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Abstract

Fake controversies have influenced policy-making on health and environmental issues for decades, leading to major setbacks in the implementation of environmental conservation policies worldwide. In this paper, we expand on Rajão et al (2022) to examine fake controversies produced by a small group of Brazilian scientists that have had serious impacts on environmental conservation in the country, particularly regarding deforestation and climate change. Based on a literature review, we propose a typology of strategies deployed in fake controversies, including manufacturing uncertainty, misusing scientific credentials, and disregarding the scientific literature. We also argue that the spread of these fake debates has been amplified by mass media, which has often provided visibility to fringe claims and false equivalences in the name of balance or sensationalism. Editors and journalists have therefore played a key role in legitimizing and disseminating these controversies and should adopt more responsible practices when covering scientific issues. Subsequently, we examine the influence of these 'fake-controversy makers' on environmental policy-making, particularly within the National Congress. We further analyze the fake controversies promoted by these scientists and argue that, to properly understand them, it is necessary to consider a strategy that has so far been overlooked in the literature: the manufacture of alternative facts. Unlike in other contexts, where denialists primarily attempt to cast doubt on consensual issues by highlighting supposed uncertainties, in Brazil alternative facts on deforestation have been produced and circulated outside peer-reviewed literature. We conclude with recommendations on how professional journalism could help to counter fake scientific controversies and promote evidence-based environmental policy-making.

Keywords

Controversies; Uncertainty; Disinformation; Deforestation; Media; Policy

1 Introduction

Fake scientific controversies consist of manufactured dissensus aimed at influencing public opinion and policy-makers so as to prevent regulatory policies from being put in place. They are created by credentialed scientists, which gives those outside the scientific community the impression that there are legitimate disagreements in science in cases in which consensus has already been reached. Over the past two decades an important literature has emerged on fake controversies and shown their deleterious impacts on human health (Michaels, 2008; Michaels and Monforton, 2005; Weinel, 2007, 2011) and environmental conservation (McCright and Dunlap, 2003; Jacques et al., 2008; Lahsen, 2008; Oreskes and Conway, 2010). A parallel literature on climate communication and media studies shows that mass media have been crucial in amplifying these manufactured controversies, especially through journalistic norms of "balance" and "objectivity" that give disproportionate visibility to fringe positions and denialist claims (Boykoff and Boykoff, 2004; Brüggemann and Engesser, 2017). More recently, social and digital media have further intensified the circulation of climate-related misinformation and fake news, enabling fast, targeted dissemination of misleading content to large audiences (Treen et al., 2020; Tomassi et al., 2025).

The most well-known case is that of climate denialists in the US who seriously affected public opinion and policy-making in this country. The US is one of the world´s main emitters of greenhouse gases in the atmosphere and, particularly during Republican administrations, has been reluctant to implement policies to reduce its emissions. As a result, global efforts to mitigate climate change have been strongly impacted. McCright and Dunlap (2003) have provided a detailed illustration of the influence of fake controversies propelled by denialists aligned with the conservative movement in US policy-making. According to them, in the years leading to the US Congress refusal to ratify the Kyoto Protocol, a considerable number of testimonials by climate denialists took place in US Congress hearings. In the same period climate denialists received as many citations in articles on climate change published in widely circulated US newspapers as leading mainstream climate scientists, contributing to the perception that there was still controversy over the reality of climate change (Lahsen, 2008) and exemplifying how mass media can transform a manufactured dispute into an apparently legitimate scientific debate (Boykoff and Boykoff, 2004; Boykoff, 2007). A few years later, Republican president George W. Bush rejected the Kyoto Protocol arguing that there was still uncertainty around the issue and that it would harm the US economy (Lahsen, 2008).

In this paper, we draw on Rajão et al (2022) to examine the role a specific group of scientists and mass media in spreading fake controversies that have emerged in Brazil over the past few decades, which have also harmed environmental conservation, particularly in the issues of climate change and deforestation. An unprecedented reduction of deforestation by over 80% took place in this country between 2004 and 2012. However, at the end of this period began the dismantling of Brazil's environmental policies, which has been increasing the rate of Amazon's destruction (Artaxo, 2019; Kehoe et al., 2019). This process started with the approval of a revised version of the Brazilian Forest Code in 2012 (Soares-Filho and Rajão, 2018) – the suite of laws regulating nature conservation on private properties. Later, the presidency of Michel Temer (MDB party, 2016–2018) attempted to reduce and downgrade protected areas in the Amazon, sending a strong political signal to encourage deforestation (Rochedo et al., 2018). This deregulatory political period resulted in a 72% increase in annual deforestation rates from 2012 to 2018 (Kehoe et al., 2019). To make things worse, Jair Bolsonaro was elected as the new president in 2018 with the promise to "end the 'industry' of environmental fines", indicating that illegal deforestation would go unpunished. To fulfill the campaign promise, Ricardo Salles, the Minister of the Environment of the new administration, extinguished the Ministry's climate change secretariat and substantially reduced law enforcement activities (Rajão et al., 2020). As a consequence, between August 2018 and July 2019 the Amazon lost one million hectares of mature forests, the highest figure in more than a decade, and deforestation rates exceeded 1.1 million hectares between August 2019 and July 2020, 10% higher than the preceding 12 months (INPE, 2020). These radical moves pose a tremendous threat not only to Brazil's own environment but to global efforts against climate change, with the potential addition of 105 ± 21 Gt CO_2e, pushing the world even closer to exceeding 2 °C of warming (Rochedo et al., 2018; Soares-Filho et al., 2014). In Brazil, as elsewhere, mass media and digital platforms have played a key role in this process by giving sustained visibility to denialist narratives and environmental fake news, often aligned with agribusiness and far-right political agendas (Miguel, 2020; Salles et al., 2023; da Silva and Medeiros, 2025), thereby shaping public debate and helping to legitimate policy dismantling.

What is less known in the case of Brazil is that the assault on environmental policies was boosted by a systematic and often veiled effort to misinform decision makers and society, most clearly in the case of climate change and deforestation. In order to illustrate this issue in Brazil, Rajão et al (2022) has provided a close look at the discourse and actions by

part of the research team in a branch of a federal corporation (Embrapa Territorial, hereafter ET) that exerts significant political influence and systematically produced content used by the agribusiness caucus and the Bolsonaro government to dismiss concerns about deforestation in Brazil. The coordinator of this research team, Dr. Evaristo de Miranda, was part of Bolsonaro's transition team and proposed to drastically reduce law enforcement actions amongst other reforms that point towards the weakening of previously successful deforestation reduction policies (Walendorff, 2018). Reports, newspaper articles, presentations, and videos produced by the ET group are being widely disseminated by landowner-oligarch lobbies, mainstream news outlets, and partisan media ecosystems, turning misleading claims into widely shared "facts" and feeding the machinery of environmental fake news. These materials are also being used in high-level international meetings by the Brazilian Ministry of Foreign Affairs and in presidential speeches to the UN (BBC, 2019). In particular, in this paper we expand on this previous work by also indicting the role of mass media in promoting fake controversies.

2 Brazilian case: the influence of fake controversies in environmental and land management debates in the National Congress

To examine the influence of Dr. Evaristo de Miranda and his associated group on environmental policy debates in Brazil, Rajão et al (2022) conducted a systematic search of the official websites of the Brazilian National Congress—namely the Federal Senate and the Chamber of Deputies—using his full professional and publication names. Despite not being a politician, Miranda's name appeared in 119 search results as of April 2019, which was refined to 105 validated documents. These comprised 9 requests or proposals, 35 plenary speeches, and 17 official news articles in the Chamber of Deputies, and 19 official proceedings in the Senate Journal, 6 legislative records, and 19 official news articles in the Senate. Analysis of temporal trends revealed peaks in references to Miranda during key moments of environmental policy debate, particularly in 2009 (34 mentions), coinciding with discussions to weaken the Brazilian Forest Code, and increases in 2017 and 2018 during intensifying attacks on environmental protections under President Temer.

The article closely examined 105 legislative documents and identified nine instances of Miranda's direct participation in congressional events between 1997 and 2019. After excluding news items (which merely reproduced events), the dataset was reduced to 69 relevant documents. Mentions of his name were coded according to position (agreement, disagreement, inquisitive, requesting, or neutral) and thematic focus. After disregarding procedural or duplicate excerpts, 125 meaningful excerpts were analyzed, of which 99 were from members of Congress and 26 from representatives of government bodies, NGOs, and other institutions.

Most mentions revolved around discussions concerning the Forest Code (74 excerpts, 59.2%), followed by agriculture (17, 13.6%) and agricultural expansion (14, 11.2%). Among the congressional excerpts, 66 expressed agreement with Miranda's views, 4 disagreement, 4 inquisitive, 15 requests for further input, and 10 neutral statements. Support predominantly came from members of the agribusiness caucus, whose interests aligned with efforts to weaken environmental regulations. These findings highlight the prominence and political impact of Miranda's intervention in legislative debates, despite his non-legislative role and lack of specialization in environmental sciences.

The stark contrast between the large social and environmental impact, on the one hand, and the fragility of fake controversies claims, on the other, raises important questions about how the group focused in our study case managed to not only maintain their status but even increase their influence over the years. A closer analysis of the strategies

adopted at the science-policy interface reveals that the practices already described in the literature. However, rather than manufacturing uncertainty on consensual science, this case was particularly active in producing alternative facts. Below the following strategies are analyzed in detail: manufacturing alternative facts, misusing scientific credentials and disregarding the scientific literature.

3 Fake scientific controversies: definition and tactics

A growing literature distinguishes genuine scientific disagreements from fake controversies intentionally manufactured to influence policy-making. While scientific debate is normal, some actors deliberately create the illusion that consensus is lacking to delay or block regulation (Michaels, 2008; Ceccarelli, 2011; Weinel, 2019). Such controversies typically arise in fields central to regulatory decisions, particularly environmental, climate, and public health sciences (Jasanoff, 1990). Research has exposed how industries and interest groups have denied evidence on issues such as smoking, AZT toxicity, acid rain, ozone depletion, and climate change, systematically violating core scientific norms (Oreskes and Conway, 2010; Michaels, 2008; Michaels and Monforton, 2005; Weinel, 2007, 2011; Lahsen, 2008). Rajão et al (2022) identified three tactics as being widely deployed by denialists and fake scientific controversy promoters: *manufacturing uncertainty*, *misusing scientific credentials*, and *disregarding the scientific literature*.

3.1 Manufacturing alternative facts

Manufacturing uncertainty involves deliberately casting doubt on established scientific consensus to delay, distort, or block public policy. Industries have historically used this tactic when scientific findings threatened their economic interests (Michaels, 2008; Oreskes and Conway, 2010). By creating confusion and claiming that more research was needed—despite strong evidence—they sought to undermine public trust in science. As Michaels (2008: 9) notes regarding the tobacco industry, the strategy was to "create doubt, uncertainty, and confusion." Similar methods have been used in environmental debates to question issues such as climate change.

In the same line, one of the main tactics identified in fake scientific controversies in Brazil by Rajão et al (2022) is the manufacturing of uncertainty. In the Brazilian case, however, rather than focusing on disputing established knowledge, the strategy often involved promoting alternative versions of facts and figures that contradicted widely accepted scientific evidence. This was particularly evident in debates leading up to the 2012 revision of the Forest Code (FC), which weakened environmental regulations. While historical deforestation and weak enforcement had long been issues, environmental monitoring and law enforcement had significantly improved since 2004. Despite published evidence showing that agricultural production rose alongside strengthened environmental protection, agribusiness interests—seeking to relax the FC—argued that full compliance with existing rules would severely restrict agricultural expansion.

Dr. Evaristo de Miranda and collaborators played a central role in this fake controversy by presenting studies in congressional hearings claiming that only 33% of Brazilian territory could be used for agriculture under full implementation of the FC, and that no land would be available in the Amazon and Pantanal regions. These estimates deviated significantly from peer-reviewed scientific studies, which identified between 96 and 120 million hectares of available agricultural land in the Amazon alone. Miranda et al. did not publish their findings in peer-reviewed journals, and subsequent analysis revealed that their

inflated estimates stemmed from applying the maximum riparian protection buffer (500 m) uniformly to all rivers, regardless of width—contrary to the FC's specifications. More robust analyses using high-resolution hydrological data demonstrated that Miranda's calculation overestimated protected areas around rivers by more than 300%.

Despite substantial evidence refuting these calculations, these figures were politically influential during congressional debates on the Forest Code. They provided a technical justification for relaxing environmental requirements and approving amnesty for 58% of illegal deforestation committed before 2008. The revised FC was approved with broad political support, including from both right- and left-wing parties, contributing to the reversal of Brazil's progress in reducing deforestation. Following the reform, deforestation rates more than doubled between 2012 and 2019, undermining Brazil's capacity to meet its commitments under the Paris Agreement and exemplifying how fake scientific controversies can have long-lasting consequences for environmental governance.

3.2 Misusing scientific credentials

Misusing scientific credentials occurs when scientists leverage their academic status to comment on fields outside their expertise, giving undue weight to their opinions. Scientific knowledge has become increasingly specialized, and meaningful contributions typically require deep experience in narrow fields (Collins and Evans, 2007; Collins, 2011; Duarte, 2017). A well-known example involves prominent retired physicists who used their reputations from Cold War research to challenge environmental and health science, despite lacking expertise or peer-reviewed work in these areas (Oreskes and Conway, 2010; Lahsen, 2008). Their arguments were amplified by the media and politicians due to their credentials, rather than scientific relevance.

According to Rajão et al (2022) a central strategy used by Congress members aligned with the agribusiness caucus to promote fake scientific controversies is the framing of environmental disputes as a battle between "science" and "ideology." In this rhetoric, environmental positions are portrayed as being influenced by foreign interests or financial incentives, whereas researchers supporting agribusiness interests—particularly Miranda and his collaborators—are presented as objective and scientifically authoritative. Statements from congressional representatives emphasize this contrast by discrediting environmental scientists and NGOs as "fake environmentalists" while exaggerating Miranda's credentials and portraying him as a world-renowned expert whose work underpins agriculture-related policy decisions.

However, a detailed analysis of Miranda's academic record contradicts these claims of scientific authority. Examination of his official CV on the Lattes Platform shows that the majority of his listed "journal articles" were either publications in non-peer-reviewed magazines or book chapters. Of 83 entries, only 17 were peer-reviewed, and only 10 were indexed in scientific databases, averaging just one scientific paper every 3.8 years since 1982—often without Miranda as lead author. In several cases, he misrepresented his authorship position. Notably, none of these indexed publications provide methodological transparency regarding the agricultural and land-use claims used in congressional debates, which remain confined to internal reports and media appearances.

Although Miranda's association with Embrapa—a reputable agricultural research institution—is frequently invoked to support his authority, this affiliation has been controversial within the scientific community. While some congressional members leverage Embrapa's institutional prestige to defend Miranda and dismiss criticisms from independent scientific organizations researchers from other Embrapa units have openly distanced themselves

from his claims. For example, in 2019, scientists from 31 Embrapa centers publicly rejected proposed legislative changes to dismantle legal reserves, reaffirming the scientific consensus on the importance of environmental protections. This demonstrates that despite failing scrutiny by academic standards, claims of scientific authority remain an effective tool for cultivating fake controversies in the public and political arenas.

3.3 Disregarding the scientific literature

Disregarding the scientific literature is another common strategy. Genuine controversies generate debate in peer-reviewed journals, but once resolved, mainstream journals stop publishing arguments already disproven (Collins and Evans, 2017). Rather than engage with scientific peers, fake controversy-makers address public and political audiences directly through media appearances, online platforms, or publications in predatory journals and think tanks (Collins, 1992; Weinel, 2019). In the case of climate change, Oreskes (2004) found no peer-reviewed paper disputing anthropogenic warming, yet denialist arguments continued to circulate via think-tank publications and non-academic books (McCright and Dunlap, 2000; Jacques et al., 2008), often mimicking scientific style without adhering to peer-review or engaging with credible literature.

In line with tactics used by promoters of fake scientific controversies around issues such as climate change and tobacco, the Brazilian case demonstrates a systematic avoidance of engagement with the scientific community. Rather than interacting with established research, Miranda and collaborators often presented their findings as original while disregarding extensive pre-existing literature. For instance, Miranda et al. (1997) described their analysis of sugarcane burning as novel and beneficial, despite multiple earlier studies—some by fellow Embrapa researchers—indicating adverse impacts. More recently, Miranda (2020) argued in a major newspaper that the public is overwhelmed by conflicting information about the Amazon and proposed an annual report to clarify the situation, a narrative that bypasses decades of rigorous research and monitoring conducted by scientific institutions such as INPE.

Scientific credibility relies on peer-reviewed publication and engagement within the academic community. However, during debates surrounding the revision of Brazil's Forest Code, senior researchers raised concerns about the lack of transparency and scientific rigor in the studies presented by Miranda. Dr. Gilberto Câmara, then director of INPE, criticized the absence of openly available data and pointed out that unlike INPE and IBGE, Miranda had not published his results through peer-reviewed channels. Similarly, Dr. Braulio Ferreira de Souza Dias highlighted that Miranda's study lacked validation, reproducibility, and peer review, stressing that legislative decisions should be grounded in consolidated scientific evidence rather than unpublished and unverifiable analyses.

In public and political debates, Miranda's influence relied less on academic legitimacy and more on strategic alliances and media presence. Most of his appearances in the National Congress were alongside politicians supportive of agribusiness interests, while his engagement with academic experts remained minimal. Instead, his messages were amplified through social media, with at least one controversial video receiving over 340,000 views and similar content circulating widely via WhatsApp. This demonstrates how scientific misinformation, when disseminated through digital platforms and aligned with economic interests, can shape public perception and distort policy debates, even in the absence of scientific credibility.

3.4 Engaging with traditional and online media

Adding to these the three strategies outlined above, we would like to call the attention to the *engagement with traditional and online media* in establishing fake controversies. Traditional media have historically contributed to the persistence of fake scientific controversies by adhering to journalistic norms of "balance," often granting equal coverage to mainstream scientists and fringe climate contrarians despite a well-established scientific consensus. Boykoff and Boykoff (2004) demonstrate that this "balance as bias" resulted in the prestige press presenting climate change as scientifically disputed, artificially magnifying dissent and misleading the public into perceiving an ongoing debate where none existed. This distortion has been further intensified in the digital media environment. Research shows that sensationalistic or "truth-telling" style content promoted by fringe outlets tends to attract higher levels of engagement compared to evidence-based reporting, as emotionally charged, dramatic, or conspiratorial narratives are more likely to trigger reactions and shares (Treen et al., 2020). As online platforms prioritize engagement-driven visibility, such attention-grabbing content is algorithmically amplified, reinforcing misleading perceptions of controversy around settled scientific issues and lending disproportionate visibility to denialist viewpoints (Brüggemann and Engesser, 2017; Tomassi et al., 2025). Thus, both traditional media practices of presenting fringe claims alongside expert consensus and digital media incentives favouring sensationalism play a decisive role in promoting fake controversies and skewing public and political perceptions of scientific knowledge.

Dr. Miranda, during his tenure as head of ET, devoted a substantial portion of his professional activity to media engagement rather than scientific research. As demonstrated in the analysis of his curriculum vitae above, his output in peer-reviewed scholarship is limited—he has authored fewer than 20 scientific articles over more than four decades of professional activity. In stark contrast, his personal website lists over 1,500 articles, the vast majority of which are journalistic or opinion pieces directed at general audiences rather than academic or technical communities. Dr. Miranda has maintained a strong and longstanding presence in mass media. For eight years, he hosted a regular segment on the weekly television program *Caminhos da Roça* on EPTV-Globo, the regional affiliate of Brazil's largest TV network headquartered in Campinas. He also serves as an agricultural commentator for major national media outlets, including the Bandeirantes Radio and Television Network, BandNews, Canal Agro Mais, and Canal Terra Viva. Additionally, he presents the weekly program *Brasil Verde*, focused on agribusiness sustainability, on Canal Agro Mais, and previously acted as a commentator for the news program of Rede Século XXI Television. His media contributions extend to publications such as *National Geographic*, *ECO 21*, *AgroDBO*, *A Lavoura*, *Animal Business Brasil*, *Jornal da Universidade*, *A Tribuna*, *Agroanalysis*, *Revista Opiniões*, *O Estado de São Paulo*, and *Revista Oeste*.

Of particular relevance are his articles published in *O Estado de São Paulo* and *Revista Oeste*. *O Estado de São Paulo*, founded in 1875, is one of Brazil's oldest and most prestigious newspapers. Between 1984 and 2020, Dr. Miranda authored 47 pieces for this outlet, generally portraying Brazilian agribusiness as among the most environmentally sustainable worldwide and criticizing key environmental policies. Following increasing public criticism, including from Rajão et al (2022), his contributions shifted predominantly to *Revista Oeste*, a far-right digital platform, where he continues to publish on a regular, often weekly, basis. These pieces maintain a narrative favourable to agribusiness interests and frequently oppose mainstream environmental regulation. Despite being removed from his leadership position at Embrapa Territorial in 2021 and retiring in 2023, Dr. Miranda continued to exert influence within the institution and remained closely connected to the agribusiness sector, with frequent presence in media outlets.

4 Importance of professional media in opposing fake science controversies

Peer-review processes and mechanisms for scientific rebuttal remain essential to knowledge production. However, the scientific community has not been sufficiently prepared to confront fake science controversies operating outside traditional academic pathways. By often dismissing such claims as unworthy of scholarly attention, scientists have inadvertently allowed them to circulate unchallenged in public discourse. This gap has enabled proponents of fake controversies to shape political debates effectively, exploiting their strategic media engagement. In this sense, academia shares partial responsibility for the resilience and policy influence of fabricated controversies.

The role of professional media is central in either amplifying or dismantling fake science controversies. Traditional journalistic practices—particularly the pursuit of "balance" and heightened attention to conflict-driven narratives—have often resulted in false equivalency, giving fringe scientific views the same visibility as well-established scientific consensus. Editors and journalists, frequently operating without sufficient scientific training or under the pressure of engagement metrics such as views, clicks, and audience retention, may inadvertently prioritize sensationalism over accuracy. As a result, fabricated disputes are presented as legitimate scientific debates, distorting public perception and policy discussions. Professional media must evolve from passive conduits of conflicting viewpoints to active defenders of evidence-based information. This requires stricter editorial standards, scientist-led verification processes, improved scientific literacy among media professionals, and institutional collaborations with trusted scientific bodies. High-quality, responsible journalism—when grounded in rigorous fact-checking and clear distinction between consensus and dissent—is one of the most powerful tools available for countering misinformation.

The risk that fake controversies pose to the global environment—including the potential rollback of critical environmental protections—underscores the urgency of reform in science communication and media response. While it is impractical to fact-check every claim made by actors who deliberately bypass peer-reviewed channels, scientific journals should create formal spaces for rebuttals and critical commentary (as demonstrated by this article). Moreover, media and educational institutions should work to improve public understanding of how science is developed—its provisional nature, dependency on transparent methods, reproducibility, and collective scrutiny (Shapin, 1992; Collins and Pinch, 1998; Lynch et al., 2015). By reinforcing the distinction between rigorous scientific inquiry and unverified assertions, professional media can function as a protective barrier against the spread of fake controversies, strengthening public trust in science and supporting evidence-based policymaking. Ultimately, combating these controversies demands a coordinated response across academia, journalism, and society—where professional media serve not merely as observers, but as active allies in the defense of scientific integrity and the public interest.

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