ambiente – Conama. Porém, a análise realizada aqui se restringe àquelas estruturas governamentais responsáveis pela execução das políticas, analisadas por meio das ações presentes no orçamento.

Cabe ressaltar ainda que a estruturação desses órgãos se deu ao longo do tempo. Aqui está retratada a estrutura predominante entre os anos de 2008 e 2018. Nesse período, podemos destacar algumas mudanças importantes, como a criação do Instituto Chico Mendes de Conservação da Biodiversidade – ICMBio, pela Lei nº 11.516, de 28 de agosto de 2007, com o objetivo de executar ações da política nacional de unidades de conservação da natureza, entre outras (BRASIL, 2007), e o Serviço Florestal

Brasileiro – SFB, com foco na gestão das florestas públicas, criado pela Lei nº 11.284, de 2 de março de 2006 (BRASIL, 2006).

Essa estrutura organizacional sofreu mudanças ao longo do período analisado. As mais recentes modificações a serem destacadas são: a saída do Serviço Florestal Brasileiro – SFB e da Agência Nacional de Águas – ANA da estrutura do Ministério do Meio Ambiente por meio do Decreto n. 9.672/19 (BRASIL, 2019a). Além disso, o principal órgão de gestão da biodiversidade, o ICMBio, passou por uma reestruturação, por meio da qual foram extintas seis das 11 coordenações regionais, e as chefias de Unidades de Conservação foram reduzidas de 204 para 182 mediante o Decreto n. 10.234/2020 (BRASIL, 2020a).

Também houve uma reestruturação da Comissão Nacional de Biodiversidade, com a exclusão de membros indígenas e de movimentos sociais de sua composição por meio do Decreto n. 10.235, de 11 de fevereiro de 2020 (BRASIL, 2020b). Isso parece reforçar a tendência observada de redução da participação social, situação também observada na modificação do Conselho Nacional de Meio Ambiente – Conama, por meio do Decreto nº 9.806, de 28 de maio de 2019 (BRASIL, 2019b). Esse tipo de reestruturação vai contra as boas práticas de governança, uma vez que o envolvimento dos cidadãos e das Organizações da Sociedade Civil na elaboração das políticas ambientais é amplamente reconhecido como uma forma importante de melhorar a eficácia e qualidade dessas políticas e é um princípio de boa governança (MAO *et al.*, 2020; VINOGRADOVA, 2022)

Esses eventos de mudanças institucionais destacados podem demonstrar que, após um período de relativa estabilidade, as instituições responsáveis pela conservação da biodiversidade em nível federal sofreram modificações significativas. No entanto, essas mudanças não indicam aumento de atuação ou eficácia. Pelo contrário, as mudanças parecem apontar para uma desarticulação proposital na gestão da conservação da biodiversidade em nível federal no Brasil.

Isso reforça a importância do entendimento da situação e das mudanças na paisagem institucional relativas à conservação da biodiversidade no Brasil. Esse retrato da paisagem institucional dos últimos 20 anos nos permite demonstrar que as mudanças recentes indicam comprometimento nas ações para a conservação da biodiversidade.

Por fim, é importante destacar que, para compreender o arcabouço institucional desenhado para a implementação das políticas ambientais em geral e, especificamente, as de biodiversidade no Brasil, é crucial entender a estrutura federativa do país, desdobrada em seus três níveis de governo.

Nessa organização, as Unidades da Federação e os governos municipais dispõem de autonomia para estabelecer políticas de acordo com suas próprias prioridades, dentro de suas áreas de competência e nos limites fixados por seus territórios (IPEA, 2016). Essa organização foi estabelecida pela Lei Complementar 140 (LC-140), que fixou as normas para a cooperação entre a União, os Estados, o Distrito Federal e os Municípios nas ações administrativas decorrentes do exercício da competência comum relativas à proteção das paisagens naturais notáveis, à proteção do meio ambiente, ao combate à poluição em qualquer de suas formas e à preservação das florestas, da fauna e da flora (ANTUNES, 2015).

Entender esse aspecto da descentralização é importante, pois a descentralização política, fiscal e administrativa difere em seus impactos sobre o desempenho da política ambiental. O alto desempenho da política ambiental ocorre com mais frequência quando um país é fiscal e administrativamente descentralizado e seu contexto é favorável, ou seja, economia avançada, boa governança e regulamentações ambientais rigorosas (MAO, 2018).

É importante destacar isso, pois a organização institucional no nível federal se deu ora a partir da extinção e da fusão de alguns órgãos (como na criação do Ibama – Agência ambiental federal do Brasil),

ora a partir do desmembramento de outros (como no caso do ICMBio – Agência ambiental federal responsável por Áreas Protegidas, que surgiu a partir de uma repartição do Ibama). Foram criados, ainda, órgãos novos que viessem a suprir lacunas ainda não atendidas pelas instituições existentes, tal como a Agência Nacional de Águas – ANA, criada para implantar os instrumentos da Política Nacional de Recursos Hídricos, mas também com atuação na Política Nacional de Saneamento. Esses movimentos de estruturação, por vezes conflitivos, exigiram sempre uma nova acomodação para o atendimento das funções recém-criadas e o trabalho de desenvolvimento (contratação e treinamento de pessoal, estrutura física, logística de equipamentos, entre outros) que continua até a atualidade (IPEA, 2016).

Dessa forma, podemos entender que a mais recente desarticulação das estruturas orçamentárias e institucionais responsáveis pela conservação da biodiversidade não foi balanceada com um aumento das responsabilidades dos demais entes federativos no Brasil. E a paisagem institucional demonstrada aqui retrata uma recente perda de capacidade de promoção da conservação da biodiversidade em nível federal no Brasil.

4 CONSIDERAÇÕES FINAIS

Considerando, por um lado, a crescente crise de perda de biodiversidade no planeta e, por outro, a necessidade cada vez maior de buscar eficiência das ações governamentais, este trabalho se destaca pela abrangência dos dados coletados sobre a ação governamental especificamente relacionada à biodiversidade em nível federal no Brasil.

O principal resultado desse estudo demonstra o descompasso entre os objetivos e instrumentos para a conservação da biodiversidade previstos nas leis e as ações governamentais executadas no orçamento federal. Isso parece demonstrar que as ações executadas pelo governo federal ao longo desses 20 anos estão, ao menos em parte, desconectadas das diretrizes previstas para o enfrentamento da perda de biodiversidade.

Os resultados mostram quão complexa é a estrutura de gestão da biodiversidade no Brasil. Mesmo considerando apenas o nível do governo federal, o estudo demonstra como, ao longo dos 20 anos analisados, houve mudanças significativas nos arranjos de gestão que podem dificultar a implementação duradoura de ações de conservação.

Essas mudanças foram especialmente percebidas nos anos recentes. Modificações nos aspectos orçamentários, normativos e institucionais foram adotadas de maneira deliberada. As mudanças foram contrárias ao que se sabe da literatura e do conhecimento empírico que promovem a eficácia dos instrumentos de conservação da biodiversidade.

Outros resultados deste estudo parecem demonstrar que há uma carência de fundamentação teórica na elaboração das diretrizes e instrumentos para a conservação da biodiversidade, tanto nas normas quanto nas ações orçamentárias analisadas.

Ainda foi possível observar nos dados analisados uma progressiva redução das ações orçamentárias, o que pode indicar uma diminuição na alocação de recursos para conservação nos últimos 20 anos. Destaca-se a redução da participação do Ministério do Meio Ambiente nas ações de conservação da biodiversidade.

Esses elementos apontam para um cenário de redução da priorização do tema da conservação da biodiversidade em nível federal no Brasil. No entanto, é importante ressaltar o caráter subjetivo das análises realizadas neste trabalho, uma vez que se trata da análise qualitativa de documentos textuais e de um grande volume de dados, para os quais não existe necessariamente uma diretriz para análise.

Por isso, é necessário aprofundar o tema em pesquisas futuras, tanto no que diz respeito à análise do arcabouço legal quanto das estruturas administrativas e das ações orçamentárias. Além disso, é essencial cruzar os dados e análises feitos neste trabalho com dados de avaliação de impacto das políticas públicas relacionadas.

Apesar das lacunas deste trabalho, os resultados mostram uma primeira contribuição ao necessário detalhamento das ações do governo, em especial na temática ambiental. Essa contribuição é de especial importância para o desenvolvimento da abordagem de revisão política e institucional (PIR), prevista na iniciativa Biofin.

Isso porque, embora existam diretrizes bem estabelecidas, a PIR não apresenta um detalhamento metodológico a ser seguido. Assim, este trabalho contribui com uma primeira proposta de detalhamento de execução de uma revisão dessa natureza. Dessa forma, estabelece-se um marco a ser seguido em pesquisas futuras, especialmente focadas em níveis estaduais e municipais. O desenvolvimento de pesquisas futuras com a elaboração de PIRs nos diferentes níveis federativos pode contribuir para uma melhor definição das divisões de responsabilidade e maior efetividade das políticas de conservação.

O levantamento de dados sobre como os governos estão agindo diante da crise de perda de biodiversidade é indispensável para o processo de controle social em prol de mudanças efetivas para uma melhor gestão do capital natural.

NOTAS

1| O Siop pode ser acessado em: https://www1.siop.planejamento.gov.br/QvAJAXZfc/opendoc.htm?document=IAS%2FExecucao_Orcamentaria.qvw&host=QVS%40pqlk04&anonymous=true

2| A Lei Nº 12.651, de 25 de maio de 2012, que dispõe sobre a proteção da vegetação nativa, conhecida de forma genérica como o Novo Código Florestal, substituiu a lei anterior do ano de 1965, e foi alvo de um grande embate no Congresso Nacional, sendo aprovada com grande número de vetos, e com críticas importantes por parte da sociedade civil e setor acadêmico, em relação a pontos considerados como retrocessos ambientais, e aprovados no Congresso por interesse de parlamentares.

3| Os artigos 45 e 46 da Lei de criação do Sistema Nacional de Unidades de Conservação versam sobre a possibilidade de pagamento por serviços ambientais nas áreas protegidas federais, porém até a presente data não foram regulamentados gerando insegurança jurídica e dificuldades na implementação de tais mecanismos.

4| Durante a maior parte do período analisado neste trabalho o Mapa ficou responsável pela agropecuária convencional, enquanto o Ministério do Desenvolvimento Agrário era responsável pelo desenvolvimento da agricultura familiar.

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Discontinuity of practices in environmental health: perception of municipal professionals in Southern Brazil

*Descontinuidade de práticas em saúde ambiental:
percepção de profissionais de município
do Sul do Brasil*

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ARTICLE- DOSSIER

ABSTRACT

This research investigates how professional knowledge could be employed as a conceptual strategy to understand the dismantlement of public policies regarding health and the environment. The goal was to examine the conditions and limitations perceived by health surveillance professionals involved directly with environmental issues and how that can affect their knowledge and professional practices. This research was based on a qualitative approach and an empirical nature, as it was performed through semi-structured interviews with an environmental health surveillance team linked to a public agency in a municipality in southern Brazil. Data analysis was performed by thematic coding and categorisation. The interviewees mentioned several recent performance difficulties linked to the concept of professional knowledge. Thus, the research concluded that the reduction in the number of professionals and other difficulties of environmental health teams represent negative impacts on the continuity of the work and preservation of the professional knowledge accumulated over the years.

Keywords: Health and Environment. Public Health Surveillance. Health Policy. Dismantlement. Brazil.

RESUMO

Esta pesquisa consistiu em investigar como o uso dos saberes profissionais pode ser empregado como estratégia conceitual para compreender o desmonte das políticas de saúde e ambiente. O objetivo foi examinar as condições e limitações percebidas por profissionais de vigilância em saúde envolvidos diretamente com questões ambientais e como isso pode afetar seus conhecimentos e práticas profissionais. Tratou-se de pesquisa com abordagem qualitativa e de natureza empírica, realizada por meio de entrevistas semiestruturadas com uma equipe de vigilância em saúde

ambiental ligada a órgão público de um município do Sul do Brasil. A análise de dados foi feita por codificação e categorização temáticas. Os entrevistados citaram diversas dificuldades recentes de atuação que foram articuladas ao conceito de saberes profissionais. Dessa forma, a pesquisa concluiu que a redução do número de profissionais e outras dificuldades de equipes de saúde ambiental representam impactos negativos para a continuidade do trabalho e preservação dos saberes profissionais acumulados ao longo dos anos.

Palavras-chave: Saúde e Ambiente. Vigilância em Saúde Pública. Política de Saúde. Desmonte. Brasil.

1 INTRODUCTION

Brazil has faced significant advances and setbacks in its environmental and health policies over the last few decades. Gusmão and Pavão (2020) point out several advances in environmental planning and management in the Brazilian context between 1970 and 2010. However, from the 2010s to the 2020s, there were significant setbacks, mainly with the New Brazilian Forest Code enacted in 2012 and the various attempts by the federal government, as of 2019, to extinguish environmental agencies, reduce protected areas and make environmental legislation more flexible.

If, on the one hand, the idea of environmental setbacks at the federal level is seen as recent, on the other hand, social policies that are intensive in human resources, such as education and health (NEY; GONÇALVES, 2020), seem to suffer for a longer time with successive and recurrent setbacks in all administrative spheres of the country. In the health area, in particular, the situation has worsened since the Constitutional Amendment No. 95 of 2016, which establishes a ceiling for federal public spending for 20 years, and the Covid-19 pandemic (PERES *et al.*, 2020; SOUZA, 2020).

In this same context, the articulation of health policies with the environmental issue has been increasingly evident in recent decades, being observed in national and international conferences, in the Federal Constitution of 1988 and in the law creating the Brazilian Unified National Health System (SUS) (BRASIL, 2009; STEDILE *et al.*, 2015). In Brazilian health surveillance services, the responsibility for planning and implementing public health measures related to environmental factors is mainly assigned to environmental health surveillance. From the institutional point of view of the Brazilian Unified National Health System (SUS), this is the most recent area of health surveillance compared to the areas of sanitary, epidemiological and occupational health surveillance. It has been implemented and organised in different ways within the Brazilian states and cities without a national policy and with constant changes in its regulatory structure (BARCELLOS; QUITÉRIO, 2006; BEZERRA, 2017).

Considering this, it is essential to develop conceptual and methodological strategies for a better understanding of the phenomenon of dismantling in public health and environmental management. One of the possible approaches is to explore its impacts through the perceptions of its workers, articulating these perceptions with the definition of different types of professional knowledge. These types of knowledge are those constructed and involved in work processes, originating from the formal dissemination of technical-scientific knowledge and practical experience (RAMOS *et al.*, 2017). They are classified into three types: technical-scientific, relational and ethical-political.

Thus, this research investigated how these different types of professional knowledge can be employed as a conceptual strategy to understand the dismantling of health and environmental policies. The goal was to examine the conditions and limitations perceived by health surveillance professionals directly involved with environmental issues - the so-called environmental health surveillance - and how this can affect their knowledge and professional practices.

In order to achieve that goal, this research explored the perceptions of an environmental health surveillance team working in a public agency in a municipality located in the South Region of Brazil

and which has suffered from contexts of reduction in the number of professionals, among other difficulties in recent years. The site where we conducted the research is located in a municipality with a population of almost one and a half million people. It is nationally recognised for its efforts in establishing health surveillance in the 1990s and environmental health surveillance in the mid-2010s.

2 METHODOLOGY

We adopted an empirical qualitative approach following the guidelines for qualitative research by O'Brien (2014). Minayo (2012) considers that qualitative research is more suitable for scientific investigations of groups, delimited and focused segments, of social histories from the point of view of social actors, of relationships and for analysis of discourses and documents. In this way, we justify the choice of this approach to enrich the understanding of the different notes of public health professionals about their operating conditions in the field of environmental health.

We followed the guidelines of authors Minayo (2012) and Turcato (2005) on sampling in qualitative research. For the authors, the representativeness of the sample in this type of approach is not necessarily in numerical (probabilistic) criteria but in the meaningful connection that the subjects have with the studied phenomenon and the researcher's ability to understand the homogeneities, diversities and intensities of individual and collective meanings of this phenomenon to people's lives. Although in the exploratory phase, there was the intention of covering interviews with multi-professional health teams from the four areas of surveillance (sanitary, epidemiological, environmental and occupational health), the empirical focus of the interviews was directed to the area of surveillance operating in environmental health. This focus was chosen because of the difficulties encountered during the Covid-19 pandemic context and because the multidisciplinary team in question brought a wealth of pertinent and sufficient data for this study.

This way, we defined as participation criteria the inclusion of professionals from the multidisciplinary team of health surveillance who were acting or had acted for at least six months in the planning and/or execution of actions in environmental health in the municipality of study and whose results are part of a broader research, still in progress, on notions of the environment in health surveillance.

A preliminary meeting occurred between researchers and public health professionals within the inclusion criteria to explain the research objectives. We collected data through semi-structured interviews and applied directly between August and October 2022. A script of questions divided into three axes guided data collection: professional training and performance, practices in environmental health and the meaning of environment. The research ethics committee of the health department of the respective municipality approved the research. Participants received the Term of Free and Informed Consent.

There was no refusal to participate in the interview, so the six participants who were invited answered the questions in a reserved room at the work institution itself, four individually and two in the same interview. The average duration of the interviews was one hour, registered through standard audio recording and transcription. In addition, we entered the data in a field notes right after the meetings and interviews.

For data systematisation, we used the thematic coding and categorisation technique by Gibbs (2009) with the help of the NVivo qualitative data analysis software. The interviews were first coded by the attribute of conditions and limitations on the general and specific difficulties of the team's performance. Afterwards, the coding was based on the three types of professional knowledge according to Ramos *et al.* (2017): technical-scientific, relational and ethical-political knowledge. These codifications were categorised by thematic groupings being articulated to the preliminary literature review. For the presentation of results and analyses, we divided the text into four topics: 1)

Characterisation of the place of study, 2) Conditions and limitations of performance, 3) Professional knowledge, which sought to articulate the trajectory narratives of the participants with the definition of professional knowledge and 4) The impacts of the emptying of professional knowledge, which sought to explore the consequences of the quantitative and qualitative reduction in the number of professionals in multidisciplinary environmental health teams.

3 RESULTS AND DISCUSSIONS

3.1 CHARACTERISATION OF THE PLACE OF STUDY

The health surveillance service in the municipality where the study was carried out is an agency linked to the municipal health department, created in the mid-2000s. It provides worker health care and health surveillance services through sanitary surveillance, epidemiological surveillance and environmental health surveillance. Aimed at implementing the municipalisation process of several health services, this municipality incorporated at the time the alternative model of health surveillance (AERTS *et al.*, 2004).

Porto (2017) revisited categorisations such as those by Teixeira *et al.* (1998) and other studies from the 1990s to define two health surveillance proposals still in dispute today. For this author, the restricted aspect of health surveillance would be the classic model of control of specific problems based on Public Health. It is still the prevailing perspective in the Ministry of Health and the Brazilian Unified National Health System (SUS) organisation. The expanded aspect, on the other hand, constitutes a critical alternative to the medical assistance and/or sanitary-campaign-based model. It has foundations in Collective Health, in the understanding of the health-disease process and goes back to the very discussion of the care model that was being built in the early 1990s in Brazil. For some authors, this strand is called health surveillance, while the restricted strand, is surveillance on health (SILVA, 2006; TEIXEIRA *et al.*, 1998).

The creation of a team in this municipality to act specifically in what would be environmental health surveillance took place in 2009. Although there are several possible sectoral divisions of action in environmental health surveillance, in the case of this municipality, actions in environmental health declared themselves to what is known as non-biological factors related to air and soil contamination, environmental contaminants and chemical substances, natural disasters, physical factors and work environment factors.

Currently, practices refer to receiving complaint reports, inspection, guidance and/or notification of internal and external environments in relation to air quality and exogenous intoxications from chemical contaminants. Within the actions on the risk of exposure to chemical contaminants, the team collaborates with an association of agroecological producers that acts in the participatory certification of organic production.

3.2 PERCEPTIONS ON INSTITUTIONAL CONDITIONS AND LIMITATIONS

The first codification had as an attribute the conditions and limitations for the performance of the environmental health team, mainly in the latter. Gibbs (2009, p.67) defines conditions or limitations as the precursor or cause of events or actions, things that limit behaviour or actions. For the analysis, only the items related to the institutional aspect were considered, without considering the speeches about the conditions and limitations in relation to the population, such as the lack of knowledge of the municipality's population about the performance of environmental health surveillance.

It is a consensus among the interviewees with the longest experience that some practices in the team have been reduced or suppressed over the last five years. In the reports, there is a temporal marker of before and after regarding the performance in the field of environmental health. The participants' reports brought this temporal aspect when we asked them to make a brief report on the current practices of the team.

The professionals used different terms to characterise the current context in which this team operates: "precariousness", "dismantling", "disqualification", "limitation", and "obstacles". These are difficulties of different kinds perceived by them in the context of public services and municipal health surveillance, as well as specific difficulties related to environmental health activities, such as lack of professionals and resources, outsourcing, difficulties in integrating with other teams and agencies, lack of recognition by the municipal management, uncertainty regarding the fate of health inspectors and changes in the organisational structure. Finally, they mentioned the Covid-19 pandemic as a factor that recently changed the team's performance.

For the analysis, only some of these difficulties were deepened, such as the lack of professionals and resources, difficulties in integrating with other teams and agencies and changes in the organisational structure. According to the reports, the decrease in the number of professionals was one of the aspects that most impacted the team's performance in recent years. In one decade, at least five professionals retired. At the time of the interviews, the staff was composed of six professionals, five from their own staff and one outsourced, most female.

According to Chart 1, the performance time varies between one and ten years. Five have been working for approximately ten years, almost coinciding with the team's creation; however, none of the team's founding professionals is still performing. Only one professional has less time of experience, approximately one year. She acts as coordinator (manager) of the environmental surveillance unit as a whole and has previously worked in health surveillance.

Chart 1 | Performance and education level of professionals in the environmental health team

<i>Participant</i>	<i>Time working in the team</i>	<i>Job position</i>	<i>Education level</i>
P1	Approximately 10 years	Receptionist	Technic course
P2	Approximately 10 years	Administrative assistant	University graduate
P3	Approximately 10 years	Inspection Agent	Specialisation
P4	Approximately one year	Veterinarian	University graduate
P5	Approximately 10 years	Nurse	Specialisation
P6	Approximately 10 years	Inspection Agent	Specialisation

Source: Elaborated by the authors.

Regarding the team's organisational structure, two changes affected the team's performance. The first one was the team's disarticulation of duties related to the worker's health. The second change occurred in 2021 when the environmental health team was reorganised and incorporated as a nucleus in the human consumption water surveillance team.

Another difficulty pointed out is the lack of recognition by other teams and the municipal management of the role of surveillance in environmental health. Ivancko *et al.* (2021) point out that, as the environmental area is more recent in relation to the other areas of health surveillance (sanitary, epidemiological and occupational health), it does not have the same visibility on the part of the population and on the part of health professionals and managers themselves. The visibility and articulation of the team's actions could take place through intersectoral meetings.

The lack of logistical and operational support was another factor mentioned, especially the availability of vehicles for actions outside the institution. As an example, one professional mentions training actions with public primary health care professionals on air pollution that the team carried out in recent years within the scope of the National Environmental Health Surveillance Program for Populations Exposed to Atmospheric Pollution.

In summary, reports of general difficulties in health surveillance are related to a lack of professionals and resources, outsourcing, difficulties in integrating with other teams and agencies, lack of recognition by municipal management, etc. Some studies point to these same difficulties from the perception of managers, technicians and other professionals who work in health surveillance (GARIBOTTI *et al.*, 2006; SILVA, 2018; SOUSA, 2017).

3.3 TYPES OF PROFESSIONAL KNOWLEDGE

According to the situation presented, it can be observed that some practices adopted at work are not in accordance with what was previously established, which can generate a feeling of frustration in some of the participants involved. This dissatisfaction is not only expressed in the quantitative aspect of the workforce and available resources, as it is also expressed in the set of different types of knowledge that does not seem to echo in the team's practices as before. The second codification was elaborated according to the definition of professional knowledge.

The study coordinated by Ramos *et al.* (2017) on the work of Family Health team *technicians* helps to think about this feeling shared by the participants through what the authors call professional knowledge. That is the knowledge constructed and involved in the work processes, which originates from the formal dissemination of technical-scientific knowledge and practical experience. There are three types of health technicians in this context: technical-scientific, relational and ethical-political. This division is for analysis purposes only, as, in reality, they are always present and intermingled. Although data were not collected from the script of questions presented by Ramos *et al.* (2017), several of the participants' statements fit the three types of knowledge presented.

Technical-scientific knowledge refers to "the sciences that underlie the profession/speciality and the techniques appropriate to the respective procedures" (RAMOS, 2017, p. 59). Chart 1 reveals that five of the six professionals have a higher education level than required for the position. An important case is that of two health inspectors, positions with initial training in high school: both highlighted the importance of their qualification to act as an agent assigned explicitly to health surveillance³.

The two other contents of professional knowledge refer to relational and ethical-political knowledge. Ramos *et al.* (2017) recall that knowledge learned through experiences is obtained through work processes and everyday life, such as in one's family environment, community, and territory, as well as in social, political, union, religious and cultural movements.

The relational knowledge, as defined by Ramos *et al.* (2017, p. 50), refers to the knowledge and skills related to communication, collaboration, and teamwork, which are essential in complex work environments and for successful organisational performance. Regarding this type of knowledge, all participants mentioned colleagues who have already retired and who influenced and contributed to the formation and performance of the team. It is understood, therefore, that they were professionals with a propositional and articulating profile, which partly explains the pioneering history of several actions of this team, including at the national level.

Thus, it can be seen that the team's actions aimed at education and health promotion were driven more by the individual and collective engagement of the professionals than by an agenda defined by the different municipal administrations. The partnerships established with the health council, executive

and legislative organs of the municipality, judicial organs and, more recently, with an association of organic farmers are the result of the individual and collective trajectory of these professionals in seeking transversality of surveillance actions in environmental health.

However, these actions became increasingly rarefied in the context of recent retirements and the lack of replacement of professionals. This lack of replacement directly hindered practices based on knowledge built through the professionals' own experience and trajectory. This knowledge is not "ready" in manuals and training but rather shared throughout their respective trajectories through multidisciplinary and plural contact with other professionals from this and other teams.

The professionals who retired were key professionals who directly participated in the process of municipalisation of health surveillance, being close to primary care and the notion of territorialisation of health. Likewise, they had contact with the discussion about the health surveillance model to be implemented in the municipality in the mid-1990s.

Although the types of professional knowledge in relation to what would be an expanded health surveillance are marked in their experience and trajectory regardless of their education level, it is necessary to emphasise that there are professional trainings that are fundamentally important to think about this expanded model, represented by the field of human sciences and social sciences. In the case of this team, professionals from social work and sociology stand out. These are essential training courses to consider the link between health services and the population. In addition to the permanent staff, professionals and students from different areas have already worked in professional internships and residency programs, such as biology, anthropology, geography, and social work, among others not specifically from the health area.

The interviewees praised the function of health surveillance, especially environmental health surveillance, establishing contact with the population beyond the aspect of applying a certain sanitary or even environmental norm. In the case of the health inspectors, they emphasise supervisory and repressive purposes and preventive and educational ones. The two health inspectors seek to enhance their performance beyond the power of administrative police. For example, one of the inspection agents mentions that the team collaborates with an association of agroecological producers for participatory certification of organic production.

This action is an example of how the ethical-political engagement of professionals can stimulate a perspective of health promotion, in this case, through the appreciation of agroecology. By emphasising this action as positive and persisting in it, even while stating the disinterest of municipal management, they also defend an expanded health surveillance model discussed in the context of Collective Health.

3.4 THE IMPACTS OF PROFESSIONAL KNOWLEDGE AND PRACTICES LOSS

In summary, there was an emptying of the team, which is not only quantitative or workforce, but also of professional knowledge. Consequently, there is a negative impact on the possibilities of thinking and acting in environmental health surveillance. This is because the reduction in the number of professionals and several other perceived difficulties represent a challenge for the continuity of the work and for the maintenance of knowledge and practices accumulated over the years. Sousa (2017) calls this emptying of knowledge a "loss of institutional memory".

From the point of view of knowledge, the loss of diversity of technical-scientific knowledge characterised by multi-professional teams reduces the ability of health and environmental services to seek solutions for complex and unequal contexts related to the environmental health of the Brazilian population. The loss of relational and ethical-political knowledge has a direct negative impact on

reducing the ability of services to establish partnerships and engage popular participation in health and environment policies.

From the point of view of practices, it restricts them to the scope of the inspection, leading mainly to the discontinuity of health promotion and education actions, as well as environmental education. These limitations affect the ability of agencies to plan and execute broader agendas related to social and environmental rights, including the difficulty of designing and applying an expanded health surveillance model (PORTO, 2017). Extending this case to a larger context, we can thus relate the knowledge and practice loss in certain public agency teams with the discontinuity of actions and, consequently, with the dismantling of public policies.

4 CONCLUSIONS AND FINAL CONSIDERATIONS

This study sought to report the several difficulties of acting at the municipal level of environmental health surveillance from the perspective of public health professionals. We emphasise that there are limits to the research data analysis since they are linked to previous research with a different objective and that the results may be different for municipalities with smaller populations. Even so, the comparison with previous studies showed that these are shared difficulties in health surveillance, mainly at the municipal level.

In this scenario, it is necessary to rescue the principles that sought to guide the implementation of health surveillance at the municipal level, re-establishing a territorial agenda that includes the availability of professionals and resources to implement environmental health actions in line with the respective Health Promotion Policies and Health Surveillance Policy.

The dismantling of public policies is a broad phenomenon that characterises the discontinuity of actions necessary to carry out a public agenda represented by constitutional norms. We conclude that using professional knowledge can be a conceptual strategy to understand the dismantling of health and environmental policies. The main contribution of this study was to highlight the negative impacts derived from attempts to deplete professional knowledge in certain teams of public agencies, especially those related to the environmental area of health surveillance.

This approach can help other studies to identify practices and specific knowledge of the professionals involved in these policies and highlight the negative impacts of dismantling. This way, it is possible to relate the emptying of knowledge and practices in certain teams of public agencies with the discontinuity of actions and, consequently, with the dismantling of public policies. Thus, there is a methodological context to understand this dismantling from the professionals' perspective.

NOTES

- 1| In order to avoid or reduce risks to the interviewee's privacy, names and other identification data were omitted.
- 2| It was from the Normative Instruction of 01/2005 of the Ministry of Health that this division became more evident. It regulated the competencies of the Union, states and municipalities in the area of environmental health surveillance, especially in the areas of water for human consumption, air, soil, environmental contaminants and chemical substances, natural disasters, accidents with dangerous products, physical factors and the environment of work.
- 3| Nursing assistant and Nursing technician, Dental assistant and Dental technician, Endemic Control Agent and Community Health Agent.

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Descontinuidade de práticas em saúde ambiental: percepção de profissionais de município do Sul do Brasil

Discontinuity of practices in environmental health: perception of municipal professionals in Southern Brazil

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RESUMO

Esta pesquisa consistiu em investigar como o uso dos saberes profissionais pode ser empregado como estratégia conceitual para compreender o desmonte das políticas de saúde e ambiente. O objetivo foi examinar as condições e limitações percebidas por profissionais de vigilância em saúde envolvidos diretamente com questões ambientais e como isso pode afetar seus conhecimentos e práticas profissionais. Tratou-se de pesquisa com abordagem qualitativa e de natureza empírica, realizada por meio de entrevistas semiestruturadas com uma equipe de vigilância em saúde ambiental ligada a órgão público de um município do Sul do Brasil. A análise de dados foi feita por codificação e categorização temáticas. Os entrevistados citaram diversas dificuldades recentes de atuação que foram articuladas ao conceito de saberes profissionais. Dessa forma, a pesquisa concluiu que a redução do número de profissionais e outras dificuldades de equipes de saúde ambiental representam impactos negativos para a continuidade do trabalho e preservação dos saberes profissionais acumulados ao longo dos anos.

Palavras-chave: Saúde e Ambiente. Vigilância em Saúde Pública. Política de Saúde. Desmonte. Brasil.

ABSTRACT

This research investigates how professional knowledge could be employed as a conceptual strategy to understand the dismantlement of public policies regarding health and the environment. The goal was to examine the conditions and limitations perceived by health surveillance professionals involved directly with environmental issues and how that can affect their knowledge and professional practices. This research was based on a qualitative approach and an empirical nature, as it was performed through semi-structured interviews with an environmental health surveillance team linked to a public agency in

a municipality in southern Brazil. Data analysis was performed by thematic coding and categorisation. The interviewees mentioned several recent performance difficulties linked to the concept of professional knowledge. Thus, the research concluded that the reduction in the number of professionals and other difficulties of environmental health teams represent negative impacts on the continuity of the work and preservation of the professional knowledge accumulated over the years.

Keywords: Health and Environment. Public Health Surveillance. Health Policy. Dismantlement. Brazil.

1 INTRODUÇÃO

O Brasil enfrentou avanços e retrocessos significativos em suas políticas ambientais e de saúde ao longo das últimas décadas. Gusmão e Pavão (2020) apontam diversos avanços no planejamento e gestão ambiental no contexto brasileiro durante o período de 1970 a 2010. No entanto, da década de 2010 a 2020 ocorreram retrocessos significativos, principalmente com o novo Código Florestal promulgado em 2012 e as diversas tentativas do governo federal, a partir de 2019, de extinção de órgãos ambientais, redução de áreas protegidas e flexibilização da legislação ambiental.

Se, por um lado, a ideia de retrocessos ambientais em nível federal é vista como recente, por outro lado, as políticas sociais intensivas em recursos humanos, como educação e saúde (NEY; GONÇALVES, 2020), parecem sofrer há mais tempo com sucessivos e recorrentes retrocessos em todas as esferas administrativas do país. Na área da saúde, em particular, a situação se agravou ainda mais a partir da Emenda Constitucional (EC) nº 95, de 2016, e da pandemia da Covid-19 (PERES *et al.*, 2020; SOUZA, 2020).

Nesse mesmo contexto, a articulação de políticas de saúde com a questão ambiental tem sido cada vez mais evidente nas últimas décadas, sendo observada em conferências nacionais e internacionais, na Constituição Federal de 1988 e na lei de criação do Sistema Único de Saúde (BRASIL, 2009; STEDILE *et al.*, 2015). Nos serviços de vigilância em saúde brasileiros, a responsabilidade pelo planejamento e implementação de medidas de saúde pública relacionadas aos fatores ambientais é atribuída principalmente à vigilância em saúde ambiental. Do ponto de vista institucional do Sistema Único de Saúde, é a área da vigilância em saúde mais recente, se comparada às áreas de vigilância sanitária, epidemiológica e saúde do trabalhador. Ela tem sido implementada e organizada de formas variadas no âmbito dos estados e municípios brasileiros em meio à falta de uma política nacional e com constantes modificações na sua estrutura regulatória (BARCELLOS; QUITÉRIO, 2006; BEZERRA, 2017).

Diante disso, é fundamental desenvolver estratégias conceituais e metodológicas para uma melhor compreensão sobre o fenômeno de desmonte na saúde e gestão ambiental públicas. Uma das abordagens possíveis é explorar os seus impactos por meio das percepções dos seus trabalhadores, articulando-as com a definição de saberes profissionais. Esses saberes seriam os conhecimentos construídos e implicados nos processos de trabalho, originados tanto da veiculação formal do conhecimento técnico-científico quanto da experiência na prática (RAMOS *et al.*, 2017). Eles são classificados em três tipos: técnico-científico, relacional e ético-político.

Assim, esta pesquisa consistiu em investigar como o uso dos saberes profissionais pode ser empregado como estratégia conceitual para compreender o desmonte das políticas de saúde e ambiente. O objetivo foi examinar as condições e limitações percebidas por profissionais de vigilância em saúde envolvidos diretamente com questões ambientais – a chamada vigilância em saúde ambiental – e como isso pode afetar seus conhecimentos e práticas profissionais.

Para isso, a pesquisa explorou as percepções de uma equipe de vigilância em saúde ambiental atuante em um órgão público de município localizado na Região Sul do Brasil e que sofreu com contextos de redução no número de profissionais, entre outras dificuldades nos últimos anos.¹ O local onde

conduzimos a pesquisa está situado em um município com quase um milhão e meio de habitantes e é reconhecido nacionalmente por seus esforços em estabelecer vigilância em saúde na década de 1990 e vigilância em saúde ambiental em meados da década de 2010.

2 METODOLOGIA

Adotamos a abordagem qualitativa de natureza empírica seguindo as diretrizes para pesquisas qualitativas de O'Brien (2014). Minayo (2012) considera que as pesquisas qualitativas são mais adequadas a investigações científicas de grupos, segmentos delimitados e focalizados, de histórias sociais sob o ponto de vista dos atores sociais, de relações e para análises de discursos e documentos. Dessa maneira, justificamos a escolha dessa abordagem como forma de enriquecer a compreensão sobre os diversos apontamentos de profissionais da saúde sobre suas condições de atuação no campo da saúde ambiental.

Seguimos as orientações das autoras Minayo (2012) e Turcato (2005) sobre amostragem em pesquisas qualitativas. Para as autoras, a representatividade da amostra nesse tipo de abordagem não está necessariamente em critério numérico (probabilístico) e sim na vinculação significativa que os sujeitos possuem com o fenômeno estudado e a capacidade de o pesquisador compreender as homogeneidades, diversidades e intensidades dos sentidos individuais ou coletivos desse fenômeno para a vida das pessoas. Embora na fase exploratória houvesse a intenção de abrangência de entrevistas com equipes multiprofissionais das quatro áreas de vigilância (sanitária, epidemiológica, ambiental e saúde do trabalhador), o recorte empírico das entrevistas foi dirigido à área da vigilância com atuação na saúde ambiental. Esse recorte foi escolhido tanto em função das dificuldades encontradas ao longo do contexto pandêmico da Covid-19 quanto pela constatação de que a equipe multiprofissional em questão trazia riqueza de dados pertinentes e suficientes para os objetivos deste estudo.

Dessa forma, definimos como critérios de inclusão a participação de profissionais de equipe multiprofissional da vigilância em saúde que atuassem ou tivessem atuado há pelo menos seis meses no planejamento e/ou execução de ações em saúde ambiental no município de estudo, cujos resultados são parte de uma pesquisa mais ampla, ainda em andamento, sobre noções de ambiente na vigilância em saúde.

Um encontro preliminar ocorreu entre pesquisadores e profissionais da saúde dentro dos critérios de inclusão para explicação sobre os objetivos da pesquisa. Coletamos os dados por meio de entrevistas semiestruturadas, aplicadas de forma direta no período entre agosto e outubro de 2022. Um roteiro de perguntas dividido em três eixos guiou a coleta de dados: formação e atuação profissional, práticas em saúde ambiental e significado de ambiente. A pesquisa foi aprovada pelo comitê de ética em pesquisa da Secretaria de Saúde do respectivo município. Os participantes receberam o Termo de Consentimento Livre e Esclarecido (TCLE).

Não houve recusa em participar da entrevista, de modo que os seis participantes convidados responderam em sala reservada na própria instituição de trabalho, sendo quatro individualmente e dois em uma mesma entrevista. A duração média das entrevistas foi de uma hora, com o registro por meio de gravação e transcrição de áudio padrão. Além disso, inserimos em um diário de campo as notas logo após as reuniões e entrevistas.

Para a sistematização dos dados, utilizamos a técnica de codificação e categorização temáticas de Gibbs (2009), com o auxílio do *software* de análise de dados qualitativos NVivo. As entrevistas foram codificadas primeiramente pelo atributo de condições e limitações sobre as dificuldades gerais e específicas de atuação da equipe. Depois disso, a codificação foi feita com base nos três tipos de saberes profissionais segundo Ramos *et al.* (2017): conhecimento técnico-científico, relacional e ético-político. A categorização dessas codificações foi feita por agrupamentos temáticos sendo articulada à

revisão preliminar de literatura. Para a apresentação dos resultados e análises, dividimos o texto em quatro tópicos: 1) Caracterização do local de estudo; 2) Condições e limitações de atuação; 3) Saberes profissionais, que buscou articular as narrativas de trajetória dos participantes com a definição de saberes profissionais; e 4) Os impactos do esvaziamento de saberes profissionais, que buscou explorar as consequências da redução quantitativa e qualitativa de número de profissionais em equipes multidisciplinares de saúde ambiental.

3 RESULTADOS E DISCUSSÕES

3.1 CARACTERIZAÇÃO DO LOCAL DE ESTUDO

O serviço de vigilância em saúde do município onde foi realizado o estudo é um órgão ligado à Secretaria Municipal de Saúde, com criação em meados da década de 2000. Presta serviços tanto de atenção à saúde do trabalhador quanto serviços de vigilância em saúde, por meio da vigilância sanitária, vigilância epidemiológica e vigilância em saúde ambiental. Voltado a concretizar o processo de municipalização de diversos serviços de saúde, esse município incorporou na época o modelo alternativo de vigilância em saúde (AERTS *et al.*, 2004).

Porto (2017) revisitou categorizações, como as de Teixeira *et al.* (1998) e de outros estudos da década de 1990, para definir duas propostas de vigilância em saúde que estão até hoje em disputa. Para esse autor, a vertente restrita de vigilância em saúde seria o modelo clássico de controle de agravos específicos com base na saúde pública. Ainda hoje é a perspectiva predominante na organização do Ministério da Saúde e do Sistema Único de Saúde. Já a vertente ampliada constitui-se como alternativa crítica ao modelo de base médico-assistencial e/ou sanitário-campanhista. Possui fundamentos na Saúde Coletiva, na compreensão do processo saúde-doença e remonta à própria discussão de modelo de atenção que estava sendo construído no início dos anos 1990 no Brasil. Para alguns autores, essa vertente é chamada de vigilância da saúde, enquanto a vertente restrita, de vigilância em saúde (SILVA, 2006; TEIXEIRA *et al.*, 1998).

A criação de uma equipe nesse município para atuar especificamente no que seria a vigilância em saúde ambiental ocorreu em 2009. Embora existam diversas possíveis divisões setoriais ² de atuação em vigilância em saúde ambiental, no caso desse município as ações em saúde ambiental voltaram-se ao que se conhece como fatores não biológicos relacionados às contaminações do ar e do solo, contaminantes ambientais e substâncias químicas, desastres naturais, fatores físicos e ambiente de trabalho.

Atualmente, as práticas referem-se ao recebimento de denúncias, fiscalização, orientação e/ou notificação de ambientes internos e externos em relação à qualidade do ar e intoxicações exógenas por contaminantes químicos. Dentro das ações sobre risco à exposição a contaminantes químicos, a equipe atua como colaboradora de uma associação de produtores agroecológicos que atua na certificação participativa da produção orgânica.

3.2 PERCEPÇÕES SOBRE CONDIÇÕES E LIMITAÇÕES INSTITUCIONAIS

A primeira codificação teve como atributo as condições e limitações para a atuação da equipe de saúde ambiental, principalmente essas últimas. Gibbs (2009, p.67) define condições ou limitações como o precursor ou a causa de eventos ou ações, coisas que limitam o comportamento ou as ações. Para a análise, foram considerados apenas os itens relacionados ao aspecto institucional, sem considerar as falas sobre as condições e limitações em relação à população, como, por exemplo, o desconhecimento da população do município sobre a atuação da vigilância em saúde ambiental.

É consenso entre os entrevistados com maior tempo de atuação que algumas práticas na equipe foram reduzidas ou suprimidas ao longo dos últimos cinco anos. Nos relatos, existe um marcador temporal de antes e depois em relação à atuação no âmbito da saúde ambiental. Os relatos dos participantes trouxeram esse aspecto temporal quando solicitamos que fizessem um breve relato sobre as práticas atuais da equipe.

Os profissionais utilizaram diversos termos para caracterizar o contexto atual de atuação da equipe: “precarização”, “desmonte”, “desqualificação”, “limitação” e “entraves”. São dificuldades de diversas ordens percebidas por eles no âmbito dos serviços públicos e da vigilância em saúde municipal, bem como dificuldades específicas relacionadas à atuação na saúde ambiental, como falta de profissionais e recursos, terceirizações, dificuldades de integração com outras equipes e órgãos, falta de reconhecimento por parte da gestão municipal, incerteza em relação ao destino dos agentes de fiscalização e mudanças na estrutura organizacional. Por fim, mencionaram a pandemia da Covid-19 como um fator que modificou a atuação da equipe nos últimos anos.

Para a análise, foram aprofundadas apenas algumas dessas dificuldades, como falta de profissionais e recursos, dificuldades de integração com outras equipes e órgãos, e mudanças na estrutura organizacional. Segundo os relatos, a diminuição do número de profissionais foi um dos aspectos que mais impactaram a atuação da equipe nos últimos anos. Em uma década, pelo menos cinco profissionais se aposentaram. No momento das entrevistas, o quadro estava composto por seis profissionais, cinco do quadro próprio e um terceirizado, a maioria do sexo feminino.

Conforme o Quadro 1, o tempo de atuação varia entre um e dez anos. Cinco têm atuação aproximada de dez anos, quase coincidindo com a criação da equipe; no entanto, nenhum profissional fundador da equipe ainda está atuando. Apenas uma profissional tem tempo menor, aproximadamente um ano. Ela atua como coordenadora (gerente) da unidade de vigilância ambiental como um todo e tem atuação anterior na vigilância sanitária.

Quadro 1 | Atuação e formação dos profissionais da equipe de saúde ambiental

<i>Participante</i>	<i>Tempo de atuação na equipe</i>	<i>Cargo</i>	<i>Nível de formação</i>
P1	Aproximadamente 10 anos	Recepcionista	Técnico
P2	Aproximadamente 10 anos	Assistente administrativo	Graduação
P3	Aproximadamente 10 anos	Agente de fiscalização	Especialização
P4	Aproximadamente 1 ano	Médico veterinário	Graduação
P5	Aproximadamente 10 anos	Enfermeira	Especialização
P6	Aproximadamente 10 anos	Agente de fiscalização	Especialização

Fonte: Elaboração própria.

Em relação à estrutura organizacional da equipe, houve duas mudanças que afetaram a atuação desta. A primeira foi desarticulação da equipe das atribuições relacionadas à saúde do trabalhador. A segunda alteração ocorreu em 2021, quando a equipe de saúde ambiental foi reorganizada e incorporada como um núcleo na equipe de vigilância de águas para consumo humano.

Outra dificuldade apontada é a falta de reconhecimento por parte de outras equipes e da própria gestão municipal do papel da vigilância em saúde ambiental. Ivancko *et al.* (2021) ressaltam que, como a área ambiental é mais recente em relação às demais áreas da vigilância em saúde (sanitária, epidemiológica e saúde do trabalhador), ela não tem a mesma visibilidade por parte da população e dos próprios profissionais e gestores da saúde pública. A visibilidade e articulação das ações da equipe poderiam se dar através de reuniões intersetoriais.

A falta de suporte logístico e operacional foi outro fator citado, em especial de disponibilização de veículos para ações fora da instituição. Como exemplo, uma profissional cita as ações de capacitação com profissionais da saúde da atenção básica sobre poluição do ar que a equipe realizou nos últimos anos no âmbito do Programa Nacional de Vigilância em Saúde Ambiental de Populações Expostas à Poluição Atmosférica (Vigiar).

Em resumo, os relatos de dificuldades gerais de atuação na vigilância em saúde estão relacionados à falta de profissionais e de recursos, terceirizações, dificuldades de integração com outras equipes e órgãos, falta de reconhecimento por parte da gestão municipal, etc. Alguns estudos apontam essas mesmas dificuldades a partir da percepção de gestores, técnicos e demais profissionais que atuam na vigilância em saúde (GARIBOTTI *et al.*, 2006; SILVA, 2018; SOUSA, 2017).

3.3 SABERES PROFISSIONAIS

De acordo com a situação apresentada, pode-se observar que algumas práticas adotadas no trabalho não estão de acordo com o que foi estabelecido anteriormente, o que pode gerar um sentimento de frustração em alguns dos participantes envolvidos. Essa insatisfação não está expressa apenas no aspecto quantitativo de força de trabalho e de recursos disponibilizados. Ela se expressa também no conjunto de saberes que parece não ecoar nas práticas da equipe como antes. A segunda codificação foi elaborada segundo a definição de saberes profissionais.

O estudo coordenado por Ramos *et al.* (2017) sobre o trabalho de técnicos em saúde³ no âmbito da Estratégia de Saúde da Família (ESF) auxilia a pensar sobre esse sentimento compartilhado pelos participantes por meio do que os autores denominam de saberes profissionais. Os saberes profissionais seriam os conhecimentos construídos e implicados nos processos de trabalho e que são originados tanto da veiculação formal do conhecimento técnico-científico quanto da experiência na prática. Seriam três os tipos de técnicos em saúde nesse contexto: técnico-científico, relacional e ético-político. Essa divisão é apenas para fins de análise, já que na realidade eles estão sempre presentes e mesclados. Embora os dados não tenham sido coletados a partir do roteiro de perguntas apresentado por Ramos *et al.* (2017), diversas falas dos participantes se encaixaram nos três tipos de conhecimentos apresentados.

O conhecimento de tipo técnico-científico refere-se “às ciências que fundamentam a profissão/especialidade e às técnicas adequadas aos respectivos procedimentos” (RAMOS, 2017, p. 59). O Quadro 1 revela que cinco dos seis profissionais apresentam nível de formação maior do que o exigido para o cargo. Um caso importante é o de dois agentes de fiscalização, cargo com formação inicial em ensino médio. Ambos ressaltaram a importância da sua qualificação para atuar como agente especificamente lotado na vigilância em saúde.

Os dois outros conteúdos dos saberes profissionais referem-se aos conhecimentos do tipo relacional e ético-político. Ramos *et al.* (2017) lembram que são conhecimentos aprendidos por meio das experiências que ocorrem não só nos processos de trabalho, como também na vivência cotidiana em família, comunidade, território, bem como em movimentos sociais, políticos, sindicais, religiosos e culturais.

O conhecimento relacional é definido por Ramos *et al.* (2017, p. 50) no contexto de técnicos em saúde da atenção básica como a “forma como aborda/acolhe o usuário e como se relaciona com os membros da equipe”. Em relação a esse tipo de conhecimento, todos os participantes citaram colegas que já se aposentaram e que influenciaram e contribuíram para a formação e atuação da equipe. Entende-se, portanto, que foram profissionais com perfil propositivo e articulador, o que explica em parte a história de pioneirismo de diversas ações dessa equipe, inclusive em âmbito nacional.

Assim, pode-se perceber que as ações da equipe voltadas para a educação e promoção da saúde foram impulsionadas mais pelo engajamento individual e coletivo dos próprios profissionais do que por uma agenda definida pelas diferentes gestões municipais. As parcerias realizadas com o conselho de saúde, órgãos executivos e legislativos do município, órgãos judiciários e, mais recentemente, com uma associação de agricultores orgânicos são resultado da própria trajetória individual e coletiva desses profissionais de buscar uma transversalidade das ações de vigilância em saúde ambiental.

No entanto, essas ações acabaram ficando cada vez mais rarefeitas em um contexto de aposentadorias recentes e falta de reposição de profissionais. Essa falta de reposição dificultou diretamente as práticas baseadas em saberes construídos por meio da própria experiência e trajetória dos profissionais. Esses saberes não estão “prontos” em manuais e capacitações, mas sim compartilhados no decorrer das respectivas trajetórias mediante o contato multidisciplinar e plural com os demais profissionais dessa e de outras equipes.

Os profissionais que se aposentaram foram profissionais-chave, que participaram diretamente do processo de municipalização da vigilância em saúde, tendo proximidade, inclusive, com a atenção básica e com a noção de territorialização da saúde. Da mesma forma, tiveram contato com a própria discussão sobre o modelo de vigilância em saúde a ser implementado no município, em meados da década de 1990.

Embora os saberes dos profissionais em relação ao que seria uma vigilância em saúde de caráter ampliado estejam marcados na experiência e trajetória independentemente de sua formação, é necessário ressaltar que existem formações profissionais de fundamental importância para pensar esse modelo ampliado, representado pelo campo de ciências humanas e sociais. No caso dessa equipe, ressaltam-se profissionais do serviço social e da sociologia. São formações essenciais para se pensar o vínculo entre serviços de saúde e população. Além do quadro permanente de profissionais, já atuaram profissionais e estudantes de diversas áreas em caráter de estágio profissional e de programa de residência, como biologia, antropologia, geografia, serviço social, entre outras não especificamente da área da saúde.

Os entrevistados enaltecem a função da vigilância em saúde, em especial da vigilância em saúde ambiental, de estabelecer o contato com a população para além do aspecto de aplicação de determinada norma sanitária ou mesmo ambiental. No caso dos agentes de fiscalização, eles ressaltam as finalidades não apenas fiscalizadoras e repressivas, como também as preventivas e educativas. Os dois agentes de fiscalização buscam enaltecer sua atuação para além do poder de polícia administrativa. Como exemplo, um dos agentes de fiscalização cita a forma de participação da equipe como colaboradora de uma associação de produtores agroecológicos para certificação participativa da produção orgânica.

Essa ação é um exemplo de como o engajamento ético-político dos profissionais tem potencial de estimular uma perspectiva de promoção da saúde, nesse caso por meio da valorização da agroecologia. Ao ressaltar essa ação como positiva e persistir nela mesmo afirmando o desinteresse da gestão municipal, estão atuando também em defesa de um modelo de vigilância em saúde ampliado discutido no âmbito da Saúde Coletiva.

3.4 OS IMPACTOS DO ESVAZIAMENTO DE SABERES PROFISSIONAIS

Em resumo, houve um esvaziamento da equipe que não é só quantitativo ou de força de trabalho, mas também de saberes profissionais. Conseqüentemente, há um impacto negativo nas possibilidades de se pensar e atuar na própria vigilância de saúde ambiental. Isso porque a redução do número de profissionais e as diversas outras dificuldades percebidas representam um desafio para a continuidade

do trabalho e para a manutenção de saberes e práticas acumulados ao longo dos anos. Sousa (2017) denomina esse esvaziamento de saberes de “perda de memória institucional”.

Do ponto de vista dos saberes, a perda da diversidade de conhecimentos técnico-científicos caracterizados pelas equipes multidisciplinares reduz a própria capacidade dos serviços de saúde e ambientais de buscar soluções para contextos complexos e desiguais relacionados à saúde ambiental da população brasileira. A perda de conhecimentos relacionais e ético-políticos possui um impacto negativo direto na redução da capacidade dos serviços de estabelecerem parcerias e engajar uma participação popular nas políticas de saúde e ambiente.

Do ponto de vista das práticas, restringe-as ao escopo da fiscalização, levando principalmente à descontinuidade de ações de promoção e educação em saúde, assim como de educação ambiental. Essas limitações afetam a capacidade dos órgãos de planejar e executar agendas mais amplas relacionadas aos direitos sociais e ambientais, incluindo a dificuldade de conceber e aplicar um modelo ampliado de vigilância em saúde (PORTO, 2017). Ampliando esse caso para um contexto maior, podemos, dessa forma, relacionar o esvaziamento de saberes e práticas em determinadas equipes de órgãos públicos com a descontinuidade de ações e, conseqüentemente, com o desmonte de políticas públicas.

4 CONCLUSÕES E CONSIDERAÇÕES FINAIS

Este estudo buscou relatar as diversas dificuldades de atuação no âmbito municipal de vigilância em saúde ambiental a partir da percepção dos profissionais de saúde. Ressaltamos que existem limites para a análise dos dados da pesquisa visto que eles estão atrelados a uma pesquisa anterior com objetivo diferente e que os resultados possam ser distintos para municípios com menor porte populacional. Ainda assim, a comparação com os estudos prévios demonstrou que são dificuldades compartilhadas na vigilância em saúde, principalmente no âmbito municipal.

Diante disso, torna-se necessário resgatar os princípios que buscaram nortear a concretização da vigilância da saúde no âmbito municipal, reestabelecendo uma agenda territorial que contemple a disponibilização de profissionais e recursos para concretizar as ações de saúde ambiental em consonância com as respectivas Políticas de Promoção da Saúde e Vigilância em Saúde.

O desmonte de políticas públicas é um fenômeno amplo para caracterizar a descontinuidade de ações necessárias para efetivar uma agenda pública representada pelas normas constitucionais. Concluímos que o uso dos saberes profissionais pode ser uma estratégia conceitual para entender o desmonte de políticas de saúde e ambiente. A principal colaboração deste estudo foi evidenciar os impactos negativos derivados das tentativas de esvaziamento de saberes profissionais em determinadas equipes de órgãos públicos, em especial relacionadas à área ambiental da vigilância em saúde.

Essa abordagem pode auxiliar outros estudos a identificarem as práticas e conhecimentos específicos dos profissionais envolvidos nessas políticas e evidenciar os impactos negativos de desmontes. Dessa maneira, é possível relacionar o esvaziamento de saberes e práticas em determinadas equipes de órgãos públicos com a descontinuidade de ações e, conseqüentemente, com o desmonte de políticas públicas. Assim, há um encadeamento metodológico para compreender o desmonte a partir da percepção dos profissionais envolvidos.

NOTAS

1| Para evitar ou diminuir os riscos à privacidade dos entrevistados, nomes e demais informações de identificação foram anonimizados.

2| Foi a partir da Instrução Normativa de 01/2005 do Ministério da Saúde que esta divisão ficou mais evidenciada. Ela regulamentou as competências da União, estados e municípios na área da vigilância em saúde ambiental, especialmente nas áreas de água para consumo humano, ar, solo, contaminantes ambientais e substâncias químicas, desastres naturais, acidentes com produtos perigosos, fatores físicos e ambiente de trabalho.

3| Auxiliar e Técnico de Enfermagem, Auxiliar e Técnico de Saúde Bucal, Agente de Combate a Endemias (ACE) e Agente Comunitário de Saúde (ACS).

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Treated wastewater application in agriculture: potential assessment in the State of Santa Catarina/Brazil

Aplicação de esgoto tratado na agricultura: avaliação de potencial no Estado de Santa Catarina/Brasil

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ABSTRACT

This study aimed to evaluate the potential of using treated wastewater in the irrigation of 7 crops produced in the State of Santa Catarina by assessing the current demand for irrigation water in the study area and the future production of treated wastewater. Food production data were collected from the most significant public agricultural institution in the study area to calculate their blue water footprint, given the amount of food harvested. Future wastewater production data were gathered from official reports which present the sanitation plans to be performed by 2035. Geographic Information System tools and risk assessment approaches were used to present and discuss results from quantitative and qualitative perspectives. Results show that the amount of wastewater to be produced in 2035 could not only supply the current irrigation water demand for the selected crops but also allow agriculture to expand without consuming more potable water.

Keywords: Ecological Sanitation. Irrigation. Reuse. Crops. Circular Economy.

RESUMO

Este trabalho teve como objetivo avaliar o potencial de utilização de esgoto tratado na irrigação de sete culturas produzidas no estado de Santa Catarina, avaliando a demanda atual de água para irrigação na área de estudo e a produção futura de esgoto tratado. Os dados de produção de alimentos foram coletados por intermédio da instituição agrícola pública mais importante presente na área de estudo para calcular sua pegada hídrica azul, dada a quantidade de alimentos colhidos. Os dados de produção futura de esgoto tratado foram recolhidos a partir de relatórios oficiais que apresentam os planos de saneamento a serem executados até 2035. Ferramentas de sistema de informação

geográfica e princípios de avaliação de risco foram utilizados para apresentar e discutir resultados de perspectivas quantitativas e qualitativas. Os resultados mostram que a quantidade de esgoto tratado a ser produzida em 2035 poderia não apenas suprir a demanda atual de água para irrigação das culturas selecionadas, mas também permitir a expansão da agricultura sem consumir mais água potável.

Palavras-chave: Saneamento Ecológico. Irrigação. Reúso. Culturas Agrícolas. Economia Circular.

1 INTRODUCTION

It is estimated that the global population will achieve 9.6 billion people in 2050, requiring a 70% increase in food production (HECKENMÜLLER; NARITA; KLEPPER, 2014). Agriculture accounts for 85% of the global blue water consumption, representing the volume of underground or superficial water used to complement precipitation to grow crops (MEKONNEN; HOEKSTRA, 2011). Another side effect of population growth is more wastewater to be dealt with appropriately. According to WHO and Unicef (2017), 39% of the global population did not have access to ideal sanitation facilities, and the excreta from 4,5 billion people was disposed into the environment without any treatment in 2015. Moreover, 870 thousand deaths related to the lack of sanitation and hygiene occurred worldwide in 2016 (WHO, 2018).

The ecological sanitation and circular economy approach bring potential solutions to these issues. Whereas sanitation by-products, such as treated wastewater, are considered waste or contaminants in the traditional sanitation mindset, they are resources in the view of ecological sanitation, presenting opportunities to be applied in different contexts (WIELEMAKER *et al.*, 2018). Several authors recommend the benefits of sanitation by-products reuse, such as Courault *et al.* (2017), Jössom *et al.* (1997), Magri *et al.* (2013), and Moazeni *et al.* (2017).

Nonetheless, despite having several benefits, the reuse of sanitation products raises concerns regarding the presence of pathogens and their potential negative impacts on human health (COURAULT *et al.*, 2017; MOAZENI *et al.*, 2017). However, these risks should not be seen as impediments to recycling sanitation by-products but as important key points to be studied and managed to achieve the benefits of ecological sanitation and preserve human and environmental health simultaneously (OWAMAH, 2014).

In Brazil, agriculture employs 15 million people and covers 351 million ha. In addition, research indicates a 48% increase in agricultural irrigation demand and a 5% increase in the agricultural area compared to 2006 (IBGE, 2017). Besides that, sanitation coverage in Brazil varies considerably throughout its territory. Considering all 26 states in Brazil, 3 have over 70% of wastewater collection by sewers, 8 are between 40-70%, and the other 15 are under 40%. Moreover, Brazil (2019) shows that, among the 4.050 cities studied, 996 presented less than 20% and 574 more than 80% of their wastewater treated.

Although Brazil has yet to update legal instruments with minimal quality standards guiding the application of sanitation by-products in the soil, recent Brazilian legislation meets the importance of this practice. The Ministry of Science, Technology, Innovation, and Communication of the Brazilian government, in the document MCTIC No 1.122 of March 19th, 2020, which sets the priority areas of research in science, technology, innovation, and communication, prioritised the development of innovation regarding sanitation, life quality, treatment of pollution, environmental preservation, health, sanitation, water safety, among others. Moreover, Brazilian law No 14.026 of July 15th, 2020, which refers to the new Brazilian basic sanitation legal framework, brings the word reuse repetitively as long as it meets environmental restrictions and public health concerns (BRASIL, 2020).

Given that, mapping the agricultural water demand and the possible supply of treated wastewater makes it possible to identify locations with greater potential of reusing sanitation by-products, allowing for a more assertive study of the risk involved and recommending good hygiene and prevention practices, as carried out by Barbagallo *et al.* (2012), Mara *et al.* (2007), and OMS (2006). Furthermore, potential and quality assessment studies provide a starting point for logistics and economic evaluation to implement specific solutions to high-potential areas and foment the creation of legislation to guide reuse practices. Therefore, the study of the application of treated wastewater in agricultural irrigation covers not only food production and water saving but an alternative to the disposal of this sanitation by-product, meeting the multi-barrier approach proposed by the World Health Organization (WHO). The study herein presented aims to evaluate the potential of treated wastewater use in agricultural irrigation in the State of Santa Catarina, located in southern Brazil, by assessing the current demand for irrigation water in the study area and the future production of treated wastewater. Food production data were collected from the most significant public agricultural institution in the study area. They covered historical series from 2016 to 2020 to calculate their blue water footprint, given the amount of food harvested from selected crops. Wastewater production data were gathered from official reports, which present the sanitation plan to be performed by 2035, the number of wastewater treatment plants (WWTP), served population, flow rate, type of treatment, and load discharged. Geographic Information System (GIS) tools and risk assessment approaches were used to present and discuss results in quantitative and qualitative perspectives, providing data that allow future studies to assess specific areas in further detail, fomenting ecological sanitation and assisting decision-makers.

The study herein presented aims to evaluate the potential of treated wastewater use in agricultural irrigation in the State of Santa Catarina, located in southern Brazil, by assessing the current demand for irrigation water in the study area and the future production of treated wastewater. Food production data were collected from the most significant public agricultural institution in the study area. They covered historical series from 2016 to 2020 to calculate their blue water footprint, given the amount of food harvested from selected crops. Wastewater production data were gathered from official reports, which present the sanitation plan to be performed by 2035, the number of wastewater treatment plants (WWTP), served population, flow rate, type of treatment, and load discharged. Geographic Information System (GIS) tools and risk assessment approaches were used to present and discuss results in quantitative and qualitative perspectives, providing data that allow future studies to assess specific areas in further detail, fomenting ecological sanitation and assisting decision-makers.

2 METHODS

2.1 STUDY AREA

The State of Santa Catarina is located in southern Brazil and has an area of 95.736 km² and a current population of over 7 million people. Agriculture activity is present throughout most of its territory, and despite not having an arid or semi-arid climate, the study area has experienced periods of drought, which generated negative impacts on food and energy production, in addition to bringing attention to reducing water consumption to provide security and stability to its water supply.

The study area has 16.214 agricultural establishments totalising 167.243 ha of irrigated area (IBGE, 2017) and under 40% of wastewater collection through sanitary sewers (BRASIL, 2019), indicating that most of the wastewater produced is either treated in loco or discharged without any quality control. However, Santa Catarina had the 6th biggest investment in sanitation between 2016 and 2018 among all the Brazilian States and intends to increase its number of WWTP by 2035 (ANA, 2013).

2.2 ASSESSMENT AND DATA COLLECTION

2.2.1 AGRICULTURAL IRRIGATION WATER DEMAND

At first, 23 crops were pre-selected. Data from the Agricultural Research and Rural Extension Company of Santa Catarina (Epagri) were collected regarding the production of vegetal crops and their respective harvests performed between 2016 and 2020 in different municipalities.

Given the lack of local irrigation requirements databases, data collection considered the report entitled *The Green, Blue and Grey Water Footprint of Crops and Derived Crop Products* (MEKONNEN; HOEKSTRA, 2010), produced by the Institute for Water Education of Unesco, which provides information about water footprints of different crops in distinct locations, including the study area. Moreover, Mekonnen and Hoekstra (2010) provide details regarding blue water consumption in agriculture, which equals zero in non-irrigated crops. This approach to irrigation water footprint has also been used by Rost *et al.* (2008) and Seckler *et al.* (1998). Given that, this study considered that a crop's respective blue water footprint is equivalent to its irrigation needs once it complements the precipitation volume, represented by green water. The crops with blue water footprint values equal to zero were excluded from the study. The calculation of the irrigation water demand for the remaining crops and the municipalities that produce them was carried by the multiplication between the amount of food ($t \text{ year}^{-1}$) and the required amount of irrigation water needed to produce one ton of one specific crop ($m^3 t^{-1}$), resulting in the necessary volume of irrigation water per year ($m^3 \text{ year}^{-1}$). Afterwards, these results were transformed into people equivalent to facilitate their comprehension by dividing the results by the average water consumption ($m^3 \text{ year inhab}^{-1}$) of 2016, 2017, and 2018 in the study area (BRASIL, 2018), achieving a value in inhabitants per year. Municipalities that irrigated volumes equivalent to less than 1.000 inhab were excluded from the study. Therefore, considering the criteria applied, the scope of this study covered 7 crops (rice, onions, garlic, cavendish, banana, potatoes, tomatoes, and chunky banana) grown in, respectively, 85, 18, 7, 6, 2, 2, and 1 cities that irrigate more than the equivalent to the water consumption of 1.000 inhabitants.

2.2.2 TREATED WASTEWATER PRODUCTION AND INVESTMENTS IN SANITATION

Data provided by the Brazilian government (ANA, 2013) were collected for the municipalities selected regarding their planned WWTP by 2035. Data collection covered the names of the WWTP, population served, type of treatment, flow rate, and BOD load discharged, as well as the investments planned for future sanitation coverage expansions.

Besides, information regarding bacteria concentrations in the treated wastewater produced was gathered and further used to discuss the risks related to irrigating crops with treated wastewater. Data collection was performed by identifying the technologies chosen for the WWTP planned and using their efficiency and removal data presented by Von Sperling (2007). Equivalence between faecal coliform (FC) and *E. coli* concentrations was considered, given the data available in different databases.

2.3 AGRICULTURAL IRRIGATION POTENTIAL WITH TREATED WASTEWATER AND RISK ASSESSMENT

The potential of agricultural irrigation with treated wastewater was calculated to indicate how much of the current irrigation demand could be covered by the future production of treated wastewater. Moreover, load discharge data were assessed to present the percentage resealed into water bodies that could be avoided if the municipalities studied used all of their potential to irrigate the current food production scenario.

The qualitative evaluation performed aimed at presenting the tolerable health risks for different irrigation scenarios, besides discussing the reduction of pathogens necessary to achieve such tolerable risks and determining how the necessary reduction of pathogens can be achieved. This approach became possible after the Disability Adjusted Life Years (DALY) parameter was introduced by WHO in 1993, which calculates the time of life lost due to the practice of a risk activity when compared to a disease-free life, as presented by Mara *et al.* (2007) and WHO (2006).

Given that different crops have different levels of restriction regarding the quality of the effluent that can be used in their irrigation, onion and garlic crops were chosen once they are cultivated under the soil, representing the worst possible situation. In addition, this choice allowed us to evaluate unrestricted and restricted irrigation of some of the highest water-demanding crops among the ones studied. Onions presented the second-highest irrigation demand, with an average annual production of approximately 533.673 tons. Besides, despite having the third greatest irrigation demand among the crops evaluated, garlic crops present a water requirement per ton produced approximately 9 times higher than onions, with an annual production of around 72.123 tons.

The reference values adopted for the acceptable risk of rotavirus infection per person per year (pppy) agree with the ones proposed by Mara *et al.* (2007) and presented by WHO (2006), being between 10^{-2} and 10^{-3} , meaning that between 0,1 and 1,0% of the exposed population gets ill every year. Thus, it was possible to evaluate scenarios with different levels of restriction and regulation, simulating more and less conservative guidelines with regard to the minimum quality standards required for the practice of agricultural irrigation with treated wastewater.

The qualitative evaluation of onion crops' unrestricted irrigation considered a scenario with pppy equal to 10^{-3} , which implies a maximum concentration of 10^3 E. coli/100mL in the effluent used to irrigate, meeting the recommendations of Mara *et al.* (2007) and the epidemiological studies carried out by WHO (2006), since onions develop underground and can be eaten raw by end consumers.

The evaluation of garlic crops considered two restricted irrigation scenarios to study the risks to farmers involved in its production. The scenarios evaluated considered the WHO recommendation for pppy equal to 10^{-3} in different types of agriculture: 1) more restrictive labour-intensive agriculture, which implies a maximum concentration of 10^4 E. coli/100mL in the effluent used to irrigate, 2) scenario of highly mechanised agriculture, less restrictive, which implies in a maximum concentration of 10^5 E. coli/100mL in the effluent used to irrigate.

The criteria considered in these scenarios followed the ones from the research and epidemiologic studies performed by Mara *et al.* (2007), being the consumption of 100g of raw onion per person per week over five months and 1-5 mL of sewage remaining in 100g of onion after irrigation. Regarding the garlic crops scenarios, they considered 150 and 300 days of annual exposure with 10^{-100} mg of soil consumed per exposure for labour-intensive agriculture and 100 days of annual exposure with 1^{-10} mg of soil consumed per exposure for highly mechanised agriculture.

Moreover, health protection measures suggested by WHO (2006) were used to discuss the results obtained and present good practices to increase the safety of production and consumption of the crops studied.

3 RESULTS AND DISCUSSION

3.1 AGRICULTURAL IRRIGATION WATER DEMAND

Data regarding blue water footprints and the agricultural irrigation water demand of each crop studied are presented in Table 1. Figure 1 shows the distribution of agricultural irrigation water demand in the study area.

Table 1 | Annual yield, blue water footprint, and irrigation demand for the selected crops

<i>Crop</i>	<i>Product Code (Faostat)</i>	<i>Total Yield per year (t year⁻¹)⁽¹⁾</i>	<i>Average Blue Water footprint for Santa Catarina/Brazil (m³ t⁻¹)</i>	<i>Agricultural Irrigation water demand (m³ year⁻¹)⁽¹⁾</i>
Rice	27	1.156.461	500	578.230.263
Onions	403	533.673	12	6.404.081
Garlic	406	18.041	110	1.984.496
Cavendish Banana	486	620.148	2	1.240.296
Potatoes	116	114.839	9	10.331.552
Tomatoes	388	164.569	3	493.708
Chunky Banana	486	115.959	2	231.917

Values cover all of the municipalities that produce the crops studied, including those that irrigate less than the equivalent of 1.000 inhab.

Source: Epagri (2022), Mekonnen and Hoekstra (2010).

3.2 TREATED WASTEWATER PRODUCTION AND ITS POTENTIAL TO IRRIGATE AGRICULTURE

Data regarding the investments in sanitation are presented in Table 2. Moreover, information about agriculture, irrigation, and sanitation in the study area is shown in Table 3. Figure 2 presents the distributions and ranges of treated wastewater production in the study area, whilst Figure 3 shows the potential of agricultural irrigation with treated wastewater by municipality and crop.

Table 2 | Investments planned to improve sanitation until 2035 in the cities that produce the crops studied

<i>Crop</i>	<i>Investments planned until 2035 (BRL)⁽¹⁾</i>			<i>Population served</i>	<i>Investment per inhab</i>		<i>Population served with WWTP</i>
	<i>Collection</i>	<i>Treatment⁽²⁾</i>	<i>Collection and Treatment</i>		<i>BRL</i>	<i>USD⁽³⁾</i>	
Rice	5.053.715.068	1.377.865.163	6.431.580.231	3.343.905	1.923	350	91%
Onions	367.906.000	109.715.566	477.621.566	216.335	2.208	401	90%
Garlic	268.478.483	90.121.898	358.600.381	173.552	2.066	376	90%
Cavendish Banana	345.385.261	107.444.075	452.829.336	258.048	1.755	319	92%
Potatoes	96.565.696	26.835.179	123.400.876	49.470	2.494	454	90%
Tomatoes	136.977.087	38.573.286	175.550.374	80.432	2.183	397	90%
Chunky Banana	11.783.082	3.036.959	14.820.041	5.990	2.474	450	90%

1] Corrected values to January 2022 given IPCA (Brazilian National Broad Consumer Price Index)

2] Most common solutions planned: Conventional and Advanced secondary treatment

3] The exchange rate between BRL and USD considered in this study was 5,50 BRL to 1 USD

Source: ANA (2013), Brasil (2018).

Table 3 | Agriculture, irrigation, and sanitation information regarding the crops and municipalities studied

Crop	Agriculture information			Irrigation water consumption		WWTP information			Agricultural irrigation potential range (%)	Load discharge avoided (%) ⁽⁵⁾	
	No. of cities ⁽¹⁾	Cultivated area (ha)	Yield (t year ⁻¹) ⁽²⁾	Irrigation Water (m ³ year ⁻¹) ⁽³⁾	Irrigation water: People equivalent (inhab)	No. of WWTP	Population served	Inlet flow (m ³ year ⁻¹)			Load discharged (kg BOD day ⁻¹)
Rice	85	283.888	1.155.996	577.997.917	10.445.620	100	3.349.170	130.978.469	36.814	0 - 2.685	74
Onions	18	72.922	494.532	5.934.390	107.247	24	216.335	7.089.293	1.977	15 - 642	59
Garlic	7	8.239	2.002	453.778	8.201	13	152.856	3.954.614	886	17 - 3.082	49
Cavendish Banana	6	28.254	434.879	869.759	15.718	8	258.048	9.460.800	2.836	231 - 6.351	8
Potatoes	2	3.350	43.250	389.250	7.035	2	49.470	567.648	562	86 - 367	30
Tomato	2	2.920	72.145	216.436	3.911	5	80.432	2.570.184	472	571 - 1.659	10
Chunky Banana	1	5.000	32.500	65.000	1.175	1	5.990	394.200	129	(4)	40

- 1| 10 municipalities produce two crops, and 2 municipalities produce 3 crops in their territory. The remaining cities produce only one of the crops studied.
- 2| The yield was calculated by the division of the total yield produced by the number of harvests performed between 2016 and 2020 in the municipalities that produce the crops studied and irrigate more than the equivalent of 1.000 inhab.
- 3| The presented volumes cover only the municipalities that produce the crops studied and irrigate more than 1.000 inhab.
- 4| No range presented once this crop was produced by 1 municipality.
- 5| Potential percentage of load discharged directly into water bodies that could be avoided if the municipalities studied used all of their agricultural irrigation potential to irrigate the current food production scenario.

Source: ANA (2013), Brasil (2018), Epagri (2022), The Authors.

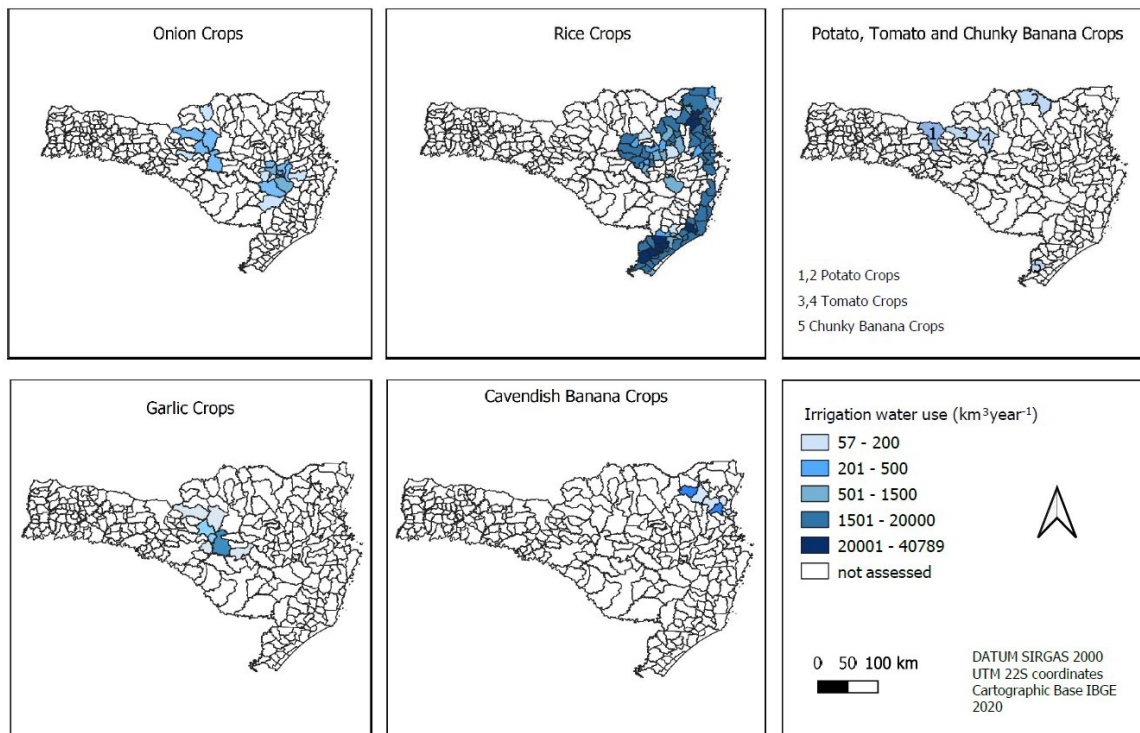


Figure 1 | Agricultural water demand by municipality and crop

Source: The authors.

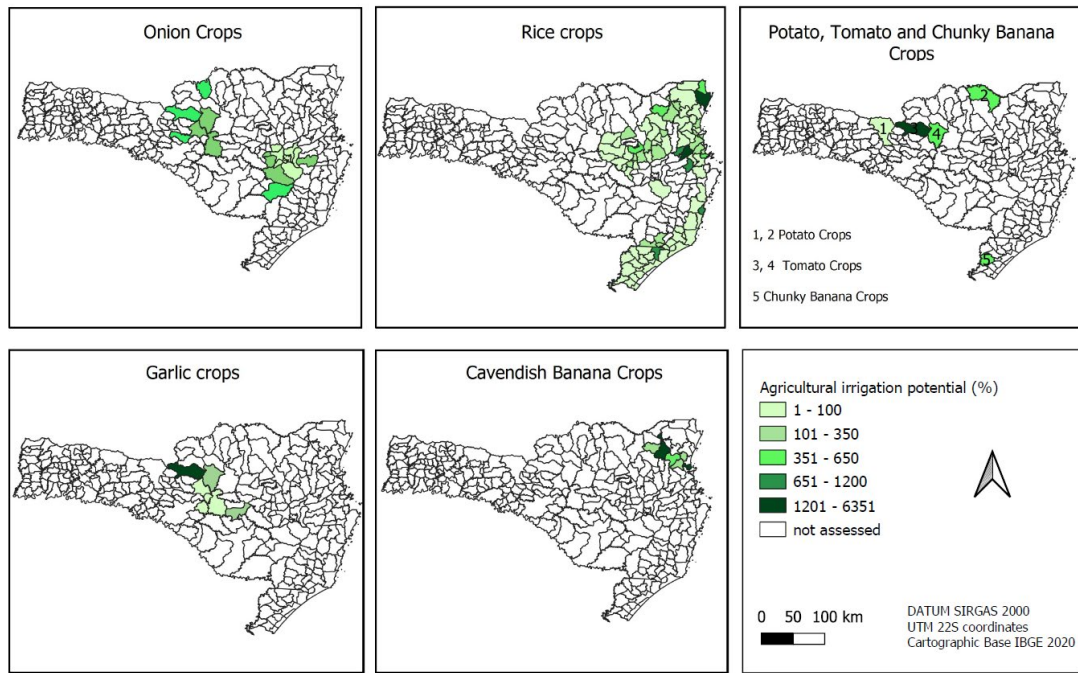


Figure 2 | Treated wastewater production by municipality and crop

Source: The authors.

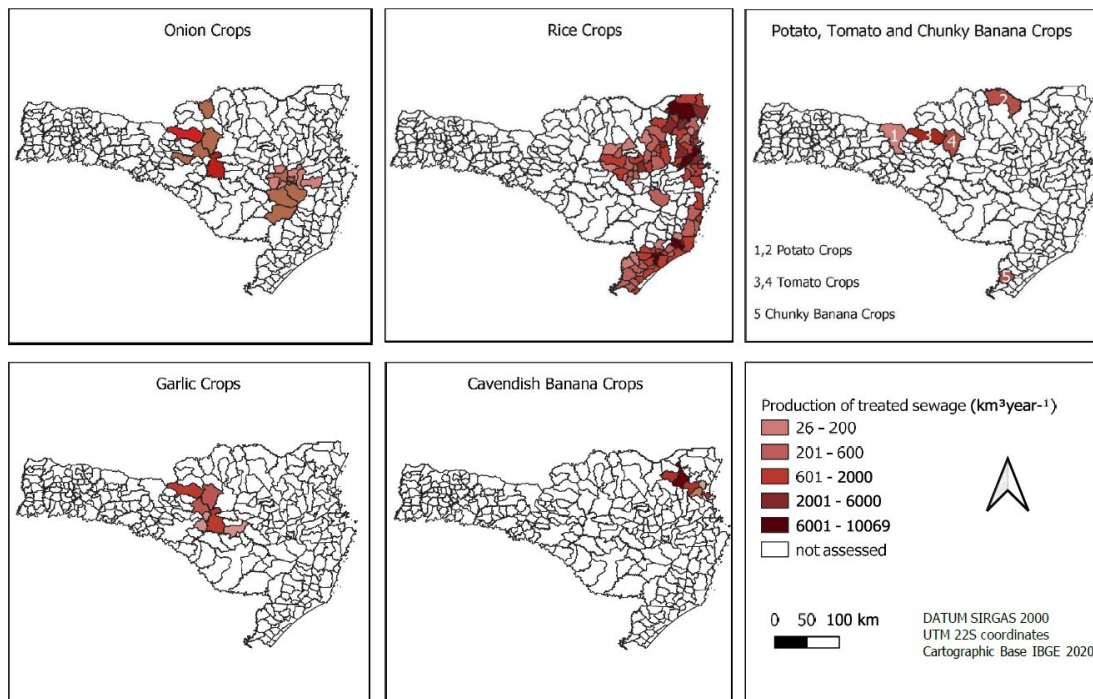


Figure 3 | Potential of agricultural irrigation with treated wastewater by municipality and crop

Source: The authors.

It is possible to observe that most of the municipalities that produce rice are located on the coast side of the study area, having the biggest irrigation water consumers in the north and south regions of the state. Most of the cities studied consumed irrigation water volumes above $501 \text{ km}^3 \text{ year}^{-1}$, reaching values up to $40.789 \text{ km}^3 \text{ year}^{-1}$. Future wastewater production in the cities that most

irrigated rice was not enough to provide the highest agricultural irrigation potential values, once none of the top 10 cities in terms of irrigation water volumes were among the top 10 highest agricultural irrigation potentials, mainly due to their low population when compared to the amount harvested. However, 34 out of the 84 rice-producing municipalities presented potentials over 80%. The cities with the highest agricultural irrigation potentials were Brusque (2.685%), São Francisco do Sul (2.348%), Criciúma (1.154%), Guabiruba (1.125%), Garopaba (654%), and Porto Belo (597%), totalising 1.894 km³year⁻¹, being equivalent to 34.228 inhab per year. The total irrigation water demand related to rice production was equivalent to over 10 million inhabitants, which is higher than the current population of Santa Catarina.

Onion production occurred in two distinct regions, with municipalities irrigating between 65 and 1.441 km³year⁻¹. Half of the top 10 cities in terms of irrigation water volumes were among the top 10 highest agricultural irrigation potentials, and 13 out of 18 onion-producing municipalities presented potentials over 80%. The cities with the highest agricultural irrigation potentials were Caçador (642%), Tangará (540%), Irineópolis (532%), Urubici (473%), and Curitibanos (289%), totalising 759 km³year⁻¹, being equivalent to 13.718 inhab per year. Onion crops had the second highest irrigation water demand in terms of people equivalent, around 107 thousand inhabitants.

The seven municipalities that produce garlic were concentrated in the same region in the study area, with irrigation water volumes ranging from 66 to 750 km³year⁻¹. Four cities presented potentials over 80%, those being Caçador (3.082%), Lebon Régis (320%), Ponte Alta (224%), and Curitibanos (81%), totalising 925 km³year⁻¹ or 16.721 inhab per year.

All the six cities that produce cavendish banana were located in the north of the study area and had agricultural irrigation potentials over 200%. The cities Jaraguá do Sul and Balneário Piçarras presented potentials of 6.351% and 2.394%, respectively. Given that, all of the necessary irrigation water volume could be supplied by treated wastewater, given the scope of this research, which would totalise 870 km³year⁻¹, equivalent to 15.718 inhab per year.

The cities that produce potatoes were Água Doce and Mafra, which presented potentials of 86% and 367%, respectively. The amount of irrigation water used by both cities to irrigate potatoes is 389 km³year⁻¹, equivalent to 7.035 inhab per year.

Tomatoes are produced in Caçador and Lebon Régis, which presented potentials of 1.659% and 571%, respectively. The amount of irrigation water used by both cities is 123 km³year⁻¹, equivalent to 2.216 inhab per year.

Jacinto Machado, the only producer of Chunky banana considered in this study, presented 606% of agriculture irrigation potential. The irrigation water volume used in this crop is 65 km³year⁻¹, equivalent to 1.175 inhab per year.

In relation to the WWTP planned until 2035, the most common types of solutions are conventional and advanced secondary treatment. Among the treatments planned, anaerobic reactors, activated sludge and anaerobic and aerobic filters stand out. The average adopted efficiency for the WWTP present in the cities that produce rice, onions, garlic, cavendish banana, potatoes, tomato, and chunky banana are, respectively, 73%, 72%, 78%, 76%, 84%, 79%, and 60%.

Regarding load discharge, if all the municipalities studied used all their agricultural irrigation potential to irrigate the current scenario of food production, the amount of BOD not discharged directly into water bodies, considering rice, onions, garlic, cavendish banana, potatoes, tomato, and chunky banana producers, would be, respectively, 27.240, 1.160, 436, 214, 169, 49, and 129 kg BOD day⁻¹. The total load discharge avoided would be around 60% of the one from the biggest WWTP in Latin America, located in the state of São Paulo, which has a current capacity to treat over 40 thousand litres per

second (ANA, 2013). Considering the study area, its biggest WWTP, located in the capital of the State of Santa Catarina, discharged 231.2 kg BOD day⁻¹ in 2013 and has an estimated load discharge of 468.3 kg BOD day⁻¹ after improvements planned until 2035 (ANA, 2013).

The results found make it possible to visualise the big picture of all the municipalities and crops considered in the scope of this research, in addition to analysing individual data of each city and the crops they produce. As an example, there is the city of Caçador, which presented the highest agricultural irrigation potential for Onions (642%), Garlic (3.082%), and Tomatoes (1.659%). In fact, its planned yearly treated wastewater production in 2035 can still cover 403% of the annual irrigation demand of the present production of all those three crops.

Moreover, Figure 1, Figure 2 and Figure 3 show that different municipalities with high demand for irrigation water and elevated treated wastewater production are grouped in clusters along the State of Santa Catarina, which indicates the possibility of cooperation among those cities. This increases the success rate of using treated wastewater to irrigate crops grown in the study area once it allows the centralisation of complementary treatment that may be necessary in order to meet quality standards imposed by the government and other regulatory institutions, as well as facilitating quality control, distribution, management, among other important factors to be considered.

Besides, it is important to highlight the importance of treated wastewater quality to safely use it to irrigate different crops, as well as taking other logistical, economic, and risk-related aspects into consideration. For instance, future studies should address the presence of family farming in the study area, as it is responsible for 23% of the farmed area in Brazil, Santa Catarina being the 8th State in terms of family farming presence out of 26 States in the country (IBGE, 2017). Furthermore, other water footprints must be assessed to fully understand the dynamics of crop irrigation with treated wastewater, such as the green water footprint, which is the rainwater used, and the grey water footprint, which refers to the amount of freshwater used to dilute pollution.

Ultimately, the data collection performed in this study considered information provided by the national government, representing a plan for improving sanitation by 2035. That being said, the authors here express that they intended to indicate potential and point out which crops and locations in the study area have a higher tendency to implement agricultural irrigation with treated wastewater, fomenting further research.

3.3 HEALTH SAFETY IN AGRICULTURAL IRRIGATION WITH TREATED WASTEWATER

Given the scenarios evaluated for onion and garlic crops, the qualitative evaluation performed allowed identifying the tolerable health risks for different irrigation scenarios, besides presenting the necessary reduction of pathogens to achieve such tolerable risks.

Among the 18 municipalities that produce onions, 16 have only one planned WWTP. Two presented more than one proposed WWTP, representing, respectively, 33% and 15% of the total population served by all evaluated WWTP. In addition, it should be noted that another city, despite having only one WWTP, is responsible for 16% of the total population served, which shows the concentration of production of treated wastewater in some locations. There was only one municipality that presented treatment via Waste Stabilization Ponds (WSP) with anaerobic followed by facultative and maturation ponds, reaching an average effluent quality between 10²-10⁴ FC/100mL, which requires only produce washing before eating to ensure infection risk equal to 10⁻³ pppy, once this practice has the potential of reducing 1 log (OMS, 2006). However, considering that onions are usually peeled before consumption, such a measure already implies a potential reduction of 2 logs. Therefore, the traditional consumption of onion can be safe, given the scope of the scenario assessed.

The remaining onion-producing cities have 15 WWTP planned with sewage treatment via anaerobic reactor, 1 via UASB followed by submerged aerated biofilters, 4 via conventional activated sludge, 1 via UASB reactor followed by anaerobic filters, and 2 via UASB followed by high-rate trickling filters. According to Von Sperling (2007), these types of treatment produce effluent with concentrations between 10^6 - 10^8 FC/100mL. The effluent from these solutions requires a reduction of 3-5 logs in its bacteria concentration to ensure its safe application, given the scenario considered. Possible health protection measures and cooking technics can contribute to achieving such logs reductions, e.g., washing with clean water (1 log), produce disinfection (2 logs), and peeling (2 logs). Combinations of good practice are possible. Besides, in addition to being eaten raw, onions usually go through cooking processes, which have the potential to reduce 6-7 logs (WHO, 2006).

Among the 7 selected municipalities that produce garlic, 5 have one WWTP planned. The other 2 concentrate 68% of the total population served by all WWTP evaluated in garlic-producing cities. Another city, despite having only one WWTP, is responsible for 23% of the total population served, which also shows the concentration of treated wastewater production. There are 7 WWTP planned with treatment via anaerobic reactor, 3 via conventional activated sludge, 1 via UASB reactor followed by anaerobic filters, and 2 via UASB followed by high-rate trickling filters. According to Von Sperling (2007), these types of treatment produce effluent with FC concentrations between 10^6 - 10^8 /100mL. The effluent from these solutions requires a reduction between 1-4 logs to ensure the safety of farmers who will work in irrigated fields with treated wastewater, depending on the type of agriculture practised. This reduction can be achieved through the implementation of complementary treatment units in order to reach the minimum quality of 10^4 and 10^5 E. coli/100mL, for labour-intensive and highly mechanised agriculture, respectively, as recommended by WHO (2006).

It is important to emphasise that the qualitative evaluation applied to garlic crops refers to the practice of restricted irrigation and, therefore, did not address the safety of the final consumer. Mara *et al.* (2007) and WHO (2006) recommend a concentration of $\leq 10^3$ E. coli/100mL for unrestricted irrigation of root crops and, as an example of a potential combination of health protection measures, indicate effluent treatment (reducing 4 logs), followed by the death of pathogens up to consumption (reducing 2 logs), ending with washing the product at home under running water (reducing 1 log). This combination applies to vegetables and salads irrigated with treated sewage. However, garlic is commonly cooked before eaten, which can reduce 6-7 logs.

It should be noted that different types of agriculture and crops imply different risks associated with the recycling of treated wastewater in irrigation. Therefore, it is necessary to continue researching more specific scopes in Brazil, once, despite labour-intensive agriculture being common in developing countries, Brazil is a reference country in agribusiness and, therefore, applies different types of technology in its agriculture. Besides, it is necessary to expand data collection and complementary evaluation of the proposed wastewater treatment solutions, addressing the systems as a whole by including all their treatment units in the evaluation.

Furthermore, Mara *et al.* (2007) indicate the possibility of reducing pppy requirements from 10^{-3} to 10^{-2} for both restricted and unrestricted irrigation, considering the global incidence of diarrheal diseases. The authors recommend concentrations $\leq 10^5$ E. coli in 100mL for labour-intensive agriculture, as long as farmers adopt good hygiene practices, and that the maximum concentration is reduced to $\leq 10^4$ E. coli in 100mL if people under the age of 15 are exposed. The authors suggest changing quality standards for highly mechanised agriculture from $\leq 10^5$ to $\leq 10^6$ E. coli in 100mL. Moreover, they agree with $\leq 10^3$ E. coli in 100mL for unrestricted irrigation of root crops grown underground and eaten raw. For crops that grow above ground level, they suggest changing from $\leq 10^3$ to $\leq 10^4$ E. coli in 100mL.

Furthermore, it is necessary to understand the particularities of each context when defining quality standards to be followed to guarantee the safety of farmers and end consumers without jeopardising the technical and economic feasibility of recycling sanitation by-products. As presented by Mathers

et al. (2002), the incidence of diarrheal diseases in developing countries is higher than the risk that their legislation aims to contain. Bearing in mind that one of the main causes of this type of disease is the lack of access to adequate sanitation services, it is necessary to reflect on whether the allocation of efforts should be in highly restrictive regulations or in the education, research and identification of alternative solutions that gather the expansion of sanitation coverage and food production.

4 CONCLUSIONS

The present study reports the wastewater irrigation potential in agriculture in the State of Santa Catarina/Brazil. The results regarding agricultural irrigation potential present the presence of many municipalities over 100%, going up to more than 6.000%, showing that the amount of wastewater to be produced in 2035 could not only supply the current irrigation water demand but also allow agriculture to expand without consuming more potable water to do so. Cooperation among different municipalities is possible, and the organic load discharge avoided is substantial.

The effluent quality produced by most of the planned WWTP requires further treatment or, at least, the application of hygiene and cooking methods to prevent infection risks. Given that most of these WWTP still need to be in operation, changes may be implemented to provide better quality effluent to irrigate crops.

Further research is necessary regarding economic evaluation, risk analysis, and other viability assessment key factors. Given that these aspects are very site-specific, they have not been taken into account in this study but can be applied in future research regarding the potential crops and cities hereby presented. Aspects regarding green and grey water footprints, as well as the presence of family farming, must be addressed in order to understand the dynamics of crop irrigation with treated wastewater fully and to foment the achievement of the Sustainable Development Goal 6, which focuses on ensuring access to water and sanitation for all.

Furthermore, the train of thought used in this study can be applied to perform similar assessments in other locations, considering their particularities.

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SAFA FAO as an assessment tool for family farming under the sustainability bias

SAFA FAO como ferramenta de avaliação da agricultura familiar sob o viés da sustentabilidade

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ABSTRACT

The use of Rapid Assessment Protocols can characterise environmental problems such as the degradation of river sources, help understand the socio-environmental scenario of rural communities, and contribute to a more in-depth characterisation of the context and the elaboration of public policies for its solution. This work aims to evaluate the sustainability index (SI) of rural properties using the SAFA tool. Indicators were selected that can contribute to identifying the advantages and limitations of rural properties inserted in a stream micro-basin in Brazil (Barra Grande, Canoinhas, Santa Catarina State). The community generally has a good SI, mainly due to economic resilience and social well-being dimensions, with lowest scores in environmental integrity and good governance. On the other hand, themes that should receive attention to increase the SI of the families are related to the increase of biodiversity in the properties, with an emphasis on forest coverage.

Keywords: Socioenvironmental. Sustainability index. SAFA.

RESUMO

A utilização de Protocolos de Avaliação Rápida pode caracterizar problemas ambientais como a degradação das nascentes dos rios, entender o cenário socioambiental das comunidades rurais, contribuir para uma caracterização mais aprofundada do contexto e para a elaboração de políticas

públicas para sua solução. Este trabalho tem como objetivo avaliar o índice de sustentabilidade (IS) de propriedades rurais utilizando a ferramenta SAFA. Foram selecionados indicadores que possam contribuir para identificar vantagens e limitações de propriedades rurais inseridas em uma microbacia do córrego no Brasil (Barra Grande, Canoinhas, Santa Catarina). Em geral, a comunidade tem um bom IS principalmente para resiliência econômica e dimensões de bem-estar social, com pontuações mais baixas em integridade ambiental e boa governança. Por outro lado, temas que devem receber atenção para aumento do IS das famílias estão relacionados à elevação da biodiversidade nas propriedades, com destaque para a cobertura florestal.

Palavras-chave: Socioambiental. Índice de sustentabilidade. SAFA.

1 INTRODUCTION

The debate over the last four decades on sustainability in rural areas has focused mostly on issues related to the maintenance of natural resources (environmental dimension) and their use in activities that generate the least possible impact on agricultural productivity (economic dimension) without due emphasis on the social and institutional dimensions (HANISCH *et al.*, 2019; POTRICH *et al.*, 2017).

As societies worldwide grapple with increasing challenges to environmental sustainability, questions about what makes knowledge actionable, how we design and fund programs to incentivise it, and how we evaluate the outcomes of its use and societal impact are more relevant than ever (MACH *et al.*, 2020).

Maintaining the balance between socioeconomic and environmental dimensions requires an understanding of economic flows related to the impacts that these actions can generate on the life of the family inserted in each productive system, providing sufficient resources to ensure the well-being of the individual (BENEDICTO *et al.*, 2022). Sustainability analysis is a fundamental strategy and must be carried out with tools that synergistically assess all its dimensions, proposing a continuous process of education and management of the sustainable development of a region, as well as the adoption of good resilient agricultural practices (BENEDICTO *et al.*, 2022; DESA *et al.*, 2016; LOCH *et al.*, 2015).

The great challenge of sustainability analyses has still been the use of adequate tools that adapt to the rural environment's different realities (HANISCH *et al.*, 2019). Interdisciplinary methodological approaches to evaluate the sustainability of complex productive systems relying on natural resources are therefore necessary.

Models facilitate the analysis of the complexity of the agricultural system. However, a well-selected set of indicators that allow the various aspects of its complex nature to be translated into clear, objective and general values constitutes an irreplaceable tool to summarise information and guide farmers' decision-making. (LARSEN *et al.*, 2020).

Several methodologies and models assess farming sustainability in countries (ALVAREZ *et al.*, 2010; BRIQUEL *et al.*, 2001; LÓPEZ-RIDAURA *et al.*, 2000; VIGLIZZO *et al.*, 2006). Among the tools that seek synergy between the four dimensions of sustainability in analysing agricultural systems, the SAFA tool - Sustainability Assessment of Food and Agriculture Systems, Smallholders version (FAO, 2014) has gained prominence. SAFA was developed by Food and Agriculture Organization of the United Nations (FAO) in 2012 to assess the degree of sustainability of agricultural holdings and provide public and private entities with indicators useful for detecting problems and identifying solutions. It is a tool for assessing the sustainability of food and agricultural systems, which sets an international benchmark in identifying the antagonism and synergism between the four dimensions of sustainability (good governance, environmental integrity, economic resilience and social well-being), making it possible to identify and understand the importance of transformations in knowledge management in productive

and social processes (CAMMARATA *et al.*, 2021; ELOI *et al.*, 2018; FAO, 2022; GAYTRI *et al.*, 2016; HANISCH *et al.*, 2019).

Knowing how the productive activities on a rural property impact the dimensions of sustainability is essential to seek strategies to improve the productive model and to contribute to the construction and implementation of public policies that meet the demands not only of the family directly involved but also of the community in the region and surroundings (COLOMBO *et al.*, 2020; CRUZ *et al.*, 2021). This is even more important in municipalities where most of the economy depends on the agricultural sector, especially family farming. In the municipality of Canoinhas, in Santa Catarina State, Brazil, agricultural production is characterised mainly by the cultivation of tobacco, grains, reforestation, and raising of pigs and dairy cattle. More than 70% of these activities come from properties with less than two fiscal modules (TORESAN, 2019).

The integrated tobacco production system, which stands out in the micro basin, follows the principle of mutuality, based on a technical-commercial partnership with the producers, who contract their tobacco crop with the guaranteed purchase of the entire volume produced, and where the company provides specialised technical assistance to farm production and for the economic, social and environmental planning of the property (BRUM *et al.*, 2020). Despite that, farming tobacco is a health risk because its leaves are nicotine rich. Especially in the morning, when air moisture forms dew in the tobacco leaves, water-soluble nicotine is dissolved in that dew water (ALI *et al.*, 2022). Based on this, evaluating the sustainability of rural properties that produce tobacco may help decision-makers in the region promote sustainability by reducing the adverse impacts of tobacco cultivation.

Due to several factors, the conservation of water resources has not been a priority in the rural areas of the region's municipalities over the last few decades, which has contributed to the increasingly frequent appearance of problems related to water scarcity from water courses. (MENICUCCI *et al.*, 2016). Work carried out by various governmental and private Brazilian institutions, mainly Epagri, the Agricultural Research and Rural Outreach Company of Santa Catarina, and the Canoinhas River and Negro River tributaries Committee, within the scope of environmental education and preservation of the environment, has sought to reverse this situation with the communities most affected by this type of problem.

Public engagement is understood as a prerequisite for sustainability transitions. However, it has remained peripheral to the transitions research agenda and the efforts to engage citizens in transitions research remain scattered. Thus, there is a need to create a more holistic understanding of how citizens participate in knowledge co-creation for sustainability transitions (HUTTUNEN *et al.*, 2022). Participatory governance involves relationality between those entrusted with formal governance of natural resources and those who directly use, benefit from, and impact natural resources (PALMER *et al.*, 2022). Based on the exposed, a work carried out with the Community of Salto da Água Verde, in the rural area of Canoinhas, Santa Catarina State, Brazil, stands out, where the observation of the low volume of water in its mainstream, due to the excess of sediments in its bed, associated with the absence of surrounding vegetation led to the development of more intense inter-institutional work in the watershed. Based on studies and articulations of these institutions, a revitalisation plan for the Barra Grande stream was initiated, directly involving 22 families of family farmers, who represent approximately 40% of the families residing in the watershed of the Barra Grande stream.

Thus, the present work aims to evaluate these rural properties' sustainability index, SI, using the SAFA tool. For this, indicators were selected that can contribute to identifying the advantages and limitations of rural properties inserted in the Barra Grande stream micro-basin and contribute to the strengthening of environmental recovery actions of the same and the better quality of life of the community.

2 METHODOLOGICAL PROCEDURES

The study area comprises the delimitation of the hydrographic micro-basin of the Barra Grande stream, between the coordinates 26.21° and 26.27° South latitude and 50.40° and 50.37° West longitude, located in the Canoinhas River Hydrographic Basin, located in Hydrographic Region 5 (RH5) of the state of Santa Catarina, Brazil, known as Planalto de Canoinhas, with an area of 932.62 hectares (PERH/SC, 2017; SANTA CATARINA, 2013) (Figure 1).

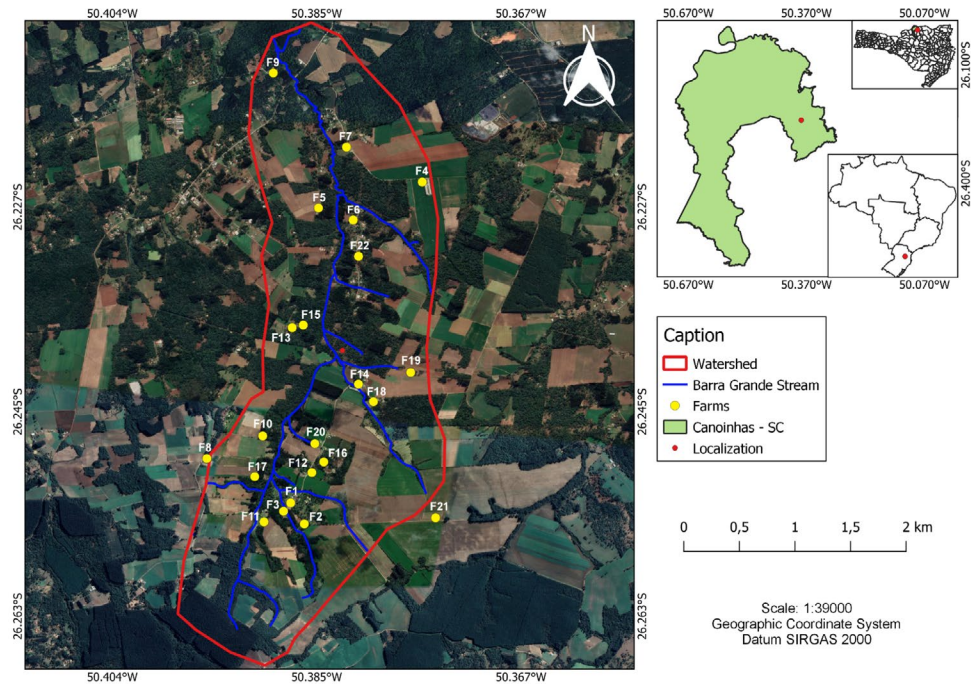


Figure 1 | Canoinhas Region, North Plateau of Santa Catarina, Brazil, with emphasis on the watershed of Córrego Barra Grande and the location of surveyed farms.

Source: Authors.

To collect the information, a questionnaire was applied based on the SAFA tool (Sustainability Assessment of Food and Agriculture Systems) Smallholders version, consisting of seventy questions related to perceptions regarding economic and environmental sustainability, governance and social well-being of the families included in the community. The 70 questions are divided into 4 dimensions, 20 themes and 32 indicators (Table 1). All points evaluated in the survey were selected because they correlate with the community's reality and which production systems are developed on the rural property.

Table 1 | Dimensions, themes and sustainability indicators selected from the SAFA tool, for the elaboration of the diagnosis used in the 22 families of the Barra Grande Community in Canoinhas, Santa Catarina State, Brazil, 2022

<i>Dimension</i>	<i>Subject</i>	<i>Indicator</i>
Good Governance (9 questions)	Corporate Ethics	Mission Knowledge
	Social Accounting	Social Accounting
	Participation	Participation
	Holistic Management	Sustainable Management Plan
	Legal aspects	Land ownership and use rights
Environmental Integrity (27 questions)		GHG mitigation practices
		Air pollution prevention practices
		Soil improvement practices
		nutrient balance
	Atmosphere	Area conservation and recovery practices
	Materials and Energy	Water conservation practices
	Ground	Water pollution prevention practices
	Water	Pesticides
	Product Quality and Information	Ecosystem diversity
	Biodiversity	Species conservation practices
		Genetic conservation of seeds and breeds
		Renewable and recycled materials
Economic Resilience (19 questions)		Energy use and consumption / Renewable energy
		Profitability
		Production Diversification
	Investment	Market Stability
	Vulnerability	Liquidity
	Product Quality and Information	Safety Nets
		Food Quality
	Certified Products	
Social Welfare (15 questions)		Fair Pricing and Transparency in Contracts
	Fair Trade Practices	Safety in the Workplace, Operations, And Facilities.
	Human Health and Safety	Capacity Development
	Decent Life	Gender Equity
	Equity	Food Sovereignty
	Cultural Diversity	Traditional Knowledge
	Quality Of Life	

Source: Adapted from HANISCH et al., 2019.

The score for each theme was determined according to the SAFA criteria, where the question for each indicator can have the answers: yes, no, partial or percentage calculation. Each response was transformed into a percentage, generating a sustainability index that can be classified as: Great > 80% represented by the dark green colour; Good: from 79 – 60% (light green); Moderate: from 59 – 40% (yellow); Limited: from 39 – 20% (orange); Unacceptable < 20% represented in turn in red colour.

The survey was carried out virtually after approval by the Ethics Committee for Research with Human Beings (CEPSH – IFC SC) in February and March 2022. The questionnaire was applied via the Google Forms platform, and firstly the farmer read the Free and Informed Consent Form (TCLE) and, agreeing, answered the research questions. Assurance of your integrity and that your participation will not present you with any physical, social or financial risk, and your responses will be kept confidential. Completing the questionnaire in full took approximately 30 (thirty) minutes, varying according to the individual rhythm.

The collected data were transferred to the Microsoft Excel program, where the analysis of the averages of each group and the elaboration of the “radar” type graphs suggested by FAO for the SAFA model were carried out. Graphs were prepared with the average response for each of the 70 guiding questions and presented according to the indicators defined for each dimension.

3 RESULTS AND DISCUSSION

Despite the spatial proximity of the rural properties (Figure 1), there was a considerable difference in the sustainability indices between them, which ranged from 48.14 (property B) to 87.44 (property G) and can be better visualised in the polygon’s individual of each (Figure 2).



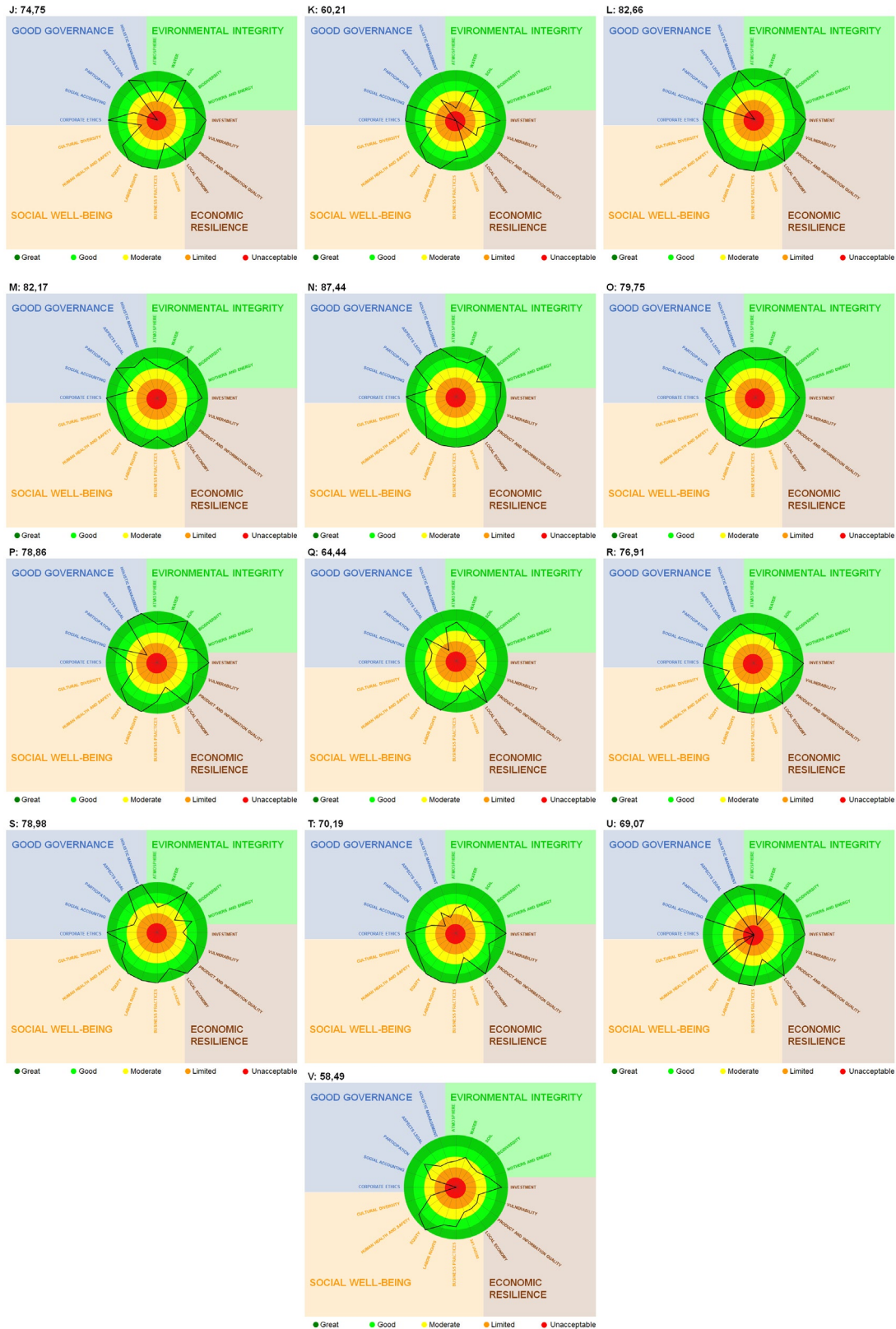


Figure 2] Graphical representation and sustainability index (represented by the value next to the letters from A to V) of 22 rural properties in the Barra Grande Community in Canoinhas State, Brazil, 2022. The highlighted polygon reflects the performance of each indicator evaluated by through the guiding questions; the colours represent the performance of the indicator: Great > 80% (dark green); Good: from 79 – 60% (light green); Moderate: from 59 – 40% (yellow); Limited: from 39 – 20% (orange); Unacceptable < 20% (red).

Source: Authors.

Despite the variability between properties, it is possible to verify that, in the average of the 22 properties, most of the evaluated indicators are found in the green zone, classified as good (Figure 3).

The lowest sustainability indices were obtained in the dimension of Good Governance, with emphasis on the theme of “participation”, followed by the theme of “biodiversity” in the dimension of Environmental Integrity, which contributed to the average value of these dimensions being below 70% (Figure 3 and Table 2). The dimensions of Economic Resilience and Social Well-Being reached high averages, indicating that the quality of life in the community tends to be high.

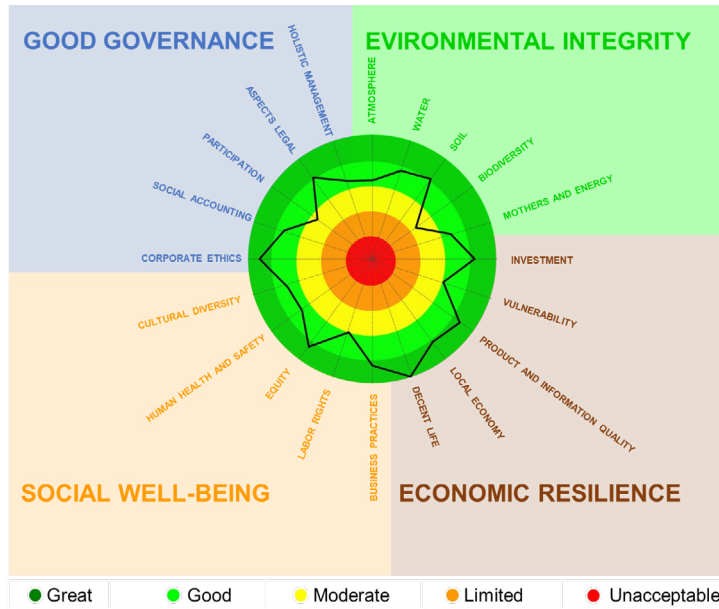


Figure 3 | Overall performance of the sustainability analysis of 22 rural properties in the Barra Grande Community, in Canoinhas, State, Brazil, 2022. The highlighted polygon reflects the performance of each indicator evaluated through the guiding questions.

Source: authors

Table 2 | Average sustainability index of the 22 properties in the Barra Grande Community in Canoinhas State, Brazil, and average value per analysed dimension, according to the SAFA tool.

Dimension	Subjects	Sustainability Index	Mean Value
Good governance	Corporate ethics	81,82	68,94
	Social accounting	65,91	
	Participation	43,18	
	Legal aspects	79,55	
	Holistic management	74,24	
Environmental integrity	Atmosphere	63,07	67,64
	Water	65,91	
	Ground	80,68	
	Biodiversity	54,17	
	Materials and energy	74,35	

<i>Dimension</i>	<i>Subjects</i>	<i>Sustainability Index</i>	<i>Mean Value</i>
Economic resilience	Investment	90,34	79,42
	Vulnerability	71,28	
	Product quality and information	69,70	
	Local economy	86,36	
Social well-being	Decent life	61,36	78,91
	Fair trade practices	85,23	
	Labor rights	98,86	
	Equity	81,82	
	Human health and safety	86,36	
	Cultural diversity	59,85	

Source: Authors.

3.1 GOOD GOVERNANCE

The Good Governance dimension can be understood as a horizontal dimension directly affecting other dimensions (GAYATRI *et al.*, 2016). The good performance in this dimension in the group's average is because the families work mainly with tobacco growing, which raised the averages in the themes of corporate ethics, legal aspects, and holistic management. The dynamics of tobacco growing are linked to integrating companies that are very strict throughout the production process, seeking to comply with the relevant legislation. In addition, as integrators provide technical and commercial support, all managerial issues are also adequately worked on with families.

On the other hand, the low average value obtained for the group of 22 families for the theme "participation" indicates little interaction between families and the community. For Cammarata *et al.* (2021), participation refers to the process of involving all interested parties and is characterised by dialogue and the generation of procedures for conflict resolution, without the risk of negative consequences, based on respect, mutual understanding, and equality. In the presentation of the graph by family, it is possible to verify that this theme was low even for families with a high sustainability index (Families B, C, D, G, H, J, K, L, P, T and U).

In the diagnosis, the participation theme was linked to the question related to the involvement of a family member in representative entities of the rural environment, such as cooperatives, associations, and unions. The fact that it was very low for several families indicates their individualism, which may also be related to the fact that they work with integrating companies, which, by their nature, tend to solve all problems directly with the integrated family.

On the other hand, it is interesting to point out that, due to a problem common to the entire community, which was the reduction in the availability of water in its mainstream, there was considerable involvement of everyone in projects related to environmental recovery, as a strategy to seek a joint resolution. This fact confirms the importance of working to increase awareness and individual commitment to sustainability issues. (SOLDI *et al.*, 2019).

3.2 ENVIRONMENTAL INTEGRITY

In this dimension, three themes obtained SI less than 70 (atmosphere, water, and biodiversity), and the SI of biodiversity, of 54.17 was the lowest of all the themes addressed in the diagnosis. These results are in accordance with the community's current situation since it was the search for the recovery of its

main body of water that is degraded. In addition, the results prove the efficiency of the SAFA diagnosis in detecting problems in the different dimensions of sustainability. This is visually confirmed in the individual polygons of the properties, where, except for property M, all the others have a lower score in the environmental dimension (Figure 3).

Interestingly, in the theme “soils”, the average SI was 80.67, indicating that the families understand that they adopt soil conservation practices (Table 2). However, the silting up of the body of water indicates that these practices may have implementation problems, which in turn requires an effort from the technical assistance institutions involved to detect the problems. It is very common in the region that the practice of minimum cultivation is understood as direct planting. However, avoiding soil preparation operations in minimum cultivation does not prevent the loss of water and soil since this practice is not validated by the presence of a significant amount of vegetation cover on the soil and is often carried out without respecting the natural unevenness of the terrain.

Regarding biodiversity, the low SI indicated that virtually all properties lack an organised environmental conservation plan. This theme addressed issues related to plant conservation and species diversity that contribute to establishing balance within the agro-ecosystem. The silting up of the water body refers precisely to preserving the riparian forest.

The good assessment of materials and energy is the result of investments in systems that have generated electricity savings in recent decades, both in greenhouses for drying tobacco and for use on properties. For the SAFA diagnosis, the two fundamental aspects of this thematic area are the share of recycled and renewable materials and the reduction of the material intensity of production (CAMMATTÀ *et al.*, 2021). Indeed, it was possible to detect that some properties have been adopting a source of solar energy, for example. In addition, most families are concerned with the disposal of pesticide packaging in compliance with relevant legislation and the use of inputs in accordance with technical recommendations.

The negative highlight for this dimension is related to the predominance of monoculture with tobacco cultivation, with the scheduled use of fertilisers and pesticides, and due to this great dependence on external inputs.

3.3 ECONOMIC RESILIENCE

The fact that most families practice agriculture based on tobacco production, the dimension of economic resilience is positively impacted, with the highest sustainability index, which was SI 79.42, with emphasis on financial investment themes on properties SI 90.34 and contribution to the local economy SI 86.36 (Table 2). Families, in general, demonstrated knowledge about expenses with activities carried out on the property, monitoring the cost of production, in addition to having a good estimate of profitability. This is an important factor for the permanence and autonomy of families in rural areas since, more autonomous and aware, producers feel less vulnerable to the market (COLOMBO *et al.*, 2020; ELOI *et al.*, 2018).

The productive system of tobacco cultivation has a large commercialisation network. There are, however, some negative aspects in relation to the setting of prices by integrator companies and their relationship with the classification of the final product. In recent years, marketing problems related to prices have been recurrent, even when the producer presents a final product of excellent quality. However, this fact is highlighted by the SI 69.70 (Table 2), the lowest in this dimension.

In the SAFA tool, investments are seen from a microeconomic perspective and are understood as the portion of the money spent on improvements that can make the farm more sustainable because by allocating money for the purchase of new land or equipment, the properties improve their capacities

and long-term profits (CAMMARATA *et al.*, 2021). This is necessary to keep them competitive. Based on the above, practically all families presented high values for the investment theme. This fact is related to tobacco companies' offers of lines of credit. In the same way, most of the families that participated in this diagnosis declared that they had some risk management plan, agricultural insurance or even some financial reserve, aiming to minimise losses with possible weather events, especially the risk of hail, a relatively common fact in the region.

3.4 SOCIAL WELL BEING

In the dimension of social well-being, it was possible to identify how families advanced in the issue of "fair trade practices" and "equity", with SI of 85.23 and 81.82 being results related to tobacco production, which has a well-defined and well-consolidated strategy for purchasing products and legal obligations to be followed by integrated families. In this dimension, on the other hand, the low rates in the theme "decent life" and "cultural diversity", with SI of 61.32 and 59.85, respectively, drew attention. In a way, there is also a certain relationship with the tobacco culture, which demands a large workforce, for a long period of the year, leaving little time to invest in activities that bring a better quality of life. Most properties do not hire labour, but when this is done, rural producers prioritise hiring people from the community, contributing to the local economy.

The social well-being dimension also maintained a good level, where "human health and safety" and "labour rights" are points respected by family members. Being a determinant for the quality of life of families, which includes aspects related to healthy eating, safe housing, time in which the family intends to remain together, and time for leisure, in addition to physical and financial security (ELOI *et al.*, 2018).

The surveyed community generally performs well in terms of the evaluated dimensions. The diagnosis tends to facilitate the discussion on which the families should prioritise topics to increase the sustainability of the properties and, consequently, the community. Undoubtedly, depending on the theme being worked on, attention should be paid to environmental integrity, with an SI of 67.64 and good governance, with an SI of 68.94 (Table 2). In environmental integrity, applying soil and water conservation practices, with training, lectures, and courses, applied by public and private institutions favours awareness and consequently an environmental improvement. To improve the dimension of good governance, the main point is the integration between families, which through work groups, can develop meeting routines to seek support from institutions that can help with difficulties encountered in the community.

In addition, in the dimension of social well-being, it highlights points that can be used by the community, together with the public sector, to propose and develop strategies for the implementation of public policies that allow access to culture to provide a more decent life, which had a low rating in the survey.

Although the focus of the research project was to build a vision of the sustainability of the community, there is undoubtedly an invaluable value in the individual analysis of each of the families since this data can be of great value in rural extension and implementation work of public policies. The fact that most families are at good and optimal levels of sustainability (Figure 4) allows the government to focus more heavily on families with lower IS and allows greater optimisation of efforts in the themes detected as problems for each participating families. The result of the proper use of tools such as SAFA can be a starting point for discussion, reflection, and learning, clearly indicating where each family can act to improve their sustainability indexes (OLDE *et al.*, 2016).

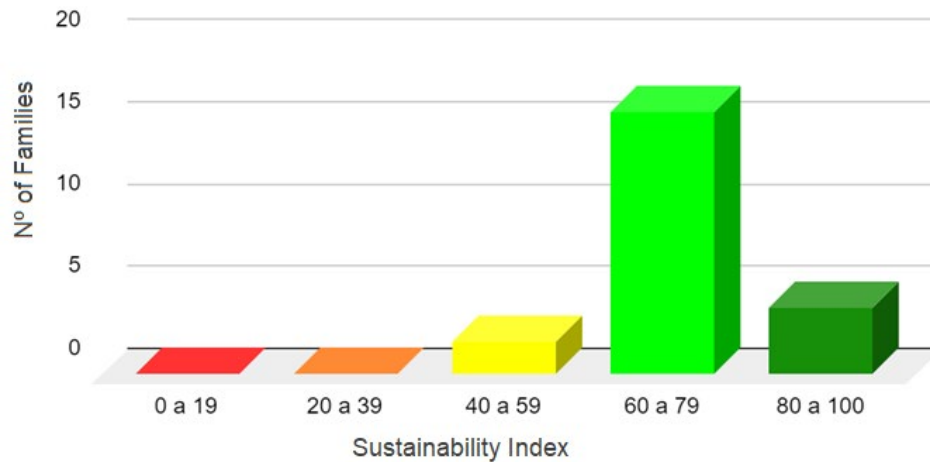


Figure 4| Number of families in the Community of Barra Grande, in Canoinhas State, Brazil, at each level of the sustainability index, according to the SAFA tool.

Source: Authors.

Finally, it was possible to observe that the use of the SAFA tool to evaluate the sustainability of the properties results in objective information, highlighting positive and negative aspects in a visual way of easy understanding and interpretation, always in the search for themes that can be worked on and implemented in the productive systems and properties evaluated similarly to those observed by other authors who used it (COLOMBO *et al.*, 2020; ELOY *et al.*, 2022; HANISCH *et al.*, 2019; POTRICH *et al.*, 2017). While a SAFA has a default set of indicators to ensure a holistic approach, it is also important for the assessor to identify critical areas based on materiality principles for the context of that entity.

4 CONCLUSIONS

Based on the farmers' perceptions, it was observed that families within the same watershed have different positions that can determine better or worse IS.

The use of the SAFA tool identified that there is, in the evaluated community, a good IS, despite the problems that exist in the environmental dimension, confirming the importance of analysing sustainability in rural areas using the evaluation of the four dimensions.

Sustainability scores were highest on the dimensions of economic resilience and social well-being, with lowest scores on environmental integrity and good governance. The themes that should receive more attention for the increase of the SI of the families are related to the increase of the biodiversity in the properties, with emphasis on the forest coverage and the development of strategies that increase the participation of the families in the different forms of organisation and joint resolution of problems.

The SI obtained with the SAFA tool can be used as a basis for structuring and improving the analysed rural properties and can be replicated in other properties, obtaining an adequate standard to indicate improvements for the members of the analysed rural properties.

Despite the efficiency, applicability, and minimised cost of doing a SAFA, making the best use of existing data from other sustainability, environmental and social management, a validation, in the field, by remotely collected information is recommended.

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A soft systems approach for innovation in the fruits and vegetables market in Uruguay

Uma abordagem de sistemas flexíveis para a inovação na cadeia de frutas e hortaliças no Uruguai **Marcela**

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ABSTRACT

“Systems thinking” approaches include some techniques and methods developed by social scientists to encourage debate, recognising that their practice is inevitably full of value and that research is a part of intervention. In general, systems theories explain the need to transcend disciplines to increase our understanding of a situation by considering different levels of impact, especially through visualisation tools. In a very complex environment such as the fruit and vegetable market in Uruguay, especially focusing on the roles of agents and the interactions between them, “soft systems methodologies” contributed to building a representation integrating different perspectives with consensual and conflicting aspects, delving into the particularities and opportunities for technological innovations and collaborative management for the fruit and vegetable chain, ending in important reflections on opportunities for positive change and the risks of marginalisation or social exclusion.

Keywords: Systems thinking. Farmers. Markets. Innovation. Sustainable development.

RESUMO

Abordagens de “pensamento sistêmico” incluem certas técnicas e métodos desenvolvidos por cientistas sociais para promover o debate, reconhecendo que sua prática é inevitavelmente cheia de valor e que a pesquisa é parte de uma intervenção. No geral, as teorias de sistemas explicam que é preciso

transcender as disciplinas para aumentar nossa compreensão de uma situação considerando diferentes níveis de impacto, especialmente fazendo uso de ferramentas de visualização. Em um contexto muito complexo, como o do setor de frutas e hortaliças no Uruguai, principalmente em respeito à atuação dos agentes que participam e às interações entre eles, as “metodologias de sistemas flexíveis” contribuíram para construir uma representação que considera diferentes perspectivas com consensos e conflitos, aprofundando-se nas particularidades e oportunidades de inovação tecnológica e gestão colaborativa da cadeia, finalizando com importantes reflexões sobre as oportunidades de mudança positiva e sobre os riscos de marginalização ou exclusão social.

Palavra-chave: Pensamento sistêmico; Produtores; Mercados; Inovação; Desenvolvimento sustentável.

1 INTRODUCTION

The low consumption of fresh fruits and vegetables in Uruguay (311 gr/person/day) in relation to what is recommended by the World Health Organization (400 gr/person/day, 2018), together with the country's commitment to an advanced set of policies and mitigation plans to cope with climate change by 2030 (CORTELEZZI, 2019), reaffirms the necessity of working on the promotion of healthier lifestyles. This might represent an opportunity for rural farmers who are not ready to face transformations in their systems to achieve food quality stably: sustaining natural resources and reducing food waste throughout the production and distribution chain to the final consumer (FAO, 2012; ZOPPOLO; COLNAGO, 2021).

Fruit and vegetable production in Uruguay involves 7,056 rural farms and occupies 0.36% of the total land, 12% of the total number of permanent workers linked to agricultural activity and 63% of temporary workers (ranking second in employment importance after the beef cattle industry). More than 85% of the horticultural and fruit farms are family farms. Therefore, added to its importance in food production (674,320 tons of fruit and vegetables produced per year) and security, the fruit and vegetable sector represents the means and livelihood of many rural families, fulfilling an important social role by creating roots in the rural area, contributing to sustainable rural development (ACKERMAN *et al.*, 2017).

Trying to understand the particular situation of Uruguayan participants of traditional and new rural marketing channels for fruits, vegetables and other farm products (honey, cheeses, crafts, etc.), we gather information during a four-month internship (November 2022 to February 2023) at the research institute *Instituto Nacional de Investigación Agropecuaria* (INIA) “Las Brujas” in Uruguay, gaining insights about recent innovations.

Based on the literature, technological innovations, in a broad sense, result from exogenous events that temporarily disturb the state of balance (LUNDVALL, 1992). We intended to consider the perception of risk, including an analysis of how the participating actors face double exposure to environmental and socioeconomic risk: including technical innovations, shocks of prices, barriers to commercialisation, problems with family labour, public policies that are not always friendly, pressure for land use and price increases due to competition, etc. (O'BRIEN; LEICHENKO, 2000). We arrived, then, at a wider vision of innovation (BIANCO, 2020; GOULET *et al.*, 2019): a result of a social process in which learnings and skills are produced and useful solutions to specific problems are implemented in the areas of goods and services production, marketing and logistics, social organisation and institutions, territories and communities (that can be valued). The nature of innovation is social and technical simultaneously (sociotechnical), so the analysis implies understanding interactions between several organisations and social groups (technicians, researchers, producers, merchants, intermediaries, and other organisations).

Nowadays, information technologies or telematics open up a whole new perspective regarding labour and the forms of capital valorisation. However, although the concept of value addition has evolved with innovation (and increasingly includes productive, social, cultural, identity and environmental aspects), it still keeps a predominantly economic character (PALERMO *et al.*, 2020). Including environmental aspects in the reflections on value-adding would consider preserving value more than just creating and capturing value (CASTELLANO; GOIZUETA, 2015). Social aspects would consider conflictive and contradictory processes, social positions, claims of traditions, representations of nature and how local society relates to them (CHAMPREDONDE; BORBA, 2015; IRIARTE, 2013). These facts, together with the permanence of problems of distribution, poverty and productive structure in Latin America and East Asian countries, bring again the importance of supporting value addition through development and productive diversification and the need to have new instruments that allow us to understand the dynamics of these challenges (LÓPEZ; MUÑOZ, 2015).

In this sense, Champredonde and Cosiorovski (2016) propose the idea of “integral valuation” beyond “value adding”, where projects are not conceived based on pre-established objectives –to capture value- but on the objectives, motivations and limitations of the actors involved, and the direction of actions result from power struggles. Thus, a more comprehensive concept is proposed, placing people in the foreground and estimating the multiplicity of intrinsic aspects of human activity (CARENZO, 2007).

Seeking to illustrate the richness and variety of perceptions according to Soft Systems Methodology in action (CHECKLAND; SCHOLLES, 1999; MIDGLEY, 2001), the data were obtained mainly from interviews with semi-structured questionnaires to several actors in the fruit and vegetable chain (farmers, traders, intermediaries, consumers, private and public technicians), as well as from participatory workshops and relevant bibliographic material.

The main aspects of this exercise allowed us to promote discussion around: alternative distribution channels, collaborative management and other innovations, for whom?

2 SOFT SYSTEM METHODOLOGIES

System Thinking includes a variety of methodologies to analyse problems that implicate complexity, risk and uncertainty by considering the ‘whole’ of a system and the behaviours and interactions of its parts. These methodologies include Soft Systems approaches such as Checkland’s (1999), which aims to build a “rich picture” to understand a situation by illustrating the variety of perceptions, and Midgley’s (2000) ‘Systemic Intervention’, generally used to tackle very complex problems involving social aspects with unclear objectives.

In local situations, the usefulness of Systems Thinking is proven when the interconnection between ecological, social and personal problems demonstrates that none of these would be possible to solve if the problematic situation is not taken as a whole (MIDGLEY, 2000). The “systems thinking” approach invites researchers in the natural sciences to employ some of the techniques and methods that social scientists have developed before to encourage discussion because, whether in the natural or social sciences, scientific practice it is inevitably full of value (it is not neutral, and research is a part of intervention). In general, systems theories, such as Von Bertalanffy’s (1968), explain the need to transcend disciplines to increase our understanding of a problem or situation, considering different levels of impact, especially through visualisation tools (Figure 1).

Within a picture of the situation, the integrity between socio-cultural, economic, organisational and ecological spaces is necessary to understand regional sustainable development. Therefore, each of the spaces should be taken into account (FAGGIAN; SPOSITO, 2009).

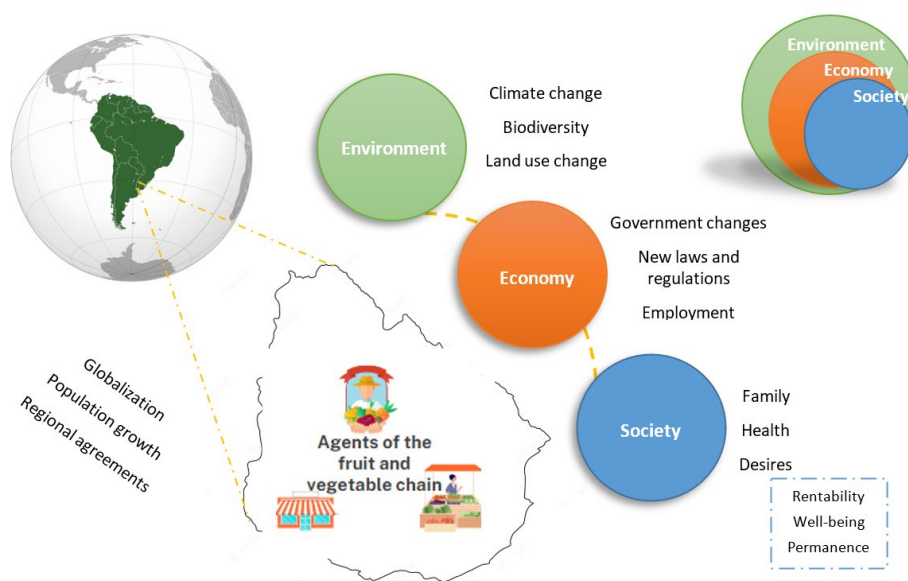


Figure 1 | Application of “systems thinking” to the study

Source: Adapted from Faggian and Sposito (2009).

The influence of an external environment or a ‘vulnerability context’ should also be contemplated, represented by trends (national or economic, macro-policies, population changes, etc.) and shocks (particular challenges), which mediate the strategies that people undertake to achieve their livelihood objectives (ELLIS, 2000).

Midgley’s approach also suggests theoretical pluralism (MATURANA, 1988). Therefore, a balanced variety of theories may be useful to gain an understanding if a variety of values or objectives are pursued in diverse contexts. “Why seek a unitary explanation at all? Within a group of people who accept the existence of a phenomenon (say, pluralism of viewpoints), isn’t this acceptance sufficient to co-ordinate actions?”.

Systemic Intervention is, then, basically founded on exploring boundaries (with the engagement of stakeholders to understand the wicked problems), using mixing methods and taking action for improvement from where you are.

With this approach, we gathered information from 48 actors in the Uruguayan fruit and vegetable chain: farmers, traders, intermediaries, consumers, and private and public technicians who represent several organisations, with different years of experience, different roles in the chain, and linked to different types of marketing systems.

The interviews were developed through semi-structured questionnaires (JIMÉNEZ *et al.*, 2006) and “snowball” sampling: a technique to find the research object where a subject gives the researcher the name of another, who provides the name of a third, and so on. This method is usually associated with exploratory research, especially in studies that require a high level of confidence (ATKINSON; FLINT, 2001).

When selecting the interviewees, we intended to represent all types of agents in the different farming areas of the country according to the typical categorisation (Figure 2). Ethical considerations on vulnerability in qualitative research were taken into account (LOUE; MOLINA, 2015), establishing prior agreements of respect with the participants regarding the information they wanted or not to share.

“Attitude towards innovation” was conceptualised as a subjective or endogenous factor related to uncertainty (PANNELL *et al.*, 2000) and risk aversion: a variable that represents a psychological propensity that can not be studied through direct experience but through observable indicators (ALLUB, 2001). At first, categorical values were assigned between “highly positive” (indicating a positive evaluation of the innovative proposals discussed) and “highly negative” (indicating a negative evaluation of the innovative proposals discussed), based on discussions about identified benefits, level of confidence and commitment for the future. The questionnaires then gave rise to a collective analysis of attitudes towards technological and social innovation and the strengths and weaknesses of the innovation systems we integrate. In addition, at an organised workshop in INIA Las Brujas, participants gave their opinions (especially as consumers) to enrich the debate and knowledge about the vegetable and fruits sector, providing diverse perspectives from different disciplines, genders, socioeconomic levels, roles within the company, etc.

3 CHANNELS AND COMMERCIAL AGENTS OF FARM PRODUCTS

To start understanding the Uruguayan fruits and vegetables chain, it is essential to characterise the main agents who participate. Figure 2 shows a simple representation of the actors involved, following more traditional ways of describing the vegetables and fruits market (LAMARCA *et al.*, 2009):

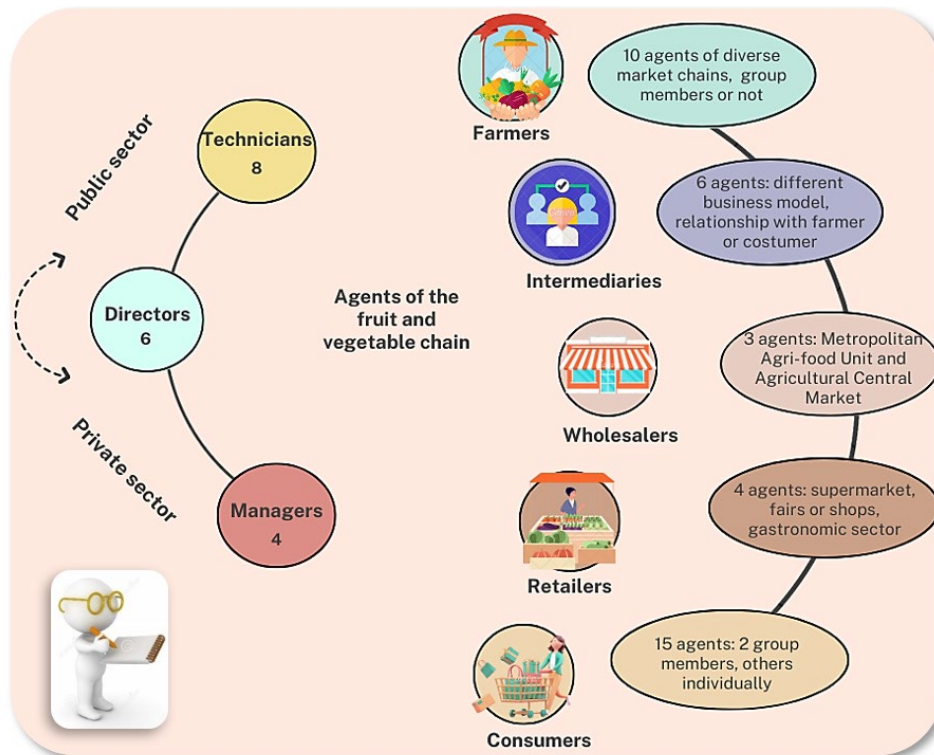


Figure 2| Representation of the fruit and vegetable chain and its participants

Source: Prepared by the authors

3.1 FARMERS (PRODUCERS)

“Intensive farming” in Uruguay (which includes plant production such as vegetables, fruit trees, vineyards, citrus, fruit, horticultural and flower nurseries, and also specialised animal production or for self-consumption including rabbits, pigs, birds, and bees, among others) historically occupied three

regions: south, the north coast and other specific areas with different relative participation in the offer (Figure 3). Currently, fruits and vegetables production involves a total of 58,354 ha and involves 7,056 rural farms. Despite using only 0.36% of the land, horticulture still employs 12% of the total number of permanent workers linked to agricultural activity and 63% of temporary workers (MGAP; DIEA, 2014). Considering the total direct employment (permanent and temporary), the fruit and vegetable sector ranks second in importance after beef cattle. According to MGAP and DIEA (2021), 674,320 tons of fruits and vegetables are produced annually, and imports represent 13% of the total sales. Most of the farms involved are family farms: 88% in horticulture and 86% in fruit growing (MGAP; DIEA, 2020, 2021), so the fruit and vegetable sector represents not only great importance for food production and security but also the means and livelihood of many rural families, fulfilling an important social role given by a sense of belonging in the rural area and contributing to its development (ZOPPOLO; COLNAGO, 2021).

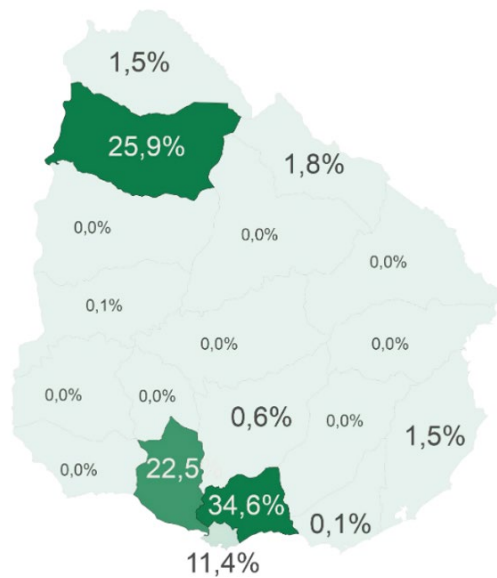


Figure 3 | Relative importance of different areas in the supply of fresh fruits and vegetables

Source: Observatorio Granjero (2021)

3.2 INTERMEDIARIES

Intermediaries are located between producers (farmers) and wholesalers and between these and retailers. Generally, wholesalers acquire ownership of the products they sell, but in the fruits and vegetables marketing chains, there is a group of intermediaries who handle large volumes of products which may or may not be their own. These are commonly called commission agents: “brokers”, commercial agents or representatives, distributors, etc.

3.3 WHOLESALERS

The *Mercado Agrícola* (Agricultural Market) arises as the first experience in the country of an organising structure of supply and demand. Later, for better capacity and transit facilities, it was replaced by the *Mercado Modelo* (Model Market), although there is currently a reopening project, and it is an alternative source of supply for small and medium-sized merchants in Montevideo. The *Mercado Modelo* currently works as the most important fruit and vegetable market in Uruguay. It is governed by a co-management system (gathering representatives of the municipal government, the department of agriculture, producers, wholesalers, retailers, and workers). In 1995, approximately

75% of the total production of vegetables and fruits was sold there. In 2021, that value was estimated as 63% by Observatorio Granjero (2021).

3.4 RETAILERS

“Retailers” category includes large surfaces (supermarkets), warehouses or self-service stores and municipal fairs. In general, the main chains organise purchases from the fruit and vegetable section, which have supply, conditioning and redistribution centres, maintaining high-quality standards, as well as strict rules for marketing with producers, such as formalities in the documentation of transactions (obligation of invoice sales for tax deduction, etc.). These standards mean that certain producers are not able to sell all their production to the supermarket and must look for alternative channels to market the remaining to avoid permanent losses. In that sense, fairs are alternative channels where the farmer chooses to deliver his or her production more directly to the customer, sometimes presenting advantages such as lower prices, greater variety, the possibility of bargaining, etc. In general, the free fairs sell basic fresh products. They are organised and regulated by the municipal authorities and often provide directly from the wholesale markets. This could mean that, individually, the stallholders have little bargaining power against the suppliers (wholesale market operators) due to the low volume acquired by each one.

There are also mobile markets, where the merchant has specially adapted vehicles to transport, store, display the products and even make the sale. Sometimes neighbours get together to construct small stores to present the local product to buyers from more distant areas. They often provide other services, such as granting credit to producers and supplying agricultural inputs and other products.

3.5 CUSTOMERS

MGAP and DIEA (2021) estimated an apparent consumption of fruit and vegetables of 510,579 tons per year by the entire Uruguayan population and 395 g per inhabitant per day. The consumption of fresh fruits and vegetables was 311 g/inhab/day and is less than the 400 g per day recommended by the World Health Organization (2018). The weight of food can represent up to 26% of the income of an Uruguayan household.

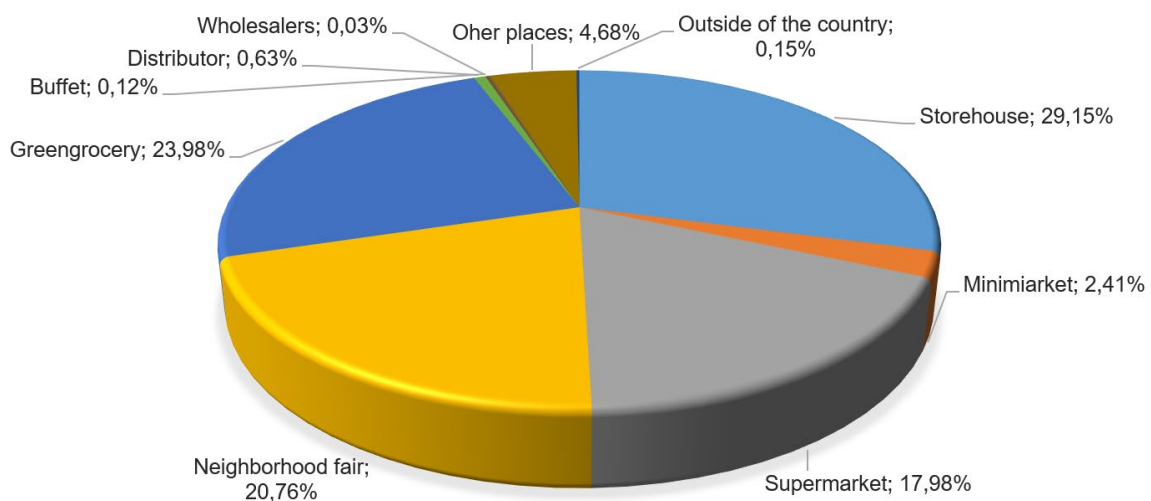


Figure 4 | Household consumption by commercial channel

Source: Bove and Cerruti (2008)

Ackerman *et al.* (2017) and Bove and Cerruti (2008) observed that the participation of fairs, greengrocers, and self-services (called “other retailers”) prevailed in marketing (between 50% and 68% depending on the product); while supermarkets channelled between 18% and 29% of the available offer for consumption. The gastronomic sector demanded between 1% and 16% of the supply for consumption, with significant growth potential. Meanwhile, the State absorbed between 2% and 4% of the available volume. According to the *Instituto Nacional de Estadística* (INE, 2017), in 2016-17, in other regions of the country, the store was the most important place of purchase (43.7%), while in Montevideo, that place was the supermarket (46.4%).

Within other places of purchase, initiatives such as the formation of “purchasing groups” have also emerged. This is the case of the popular market *Mercado Popular de Subsistencia* (MPS), founded in 2017 by a host of neighbourhood organisations, cooperatives, unions, and others, who met without profit, supported by voluntary work so that each family acquires what is needed at relatively low prices through a list system (MPS, 2022).

Although in 2020 the economic context was severely affected by the pandemic (with a reduction in the employment rate and income), Uruguayan researchers of *Id Retail* (2021) identified that customers did not fully restrict their consumption to basic categories and low-price brands. In addition to concerns about insecurity and unemployment, they added health and environmental care. Thus, depending on the occasion, the consumer sometimes chooses saving or selecting “premium” and value-added consumption. This context came with a leading role of local and specialised stores. According to the study by *Impulsa Industria* (2020), 36% of the Uruguayan population changed their consumption and food preparation habits with the arrival of the pandemic. Currently, 13% of them return to the former situation of consumption.

3.6 PUBLIC AND PRIVATE INSTITUTIONS

The whole Uruguayan fruit and vegetable chain is susceptible to policies and interventions from many public and private institutions with decision-making power and different articulation levels. Some of them are the department of agriculture *Ministerio de Ganadería, Agricultura y Pesca* (MGAP), particularly the *Dirección General de la Granja* (Digegra); the national research institute *Instituto Nacional de Investigación Agropecuaria* (Inia); the referent public agency for land policy *Instituto Nacional de Colonización* (INC); the institute for extension, technology transfer and training *Instituto Plan Agropecuario* (IPA); the department of social development *Ministerio de Desarrollo Social* (Mides), the public university *Universidad de la República* (Udelar); the public bank *Banco República* (Brou); as well as private banks, other private financial institutions, research and education agencies and service companies.

In addition, in Uruguay in 1915, rural development societies *Sociedades de Fomento Rural* (SFRs) founded a national commission *Comisión Nacional de Fomento Rural* (CNFR), projected as the main representative organisation of small and medium farmers in rural areas, influencing the development of unions, cooperatives, colonisation, agro-industries, production plans, etc. (ROSSI; NOTARO, 2016). SFRs are civil associations, entities with legal status approved by the department of education and culture *Ministerio de Educación y Cultura* (MEC). Fruit and vegetable farmers often assembled into cooperatives or networks, such as the agroecology network *Red de Agroecología* (RAU).

3.7 INTERCONNECTIONS

The use of Soft Systems Methodologies allowed for deepening into the representation of the actors involved when the interactions and shared roles between them were observed to a greater extent. Some actors occupy more than one role at the same time (for example, being a farmer and also an

intermediary or a technician and a farmer), a market in more than one “way” and offer more than one “type of product or service” to more than one “sale destination”. This is illustrated in Figure 5: a more complex scheme also wanting to show the role of researchers as participants who must be considered in the analysis since they will inevitably bring subjectivities to the situation (MIDGLEY, 2000).

Visualisation tools helped to build a holistic vision of the situation that facilitated our understanding of the commercial circumstances for fruits and vegetables in rural Uruguay (CHECKLAND, 1999). Along with a diversity of issues discussed between actors, the notion of innovation, and an evaluation of how they position themselves in relation to it, was discussed together. We discussed traditional commercial channels for farm products with the main agents, some particularities of Uruguayan consumption and innovations such as alternative channels for sale and collaborative management. In particular, we discuss innovations promoted by the recent crisis due to the start of the Covid-19 pandemic in 2020 and the challenges posed by climate change, questioning the idea of value-adding.

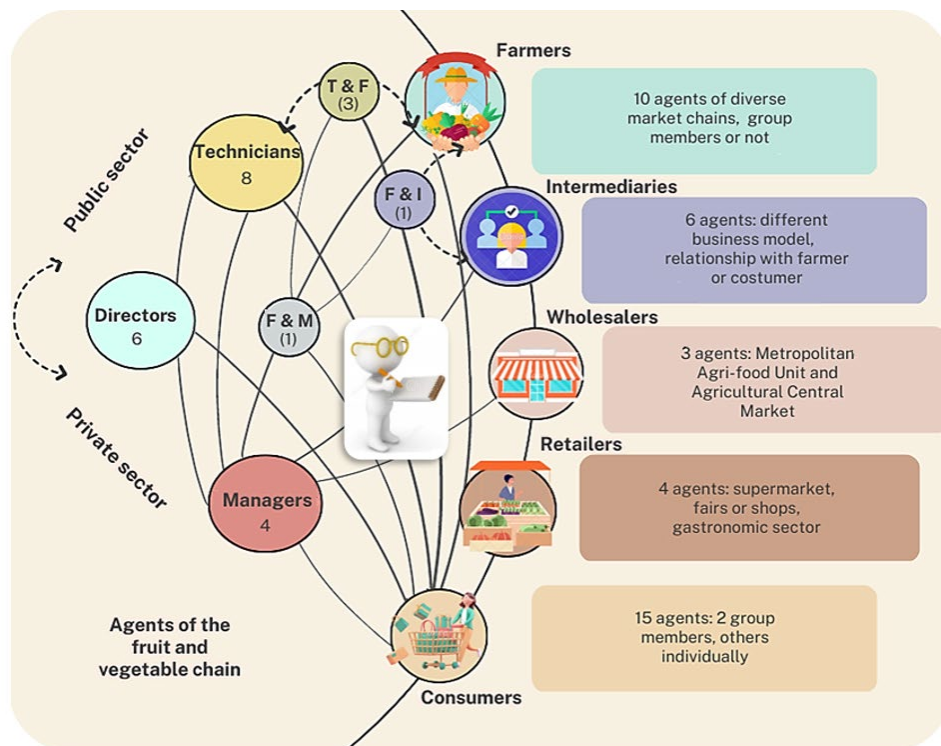


Figure 5 | Representation of the identified relationships within the fruit and vegetable chain

Source: Prepared by the authors.

Clearly, it could be recommended to extend this study to other areas if the objective was to have a representative national sample, but we still consider these opinions enrich the debate and knowledge of the sector qualitatively.

4 A VIEW ON INNOVATION IN THE AGRICULTURAL SECTOR

At the beginning of this research, to study innovation processes, we observed the predisposition to “technological innovation” and “social innovation” separately for practical purposes. The first variable would be linked to the use of computers and/or digital tools in business management, communication and, to a lower extent, production (since it is not the main focus of this study), while “social innovation” referred to the predisposition to integrate new levels of social and financial organisation, strategic alliances with other actors in the chain, and cooperative strategies.

At an exploratory level, the majority of actors (50%) expressed a positive (P) attitude towards technological innovation; while the attitude towards social innovation presented more controversies: 38% expressed a highly positive (HP) attitude and almost the same proportion a moderate (M) attitude (Figure 6).

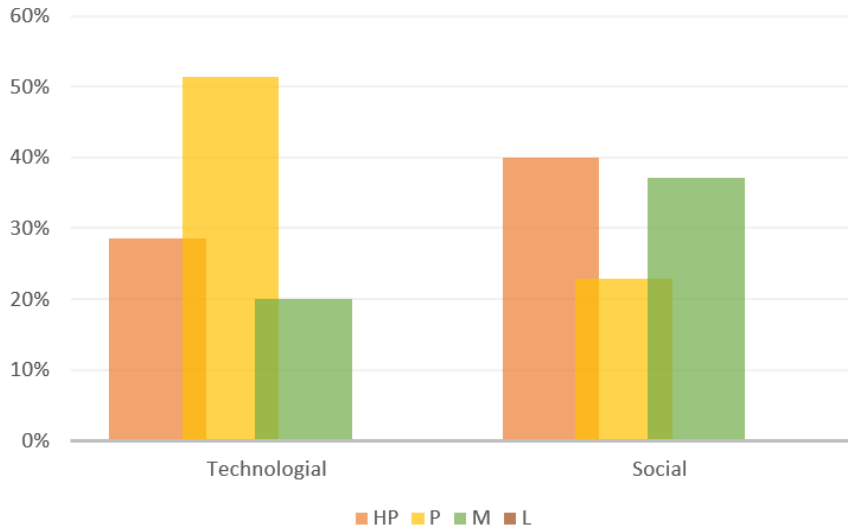


Figure 6 | Attitude towards innovation according to actors in the chain

Source: Prepared by the authors.

Some common patterns were observed according to each actor's role in the chain: most of the technicians reflected a moderate attitude towards innovation, and the directors were highly positive. Farmers are more positive regarding incorporating the new material technology than the new social organisation (between positive and moderate attitude), and managers, on the contrary: highly positive regarding the social organisation and positive regarding the technology.

We perceived this way of discussing or studying innovation would be bringing us closer to a linear or rigid notion of innovation, according to Bianco's (2020) study, as the ones conceived in the sixties and seventies according to the rural sociologist Rogers (1983): with the focus on the relationship between the characteristics of individuals, their attitude towards innovation and the factors linked to the relative complexity of technologies and the risk involved in their eventual adoption. Making use of the theoretical pluralism allowed by the selected methodology, we then evolved towards more qualitative analysis, arriving at a criticised version of the Schumpeterian concept of innovation by Suarez (2004), where technological and social aspects exist only integrated, and we must avoid falling into a technological determinism by isolating the socio-cultural element from economic development. Bianco (2020) also defends innovation's simultaneous social and technical (sociotechnical) nature. Her research also frames our research into a systemic vision that has been applied in Latin America, including analysis of the dynamics in the farms, appreciation of specific practices as a relevant aspect and promotion of active participation of the actors involved in research processes.

This systemic and qualitative vision allowed actors to express themselves in a comfortable environment (ATKINSON; FLINT, 2001). Technicians of the private and public sector mentioned as positive innovative aspects: state support to farmers organisations through resources and public projects such as *Proyecto Rural Uruguay* (PUR); funds that promote public-private articulation and with academia towards the Sustainable Development Goals (UNITED NATIONS, 2018); strengthening of connectivity in rural educational centers by Ceibal (the public center of innovation), programs such as "computational thinking", "youth to program"; together with MGAP; policies for innovation and participatory research

and promotion of agroecological groups, as well as for rural women, focused on technical support and technology (“AgroTICS”, “Mujeres de la granja”, “Más tecnología”, “Más valor”); law 19,292 on public purchases for family farming offers a new commercial possibility; Laguna del Sauce protection project within a collaboration of the environmental department and the MGAP; financial incentives have been received from the World Bank and business strategies are being planned; public “development roundtables” where farmers have a voice; openness of the Uruguayan population to collaboration (especially in times of crisis). At the same time, they pointed out negative aspects, such as: late or non-arrival of funds from the state to the territory, concentrated incentives in a small group of farmers; warranty and tax returns issues for small farmers; projects that are not sustained beyond the period of public financing; the difficulty of measuring social processes and pressure to achieve economic growth; “territorial interventions on demand” from the MGAP that have not yet been formally implemented; the law for public purchases is sometimes not complied due to high-quality requirements or lack of products; disparity in digital literacy, connectivity or electricity and social factors of exclusion of the digitisation processes that remain; coexistence of very different lifestyles, land values and challenges; lack of regulations for new farmers regarding the use of territory; lack of awareness of available public educational opportunities.

Directors shared contradictory opinions such as: “It would be interesting to generate spaces where people could access information or advice, but also motivate them to go to the sources of knowledge (instead of them asking for resolution, postponing adoption or losing opportunities)”. “The rural context is very diverse and complex: there are people who still do not have electricity despite being close to the city, there are still problems of signal or connectivity in elevated areas, even if today’s education depends on it; this requires articulation with public companies but it is necessary to approach it from the territory”. “There is a lack of knowledge or misinformation about the public educational opportunities available, even in a scenario where we are apparently all connected; there is competition with other sectors for labor and technology, and farmers can not afford them”, “there are people who rely on technology and others do not (they do not prioritise it), farmers’ organisations need collaborative policies between the state and the productive sector for a better situation for everyone”.

We noticed that, in public and private institutions that influence the fruit and vegetable market, different concepts of innovation mentioned by Bianco (2020) still coexist: from a narrow vision based on the farmer conceived as an adopter of technology towards comprehensive approaches that overlap the social and the technical in processes of a systemic nature but, as pointed by the author, in some cases, the change from one approach to another is not discreet but can be noticed.

In this sense, wholesalers argued about access to positions in the metropolitan agrifood unit. “The *Unidad Agroalimentaria Metropolitana* (UAM) was originally designed for companies with infrastructure and technology out of access for many (based on foreign market models), farmers still have difficulty to adapt and negotiate”, others defend “it represents a model infrastructure for storage and subdivision, where established norms for new members are flexible and the business fair due to transparent information about fruit and vegetable prices and food safety”.

For supermarkets’ representatives, “the trend is toward reducing staff, even if the products’ management becomes more difficult”, and “there is little opportunity for value-adding because small farmers do not reach the volumes with required standards”. Apparently, recent changes in the internal policy of the companies bring conflicts in the relationship or agreements with farmers.

The work with commission agents or intermediaries is usually perceived as a limitation. This type of agent also senses low confidence and vulnerability, especially during recent times of management changes in the wholesale market or department stores. Many agree: “the intermediary has a lot of work and many costs that are not always acknowledged”, and “our most important job is to

communicate, convey the importance of consuming certain types of products, and to maintain an honest relationship with farmers”.

Controversial discourses were also observed regarding the vulnerability of family farmers in the face of free supply and demand and the need for capacity development. Many expressed that the price they receive is sometimes less than the cost of production. They also express problems of scale in relation to family economic needs.

Despite the agent’s role on the chain, some repeated issues were: currently restricted certification for differentiated products, indebtedness to face the pandemic, public support for small businesses considered insufficient, and laws not adapted to the Uruguayan reality.

4.1 A PERSPECTIVE FROM URUGUAYAN CONSUMERS

To keep considering perceptions regarding innovations, barriers to commercialisation, etc., in the workshop, we discussed the main problems for customers. The participants repeatedly identified: high prices; high cost of local versus imported fruit; scarce variety; distance from the farmer and consumer (reflected in the range of established prices); quality: appearance and taste; sector poorly adapted to changes; lack of basic regulation; lack of technology adoption; difficult access to organic or agroecological products; competence; meeting the demands of production standards; lack of initiatives; valuation of local production.

It is clear that when we talk about agents’ perceptions of innovations, there is a gap between discourse and practices (like the ones shared by Ackerman *et al.*, 2017 and Bove and Cerruti, 2008). However, we still consider that having thought and shared solutions from the different roles that challenge actors in daily life contributes to the social function of scientific research (BERNAL, 1939). This analysis allowed us to reflect further on the path towards sustainable innovation for the farming sector.

Some identified opportunities were: direct sales or less intermediation; varying species (importing seeds, varying soils, diversifying plantations); improving quality (improving transportation, storage, organoleptic quality); alternative forms of trade; reducing waste; supporting innovators; promoting more consumption; maintain traceability of organic and agroecological products; free trade; exclusive sale of seasonal products; communication improvements between all parties; guide the consumer into the use of local products; promoting local markets; offer for sales channels with delivery options; more stores. Uruguayan researchers of Id Retail (2021) and Impulsa Industria (2020) also pointed out the last four ideas.

Other participants shared some of their initiatives that were aligned with costumers’ ideas: pilot experience in cooperative exportation by a group of farmers in the east of the country; cooperatives with their own brands, packaging and certification systems and diversification of products: sweets, preserved food, honey, soaps, organic eggs and others with higher value; successful cases of direct sales to customers; conduction of workshops and events for education and customer awareness; achievement of value-added gastronomic projects; close relationship of the gastronomic sector with farmers and consumers; diversification of sales channels; direct link between farmers and supermarkets; political organisation and volunteer work to achieve fair prices (such as MPS’s); collective sale of local products supported by the state; innovation in delivery scheme at home and stores; carrying out market studies; in the Montevideo market, meeting the demand for healthy products; new ways of communication through social networks; closer link of the intermediary with farmers and consumers.

Today’s tools for building new relationships include everything from websites, blogs, live events and video presentations, online communities and social networks such as Facebook, Youtube, Twitter or

the companies' own social networking sites. Currently, customers give as much as they receive in the form of two-way relationships, with a more active role in providing ideas, funding (with crowdsourcing) and creating new products, with marketing content generated by themselves, with the dissemination of brand messages and interaction in customer communities, among other advances (KOTLER; ARMSTRONG, 2012). In Uruguay, these ideas coexist with the still very strong "word of mouth", which has a powerful impact on consumer purchasing behaviour. Words and personal recommendations from trusted friends, colleagues and other consumers often carry more credibility than those from commercial sources, such as advertisements or salespeople.

4.2 ALTERNATIVE CHANNELS, COLLABORATIVE MANAGEMENT AND OTHER INNOVATIONS: FOR WHOM?

Since the beginning of the 1990s, an ideology of virtuality began to take shape with certain ideas of technological futurism and a liberal excitement around the individual's potential. This was added to the rapid expansion of the Internet, a virtual territory that promised full freedom, horizontality, liberation from hierarchies, etc. (PALERMO *et al.*, 2020). However, it is still observed how these ideals are connected with the powerful contemporary discourses about entrepreneurship and meritocracy. In some environments, conditions of workforce disadvantages and tensions between the "economy platform" and the logic of collaborative organisation are replicated.

Analysing the fruit and vegetable chain, we could observe that the projects of different participating actors can be divergent and contradictory (IRIARTE, 2013). Some actors still consider that "taking charge of the marketing of their products would be neglecting production, which is what we know and want to do". Others are focused on accessing better infrastructure first and then on attending sales. One farmer stated: "direct marketing requires a lot of work, we launched with enthusiasm, and then we get tired... it must be made economically viable for us as well".

Many would like to implement more technology in the productive sector to reduce labour, although it requires a large investment: "We would like to have more support or publicity, but we prefer not to get involved in credits, even if low-interest alternatives are offered".

Many of the mentioned innovations were triggered by the pandemic or other crises. "During the pandemic, consumers were diverse in terms of profile. The interest was in direct delivery". Most farmers join, but do not necessarily carry out, communal activities except in specific initiatives for sale. Those who share sales agree on the need to plan collectively to avoid overproduction and overlapping items. "Our challenge will always be the gradualness of production: we need to stagger to sell fresh products". They also identify competition problems related to the allocation of products.

Inside cooperatives, in certain cases, a recent drop-in communal activity can be attributed to external achievements discouraging internal organisation. In others, the functioning of farmers' organisations is threatened because they were born from political imposition. Similar issues are reported for Uruguayan livestock farmers (COURDIN, 2021).

These facts, together with the permanence of problems of distribution, poverty and productive structure in Latin America and East Asian countries, bring again the importance of implementing public policies that support value addition through territorial development and productive diversification (as suggested by the interviewees), and the need to have new instruments that allow us to understand the dynamics of these challenges (LÓPEZ; MUÑOZ, 2015), also contemplating the vulnerability of the positions that are no longer filled in this reorientation, as suggested by Midgley (2000), facilitating their transition process.

“Territorial development” should be considered as a conflictive and contradictory process that is not limited to productive or material aspects but also comprehends social positions, claims of traditions, representations of nature and the preserved links by local society (IRIARTE, 2013). This notion is aligned with systemic concepts of innovation (BIANCO, 2020; MIDGLEY, 2021) and value-adding (CARENZO, 2007; CHAMPREDONDE; COSIOROVSKI, 2016), and together they allowed us to place people in the centre of this intervention, bearing in mind the multiplicity of aspects inherent to human activity, appreciating the diversity of objectives, motivations and limitations of the actors involved, and understanding that the direction of actions results from power struggles.

5 FINAL REFLECTIONS

This research aimed to study the Uruguayan fruit and vegetable market with its main actors; delving into particularities and opportunities for technological innovations and collective management. Seeking to illustrate the richness and variety of perceptions, Soft Systems methodologies were implemented in action. It could be recommended to extend this study if the objective was to have a representative national sample, but we prioritised quality debate and knowledge around the sector.

We consider that this approach contributes to building a rich image, a holistic vision of the fruit and vegetable chain and its actors, that allowed us to observe and reflect on the complexity of the roles that actors adopt and the interactions and exchanges that happen, as well as to question the role of researchers and decision-makers.

This intervention enabled the generation of a discussion around the role of technological-social innovation for the sector, in which controversial discourses on strengths and weaknesses are observed, ending in important reflections on the opportunities and challenges for positive change and on the risks of marginalisation or social exclusion.

In particular, we discuss the appearance of alternative channels and other innovations promoted by the recent crisis linked to the start of the Covid-19 pandemic in 2020 and the challenges posed by climate change management, questioning the idea of “value addition”.

Participants share their realities, delving into the vulnerabilities that each one faces from their part in the fruit and vegetable chain, explaining how they conceive power relations, and the stories behind their choices or innovations. Some peculiarities of the Uruguayan fruit and vegetable market could be observed: relationships of trust and transparency with intermediaries are highly appreciated but also questioned; there are concerns about the threat of price competition from regionally smuggled products. The benefits of remaining in informal businesses are often discussed, as well as the need for government support to meet the requirements of the formal market. Different profiles of entrepreneurs are seen: farmers that seem content with integrating a single role in the chain and maintaining their level of technology and those who constantly seek to occupy new places in the chain and implement novelties in their businesses. The search to integrate collective networks as a resilience mechanism stands out, especially in moments of crisis, but is also sometimes forgotten.

Having thought and shared solutions from the different roles that challenge us in daily life is perceived as a way of contributing to maintaining the social function of scientific research.

We arrive at notions of innovation and development that consider the diversity of aims of each project, placing people who plan them in the foreground, considering actions as a result of power struggles that occur in a territory, not only accounting for economical processes but also for ‘non-material’ dimensions linked to the social and environmental development of cultures.

Thus, this research continues by studying integral valuation initiatives in the rural sector through specific collaboration with farmers' groups who wish to innovate in marketing with the co-construction and implementation of digital platforms and other communication resources for their sustainable development (starting from their own notion of what this means), trusting that it can be a positive learning experience for the region.

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In this first issue of 2023, SiD, in its editorial, reflects on the (un)certainities and consequences of the rapid advance of artificial intelligence (A.I.), arguing that it might be the right time to extend the precautionary principle to this topic as well.

The *Dossier* "Dismantling of the Brazilian Environmental Policy" presents six articles, while the *Varia* section brings three additional articles. Additionally, SiD publishes a tribute note to the recently deceased Julie Thompson-Klein. The published articles evaluate the construction of Brazilian environmental policies and the recent abrupt changes. They also present the effects of former President Bolsonaro's administration on environmental analysts' actions in deforestation prevention and control policy in the Brazilian Legal Amazon. Besides, there is a discussion around Ibama's capacity and bureaucratic identity and a debate on dismantling the pesticide control policy. In addition, the political and institutional aspects that contributed, or did not, to funding biodiversity policies within the federal government and a discussion about the various difficulties in implementing environmental health actions in a municipality in southern Brazil are also presented. Finally, some articles discuss the potential use of treated sewage in the irrigation of crops produced in the state of Santa Catarina, a sustainability index (S.I.) of rural properties, and how the "soft system methodologies" contribute to building a representation of the different perspectives in the fruit and vegetable chain in Uruguay.

Em seu primeiro número de 2023, SiD, em seu editorial, traz uma reflexão sobre as (in)certezas e consequências do rápido avanço da inteligência artificial (I.A.), defendendo que talvez seja a hora de estender o princípio da precaução também para esse tema.

No Dossiê "Desmantelamento da Política Ambiental Brasileira" são apresentados seis artigos, enquanto a seção Varia traz três artigos adicionais. Além disso, SiD publica uma nota de homenagem à recentemente falecida Julie Thompson-Klein. Os artigos publicados apresentam: uma avaliação sobre a construção das políticas ambientais brasileiras e as mudanças abruptas recentes; os efeitos da administração do ex-presidente Bolsonaro sobre analistas ambientais envolvidos com a condução de políticas de prevenção e controle do desmatamento na Amazônia Legal; uma discussão sobre a capacidade e a identidade burocrática do Ibama; um debate sobre o desmantelamento da política de controle de agrotóxicos; aspectos políticos e institucionais que contribuíram ou não para o financiamento de políticas de biodiversidade no âmbito do governo federal; uma discussão sobre as diversas dificuldades de implementação de ações de saúde ambiental em um município do Sul do Brasil; o potencial de utilização de esgoto tratado na irrigação de algumas culturas produzidas no estado de Santa Catarina; um índice de sustentabilidade (IS) de propriedades rurais em Santa Catarina; e, como as "metodologias de sistemas flexíveis" contribuem para construir uma representação que considera diferentes perspectivas na cadeia de frutas e hortaliças no Uruguai.

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