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Why Might We Fight? International Resource Conflicts and Water Security in South America*

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Abstract: In a context of accelerated climate change, increasing scarcity, and global population growth, environmental issues and natural resources have become a matter of heightened concern for international security. Competition for access to and use of scarce natural resources are increasingly part of the nations' geostrategic policies. South America, one of the richest regions in the world in terms of natural resources, especially water, attracts the international interest. This article builds up a picture of such water resources and presents evidence suggesting the urgent need for more effective cooperation among South American states to establish guidelines for the management and defense of the region's natural wealth.

Keywords: International security; environment; water resources; South America

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¿Por qué podríamos enfrentarnos? Conflictos internacionales por los recursos y seguridad hídrica en Sudamérica

Resumen: en medio del cambio climático acelerado, de una mayor escasez y del crecimiento de la población mundial, las problemáticas ambientales y los recursos naturales se han convertido en una gran preocupación para la seguridad internacional. La competencia por el acceso y el uso de los escasos recursos naturales se contempla cada vez más en las políticas geoestratégicas de las naciones. Sudamérica, una de las regiones más ricas del mundo en recursos naturales, especialmente en agua, atrae el interés internacional. En este artículo, se dibuja un panorama de esos recursos hídricos y se presenta evidencia que sugiere la necesidad urgente de una cooperación más efectiva entre los estados sudamericanos con el fin de establecer pautas para el manejo y la defensa de la riqueza natural de la región.

Palabras clave: seguridad internacional; medio ambiente; recursos hídricos; Sudamérica

Por que poderíamos nos enfrentar? Conflitos internacionais pelos recursos e segurança hídrica na América do Sul

Resumo: Em meio da mudança climática acelerada, de uma maior escassez e do crescimento da população mundial, as problemáticas ambientais e os recursos naturais vêm se convertendo em uma grande preocupação para a segurança internacional. A competência pelo acesso e pelo uso dos escassos recursos naturais foi incorporada cada vez mais nas políticas geoestratégicas das nações. A América do Sul, uma das regiões mais ricas do mundo em recursos naturais, especialmente em água, atrai o interesse internacional. Neste artigo, são apresentados um panorama desses recursos hídricos e evidência que sugere a necessidade urgente de uma cooperação mais efetiva entre os Estados sul-americanos para estabelecer diretrizes para a gestão e defesa da natureza da região.

Palavras-chave: segurança internacional; meio ambiente; recursos hídricos; América do Sul

Introduction

The fight for environmental protection, sustainable development, concerted actions between governments and institutions, Non-Governmental Organizations' (NGOs) and civil society's democratic participation in the debates needed to address climate change, and the depletion of finite natural resources has come a long way in recent decades in the global arena. However, in a context in which the Paris Agreement has come under attack by the current United States administration —calling into question even the worldwide wealth of scientific evidence on climate change—, the issue becomes more problematic. Extreme weather and natural disasters happen at a more violent and frequent pace, entire populations are being environmentally displaced, and there is a constant push for privatizing basic vital resources such as water, so the need for addressing these questions presents itself as an extremely urgent task (Kestler-D'Amours, 2018).

Sometimes this context is presented as a doomsday scenario, bureaucratized and militarized by exclusionary public policies, which might hinder needed cooperative actions and makes open debate and participation of all societies, governments, and global institutions even more important. Science, too, is called to erase barriers and produce research and work collectively on inter/transdisciplinary approaches. This effort involves not only physicists, biologists, environment and energy scientists, geographers, economists, political scientists, but also sociologists, anthropologists, artists, health care professionals, and social workers. It also points to the need for transparency and good governance as vital to the success of public policies in order to both coordinate common goals and promote equity, participation, and justice (Empinotti *et al.*, 2016).

The year 2016 was the world's hottest ever recorded (National Aeronautics and Space Administration [NASA], 2017). If global warming seemed to be a distant concern on the international agenda a few years ago, today it is of central importance at the global level. For the first time, climate analysis demonstrated that each month of 2016 was the warmest globally in modern temperature records since 1880 (World Meteorological Association [WMO], 2017). If the preservation of the environment is cause for concern, disputes over natural resources have also expanded in the context of population and energy consumption increase amidst resource scarcity.

The year 2019 might be one of the most catastrophic for the protection of one of the most important ecosystems in the world, the Amazon Rainforest. Brazil has recorded more than 72,000 fires this year, an 84 % increase compared with the same period in 2018, according to the INPE, the Brazilian National Institute for Space Research (Watts, 2019). Not all were forest fires, but more than half were in the Amazon, according to a report published by *The Guardian* (Watts, 2019). Less than a year after taking office and a series of actions to modify the legislation and cut or diminish other government efforts to protect the environment, Brazilian far-right president Jair Bolsonaro sparked international concern and outrage over his handling of the forest (Watts, 2019).

In a special report on the probable wars of the 21st century, *The New York Times* listed the fight over natural resources, especially the dispute over the Amazon, as the world's contemporary main source of tension. In the article *Why we might fight* (Shanker, 2012), the newspaper points out that the international voracity for natural resources such as oil, the competition for minerals and coping with the effects of climate change are a fundamental concern of international defense and security to the United States government. According to the report, the US military confirmed these issues represent a new source of conflict and have systematically become a new field of study in research centers, the Pentagon, and intelligence agencies. The Amazon Rainforest is one of the hot spots for the outbreak of a possible world war still in this century (Shanker, 2012). The reasons for a possible conflict over the Amazon Rainforest include the region's biodiversity, arable land and habitable areas; the largest hydrographic basin in the world (covering an area of 7 million km²) and its impact on the maintenance of the global supply of oxygen, and the dispute over

its water, pharmaceuticals, and mineral resources (Shanker, 2012).

Recently, a report produced by the Center for Climate and Security, issued by 25 military experts and prominent members of the US National Security community, strongly warned that climate change poses "significant risk for US national security and also for international security" and that the issue requires more attention from the US government (Shanker, 2016).

In the South American regional level, tensions over natural resources persist, whether in territorial-border disputes, control of water and/or energy resources and even because of pollution. The environmental issue in South America involves domestic, transnational, and global issues. The struggle for water (attempted privatization) in Bolivia in early 2000, for example, was a turning point in the struggle for control of natural resources (Bruckmann, 2011; Forti, 2013). One of the drivers of the Brazil-Argentina approach was the resolution of the water issue involving the Paraná Basin through the 1979 Itaipu-Corpus Tripartite Agreement (Bragatti, 2015; 2016).

In the Brazilian domestic scenario, even with the country's efforts to protect the environment and the progress in containing deforestation and the emission of carbon dioxide in recent years, the water issue is worrisome. The biggest environmental disaster in Brazil's history was that of Mariana (also the world's largest dam accident) in 2015 when a mining company's dam rupture left 19 dead, polluted the waters, and destroyed thousands of kilometers along the Doce River, reaching dozens of cities to the mouth of the Atlantic Ocean (Miranda *et al.*, 2017). This tragedy, among others, demonstrates the importance of managing water resources in Brazil, as well as throughout the subcontinent, requiring effective, sustainable, and transparent public regulatory frameworks.

In international forums, the environment and related issues have gained prominence in the new global context. With the end of the Cold War, more than a hundred heads of state and government and thousands of representatives of NGOs met in a context characterized by multiculturalism and held a wide-ranging debate with representatives of civil society in the Second United Nations Conference on Environment and Development (Rio de Janeiro), also known as ECO-92, Earth Summit or Rio-92. As a concrete result, "Agenda 21" signed by 175 countries was launched and the idea of sustainable development was incorporated. However, obstacles to protect the environment while maintaining economic development persist at the local, regional, national, and international levels.

Using a qualitative methodology and a historical-interpretative approach, based on analysis literature review and documentary sources, this article aims to discuss the question of natural resources regionally in the prism of security, with special emphasis on water in South America. An overview of natural and water resources in the South American region is provided to contextualize and analyze the issues from the regional perspective of international security, given their potential for generating conflicts.

The environment as a global concern

The end of the Cold War marks a change in the international agenda, which no longer centers on traditional security issues. Now it includes themes such as pandemics, AIDS, the environment, poverty, transnational terrorism, etc., in a context of global and regional governance, seeking rapid responses to the new configuration of power (Rosenau, 2000).

An example of the growing importance of the environment in the development plans of nations in recent years is the United States, historically reluctant to adapt its internal standards to the parameters suggested by international forums, such as the non-ratification of the Kyoto Protocol. However, Barack Obama's eight years leading the world's largest power reflected changes in that pattern of behavior, as demonstrated by the decision to cut carbon output by one-third, even under heavy pressure from the country's industrial sector. In December 2015, President Obama sought a partnership with Brazil to limit global temperature increase by two degrees Celsius this century. These decisions revealed an attempt at alignment

with the COP-21 (Sutter *et al*., 2015), which are now under check by the Trump's administration resuming the previous historical standard.

In regards to water, several international initiatives were developed. Initially, in 1977, there was the United Nations Water Conference (Mar del Plata), and in the 1980s, the issue gained more robustness with the Brundtland Report, titled "Our Common Future," which brought attention to this resource in a more assertive way. In 2005, the UN established the "Decade of Water," in which a series of studies and actions were signed to treat the issue with greater ownership and effectiveness (United Nations Brazil [UN-Brazil], 2015).

In addition to the various water conferences, forums, and meetings around the world, there are a number of initiatives by international organizations and actors on the subject, such as the United Nations Food and Agriculture Organization (FAO) and Educational, Scientific and Cultural Organization (UNESCO), which, although not exclusive to water, give prominence to the theme. In the 1970s, UNESCO, together with the International Hydrological Program (IHP), created the Hydrological Map of South America with the help of regional experts.

As early as 1992, the International Conference on Water and the Environment in Dublin declared water as a finite resource, vulnerable, and of high economic value, in addition to Rio-92, which emphasized the environment and sustainable development. Following this milestone, economic and financial forums, such as the World Bank and the International Monetary Fund (IMF), have also highlighted the matter. New institutions to stimulate water management, such as the Global Environment Facility (GEF) (1991), the Global Water Partnership (GWP) (1996), and the World Water Council (WWC) (1996), were created with the support of these international organizations. Thus, in new spaces of dialogue, such as the World Water Forum and the Alternative World Water Forum, there is a new approach to the exploration and management of water resources, which cease to be the attribution of governments to become an economic activity; that is, water becomes a commodity. In 2003, what was once the UN subcommittee on water issues became a coordinating mechanism for the area through the creation of United Nations Water [UN-Water], which in a recent report warns that:

> Globally, water demand is predicted to increase significantly over the coming decades. In addition to the agricultural sector, which is responsible for 70 % of water abstractions worldwide, large increases in water demand are predicted for industry and energy production. Accelerated urbanization and the expansion of municipal water supply and sanitation systems also contribute to the rising demand (...) Two thirds of the world's population currently live in areas that experience water scarcity for at least one month a year. About 500 million people live in areas where water consumption exceeds the locally renewable water resources by a factor of two. (United Nations World Water Assessment Programme [WWAP], 2017, pp. 1–2)

These findings put together a dramatic picture where, unlike other environmental issues, water has not yet mobilized different states and actors to formulate a specific international convention, not to mention a number of signed but not ratified documents that did not come into effect (Ribeiro, 2008). Along these lines, there are specific advances in crosscutting water policies, as can be seen in the Millennium Development Goals (MDGS) and the Sustainable Development Objectives (ODS), both of which are coordinated by the UN, but insufficient when compared to the magnitude of the problem and/or the construction of global environmental governance.

When we look at this issue within the subcontinent, we find that the South American scenario is crucial in water resources, given that:

> According to the Global Water Partnership (GWP), almost one-third of renewable water resources are in South America. Three of Latin America's countries are among the first in the list of countries with the highest amount of water: Brazil (first), Colombia (third), and Peru (eighth). (Casma, 2015)

There are 263 transboundary basins in the world. In the American continent, there are 78 transboundary river basins, 38 of which are in South America (UNEP, 2002; UN-Water, 2019).

Besides, it is in South America that some of the largest transboundary hydrographic systems are located: the Amazon Basin, the Plata Basin, and the Orinoco Basin. Observing only the two largest watersheds in South America, the Amazon Basin, and the La Plata Basin, there are 83 bilateral or multilateral treaties among their countries (Oregon State University, 2002).

The South American region has some initiatives concerning transboundary water governance, including the La Plata Basin Treaty (1969), which consolidated the Intergovernmental Coordinating Committee of the La Plata Basin Countries (1973); the Tripartite Technical and Operational Cooperation Agreement between Itaipu and Corpus (1979); the Amazon Cooperation Treaty (1978); the Treaty of Yacyretá (1973), and important projects, such as the Amazon Cooperation Council (GEF Amazonas), which provides tools for shared management of this basin (Villar, 2017).

However, the effects of climate change, the impact of major infrastructure projects, population growth, and the risks of contamination are just some of the challenges faced in managing these waters, as well as including the local communities in these management models. The Pilcomayo River basin is an example, once shared by Argentina, Bolivia, and Paraguay over an area of approximately 290,000 km². It is divided into Alto Pilcomayo (*alta cuenca*) and Baixo Pilcomayo (*baja cuenca*), while the upper part is in Bolivian territory and corresponds to approximately one-third of the basin area (Villar, 2016). This watershed presents serious environmental problems, mainly due to contamination by the mining activity carried out since pre-colonial times, particularly in Bolivia (Villar, 2017). This is a concern for people who use the water and its resources, such as fishers and indigenous communities, and has generated serious conflicts.

The alliance among the state, international organizations, NGOs, and the epistemic community has gained prominence and brought with it the idea of governance for this issue. One example is the Internationally Shared Aquifer Resources Management (ISARM), established by the International Association of Hydrogeologists (IAH), UNESCO, FAO, and the United Nations Economic Commission for Europe (UNECE), which involved the creation of a monitoring system for aquifers in the South American region. One of ISARM's objectives is to subsidize cooperation among countries holding shared underground water reserves, bringing technical-scientific information, training, and education that serves as a basis for political decision-making in this regard (Fuccille *et al.*, 2017; Ministério do Meio Ambiente, 2016).

The ISARM initiative divides its projects by regions of the world, one of which is the Americas. In the Americas case, in the 2003 Montevideo Workshop, three case studies were selected to become ISARM projects, and after that, in 2006, three other cases were selected (ISARM, 2019). Also, a pilot project for the Guarani Aquifer was added in 2003, which involved technical and political staff from the four countries to which this reserve is limited. This is the most developed case for water-related governance in the South American region. The Guarani Aquifer is one of the largest transboundary aquifers in the world, shared by Argentina, Brazil, Paraguay, and Uruguay. In 2010, following the end of the project for this aquifer, the Guarani Aquifer Agreement was signed by its owners, which was ratified by Argentina and Uruguay in 2012, Brazil in 2017, and Paraguay in 2018 (Leite, 2018). However, this agreement has not yet entered into force.

The projects developed in South America regarding transboundary aquifers involve many countries and international organizations, as shown in Table 1.

Table 1. Cooperative International Projects for Water Resources in South America

Project	National and International Institutions	Countries
Project for the Implementation of Integrated River Basin Management Practices for the Pantanal and Upper Paraguay River Basin (1999–2004)	National Water Agency of Brazil, GEF, UNEP, OAS	Brazil and Paraguay
Project for the Characterization of the Zarumilla Aquifer and Monitoring of Water Quality, carried out in coordination with the Puyango Tumbes Binational Project (2001)	IAEA	Ecuador and Peru
Project for the Integrated Management of Transboundary Water Resources in Puyango-Tumbes, Catamayo-Chira and Zarumilla River Basins and Aquifers Subject to Climate Variability Concerns (2013)	National Water Secretariat of Ecuador (Senagua), the Peruvian Water Authority, the United Nations Development Program (UNDP), GEF, FAO, and IUCN	Ecuador and Peru
Guarani Aquifer System Environmental and Sustainable Development Project (2003)	IAEA, Germany's Federal Institute for Geosciences and Natural Resources (BGR), OAS, World Bank, Bank Netherlands Water Partnership Program, and GEF	Argentina, Brazil, Paraguay, and Uruguay
The Framework Program for the Sustainable Management of La Plata Basin's Water Resources with Respect to the Effects of Climate Variability and Change. Component Integrated Management of Groundwater: Sustainable Management of the YrendaToba-Tarijeño Aquifer System (SAYTT)	ISARM Americas, GEF, FONPLATA, CIC, OAS, UNEP	Argentina, Bolivia, Brazil, Paraguay, and Uruguay

Source: Prepared by the authors based on Villar (2016).

According to a survey by UNESCO, ISARM, and OAS (2007), despite the 29 transboundary aquifers in the South American continent, 15 of them lack basic information, which can be a barrier and at the same time an opportunity for countries to move forward in making arrangements for the governance of those waters. One of the possible explanations for this absence of regulatory frameworks is the fact that aquifers are not used for navigation, fishing, border delimitation or energy production, practices that permeate water conflicts in general (Mechlem, 2009). Groundwater is subject to overexploitation and transboundary pollution and needs further study to prevent these issues. Aquifer outcrop and recharge areas are the most vulnerable and joint measures are a way of managing them.

Fossil aquifers are another challenge as their waters are not renewable after extraction. Puneños, in Argentina and Bolivia; Concordia/Caplina-Writings in Chile and Peru, as well as Ollague-Pastos Grandes in Bolivia and Chile are some examples of fossil water aquifers widely used in South America (UNESCO/OAR/ISARM Americas, 2007). The groundwater cycle is different from that of surface water and its degradation is considered critical and, in some cases, irreversible. These can be sensitive cases in the region, just as the Caplina Aquifer overexploitation by Peru, which causes saline intrusion and compromises water in Chile, and the Guajira Aquifer in Colombia and Venezuela (UNESCO/OAR/ISARM Americas, 2007; Villar, 2016).

Integration initiatives in South America, such as the Southern Common Market (MERCOSUR) and the Union of South American Nations (UNASUR), also have instances related to the environment, which could help with these issues. In MERCOSUR, the Working Subgroup 6 is composed of technical experts from the member countries, and the Meeting of Ministers of the Environment, a political body to deal with the block's environmental issues. In regards to water resources, the Guarani Aquifer Agreement was signed in 2010 to promote shared management for the aquifer among its owners (Brazil, Argentina, Paraguay, and Uruguay). It should be emphasized that this is a rare action, as there are only five agreements for transboundary groundwater worldwide (Villar, 2016). So, this is an innovative initiative in the region, which is abundant in aquifers but lack information, treatment, and technical organization.

Within the scope of UNASUR, at the discourse level, the protection and sustainable exploitation

of natural resources support this initiative, as these are considered an essential part of the region's development strategies and the subcontinent possesses immeasurable natural wealth. However, despite the preservationist rhetoric in many of UNASUR's statements, including recognizing the importance of the environment in its Constitutive Treaty, there is not a specific internal body —among the more than a dozen Councils that make up its institutional structure— dedicated to environmental issues, let alone water. It is worth mentioning that Bolivia, Ecuador, and Uruguay explicitly recognize the human right to water in their respective Constitutions (Bragatti, 2019; Fuccille *et al.*, 2017).

Geopolitics of natural resources in South America

As the environment has gained prominence in the field of International Relations (IR) blurring the traditional boundaries between high and low politics, we focus here on understanding how natural resources have become an essential strategic and international security issue, especially in the view of many countries in South America. This has been called the "Geopolitics of Natural Resources" (Bruckmann, 2011).

Economic development models, public policies, bureaucracies, local authorities, military preoccupations, cultural and societal aspirations clash, thus making the situation even more sensitive in the region. The discussion on issues such as sovereignty, natural resources, and hydro-energy, preservation of biodiversity —as well as the Amazon as a disputed area and target of international greed— are at the center of the political debate in the contemporary Latin American context, according to scholars such as the Peruvian political scientist Mônica Bruckmann (2011).

The way of life of some indigenous and peasant communities in South America is based on cultural concepts such as *buen vivir* —or *sumak kawsay* in Quechua—. Bruckmann reminds us that this concept means a relationship of respect and harmony with nature, seeking ecologically balanced and sustainable development. These concepts were officially adopted in countries such as Bolivia and Ecuador, which could represent a contradiction of capitalist exploitation in the global production system. Bruckmann sees a confrontation between two models of development:: "(…) one based on the planning and sustainable use of natural resources, oriented to meet the needs of the majority of social actors, and another based on the violent exploitation and expropriation of these resources and social forces and the people who own them" (Bruckmann, 2011).

With the dissipation of rivalries in the Southern Cone, strategic and defense concerns for Brazil have increasingly focused on the Amazon region and the so-called northern border (Miyamoto, 2009). The Amazon region is of fundamental importance for better coordination and integration of South America, either because of its extraordinary possibilities of connecting the subcontinent or because of the limitations and preoccupations it entails, constituting a crucial point in the defense of the natural resources of the region and raising non-state threats (stemming from transnational crime, drug trafficking, and activities of guerrilla and paramilitary groups).

In parallel, the Amazon Cooperation Treaty (TCA), signed in 1978 by Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, and Venezuela, was a legal instrument recognizing the transboundary nature of the Amazon, which became, with the subscription of its members in December 1998, the Amazon Cooperation Treaty Organization (ACTO) —the only international organization based in Brazil—, has the purpose of "boosting the future development of our countries and the region; an asset that must be preserved, but essentially promoted, in line with the principles of sustainable development" (Ministério das Relações Exteriores [MRE], 2015). No other ecosystem on the planet has an international organization as the Amazon does, despite its problematic functioning and timid and precarious results that persist to this day.

According to Amayo Zevallos (1997), these countries signed the treaty mainly for defense reasons and against attempts by central countries to "justify" the internationalization of the Amazon. The author reminds us that François Mitterrand,

then president of France, argued directly and clearly for the internationalization of the Amazon in 1989:

> At the Environmental Conference in The Hague, he proposed the creation of a World High Authority for Environmental Affairs capable of interference, which would limit national sovereignty over goods considered of interest to humanity in the Amazon. (Amayo Zevallos, 1997, p. 129)

Concepts such as that of "relative sovereignty" and proposals for the internationalization of the Amazon by developed countries are not new (Amayo Zevallos, 1997). As the geographer Bertha Becker (2005), one of the most important scholars of the Amazon, points out, the struggle of international powers for the stocks of natural resources located in peripheral countries is aggravating in the 21st century:

> There are three great natural 'El Dorado' in the contemporary world: Antarctica, which is a space shared by the great powers; the ocean floor, very rich in minerals and plants, which is not legally regulated; and the Amazon region, which is under the sovereignty of national states, including Brazil. (Becker, 2005, p. 77)

In UNASUR, the issue of natural resources has been treated strategically and focusing on international security, with the need for guaranteeing access and exploitation control, as well as the concern that nations with scarce resources may destabilize the region in search of them. This is a result of the fact that:

> The countries of South America have one of the largest mineral reserves on the planet: 65 % of the world's lithium reserves, followed by silver (42 %), copper (38 %), tin 33 %, iron (21 %), bauxite (18 %), and nickel (14 %). It is estimated that the mining potential would be even greater since the available geological information is partial. Oil reserves are also important, especially after the certification of extra-heavy oil from the Orinoco Belt in the Bolivarian Republic of Venezuela. In addition, the region holds about 30 % of the world's total renewable water resources, which is more than 70 % of the water of the American continent. (Comissão Econômica para a América Latina e o Caribe [CEPAL], 2013)

South America holds 28.9 % of the world's freshwater resources, with a natural annual renewal of more than 20,000 cubic meters per capita, while the region's population represents less than 6 % of the world's total. It is important to note that most of the region's water resources are shared: the region has 25 of the 263 transboundary river basins in the world, with shared systems that are precisely those that offer the largest volumes of freshwater, including the Basin Silver, with five countries, and the Amazon Basin, which brings together eight of them. Besides, South America is rich in groundwater, with more than 30 transboundary aquifers in the region (Forti, 2013).

If all these factors are cause for concern, they also give South America a comparative advantage over countries outside the South American subcontinent. Water resources are seen in a variety of ways: as a human right, as an integrating source of its member countries, and/or as part of sustainable development and protection of the environment (such as the presentation of research on the various aspects of this theme in the scope of Rio-20, as well as meetings promoted by UNASUR for the formulation of joint guidelines for COP-21).

Water resources in a context of security

According to the realist thinking of IR, international conflicts —in general terms— derive from the idea of an absence of a legitimate monopoly of force above the states (self-help), which act to protect their sovereignty in search of power and survival (Baldwin, 1997; Buzan, 2008).

Most of the attempts to insert the environment into security agendas were made through the "securitization"[1] process, according to Buzan and Wæver's (2003) terminology, generating new environmental threats and even legitimizing interventionist actions in areas of the South, as stressed by the authors Filippi and Brandão (2017). On the

1 Securitization in International Relations refers to the process in which actors of the state transform any matter into a matter of "security," that is, an extreme version of politicization that allows using extraordinary means in the name of security (Buzan & Waever, 1998, pp. 29–31).

other hand, the materiality of the contemporary environmental crisis is undeniable, as is a fact that both its causes and consequences are distributed unequally around the globe, without necessarily coinciding with the borders of states (Filippi & Brandão, 2017, p. 72).

Global environmental changes, in turn, contain great potential for economic, political, and social destabilization (Homer-Dixon, 1991; Huntjens & Nachmar, 2015). If a resource is denied to or lacked by a particular state, it can resort to various types of mechanisms —persuasion, law, force, and so on— as a way of obtaining it. This is the case of water resources, which is unevenly distributed across the globe. In this scenario, where the conflict may correspond to any confrontation of interests and legal contestation between states or even reaching its most extreme form —war—, the notion of sovereignty, development, and national security may appear as a hindrance to international cooperation. Indeed, the role of contemporary states in providing security is an open and complex debate (Brauch *et al.*, 2011; Dalby, 2009), permeating diffuse and polymorphic themes, especially those related to water (Fuccille *et al.*, 2017).

The theoretical approaches in environmental security can be grouped into two main groups, according to Filippi and Brandão (2017): on the one hand, the Environmental Conflicts Thesis, with a close dialogue with the realist and neorealist theories of IR; on the other, the theorists of Human and Ecological Security, more aligned with liberal assumptions and strongly identified with the environmental agenda. The first seeks to prove the existence of "water wars" to identify which elements influence the emergence of violent conflicts and to understand how such dynamics affect the regional security of states. The second, more in line with critical theories, emphasizes the importance of directing the analysis to agents other than national states, such as people and communities affected by diverse insecurities in areas such as health, food, energy, etc., in addition to the need for including an ecological vision on the environment (Filippi & Brandão, 2017, p. 73).

One issue to be addressed is that most of the environmental security research and theories are produced in research centers from developed countries. However, they usually carry out their analysis on cases in developing countries, notably in regions such as Africa and the Middle East, as stated by Filippi and Brandão (2017). This discrepancy between researchers and research "subjects" poses a series of challenges for the autonomous intellectual production of developing countries, including Brazil, evidencing the necessity of developing and applying methodologies that meet the demands of local realities for environmental security. In this sense, according to the authors, the search for greater transdisciplinarity capable of aggregating knowledge and methods from areas such as geography, sociology, anthropology, ecology, law, and so on, is one of the ways to strengthen environmental security analyses (Filippi & Brandão, 2017, p. 83).

In addition to the importance of water security for irrigation (which consumes more than two-thirds of the freshwater used on the planet), industry (about 20 %) and domestic use (with the remaining 10 %), rivers and hydrographic basins are essential and strategic because of their multiple uses, such as transportation routes, border establishment, hydroelectric power generation, as well as environmental protection and food production for local populations (Cook & Bakker, 2012; Peña, 2016). Water resources are generally seen as an element of high conflicting potential because they ignore political boundaries and escapes institutional classifications and legal generalizations (Giordano *et al.*, 2003). However, cooperation and negotiated solutions are preferred by states that share or reach an impasse when it comes to this resource (Mason & Calow, 2012).

Researchers in line with critical theories refuse to base their analysis on the assumption that scarce resources would lead to the outbreak of violent conflicts, Filippi and Brandão (2017) point out. Instead, they consider that the study of security and environmental violence should focus on the political-economic relations of access, control, and struggle for natural resources, emphasizing the inequalities derived from these processes. Thus, the origin of most environmental threats is related to the way of life of industrialized

and wealthy nations. Such a dynamic of unequal distribution of environmental risks engenders a new security dilemma, according to the authors. Industrialized societies, in seeking to increase their security by expanding their economic and industrial activities, would end up undermining the security of other societies, threatening economies, and the survival of countless people. At the same time, the environmental degradation generated by these economic and industrial activities would affect the global ecological balance as a whole, reducing the safety of all societies (Filippi & Brandão, 2017, p. 76).

Some studies suggest that water will be at the center of possible conflicts: water demand is increasing, groundwater supply levels are decreasing, and pollution has increased, just as infrastructure and treatment expenditures (Giordano *et al.*, 2003). Moreover, the water crisis provokes controversies and diverse diagnoses:

> According to some experts, the water crisis in the 21st century is a management crisis rather than one of scarcity and stress (Rogers *et al.*, 2006). However, for other specialists, it is the result of a set of environmental problems aggravated by other problems related to the economy and social development (Gleick, 2000). According to Somlyody and Varis (2006), the aggravation and complexity of the water crisis are due to real problems of availability and increase in demand, as well as a sectoral management process and response to crises and problems without a predictive attitude and systemic approach. (Tundisi, 2008, p. 7)

In this context, the concern for environmental resources and inter-state conflicts in the post-Cold War period increases with the extension of the concept of security, creating the notion of environmental security, which gradually gains ground from the Brundtland Report, which points to "unsustainable" development and conflict (Barnett, 2001; Sachs & Santarius, 2007). Thus, water becomes part of the international security issue because of its conflicting potential, as it has undergone "securitization" processes in several regions of the globe (the Middle East, South Asia, sub-Saharan Africa, etc.). Water security has also been the theme of several international documents, such as the Human Development Report 2006, which established the human right to access to a sufficient quantity of quality water at an affordable price that can contribute to a healthy, dignified, and productive life while allowing ecosystems to continue producing water (Cook & Bakker, 2012; Sant'Anna, 2013). At the same time, over the current decade, UN-Water has systematically published reports pointing to prospects of scarcity, population and demand increase, low reservoirs, food crisis, among other factors, creating a future scenario that evokes the present concern.

Some other theories contemplate concepts of international security and water. The Hydropolitical Security Complex (HSC) is prominent among them since it focuses on the interdependence among states with transboundary and shared water resources as a prominent aspect of their security agenda (Schulz, 1995). In this sense, HSC derives from a larger theoretical framework, which is the Regional Security Complex, as proposed by Buzan and Waever (2003). However, a broad debate criticizes the extension of the traditional concept of security beyond traditional military threats (Booth, 2004). In this regard, the central concern is that this conceptual expansion trivializes the idea of security, opening the doors to the instrumentalization of means of force in resolving crises that can escalate (Fuccille *et al.*, 2017).

The water security of a given region depends heavily on the correct management and availability of economic and technological resources to make adequate use of it, according to Filippi and Brandão (2017). This must be understood from its connection with other essential elements that guarantee human security concerning food (e.g., the high variability in rainfall regimes or the abnormal modification of water flows in a river basin affects agricultural productivity) and energy (especially in regions that depend on the generation of hydroelectricity for their energy supply) (Filippi & Brandão, 2017, p. 80).

Aiming to escape the traps set by the concept of HSC, which presupposes a high degree of conflict, and seeking applicability to situations which do

not present the same complexity, "hydropolitics" alternatively assumes a configuration where:

> The dependence of shared water systems —both superficial and subterranean— is of such a strategic nature that this dependence begins to influence interstate relations in a perceptible way, either to a potential framework of cooperation (friendship) and/or competition (enmity). (Turton, 2008, p. 188)

Given that political borders do not always coincide with ecological boundaries and that much of the solution to environmental problems requires joint management of shared ecosystems, Arthur Westing suggests the use of "ecogeographic regions," as remarked by Filippi and Brandão (2017). The term region refers to an area unified in the ecological sense, acquiring cohesion and integrity from it. In this way, ecogeographic regions are coherent, a unit composed of the living and non-living elements of an environment, which interact with each other and form a life support system. Examples of such sub-regions include seas, water systems (such as river basins and aquifers), aggregated islands, forests, mountain ranges, deserts, areas permanently covered by ice, etc. (Filippi & Brandão, 2017, p. 83).

Recently, ecogeographic regions have also been recognized as political units in international co-operative arrangements. Several agreements signed over the last decades take these spaces into account or are based on them for the management of shared resources, such as the 1978 Amazon Cooperation Treaty, the 1973 Convention on the Protection of the Marine Environment of the Baltic Sea, and the Agreement stipulated by the International Commission for the Protection of the Rhine against Pollution of 1963 (Filippi & Brandão, 2017, p. 83).

Other possible responses to the approach of water resources in a context of security have been proposed. In any case, there is a growing tendency nowadays to securitize the issue. Water security and other related matters require urgent proposals for addressing and solving scarcity, but securitization and/or militarization are not the best responses to the challenge posed by the current historical context (Fuccille *et al.*, 2017).

Final considerations

Scientific evidence on climate change demonstrates the acceleration of global warming, natural disasters happening at a more violent and frequent pace, and entire populations becoming environmentally displaced. In this context, water is becoming an even more vital and precious asset. Being one of the richest regions in the world in terms of water resources, South America demands more effective cooperation to manage and regulate these resources.

The concern for the environment and the discussion about natural resources have gained more prominence in the last decades, as projections and scientific studies point to their finitude and need for change to face this situation. The theme is increasingly important in international forums and demands greater attention from the field of IR, which should expand its scope and work on transdisciplinary analyses. The perception of scarcity is something that does not know borders, and for that reason, cooperative solutions to this challenge must be sought.

In regards to water, as well as a large part of renewable natural resources, there is a greater space on the international agenda for the topic to be debated and researched, largely by initiatives within international organizations. The initiatives described in this article demonstrate that, at global and regional levels, some actions, organizations, and measures have been created. However, despite their fundamental importance, water resources, especially those transboundary and underground, still lack specific international legislation and appropriate approach.

Part of the reasons for noncompliance with goals such as those proposed by Agenda 21 for the environment or a lack of formulation of new preventive agreements for transboundary resources is that they also run counter to development patterns which, even if predatory and destructive, remains dominant. Also, compliance with certain international regulations and standards in governance still faces uncertainty because in some cases it requires states to relinquish some of their sovereignty to supranational governance schemes, not

always seen with good eyes, especially in South American countries.

The debate on the effective and cooperative management of shared natural resources, especially water, is an urgent issue in the South American region. The fact that the topic has gained more space for discussion, presenting some advances in research in several knowledge domains, is encouraging. However, more action and better policy are needed for greater regional cooperation in this area to avoid the emergence of conflicts, while ensuring the sustainable use of these resources and the protection of the environment.

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