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RESEARCH ARTICLE



Hydropower in the News: how Journalists do (not) Cover the Environmental and Socioeconomic Costs of Dams in Brazil

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ABSTRACT

Despite massive environmental impacts and socioeconomic risks, hydropower dams continue to be widely adopted and unquestioned in developing countries. This study analyzes two decades of mainstream media coverage of dams in Brazil, where two-thirds of energy consumption comes from hydropower. Through a content analysis of news articles published by the largest outlets in the country, we found coverage has relied on official and construction companies' voices and focused on economic progress, bureaucracy, corruption, and partisan politics. News rarely covered the socio-environmental risks and impacts caused by dams or questioned the country's reliance on hydropower. Overall, newspapers presented dams as highly necessary projects for national progress, conforming to a modernization-oriented mindset prevalent in newsrooms when it comes to coverage about energy. As a result, journalism has contributed to the invisibility of the struggles faced by people and the environment directly impacted by hydropower dams.

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Introduction

Climate change is one of the defining crises of our time. As its effects deepen across the globe, the need for sustainable energy solutions is more urgent than ever. At the same time, more than 1.1 billion people lack consistent access to energy globally, which severely hinders economic development (IEA, 2017). Non-fossil fuel solutions, often billed as clean energy, could help decelerate the effects of anthropogenic climate change. While wind and solar power have been growing in developing countries, it is hydropower that has boomed across the Global South, with dams being built in high biodiversity river basins (Moran et al., 2018).

Despite its “clean energy” promise, hydropower dams have massive social and environmental costs, including resettlement of local and indigenous communities, loss of biodiversity, greenhouse gas emission, destruction of fisheries, social conflict and deforestation, just to cite a few (Kahn et al., 2014; World Commission on Dams 2000; Zarfl et al., 2019). Those impacts have been widely known since the 1970s, but while some European and North American countries started removing dams, developing countries went in the opposite direction, investing in mega hydropower projects at biodiversity hotspots (Moran et al., 2018). Many of these countries were enduring authoritarian regimes that violently repressed dissenting voices. After more than a century since the first plants were built, hydropower is still a growing phenomenon in the Global South. Nonetheless, news coverage of dams only recently started attracting scholarly attention.

This research is part of an interdisciplinary effort to understand how information about hydropower is disseminated to Brazilian communities that are impacted by dams. We analyze news about hydropower after the end of official censorship post-military regime. About 67% of Brazil's energy consumption comes from hydropower, but despite activist efforts made by NGOs, a recent survey has revealed that community residents affected by dams were mostly unfamiliar with information about their impact and did not participate in meetings or activist efforts to ensure their rights (Mayer et al., 2021). Far from the urban centers, these communities often rely on national media via satellite for information. At the same time, citizens living in urban centers far from dams also rely on national news for information about hydropower.

Using content analysis, we analyze if contemporary media adequately present the risk to the health and livelihoods of local communities, and the substantial environmental cost of hydropower dams. To our knowledge, only a handful of studies provided longitudinal analyses of news coverage of dams worldwide (Arini, 2013; Paes et al., 2018; Wu et al., 2017). We add to this literature by providing a longitudinal national analysis of news coverage of Brazilian hydropower dams from 1997 to 2020, mapping general coverage patterns over time and addressing the role of sources in driving those patterns. Results reveal trends on how news covered hydropower in a period encompassing five democratically elected presidencies including the center-right Fernando Cardoso, the three leftist terms of the Workers' Party (Lula da Silva and Dilma Rousseff), the center-right government of Michel Temer and the current right-wing presidency of Jair Bolsonaro. We start with a review of what we know about environmental coverage norms and sourcing patterns, including a section on the Brazilian context. Then, we present current scholarship on news coverage of hydropower before proceeding to the analysis and discussion.

Literature review

Environmental coverage: journalistic norms and sourcing practices

Mass media is known for playing a crucial role in bringing environmental issues to the public agenda. In many cases, the coverage of serious problems such as pollution and biodiversity loss brought a much-needed awareness to enable changes in public policy (Neuzil & Kovarik, 1996). This does not seem to be the case with the coverage of the social and environmental impacts of dams.

Environmental reporters must communicate complex issues constrained by limited time and space devoted to environmental stories in mainstream media (Detjen et al., 2000). This process involves organizational constraints, relationships with sources, and the context surrounding the issue. When it comes to sourcing, Mourão (2016) found environmental coverage relies heavily on official sources, especially in the case of disasters. In stories about climate change, Takahashi et al. (2017) similarly found that non-science sources (primarily political sources) dominate coverage. It is important to note that reliance on official discourse is not unique to environmental reporting, with studies on various news beats identifying dominance of official sources in shaping coverage (Gitlin, 1980; Tuchman, 1978). Journalists' dependence on institutionally positioned officials comes from news-making norms and routines; official sources reduce reporting costs, with the beat system of newsgathering fostering a symbiotic relationship between reporters and their institutional sources (Cook, 2006). As a result, communication scholars posed the theory of *indexing*, which predicts that the range of debate about an issue depends on the degree of debate among official sources about it (Bennett et al., 2007). The way journalists act is closely linked to procedural knowledge (Traquina, 2008). Examples of usual situations involving mainstream media reporters are trips sponsored by companies or by a specific player interested in the public projection of a certain image. This happened during the construction of the Madeira River dams, as shown by Rossato (2010) in a study about the legitimization of dams in the Amazon.

The disjuncture between journalistic norms and environmental news is a major factor limiting the reporting in mainstream media. According to Beling Loose et al. (2017), the six factors present

in environmental news—long term processes, scientific uncertainty, technical complexity, perception of risk, economic interests, and social conflicts—hamper their inclusion into the news agenda. In the case of dams, because both activists and court proceedings usually refer to risk, Kitzinger and Reilly (2002, in Loose et al., 2017) argue that risk is about projections, but journalists work with current *events* (meaning that the manifestation of risk is a necessary trigger for journalistic production).

Environmental journalism in Brazil

Environmental issues started to appear in Brazilian newspapers in the late 1970s (Belmonte, 2017) and, to be inserted in the agenda of mainstream outlets, environmental news resembled scientific reporting until the late 1980s (Belmonte, 2017; Michelotti, 2005). In the early 1990s, there was prejudice against environmental journalists in the country's newsrooms, and they often received pushbacks because of a pro-modernization mindset that was prevalent among editors and media owners. Because of this, journalists started approaching environmental reporting in “a modernizing way” (Belmonte, 2017). Several empirical studies confirm that, despite presenting themselves as impartial, Brazilian media have legitimized an institutional and scientific-technological view of the environmental crisis, instead of a socio-environmental approach (Fanzeres, 2004; Morais, 2019; Mourão & Sturm, 2018).

Environmental coverage is, of course, constrained by the country's media system. Matos (2008) points out that a few families own the media system in Brazil. The media oligopoly is related to the political goals of security and national sovereignty unleashed by the military dictatorship after the 1960s, and the global readjustments of financial capitalism. To these families, one should add the local owners of radio and TV stations that rebroadcast the content of the largest five family conglomerates. In the Amazon, a 2016 report revealed one in five TV broadcasters in the Amazon region belonged to a politician (Lobato, 2016).

Hydropower in historical context: the case of Brazil

The exploitation of Brazil's hydric potential started during the military dictatorship (1964-1985) and expanded during democratic governments, indicating that energy policies didn't change significantly with democratization (Castilho, 2019). Today, the Amazon region has four of the five biggest hydropower plants in Brazil: Belo Monte, Santo Antônio, Jirau and Tucuruí.

There's clearly a *continuum* regarding energy policies in the last three decades, with a pattern of growing social and environmental impacts, even during the 12 years that the leftist Workers' Party was in power (2003-2016). Costa et al. (2017) analyzed the presidential discourses about energy policy from 1969, during the dictatorship, to 2010, during the Workers' Party government. The study reveals that institutional narratives about hydroelectric projects transcend time and ideological framing to promote repetitive technocratic discourse. Representations of efficiency and technical competence left out social and environmental aspects (Costa et al., 2017). After the impeachment of left-leaning President Dilma Rousseff in 2016, there was an intensification in efforts for deregulation and privatization of the state-controlled electricity utility company (Brum, 2019). Currently, right-wing President Bolsonaro's government (2018-2022) approved a bill changing procedures for environmental licensing in the country, which was heavily criticized by environmentalists for making procedures even more lenient (Spring, 2021).

Coverage of dams in media studies

Although hydropower projects flourished in developing countries since the 1960s with significant social and ecological impacts (Moran et al., 2018), news coverage of dams only very recently seemed to attract scholarly attention. Most communication studies were published in the last two decades and investigated singular hydropower plants mostly using ethnographic methods, feminist

approaches or Latin American audience reception theories. These qualitative studies focus on identity and power relations, showing how affected communities are coping with or being compensated for the impacts of hydropower plants. Nevertheless, none of them encompasses a systematic long-term national media analysis, with discourse and content analyses of news stories and other media texts mostly presenting case studies.

The literature in English focuses on regions where democratic and participatory processes are fragile. Yaka (2017), for example, takes a feminist-phenomenological perspective to analyze women's activism against hydropower plants in Turkey. The author found an interconnectedness between identity, political subjectivity and environmental activism (Yaka, 2017). Ozen (2014) conducted an analysis of the Turkish Government discourse against movements that oppose hydroelectric plants on environmental grounds, finding that the government has managed to gain popular consent not only for construction, but also for repressing such movements.

In the Lower Mekong basin, Quang and Borton (2020) analyzed the impact of public participation in local environmental decision making via interviews with citizen science-led grassroots initiatives. Even in developed democracies such as Portugal, where the construction process includes public consultations, Pinto-Coelho et al. (2019) found that although citizen discourses in the media indicate change in the balance of power, their participatory potential is constrained by traditional citizenship regimes.

There are very few communication studies about dams published in Brazil. A search in the database of the Coordination for the Improvement of Higher Education Personnel (CAPES, in Portuguese) found only nine studies since 1996. Most of them were published after 2010 – coinciding with the construction of the three biggest dams in the Amazon: Santo Antonio, Jirau and Belo Monte. In the top-ranked Brazilian peer-reviewed journals, only three articles about dams were published in the last 20 years.

Two of those works are reception studies informed by Latin American Cultural Studies. Rossato (2008), for example, worked with young activists of the Movement of People Affected by Dams (MAB) to understand how the political positions of the movement informed the reception of information about the dam via radio and television. Established in 1991, MAB is the most influential national movement that advocates for the rights of people displaced by hydropower dam projects. Rossato found that the media consumption is mediated by the movement's views on the power relations between rural communities and the company managing the dam (Rossato, 2008). In the Amazon region, Silva (2013) mapped the communication processes in an off-the-grid community near Tucuruí's hydropower plant reservoir. The author shows how the community used alternative sources of electricity, such as car batteries, solar panels and generators to power TVs, radios, mobile phones, etc. (Silva, 2013).

The voices of communities and displaced people, absent in the institutional messages and media coverage, are found in the activist media content produced by social movements. Longhi and Clemente (2017), for example, found resistance against government and company in the case of the Estreito dam while analyzing the discourses of the Movement of People Affected by Dams in its website. Meanwhile, content from social movements and activist-artists against Belo Monte were found on social media platforms such as Facebook (Monteiro, 2018) and YouTube (Marques & Martino, 2012), as well as on non-mainstream websites and in blogs (Santos & Mello, 2014) – all of them showing the new media as a discursive arena where voices in favor and against dams clash in the comment sections.

Regarding news coverage of dams by mainstream media outlets, the literature review shows a recurrent focus on specific cases, short periods of time or specific events. Only a handful of studies have provided longitudinal analyses of news coverage of dams (e.g. Wu et al., 2017 on the international cover of Three Gorges Dam from 1982 to 2015). In Brazil, coverage of Belo Monte case got some scholarly attention: Arini (2013) analyzed magazine covers from 1989 to 2013; Paes et al. (2018) looked at the international coverage of the dam from 2005 to 2017 and Pinto et al. (2017) focused on the period right after the dam got its environmental license – 2013 and 2014.

The three studies found one common trend: planning, licensing and construction phases are the most covered by the media. Sources are another recurrent concern, pointing to an imbalance between officials and communities affected by Belo Monte.

The selection of sources reinforces environmental problems as an issue for institutions and specialists to discuss, rarely listening to the concerns of the affected people. The government is the main source quoted, with studies showing it accounts for more than half of the voices heard. In addition to official viewpoints, coverage of dams is also shaped by discourse pushed by the companies that build or manage the dams which, along with the government, generally account for two thirds of the sources (Arini, 2013; Pinto et al., 2017; Vicentini & Hintze, 2017). Da Veiga (2010) points out that these sources have a retrogressive view of environmental impacts and their assessment. Apart from studies specifically sampling stories about social movements (Longhi & Clemente, 2017; Marques & Martino, 2012; Monteiro, 2018), there's a striking absence of viewpoints from people affected by dams, indigenous and riverside people, and traditional communities (Pinto et al., 2017; Vicentini & Hintze, 2017).

Because these studies focused on a single case or dam and our study encompasses any dam mentioned in mainstream media for two decades, we pose the following research question:

RQ1: How did the mainstream media in Brazil portray hydropower over time?

Then, we identify which sources are present in news about hydropower. Since most studies on both environmental reporting in general and the coverage of specific dams have consistently found a predominance of official sources, we hypothesize:

H1: News stories about hydropower dams will be more likely to use official sources than other types of sources.

Finally, we investigate the relationship between sourcing and patterns of coverage by asking:

RQ2: What is the relationship between sources and news coverage of hydropower focusing on a) environmental impacts, b) socioeconomic impact, c) activism, and d) licensing?

Methods

We use a combination of quantitative and qualitative content analyses of articles containing the keyword “hydropower dam” in Portuguese. Data were pulled from Factiva from the top news outlets in the country between 1997 - 2020: *Folha*, *O Estado de SP*, *O Globo*, and *G1* ($N = 2,996$). The procedure started with a qualitative assessment of a random systematic subsample following a hierarchical coding system via analytic induction in Nvivo ($N = 150$) by the first author of this study, who is a Brazilian researcher. The results of the qualitative coding and literature review informed the codebook that was used in the quantitative analysis of a systematic random sample ($N = 350$, CL: 95%, CI: 5). After several training sessions, coders (a faculty member, a doctoral and a post-doctoral student, all native Portuguese speakers) conducted intercoder reliability tests on a random subsample ($N = 51$), following the recommendation of Riffe et al. (2019). Krippendorff's α and Cohen's κ were used to calculate intercoder reliability using Recal (Freelon, 2013). Scores for each variable are detailed below.

Measures

Content characteristics

Before coding each article, coders assessed if the news mentioning the keywords was indeed about hydropower dams in Brazil or about something else, e.g. dams in other countries or a story about other issues that might have mentioned keywords in passing. We found that about 34% of the stories mentioning ‘hydropower dams’ in this dataset only briefly mentioned the term and were removed from this study ($\alpha = .91$). It is important to note that this is a finding in itself, as a

substantial portion of coverage about hydropower only mentions the term, but still symbolically connects it to other issues without proper contextualization (e.g. stories about corruption that mention dams as an example of corrupt construction or stories that mention hydropower as one of the many policies of a government). The remaining stories were distributed as follows: 21.7% from *O Globo*, 31.7% from *Folha*, 38.9% from *Estado*, and 7.8% from *G1*. The coverage characteristics were dummy coded, indicating their presence (1) or absence (0) in the news: **environmental impacts** ($\alpha = .87$); **socioeconomic impact**, including displacement, economic resources being affected, human rights, labor rights and conflicts, etc. ($\alpha = .78$); **activism** against dam construction and/or the resettlement/compensation process ($\alpha = .93$); **licensing**, including public bidding and/or construction procedures ($\alpha = .73$).

Sources

We coded the number of sources quoted directly or indirectly coming from: official sources (elected or appointed by elected officials) (α for ratio = .78), residents (α for ratio = .85), activists (α for ratio = .80), representatives from the construction/utility company (α for ratio = .73), and experts (academics, opinion leaders) (α for ratio = .78). Everything else was coded “other sources”. About 10% of the stories had no sources and 36.6% had only one source. Then, we computed the *proportion* of voices reported belonging to each group in the article (N group/ N total).

Analysis

To answer **RQ1**, we used crosstabulations to compare stories based on their publication year, dividing the dataset into six periods based on presidencies: Fernando Henrique Cardoso (center-right), Lula da Silva (center-left), Dilma Rousseff (center-left), Michel Temer (center-right), and Jair Bolsonaro (extreme right). For **H1** and **RQ2**, we used descriptive and t-tests comparing sourcing patterns and coverage characteristics.

Results

Data characteristics

About 29.1% of the stories mentioned environmental impacts, 23.9% mentioned socioeconomic impacts, 21.7% mentioned activism, and 52.2% mentioned licensing, bidding or construction procedures. When it comes to sources, on average 46.77% of quotes came from official sources, 26.92% from utility companies, 7.63% from activists (non-residents), 7.44% from experts (academic researchers, policy experts, etc.), 3.91% from residents, and 6.81% from other sources. About 12.2% of stories were published during the Cardoso presidency, 12.2% during Lula’s first term, 35.7% during Lula’s second term, 22.2% during Rousseff’s presidency, 8.3% during Temer’s half term, and 9.6% during Bolsonaro’s first years as the President.

Difference by time period

The results depicted on [Table 1](#) show differences in coverage characteristics by presidencies, showing that focus on environmental and socioeconomic impacts did not differ among center-right, center-left and extreme right governments at statistically significant levels. For activism, we found coverage during Lula’s first term and Temer’s tenure mentioned activism at higher rates [χ^2 (3) = 11.98, $p < .05$]. Coverage about licensing also peaked during Lula’s second term, with 75.6% of the coverage focusing on licensing, public bidding, and other procedural news about construction of new dams [χ^2 (3) = 33.49, $p < .001$]. News during this period emphasized the central role hydropower plays in the Workers’ Party program for growth acceleration. Much of this coverage connected hydropower and other large infrastructure construction during Lula’s presidency to

Table 1. Crosstabulations comparing content characteristics (environmental impact, socioeconomic impact, activism and licensing) by presidencies.

	Presidency (%)						Total (%)	χ^2 (3)
	Cardoso	Lula	Lula	Rouseff ¹	Temer	Bolsonaro		
Environmental impact	17.90	42.90	30.50	27.50	26.30	27.30	29.10	4.53
Socioeconomic impact	17.90	35.70	17.10	33.30	31.60	13.60	23.90	9.19
Activism	10.7 ^{ab}	39.3 ^c	22 ^{abc}	21.6 ^{abc}	31.6 ^{bc}	4.5 ^a	21.70	11.98*
Licensing	46.4 ^a	35.7 ^a	75.6 ^b	43.1 ^a	47.4 ^{ab}	18.2 ^c	58.70	33.49***

* $p < .05$, ** $p < .01$, *** $p < .001$

^{abc}For each pair of presidency periods, the column proportions are compared using z tests. If a pair of values is significantly different ($p < .05$), values have different subscript letters

¹For Dilma Rouseff's presidency, we combined her first term and the year prior to her impeachment during her second term.

progress achieved during the military regime, despite their diametrically opposed ideological leaning. For example, in a story published by *O Globo* (Paul, 2010), the lead openly compares the leftist president to dictator Ernesto Geisel, driven by a quote from Lula himself that states:

“To show that we were not talking nonsense and to show that we were doing something that Brazilian society had not seen since 1975, it is important to remember why we have a short memory: this country, after the Geisel government, had no more investment in infrastructure - said Lula, referring to the PAC [plan for growth acceleration].”

Taken together, these results reveal no major differences when it comes to hydropower among democratic governments from various political leanings. In fact, it was during the leftist government of the Workers' Party that there was an intensification of licensing and construction of dams, and news exhaustively covered the minutia of these bureaucratic processes.

When environmental impacts, socioeconomic risks, and activism were mentioned, information was often buried in the last paragraph of the story and presented without context. For example, one story published on *Estado de São Paulo* had a single paragraph that mentioned a large compensation payment without any information about the damages impacting indigenous people:

“The Federal Public Ministry signed an agreement with Vale [utility company] and the Consortium of the Aimorés Hydroelectric Power Plant, whereby the companies will pay R\$ 12 million in compensation for collective moral damages to the Krenak indigenous people. In the lawsuit, filed in 2005, the Public Ministry and Funai [National Indigenous Foundation] accused the companies of ignoring the rights and interests of the Krenak people who live in the rural zone of the municipality of Esplendor, in the contract for the construction of the plant” (O Estado de São Paulo, 2008)

The story failed to mention that the Aymorés dam impacted the river flow reducing fishery resources and causing intense flooding of the indigenous land during the raining season. The entire Itueta county, the closest commercial outpost for the Krenak people was displaced. The licensing process ignored the need to consult the Krenak people before the construction (Fiocruz, n.d.).

Other stories published several paragraphs on licensing, bidding and other macroeconomic aspects, just briefly mentioning socioeconomic and environmental impacts, often without any quotes or only with quotes from the construction company about resuming operations. For example, one story on *O Globo* reports on the final steps of Estreito dam's construction, with detailed information about the number of companies involved, the size of the reservoir and the number of workers employed in the construction, ending with a brief report on the socioeconomic impacts:

“Next May, when the river will be diverted, 60% of the two riverside families that will need to be resettled because of the future reservoir will have already moved to new homes and rural properties. The region today is very poor. But when the dam starts generating energy, the two states and the 12 municipalities will receive R\$16.8 million per year just in financial compensation.” (O Globo, 2008)

It's not possible to know if the number presented (two riverside families) is a typo, but the number of rural families impacted by Estreito dam is estimated to be 1,109 and activists denounced resettlement happened with inadequate conditions and loss of income due to impact on fish stocks (de Melo & Chaves, 2012). The construction is also blamed for the increase in violence and child prostitution (IHU Online, 2010).

Sourcing patterns

Results presented on Table 2 show the relationship between the percentage of quotes coming from different types of sources used and coverage of environmental impact, socioeconomic impact, activism, and licensing procedures. When it comes to environmental impacts coverage, findings suggest stories use a higher ratio of quotes coming from residents [$t(178) = 2.20, p < .001$], activists [$t(178) = 2.01, p < .01$], and experts [$t(178) = 1.64, p < .01$] if compared to stories that don't mention environmental impacts. Conversely, stories mentioning environmental impacts have a lower ratio of official sources [$t(178) = -1.23, p < .01$] and company sources [$t(178) = -1.62, p < .01$].

Similarly, stories mentioning socioeconomic impacts have a lower ratio of official [$t(df) = -4.03, p < .05$] and company sources [$t(178) = -1.12, p < .05$], and a higher ratio of residents [$t(178) = 2.10, p < .001$], activists [$t(178) = 6.85, p < .001$] and other sources [$t(178) = .98, p < .05$]. For stories mentioning activism, we found they have a higher ratio of activist sources [$t(178) = 6.98, p < .001$] and lower ratio of company sources [$t(178) = -1.52, p < .001$], if compared to stories that do not mention activism. For licensing stories, the ratio for official sources [$t(178) = 2.52, p < .05$] increased, while residents [$t(178) = -2.67, p < .01$] and activists [$t(178) = -1.97, p < .05$] decreased.

It is important to note that these tests only compare stories that mention environmental impacts, socioeconomic impacts, activism, and licensing versus stories that do not. Ultimately, even when the ratio of official sources decreases, it never goes under 25% of the quotes on average in a story. Conversely, at its peak, the ratio coming from residents (8.66%), for example, never goes above 10% on average. While these results suggest that inclusion of activist, resident and expert voices increases focus on environmental impacts and socioeconomic risks, their proportion in coverage is still generally much smaller than quotes from official sources and utility/construction companies. It is also important to note that the key sources used in stories about environmental impacts and socioeconomic risks were officials from the public prosecutor's office, in charge of investigating irregularities in licensing, and the inspection agency Ibama (Brazilian Institute of Environment and Renewable Natural Resources), which is part of the Brazilian government. Ultimately, we found stories not only more frequently focused on licensing, but also that official sources carry even more weight in those stories.

Discussion

This study sought to identify how Brazilian media have portrayed hydropower in the past two decades. We found that, despite more than five decades of known impacts and increasing evidence that reservoirs can be significant sources of greenhouse gas emission, news about hydropower focuses on economic progress, licensing procedures, corruption, and partisan politics. These stories were driven by official sources and largely ignored the environmental risks and the socioeconomic impacts of the projects. When mentioned, socioenvironmental risks and impacts were presented as mere hurdles causing delays in construction, with official sources pushing a narrative that attending to those risks would jeopardize energy security for the whole country, which is amplified by the ever-present threat of blackouts and energy rationing.

The results also reveal that environmental and social aspects of the construction of dams in Brazil are only given significant news space when there are disruptive protests, usually organized by social movements or indigenous leaderships. These protests gained news value when they included

Table 2. Relationship between the percentage of quotes coming from different types of sources used and coverage of environmental impact, socioeconomic impact, activism, and licensing procedures, using t-tests¹.

Source ratio:	Official		Resident		Activist		Company		Expert		Other	
	Mean	t	Mean	t	Mean	t	Mean	t	Mean	t	Mean	t
Environmental impact		-1.23**		2.20***		2.01**		-1.62**		1.64**		.30
Yes	40.51		8.47		12.87		19.71		10.69		7.75	
No	49.11		2.30		5.80		30.14		5.01		6.84	
Socioeconomic impact		-4.03*		2.10***		6.85***		-1.12*		.80		.98*
Yes	25.70		8.64		24.64		21.43		8.84		9.44	
No	53.81		2.52		2.10		29.03		5.93		6.32	
Activism		-1.52		-.93		6.98***		-1.52***		-.63		1.27
Yes	37.65		1.83		26.53		18.83		4.79		10.36	
No	49.19		4.71		2.52		29.50		7.19		6.17	
Licensing		2.52*		-2.67**		-1.97*		-.50		-.51		.76
Yes	53.84		1.01		4.97		25.80		5.92		8.06	
No	37.99		7.77		11.28		28.75		7.54		5.95	

* $p < .05$, ** $p < .01$, *** $p < .001$ ¹T-tests determine if there is a significant difference between the means of two groups, in our case, if sourcing patterns vary between news that have a certain coverage characteristic (e.g. environmental impact, activism, etc.) and those that do not, considering sample size and degrees of freedom.

tactics such as blocking roads, preventing access or occupying construction sites, which temporarily halted or delayed construction. However, in such cases, news often presented the delays in construction as a risk to energy security. The socio-environmental risks that motivated the protests were poorly addressed or explained.

These findings are not unique to coverage of environmental social movements. For decades, scholars have found that activists often need to resort to disruptive tactics to gain media attention, but when they get covered news usually marginalizes their demands by focusing on violence and spectacle (Gamson, 2008; Gitlin, 1980). Future studies should consider a more in-depth analysis of the current relationship between press-activists in the case of hydropower dams, especially in the Global South. Given the recent history these countries had with authoritarian regimes, organized activist efforts and indigenous organizations are relatively new. In recent years, these movements have also developed an identity and language, which includes learning about procedural processes, building a digital communication strategy, and fostering relationships with the press.

More than an analysis of how environmental journalists cover hydropower in Brazil, our study reveals that dams are generally not perceived as being part of a story about environmental or socio-economic issues by the country's newsrooms. We found very little specialized environmental reporting, which aligns with previous studies that points to the lack of systematic reporting on environmental topics in Brazilian media (Pinto et al., 2017). Thus, the bulk of coverage is heavily shaped by the norms, routines and sources connected to political and economy reporting. Our results show that coverage of hydropower dams – especially in the Amazon – provided excessive focus on the minutia of long and judicialized licensing processes. Consequently, news rarely questioned the country's reliance on hydropower, presenting dams as highly necessary projects for economic progress. Only a handful of stories in the sample provided nuance or context to environmental and socioeconomic impacts or risks. These results are aligned with the “modernization” mindset identified by the literature on Brazilian newsrooms (Fanzeres, 2004; Morais, 2019; Mourão & Sturm, 2018), which tend to approach energy from an institutional and scientific-technological perspective, rather than socio-environmental rationality.

When it comes to sources, we found coverage was heavily driven by official and construction company's voices. Quotes from people impacted by the dams, indigenous people and activist organizations were rare and often buried at the end of the article. We did, however, find that stories mentioning activism and socio/environmental impact had more source diversity. Yet, even in those stories, official sources were still dominant and most dissenting quotes came from the Federal Prosecution Service and the inspection agencies from the Brazilian Ministry of the Environment, in charge of investigating irregularities in licensing. These findings reinforce prior literature on sourcing patterns, suggesting the range of debate about critical issues in the news is contingent on the range of disagreement between official sources (Bennett et al., 2007). In news about socio/environmental impact and corruption in processes of licensing and construction, the Public Prosecutor's Office was frequently feeding information to reporters through press releases, digital strategies and frequent interviews. Further, because most stories are housed in the economy or politics beats, those reporters have developed a longstanding relationship with institutional sources, as opposed to local activists, residents and indigenous populations affected by the dams in the Brazilian Amazon.

Another important finding refers to the continuity of coverage patterns across leftist and rightist presidencies. In fact, we found that coverage during the leftist governments of the Workers' Party had an *increased* focus on licensing and construction of large hydropower dams. This might appear surprising as the first Minister of the Environment during President Lula's leftist government was a notorious environmental activist, Marina Silva. Under her administration, the Ministry created the Chico Mendes Institute for Conservation of Environment and the Secretariat of Climate Change and Environmental Quality. Yet, the Workers' Party *Program for Growth Acceleration* included licensing of large hydropower dams that had major environmental and socioeconomic impacts. In fact, after five years, Marina Silva left the Workers' Party due to disagreements with its

development model. A few years later, corruption scandals associated with the energy sector helped shape popular opinion towards the impeachment of President Rousseff in 2016.

The continuity of coverage focusing on progress, licensing, and rarely questioning hydropower's supremacy echoes the historical analysis of energy policies made by Costa et al. (2017), who found institutional sources from the military dictatorship to the leftist democratic presidencies were guided by a technocentric discourse. It is worth noting that these results might also be connected to the idea that hydropower produces “clean” energy, which often justifies the environmental impacts and socioeconomic risks raised during the construction phase. Environmental scientists question this perception for many reasons, including the greenhouse gas emission during dams' operation and global perturbation of carbon cycling (Deemer et al., 2016; Maavara et al., 2017; Scherer & Pfister, 2016).

This study has its limitations. First, our content analysis focuses only on print media, ignoring television and social media discourse around hydropower dams. The next steps of our research program will include those platforms. It is worth noting that these newspapers are elite-oriented and set the news agenda in the country; thus, directly influencing policymaking (Marques & Martino, 2012). They are also part of conglomerates that provide news for most of the country; e.g. *Globo* includes the newspaper, the most watched television station, cable news, online portal and streaming service. Thus, even if people are not directly consuming print news from these outlets, they are still consuming information that conforms to their editorial line.

Second, we evaluate content as the output of various journalistic practices and contexts, but we do not qualitatively investigate those processes using in-depth interviews or newsroom ethnographies. Future studies should employ a media sociology framework to understand how those decisions are made in the newsroom and how journalists interact with their sources in real life. Third, we used the qualitative analysis to set up the codebook for the quantitative methods, without going in-depth with a textual or discourse analysis of a large corpus of data. Finally, our study focuses on the Brazilian context; however, we believe results are a starting point for future comparative work in other places that rely on large hydropower dams, especially in the Global South.

Most importantly, our results highlight the invisibility of the struggles faced by people directly impacted by hydropower dams – especially indigenous and riverside communities, with minimal space given to the risks they face before, during, and after dams are constructed. There is no doubt that hydropower is an important energy source, but citizens need to be better informed about the environmental impacts and human costs of dams. Many of these communities, especially in the Brazilian Amazon, rely mostly on national news media by satellite for information. In a recent survey of people affected by dams in the region, respondents seemed to be directly reproducing national discourse pushed by official sources in the media. According to the findings, residents reported “regretting the negative outcomes [of hydropower] for them but believing the government discourse that the energy needs of the country may require them to sacrifice for the larger good” (Mayer et al., 2021, p. 1). Most of these residents did not know or participate in meetings regarding their compensation and resettlement rights, an indication that there are important information supply deficits for those citizens.

The fact that the country has formed a generation of highly qualified environmental reporters with deep relationships with scientists and social/environmental movements does not mean that media outlets will use this expertise whenever they cover large and impactful infrastructure projects. Instead, we found that coverage was determined by how newsrooms place hydropower dams within the economy or politics beats. As a result, official sources and utility company representatives drove a narrative that left hydropower essentially unchallenged, with news focused primarily on licensing and construction proceedings, ignoring the socioeconomic risks and environmental impacts dams can have on local communities and large ecosystems, such as the Amazon basin.

As Brazil faces yet another energy crisis in the 2020s—accelerated by climate change, droughts and deforestation impacting dam reservoirs—official sources have asked citizens to reduce energy consumption to avoid blackouts and energy rationing, largely treating this crisis as a “whim of

nature” (UOL, 2021). Our analysis suggests that the news media, so far, have fundamentally reproduced this discourse despite activists and experts alerting that the current crisis is systemic, rapidly deteriorating, and, in part, the result of predatory policies of deregulation and mismanagement of the country’s hydropower capacity since the early 2000s (Tolmasquim, 2000). News essentially amplifies the inaccurate narrative that, to solve the “current” energy crisis and foster the country’s economic development, the average citizen must save energy and the government must build new dams or thermopower plants. At the same time, media infrequently covered the environmental and socioeconomic impacts associated with such large energy infrastructure projects. As such, news coverage in the past decades largely helped promote official discourse that furthers a system of energy and environmental injustice for the sake of “national progress.”

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