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Essays and Perspectives

Irregular funding cycles in Brazilian science pose a barrier to biodiversity conservation and global leadership

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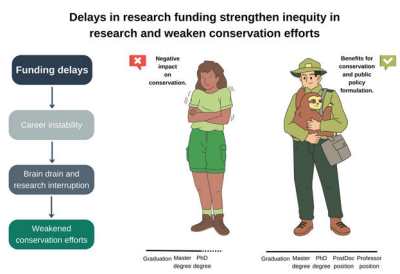
HIGHLIGHTS

- Irregular funding in Brazil fosters ECR brain drain, hindering biodiversity research.
- Delays fuel research attrition and deepen inequities in conservation science.
- Disrupted research threatens Brazil's environmental leadership.
- Streamlined funding can reduce financial insecurity and attrition among ECRs.
- Stable funding strengthens research quality and supports Brazil's conservation goals.

GRAPHICAL ABSTRACT



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ABSTRACT

Stable funding for scientific research is a cornerstone for biodiversity conservation and evidence-based policy-making. In Brazil, inconsistent funding cycles for fellowships contribute to a "brain drain" of Early Career Researchers (ECRs) who could drive significant advancements in biodiversity research, ultimately stalling innovation and weakening the ability to address the global environmental crisis. Here, we highlight the overlooked impacts of an unpredictable funding system on ECRs and discuss its broader implications for research and conservation. These include increasing inequities and mental health strains in academia, disruptions of long-term studies, and gaps in sustained data collection, ultimately undermining the evidence needed to tackle pressing issues, such as environmental and climate change. Given Brazil's critical role in global biodiversity conservation, strengthening research funding mechanisms is essential to enhance the country's knowledge production and leadership in innovation. We offer recommendations to streamline fellowship evaluation processes for ECRs, reducing gaps between positions that contribute to financial insecurity and hinder the retention of scientists from diverse socioeconomic backgrounds. By shedding light on these structural issues, we aim to foster a more inclusive and equitable academic environment, ultimately reinforcing Brazil's scientific capacity and leadership in addressing the environmental crisis. Moreover, the systemic issues discussed here are common across Latin

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America. As such, our recommendations may help strengthen regional scientific capacity to address shared challenges, including the conservation of critical ecosystems, such as the Amazon.

Introduction

Human activities are reshaping Earth's climate and biodiversity (IPBES, 2019; Masson-Delmotte and Zhai, 2021), prompting the establishment of coordinated international efforts to protect and restore ecosystems. However, recent editions of the Climate and Biodiversity Conferences of the Parties (COPs) have failed to achieve meaningful progress towards effectively implementing global commitments (Le Monde, 2024; O Eco, 2024). As a key player in such agreements, Brazil plays a crucial role in building a sustainable future due to its extraordinary biodiversity, which, if conserved, can potentially deliver global-scale benefits (Strassburg et al., 2020). Nevertheless, the country faces several challenges that threaten its ability to meet its conservation targets. One major issue is weak environmental governance, as shown by the frequent and persistent wildfires in key biodiversity regions, such as the Pantanal and Amazonia (Correa et al., 2022). Another challenge is the limited and unstable investments in both the environmental (Fernandes et al., 2017) and science and technology sectors (McManus and Neves, 2021). These financial instabilities hinder the development, implementation, and enforcement of scientific capacity and biodiversity conservation policies (Pacheco et al., 2018; Escobar, 2015). In the scientific landscape, one of the most documented consequences of inadequate funding is a decline in infrastructure quality and researcher retention (Naddaf, 2025). The latter may stem from less obvious and poorly documented processes, such as unpredictability in fellowship calls and delays in grant awarding (Juk et al., 2025). In such cases, funding may eventually be secured, but unexpected and prolonged gaps between positions undermine career planning and contribute to researcher attrition.

The human dimension of research funding

The benefits of research funding are widely recognized, ranging from greater publication impact (i.e., higher citation rates and publications in prestigious journals) to the formation of larger and more productive research teams (Ali et al., 2010). However, an often-overlooked aspect is the impact of funding on the personal lives of researchers, particularly their ability to continue working in academia. While the academic environment has become somewhat more inclusive, remnants of its early days — when only those with financial privilege could engage in research — continue to shape career success. In this context, the absence of funding can have long-lasting consequences, extending beyond the termination of a research project to potentially ending a researcher's career, particularly for scientists from vulnerable or marginalized groups (e.g., women, BIPOC, LGBTQIAP+, people with disabilities, mothers, single parents, and first-generation university students; Dorenkamp and Weiß, 2017; Naddaf, 2025; Guo et al., 2024).

This issue disproportionately affects Early Career Researchers (ECRs), who are often employed on short-term contracts for one to two years, forcing them to repeatedly navigate the challenges of securing funding (Guedes et al., 2023). Moreover, a critical yet often overlooked factor is the amount of time ECRs invest in the funding application process. In Brazil, the evaluation of research proposals for a postdoctoral fellowship may take around three months or more (https://fapesp.br/estatisticas/analise) — a considerable period without income, as these positions often require full-time dedication. To mitigate this financial gap, many researchers begin drafting proposals before completing their doctorate to avoid missing annual funding calls. However, this strategy can divert focus from their research, potentially affecting its quality and increasing stress, thereby intensifying the mental health strain typically associated with the final stage of the PhD or academic funding support. The urgency to secure a new position quickly, combined with limited opportunities and a lack of financial safety nets, may also lead researchers to remain in or enter research groups with predatory practices, due to limited time to properly assess the working conditions or the suitability of potential supervisors. Importantly, these challenges are not limited to recent Ph.D. graduates; postdoctoral researchers also face recurring cycles of funding uncertainty and career instability, which compound over time.

The impacts of funding unpredictability are even more pronounced for researchers from marginalized backgrounds, who face systemic barriers to both entering and remaining in academia (Ruediger et al., 2025; Fig. 1). Individuals at the intersection of multiple vulnerable identities, such as Black women or first-generation mothers, have long encountered compounded structural obstacles to accessing, navigating, and remaining in academic spaces (Wright-Mair, 2023). Months-long gap between positions exacerbates the mental strain already experienced by these groups, who often deal with limited financial resources and reduced access to academic opportunities, including international mobility and networking. These challenges are amplified by the lack of institutional structures designed to support them, such as childcare services, financial aid, or inclusive academic environments, placing the burden of navigating adversity on individuals rather than on systems. Because these structural barriers are particularly severe for marginalized ECRs, the resulting mental health impacts also tend to be more pronounced in these groups. This hostile environment can push researchers to leave academia, either temporarily or permanently, leading to long-term losses for science, including the weakening of diverse research teams (Alper, 1993). When academic institutions only retain those from privileged backgrounds (e.g., financially secure white men), science suffers as a whole: it becomes narrower in perspective and less equipped to address complex societal challenges.

In recent years, Brazilian ECRs have had a poor experience with state and federal funding agencies, which have repeatedly failed to meet deadlines for calls (Fig. 1). Some agencies (e.g., The National Council for Scientific and Technological Development — CNPq; Carlos Chagas Filho Foundation for Research Support of the state of Rio de Janeiro — FAPERJ) have taken up to six months to announce the results of postdoctoral fellowship calls, often exceeding the initially stated deadlines without communicating revised schedules through official channels. Furthermore, once fellowships are granted, bureaucratic processes often delay their implementation by several months. As a result, many candidates experience nearly a year-long gap between PhD defense and the start of a new research position. These unforeseen delays disrupt candidates' logistical and financial planning, making it increasingly difficult to remain on the academic path (Fig. 1).

The figure illustrates hypothetical trajectories of two ECRs (selected from a diverse pool of researchers) navigating delays in fellowship result releases. Stages of the application process are shown alongside corresponding stress levels, which peak during the extended gaps between PhD completion and the start of new positions. These delays disproportionately impact researchers from vulnerable groups, including women, BIPOC, LGBTQIAP+, people with disabilities, mothers, single parents, and first-generation university students. Colors represent stress levels: green (low), yellow (moderate), and red (high). ©Sketchifyedu, Vectorsmarket, Twemoji, Kiwastudio, Pixabay, and some graphic elements generated with Artificial Intelligence via Canva.com.

Impacts of funding delays in research and biodiversity conservation

Funding delays have widespread consequences, not only affecting

individual career trajectories but also the broader scientific community and biodiversity conservation.

At the individual level, researchers may face:

- Reduced academic productivity.
- Loss of confidence in their professional future and abilities.
- Lack of financial stability.
- Limited career development opportunities.
- Increased stress and mental health struggles.
- Being pushed to emigrate in search of new opportunities.
- Career abandonment.

At the collective level, funding delays contribute to:

- The loss of talent, particularly among marginalized groups.
- The weakening of diverse, inclusive, and equitable research teams (Fig. 1), with diverse perspectives.
- The exacerbation of the mental health crisis in academia (Schwaller, 2024; Beiter et al., 2015).
- Declines in national scientific capacity and consequent loss of public investment.
- Setbacks in biodiversity conservation efforts due to disrupted fieldwork and resulting data gaps, reducing knowledge production to inform evidence-based policies.
- The disruption of long-term research projects.

Ultimately, these impacts hinder scientific progress on urgent global challenges, such as reversing biodiversity loss and mitigating environmental and climate change. Tackling these challenges requires sustained, long-term research efforts and an environment that nurtures innovation, both of which rely on strengthening the country's scientific foundation and retaining qualified researchers. Predictable funding is essential to achieve this outcome, as it enables career planning, supports researchers' mental health, and fosters creativity in problem-solving. In contrast, short-term contracts and prolonged gaps between academic positions compel researchers to deliver immediate results, stifling disruptive science (Nature Materials Editorial, 2003), giving incentives to questionable research practices (e.g., salami science), and limiting the development of science-based solutions that require long-term, continuous funding schemes. Among the projects that could be affected by the loss of qualified researchers are the development of climate adaptation strategies and the establishment of protected areas (which rely on long-term data to be climate-resilient), both of which relate to key Sustainable Development Goals. These examples underscore how ongoing challenges in talent retention can have long-term repercussions (Guedes et al., 2023), undermining Brazil's ability to meet its environmental commitments and develop effective, evidence-based public policies.

How to best support the career of ECRs?

While we recognize that delays stem from systemic issues, we provide a few suggestions to streamline the funding process for fellowships and research grants, and hopefully, help reduce ECRs' attrition:

- **Minimize delays.** Funding agencies should ensure that delays are the exception rather than the norm. Collecting data on the expected number of applicants based on previous calls, as well as expanding the reviewer pool, can help agencies set realistic deadlines and avoid unexpected processing backlogs.
- **Improve communication.** Agencies must provide timely updates about delays. The lack of transparency leaves researchers uncertain about their future. Effective communication, including updated deadlines, should be standard practice. Additionally, dedicated communication channels should be responsive and provide clear information.
- **Review procedures to reduce unnecessary bureaucracy.** Excessive paperwork burdens both researchers and funding agencies. Simplifying application and review processes would increase efficiency and accessibility.
- **Increase transparency.** Some funding agencies do not grant researchers access to evaluations of their project proposals. This lack of transparency hinders their ability to incorporate constructive feedback and enhance their chances of success in future submissions. Furthermore, without access to evaluations, researchers face significant challenges in preparing effective appeals against preliminary rejections.
- **Establish fixed dates for calls.** Regular funding opportunities should be available annually at both the state and federal levels, given that new graduates enter the job market every year. While rolling basis applications are ideal, they are often impractical for state foundations due to their reliance on annual budget allocations. However, establishing a fixed date for calls can enhance the predictability of career funding opportunities, allowing candidates to plan accordingly. It is crucial that federal agencies, such as the National Council for Scientific and Technological Development (CNPq), adopt this approach, as their postdoctoral calls do not open yearly or have overly long evaluation phases, making it difficult to support newly graduated researchers.
- **Engage with the academic community.** Overall, agencies design calls based on their internal demands and governmental priorities. Nonetheless, regularly consulting with the scientific community via forums and workshops is an important step toward creating calls that alleviate researchers' needs and concerns. This approach can make

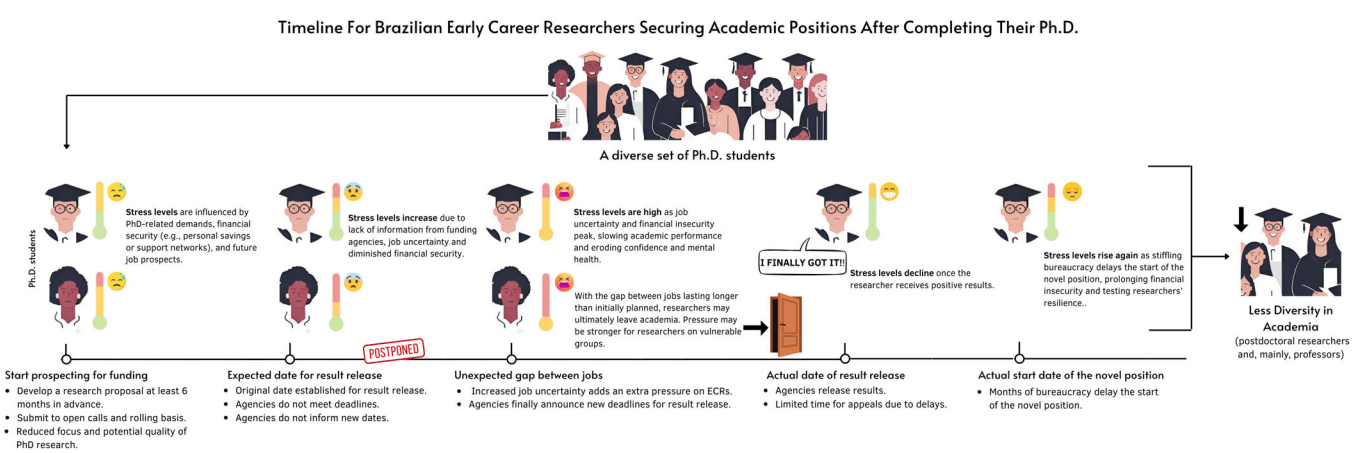

Fig. 1. Pathway of Early Career Researchers (ECRs) to secure academic positions after completing the PhD.

academic careers more attractive and inclusive, improve researcher retention, and reduce the loss of talent. Ultimately, it can also contribute to narrowing the gap between science and policymakers.

- **Expand funding opportunities for ECRs**. While some initiatives are aimed at ECRs, such as the CNPq Junior Postdoctoral Program, these remain limited in scope (i.e., a small number of one-year fellowships for the entire country). Nonetheless, Brazil does have programs that provide a more structured academic career path, such as FAPESP's Young Researcher Grant, which is available only to researchers in São Paulo. Expanding such initiatives nationwide would be a game-changer for Brazilian research, easing the transition from postdoc to permanent positions.

Implementing these measures can foster predictability in the funding system, ensuring that scientists from diverse socioeconomic backgrounds remain in academia and preventing the "brain drain" of experts essential to advancing biodiversity conservation. The current system threatens such equity, as delays of up to six months in securing funding disproportionately impact scientists from marginalized groups, forcing them out of academia despite years of government-funded training. This creates far-reaching consequences for research and ultimately compromises the achievement of Brazil's environmental goals, undermining its leadership in global conservation. It is only by valuing our scientists and investing in their careers that we can effectively address the environmental crisis that extends far beyond Brazilian borders.

While our essay focuses on Brazil, we hope the suggestions raised here may also resonate with other countries in the Global South — particularly in Latin America — that are similarly affected by brain drain. Like Brazil, these nations hold significant potential to help mitigate the biodiversity crisis (Provete et al., 2024), but face systemic inequities, chronic underfunding, and persistent barriers to fostering diversity and inclusion in academia (Lessmann et al., 2024; Morales-Marroquín et al., 2022). Nonetheless, strengthening scientific careers at the regional level is essential for developing and implementing context-appropriate conservation policies that safeguard globally significant ecosystems, such as the Amazon.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the authors Quezia Ramalho and Joice Souza used Chat GPT to revise and improve the English language. Moreover, the author Joice Souza also used an AI Image Generator from Canva to create characters in Fig. 1. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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CRediT authorship contribution statement

Quezia Ramalho: Writing - review & editing, Writing - original draft, Visualization, Project administration, Conceptualization. **Joice Silva de Souza:** Writing - review & editing, Writing - original draft, Visualization, Conceptualization. **Diogo B. Provete:** Writing - review & editing, Writing - original draft, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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