

Social participation in water resource management: reality of the Center Hydrographic Region Council (Portugal) and the Apodi-Mossoró River Basin Committee (Brazil)

Participação social na gestão dos recursos hídricos: realidade do Conselho da Região Hidrográfica do Centro (Portugal) e do Comitê de Bacia Hidrográfica Apodi-Mossoró (Brasil)

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ABSTRACT

Research Purpose: Water is a natural resource essential to human development, with multiple uses, which generates pollution processes, with environmental, economic, and social consequences. This work aims to evaluate the social participation in the management of water resources in Portugal and Brazil.

Methodology: For this, we adopted the methodological procedures of systematic literature review, investigation of the documentation on the Council of the Hydrographic Region (CRH) of Center/Portugal and the Hydrographic Basin Committee (CBH) of the Apodi/Mossoró River in Brazil and obtaining field data with the application of interviews to the members of these two institutions.

Findings: It was found that the participation of the members of CRH Center/Portugal and the CBH of the Apodi/Mossoró River in Brazil refers to the similarities in the degree of participation, diversity of the segment, number of members, participation of civil society, and participation of the private sector; however, they are distinct concerning the degree of interest, ways of choosing the members, their level of knowledge, the interaction between the members and the participation of the public authorities.

Originality/Value: Therefore, it is recommended for the evolution of these management models a deeper knowledge of their representatives, through the diagnosis of the socioeconomic profile, as well as their environmental perception.

Keywords: Environmental Public Policies; Water Governance; Participatory Management; Environmental Justice.

RESUMO

Objetivo da Investigação: A água é um recurso natural imprescindível ao desenvolvimento humano, sendo seu uso múltiplo, gerando processos de poluição, com consequências ambientais, econômicas e sociais. Este trabalho tem por objetivo avaliar a participação social na gestão dos recursos hídricos de Portugal e Brasil.

Metodologia: Para isso, adotaram-se os procedimentos metodológicos de revisão sistemática de literatura, investigação da documentação sobre o Conselho da Região Hidrográfica (CRH) do Centro/Portugal e o Comitê da Bacia Hidrográfica (CBH) do Rio Apodi/Mossoró/Brasil e obtenção de dados de campo com aplicação de entrevistas aos membros destas duas instituições.

Resultados: Constatou-se que a participação dos membros do CRH Centro/Portugal e do CBH do Rio Apodi/Mossoró/Brasil refere-se as semelhanças sobre o grau de participação, diversidade do segmento, quantidade de membros, participação da sociedade civil e participação do setor privado; entretanto são distintas no que diz respeito ao grau de interesse, formas de escolha dos membros, seu nível de conhecimento, interação entre os membros e participação do poder público.

Originalidade/Valor: Para tanto, recomenda-se para evolução destes modelos de gestão o maior conhecimento dos seus representantes, através do diagnóstico de perfil socioeconômico, bem como sua percepção ambiental.

Palavras-chave: Políticas Públicas Ambientais; Governança das Águas; Gestão Participativa; Justiça Ambiental.

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1. Introduction

Water is an indispensable element for the planet's life and human development. It is used mutually, in a consumptive (irrigation, human supply, industrial sector, and animal use) and a non-consumptive way (generation of electric energy, navigation, dilution of effluents, fishing, preservation of flora and fauna, as well as for recreation and leisure), leading to the generation of punctual and diffuse sources of pollution, which cause natural and anthropic pollution (urban, agro pastoral and industrial), which produces economic, social, environmental, health and political impacts (Derísio, 2017).

Based on the scenario of environmental conflicts in which water resources fit, water governance models were instituted in the most diverse nations of the world, with different objectives, such as: preserving water quality, improving the uses of aquatic environments, controlling water pollution agents, preventing water pollution and contamination, resolving water scarcity conflicts, mitigating adverse consequences of water change and ensure the sustainability of water resources. In this opportunity, the countries of Portugal and Brazil formulated their water resources legislation based on influences from external experiences.

In this way, the water management in Portugal occurs from the delimitation of the Regional Hydrographic Administration - ARH, which carry out water management attributions, including the respective planning, licensing and inspection, being carried out by the Councils of Hydrographic Region - CRH, in which the consultative bodies of the aforementioned administrations are considered (Law No. 58/2005) (PORTUGAL, 2005). In this panorama, the CRH of Center is delimited, which is inserted in a region with conflicts, related to climate change, inconstant water regime, typical of the Mediterranean climate, multiple uses, floods, urban pollution and impacts of pollution by industrial activities.

That said, the theme of water resource management in Portugal has been the subject of investigation by researchers: Bento and Brás (2019), Coelho (2019), Teixeira (2018), Ferreira (2017), Cabo (2016), Martins and Fortunato (2016), Poças Martins and Godinho (2016), Sereno (2015), Soares (2015) and Zucco and Costa (2015). However, these surveys need to refine the perception of the representatives of CRH.

In Brazil, the water management model is based on the National Water Resources Policy – PNRH (Brasil, 1997), which is based on the following principles: i) water is a public domain asset ; ii) water is a limited natural resource, endowed with economic value; iii) in situations of scarcity, the priority use of water resources is human consumption and animal drinking; iv) the management of water resources must always provide for the multiple uses of water; v) the river basin is the territorial management unit and vi) the management of water resources must be decentralized and count on the participation of the public authorities, users and communities.

The management of water resources in a decentralized way occurs from the institution of the Hydrographic Basin Committees - CBH, which have the function of playing a strategic role in the PNRH, as such organizations count on the participation of governments, users and civil society and have the hydrographic basin as a management unit. As a result, they are proponents of public policies, and currently, a total of 232 public policies have been instituted in Brazil (ANA, 2020). In this context, the CBH of the Apodi/Mossoró River is delimited, which is inserted in an area with systemic problems, related to climatic restrictions, water scarcity, multiple uses, floods and inundations, urban pollution, intensive agricultural use and industrial activities.

The theme of water management in Brazil, gained notoriety, developing several studies, namely: Barbosa (2019), Martins (2015);, Schultze et al. (2019), Trindade, Scheibe and Ribeiro (2018), Barros, Paiva and Cisneiros (2017), Costa (2017), Fadul, Vitória and Cerqueira (2017), Feil, Strasburg and Spilki (2017), Lopes and Neves (2017), Luz (2017), Silva, Herrero and Borges (2017), Amorim, Ribeiro and Braga (2016), Bolson and Haonat (2016), Cerqueira et al. (2016), and Vasconcelos et al. (2016). However, these studies did not address perception of CBH members, a fundamental method in water management.

In view of this panorama of multiple approaches to the management of water resources, comparative studies were developed between the models adopted by different countries, in this case of Portugal and Brazil, highlighting those of Caldas et al. (2019), Young and Sedoura (2019), Ferreira and Debeus (2018), Silva et al. (2018), Casarin (2017), Ribeiro (2016), Ribeiro, Ribeiro and Varanda (2016), Agra Filho and Ramos (2015), Amorim et al.(2015), Araújo et al.(2015), Foletto et al. (2015), Meier, Costa and Basso (2015), Meier, Zucco and Costa (2015), Travassos (2013), Silva, Ferreira and Pompêo (2013), Alovise Jr. and Berezuk (2012), Costa et al. (2011), Magalhães et al. (2011), Vasconcelos et al. (2011) and Campos and Francalanza (2010). However, these trials did not address a comparison of social participation in water management.

In order to understand the complexity of water governance in Portugal and Brazil, this article proposes to carry out a comparative study on the contribution, in terms of participation, of the members of institutions concerned with water management models, in those respective countries, so as to better understand the interrelationships between its elements, to seek ways of improvement.

This work has the general objective of comparatively analyzing social participation in the CRH of Center/Portugal and in the CBH of Apodi-Mossoró River in Brazil. For this, specific objectives were defined: to describe the history of these water resource management models; to characterize the members of the investigated CRH and CBH; to point out the perception of the analyzed CRH and CBH members when it comes to their performances; identify perceptions of the researched CRH and CBH members regarding their participation and to mention the perceptions of the studied CRH and CBH members regarding the challenges and dilemmas of their operation.

2. Methodology

The development of this research was based on the delimitation of the object of study and deliberation of appropriate methodological procedures.

2.1 Characterization of the Study Area

The development of this research was based on the delimitation of the object of study and deliberation of appropriate methodological procedures.

The research is carried out in river basins with distinct characteristics, contexts, factors and dimensions, but which present similarities as to existing conflicts and environmental problems and are located in two countries which, despite being connected since the Age of Discovery, given the relationship of colonizer and colony, in this case, Portugal and Brazil, respectively, are nowadays inserted in different international contexts and present significantly dissimilar political, institutional and management models.

In Portugal, we investigated the Center Hydrographic Region - CRH 4 (Figure 1), which is formed by the rivers Vouga, Mondego and Lis, with an area of 12.144 km², integrating the basins of the rivers Vouga, Mondego and Lis and the basins of the coastal creeks, including their respective groundwater and adjacent coastal waters (APA, 2020).

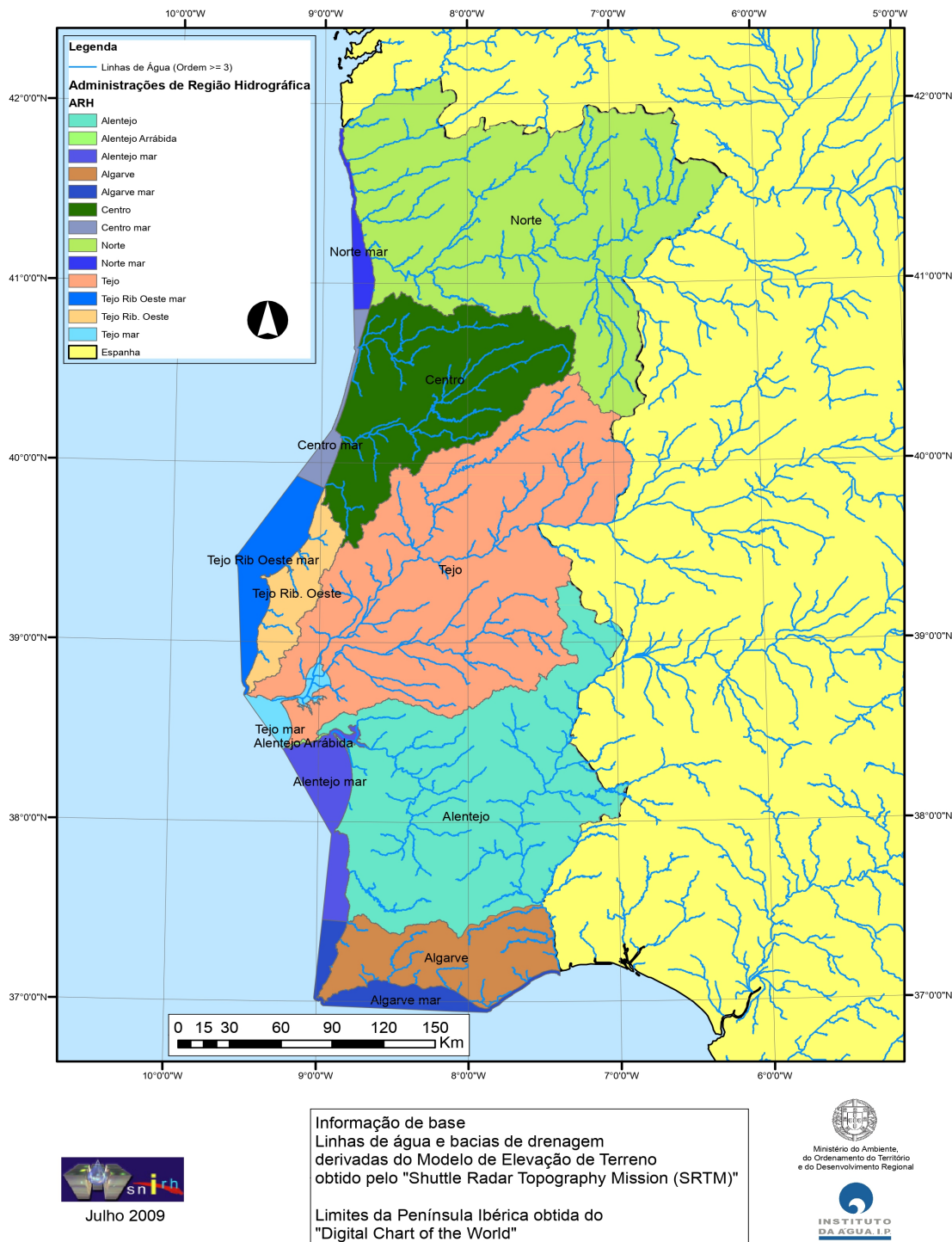
The Vouga River starts in the Lapa mountain range, at 930 m altitudes, and runs for 148 km until it flows into Barra de Aveiro. Its main tributaries are the Águeda and its affluent, the Cértima, the Caster and the Antuã, in the North, and the Boco and the Ribeira da Corujeira, in the South. Its basin, in the transition zone between the North and South of Portugal, is limited by the parallels 40°15' and 40°57' North latitude and the meridians 7°33' and 8°48' West longitude, being confined to the south by the Buçaco mountain range, which separates it from the Mondego river basin, and to the north by the Leomil, Montemuro, Lapa and Freita mountains, which separate it from the Douro river basin (APA, 2020).

The Mondego River is the largest river in Portuguese territory, which originates in Serra da Estrela, at an altitude of 1,525 m, in a spring called "The Mondeguinho", running 258 km to the Atlantic Ocean near Figueira da Foz, with its tributaries the Dão, Alva, Ceira, and Arunca rivers. The river basin of this river, the second largest basin integrally in Portugal, is located in the central region of Portugal, specifically between the basins of the rivers Vouga and Douro to the east and north, and between the basins of the rivers Tejo and Lis to the south, at parallels 39°46' and 40°48' North latitude and the meridians 7°14' and 8°52' West longitude, thus presenting a rectangular-shaped watershed area of 6,645 km² (APA, 2020).

The Lis River begins in Fontes, in the municipality of Leiria and flows into the Atlantic Ocean, north of Vieira Beach, is about 40 km long and with the tributaries Fora and Ribeira da Caranguejeira on the right bank, and

Lena and Ribeira do Rio Seco on the left bank. The river basin of this river is a coastal one with an area of 945 km² and is to the east by the Tagus River basin and the south by the Alcoa basin (APA, 2020).

Figure 1
ARH of Center, Portugal

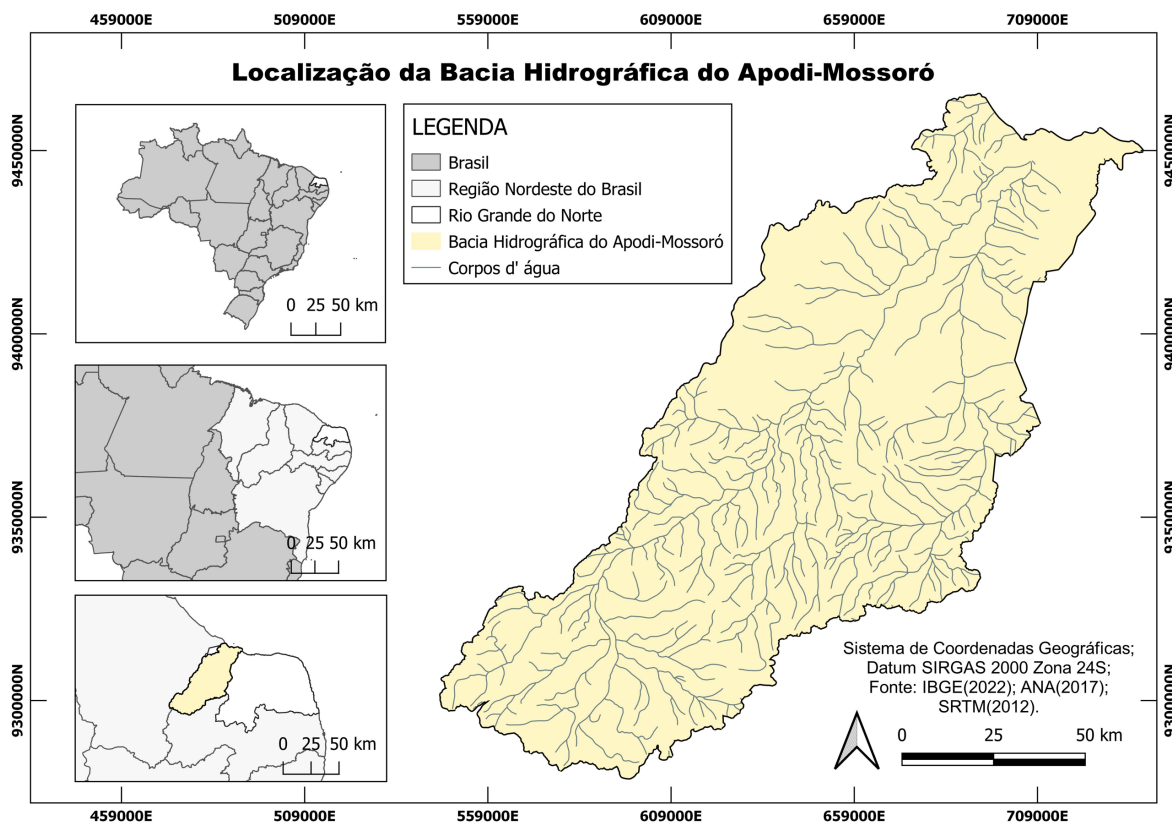


Source: ARH Center (2020).

In Brazil, the Apodi-Mossoró River Basin was investigated (Figure 2), which has an area of 14,276.00 km², configuring itself as the second-largest basin in the state, with the concentration of 618 dams, totaling an

accumulation volume of 469,714,600 m³ of water, equivalent, respectively, to 27.4% and 10.7% of the total dams and accumulated volumes of Rio Grande do Norte (IGARN, 2017).

Figure 2
Basin of the Apodi-Mossoró River, Brazil



Source: SEMARH (2020).

2.2 Research Procedures

The methodological procedures of this study were carried out through the following steps: i) definition of the theme of the study; ii) theoretical survey of the theme; iii) definition of the study instruments; iv) obtaining, organizing, and processing the data, and v) data analysis.

Step I - Defining the theme of the study

This study is part of the project Comparative analysis of water resources management in Brazil and Portugal: case study of the Council of Hydrographic Region of the Center/Portugal and the Hydrographic Basin Committee of the Apodi-Mossoró River in Brazil. Thus, the delimitation of the present approach was done by defining the characterization of the segments of these water governance models, to define guidelines for greater social participation in the respective cases.

Step II - Theoretical survey

From the definition of the theme of the study, its theoretical survey was developed, through the Systematic Literature Review - SLR, which Morandi and Camargo (2015), defined as a sequence that the researcher needs to understand and follow so that the review work is well done, to minimize the problems that can hinder or even misrepresent the final report, being composed of the following steps: (a) sources for searching the topic, (b) strategies for research bias, (c) evaluation of the literature studies selected to be used in the SLR, (d) tools to be used in synthesizing the results, and (e) the presentation of the study.

In this way, methods were defined in the SLR on Water Resources Management in Portugal and Brazil: i) selection of the search tool for scientific articles (Google Academic was defined); ii) definition of descriptors for the search of scientific articles (comparison of social participation in the performance of the Basin Committee in Portugal and Brazil); iii) literature search with the first filter of the temporal delimitation of articles between 2010 and 2019 (12. 200 results); iv) literature search with the second filter with the thematic approach: social participation, public participation, social actors, democratic management, environmental justice and water governance in the title of the articles between 2010 to 2019 (20 results); v) methodological quality assessment (finding peer-reviewed methodologies); vi) data meta-analysis (variables: authors, database, types of production, scientific method, researcher's profession, research group, thematic, main results, study region, name of the place of publication, year of study); vii) evaluation of the quality of evidence (confrontation of the main results with the cited legislations); and viii) final writing of the results. Importantly, we repeated this procedure for research directed to Portugal and Brazil, exclusively, but with temporality from 2015 to 2019, being identified in 10 and 15 studies, respectively.

For this purpose, a total of 25 research papers on popular participation in water resources management in Portugal and Brazil were analyzed.

Step III - Research Instruments

To enable the study, data collection techniques were adopted, which are understood based on Marconi and Lakatos (2017) as a set of precepts or processes that science uses and the skills to use these precepts or standards in obtaining its purposes. With this, the technical procedures used were: bibliographical research (Management of Water Resources in Portugal and Brazil); documentary survey (History of the CRH of the Center/Portugal and the CBH of the Apodi-Mossoró River in Brazil) and semi-structured interviews, containing the variables of: characterization of the representations (name, period of existence, scope and mission, quantity of members, representation period, segment represented, relationship, Representation's contribution to management and representation structure), perception of functioning (performance of the autarchy, frequency of the meetings its attend, themes of the meetings its most participate, performance of the representatives, conflicts in meetings, conflict resolutions, meeting deficiencies, difficulties in operation,

interaction with the society and articulation with institutions), perception of participation of the representation (participation of members, interest of the members, diversity of the segments, quantity of members, how the members are selected, level of Knowledge, interaction between members, participation of civil society, public authority participation and private sector participation), perception of the performance of the representation and planning of the representation (representative's formation, representative's motivation, representative's contribution, representative's difficulties, representative's interaction, activity planning, Planning with another sector, priorities of the municipality, action plan for priorities and future challenges).

Step IV - Obtaining the data

Initially, a pre-test was conducted with 10% of the sample (2 interviews) to adjust the variables, optimize time, and plan the execution of the field research application. In the second moment, the interviews were applied to the players in research, and the Informed Consent Form was presented. The choice for the data collection technique by interviews is due to the fact that it is accessible to every researcher and, mainly, for allowing the interviewees interaction; however, the use of the interview requires prior planning and maintenance of the ethical component, expressed by the choice of the participant, the interviewer, the location, the mode or even the time for its realization (Marconi & Lakatos, 2017).

The collection of data with the representatives of the segments of the Center/Portugal CRH occurred during the period from 17 to 28 February 2020, being contemplated, 13 interviewees. The collection of data from the representatives of the segments of the CBH of the Apodi/Mossoró River in Brazil occurred with its director from January 10 to 21, 2020, being approached by ten interviewees. From this moment, data were organized in texts, tables and charts, by institution, from the order of the structure of the interview script and treated in a way that allows the understanding of popular participation in water governance in Portugal and Brazil in a systematized way.

Step V - Data analysis

The data analysis occurred in a probabilistic way, where the data obtained in the application of the questionnaires were quantified, then they were arranged in tables in Microsoft Excel, calculating the percentage of each response, presenting them in tables with comparison between the values of the CRH of the Center/Portugal and the CBH of the River in Apodi-Mossoró/RN/Brazil.

To this end, the data were presented following the order of discussion: characterization and environmental perception of the representatives of the segments of the CRH of Center/Portugal, characterization and environmental perception of the representatives of the segments of the CBH of the River in Apodi-Mossoró/RN/Brazil and comparative performance between the members of the CRH of Center/Portugal and the CBH of the River in Apodi-Mossoró/RN/Brazil, making viable the data analysis by comparing the systematic review.

3. Results and Discussion

3.1 Formation of Center/Portugal CRH and Apodi/Mossoró River CBH

The Management of Water Resources in Portugal and Brazil is based on external influences, in Portugal based on European Community regulations, while in Brazil the influence comes directly from the French system. In this way, these States have structured, in their environmental legal framework, devices for popular participation to improve the rational use of water resources. In Portugal, the Water Law is approved, transposing Directive No. 2000/60/CE, of the European Parliament and of the Council, of 23 October (PORTUGAL, 2000), into national law, being updated by Law No. 44/2017 of 19 June, which establishes the bases and institutional framework for sustainable water management (PORTUGAL, 2017). In Brazil, PNRH is established by Federal Law 9.433/1997, which also creates the National Water Resources Management System, regulating item XIX of art. 21 of the Federal Constitution and amends art. 1 of Law No. 8,001, of March 13, 1990, which amended Law No. 7,990, of December 28, 1989 (BRASIL, 1997).

In this perspective of advancement in the management of water resources, decentralization models are instituted, with the perspective of following the uses of these resources democratically, through informative, consultative, normative, deliberative and negotiated measures. With that, spaces of the community of a River Basin are established to carry out the management of the water resources sharing management responsibilities with the public power.

Therefore, it is possible to highlight that in Portugal social participation in water management occurs in two spaces, being defined by Meier, Costa and Basso (2015) as: (a) Participatory institutions: the National Water Council - NWC and the Councils Hydrographic Region - CRH; (b) Water planning process: structuring of water management plans with the participation of society and participatory institutions, these plans are on two levels, the National Water Plan and the Hydrographic Region Management Plans. While in Brazil it occurs through the Hydrographic Basin Committee - CBH.

In particular, in Portugal and Brazil, there are currently four CRH (APA, 2020) and 232 CBH (ANA, 2020), which operate in an integrated manner with the community and national sectoral policies. Within this context, it was delimited to investigate the CRH of Center/Portugal and the Apodi/Mossoró River in Brazil CBH as they represent devices of popular participation to improve the rational use of water resources.

The Centro/Portugal CRH has its formation from the jurisdiction of the CRH territory, which coincide respectively with the territorial areas of the ARH, of the North, of the Centro, of the Tagus and West, of the Alentejo and the Algarve (established in the Decree-Law). Law No. 347/2007, of 19 October and, in Ordinance No. 108/2013, of 15 March) (PORTUGAL, 2007). In this way, with Ordinance No. 37/2015 of 17 February, the Center CRH is created, currently comprising up to 49 members, representatives of ministries, public

administration bodies, interested municipalities, entities representing water users and technical, scientific and non-governmental organizations representing water uses (PORTUGAL, 2015; APA, 2020).

Thus, it is observed that water management in Portugal is strongly influenced by the Water Framework Directive, in Soares' understanding (2015) of the adoption of the principles for domestic law based on the Water Resources Ownership Law and the Water Law, thus allowing to define evolution in the sense of: (i) normative imposition that establish deadlines and obligations with direct effects on the funds received; (ii) existence of financial funds from water resources liable to finance the plan's proposals, the so-called "community funds"; (iii) imposition of deadlines that oblige the plans to be reviewed and updated every six years and, consequently, establishes an iterative process; (iv) entry of a new management system, which prioritizes ecological aspects and presupposes its connection with the elements of abiotic quality; and (v) expansion of the quantitative and qualitative monitoring of groundwater and surface water.

The Apodi-Mossoró River in Brazil CBH was constituted by Government Decree No. 21,881, of 10/09/2010, being installed on February 21, 2013, with the election of the 1st Board of Directors on February 22, 2013, thus forming a body collegiate with deliberative (makes decisions), normative (establishes norms) and consultative (issues opinions) functions, composed by the federal, state and municipal public authorities, water users and civil society, for the purpose of managing the waters in which the basin acts, composing the Integrated Water Resources Management System - SIGERH. It emphasizes that this process took place under the terms of State Law No. 6,908, of July 11, 1996, modified by Law No. 481 of January 3, 2013 and in line with Federal Law No. 9,433, of January 8, 1997. As a result, the CBH of Apodi-Mossoró River currently has a collegiate body of up to thirty representatives and up to thirty alternates, defined as follows: i) twelve representatives of users of water resources; ii) nine representatives of organized civil society operating in the river basin and iii) nine representatives of municipal, state and federal public administration bodies with investments or competence in the area of the basin (SEMARH, 2020).

In understanding these GRH models, the authors Foleto et al. (2015) stated that the legal basis for water resources in Portugal and Brazil is based on similar principles concerning the following aspects: water management takes place in a holistic and integrated manner in the River Basin; aims at sustainable management and protection of water bodies; they have planning instruments structured in a participatory way and; a specific institutional structure for the implementation of water management.

It is still possible to mention similarities related to the objectives, since Araújo et al. (2015) state that both seek to provide a consistent amount of high-quality water. However, they also have differences, being related to different contexts: water availability, levels of development, population growth, exploitation of resources, levels of pollution and environmental degradation.

It is also worth highlighting that these managerial models also have different understandings, since in the case

of Portugal, water is considered an ecological resource, which allows it to be a public good without clearly defining a priority for the use of the people, being managed with participation. Public through CRH, but with informative and consultative characters, while in Brazil, water resources are understood as natural and economic, allowing to be a public resource managed by the State with priority use for the population, which allows the constitution of CBH with personalities that they allow a negotiating and deliberative capacity. Thus, to improve these mechanisms, it is necessary to understand their respective structures and compositions.

3.2 Characterization of Center/Portugal CRH and Apodi/Mossoró River CBH

In this line of interpretation of water resource operation models in Portugal and Brazil, it was possible to notice similarities (diversity of members, time of existence, scope of institutions, quantity of members, and types of representation) and differences (time of characterization, the relationship of an institution with management, the contribution of representation in administration, and environmental structure of representation) as for the representations in the CRH of Center/Portugal and the CBH of the Apodi/Mossoró River in Brazil (Table 1).

Table 1

Characterization of water resource management models in Portugal and Brazil

Comparative aspect	Portugal ¹	Brazil ²
Name of the authority	Diversified	Diversified
Period of existence	Up to 1 year (0%) Between 1 and 5 years (0%) Between 6 and 10 years (7.6%) Above 11 years (92.4%)	Up to 1 year (0%) Between 1 and 5 years (0%) Between 6 and 10 years (20%) Above 11 years (80%)
Scope and mission	Diversified	Diversified
Quantity of members in representation	Up to 10 people (7.6%) Between 11 and 50 people (46.2%) Between 51 and 100 people (30.5%) Above 101 people (7.6%)	Up to 10 people (10%) Between 11 and 50 people (30%) Between 51 and 100 people (30%) Above 101 people (30%)
Representation period	Up to 1 year (7.6%) Between 1 and 5 years (46.2%) Above 4 years (46.2%) * second representation of membrs	Up to 1 year (00%) Between 1 and 4 years (30%) Above 04 years (70%) * second representation of membrs
Segment represented	Local administration (23%) Economic sector (30.5%) Scientific technician (15.5%) Central administration (15.5%) Civil society (15.5%)	Public power (30%) Water user (30%) Civil society (40%)
Relationship between the institution and management	Informational (46.2%) Consultative (53.8%) Deliberative (0%) Normative (0%) Negotiators (0%)	Informational (10%) Consultative (20%) Deliberative (30%) Normative (20%) Negotiators (20%)
Representation's contribution to management	Technical (15.5%) Politics (15.5%) Structural (46.2%) Administrative and org. (22.8%) Financial (0%)	Technical (20%) Policy (20%) Structural (20%) Administrative and organizational (20%) Financial (20%)
Representation structure	Exists (53.8%) Does not exist (46.2%)	Exists (40%) Does not exist (60%)

¹It was based on interviews with representatives of the CRH of the Center/Portugal.

²It was based on interviews with representatives of the CBH of the Apodi/Mossoró River in Brazil.

The results obtained from differences and similarities in the characterization of the representations in the CRH of Center/Portugal and the CBH of the Apodi-Mossoró River in Brazil are in line with the research by Costa et al. (2011), when observing that the process of decentralization of decisions in water resources occurs through organisms of basins of wide representation, because it is represented in several segments and with the thought of Vasconcelos et al. (2016) when identifying that the institutional arrangements are disorganized, since they are structured in a fragmented way (representation structure). Thus, there is a need to have a strong State (technically and financially) capable of implementing public policy and supporting the models of decentralization of decisions (Trindade et al., 2018).

3.2 Performance of the CRH of Center/Portugal and the CBH of the Apodi/Mossoró River in Brazil

In this context of structuring the water resources management autarchies of Portugal and Brazil, their forms of action were identified, with similarities being found between the CRH of the Center/Portugal and the CBH of the Apodi/Mossoró River in Brazil concerning greater involvement, that occurs with meetings, by means of frequency every four months, being very much attended by the representatives, where the eventual conflicts occur because of the agenda points.

The distinctions refer to the content of the debate, being in Portugal focused on environmental monitoring and risk management, and in Brazil on popular participation and environmental monitoring, and to how the conflicts are solved, since in the Portuguese case they are debated in the plenary and board of directors, and in the Brazilian case they are only discussed in the plenary (Table 2)

Thus, the panorama of water resources in Portugal and Brazil presents differences and similarities, concerning environmental, economic, social, and territorial differences, which represent a challenge to the integrated and participatory management model in these countries, providing a particular and authentic character to the Brazilian water management mechanism (Silva et al., 2017); with respect to similarities, these are related to the lack of monitoring in much of the waters of these countries, with the Portuguese situation being better (Alovisi Jr. & Berezuk, 2012). This scenario is corroborated by Araújo et al. (2015) when they state that Brazil needs to implement a national network of quantitative and qualitative monitoring of water resources; while Portugal needs to expand and maintain its existing network.

Table 2

Comparative performance of water resources management models between Portugal and Brazil

Comparative Aspect	Portugal ¹	Brazil ²
Performance of the autarchy	Meetings (46.2%) Technical visits (7.6%) Drafting (15.5%) Issuance of reports (15.5%) Environmental debates (7.6%) Event organization (7.6%)	Meetings (40%) Technical visits (10%) Drafting (10%) Issuance of reports (20%) Environmental debates (10%) Event organization (10%)
Frequency of the meetings its attend	Weekly (0%) Monthly (15.5%) Bimonthly (15.5%) Quarterly (22.8%) Four-months (46.2%) Half-yearly (0%) Annual (0%)	Weekly (0%) Monthly (20%) Bimonthly (10%) Quarterly (10%) Four-months (50%) Half-yearly (0%) Annual (0%)
Themes of the meetings its most participate	Institutional framework (15.5%) Water quantity and quality (15.5%) Conflict/risk management (22.8%) Environmental monitoring (46.2%) Popular participation (0%)	Institutional framework (0%) Water quantity and quality (10%) Conflict/risk management (20%) Environmental monitoring (30%) Popular participation (40%)
Performance of the representatives	Very participative (46.2%) Participative (15.5%) Regularly (15.5%) Not very participative (22.8%) Very little participative (0%)	Very participative (40%) Participative (30%) Regularly (20%) Not very participative (10%) Very little participative (0%)
Conflicts in meetings	Meeting dynamics and time (22.8%) Meeting agenda items (46.2%) Communication (0%) Choice of meeting dates (15.5%) Choice of meeting places (15.5%)	Meeting dynamics and time (0%) Meeting agenda items (80%) Communication (0%) Choice of meeting dates (10%) Choice of meeting places (10%)
Conflict Resolutions	Discussed in the plenary (22.8%) Debated in the board (46.3%) Voted in plenary (15.5%) President's decision (7.7%) Definition of the higher body (7.7%)	Discussed in the plenary (80%) Debated in the board (10%) Voted in plenary (10%) President's decision (0%) Definition of the higher body (0%)
Meeting deficiencies	Dialogues (46.2%) Suggestions (22.8%) Technical discussions (15.5%) None (0%) Don't know (15.5%)	Dialogues (10%) Suggestions (0%) Technical discussions (10%) None (60%) Don't know (20%)
Difficulties in operation	Structure (15.5%) Time availability (22.8%) Financial (15.5%) Articulation with other members (46.2%) None (0%)	Structure (30%) Time availability (20%) Financial (30%) Articulation with other members (20%) None (0%)
Interaction with the society	Very interactive (46.2%) Interactive (15.5%) Regularly (15.5%) Not very interactive (22.8%) Very little interactive (0%)	Very interactive (30%) Interactive (30%) Regularly (20%) Not very interactive (10%) Very little interactive (10%)
Articulation with institutions	Very articulate (46.2%) Articulate (15.5%) Regularly (15.5%) A little articulated (22.8%) Very little articulated (0%)	Very articulate (30%) Articulate (20%) Regularly (20%) A little articulated (20%) Very little articulated (10%)

¹It was based on interviews with representatives of the CRH of the Center/Portugal.

²It was based on interviews with representatives of the CBH of the Apodi/Mossoró River in Brazil.

From this perspective, the data reflect the functioning of water resources management in Portugal and Brazil, since several authors in their research have determined that problem-solving in CRH and CBH occur according to the stage of development of the institutions, being that in shared river basin usually a Technical Chamber for Conflict Resolution is created (Amorim et al., 2016), the meetings formally take place, but in the Portuguese case (consultative bodies) there is a limitation of the possibilities of dialogue and, above all, of co-construction of water problems and policies (Ribeiro, 2016), the interaction that public participation in the management of water resources in Brazil needs greater organization by the members, while in Portugal, characteristics of centralization are observed, where the CRH are spaces for the provision of information from the administration to the other represented segments (Ribeiro, 2016).

In conform performance of the representatives (Table 02) in Brazil's water management occurs greater interaction with society because it has learned to think about the integrated management of the basin, once all users will be affected through the reservoir operation policy (Barros et al., 2017), and the need for consensus among the participants of the committees, for the strengthening of the decision-making process (Campos & Francalanza, 2010).

It is still possible to highlight that innovation in terms of content, have already been observed in the meetings of these management models, as Cabo (2016) states that when analyzing the minutes of the meetings of the CRHs of the Center observed several themes discussed by stakeholders, including climate change, which were prioritized and debated.

Therefore, the scenario of difficulties in operation (Table 2) presented above corroborates the thesis that the deficiencies in planning and management activities are common to both the Portuguese and Brazilian scenarios, namely: the existing bureaucratic and political context; the lack of effectiveness of the proposed measures and actions; and the ineffectiveness, of the spaces open to social participation (Travassos, 2013).

3.3 Participation in the CRH of the Center/Portugal and in the CBH of the Apodi-Mossoró River in RN/Brazil

From this perspective of the performance of the water resources management models in Portugal and Brazil, the participation of members of the CRH Center/Portugal and the CBH of the Apodi/Mossoró River in Brazil was addressed, and similarities were identified (degree of participation, diversity of the segment, number of members, participation of the civil society and participation of the private sector) and differences (degree of interest, ways of choosing members, level of knowledge of the members, interaction among members and participation of the public power) (Table 3).

Table 3

Participation of members in water resources management in Portugal and Brazil

Comparative Aspect	Portugal¹	Brazil²
Participation of members	Very participative (22.8%) Participative (46.2%) Regularly (15.5%) Not very participative (15.5%) Very little participative (0%)	Very participative (40%) Participative (30%) Regularly (20%) Not very participative (10%) Very little participative (0%)
Interest of the members	Very interested (22.8%) Interest (15.5%) Regularly (46.2%) Little interest (15.5%) Very little interest (0%)	Very interested (30%) Interest (40%) Regularly (20%) Little Interest (10%) Very Little Interest (0%)
Diversity of the segments	Very diversified (46.2%) Diversified (22.8%) Regularly (15.5%) Not very diversified (15.5%) Very little diversified (0%)	Very diversified (40%) Diversified (30%) Regularly (20%) Not very diversified (10%) Very little diversified (0%)
Quantity of members	Very high (7.7%) High (22.8%) Regularly (46.3%) Low (15.5%) Very low (7.7%)	Very high (10%) High (20%) Regularly (40%) Low (20%) Very low (10%)
How the members are selected	Very judicious (22.8%) Judicious (46.2%) Regularly (15.5%) A little judicious (15.5%) Not very judicious (0%)	Very judicious (30%) Critical (30%) Regularly (40%) A little judicious (0%) Not very judicious (0%)
Level of Knowledge	Very high (22.8%) High (46.3%) Regularly (15.5%) Low (7.7%) Very low (7.7%)	Very high (20%) High (30%) Regularly (40%) Low (10%) Very low (0%)
Interaction between members	Very high (7.7%) High (7.7%) Regularly (46.3%) Low (22.8%) Very low (15.5%)	Very high (10%) High (30%) Regularly (40%) Low (10%) Very low (10%)
Participation of civil society	Very high (7.7%) High (7.7%) Regularly (46.3%) Low (22.8%) Very low (15.5%)	Very high (10%) High (10%) Regularly (40%) Low (20%) Very low (20%)
Public authority participation	Very high (46.2%) High (22.8%) regularly (15.5%) Low (15.5%) Very low (0%)	Very high (20%) High (40%) Regularly (30%) Low (10%) Very low (0%)
Private Sector Participation	Very high (15.5%) High (22.8%) Regularly (46.3%) Low (7.7%) Very low (7.7%)	Very high (20%) High (20%) Regularly (30%) Low (20%) Very low (10%)

¹It was based on interviews with representatives of the CRH of the Center/Portugal.

²It was based on interviews with representatives of the CBH of the Apodi/Mossoró River in Brazil.

The participatory process in public policy follows the historical and cultural evolution of society, becoming it necessary to make a continuous effort to improve the set of institutions so that they correspond to society's expectations (Barbosa, 2019).

These data on the participation of members in the management of water resources (Participation of civil society - Table 02) are corroborated by Agra Filho and Ramos (2015) who observe that public participation, in both countries, presents weaknesses and a passive interaction of society, being that in Portugal the procedures are more systematized throughout the various phases of the implementation process of the plans. In this line of thought, Fadul, Vitória, and Cerqueira (2017) explain that for this participation of society to be incipient, the distancing between the places of conflict around the uses of water resources and the appointment of regional mobilizers without the appropriate profile.

The authors emphasize that the decentralization of competencies in the planning and management of public waters occurs more frequently in Brazil (Magalhães et al., 2011), and this scenario is explained by Luz (2017) when highlighting that the way the Committee is conducted through its managers proves to be paramount, insofar as it means abandoning centralizing and authoritarian management practices and adopting a democratic model.

Thus, it is seen that for water governance it is necessary that: public participation seeks more creative and innovative solutions and that the government should point and be able to continue these solutions through management tools (Ribeiro et al., 2016). This reasoning is added by Bento and Brás (2019) when they mention the need to inaugurate a more reflective vision of participation, through involvement, connection and experience, for this it is necessary to invite other views, question the meaning of participatory processes, and seek a collaborative positioning.

3.4 Operation of the CRH in Center/Portugal and the CBH of the Apodi-Mossoró River in Brazil

In this circumstance of participation of members of the water resources management models from Portugal and Brazil, we investigated the forms of action and planning of the representations of the CRH in the Center/Portugal and the CBH of the Apodi/Mossoró River in Brazil, being identified affinities regarding the formation of the representative, the form of interaction of the representative (very interactive), the planning of activities (highest regularly), the planning with other sectors (highest regularly), the priorities of the autarchies (participate in meetings), the action plan for priorities (individual) and the future challenges (structure). However, the main differences refer to the representative's participation (technical motivation, scientific motivation and civic motivation), of the contribution of the representative (a lot of contribution) and the difficulty of the representative's participation (structure) (Table 4).

Table 4

Performance and planning of water resources management in Portugal and Brazil

Comparative Aspect	Portugal¹	Brazil²	
Performance of the Representation	Representative's formation	Diversified	Diversified
	Representative's Motivation	Technical motivation (46.3%) Scientific motivation (7.7%) Civic motivation (15.5%) Political motivation (22.8%) Economic motivation (7.7%)	Technical Motivation (30%) Scientific motivation (20%) Civic motivation (30%) Political motivation (20%) Economic motivation (0%)
	Representative's contribution	A lot of contribution (22.8%) Contributing (46.2%) Regularly (15.5%) Low contribution (15.5%) Very little contribution (0%)	A lot of contribution (40%) Contributing (30%) Regularly (20%) Low contribution (10%) Very little contribution (0%)
	Representative's Difficulties	Structure (15.5%) Time availability (22.8%) Financial (15.5%) Articulation with other members (46.2%) None (0%)	Structure (30%) Time availability (20%) Financial (30%) Articulation with other members (20%) None (0%)
	Representative's interaction	Very interactive (46.2%) Interactive (15.5%) Regularly (15.5%) Not very interactive (22.8%) Very little interactive (0%)	Very interactive (30%) Interactive (30%) Regularly (20%) Not very interactive (10%) Very little interactive (10%)
	Activity Planning	Very Often (15.5%) Often (22.8%) Regularly (46.2%) Not Very Often (15.5%) Very infrequent (0%)	Very Often (20%) Often (30%) Regularly (30%) Not Very Often (10%) Very infrequent (10%)
Planning of the Representation	Planning with another sector	Very Often (7.7%) Often (22.8%) Regularly (46.3%) Not very often (15.5%) Very infrequent (7.7%)	Very Often (10%) Often (30%) Regularly (40%) Not very often (10%) Very infrequent (10%)
	Priorities of the municipality	Participate in meetings (46.2%) Participate in technical visits (7.6%) Elaborate draft (15.5%) Issue reports (15.5%) Hold environmental debates (7.6%) Organize events (7.6%)	Participate in meetings (30%) Participate in technical visits (20%) Elaborate draft (10%) Issue reports (20%) Hold environmental debates (10%) Organize events (10%)
	Action Plan for Priorities	Individual (46.2%) Internally articulated (15.5%) With higher body influence (15.5%) Externally articulated (22.8%)	Individual (40%) Internally articulated (10%) With higher body influence (30%) Externally articulated (20%)
	Future Challenges	Structure (46.2%) Articulation of members (0%) Time availability (15.5%) Financial (22.8%) Autonomy (15.5%) Capacity building (0%)	Structure (40%) Articulation of members (0%) Time availability (20%) Financial (20%) Autonomy (10%) Capacity building (10%)

¹It was based on interviews with representatives of the CRH of the Center/Portugal.

²It was based on interviews with representatives of the CBH of the Apodi/Mossoró River in Brazil.

These aspects of water resources management planning in Portugal and Brazil have been corroborated by Amorim et al. (2015), who identified that the public participation process (whether in Brazil or the Iberian Peninsula) still presents huge flaws, and improvement is needed to adjust it to the requirements of international conventions and national right to information laws.

Thus, the improvement of water resources management occurs with the adoption of several factors, as highlighted by the investigations of Caldas et al. (2019) who highlighted the need for a participatory management model, with the adoption of environmental rationality that takes into account the cultural values present in society, and Ferreira and Debeus (2018) who affirmed the need for the insertion of civil society in the decision-making process in aspects that touch on river basin management, since these acts generate the appropriation of natural resources by a greater number of social actors, enabling a broader look at the problems of the basins, making water management much more solid and efficient.

In this understanding, Barbosa (2019) ratifies that for the exercise of effective and legitimate management of water and water resources, it is essential to assume participation as a process that is based on indirect participation, carried out through the representation of institutions and their co-responsibilities, especially in the Hydrographic Basin Committees.

However, Schultze et al. (2019) warn that the quality of the process and outcomes of public participation depends, on all actors and their interactions - both public and government actors - as well as the preparation and follow-up of these activities and their subsequent implementations.

Importantly, this behavior of promoting public participation in environmental governance, enables in Schultze et al.'s (2019) understanding a more conscious and fairer participation process (goal of procedural and interactional justice) that will result in more appropriate decisions that provide benefits to natural resources and their users and, distribute risk exposure more equitably (goal of product quality and; distributive justice).

This conception of challenges is expanded in the view of other authors who have addressed management instruments. Thus, Ferreira (2017) highlights that the water issue is an excellent field to evaluate the functioning of democracy, and for this, it is necessary to develop cooperation mechanisms capable of facing the situations of greater environmental insecurity and preventing the existence of conflicts. Costa (2017) emphasizes the need for greater participation of the municipal public power, of the Intermunicipal River Basin Consortium and implementation of watershed management instruments, and Silva, Ferreira, and Pompêo (2013) stated the need for advances in measures for the recovery of water bodies and incorporation of new information tools since they are essential for political decision, institutional adequacy, and rigor in the application of these new instruments. For their part, Lopes and Neves (2017) affirmed the need for important changes from public administrators and users, since the Council requires receptiveness to the process of building partnerships, while Young and Sedoura (2019) guided the compatibilization of the various plans to achieve efficiency at a lower cost, optimizing diagnoses and prioritizing actions that coincide with the aspirations of the basin's population.

In this same line of thought, several other authors highlight the challenges in the management of water resources, being reported by several studies, namely: Bolson and Haonat (2016) guide the need for the

creation of water resources consortia; Cerqueira et al. (2016) stated the need to observe the sociopolitical aspects in the efficiency of the management model; Casarin (2017) highlighted as priorities for water governance the understanding of water as an inheritance that must be protected, defended and treated, from the implementation of fees and licenses for goods and services generated by water, which should finance the guarantee of the sustainability of use; regarding environmental goals, Zucco and Costa (2015) state the need for intervention of more experts and authorities to define environmental goals of management plans; and Feil, Strasburg, and Spilki (2017) warn about the need for measures in the RBs before their degradation, because in this case, management becomes more efficient and conflicts milder, thus contributing to the establishment of the resilience of the environmental system.

It is also possible to add that Araújo et al. (2015) emphasize that the legal and institutional frameworks that have been established in Brazil and the European Union have allowed great advances in water resource management and, consequently, the availability of high-quality water; however, it requires an evolution in the sense of seeking a water resources legislation with guidelines for the preservation of forests and to be integrated with forest legislation, because forests are the key to ensuring water supply and sustainability.

Thus, for the water management process to be efficient, it is necessary to plan, in cycles, at the river basin scale, and in Portugal, as required by the DQA, these cycles occur every six years, performed by the PWRM; as for the PNRH, in Brazil, the update cycles happen every ten years (Silva et al., 2018).

In this context of a perspective on water management, Teixeira (2018) also emphasizes that it should be oriented towards greater local participation, through remunicipalization, providing opportunities for benefits for the municipalities, such as the reduction of the rate applied in the provision of the service, the increase and better adjustment of investment to the needs of the population, increased transparency, universality, accessibility of the service, lower costs, and an increased focus on environmental sustainability.

In terms of innovation, it is necessary that water resource management models address new systemic concepts, and for this, the need to include climate adaptation variables stands out, since it has been approached by multiple studies.

Along this line of interpretation, Young and Sedoura (2019) addressed that water resources management planning should definitely consider land management as an important tool to maintain and restore waterways.

This holistic thinking is corroborated by Poças Martins and Godinho (2016), when they state that issues related to water resources remain on political agendas and in the media, not only concerning the environment, but also in the areas of social and economic development, security, quality of life, agriculture, industry, energy, and tourism.

This being said, Martins and Fortunato (2016) state that there is an urgent need in the reorganization of the water debate, towards a territorial and corporate restructuring plan for the respective sector, with claims on increased efficiency, sustainability and the promotion of social cohesion and territorial equity.

In a more innovative line of reasoning, Araújo et al. (2015) clarify that climate change has been a prominent topic of debate in online forums focused on water-related topics, thus it is essential to preserve anthropogenic and natural activities in river basin, which will be possible through a new model of spatial planning, since it often has a narrow focus on flooding, with this it is necessary to adopt a more comprehensive approach in which studies and actions are carried out throughout a river basin.

Thus, to adopt this new path in water management is challenging, since Cabo (2016) states that climate change generates conflicts of interest due to the diversity of uses, and these uses are not always compatible with the multiplicity of users, thus generating numerous pressures and points of contention, for this a participatory approach is needed, through adaptive management of water resources to climate change as a common task and that all parties involved will have to sacrifice some of their interests for the common good.

In this sense, Sereno (2015) defines that the path to effective public participation in water management and planning is through the expansion of participatory democracy mechanisms, where the authorities responsible for promoting these procedures should stop considering them as mere obstacles, mere procedural stages that postpone decision making, and, on the contrary, strive for their adequate realization.

The path to be followed for the adoption of these new paradigms regarding the management of water resources in Coelho's conception (2019) must be aligned with a holistic vision, being composed of indicators that contemplate the themes of resources, socio-economic, governance, and risks (in particular climate change); to characterize the baseline situation, assess the state of resources and the implementation of planning options and, monitor the implementation of the proposed measures against the objectives and targets of the new management solutions.

4. Final Considerations

Water resources have been used in multiple and conflicting ways, generating environmental, social and economic consequences. With this in mind, legal aspects are being developed to discipline these conflicts, such as, for example, the establishment of management models with greater social participation to discuss the improvement in the use of these natural resources.

This being said, in Portugal and Brazil, CRH and CBH have emerged as popular participation devices to improve the rational use of water resources. Thus, in the Portuguese model there are currently 4 CRHs, while in the Brazilian there are 232 CBHs. Within this cutout stands out the Councils of the Hydrographic Region

of the Center in Portugal and the Hydrographic Basin Committee of Apodi-Mossoró River in Brazil that are municipalities of recent creation, installation and operation, enabling a comparative case analysis or study.

The history of these water resources management mechanisms allows us to see that they were instituted recently, as the CRH of Center/Portugal was established in 2007 and created in 2015 with up to 49 members, while the CBH of the Apodi-Mossoró River in Brazil was instituted in 2010 and installed in 2013 with up to 30 titular members and 30 alternates.

The performance of these authorities showed similarities related to the execution of actions in meetings held every four months, and the representatives were very participative. However, the differences are related to the themes discussed, since in Portugal environmental monitoring and risk management prevail, and in Brazil, the main concerns are popular participation and environmental monitoring.

Thus, it can be observed that the participation of the members of the CRH Center/Portugal and the CBH of the Apodi/Mossoró River in Brazil, also presented similarities (degree of participation, segment diversity, number of members, participation of the civil society and participation of the private sector) and differences (degree of interest, ways of choosing members, level of knowledge of the members, interaction among members and participation of the public power).

Given this scenario, some improvement measures are pointed out for the operation of these management bodies regarding the adequate training of the representatives, a greater contribution from the representatives, more interaction among the representatives, stimulating the motivation of the representatives' participation, planning activities with more recurrence, interactive planning with other sectors, defining priorities, establishing an action plan for priorities, organizing the difficulties of the representatives' participation, and energizing future challenges.

Therefore, given the fragile scenario of performance in the CRH of Center/Portugal and the CBH of the Apodi-Mossoró River in Brazil, new studies on these representatives are necessary, which address aspects related to their socio-economic profile and level of environmental perception, aiming to define guidelines for greater involvement.

Informação Suplementar

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Referências

- Agra Filho, S. S. & Ramos, T. B. (2015) Análise do modelo institucional de gestão da água para a aplicação da AAE: estudo comparativo entre Portugal e Brasil. *Revista Eletrônica de Gestão e Tecnologias Ambientais (GESTA)*, 3(2).
- Araújo, R. S., Alves, M. Da G. A., Melo, M. T. C. de, Chrispim, Z. M., Mendes, M. P. & Silva Júnior, G. C. (2015). Water resource management: A comparative evaluation of Brazil, Rio de Janeiro, the European Union, and Portugal. *Science of the Total Environment*, 511, 815–828.
- Alovisi Júnior, V. & Berezuk, A. G. (2012). Análise comparativa de gestão de recursos hídricos em Portugal e no Brasil. *Associação Portuguesa dos Recursos Hídricos*, 33(1).
- Amorim, A., Ribeiro, M. Braga, C., Schmidt, L. & Ferreira, J. (2015). *Marcos Regulatórios e Convenção de Albufeira: a participação pública nos mecanismos de gestão e planeamento da água no Brasil e na Península Ibérica*. XXI Simpósio Brasileiro de Recursos Hídricos, Brasília.
- Amorim, A. L., Ribeiro, M. M. R. & Braga, C. F. C. (2016). Conflitos em bacias hidrográficas compartilhadas: o caso da bacia do rio Piranhas-Açu/PB-RN. *Revista Brasileira de Recursos Hídricos*, 21(1).
- ANA, (2020). *Gestão das Águas 2019*. Agência Nacional das Águas – ANA.
- APA (2020). *Água 2019*. . APA - Agência Portuguesa do Ambiente,
- Barbosa, F. D. (2019). *Comitês de Bacias Hidrográficas, representação e participação: desafios e possibilidades à gestão da água e dos recursos hídricos* [Tese de Doutorado]. Universidade Federal de São Carlos.
- Bento, S. & Brás, O. (2019). Participação na gestão da água em Portugal: reflexões sobre o espaço, o tempo e as formas de participação. *Recursos Hídricos*, 1(40).
- Barros, A. M. L., Paiva, L. F. G. & Cisneiros, S. J. N. (2017). Desafios da gestão dos usos múltiplos da água para atendimento energético ante a crise hídrica da bacia hidrográfica do Rio São Francisco – Operador Nacional do Sistema Elétrico (ONS). *Bahia Análise de Dados*, 27(1), 258-278,
- Bolson, S. H. & Haonat, A. I. (2016). A governança da água, a vulnerabilidade hídrica e os impactos das mudanças climáticas no Brasil. *Veredas do Direito*, 13(25).
- Brasil (1997). *Lei das Águas. Lei nº 9.433, de 8 de janeiro de 1997*.
- Cabo, E. F. De M. (2016). *Governança dos Recursos Hídricos e Alterações Climáticas: o papel dos Conselhos da Região Hidrográfica* [Dissertação de Mestrado]. Universidade Nova de Lisboa.
- Caldas, R. C. da S. G., Diz, J. B. M., Andreucci, A. G. A. & Accioly, E. (2019). Gestão sustentável participativa transnacional: o direito de acesso a água potável, saneamento e sua governança global. *Revista Opinião Jurídica*, 17(25).
- Campos, V. N. de O., Francalanza, A. P. F. (2010). Governança das águas no Brasil: conflitos pela apropriação da água e a busca da integração como consenso. *Ambiente & Sociedade XIII*, 2.
- Casarin, L. P. (2017). *Avaliação da legislação vigente dos recursos hídricos no Brasil: um enfoque nas questões ecológicas*. Universidade Estadual Paulista
- Cerqueira, L. S., Fadul E., Vitória, F. T. & Morais, J. L. M. (2016). Produção científica em gestão de recursos hídricos no Brasil no período de 2002 a 2011: uma análise da sua contribuição para o setor. *Revista Gestão e Planejamento*, 17(2).
- Coelho, M. G. M. S. C. (2019). *Indicadores dos processos de planeamento de recursos hídricos e de avaliação*

- ambiental estratégica* [Tese de Doutorado]. Universidade Nova de Lisboa.
- Costa, F. S., Nossa, P., Magalhães, S. & Magalhães, M. (2011). *A legislação dos recursos hídricos em Portugal e no Brasil: uma análise histórica comparativa*. International Water Resources Association (IWRA)
- Costa, F. E. V. (2017). *Gestão dos recursos hídricos na bacia hidrográfica do rio Caeté/Pará/Brasil* [Tese de Doutorado]. Universidade Estadual Paulista – UNESP.
- Derísio, J. C. (2017). *Introdução ao controle da poluição ambiental* (5ª edição). Oficina de Textos.
- Fadul, E., Vitória, F. T. & Cerqueira, L. S. (2017). Governança participativa na gestão de recursos hídricos no Brasil: uma análise da realidade do estado da Bahia. *SINERGIA*, 21, 79-90.
- Feil, A. A., Strasburg, V. J. & Spilki, F. R. (2017). Variáveis intervenientes na existência de comitês de bacias hidrográficas no Brasil. *Ambiente & Água: An Interdisciplinary Journal of Applied Science*, 12(2).
- Ferreira, S. M. & Debeus, G. (2018). Avaliação dos modelos de gestão ao longo da história em Portugal e Brasil: um olhar acerca das tendências internacionais nas políticas hídricas. *Revista Geografia em Atos*, 2(9).
- Ferreira, C. (2017). Os hidroconflitos e a hidrodiplomacia na gestão das bacias hidrográficas internacionais. O caso ibérico. *XVII Simpósio Brasileiro de Geografia Física: Os desafios da Geografia Física nas fronteiras do conhecimento*, 7423-7427. - 10.20396/sbgfa.v1i2017.2606
- Foleto, E. M., Costa, F. S., Zucco, E. & Meier, M. A. (2015). Conjuntura da gestão das águas no Brasil e em Portugal. In *Anais do XVI Simpósio Brasileiro de Geografia Física Aplicada* (pp. 3070-3077).
- IGARN (2017). *Dados oficiais 2017*. IGARN - Instituto de Gestão das Águas do Estado do Rio Grande do Norte.
- Lopes, M. M. & Neves, F. F. (2017). A gestão de recursos hídricos no Brasil: um panorama geral dos estados. *FACEF Pesquisa: Desenvolvimento e Gestão*, 20(3).
- Luz, J. P. (2017). *A governança dos recursos hídricos no comitê de gerenciamento da bacia hidrográfica Taquari-Antas* [Tese de Doutorado]. UNIVATES.
- Magalhães, S. C. M., Magalhães, M., Costa, F. & Nossa, P. (2011). *O gerenciamento das bacias hidrográficas no Brasil e em Portugal: um contributo atual*. International Water Resources Association (IWRA).
- Marconi, M. de A. & Lakatos, E. M. (2017). *Fundamentos de Metodologia Científica* (8ª edição). Atlas.
- Martins, R. C. (2015). Fronteiras entre desigualdade e diferença na governança das águas. *Ambiente & Sociedade*, 13(1).
- Martins, R. & Fortunato, A. (2016). Critical analysis of the Portuguese Water Industry Restructuring Plan. *Utilities Policy*, 43, 131-139.
- Morandi, M. I. W. M. & Camargo, L. F. R. (2015). Revisão sistemática da literatura. In A. Dresch, D. P. Lacerda & J. Antunes Jr. (2015). *Design science research: método e pesquisa para avanço da ciência e da tecnologia*. Bookman. (pp. 100-102).
- Meier, M. A., Costa, F. S. & Basso, L. A. (2015). A participação social na gestão dos recursos hídricos: um paralelo entre Brasil e Portugal. In *Anais do XII Simpósio Luso-Brasileiro de Engenharia Sanitária e Ambiental – SILUBSA*. Associação Brasileira de Recursos Hídricos. (pp. 06-09).
- Meier, M. A., Zucco, E. & Costa, F. S. (2015). O planejamento dos recursos hídricos no Brasil e em Portugal. In *Anais do XXI Simpósio Brasileiro de Recursos Hídricos*. Associação Brasileira dos Recursos Hídricos. (pp. 02-07).
- Poças Martins, J. & Godinho, F. N. (2016). *Conselho Nacional da Água, 20 anos da história da água em Portugal* (vol. 1) Conselho Nacional da Água.
- Portugal (2000). *Directiva 2000/60/CE de 23 de Outubro de 2000*. Jornal Oficial das Comunidades Europeias.
- Portugal (2005). *A presente lei aprova a Lei da Água, transpondo para a ordem jurídica nacional a Directiva n.º 2000/60/CE, do Parlamento Europeu e do Conselho, de 23 de Outubro, e estabelecendo as bases e o quadro institucional para a gestão sustentável das águas* (Lei n.º 55 de 29 de dezembro de 2005).
- Portugal (2007). *Decreto-Lei n.º 347 de 19 de outubro de 2007*.
- Portugal (2015). *Criação dos conselhos de região hidrográfica e regula o seu funcionamento* (Portaria n.º 37 de 17 de fevereiro de 2015).
- Portugal (2017). *Lei n.º 44 de 19 de junho de 2017*.
- Ribeiro, M. A. de F. M. (2016). *Participação pública na gestão de recursos hídricos no Brasil e em Portugal* [Tese de Doutorado]. Universidade Federal de Campina Grande – UFCG.
- Ribeiro, M. A. de F. M., Ribeiro, M. M. R. & Varanda, M. P. (2016). Public participation for bulk water charge: Paraíba River Basin Committee (Brazil) and Alentejo Hydrographic Region Council (Portugal) cases study. *Revista Brasileira de Recursos Hídricos*, 21(4).
- Rio Grande Do Norte (2003). *Política Estadual de Recursos Hídricos, institui o Sistema Integrado de Gestão de Recursos Hídricos – SIGERH e dá outras providências* (Lei Estadual nº 6.908, de 11 de julho de 1996, modificada pela Lei Nº 481 de 03 de janeiro de 2013).
- Rio Grande Do Norte (2010). *Comitê da Bacia Hidrográfica do Rio Apodi-Mossoró* (Decreto Governamental nº 21.881, de 10/09/2010).
- Schultze, M. S., Gomes, E. T. A., Gottald, S. & Rodorff, V. (2019). O que é uma boa participação pública? Conceitos, desafios e guias para reflexão. *Revista Iberoamericana del Agua*, 6(1).
- Sereno, A. (2015). A participação pública: uma das respostas à denominada "crise a democracia"? o caso dos planos das regiões hidrográficas portuguesas. *Direito*, 13.
- SEMARH (2020). *Dados oficiais 2020*. SEMARH - Secretaria de Meio Ambiente e Recursos Hídricos
- Silva, A. R., Fonseca, A., Monteiro, J. & dos Santos, L. (2018). A gestão e monitoramento das águas: uma abordagem das legislações em Portugal e no Brasil. *Revista Brasileira de Geografia Física*, 11(4), 1512-1525.
- Silva, M. B., Herrero, M. M. A. G. & Borges, F. Q. (2017). Gestão integrada dos recursos hídricos como política de gerenciamento das águas no Brasil. *Revista de Administração da Universidade Federal de Santa Maria*, 10(1).
- Silva, S. C., Ferreira, T. & Pompeo, M. L. M. (2013). Diretiva quadro d'água: uma revisão crítica e a possibilidade de aplicação ao Brasil. *Ambiente & Sociedade*, 16(1).
- Soares, E. Z. (2015). *Os Planos de Gestão de Região Hidrográfica em Portugal Continental: contributo para o desenvolvimento de um instrumento para a avaliação de planos de recursos hídricos* [Tese de Doutorado]. Universidade do Minho.
- Teixeira, P. A. C. (2018). *O setor da água em Portugal e a introdução da remunicipalização: o caso de Mafra* [Dissertação de Mestrado]. Universidade de Lisboa.
- Travassos, N. L. M. (2013). *A gestão dos recursos hídricos frente aos desafios de efetivação da legislação ambiental: uma abordagem comparativa entre Portugal e Brasil* [Dissertação de Mestrado]. Universidade do Porto.

- Trindade, L. de L., Scheibe, L. F. & Ribeiro, W. C. A governança da água: o caso dos comitês dos rios Chapecó e Irani-SC. *Geosul*, 33(68).
- Vasconcelos, L. (2011). Ecosistemas, Água e Participação: estratégias nas políticas de recursos hídricos do Portugal, Brasil e Moçambique. *Revista Online da Sociedade Portuguesa de Ecologia*, 2, 29 – 41.
- Vasconcelos, D., Gondim, N., Hordones, P., Silva, A. & Barros, M. (2016). Governança da água no Brasil: uma contribuição bibliométrica. *Revista HOLOS*, 8, 147-155.
- Young, J. & Sedoura, F. M. (2019). Planos diretores municipais e planos de gestão das águas: uma análise comparada das cidades de Lisboa/PT e Porto Alegre/BR. *Urbe: Revista Brasileira de Gestão Urbana*, 11, 1-16.
- Zucco, E. & Costa, F. S. (2015). Avaliação dos planos de gestão de região hidrográfica de Portugal: os ciclos de planeamento e o programa de medidas. In O. Vieira & F. Costa (Orgs.), *II Simpósio de Pesquisa em Geografia*, (pp. 64-72). Departamento de Geografia da Universidade do Minho.