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The Brazilian and Australian political-institutional scenario concerning water resources management

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Authors' notes

The authors have no conflicts of interest to declare.

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Abstract

Aim: This research aims to analytically compare the functioning of the institutional procedures concerning water resources management in Brazil and Australia.
Method: Through a literature review and document analysis, this paper presents a characterization of the Brazilian and Australian political-institutional water management scenarios based on both direct and indirect information sources. It then compares the institutional processes of these two countries using a SWOT matrix analysis, highlighting their strengths, weaknesses, opportunities, and threats.
Novelty/Relevance: This research seeks to fill a scientific information gap by examining how actors in both developing and developed countries' influence decision-making toward more sustainable environmental management, using water management as a case study.
Results: The results show that both countries have legislation prescribing decentralized and participatory decision-making processes. However, the implementation of this legislation does not guarantee democratic management of hydric resources. Moreover, the stages and scopes of legislative implementation and execution differ between Brazil and Australia. The Brazilian institutional scenario demonstrates a weaker capacity for implementing and enforcing water legislation compared to Australia, where a more developed water management system exists, and society shows greater willingness to proactively engage in management.
Social/management contributions: This diagnostic approach can help examine other environmental management scenarios by presenting institutional patterns within a given territory and demonstrating the causalities that may lead to states having varying levels of capacity.

Keywords: water security, sustainable water resources management, stakeholders' participation, institutional analysis, regional and urban management

Resumo

O cenário político-institucional brasileiro e australiano relacionado à gestão das águas

Objetivo: Comparar analiticamente o funcionamento dos procedimentos institucionais relativos à gestão de recursos hídricos no Brasil e na Austrália.
Metodologia: Este artigo apresenta uma caracterização dos cenários político-institucionais da gestão da água no Brasil e na Austrália através de uma revisão bibliográfica e análise documental. Na sequência, os processos decisórios de ambos os países são comparados por meio de uma análise de matriz SWOT, destacando os pontos fortes, fracos, oportunidades e ameaças.
Originalidade/Relevância: Esta pesquisa visa preencher uma lacuna teórica sobre como os stakeholders de territórios de países em desenvolvimento e desenvolvidos influenciam nas tomadas de decisões para uma gestão ambiental mais sustentável, tomando a gestão da água como exemplo aplicado.
Resultados: Os resultados mostram que ambos os países possuem legislações que prescrevem processos decisórios descentralizados e participativos, mas sua implementação não garante a gestão democrática dos recursos hídricos. Além disso, a implementação e execução da

legislação no Brasil e na Austrália estão em diferentes estágios e escopos. O cenário institucional brasileiro mostra uma capacidade frágil na implementação e execução da lei das águas em relação ao australiano, conferindo a esse último um sistema de gerencial mais desenvolvido, onde a disposição da sociedade em participar proativamente na gestão é maior do que no Brasil. **Contribuições sociais/para a gestão:** Esta abordagem de diagnóstico pode subsidiar o exame de outros cenários de gestão ambiental ao apresentar padrões institucionais de um território, e demonstrar algumas causalidades de como os seus arranjos podem resultar em uma baixa ou elevada capacidade estatal.

Palavras-chave: segurança hídrica, gestão sustentável dos recursos hídricos, participação dos stakeholders, análise institucional, gestão urbana e regional

Resumén

El escenario político-institucional brasileño y australiano relacionado con la gestión del agua

Objetivo: Comparar analíticamente el funcionamiento de los procedimientos institucionales relacionados con la gestión de los recursos hídricos en Brasil y Australia.
Metodología: Este artículo presenta una caracterización de los escenarios político-institucionales de la gestión del agua en Brasil y Australia a través de una revisión bibliográfica y análisis documental. A continuación, los escenarios son comparados a través de un análisis matricial FODA, destacando las fortalezas, debilidades, oportunidades y amenazas.
Originalidad/Relevancia: Esta investigación tiene como objetivo llenar un vacío teórico sobre cómo las partes interesadas de territorios en países en desarrollo y desarrollados influyen en la toma de decisiones para una gestión ambiental más sostenible, tomando la gestión del agua como un ejemplo aplicado.
Resultados: Los resultados muestran que ambos países cuentan con legislación que prescribe procesos de toma de decisiones descentralizados y participativos, pero su implementación no garantiza la gestión democrática de los recursos hídricos. Además, la implementación y el cumplimiento de la legislación en Brasil y Australia se encuentran en diferentes etapas y alcances. El escenario institucional brasileño muestra una débil capacidad en la implementación y ejecución de la ley de aguas en relación a la australiana, que tiene un sistema de gestión más desarrollado, donde la sociedad participa más proactivamente en la gestión que en Brasil.
Contribuciones sociales/de gestión: este enfoque de diagnóstico puede respaldar el examen de otros escenarios de gestión ambiental al presentar patrones institucionales de un territorio y demostrar algunas causalidades de cómo sus arreglos pueden resultar en una capacidad estatal alta o baja.

Palabras clave: seguridad del agua, gestión sostenible de los recursos hídricos, participación de los interesados, análisis institucional, gestión urbana y territorial

As a strategic resource for life support, effective water governance related to sustainable and integrated water resources management (IWRM) is required, with intersectoral integration and institutional dimensions coordinated across different scales (Nesheim et al., 2010). A sustainable water management system supports social needs throughout the infrastructure's lifespan while also maintaining the ecological services and values over the long term (Poff et al., 2016). This climatic context highlights the importance of engaging all relevant stakeholders in integrated water resources management to optimize and protect this natural resource, thereby supporting modern human life and environmental maintenance.

Participatory management has been a subject of extensive debate in the Brazilian context for over two decades, particularly in light of the 1988 Federal Constitution, which envisioned decentralized management. The primary objective of this new constitution was to challenge the authoritarian and technocratic nature of central authority. In the specific domains of water resources management, this dynamic has led to the distribution of public power to decentralized river basin institutions. These institutions adopt a deliberative approach, involving governmental and non-governmental actors who are appointed to serve on their governing bodies. Nonetheless, there are limited instances of successful implementation and operationalization of the water governance structure in Brazil (Jacobi, 2005).

The design and implementation of water management structures vary significantly across Brazil. One contributing factor is the country’s vast territorial extent, characterized by considerable diversity in climate, income levels, demographic distribution, and cultural aspects. Furthermore, the coverage and condition of water and sanitation infrastructure vary widely, with more pronounced challenges in rural and remote areas, as well as in slums and informal settlements (Carvalho & van Tulder, 2022).

Brazilian water management is a complex endeavor, encompassing not only technical aspects but also political, economic, and cultural issues. One of the primary factors contributing to institutional dysfunction is the slow pace and challenges associated with resource allocation, aiming for a more democratic management (Jacobi, 2005).

In light of the aforementioned inconsistencies in Brazilian water resources management, this study seeks to contribute to ongoing discussions by examining the Australian water resources management model as a comparative benchmark. This article is a result of a collaborative effort between governmental and non-governmental institutions aimed at strengthening their cooperation and developing solutions for climate change adaptation in regional and urban areas of Brazil and Australia, thereby justifying the selection of these countries for comparison.

Thus, this study aims to conduct a comparative analysis of the institutional procedures

governing water resources management in Brazil and Australia. As two of the largest economies in the Southern Hemisphere, both countries confront significant challenges in this area, particularly in their most populous regions. Brazil recently experienced a nationwide drought from 2019 to 2022, while Australia faced its peak water crisis during the Millennium Drought from 1996 to 2010, prompting the development of mitigating measures.

In this paper, we will adopt a comprehensive understanding of “institutions” as a confluence of formal and informal social elements. These elements encompass laws, regulations, and legal frameworks that govern individual behavior within a society, as well as conventions, norms, values, behaviors, beliefs, and others traditional social practices and cultural aspects embedded within a particular society (Hodgson, 2006).

Henceforth, this study starts with a section outlining the methodological approach employed to attain its objectives. This approach involves the utilization of both direct and indirect information sources, including literature reviews and document analysis. Subsequently, the institutional frameworks for water resources management in Brazil and Australia will be comprehensively described.

In the subsequent section, the study will present the results and discussion, encompassing a comparative analysis of the two institutional scenarios. The research analysis was conducted through the construction of a SWOT matrix, wherein the scenarios of Brazil and Australia were evaluated from the perspective of their strengths, weaknesses, opportunities, and threats, with the aim of deepening the understanding of the institutional systems in both countries.

Finally, this article will conclude with its final findings, contributions, and recommendations for future research endeavors.

Methods

Methodologically, this study is structured in distinct phases aligned with its objectives: an exploratory phase and an explanatory phase. The exploratory phase sought to establish a robust theoretical foundation through a comprehensive narrative literature review and document analysis to comprehend the institutional factors that influence stakeholders' decision-making in water resources management within the Brazilian and Australian contexts. The temporal scope of this study extends from 1990 to 2022, coinciding with the initiation of water reforms in both countries during the 1990s.

According to Rother (2007, p. 1), a narrative literature review provides a comprehensive overview and discussion of “the state of the science of a specific topic or theme from a theoretical and contextual point of view. […] Narrative review consists of critical analysis of the literature published in books and electronic or paper-based journal articles”. In this particular study, the

primary authors cited include Evans (1993); Malheiros, Frota, and Pérez (2013); Sousa Júnior et al. (2016); Doolan and Hart (2017); Holley and Sinclair (2018); Lindsay (2018), and Mesquita (2018).

Document analysis, in turn, involves the systematic review and evaluation of existing materials. These materials consist of “documents containing text (words) and images that have been recorded without a researcher’s intervention” (Bowen, 2009, p. 27). In this specific study, the primary documents cited include governmental publications and one from the Organization for Economic Co-operation and Development (OECD, 2015).

This theoretical framework was developed with the support of the Gestão e Tecnologias Ambientais research group from the Programa de Pós-Graduação em Gestão Urbana at the Pontifícia Universidade Católica do Paraná; and the Centre for Regional and Rural Futures research group from the Faculty of Science, Engineering and Built Environment at the Deakin University.

Moreover, the explanatory phase entails a comparative analysis of the institutional water management scenarios in both countries, grounded in document analysis of official reports and documents. This research phase is underpinned by the construction of a SWOT analytical matrix, which evaluates the scenarios of Brazil and Australia in terms of their strengths, weaknesses, opportunities, and threats, with the objective of gaining a more in-depth understanding of the institutional systems in both countries.

The SWOT matrix was chosen for its ease of construction and its ability to provide a comprehensive understanding of the managerial scenario under analysis. This method involves gathering information from the scenario, categorizing it into internal factors — strengths and weaknesses — and external factors – opportunities and threats. Subsequently, it highlights both the positive and negative aspects of the managerial system being examined, thereby guiding managers (or researchers) toward making more informed decisions (Krysanova et al., 2010; Mylopoulos et al., 2007).

Brazilian institutional scenario of water resources management

The Brazilian legal and institutional landscape was profoundly influenced by the military regime (1964-1985), characterized by political and social restrictions and political centralization in the federal government. The 1980s witnessed the emergence of citizen mobilization for more direct participation in decision-making, challenging the military’s technocratic development model. During the re-democratization process, a new Federal Constitution was approved in 1988, marking a significant milestone in the country's water resources management. This constitution

envisioned the establishment of the National System of Water Resources Management, culminating in the subsequent formulation of the National Water Resources Policy (also known as *Lei das Águas*, "Water Act") through Federal Law No. 9433, on January 8, 1997 (OECD, 2015).

The 1997 Federal Law laid down fundamental principles and guidelines for water management as a limited natural resource: management at the watershed level, multiple-use planning, and a decentralized and participatory approach involving both federal and state jurisdictions (Mesquita, 2018; OECD, 2015). As outlined by Sousa Júnior et al. (2016), the Brazilian Water Act proposes two management domains: the Federal level for interstate or transboundary water basins, and the state level for water basins wholly contained within the territory of a single state.

In order to enforce Federal Law No. 9433/97, supplementary federal and state laws were enacted to implement the five management tools outlined in the National Water Resources Policy (PNRH): water resource planning, water use charges, classification of water bodies based on their primary uses, water use permits, and the development of the National Water Resources Information System (SNIRH) (Malheiros et al., 2013).

As a decentralized and participatory model, the Brazilian water management system is rooted in the establishment of river basin committees and federal committees, composed of government representatives from all three levels (federal, state, and municipal), along with water users and non-governmental entities from civil society (Malheiros et al., 2013; Mesquita, 2018). The 1997 Water Act mandates that these committees serve as platforms for stakeholders to address critical issues such as priority allocation of funds, conflicts mediation, and the development of the Water Resources Plan (Cardoso, 2003). Committees' decisions are reached through a plenary session that relies on specialized technical chambers with a consultative character, which include external experts (Mesquita, 2018).

Two additional organizations form part of the Brazilian water management system at federal and state levels (Sousa Júnior et al., 2016): the Water Councils and the governmental Water Agencies. The Water Councils consist of representatives from the government, water companies, academia, and Non-Governmental Organizations, nominated by each sector and legally established. These councils have a collegiate structure and are responsible for formulating and evaluating policies, as well as mediating water-related conflicts, including those concerning inter-basin, interstate, international, and transboundary waters under federal scope. The Water Agencies have an executive role, ensuring the enforcement of state and national water plans and coordinating with the river basin committees.

However, despite its importance in formally ensuring decentralized and participatory water

management, this framework does not guarantee its practical application in Brazil (Malheiros et al., 2013). Most committees struggle to reach consensus on water-related issues due to the disparity in authority among the parties involved in decision-making. This limitation also extends to the formulation of local water management policies and their subsequent implementation (Sousa Júnior et al., 2016). The Water Councils and Water Agencies have been ineffective in fully implementing the principles of PNRH, largely due to political interference in decision-making processes. Consequently, at the basin level, there is often a lack of local technic expertise to make informed political decisions, and the councils have, in many cases, become extensions of the government, prioritizing its objectives over the broader interests of society.

Another outcome of the Federal Water Act aimed at addressing this managerial issue was the creation of the National Water and Basic Sanitation Agency [ANA] in 2000, tasked with both executive and regulatory functions (OECD, 2015). Currently, ANA operates as a branch of the Ministry of National Integration, overseeing the implementation, operation, control, and evaluation of the management instruments established by the 1997 Water Act. Moreover, it regulates water management domain at the federal level, as stipulated in the National Water Act (ANA, 2022).

Regarding stakeholder interaction, during the re-democratization period (1985-1989), the new Federal Constitution (1988) introduced the concept of political decentralization, delegating certain institutional responsibilities to other stakeholders. However, many tasks remained without clear designation. One of the most affected areas was environmental monitoring and inspection, as the associated costs were considered substantially high. According to Souza Júnior (2004), despite the above-average quality of the 1988 Constitution, public authorities have been negligent in the management of water resources. Costa et al. (2021) noted that the government's poor performance in this area is attributed to economic, technical, and political shortcomings, which hinder its abilities to effectively carry out its responsibilities.

Evans (1993) argues that the Brazilian institutional system is not founded on a long-term governmental plan but rather on a 4-year management cycle, contingent upon changes in leadership through elections. This fragmented approach hinders effective long-term administration, preventing the development of a cohesive ethos and organizational or political competence. As a result, there is a lack of strategies to control political spending and maneuvering. The bureaucracy's “isolated effectiveness gaps” are symptomatic of the Brazilian state's inability to reform its broader bureaucratic structure, limiting its ability to address key issues effectively. Consequently, Brazil's institutional apparatus demonstrates partial state capacity.

This incapacity is evident in the enforcement of environmental policies, including those related to basic sanitation coverage across Brazil. One key factor is the political environment,

where the exchange of favors is commonly used to secure political support (Evans, 1993).

Moreover, the government's inefficiency in environmental protection opens the door for other state entities outside the water resources management system, such as the Federal and State Public Ministries and collaborative working groups (e.g., technical chambers), to take action. These entities often mitigate environmental impacts through public civil inquiries (internal investigations to gather evidence on environmental issues, with the intent of pursuing legal action). However, these initiatives from the Public Ministries are not an ideal solution and may indicate underlying dysfunction within the water management system (Costa et al., 2021).

Direct social participation also presents a significant opportunity to address urban and regional water demands. According to Carvalho Júnior (2007), the 1997 Water Act recognized the need to respond to the diverse demands of users in order to mitigate historical conflicts of interest among various stakeholders in the water sector, which has led to institutional disarticulation at the national, state, and municipal levels.

Furthermore, stakeholder participation in formal Environmental Forums has been insufficient to raise civil society's awareness of the importance of proactive involvement in supporting urban and regional water management (Barbosa et al., 2017; Carvalho Júnior, 2007). This participation does not guarantee that social interests will be considered in federal and state river basin councils and committees. In other words, “ordinary citizens” are not included as members of river basin committees and are not considered stakeholders, even though the decisions made by these committees affect the broader community (Barbosa et al., 2017).

Souza Júnior (2004) noted that a significant portion of civil society organizations or non-governmental organizations is composed of academics, whose technical expertise is critical in the decision-making process. However, the dominance of scientific and governmental perspectives, where the government often appoints committee members based on their alignment with its interests, results in a technocratic approach that undermines social participation and engagement. Carvalho Júnior (2007) reported that, in some cases, river basin committees are created merely to fulfill legal requirements, with government members disregarding the opinions of civil society representatives and prioritizing their own interests as the group's final decision.

Australian institutional scenario of water resources management

Like Brazil, Australia has a Federal Constitution that decentralizes public power, granting state governments the authority to legislate on water resources management. By the 1980s, there was an increasing demand for water supply due to urban expansion and agricultural irrigation. Challenges related to inefficient water use, poor water quality provided by small local authorities,

and a lack of equitable water rights characterized the Australian context. These managerial challenges, along with environmental degradation issues such as water salinity, algae proliferation, and land degradation due to salinity, prompted water reform in Australia (Doolan & Hart, 2017).

The Australian water reform was initiated in 1994 with the establishment of the National Water Resources Framework by the Council of Australian Governments (COAG), supported by both Commonwealth and state governments, aiming to achieve a new sustainable water management system. This framework addressed the entire water system, focusing on reforming water allocation, developing water trading and water markets, addressing the overallocation of water resources, establishing water pricing and supply systems, managing urban water and irrigation, and building robust institutional systems to support the water sector (Doolan & Hart, 2017; Holley & Sinclair, 2018).

The increasing demand for water and the varying levels of development among states and regions underscored the need for effective water reform. As a result, in 2004, the 1994 Water Framework was reviewed, complementing and expanding its agenda to better address the needs of all stakeholders. This COAG response became known as the National Water Initiative (NWI), serving as the national blueprint for Australian water reform, and it was re-endorsed in 2014. The NWI represents “a commitment by the Commonwealth and state and territory governments to increase the efficiency of Australia's water use” (Commonwealth of Australia, 2015, p. 45). According to Lindsay (2018), the legal foundation of the Australian water reform is based on the NWI, approved in 2004, and the National Action Plan for Salinity and Water Quality, which COAG approved in 2000.

Following the enactment of the NWI, the Australian Government established the National Water Reform Committee (NWRC), which “advises on, oversees, and coordinates the implementation of water policy reforms at the national level” (Australia, 2022b, online). The NWRC consists of government representatives from the Australian Government and water agencies from all states and territories.

Another outcome of the NWI was the creation of the National Water Commission (NWC), an independent institution with members appointed by the Commonwealth, states, and territories. The NWC was established to assist in the efficient implementation of the NWI by offering a national perspective based on the commission's expertise. Additionally, since 2005, the NWC has been responsible for overseeing water resource surveillance, improvement, and innovation. This includes establishing a framework for water resource governance, rules, and standards, endorsing and ratifying state implementation plans, and developing and reviewing NWI

performance indicators in collaboration with the Natural Resources Commission. The NWC also kept the public informed about the progress of the NWI Agreement and provided evaluations and recommendations to refine its targets and outcomes (Holley & Sinclair, 2018).

To bolster the progress of the NWI, the National Plan for Water Security was established in 2007 to support its objectives, with a particular focus on the Murray-Darling Basin (MDB), Australia's largest river basin, often referred to as “Australia's food bowl”. The MDB spans the states of Queensland, New South Wales, Victoria, and South Australia, which agreed to jointly manage the basin with the Commonwealth government. In parallel, the Commonwealth government proposed actions to improve water use efficiency within the MDB and reduce losses by implementing a new set of regulations for stakeholders. These regulations included the establishment of safe and sustainable limits for surface and groundwater use, as well as plans for extensive water conservation facilities at key locations. These measures were incorporated into the Water Act of 2007, but the Act did not receive sufficient support from the states for full implementation. Instead, its enforcement relied on various Commonwealth constitutional powers and new cooperative interstate agreements (Holley & Sinclair, 2018).

The creation of the Murray-Darling Basin Authority (MDBA) and the implementation of the MDB Basin Plan highlight Australia's commitment to addressing water management challenges in a more comprehensive and collaborative manner. The MDBA, in partnership with the Commonwealth government, now oversees the planning and management of the entire MDB at the national level. While state governments continue to manage water within their jurisdictions, they now operate in alignment with the revised MDB Plan to ensure a more cohesive approach to water management (Holley & Sinclair, 2018).

The water reform also prioritized establishing a new common framework for water trading, which resulted in the strengthening of the Australian Competition and Consumer Commission (ACCC) to oversee the water market and regulate pricing rules. Additionally, the Commonwealth Environmental Water Holder (CEWH) was created to assist in acquiring and allocating government water entitlements and investing in more efficient water infrastructure to protect and restore environmental assets (Australian National Audit Office [ANAO], 2011; Holley & Sinclair, 2018).

The Murray-Darling Basin Plan, enacted in 2012, sought to address the institutional challenges within the Australian water sector by investing in infrastructure improvements and water buybacks to ensure sustainable water management (Holley & Sinclair, 2018). Through these efforts, Australia has demonstrated its commitment to implementing more effective and sustainable water management practices. This collaborative approach, involving multiple levels

of government and agencies, has contributed to addressing the complex challenges faced by the water sector and has fostered a more integrated and efficient water management system.

The National Water Initiative (NWI)'s emphasis on stakeholder involvement and decentralized power underscores Australia's commitment to a more inclusive and transparent approach to water management. By engaging various stakeholders in the decision-making process, the Australian water management system can better address the diverse needs and concerns of different communities, industries, and environmental interests.

The abolition of the NWC in 2015 was a direct result of the successful implementation of the water reform procedures outlined in the NWI. The responsibilities previously held by the NWC were subsequently delegated to other national agencies and the Productivity Commission (PC), an organization renowned for its provision of accurate and independent advice to the Australian government on economic matters, including environmental issues (Hannam, 2015; Parliament of Australia, 2014).

As noted by Lindsay (2018), the NWI framework is underpinned by three key aspects related to participation. The first aspect pertains to "participation as users" through the water market, where the public actively participates and acts as water rights holders. Typically, this form of participation occurs within the context of private business activities (such as farming or industries), taking into consideration water use rights and allocations.

The second aspect of participation within the NWI framework involves the engagement of stakeholders in water management decision-making processes through consultative committees and advisory groups. These groups can include representatives from a diverse range of sectors, such as agriculture, industry, environment, and Indigenous communities, ensuring that various perspectives are considered during the decision-making process (Lindsay, 2018).

The third feature of the NWI centers on the participation of Aboriginal people in water governance, with the aim of providing them with a meaningful role in water planning and facilitating agreements regarding traditional practices that may impact water resources (Lindsay, 2018). The Committee on Aboriginal Water Interests, composed of traditional people, advises the National Water Resources Commission (NWRC) on these matters. The implementation and progress of these measures may vary across different regions of Australia (Jackson et al., 2009).

Lindsay (2018, p. 174) identifies another implicit fourth category of public participation in the NWI: the "availability and exercise of rights to contest water uses and practices through litigation in courts, tribunals, or quasi-judicial panels." This category empowers the public to seek potential solutions to their problems during the planning process. The consultation process is interconnected with public power through the deliberative procedure, which is associated with

participatory water resource governance. In essence, Australian stakeholder consultation involves both governmental and non-governmental stakeholders, with the intention of achieving a consensus or agreement through negotiation among all parties involved.

However, in numerous water planning projects in Australia, deliberative involvement is often perceived as a means of influencing, informing, and establishing a normative framework that supports governmental decision-making. Its implications may not necessarily challenge, undermine, or even modify government decision-making or policy establishment (Lindsay, 2018). This suggests that while the NWI aims to promote stakeholder involvement and decentralize power in water management, the actual impact of public participation may be limited in terms of influencing government decisions and policies.

In conclusion, both Brazil and Australia have implemented water reform processes to address the complex challenges associated with water resources management. While Brazil's Federal Water Act and the establishment of the National Water Agency (ANA) aimed to enhance water management and stakeholder involvement, the country continues to grapple with issues related to bureaucracy, political influence, and limited social participation. In contrast, the Australian model, with its emphasis on stakeholder involvement, including Aboriginal populations and public participation through consultations and litigation, offers valuable lessons for other countries seeking to develop more effective and inclusive water management practices. However, it is crucial to recognize the limitations and challenges associated with public participation and ensure that it genuinely influences decision-making and policy development.

Identifying the opportunities and limitations in water management models in Brazil and Australia

The SDG Data Portal information for Brazil and Australia (United Nations Water [UN-Water], 2022) reveals that Australian water management implementation is more advanced than Brazil's. A plausible justification for this assessment considers the differences in Brazil's territorial extent, socio-cultural diversity, and socio-economic, climatic, and spatial inequality across the country. The complexity of managing such a diverse country with a continental-sized area, like Brazil, must be considered when compared to the Australian water management scenario.

Australia and Brazil are similar in size, but Australia has a much smaller population (approximately 12% of Brazil's) (UN-Water, 2022), and most Australians live in the coastal region. As a result, Australia's significant management efforts are focused on approximately 30% of its national territory.

Despite the critical differences between Australian and Brazilian water management

models in addressing sanitation deficiencies and climate change challenges related to water security, they share certain similarities in their resource management approaches. Both countries initiated their water reform movements in the 1990s, aiming to decentralize public power, develop comprehensive and bottom-up legislative frameworks to establish water governance, and reduce the technocratic nature of their systems (Sousa Júnior et al., 2016). Furthermore, both countries have adopted a river basin approach as a planning unit, necessitating integrated attention focused on the regional level, rather than solely at the city or state scale, and encompassing other planning scopes such as land use and occupation, urban and regional scales, sanitation, and environmental priorities.

In comparing the institutional scenarios of Brazilian and Australian water management systems, Table 1 presents a SWOT Matrix analysis, highlighting the strengths, weaknesses, opportunities, and threats of both models.

Table 1

SWOT Matrix analysis of the water resources institutional arrangements in Brazil and Australia

	Strengths	Weaknesses	Opportunities	Threats
Brazil	The 1997 Water Act is grounded in the fundamental principles of implementing Integrated Water Resources Management through a participatory and decentralized approach.	There is power conflict between the governmental political-administrative divisions and river basins boundaries, causing rivers' double dominion and shared jurisdiction.	The National Pact for Water Management (Progestão Project), established in 2011 by the National Water Agency (ANA), aimed to strengthen integrated, decentralized, and participatory water governance by enhancing the coordination between national and state levels.	The re-democratization movement, while significant, did not guarantee the effective implementation of the act due to insufficient efforts to raise social and political awareness.
		Water valuation deficiency: water charges and bill rates are not fairly valued, and there is a failure in the tax allocation application.		There is a lack of transparency and accountability regarding how and when the federal and state governments use the Progestão Project fund.
				There is no co-managerial approach regarding the water-related multisectoral interaction among policies, which may lead to conflicts in implementation.
				There is a deficiency and disparity in data availability, particularly concerning state-level water monitoring, among the states.
				The population continues to prioritize social and economic issues over environmental concerns.
				The frequent alternation of governments can result in discontinuity in environmental policies.
				The participatory processes within water management often lack democratic elements.
Australia	There are local and sectorial social organizations in which the population is effectively engaged in participating in debates and action movements related to water management.	Some jurisdictions need to be rearranged to better address the needs of indigenous communities by involving them in water governance.	One of the world's most successful references regarding the water market.	There is a significant disparity in the progress of water and sanitation systems across the country, which can be attributed to variations in regulatory frameworks, governance structures, and pricing mechanisms.
			Catchment Management Authorities (CMAs) are state-level agencies established to facilitate community engagement in decision-making processes.	In rural and remote locations, there is a deficiency in providing water and sanitation infrastructures.

Source: ANA, 2016; Lindsay, 2018; OECD, 2015; Sousa Júnior et al., 2016; Vic Catchments, 2022.

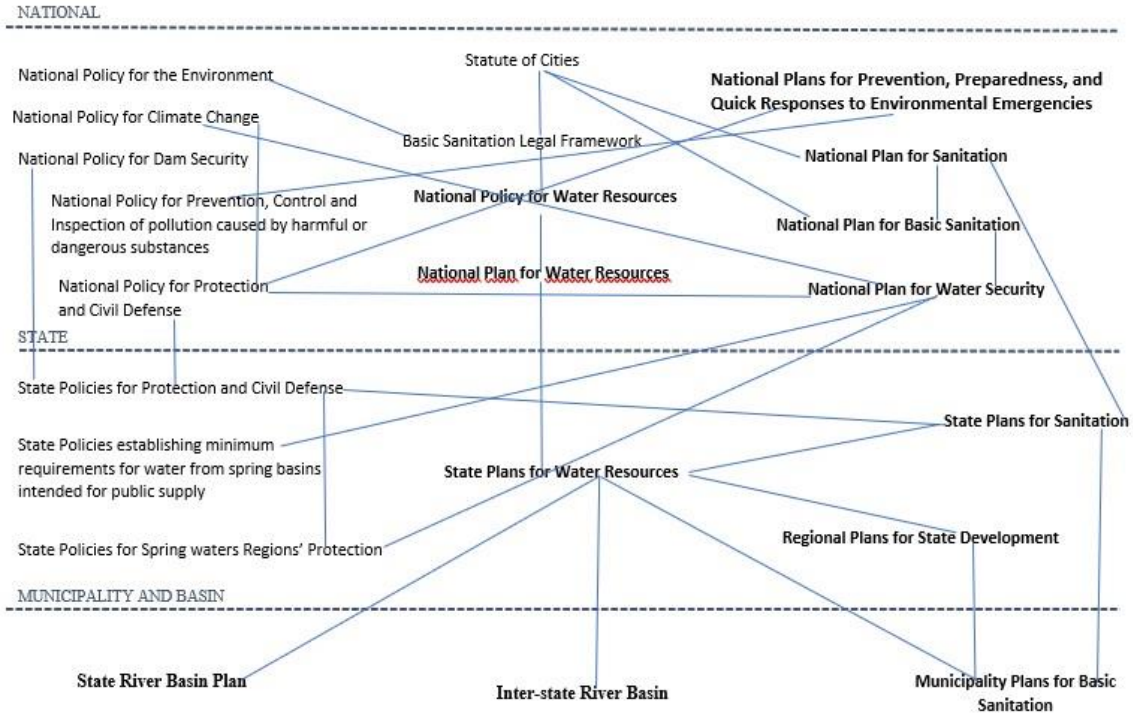
The factors driving water reform in Brazil and Australia help explain why the progress of water resources management is more advanced in Australia than in Brazil. In Australia, the reform was driven by an acute water crisis that generated significant social and governmental concern. In contrast, in Brazil, the primary drivers were social pressure to decentralize the central government and the limited institutional capacity to implement the Federal Constitution.

As shown in Table 1, although the Brazilian Federal Constitution is regarded as one of the most modern legislations globally, this distinction does not guarantee its effective implementation and application. The 1997 Water Act prescribes decentralized public power, incorporating all Integrated Water Resources Management principles, with shared responsibility for implementation, supported by the use of economic tools within a participatory framework. In practice, the movement toward reestablishing democracy did not generate sufficient social and political awareness to address some of the “isolated effectiveness gaps” in law implementation (Evans, 1993), leading to partial state managerial capacity. This is especially true since environmental issues, including the water reform agenda, are not prioritized by the government. Additionally, the Brazilian government not only holds coordination and leadership roles but also executive responsibilities (as evidenced by the number of policies and plans formulated at the national level, as seen in Figure 1). This centralization of power leads to governmental dysfunction or state incapacity to fulfill these roles effectively. Furthermore, the implementation of the water resources planning agenda is subject to changes every four years due to electoral cycles, which fragments continuity and undermines its effectiveness.

In contrast, the Australian NWI has a different structure for its decentralized decision-making process. To illustrate this difference, Figures 1 and 2 show how the most relevant Brazilian and Australian public policies and plans (at various stages of implementation and execution) are distributed across different levels and how they are interconnected (as represented by the blue tiers). As previously mentioned, Figure 2 demonstrates that most Australian policies and plans are developed at the state and regional levels, enabling better management of law implementation and execution by the states. The federal level, in turn, acts as a coordinator and leader, guiding water law reforms to promote sustainable water resources development (Australia, 2022b).

Figure 1

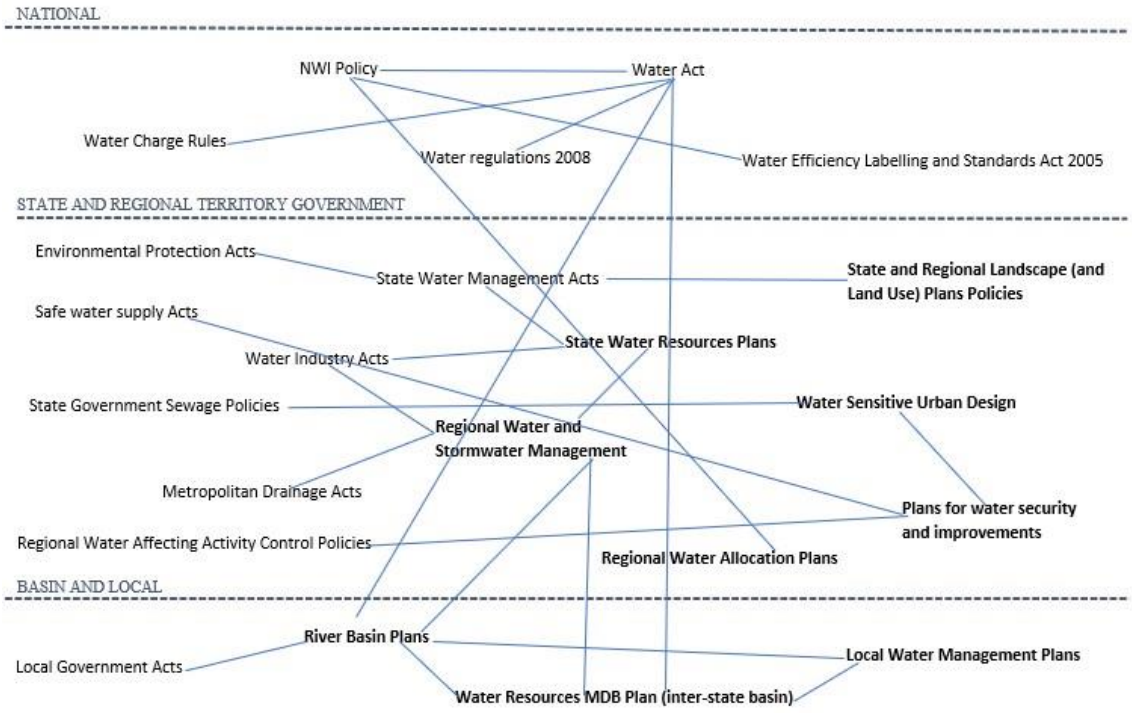
Brazilian water-related policies and plans subdivided by scope



Source: ANA (2016) and State Water and Land Institute (Instituto Água e Terra – IAT, 2022).

Figure 2

Australian water-related policies and plans, subdivided by scope



Source: Australia (2022b) and South Australia (2022).

Australian water law is primarily based on water rights and trading, along with a strategic plan supported by technical and economic tools (Sousa Júnior et al., 2016). According to Horne and Grafton (2019), the water trade in (MDB), considered Australia's most developed water market, consists of two trading modalities:

> 1) water access entitlements, commonly known as water entitlements, which represent the consumptive share of the water resources within a catchment defined by a water resource plan; and 2) water allocations that are the physical volumes of water assigned to water entitlements in a given year. These vary depending on the volumes of water in storage and expected inflows (Horne & Grafton, 2019, online).

Irrigators are the primary participants in this market. However, federal and state governments (mainly focused on nature conservation), non-governmental organizations, and investors also play a role in this management mechanism (Grafton & Williams, 2018, as cited in Horne & Grafton, 2019).

As the driest inhabited continent in the world (Australia, 2021), Australia's water reform was largely driven by the need to respond to the climate crisis, given the country's limited water availability. Additionally, the Millennium Drought was a key catalyst for raising political and social awareness. This critical period, which lasted from late 1996 to 2010, saw a significant portion of Southern Australia endure prolonged dry conditions, necessitating changes in water use patterns to conserve water (Bureau of Meteorology [BoM], 2015). Limited water availability for human consumption, along with urbanization, population growth, and the effects of climate change, prompted Australians to expand their conventional water supply (from surface water and groundwater) and improve its utilization (BoM, 2020).

Water resources management in Australia differs from Brazil in that both the government and civil society strongly adhere to the NWI, and there is greater capacity within the executive system to ensure compliance with the law. Additionally, although both countries have monitoring systems to evaluate and guide the development and effectiveness of water resources management, Brazilian politicians often establish institutional arrangements aimed at meeting specific legal requirements, even if their full implementation and execution are not guaranteed. This is evident in the case of many water councils, governmental water agencies, and river basin committees, where their establishment does not ensure that members have a meaningful voice in discussions to develop decisions and policies through stakeholder consensus. Due to power imbalances, primarily favoring water users and the government, these organizations often fail to adequately consider societal concerns.

Fracalanza et al. (2013) identified two key factors that undermine the influence of Brazilian committees in the decision-making process. The first is their heavy reliance on traditional governmental institutions, which can limit access to information and lead to shortages in financial, material, and human resources. The second is the disarticulation within the water management system, where committee deliberations are not connected to legal authority, making them susceptible to potential government interference in decision-making.

Trindade and Scheibe (2019) highlighted several factors that typically hinder the effectiveness of river basin committees, including the limited or absent use of management tools prescribed by the 1997 National Water Act, low levels of public participation, insufficient technical knowledge for informed deliberation, and the lack of support and involvement from municipal and state governments in the committees' consultation and communication efforts.

According to Mesquita (2018), the key to effectively implement the proposed law's guidelines lies in addressing the deficits in participation, communication, and coordination among stakeholders at various levels. To improve water policy design and implementation, the OECD

(2015) offered recommendations for the Brazilian context to address the following managerial gaps and enhance water governance:

- Many water policies are challenging to implement due to deficiencies in competence delegation and funding, often resulting in ineffective plans or "agreements to be accomplished by others."
- The incongruity between political-administrative divisions (federal, state, and municipal) and river basin committee boundaries can engender power conflicts due to overlapping jurisdictions on state and federal rivers. This jurisdictional overlap can lead to inefficiencies in water management and hinder the effective implementation of water policies.
- The multisectoral nature of water-related issues may present legislative conflicts, such as a lack of coordination between water, land use, sanitation, environmental, and economic development policies. These inconsistencies can jeopardize the efficiency of water policy implementation and hinder the sustainable management of water resources.
- Water charges and bill rates are often insufficient when applied, and there is a failure to allocate tax revenues adequately to water management initiatives. This lack of financial support can render the application of water charges invisible to users and discourage participation in river basin committees, ultimately hindering the implementation of effective water policies.
- The availability of hydrological, economic, and financial data from Brazilian states varies significantly across the country. Similarly, the monitoring of state water bodies for the implementation of public policies is uneven, hindering the development and implementation of evidence-based water management strategies.

Regarding the necessity to enhance the bottom-up approach, the National Water Management Pact (Progestão Project), established by the National Water Agency (ANA) in 2011 and enacted in 2013, represents a significant governmental initiative. This endeavor seeks to fortify integrated, decentralized, and participatory water governance by fostering effective articulation between national and state water management entities. The Pact supports national and state Water Resources Management Systems and is grounded in the principle of payment for outcomes achieved through voluntary state adherence. Furthermore, it aims to mitigate disparities in water governance and sanitary infrastructure across the country (ANA, 2016). The Progestão Project has garnered states' attention to water issues, acting as a catalyst for

generating political awareness and commitment, particularly in regions where water had previously been a secondary concern (OECD, 2015).

According to the OECD (2015), the Pact represents a sophisticated, formalized, and innovative instrument with considerable potential to ensure federal and state compliance with water resource regulations, strengthen intergovernmental relationships at multiple levels, and promote the enduring nature of national and state water policies in the medium to long term. Moreover, the program contributes to reducing disparities in water management among Brazilian states, fostering enhanced risk management as each state identifies local challenges and establishes five-year objectives grounded in its specific experiences.

However, the Progestão Project exhibits certain limitations, such as its restricted scope of governmental relationships (mainly the national-state connection), thereby discouraging the involvement of municipalities and river basin committees in the process. Additional concerns include the absence of guidelines for states and the national government regarding the management of multi-state or multinational river basins, a lack of transparency and accountability in fund utilization, the absence of sanction mechanisms for non-compliance, and the dearth of instructions for reporting and evaluating the Pact's impact. To enhance this program, it is imperative to develop indicators for assessing the Pact's progress and establish mechanisms to encourage compliance, transparency, accountability, stakeholder engagement, and awareness, among other measures (OECD, 2015).

While there is no direct analog to the Progestão Project within the Australian water management system, the Catchment Management Authorities (CMAs) fulfill a comparable function. These state-level entities were established to maximize community involvement in decision-making, as they are responsible for the integrated planning and coordination of environmental management within catchments and protected regions (Vic Catchments, 2022).

Moreover, when governmental intervention facilitates stakeholder collaboration in the development of regional (or catchment) water allocation plans, managers gain a solid foundation for the design of their plans or policies. The participating group is typically disbanded upon the completion of this consultative planning process. While most public consultations in Australia are not considered collaborative or deliberative processes, instances where the public collaborates with government entities in developing plans and policies can foster a heightened sense of social awareness regarding the issue at hand. Consequently, society may be more inclined to actively participate in long-term regional development. Frequently, individuals from catchment management or Regional Natural Resource Management who were invited to public consultations continue to be involved in groups, promoting long-term proactive participation in planning and

Integrated Water Resources Management, supported by the CMAs.

This social movement advocates for regional sustainable development and governance establishment, thereby ensuring economic advancement for the population and safeguarding water availability. Moreover, the spontaneous creation of these organizations, rooted in social awareness and engagement, and their disassociation from 4-year governmental planning cycles suggest a notably robust foundation. This also implies that the corresponding region can foster a more resilient culture (Sousa Júnior et al., 2016).

The participation in Australia's water trade is globally acknowledged as a successful water reform, characterized by rapid evolution and reaching $7 billion in annual turnover during the 2019-2020 period (Australia, 2022a). Water users possess the ability to buy or sell water rights on a long-term or temporary basis, facilitating efficient water utilization and ensuring that the resource is consumed where it is most needed. According to Horne and Grafton (2019), Australia''s water trade, particularly in the Murray-Darling Basin, can be regarded as an example of a market where an ongoing process of water allocation procedure rearrangements is taking place, with political support for the implementation of legal measures, resulting in demonstrable success.

However, according to Horne and Grafton (2019), following the enforcement of the 2007 Water Act, there was an attempt to subsidize a project aimed at implementing a new standardized registration system for personal water accounting and tracking of water entitlement trade to reduce interstate transaction costs. This measure was designed to enhance the efficiency of interstate trade, particularly in the Murray-Darling Basin, by automating the data transfer between states. Unfortunately, the government ultimately abandoned its endeavor to unify the water trade register system, resulting in an unfinished project despite significant governmental investment and mobilization.

According to the authors, making basin-wide information freely accessible would demand an improvement in stakeholder’s transparency, which may be one of the reasons for this state's partial capacity for law enforcement. The Murray-Darling Basin Authority (MDBA, 2017) supported this argument, stating that there is a significant lack of transparency in the states of New South Wales (NSW), Queensland, and Victoria, which undermines community confidence in the political system and, consequently, in engagement and law compliance.

There is a necessity to implement better control from the MDBA, enforcing the auditing and evaluation of the basin's outcomes to minimize disparities in the measuring of implementation stages between the basin's states, particularly in New South Wales and Queensland (Horne, 2017; Matthews, 2017; MDBA, 2017; Horne & Grafton, 2019). This instance exemplifies a typical

characteristic of Australia's political system, which “seek(s) to protect specific state interests, on the one hand, and sectoral interests (for example, prioritizing rural over urban interests) on the other, with little regard to broader national or, in this case, basin-wide interests” (Horne & Grafton, 2019, online).

Regarding this state fragmentation, Australian water legislation is in need of a more inclusive approach concerning Aboriginal participation in public consultations. It is imperative to establish dialogues aimed at reaching agreements regarding their water rights and to actively engage them in water governance. In both Australia and Brazil, indigenous participation represents an emerging movement across the country, undergoing various stages of advancement. In both cases, political concern and willingness are indispensable for achieving tangible improvements.

OECD (2015) and Mesquita (2018) have warned regarding the potential risks associated with power decentralization: there is no assurance that state autonomy will necessarily lead to improvements in public services. The delegation of power to local elites can potentially undermine social equity and service provision. Effective democratic management requires a delicate balance between bottom-up and top-down power approaches.

According to Delany-Crowe et al. (2019), the decentralized legal model in Australia poses risks to water and sanitation governance due to disparities between the state levels of development and strategic plans. All federations emphasize the importance of strengthening inter-state collaboration, including reducing the incompatibility of instruments aimed at water regulation, governance, trade, and allocation to enhance regional sustainable development. These challenges are analogous to those encountered in the Brazilian context. Moreover, both countries confront deficiencies in sanitation infrastructure in rural and remote areas compared to urban areas, primarily due to the difficulties associated with accessing these regions. In Brazil, in particular, there is a lack of government initiatives and strategies for providing adequate sanitation services in both rural and remote regions.

Final considerations

Our findings indicate that while Brazilian and Australian legislations prescribe a participatory approach to Integrated Water Resources Management as an effort to decentralize primary public power and reduce reliance on purely economic and technical decision-making approaches, a technocratic approach nonetheless remains predominant in both contexts. Furthermore, the implementation and execution of measures are at varying stages of development across the two countries and exhibit differing scopes.

The main driver for water reform in Australia was the Millennium Drought, which persisted for roughly ten years, leading to heightened public awareness, increased participation, and a search for solutions. In contrast, the Brazilian federal water reform was influenced by the re-democratization period, characterized by social pressure to decentralize central power. However, this propulsive driver did not result in a corresponding increase in public awareness regarding environmental issues, representing a limitation stemming from the prioritization of social and economic problems.

Consequently, Brazil has a lower state capacity in the implementation and execution of laws regarding water management in comparison to Australia. The establishment of Brazilian governmental water councils, water agencies, and river basin committees does not guarantee that all members have their perspectives considered in discussions due to power imbalances, particularly in relation to water users and the government. This scenario involves a representative democratic system in which the government designates each member to represent a certain stakeholder group.

In Brazil, the formation of water forums is typically coordinated with the interests of the public power, endangering social participation and engagement in the decision-making process. To address this issue, the innovative Brazilian Progestão Project was established in 2013 to strengthen integrated, decentralized, and participatory water governance while enhancing the articulation between federal and state scopes.

In contrast, there is no similar initiative in Australia, but the Catchment Management Authorities play an essential role within the community by proactively advocating for their rights in Integrated Water Resources Management over the long term. Therefore, Australia's participatory scenario functions as an expanded version of a representative democratic forum, where participants are invited to join a group during public consultations based on their expertise to help develop plans and policies alongside political parties.

Australia represents one of the most successful examples of water trade globally, while in Brazil, despite being legally guaranteed, the water market faces challenges due to an unsatisfactory valuation of the tax distribution on this resource. This type of Australian participation presents a significant opportunity for the country, as it is a profitable activity that enables water users to buy or sell water rights over a long-term period, ensuring water supply where it is most needed and promoting sustainable development and improvements in water governance for the region.

Despite its regional fragmentation, the Australian participatory model has a higher capacity for implementation and operationalization than the Brazilian model. In Australia, public power is

more effectively distributed, facilitating the establishment of a more robust decision-making process. Another strength of the Australian water governance model is that it considers planning and managing in the long-term measures that lead to effective law and plan implementation.

Moreover, the establishment of informal community organizations in Australia stems from the country's commitment, where law compliance demonstrates that their efforts will yield corresponding results. An example of this is the deliberations of the regional committees, whose measures are effectively applied within society. A justification for this willingness can be attributed to the disparity in the socioeconomic scenarios of Brazil and Australia. According to the United Nations Development Programme 2023-2024 Report, Australia's Human Development Index (HDI) is ranked 10th, while Brazil's is ranked 89th (UNDP, 2024). Consequently, Australia's economy, culture, and education are more developed than those of Brazil.

This study contributes to bridging the scientific knowledge gap regarding the influence of actors within developing and developed country territories on decision-making related to environmental management aimed at sustainable development.

The Brazilian institutional scenario exemplifies the behavior of stakeholders in developing countries, particularly those in Latin America. This opens avenues for further research to describe and analyze these scenarios' concerning issues related to the interaction of actors in public management, primarily with respect to environmental matters. Conversely, the Australian scenario represents an example of a country making ongoing progress regarding policy improvements, with the water trade being one such example.

Further research can approach this study through a systematic literature review, presenting a replicable methodology, which also contributes to mitigating bias and enhancing the research's credibility.

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