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FRONTIER TERRITORIES: COUNTERING THE GREEN REVOLUTION LEGACY IN THE BRAZILIAN CERRADO

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Environmental Policy Reform and Water Grabbing in an Agricultural Frontier in the Brazilian Cerrado*†

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Abstract The spread of soy monoculture in the Brazilian Cerrado relies on land and water grabbing, although water appropriation is a least studied issue in the current literature. A mixed-methods approach was used to study changes in water use in western Bahia and the evolution of water and environmental standards over the last 20 years. The results show that the deregulation of environmental laws by the Bahia state Institute for the Environment and Water Resources (Instituto do Meio Ambiente e Recursos Hidricos, INEMA) has facilitated deforestation and water grabbing for large-scale irrigation by industrial agriculture. The social dynamics of struggles and resistance to this process was also analysed. The results show that water appropriation in the neoliberal agricultural frontiers of the Cerrado has changed not only water use and flows but also water governance systems, flows of power, and the representations that underpin them.

Keywords water grabbing, water governance, irrigated agriculture, hydrosocial power, water conflicts, western Bahia, Cerrado, Brazil.

1 Introduction

The episode known as the 'Water War' that broke out in Correntina (west of Bahia State), Brazil in 2017 made national news. It arose from a demonstration organised by small farmers and the local population, motivated by water restrictions due to its intensive and unmeasured use by agricultural enterprises. Around 1,000 people occupied the Igarashi Farm headquarters, then destroyed the electrical equipment that pumped water for irrigation, and set fire to a shed and tractors. Two weeks later, about 5,000 people, including urban and rural residents, rallied in

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the city centre. These actions took place after months of unmet claims involving the water grants allocated to agro-industrial companies by the Bahia state Institute for the Environment and Water Resources (Instituto do Meio Ambiente e Recursos Hidricos, INEMA) and their use for irrigation (CPT 2019; Favareto 2019).

These water disputes arose over the creation of new River Basin Management Plans for two important tributary basins of the São Francisco River, as a part of the national water regulations and management. The plans were the result of social demands over the increasing release of water grants, triggered by public civil litigation brought by the Public Prosecutor's Office in 2017 (Khoury 2018). The River Basin committees[6] who represent the Rio Corrente and Rio Grande, two of the most important rivers in the west of Bahia, have become sites of dispute with agribusiness corporations, with denials of rights of traditional populations (Porto-Gonçalves and Chagas 2019).

These facts show the growing social visibility of agrarian and water conflicts in the Matopiba region (the acronym for Maranhão, Tocantins, Piauí, and Bahia), in parallel with the agro-industrial expansion (Eloy *et al*. 2016; Favareto 2019). However, the nexuses between soybean expansion, water appropriation, and water conflicts have been less explored in the literature, as well as the social processes triggered by these nexuses. Thus, the main objective of this article is to reveal the mechanisms of water grabbing in this region, based on the environmental policy reform processes in the state of Bahia. We also seek to understand the resistance strategies of social movements following the socioenvironmental conflicts that culminated in the Correntina Water War in 2017, especially concerning the disputes over social participation in water management, such as the River Basin committees.

This article is structured as follows. In section 2, we situate this reflection within the broader context of the water-grabbing literature. Section 3 outlines the study methodology. Next, in section 4, we discuss the major trends related to the expansion of irrigated agriculture in western Bahia in the face of the reform of environmental policies, along with challenges in social participation. Section 5 highlights the social conflicts, focusing on political struggles over water rights. Section 6 concludes with social movements' strategies of resistance and limits of participatory democracy in the neoliberal agrarian extractivism context.

2 Water grabbing by industrial agriculture for large-scale irrigation

Recent studies have put forward evidence in support of the links between land and water grabbing, even when water rights are not explicitly involved in the land deals (Mehta, Veldwisch and Franco 2012; Franco, Mehta and Veldwisch 2013). Water

grabbing occurs where powerful actors are able to appropriate water resources at the expense of traditional local users, often with negative impacts on the environment (Fairhead, Leach and Scoones 2012). This definition applies to a wide range of circumstances of water appropriation, such as hydropower production (Torres 2012), mining (Sosa and Zwarteveen 2012), or commercial agriculture (Damonte and Boelens 2019). Most critical analysts working on land grabbing today draw on political economy and Marxist traditions; in particular, David Harvey's notion of 'accumulation by dispossession' (Mehta *et al*. 2012: 195).

Studies on the appropriation of natural resources (water, land, forests) have gained prominence since 2008 with the global financial crisis and the search for real assets represented by the land market (Sauer and Borras Jr 2016). While the issue of land grabbing has gained greater academic visibility (Borras Jr and Franco 2012; Franco *et al*. 2013; Flexor and Leite 2017), water has been less studied (Mehta *et al*. 2012).

Franco *et al*. (2013) observe that land grabbing is driven by water grabbing; that is, global agricultural trade can be seen as the transfer of 'virtual' water in the form of commodities (Allan *et al*. 2013). Virtual water exports have more than doubled in the last two decades (Dalin *et al*. 2012), mainly due to exports of soybean, meat, and dairy products from Latin America to Asia and Europe (Clapp and Fuchs 2013). Virtual water is a major driver of Western agribusiness hegemony over the global agri-food markets and is behind the rise of foreign investment in land and competition over natural resources (Sojamo *et al*. 2012).

The increasing export of water-intensive commodities has changed water governance to shift control over water use from local, regional, and national actors to those who dominate global agricultural production chains (Vos and Hinojosa 2016). The strategies for concentrating water rights, also referred to as 'hydropower strategies', involve different dimensions of political power, including economic capacity (investments in land and high-tech irrigation equipment), technical knowledge (e.g. dominant narratives about water efficiency), and coercion (Damonte and Boelens 2019).

Insofar as irrigation projects distribute and provide access to an increasingly scarce, politically disputed resource, they are sites for scenarios of resistance and social struggle (Rocha López *et al*. 2019). Water flows are mediated by technopolitical power relations, which produce the physical-geographical, cultural, and symbolic landscape, and consequently the hydrosocial cycle (Swyngedouw 2004; Linton and Budds 2014).

In Latin America, the literature draws attention to the impact of water policy reforms on the democratisation of water governance based on the paradigm of decentralisation and social

participation (Abers and Keck 2013; Kauffman 2016), but they have not prevented large-scale water grabbing (Van Koppen 2007; Mehta *et al*. 2012; Franco *et al*. 2013).

The expansion of irrigated soybean crops based on central irrigation pivots[7] has been an important trend in the Cerrado biome since 2000, ensuring greater financial security for the production chain and return on investment (Hosono, Rocha and Hongo 2016). In western Bahia, where 90 per cent of the pivots of the Matopiba region are located, social conflicts highlight the links between irrigated industrial agricultural systems and water rights (Porto-Gonçalves and Chagas 2019). According to the National Water and Sanitation Agency (Agência Nacional de Águas e Saneamento, ANA (2022), the irrigated area increased from 8,374 hectares in 1985 to 216,631 hectares in 2019 in Bahia State (ANA 2019).

Brannstrom (2005) has studied the early stages of the water policy reform at the beginning of the soybean boom in western Bahia. By the late 1990s, Bahia State had created favourable conditions for water appropriation under the influence of agro-industrial representatives who 'played a key role in providing knowledge about the facts guiding its environmental policies' (ANA 2019: 268). Since Brannstrom's studies in the 1990s, the exponential growth of the irrigated area in Bahia State and the worsening of water conflicts have raised questions about water governance. This article examines the following questions: (1) How has state environmental policy reform opened space for large-scale irrigation in western Bahia, despite the evident water scarcity? and (2) How have the affected social actors responded to water grabbing and what resistance have they offered?

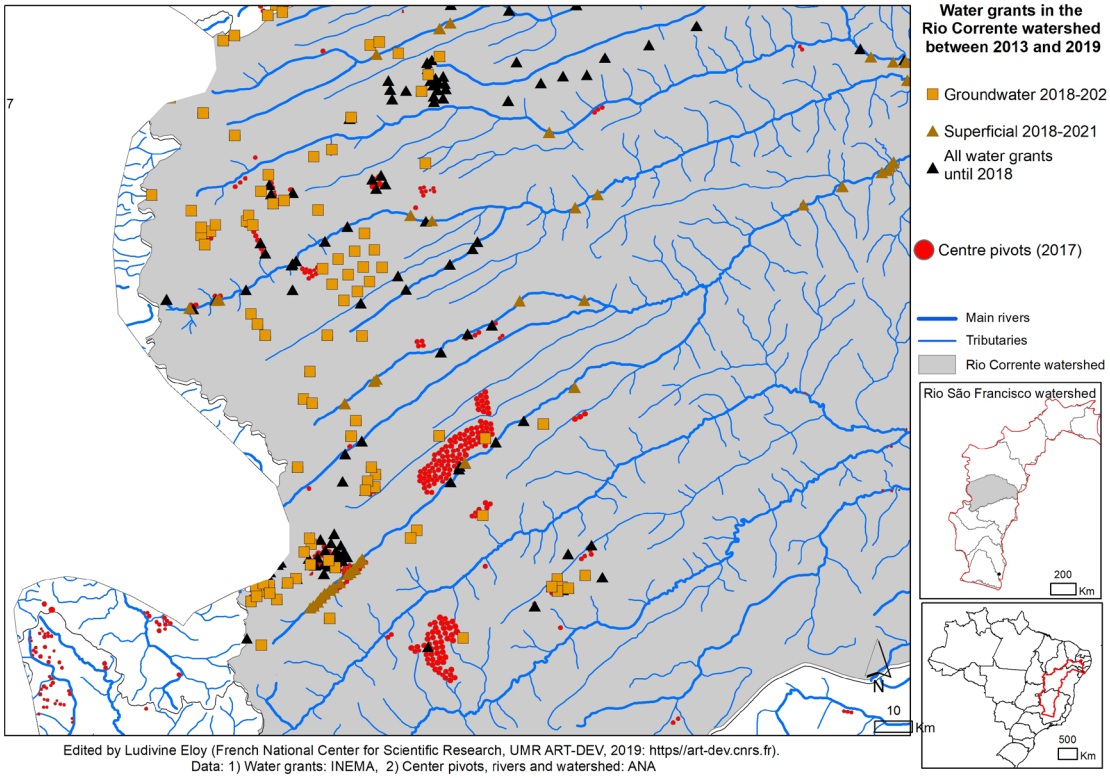
3 Material and methods

3.1 Study area

The region of western Bahia includes the Rio Grande, the Rio Corrente, and the northern part of the Rio Carinhanha basins, all tributaries of the Rio São Francisco. These depend on the Urucuia aquifer, a geological formation with an effective area of 82,000sq. km. This aquifer recharge area is central to the maintenance of the São Francisco river. This occurs through the infiltration of rainwater into the flat land, where the deep roots of Cerrado plants and the sandy latosols play an important role due to the soil porosity and permeability (Gaspar, Campos and Cadamuro 2007).

The Rio Corrente River Basin has an area of 34,875sq. km which includes 13 municipalities with a total population of 196,761 inhabitants (Figure 1). The natural vegetation of the highlands (*chapadas*), which predominate in the western part of the region, are savannas and shrublands (Cerrados). They have been largely converted into monocultures. Further east and in the valley bottoms that cut through these plains, the lowlands are

Figure 1 Surface water and groundwater grants in effect in the Rio Corrente River Basin



Source Authors' own, based on data from INEMA and ANA.[8]

dominated by tree savannas, gallery forests, and paths. These valleys are inhabited by smallholders, whose way of life has been based on complex agro-pastoral systems for centuries. Since the 1980s, these communities have been dispossessed of their communal land due to agro-industrial expansion, especially land used for cattle grazing and fruit gathering (Eloy *et al*. 2020).

3.2 Data collection and analysis

We used mixed methods to analyse the local mechanisms of water grabbing and its consequences for local communities, combining secondary data (e.g. INEMA databases, document analysis, spatial analysis, time-series analysis) with qualitative data from our participation in the virtual meetings (Corrente Basin committee, preparation of the River Basin Plan for the Rio Corrente and Rio Grande) during the Covid-19 pandemic (2020–21).

We collected, processed, and projected official data on water grants, including type of beneficiary, uses, modalities (above ground, underground, or intervention abstraction), flow rates granted, date of publication, and expiry date. The processed grants were approved by INEMA between 2013 and 2021.

To examine the institutional context that legitimises water appropriation, we compared the technical documents underlying these regulations (Bahia 2017, 1995) with official information from federal and state government websites, such as ANA, INEMA, and the Bahia State Environmental and Water Resources Information System (Sistema Estadual de Informações Ambientais e de Recursos Hídricos, SEIA). We also used documents prepared by the Hydro-Engeplus Consortium (Consórcio Hydro-Engeplus 2019) for the preparation of the River Basin Plan, and two technical opinions prepared by civil society, represented by Coletivo Águas do Oeste (2021).

4 Results and discussion

4.1 Irrigated agriculture in the Rio Corrente River Basin

In the last 20 years, the agricultural frontier in western Bahia has expanded in the flat highlands from north to south (from the town of Luís Eduardo Magalhães to the town of Jaborandi) and from west to east, occupying the productive lands of peasants and traditional communities. Rainfall is concentrated in the 100km near the border with the Serra Geral de Goiás, where most farms with pivots are located. As rainfall (the rainy season is from October to March) is more abundant in the west and decreases towards the east, the soybean expansion eastwards depends on irrigation.

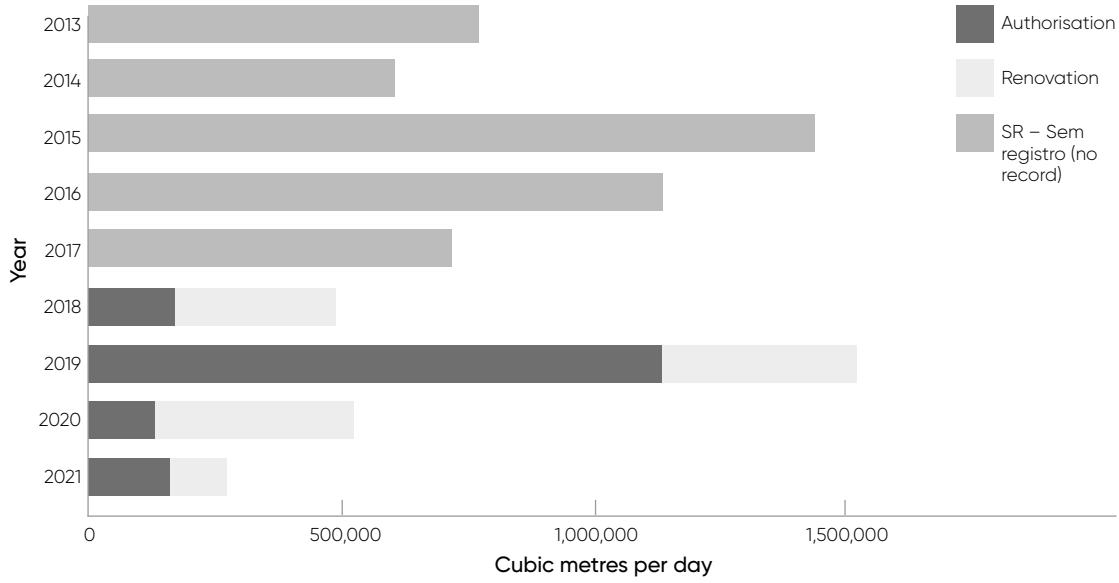
We examined 328 ordinances[9] of water grants in the Rio Corrente River Basin published between 2013 and 2021 (224 surface water withdrawal permits and 104 groundwater withdrawal permits). We found a higher concentration of grants and central pivots on the Formoso, Arrojado, Éguas, and Corrente rivers (see Figure 1). Most of the central pivots and deforestation are located in the highlands of the basin, which correspond to the recharge areas of the Urucuia aquifer.

Moreover, Figure 2 shows that the issuance of water grants has increased significantly since 2015, a period that coincides with the outbreak of water conflicts in the basin. We also observed a 'rush for water' from 2018 onwards, peaking in 2019 with the approval of more than 1.5 million cubic metres/day of new water grants (even after the Water War in 2017).

The release of large volumes of water for irrigation has occurred in spite of evidence of water scarcity in the region. Recent studies point to the overexploitation of the Urucuia aquifer, arguing that water scarcity is driven by anthropogenic impacts rather than by natural climatic variability (Gonçalves *et al*. 2020; Silva *et al*. 2021). For example, Gonçalves *et al*. (2020) show that the decrease in terrestrial water storage (TWS) was 6.5 ± 2.6mm/yr between 2002 and 2014, representing a total water loss of 9.75sq. km at the surface of the Urucuia aquifer.

The projection of water grants and irrigation data in the basin shows the spatiality of local mechanisms of water grabbing in

Figure 2 Water grants (cubic metres/day) approved by INEMA in the Rio Corrente River Basin between 2013 and 2021



Source Authors' own, based on INEMA (2013–17)[10] and *Bahia Official Gazette* (2018–21).[11]

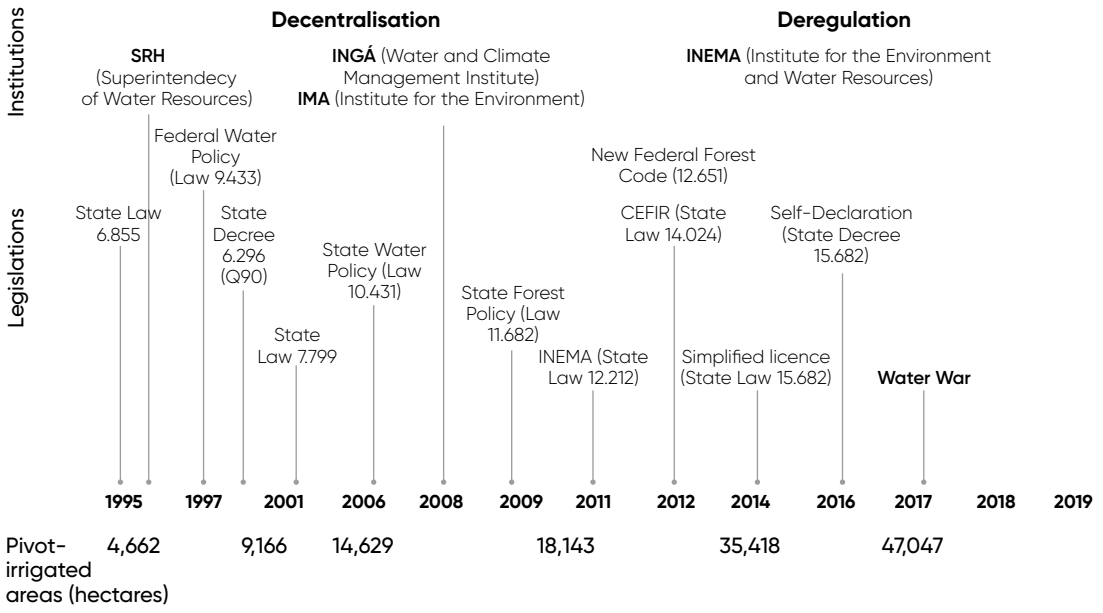
the area. In the context of increasing environmental and land conflicts in Matopiba (CPT 2019; Favareto 2019), changes in the hydrological cycle associated with the spatial dynamics of agro-industrial frontiers help explain large-scale water governance problems and water conflicts.

4.2 Deregulation of environmental policies in the agricultural frontiers of western Bahia

Based on the document analysis of water and environmental norms, we divided the evolution of environmental policies in Bahia into two periods. The first corresponds to the structuring of state policies and the decentralisation of water policies (1995–2010), and the second (from 2011) consists of the deregulation and simplification of environmental norms (Figure 3).

The first period began in 1995 with the release of the State Water Law (Bahia 1995), two years before the federal government passed the Water Resources National Policy (Law No. 9.433/1997[12]). During this period, the state government created the first state water resources agency (Superintendência de Recursos Hídricos, SRH), which was responsible for the decentralisation of water management and the allocation of irrigation water grants. In 2002, the Secretariat of Environment and Water Resources (Secretaria de Meio Ambiente e Recursos Hídricos, SEMARH) was established (Law No. 8.538), dividing the management of natural resources between two different institutions: the Institute for the Environment (Instituto do Meio Ambient, IMA) and the Water and Climate Management Institute (Instituto de Gestão de Água e Clima, INGÁ).

Figure 3 Timeline of water and forest legislation in Bahia State and pivot irrigated area



Source Authors' own.

Since the adoption of the Bahia State Water Policy (Law No. 10.431) in 2006, the state established its own instruments for water management, mainly environmental licensing through water grants, River Basin committees, and River Basin plans. However, Brannstrom, Clarke and Newport (2004) point out that democratic decentralisation of water management (participation) was blocked on three fronts: the state held power in the state water agency; the consortia and basin committees had no formal means to influence water governance; and the state provided no legal basis to empower the basin committees.

In the second period (from 2011), the state government began the deregulation phase by unifying the licensing systems for water and deforestation. In 2011, SEMARH was transformed into the Secretary of Environment of the State of Bahia (Secretaria do Meio Ambiente – Governo da Bahia, SEMA), and IMA and INGÁ were merged into a single agency, INEMA (Law No. 12.212), responsible for managing water and environmental resources. In 2012, the State Environmental Agency introduced a simple instrument to obtain simultaneous deforestation and water rights, the State Registry of Rural Forest Estate Properties (Cadastro Estadual de Imóveis Florestais Rurais, CEFIR), following the new federal Forest Code approval. The process of deregulation accelerated after 2014, when Bahia State exempted agribusinesses from the environmental licensing process (Decree No. 15.682), resulting in a civil litigation by the Public Ministry of Bahia (MPF and MPE-BA 2016).

Currently, INEMA applies a simplified environmental approval process for deforestation and the granting of rights, which is limited to an electronic 'self-declaration' model of CEFIR and excludes on-site inspection. This reform led to a 76 per cent increase in deforestation permits by INEMA between 2018 and 2019, with about 48 per cent of these permits located in protected areas and traditional peoples' territories in the Grande and Corrente basins (Rocha *et al*. 2020).

4.2.1 Licensing of water grants

For superficial water, INEMA's grant criteria are based on the Q90 reference flow (State Decree No. 6.296, 1997), which takes into account the minimal waterflow level 90 per cent of the time in the watercourse and based on the permanence curve established from the monthly data averages based on records of the fluviometric stations. The volume of water equivalent to 80 per cent of Q90 can be granted for various water uses.

The analysis of official documents reveals several gaps that have favoured the deregulation of water management in Bahia. Environmental authorities in Bahia (first SRH and later INEMA) have issued water grants for large amounts of water based on an insufficient number of run-off records (only five fluviometric stations), without updating water flow data (time series outdated since 2006), and without monitoring the impact of water extraction on ecosystems (Khoury 2018). In the early 2000s, Brannstrom (2005) pointed out that INEMA had significant problems with water use permits, both because of inaccurate hydrological and hydrogeological data and due to the lack of monitoring of the amounts of water used for irrigation. As a result, farms using central pivots have no restrictions on water use.

But water grabbing in western Bahia occurs not only through formal access to water grants but also through illegal water extraction. Bonfim (2019) points out that underground and illegal water extraction is one of the main forms of water extraction: of the 128 high-pressure wells drilled in Correntina by companies and rural producers linked to agribusiness, 90 per cent do not have permits.

The situation in Correntina is similar to other cases in Latin America where large agro-export companies gain control over water resources at the expense of other, politically less powerful actors (Yacoub, Duarte and Boelens 2015; Rocha López *et al*. 2019). Yacoub *et al*. (2015) highlight various case studies on water concentration by agro-export companies in Ecuador, Mexico, Peru, and Bolivia. In the Ica Valley (Peru), for example, Damonte and Boelens (2019) highlight how agro-extractive corporations, with state support, have gained access to groundwater resources in a water-scarce region.

The accumulation of water rights by agro-industrial corporations can be located in the field of agrarian extractivism (McKay 2017),

which is conceptualised as a hegemonic and totalising neoliberal wave that encompasses the social world. In western Bahia, access to water occupies a fundamental dimension in the process of land acquisition and territorialisation, and in the expansion of the agricultural frontier. Bonfim (2019) reports that the price of land is significantly higher when there is a permit to extract water for irrigation purposes, suggesting that water plays a central role in agricultural production but also in the real estate business.

4.2.2 Social participation in water resources management

The instances of social participation in Bahia State Water Policy consist of three collegial bodies: the State Council for Water Resources (Conselho Estadual de Recursos Hídricos do Ceará, CONERH), the River Basin committees, and the River Basin agencies entities (executive secretaries for the basin committees). The Rio Corrente River Basin Committee (Comitê da Bacia Hidrográfica do Corrente, CBHC) was established in 2008 (Decree No. 11.224). The CBHC is currently composed of 30 members and their respective deputies, maintaining the tripartite parity composition (state authorities, users, and civil society organisations).

The sharp growth of water grants, especially after 2015 (Figure 2), became the target of criticism by CBHC, according to minutes of the committee's meetings (INEMA 2019). From this time on, the government and the Bahia State Irrigation Farmers Association (Associação dos Produtores e Irrigantes da Bahia, AIBA) started to take control of the meetings and occupy strategic positions in the basin committee.

Following the Water War in 2017, federal and state prosecutors proposed a series of adjustments, based on a public hearing with the stakeholders: the suspension of the granting of water use rights by INEMA pending the approval of the River Basin Plan by the basin committee; the review of water use rights granted to large companies in the Corrente Basin and the Urucuia aquifer; and participatory monitoring of the river flow (Khoury 2018). However, the decision-making process for granting new water grants was not in line with the committee's recommendations, and large numbers of water grants continued to be approved by INEMA after 2018 (Figures 1 and 2).

Between 2019 and 2021, we followed the process of developing the River Basin Plan for the Rio Corrente and Rio Grande River Basin. In 2019, the state government hired a consortium of private companies through a public tender to elaborate on the River Basin Plan (Consórcio Hydro-Engeplus 2019).

In the absence of River Basin agencies that were not implemented in Bahia State, a network of social actors was organised to play an important role in providing technical support to the CBHC in the critical revision of the River Basin Plan, a technical document with a dense accumulation of data (hydrological, environmental,

social, etc.). The network is composed of representatives of civil society, the Public Prosecutor's Office, and scientists.

In the CBHC's[13] consultive meetings, the Coletivo Águas do Oeste network formulated a technical opinion with two reservations to the River Basin Plan (Coletivo Águas do Oeste 2021), based on the precautionary principle (World Commission on the Ethics of Scientific Knowledge and Technology 2005). The first reservation proposed the adoption of measures to restrict deforestation in priority conservation areas, based on studies carried out with the support of SEMA (WWF 2015). Also, it referred to the allocation of vegetation conservation areas (permanent conservation areas and Legal Reserves) in the upper part of the basin (the recharge area of the Urucuia aquifer), where rainfall is concentrated.

The second reservation refers to the definition of ecological flow rate portion in the 80 per cent volume of Q90 for grants. The critical analysis of the plan pointed out three gaps identified by civil society for this point. The first gap is the fragility of the Bahia State Environmental and Water Resources Information System (Sistema Estadual de Informações Ambientais e de Recursos Hídricos, SEIA), particularly in relation to the spatial density of hydrometeorological data and user registration. The second gap concerns the use of unreliable data (e.g. outdated data based on land use and land cover mapping from 1998). The third gap is the lack of guidelines for defining ecological flow. A request was made to review the maximum allowable volumes for the reference flow rate.

Although these two reservation proposals were approved by the committees, they were not taken into account in the drafting of the River Basin Plan by the environmental authority (SEMA), which violates rights of social participation guaranteed both in the national and state water policy, since the basin committees can deliberate about approvement (or not) of the basin plans.

Recent studies show the impact of large-scale deforestation by industrial agriculture on the aquifer recharge areas, leading to a rapid decline in water resources in the region (surface and groundwater) (Silva *et al*. 2021; Egger *et al*. 2021). From 1985 to 2017, the Cerrado biome lost more than 40 per cent of its native vegetation due to agriculture expansion (Alencar *et al*. 2020). The conversion of the Cerrado's native vegetation is having significant impacts on ecosystem functioning, such as regional climate regulation, hydrological stability, and biogeochemical cycles, associated with the loss of biodiversity and carbon stocks (Spera *et al*. 2016; Oliveira *et al*. 2014).

5 Conflicts, disputes, and water justice

Current research in the field of environmental justice focused on political struggles over water rights in the context of neoliberal policies highlights various processes of privatisation and commodification of water resources (Boelens, Perreault and Vos 2018).

They have showed how political alliances between the private sector and the state favoured land and water policy reforms to enable the concentration of water rights by agro-industrial companies, and their negative consequences on social equity, water use efficiency, and sustainability, along with social conflicts (Rocha López *et al*. 2019; Wilder and Lankao 2006).

Beyond that, several studies show how political alliances between the private sector and the state drove environmental policy reforms to enable the concentration of water rights by agro-industrial companies, with negative consequences for social equity, sustainability of water use, and water justice (Rocha López *et al*. 2019; Torres 2012; Vos and Hinojosa 2016).

In the recent Bahia political scenario, two cycles of control of the executive power by the conservative Liberal Front Party/ Democrats (1991–2006) have been replaced by the Workers' Party (since 2007). A relevant fraction of the parliamentary base in both cases has been linked to mining, energy, and agribusiness (Oliveira *et al*. 2021).

Based on growing processes of financialisation and on 'extractive rent', through the intensification of mining and other extractive industries, including soybean agriculture, the developmentalism model states have been ambiguous about their environmental policies. As Dagnino (2016: 164) points out, the dilemmatic paradox of the developmentalism model implemented by leftist governments could have represented new paths towards a more equal and sustainable development; however, it has implied the 'downgrading' of participatory democracy and the confining of participation to representative democracy.

The inequalities in access to water are caused and legitimised by various forms of invisible power and structural violence (Mehta 2016). In western Bahia, forms of power range from criminalising social movements during the 2017 Water War to delegitimising the social participation of basin committees during the River Basin Plan consultation process. Therefore, it is important for both affected people and water justice advocates to challenge the structural violence and hydrosocial power in water governance.

6 Conclusions

Our results show that environmental policy reform in the state of Bahia has opened up a space for simplification and deregulation of the environmental licensing system of water grants and deforestation, favouring a new phase of soybean expansion that depends on large-scale irrigation. Bahia State set the stage for water grabbing fairly early on, but deregulation took place especially after the implementation of the simplified environmental licences from 2012 on, leading to increasing volumes of water being made available to industrial agriculture, despite evidence of water scarcity in western Bahia.

The environmental reform explains how the alliance between the state and the private agro-exporting sector of soybean, through the concession of water rights, has allowed almost unrestricted access to surface and groundwater in a region with increasing water scarcity. This process has exacerbated social conflicts with downstream peasant communities, whose epicentre was the Water War in Correntina in 2017.

Finally, we illustrated social movements' strategies of resistance, including recent disputes in the technical discussions and deliberations on the River Basin Plan as movements for water justice. Although the fact that the process has demonstrated how social movements set up the conditions to resist against the interest of the agribusiness sector, it makes explicit the limits of participatory democracy in a neoliberal context that privileges agrarian extractivism.

Notes

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6 River Basin committees are collegial bodies composed of representatives of public authorities (municipal, state, and federal), civil society, and water users. They have normative, advisory, and consultative functions to promote participatory

management of water bodies (State Law No. 10.432/06 (Water Resources Bahia State Policy 2006) and No. 11.612/2009 (Water Resources Bahia State Policy 2009)). Note, Law No. 10.432/2006 was replaced by Law No. 11.612/2009.

7 The centre-pivot irrigation system consists of a mechanised, pressurised water irrigation method that applies water in a circular pattern, pivoting around a central point in the middle of the field.

8 See **Sistema Estadual de Informações Ambientais e de Recursos Hídricos (SEIA) website** and **Catálogo de Metadados da ANA (ANA Metadata Catalogue)**.

9 Of this total, 207 ordinances correspond to the technical note submitted by INEMA (2013–17) and 121 ordinances were published in the *Bahia Official Gazette* (2018–21).

10 INEMA, unpublished technical note.

11 See ***Bahia Official Gazette* website**.

12 The National Water Resources Policy (Law No. 9.433, of 8 January 1997) establishes that the management of water resources should be decentralised, with the participation of state and municipal governments, users, and communities, and that the river basin is the basic spatial unit for planning and management (Abers and Keck 2013).

13 Between 31 August and 1 September 2021, the deliberative and framework meetings of the River Basin Plan of the Rio Grande and Corrente committees, respectively, were held.

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