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Environmental Democracy and Water Governance: Agenda for the Application of the Escazú Agreement at the Pan-Amazon and Vale do Itajaí (SC)

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ABSTRACT

Devastation impacts of the Pan-Amazonian ecosystem directly affect the global environmental regime of the planet. To address this issue, Latin American and Caribbean nations signed the Escazú Agreement. This agreement not only aims at water governance within the scope of international basins but also benefits regional and local scales, that are linked to the hydrological systems of the watershed. This research aims to develop an agenda, based on the Escazú Agreement, for water governance and environmental democracy in the Pan-Amazonian and Itajaí river basins (Santa Catarina, Brazil), based on the Escazú Agreement. A qualitative study utilized a descriptive-explanatory narrative and followed three steps, namely: (i) the description of the relationship between the Pan-Amazonian and Itajaí river basins from an environmental and democratic point of view and of the strategic value of the international rivers at the Pan-Amazonian and Itajaí river basins; (ii) identification of transboundary damage risks and limitations to environmental democracy and water governance in the Pan-Amazonian and the Itajaí watersheds; (iii) analysis of the Escazú agreement as a motivator for regional development. Overall findings indicate obstacles and challenges for the application of the Escazú agreement in both watersheds and suggested a set of guidelines for water governance applicable to the Pan-Amazonian and the Itajaí watersheds.

Keywords: Escazú Agreement; Environmental Democracy; Governance; The Pan-Amazon and Itajaí River Basins.

Democracia Ambiental e Governança da Água: Agenda para Aplicação do Acordo de Escazú na Pan-Amazônia e no Vale do Itajaí (SC)

RESUMO

Os impactos da devastação do ecossistema Pan-Amazônico influenciam direta e indiretamente no regime de chuvas em diversas regiões do globo. Para fazer frente a essa questão, as nações da América Latina e Caribe firmaram o Acordo de Escazú. Este acordo visa não apenas a governança das águas no âmbito de bacias internacionais, mas também beneficiar as escalas regionais e locais, em vias da mútua dependência dos sistemas hidrológicos. Nesse sentido, o artigo tem por objetivo propor diretrizes para uma agenda direcionada para a governança das águas e democracia ambiental das Bacias da Pan-Amazônia e do Rio Itajaí (Santa Catarina, Brasil), a partir do Acordo de Escazú. A metodologia fica claramente definida como pesquisa qualitativa, de natureza descritiva – explicativa. Os procedimentos seguem três etapas a saber: (i) relação entre as bacias hidrográficas da Pan-Amazônia e do Rio Itajaí sob a ótica ambiental e da democracia; a descrição do valor estratégico dos rios internacionais da Pan-Amazônia e da Bacia Hidrográfica do Rio Itajaí; (ii) identificação dos

riscos de danos transfronteiriços e as limitações à democracia ambiental e a governança hídrica nas Bacias da Pan-Amazônia e do Rio Itajaí; (iii) análise do Acordo de Escazú como motivador para o desenvolvimento regional no contexto do estudo, com vistas a identificação do papel dos diferentes atores em escala local e regional para alcançar a governança das águas. Os resultados identificam entraves e desafios para a aplicação do Acordo de Escazú nas duas bacias hidrográficas e um conjunto de diretrizes para a governança das águas aplicável às Bacias da Pan-Amazônia e do Rio Itajaí.

Palavras-chave: Acordo de Escazú; Democracia Ambiental; Governança; Bacias Hidrográficas da Pan-Amazônia e do Rio Itajaí.

Introduction

Brazil has about 12% of all freshwater availability in the planet and a relatively comfortable situation regarding water stresses (ANA, 2020). The economic exploitation of water resources in Brazil has degraded its shared waters and related ecosystems. This has adversely impacted biodiversity and harmed human living conditions by, e.g., polluting watercourses, in addition to natural disasters. Large hydrographic regions regulate the climate at various scales. The Pan-Amazonian basin can directly and indirectly affect the rainfall regime of South American hydrographic basins since the Amazon transfers moisture to these regions, contributing to stabilize the global climate. Deforestation impairs evapotranspiration and, thus, the route of so-called “flying rivers,” which may affect the rainfall regime of the rest of the country and its various social and economic activities (Jordão, 2019).

The case study of the Pan-Amazonian and Itajaí River Basins (Santa Catarina, Brazil) have been chosen due to two main reasons: (i) the role the Pan-Amazonian basin plays in regulating climate in several scales in South and Central America and (ii) the population of Vale do Itajaí great vulnerability and susceptibility to the physical environment and socio-environmental disasters. Moreover, the choice was based on the scenario pictured by the IPCC report (IPCC, 2021) has pointed out, in which the impacts of devastating the Pan-Amazonian ecosystem directly and indirectly influences the rainfall regime in Southern Brazil. Thus, droughts, floods, and landslides tend to worsen in the Itajaí Valley (IPCC, 2021).

So, what is the study main question? The lack of information, justice, and participation in decision-making regarding land use and water resources in these basins increases their impacts on populations and the environment in both studied cases. To address this issue, Latin American and Caribbean States signed the Escazú Agreement. The agreement aims not only to govern the waters of international basins, but also to benefit regional and local scales within a process of mutual

dependence of hydrological systems (Marchezini, Rodrigues and Oliveira Júnior, 2022; Parola, 2020). According to Bárcena (2018, p. 8; ECLAC, 2019), the agreement addresses key aspects in regional environmental management and protection and regulates rights of access to information, public participation, and justice in important areas such as the sustainable use of natural resources, the conservation of biological diversity, the fight against land degradation, climate change, and increased resilience to natural disasters.

This context gives rise main question: **How can the implementation of the Escazú Agreement in Brazil contribute to the governance of waters at the Pan-Amazonian and Itajaí river basins?** This study aims to propose guidelines for an agenda, according to the Escazú Agreement, toward water governance and environmental democracy for the Pan-Amazonian and Itajaí River Basins (Santa Catarina, Brazil).

The Escazú agreement from the perspective of environmental democracy in managing and governing hydrographic basins

The most recent evidence of drastic changes in the self-regulation macro-processes of the Earth is on the agenda (Vieira and Gasparini, 2020; Kemp et al., 2021; IPCC, 2021). In recent decades, despite efforts to minimize the impacts of anthropic action, it has been observed a growing awareness that many countries have been losing the struggle to reduce ecological unsustainability and limit the negative impact of anthropic action. It has been increasingly recognized that, to a large extent, the main causes of this situation are neither technical nor “natural,” but generally social and political (Jacobi and Barbi, 2007).

Scientists and several world leaders agree that the global atmospheric composition has changed due to anthropic gas and aerosol emissions (Artaxo, 2014; Xu et al., 2020; Hausfather and Peters, 2020; Ho and Budescu, 2022). According to the Intergovernmental Panel on Climate Change (IPCC) (2018), if major countries refrain from

acting, global temperatures could rise by up to 4.8 degrees by 2100. To contain the rise of global warming, a scientific report published in South Korea assessed the prospects of limiting global warming to 1.5 °C (IPCC, 2018). If greenhouse gas emissions continue to grow at current rates, sea levels could rise up to 82 cm and cause major damage in most coastal regions on the globe (IPCC, 2018).

Poor African, Latin American, and Asian regions have the least opportunity to adapt and are thus the most vulnerable to changes in rainfall dynamics with floods and droughts, decreased food production (including from fishing), biodiversity loss, and effects on people's health, i.e., poorer places are even more susceptible to the effects of climate change (IPCC, 2018).

IPCC projects that, by the end of this century, Brazil may witness a 40% to 50% decrease in the distribution of rainfall in the Caatinga biome, which should significantly worsen local water availability (Ambrizzi et al., 2013). Moreover, the report points to more intense future rainfall in the Southern region. This climate unpredictability increases the vulnerability of the population (especially in hazardous areas), with consequences such as water scarcity, diseases, contamination, urban infrastructure problems, increased risks of natural disasters, etc.

Thus, the hypothesis is that the socio-environmental problems in Brazil also stem from a "governance crisis." But what does "governance" mean? It is characterized by how people and institutions manage common problems in their territory, a continuous process that may accommodate conflicting or different interests and carry out cooperative actions (Serrao-Neumann, 2021). It operates on multiple scales via continuous social collaboration. Thus, good governance requires "[...] the partnership between governments, citizens, and other segments of society interested in the process of reducing social and environmental risks to identify, manage, and reduce the impacts of adverse events (Bianchi and Zacarias, 2016; Junior and Nunes, 2021).

Overcoming common needs requires consensus and action planning. Laws and instruments assist the latter to develop regions and build resilient territories and communities. However, without the participation of public, private, and civil society actors, developing an efficient project that minimizes socio-environmental problems caused by the current crisis is impossible. Following such actions, on March 4, 2018, 24 Latin American and Caribbean

States signed the Escazú Agreement (UN, 2018) since they recognized the information-participation-justice triad which contributed to forming the environmental Constitutional State via procedural rights of access to information and justice and participation in environmental issues (such as water governance) which are fundamental to protect the environment.

On April 22, 2021, the Escazú Agreement (UN, 2018) entered into force after it was unreservedly ratified by 12 of the 24 Latin American and Caribbean signatory States: Antigua and Barbuda, Argentina, Mexico, Nicaragua, Panama, St. Christopher and Neves, Saint Lucia, Saint Vincent and Grenada, Bolivia, Ecuador, and Guyana. Chile was the last State to ratify the agreement (now with 13 states members), on June 13, 2022, shortly after the 1st Meeting of Parties (COP 1) from 20 to 22 April 2022. Only three Pan-Amazonian States ratified the Agreement (Ecuador, Bolivia, and Guyana). Brazil, Peru, and Colombia are yet to adhere to the agreement (ECLAC, 2022).

Among the fundamental democratic principles of the Escazú Agreement (UN, 2018), equality, non-discrimination, transparency, accountability, maximum publicity, prevention, and precautionary and generational equity are essential to the rights and procedures of public participation in environmental matters.

The Escazú approach (UN, 2018) aims to enable the exercise of access rights necessary for non-governmental actors to interfere in political decisions, postulate a human development sustained in nature, and guarantee human and fundamental rights, as established in the international legal and constitutional order of each State.

To ensure popular participation in environmental decision-making and access to justice in environmental matters, Art. 1 of the Escazú Agreement proposes guidelines for a water governance and environmental democracy agenda to guarantee the full and effective implementation of rights of access to environmental information, public participation in the environmental decision-making process, and access to justice in environmental matters, and the creation and strengthening of capacities and cooperation in Latin America and the Caribbean, contributing to protecting the right of every person of present and future generations to live in a healthy environment and to sustainable development. (UN, 2018, p.2)

In other words, under international law, this Agreement reaffirms the importance of environmental democracy for the region, in which parties must ensure

freedom of public participation and a permanent and unimpeded flow of information in decisions on undertakings showing risks of impacting the environment, such as shared water resources.

The strategic value of Pan-Amazonian international rivers

The Itajaí River Basin (IRB), whose limits are indicated in Figure 1, is a strategic region for the nine States which have territories in the Pan-Amazonian basin: Brazil, Bolivia, Colombia, Venezuela, Ecuador, Peru, Suriname, Guyana, and French Guiana (Penna Filho, 2015, p. 29; Ribeiro, 2005, p. 201).



Figure 1. Delimitation of the Pan-Amazon. Source: OTCA (2021).

The strategic value of Pan-Amazonian international rivers directly relates to its great water availability. The average flow of the Amazon River ranges around 3.8 trillion m³ per year and that of the surface water in its mouth, 62,867.27 m³/s (Fearnside, 2004, p. 64; ANA, 2018). The Amazonian basin is one of the largest cross-border watersheds on the planet. The waters of the Amazon River and the groundwater of the Amazon aquifer compose a complex system of cross-border waters. Its hydrographic basin is formed by the flows of several international rivers which flow from springs located in higher areas, such as the Andes Mountains, the Guiana Shield, the Central Brazil Shield, the Contamana mountain, and the Pacaraima Mountains, flowing into the great

Amazon plain to the mouth of the Atlantic Ocean (WCS, 2021a), Figure 2.

Among the main tributaries of the Amazon River permeating and/or delimiting the borders of Pan-Amazonian States (Figure 1 and 2), six international rivers with the largest hydrographic sub-basins should be mentioned:

a. On the right margin:

1) The Madeira River, whose main tributaries are the Madre de Dios, Beni, Abunã, Guaporé, and Mamoré rivers, spanning across 4,700 km, waters shared by Peru, Bolivia, and Brazil (CPRM, 2022; WCS, 2021a);

2) The Purus River, whose main tributaries are the Yaco, Santa Rosa, and Acre rivers, spanning

across 4,900 km, waters shared by Peru and Brazil (CPRM, 2022; WCS, 2021a);

3) The Juruá River, whose main tributaries are the Tarauacá and Envira rivers, spanning across 5,600 km, waters shared by Peru and Brazil (CPRM, 2022; WCS, 2021a); and

4) The Maranhão River, whose main tributaries are the Huallaga and Pastaza rivers, spanning across 5,700 km, with waters shared by Peru, Ecuador, Colombia, and Brazil (CPRM, 2022; WCS, 2021a).



Figure 2. Main sub-basins in the Amazon. Source: WCS (2021a)

b. On the left margin:

1) The Negro River, whose main tributaries are the Vaupés, Branco, and Tacutu rivers, spanning across 3,700 km, with waters shared by Colombia, Venezuela, Guyana, and Brazil (CPRM, 2022; WCS, 2021a) and;

2) The Caquetá-Japurá River, whose main tributary is the Apaporis River, spanning across 4,900 km, with waters shared by Colombia and Brazil (CPRM, 2022; WCS, 2021a).

Regarding the freshwater discharge from the main international tributaries of the Amazon River, the following hydrographic sub-basins are noteworthy since they contribute very much to the

local water abundance: that of the Maranhão River, with 22% (encompassing the waters of the Uyacali watershed at Bolivia, whose locals call Apurimac River and contain the springs of the Amazon River); the Madeira River with 15%; the Negro River, with 14%; and the Caquetá-Japurá River with 9%. The evaporation of the waters in the Amazon Basin due to their interactions with the climate, the Amazon forest, the Andean relief, and the Atlantic Ocean, ensures the local hydrological cycle, which feeds “flying rivers,” air masses carrying an atmospheric water flow which provides regular precipitation from the Amazon river estuary to the Andean springs and, from there, to regions beyond the Pan-Amazon (Fearnside, 2004; Noble, 2014; Abreu et al., 2015).

The strategic value of the rivers in the Itajaí Watershed

The Itajaí River Basin (IRB), whose limits are shown in Figure 3, is a strategic region for the municipalities which integrate it and lay in the Atlantic Forest.

Currently, 55 municipalities constitute the IRB, a region called Itajaí Valley. This basin belongs to the Atlantic Slope drainage system, which is divided into three sub-regions: i) the Itajaí River Mouth (Lower Valley), ii) the Medium Itajaí Valley, and iii) the Upper Itajaí Valley. It has more

than 1.5 million inhabitants and an area of about 15,000 km², the largest territorial extension in Santa Catarina State. The region has highly varied natural characteristics, showing great variation in relief (declivity and slope shape), geology (rocks, ores, and structural lines), soil, vegetation, fauna, climate, hydrology (water volume and river level variability). These factors have influenced its colonization, model of use, and occupation since the 19th century. Currently, such conditions determine different degrees of risk to disasters.

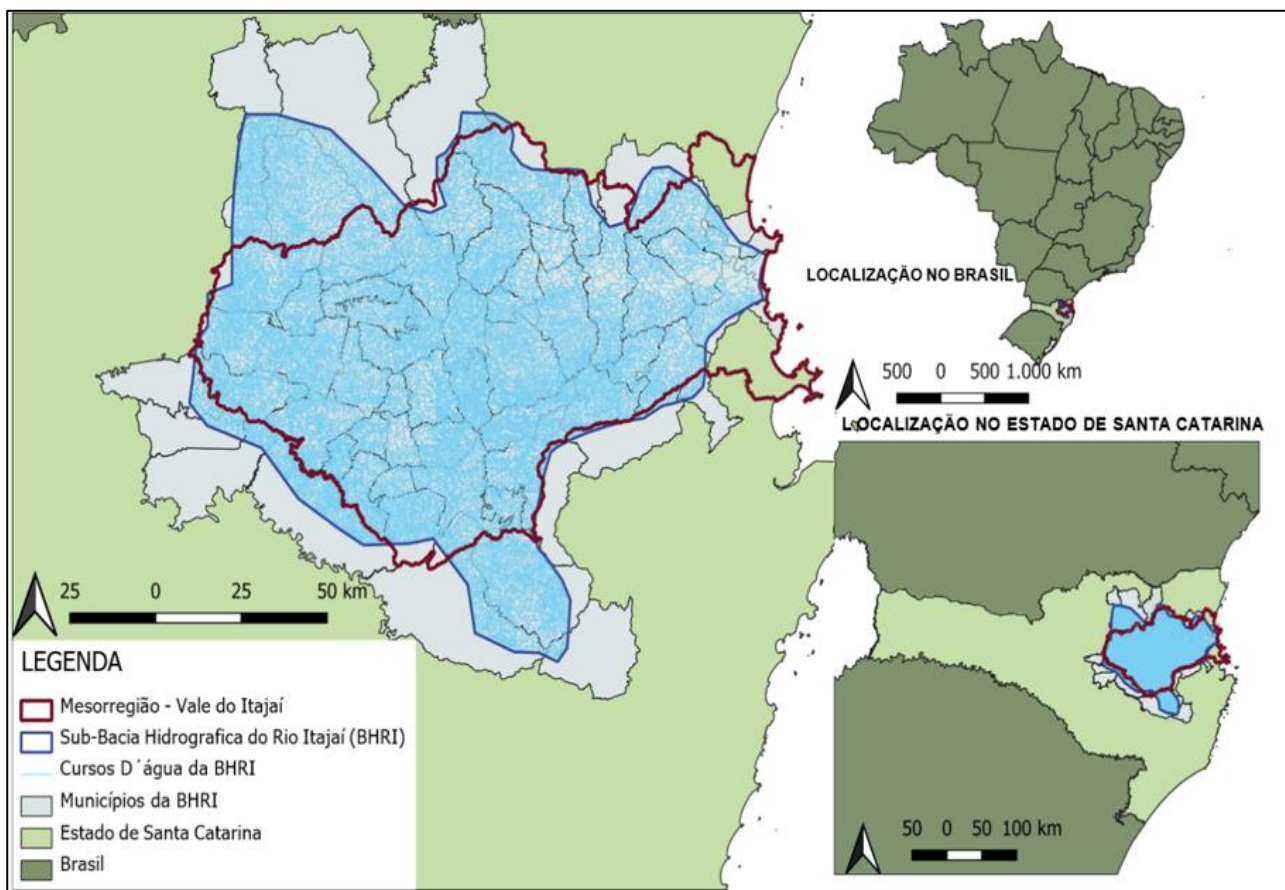


Figure 3. Location of the Itajaí River Hydrographic Basin (SC). Source: adapted by the authors from IBGE data (2021a).

The strategic value of the rivers in the Itajaí Basin directly relates to the large water availability serving about 1.5 million inhabitants and agricultural, industrial, and port activities. According to the *Regionalização de Vazões das Bacias Hidrográficas Estaduais do Estado de Santa Catarina* (Flow Regionalization of the Santa Catarina State Hydrographic Basins) (2006), the average flow of the Itajaí River is about 504,570.55L/s. Several structural works were

carried out to ensure this flow, such as rectification of riverbanks, dams, containment structures, piping, channeling, spillway channels, among others. Among the main tributaries of the Itajaí-Açu River which cross and/or delimit its borders, the six most extensive hydrographic sub-basins should be mentioned:

a. On the right margin:

1) The Itajaí do Sul River, spanning across 101 km. There are seven municipalities that share its waters: Alfredo Wagner, Chapadão do Lajeado, Imbuia, Petrolândia, Ituporanga, Atalanta, and Rio do Sul. It has a 2,091.89 km² drainage area;

2) The Itajaí-Mirim River, spanning across 170 km. There are nine municipalities that share its waters: Vidal Ramos, Presidente Nereu, Botuverá, Guabiruba, Brusque, Itajaí, Camboriú, and Balneário Camboriú. It has a 1,642.15 km² drainage area;

b. On the left margin:

1) The Itajaí do Norte River or Hercílio River, spanning across 185 km. There are seven municipalities that share its waters: Santa Terezinha, Vitorres, Witmarsum, Dona Emma, José Boiteux Presidente Getúlio, and Ibirama, covering a 3,362.97 km² drainage area;

2) The Itajaí do Oeste River spanning across 132 km. There are 11 municipalities that share its waters: Rio do Campo, Salete, Mirim Doce, Taió, Agrolândia, Braço do Trombudo, Trombudo Central, Pouso Redondo, Agronômica, Rio do Oeste, and Laurentino. It has a 3,019.76 km² drainage area;

3) The Benedito River, spanning across 83 km. There are four municipalities that share its waters: Doctor Pedrinho, Benedito Novo, Rio dos Cedros, and Timbó. It has a 1,471.19 km² drainage area;

4) The Luiz Alves River, spanning across 59.6 km. The homonymous municipality share its sub-basin waters. It has a 571.75 km² drainage area.

5) Itajaí-Açu spanning across 188 km. There are 10 municipalities that share its waters: Rio do Sul, Lontas, Apiúna, Ascurra, Rodeo, Indaial, Pomerode, Blumenau, Gaspar, Ilhota, and Navegantes. It has a 2,677.78 km² drainage area.

The relation between the Pan-Amazonian and Itajaí river basins

Both cases show a global relation in which scenarios indicate worsened access, decreased availability, and increased degradation of fresh water sources in the Pan-Amazon, which would direct affect Southern Brazil (Graham et al., 2020, p. 5; Mazzarino et al., 2020, p. 5). In this context, the Pan-Amazonian basin shows problems such as water contamination, deforestation, major infrastructure works, and insufficient integrated

water resources management (IWRM). Water contamination especially relates to illegal and/or informal mining; oil and gas extraction; the release of domestic and industrial effluents; and river transport (OTCA, 2018, p. 17). Among these, mining has considerably grown, causing many adverse socio-environmental impacts, according to a transboundary diagnostic analysis (OTCA, 2018, p. 18).

Main water users' activities in the Itajaí River Basin include public supply, sanitation, animal husbandry, industry, aquaculture, irrigation, mining, and power generation (Faavi, 2010). Thus, problems such as floods, droughts, and water pollution imply environmental, economic, and social issues which directly fragment water resource governance. Moreover, territorial problems, such as water scarcity in other states, directly affect the distribution of electricity to the municipalities in the basin. These socio-environmental problems around managing water resources can inhibit local sustainable development.

Greater precipitation constitutes a direct threat from climate change due to global warming. Since the 1980s, atmospheric vapor has increased, which should also affect the global precipitation in this century as temperatures rise on Earth. According to the IPCC (2021, p. 82), the impacts of human activities at the Pan-Amazon can influence rainfall in southern South America, including the IRB, which is highly vulnerable to hydrometeorological disasters. Both hydrological systems show mutual dependence. Thus, the environmental devastation in the Pan-Amazon may contribute to global warming, thus worsening the problems in the Itajaí River basin.

Figure 4 shows the local progression of climate change at the Itajaí Valley in southeastern South America. Local climate change is subject to a complex interaction between multiple external forces and internal variability. The temporal evolution of the mechanisms operating at different time scales can modify the amplitude of local temperature responses, the precipitation response signal, and anthropogenic forcings (high confidence). Land use forces, aerosols, and land-atmosphere feedback play important roles in modulating regional changes, as in extreme climates (high confidence) (IPCC, 2021 p. 117). Thus, human action at the Amazon accelerates the decrease of global humidity and rainfall, impacting the planet, such as by increasing rainfall in the Itajaí Valley, which already shows a drastic picture of extreme hydrometeorological events.

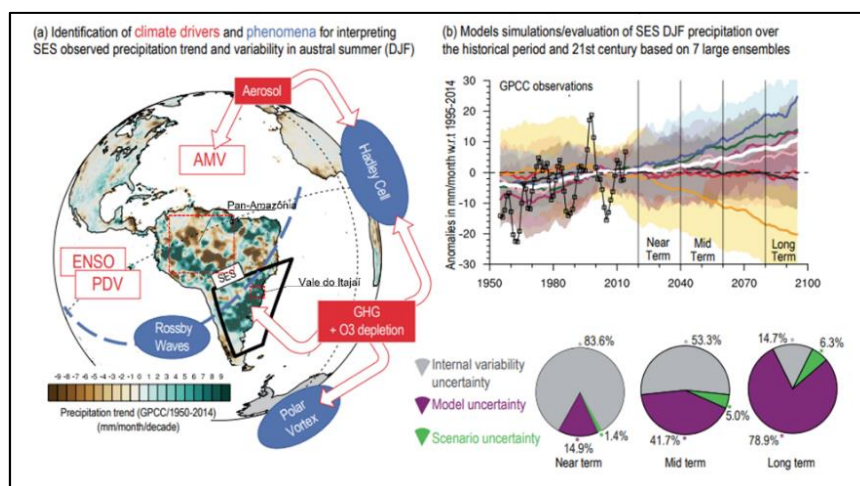


Figure 4. Path to understand the past and assess future regional climate changes – South America Case Study. Source: IPCC (2021, p. 117).

Furthermore, according to IPCC, water cycle extremes should grow more rapidly so that the warmer climate increases the transport of moisture to weather systems, intensifying wet seasons and events. Greater atmospheric humidity intensifies heavy precipitation from subsidiary and seasonal time scales, increasing flood risks and the trend of increased droughts.

The implications of the Escazú Agreement, that aims to safeguard natural resources at the Pan-Amazon and Itajaí River Basins due to the systemic nature of the threats to water resources, can be evaluated locally and remotely. Filippim, Rossetto, and Hermes (2005) claim that promoting efficient water governance requires a strategy of cooperation and articulation from social actors in a given territory, effected by a network structure characterized as a collective action strategy to socially transform a given region. Given this context, water crises also configure a governance crisis. Overcoming these problems require participatory water resources strategies and agreements. Thus, the Escazu Agreement is a fundamental step toward water governance and better sustainable development.

Materials and methods

A qualitative, descriptive, and explanatory research was conducted via three procedures: (i) the relation between the Pan-Amazonian and Itajaí river basins were described by an environmental and democratic perspective, as was the strategic value of the international rivers in the Pan-Amazon

and Itajaí hydrographic basins; (ii) the risks of cross-border damage and limitations to environmental democracy and water governance in the Pan-Amazon and Itajaí River Basins were assessed; and (iii) the Escazú agreement was analyzed as a motivator for regional development to find actors' local and regional role toward water governance.

In the first stage, the studied areas were characterized by describing the strategic value of the international rivers in the Pan-Amazon and Itajaí hydrographic basins; and the relation between them.

In the second stage, the problems and impacts of democracy and the governance of waters in the Amazon Basin were described. For this, data from the transboundary diagnostic analysis, developed by the Amazon Cooperation Treaty Organization (OTCA, 2018), were used. The documentary data was shown via maps, charts, and tables which considered: a) the main problems of international Pan-Amazonian rivers; b) environmental impacts and their social and economic consequences; c) actions toward environmental democracy; d) causes of insufficient IWRM in the Pan-Amazon and; e) strategies to respond to insufficient IWRM in the region. This stage also aimed to identify the problems, impacts, and obstacles to democracy and governance of the waters in the Itajaí River basin. Faavi (2010) and IBGE (2010) data and semi-structured interviews were used, raising the following assumptions: a)

natural disasters; b) the degradation of water bodies and water quality and quantity; c) the lack of social participation in water resources management as the source of intense socioeconomic conflicts and; d) the non-implementation of water collection for use.

In the third stage, the Escazú agreement was described as an activator of regional development in the Pan-Amazon and Itajaí basins, as was several actors' local and regional role toward the governance of waters provided for in the Escazú Agreement, which was advanced to elaborate guidelines for an environmental democracy and water governance agenda for the studied areas.

Results and discussion

Risks of damage and limitations to environmental democracy and governance in the Itajaí River Basin

The Amazon Basin transboundary diagnostic analysis (OTCA, 2018), carried out within the GEF Amazon Project, found that the main problems impacting water quality and quantity in international rivers shared by Pan-Amazonian States included water contamination, deforestation, biodiversity loss, extreme hydroclimatic events, erosion, sediment transport and sedimentation, land use change, glacier loss, major infrastructure works, and insufficient IWRM. The main risks of cross-border socio-environmental damage related to illegal and/or informal mining in the Pan Amazon is shown in Table 1.

Table 1. Main risks of cross-border damage by illegal and/or informal mining in the Pan-Amazon.

Environmental Impacts	Socioeconomic consequences
Water contamination with heavy metals	Impaired health and quality of life
Hydrobiological resources contamination	Social conflicts and insecurity
Deforestation	Cultivation area loss
Aquatic biodiversity loss	Invasion of Indigenous lands
Soil erosion	Population migration
Atmospheric impacts	Food sources decrease

Source: Adapted from OTCA (2018, p. 18)

Transboundary diagnostic analysis indicates that the main causes of deforestation include the expansion of the agricultural frontier (grain and livestock) into the Pan-Amazon, small-scale mining, forestry, and major infrastructure works (OTCA, 2018, p. 28). Figure 5 shows the growth of this environmental problem in the region, depicting its worsening by comparing the percentage of deforestation up to 2000 and until 2013, mainly in the sub-basins of the international Madeira and Marañón rivers, with 32.8% and 27.7% accumulated deforestation rates until 2013,

respectively (RAISG, 2015, p. 9). Local deforestation has also caused risks of cross-border socio-environmental damage to areas of the main Amazon River tributaries, such as hydrological cycle changes; decreased flow rates; sedimentation; bed level alterations; climate variability, floods; droughts; lower quality of life; food security risks; population displacement; and socio-environmental conflicts (OTCA, 2018, p. 30).

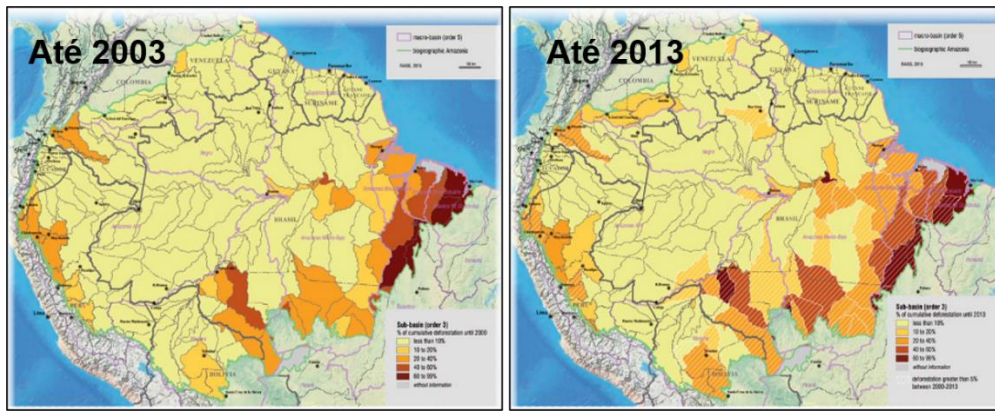


Figure 5. Amazon river sub-basins with greater proportional deforestation until 2000 and 2013. Source: Adapted from RAISG (2015, p. 8)

The other two problems analyzed are major infrastructure works and insufficient IWRM, which indicate, among other aspects, limited public participation in decisions on the use of water from international Pan-Amazonian rivers; and the lack of water security and management by their States, aggravating the risks of cross-border environmental damage (OTCA, 2018, p. 15).

Difficulties of access to information and the restricted involvement of non-governmental actors in the management of shared waters (especially of vulnerable individuals and groups, i.e., riverine

communities and Indigenous peoples) to decide on water resources and Pan-Amazonian States implementing development projects evinces a limited public participation. Table 2 shows the main risks of cross-border socio-environmental damage related to large infrastructural works in the Pan-Amazon. Local insufficient water governance is considered transversal to the other raised cross-border problems, as it directly contributes to its occurrences and/or worsens cross-border damage, justifying such a reality regarding the Pan-Amazonian IWRM.

Table 2. Causes of insufficient IWRM in the Pan-Amazon.

Causes	Description
Technical	Few technical and administrative management instruments and supply and demand studies (water balances); government personnel's poor functional organization; lack of clarity in the vision and mission of government entities; and specialized government personnel's frequent turnover or changes.
Economic	Few public resources and international cooperation; increased demand for natural resources for the international market; expansion of large-scale extractive industry; and increase of illegal/informal economies.
Sociopolitical	Population growth and migration; poverty; unemployment; extractive economic models; native communities' cultural alienation; little information and data; poor training; social conflicts; and climate variability and change.
Institutional	Few territorial plans; excessively centralized decision-making; limited decision-making capacity of subnational governments; institutional control, survey, and inspection weaknesses; poor harmonization of national laws and regulations; little promotion and dissemination of compensation mechanisms for ecosystem functions; and few mechanisms for the participation of civil society, communities, and the local population in decision-making.

Source: Adapted from OTCA (2018, p. 66-67)

In other words, several causes justify the local insufficient water governance, especially:

a) few technical and administrative management instruments and supply and demand studies (water balances);

b) greater demand for natural resources in the international market;

c) scarce information and cross-border water management data;

d) few mechanisms for the participation of civil society, communities, and local population in decision-making;

e) lack of harmonization of national laws and regulations for integrated water resources management in cross-border basins; and

f) lack of training of local communities and populations to manage cross-border water resources.

Currently, only two IWRM initiatives are being developed in the Pan-Amazon, that of the Acre and Putumayo-Içá Rivers. The MAP initiative (Madre de Dios/Bolivia, Acre/Brazil and Pando/Peru), trinationally integrates the Pan-Amazon to institutionalize the governance of the waters of the upper Acre River sub-basin, considering the delimiting border between Brazil, Peru, and Bolivia. This action arose from the mobilization of civil society in these locations, with the assistance and technical guidance from representatives of universities and non-governmental organizations in the face of changes in land use provided by the implementation of the Pacific Highway, which then demanded action from those three States.

This initiative fostered environmental and socioeconomic studies, funded by the OTCA, which described this border. However, the lack of institutional structures which enable dialogue and the organization of civil society and water users from the three States have hindered the implementation of a trinational IWRM in the aforementioned stretch of the international Acre River (ANA, 2012; Silva and Ribeiro, 2021). The most recent incipient project to implement IWRM in the Pan-Amazonian Putumayo-Içá River basin, under development by the Wildlife Conservation Society and promoted by the Global Environment Facility and the World Bank, involving some government actors from Brazil (Amazonas State Environment Secretariat), Colombia (Ministry of

Environment and Sustainable Development), Ecuador (Ministry of the Environment, Water, and Ecological Transition), and Peru (Ministry of the Environment) to conserve and sustainably use cross-border waters with involved non-governmental actors' effective participation and access to information – especially free and informed consultations with Indigenous peoples (including the use of autonomous protocols) (ILO, 1989; WCS, 2021b). The analyzed IWRM initiatives for shared international watercourses show few actions toward effective popular participation, reinforcing the need to implement the access to rights signed in the Escazú Agreement.

Risks of damage and limitations to environmental democracy and governance in the Itajaí River Basin

The Itajaí River basin shows the following socio-environmental issues: a) its floods, runoffs, landslides, and droughts configure socio-environmental problems related to excess/lack of rainwater and urbanization in areas of risk (river banks and hillsides); b) degradation of water bodies by industrial, port, agricultural, and urbanization use impairs water quality and quantity; c) the lack of social participation in the management of water resources generates intense socioeconomic conflicts (e.g., with Indigenous and riverine populations); and d) the non-implementation of water collection for use results in a more indiscriminate use of resources and decreases the financial assets of the Itajaí Committee. Thus, these issues reflect the fragmented governance of IRB water resources. This framework prevents sustainable regional development.

IRB is in a region susceptible to natural disasters due to floods, landslides, and droughts. The model of territorial occupation must be considered to evidence how it contributed to the occurrence of disasters. In a way, the local natural disasters configure announced tragedies due to the irregular occupation of risk areas (Espindola and Nodari, 2011). Heavy rains are natural; disasters, on the other hand, were socially constructed during its occupation and natural resources use. In this process, the growing population under social vulnerability who occupy areas susceptible to landslides and floods stands out.

In November 2008, a combination of landslides, runoffs, and floods greatly impacted the Itajaí Valley. More than 78,656 people were displaced or left homeless, 5,000 were injured, and

135 died in the region. The municipality of Itajaí, in the Itajaí river mouth, suffered with 85% of its urban area submerged for two days. The Middle and Upper Valley had about 4,000 landslides. In 2008, the World Bank (2018) estimated that due to rainfall impacts in Santa Catarina State, total losses and damages exceeded R\$ 4.5 billion. The most recent disaster occurred in the Upper Valley in December 2020, with landslides and intense floods. According to the Santa Catarina Civil Defense, they killed 17 people and displaced more than 500.

Regarding water resources demand and quality, the conditions which occupation historically constituted focused on urban

concentration (spread across several medium-sized cities); vis-a vis the intense industrialization in municipalities such as Blumenau, Itajaí, Brusque, and Rio do Sul and their extensive agricultural areas (especially irrigated rice ones), which share the available water with urban consumption and industrial activity. Another recorded problem is the lack of social participation in water resources management. Moreover, water-use economic instruments remain unused. These factors weaken the water governance of the IRB. Several conflicts stem from the observed problems, as per FAAVI (2010) (Table 3).

Table 3. Water use conflicts and correlates.¹

	Supply	Irrigation	Animal husbandry	Industry	Aquaculture	Port Activity	Environmental conservation	Power Generation	Urban drainage	Soil use
Supply		AB	A	A	A	A	C			A
Irrigation	AB	AB					AB	B		
Animal husbandry	A	A	A		A		A			
Industry	A	A	A	A	A		A			F
Aquaculture	A	A	A		A		A			
Mining	A						D			E
Tourism							F			
Port Activity	A						G			
Dilution of sewage	A	A	A	A			B		L	
Power Generation							F			F
Urban drainage							D			
Landfills	A						A			
Soil use	A	A	A	A	A	I	J	B	K	L
Floods	A						A			H
Legend	A - Affects water quality; B - Changes water amount; C - Sapric release into WTP; D - Causes erosion, altering river dynamics; E - Traditional peoples lose their lands; F - Landscape degradation; G - Dredging releases heavy metals into rivers; H - Restriction of and conflicts with Indigenous peoples; I - Increase of sediments in rivers threaten ports; J - river bank and permanent preservation area occupation and environmental degradation; K - Earthworks generate sediment in rivers; L - Increased infrastructure and stream maintenance costs.									

Source: Adapted from FAAVI (2010).

The results show that the most threatened use is environmental conservation, whereas the most

conflict-causing uses are irrigation, animal husbandry, industry, aquaculture, dilution of

¹ To read Chart 3, consider the potential conflict indicated in the left column and the recommended use in the upper row. It should be read as follows: "Public supply affects environmental conservation due to the release of sapric from Water Treatment Plants (WTP)".

sewage, mining, and soil use. Figure 6 shows the greater interaction in water resource management for the Itajaí Middle Valley and River Mouth microregions.

Blumenau and Itajaí are its main representatives and the microregions with greater financial capacity, population, and industrial concentration. On the other hand, they suffer the most from the impacts of environmental disasters. The municipalities in the Upper Valley scarcely interact to manage their water resources. This microregion contain the springs of the Itajaí-Açu

River and its main tributaries. It also concentrates the largest portion of the rice, onion, and pine production in the IRB. In many cases, agricultural debris is thrown into streams, affecting water quality in downstream municipalities. All IRB municipalities already have municipal sanitation policy and Municipal Basic Sanitation Plans. However, due to the high deficit in investments to treat sewage, it still remains impossible to achieve the recommended universal coverage.

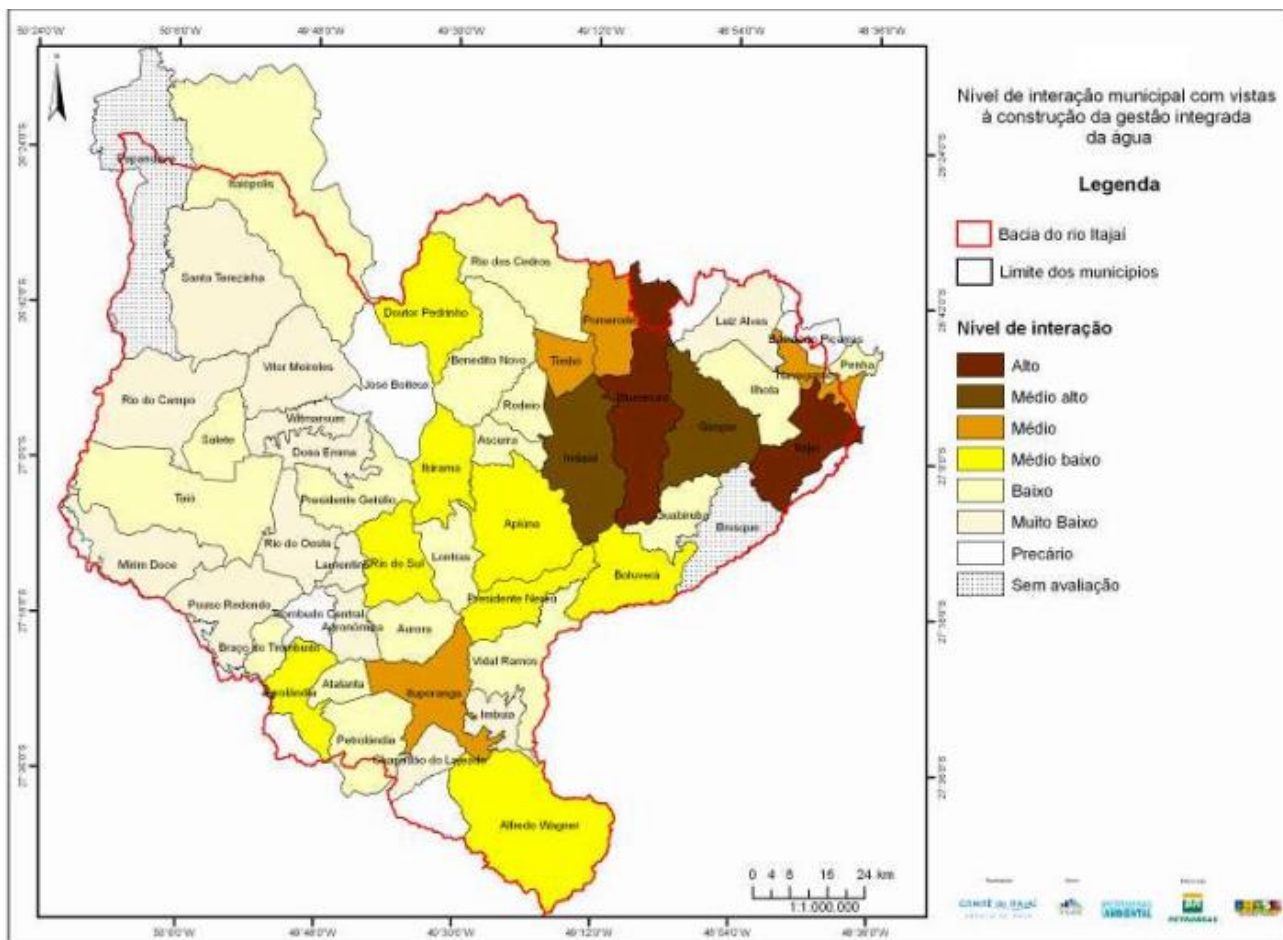


Figure 6. Level of municipal interaction to build water governance. Source: FAAVI (2010).

On the other hand, construction investments have prioritized municipalities in the worst situation, based on a diagnosis of the basin. This problem reflects the non-implementation of economic instruments to use IRB water. In other words, the Itajaí Committee depends on public resources and partnerships to implement educational projects, structural works of basic sanitation, and cleaning of streams. Thus, the low financial capacity of the Itajaí Committee is a

problem which makes requalifying IRB streams and rivers impossible. Even with its low financial capacity, the projects the Itajaí Committee implemented are sustainable and aim to reduce social inequality.

According to Preis, Franco, and Varela (2021), the Itajaí river basin shows a strong trend of forestry expansion, which may impact water availability, change its soil, increase water pollution, and alter its fauna and flora. By 2027,

estimates expect pasture and agriculture to grow by 23.2 and 13.8%, respectively, and forest cover to decrease by 13%. The deliberate expansion of agribusiness in the Itajaí basin may hinder the governance of local water resources.

Regarding socio-environmental disasters, Jansen et al (2021) found that the municipalities in the Itajaí basin show low levels of governance and disaster prevention structuring. In practice, IRB shows populational growth in risk areas, the decrease of resources to prevent disasters, and vulnerability to the risk of disasters. Thus, disasters are fundamental obstacles for IWRM since they also stem from governance crises.

On the other hand, the overall situation regarding the quality of water contaminated with sewage improves considerably; an increasing trend. However, the low interaction among IRB municipalities and water-using institutions and the non-collection of water-related financial resources by the Itajaí Committee worsen environmental problems and prevent the implementation of basic sanitation and infrastructure projects.

A water governance and environmental democracy agenda: The Escazú Agreement as an activator of regional development in the Pan-Amazonian and Itajaí River Basins

Governing water in the studied regions is a great challenge due to the difficulty of implementing an integrated management of water resources, which depends on the reconciliation of national, state, and municipal interests. These show unlike economic development, infrastructure, political orientation, military power, and cultural values, worsening this situation (Giordano and Wolf, 2003, p. 163).

Another challenge is the required technical, legal, political, and institutional coordination inherent to managing, using, and protecting national and international waters, especially regarding the environmental risks of activities in these territories (UNEP, 2016; Machado, 2009, p. 250-252; Canotilho, 2006, p. 266).

In both cases, public participation in water governance is restricted. Non-governmental actors lack the capacity and access to the information necessary to effectively engage, dialogue, and participate in decisions on the use of local river waters, especially vulnerable ones, including to instrumentalize access to justice. Water governance is limited to the scope of each state entity, and it is necessary to take joint actions to ensure the security of shared waters and their integrated management via consensus, greater

cooperation, and the application of related international and national standards.

It is essential to give effectiveness to environmental democracy and the governance of local waters to mitigate and/or, whenever possible, eliminate risks of socio-environmental damage, including cross-border ones by:

a) Strengthening water resource management bodies;

b) creating technical, financial, and institutional capacities to mitigate water contamination;

c) strengthening local actors' capacity and their access to rights to participate in water use decisions in development projects;

d) promoting an integrated system of participatory monitoring and surveillance of basins, sub-basins, and local water resources.

e) strengthening the mobilization of civil society, especially of the role of academia as an independent technical advisor provoking actions from local and national governments to dialogue and develop studies to implement the IWRM;

f) developing proposals for free and informed consultation with local Indigenous peoples (and other non-governmental actors) to stimulate and effectively participate in actions inherent to water governance;

g) giving non-governmental actors, especially vulnerable ones, the capacity and rights of access to the triad information-participation-justice to contribute to decisions on the use of waters of these rivers; and

h) implementing the safety of shared waters and integrated management via consensus, greater cooperation, and the application of related international and national standards.

To deal with the local causes of insufficient water governance, based on the Escazú Agreement, this study proposes, identifies, and systematizes response strategies, according to the priorities and trends attributed by preparing a diagnosis for the region, such as:

i) establishing a permanent regional forum to jointly manage cross-border water resources and regional agreements for technical and scientific cooperation regarding cross-border water resources;

ii) promoting the management and coordinated and planned use of natural resources

and the creation and strengthening of basin committees as a mechanism for citizens to participate in integrated management;

iii) promoting the dissemination and communication of policies and strategies to manage cross-border water resources;

iv) promoting mechanisms communities and local peoples' participation in managing cross-border water resources;

v) establishing regional guidelines and harmonizing national criteria to jointly manage water resources in cross-border basins; and

vi) promoting environmental education, training, and awareness programs and projects for local communities and populations to manage local water resources.

If Pan-Amazonian States and the Itajaí Committee implement such initiatives to regulate, adapt, and manage the use of waters, they may contribute to water security, good governance, and public participation in water-use decisions, especially regarding the implementation of development projects. Thus, reconciling human development with nature by ensuring access to fresh water is essential to the well-being of current and future generations, and mitigating risks of harm.

Environmental democracy is essential for water security and the good governance of the waters from international rivers in the Pan-Amazonian and the Itajaí basins via consensus and the effective cooperation between sharing countries, states, and municipalities. It is evident the need to provide opportunities for everyone's involvement, contribution, and participation in decisions involving sharing and managing these water resources so available springs are used fairly and the unsustainable use of shared fresh water is prevented.

Furthermore, the implications of environmental disturbances in hydrological systems of the magnitude of the Amazon Basin clearly impact other regions, such as the Itajaí Valley, which suffers the effects of worsening climate changes. Thus, the environmental impacts cannot be restricted, and, consequently, the (positive) implications of the Escazú Agreement, for the various regions of Brazil. Although certain cases show no direct relation with transnational waters, smaller basins, and distance, they also suffer the consequences of climate impacts. Safeguarding the environment is guaranteeing the

right to environmental democracy not only in the inscribed territory but in all those who have relations, however indirect, with a certain natural resource.

Conclusions

In conclusion, to comply with the study objective, i.e., guidelines for a water governance and environmental democracy agenda, must ensure the right of access to information, participation, and justice. Thus, the agenda may contribute to reconciling human development with the sustainability of existing springs by giving voice to vulnerable people and/or groups and local forces which depend on water and a healthy environment for their survival.

The action agenda proposed in this study significantly advances environmental democracy. It can increase sensitivity so social actors to make choices and interfere in political decisions when it involves the use of water in defense of the environment.

Giving the right of voice to individuals, local communities, Indigenous peoples, and other water users is essential for them to act with due diligence against governmental actions and other actors and as global forces to explore environmental assets linked to economic interests and mitigate the risks of adverse environmental and social impacts on waters.

Finally, it is extremely important to consider the terms of the Escazú Agreement to prepare a water governance and environmental democracy agenda since it relates to regionality and aims to ensure rights of access to public participation to defend the environment. Moreover, Escazú configures an "endogenous" framework-convention, rather than building on European and/or American experiences, values, and particularities, which are almost always difficult to apply to Latin America and the Caribbean. Moreover, the principles, norms, rules, and decision-making procedures of the international environmental regime, as established in COP1, already consider the social and environmental dimensions essential to reconciling human development with nature. The existing obstacles refer to other Latin American and Caribbean States ratifying and/or signing it to lend the Agreement an *erga omnes* effect.

Some governments, however, resist the Agreement to protect themselves from possible interference in their sovereign use of natural resources. Despite the principles of permanent

sovereignty of States over their natural resources and of sovereign equality (explicit in the Escazú Agreement), these nations fear subjecting themselves to either possible disputes between parties in the International Court of Justice or international arbitration to solve unresolved conflicts, especially on complex environmental issues such as water governance of international rivers; development projects with risks of environmental impacts; human rights guaranteed by international law and recognized by the domestic law of these States; and so on.

An agenda written around water governance and environmental democracy is essential to secure the users of the waters of the Pan-Amazonian and IRB rivers, rights to environmental information, public participation at the environmental decision-making processes. It is also important to be included on that agenda public access to justice on environmental issues for people living in that place, and ensured the international law principles and conventions, such as the Escazú Agreement, and the fundamental rights to a balanced environment provided for in its Environmental Constitutions.

This reconciliation between development and the environment depends on the right to development, a branch of human rights aiming to ensure the dignity and welfare of people living in the Pan-Amazon and IRB.

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