Analysis and consistency of data on the purpose of use of water resource grants in the State of Tocantins in the CNARH40 system

Análise e consistência de dados das finalidades de uso das outorgas de recursos hídricos do Estado do Tocantins no sistema Cnarh40

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ABSTRACT: The Brazilian National Registry of Water Resource Users (CNARH), established by Resolution No. 317 of 2003, is a system that aims to gather and systematize detailed information about water users, facilitating equitable and sustainable management of resources. It was implemented in Tocantins in 2017 and has been widely used since then, where the user declares data on water use and subsequent validation by technicians from the Tocantins Nature Institute (Naturatins). Given the inconsistencies in the data users declare, it is necessary to validate them on the platform. From the data export to a spreadsheet and subsequent categorization of the interferences, the status of each point was identified, including categories such as Under analysis, Rejected and not grantable, Invalid, Granted and authorized, Insignificant use, and Others. The research highlighted the categories of Granted and Insignificant use, analyzing the consistency of the declared purposes in comparison with the administrative acts in the Integrated Environmental Management System (SIGAM). Reclassifying the purposes revealed that many interferences in the "others" category could be better specified. The analysis also highlighted a notable increase in the categories "Services" and "Animal Raising," reflecting changes in the practices and needs of water resource use in the State. These results suggest the need for improvement in the categorization and processing of grant data to ensure more efficient and accurate management of water resources.

Keywords: Water use, granting, insignificant use, sustainable management.

RESUMO: O Cadastro Nacional de Usuários de Recursos Hídricos (CNARH), estabelecido pela Resolução N° 317 de 2003, é um sistema que visa reunir e sistematizar informações detalhadas sobre os usuários de água, facilitando uma gestão equitativa e sustentável dos recursos. Foi implementado no Estado do Tocantins em 2017 e amplamente utilizado desde então, onde o usuário declara os dados dos usos de água e posterior validação por técnicos do órgão Instituto Natureza do Tocantins - Naturatins. Em observância às inconsistências dos dados declarados por usuários, verificou-se a necessidade de validação dos mesmos na plataforma. A partir da exportação dos dados para uma planilha e subsequente categorização das interferências, identificou-se a situação de cada ponto, incluindo categorias como "Em análise", "Indeferido e não outorgável", "Inválido", "Outorgado e autorizado", "Uso insignificante" e "Outro". A pesquisa deu destaque às categorias "Outorgado" e "Uso insignificante", analisando a consistência das finalidades declaradas em comparação com os atos administrativos no Sistema Integrado de Gestão Ambiental (SIGAM). A reclassificação das finalidades revelou que muitas interferências na categoria "outros" poderiam ter melhor especificação. A análise também destacou um aumento notável nas categorias "Serviços" e "Criação Animal", refletindo mudanças nas práticas e necessidades do uso dos recursos hídricos no Estado. Estes resultados sugerem a necessidade de aprimoramento na categorização e processamento dos dados de outorga, para assegurar uma gestão mais eficiente e precisa dos recursos hídricos.

Palavras-chave: Uso de água, outorga, uso insignificante, gestão sustentável.

INTRODUCTION

The Brazilian National Registry of Water Resource Users (CNARH) is a fundamental instrument for the management and administration of water resources in Brazil. Established by Resolution No. 317 of August 26, 2003, its main objective is to integrate with the Brazilian National Water Resources Information System (SNIRH), which is organized, implemented, and managed by the Brazilian National Water and Basic Sanitation Agency (ANA) (Brasil, 2003). This instrument gathers detailed information about users of water resources in the country, including individuals and legal entities under public or private law that use water resources for different purposes.

The creation of CNARH enabled more efficient and sustainable management of water resources to guarantee the use of water in an equitable, integrated, and environmentally responsible manner for all. The CNARH, as Souza, Nunes, and Acselrad (2017) state, is the response to a government action implemented to generate greater efficiency and effectiveness for the public and agility in the process analysis, in addition to ensuring the availability and quality of water for current and future generations in Brazil.

The information listed by the user when registering includes basic data to identify the user, their location, the volume of water used, the purpose of use, information on the granting of the right to use water, among other essential data to assist the state water resources manager in planning and making decisions about the management of available resources.

The system, which has undergone different interfaces and significant changes, now has its improved version, CNARH 40. Souza, Nunes, and Acselrad (2017) highlight that the system, in addition to allowing the identification of each interference in water bodies point by point, also identifies the purposes related to the use and the respective regularization document.

Established by Resolution 317 of August 26, 2003, by ANA, the CNARH became a mandatory requirement for the request and renewal of water resources grants through Ordinance No. 413 of August 25, 2014, by the Tocantins Nature Institute (Naturatins), the regulatory and executor agency of environmental policy in the State of Tocantins (Naturatins, 2014). It has the power to manage the registry of uses and interferences of water resources data, with information regarding user regularization acts.

Considering that the initial registration of use in Tocantins is carried out by the user at the time of entering the granting process, some of these registrations have inconsistent information, mainly related to the purpose of water use, since this information, in some cases, may require technical knowledge to classify the purpose of use.

A recent technical study prepared by the agency's technical team of analysts presented the profiles of water resource users in the State (Naturatins, 2024), analyzing them according to the use of resources by river basin. The study used data extracted from a CNARH data spreadsheet. From then on, the need for a new study was identified, highlighting the analysis of inconsistencies in the data given by the users, primarily verifying the purpose of use of the issued permits and the declarations of insignificant use in the State of Tocantins.

In this sense, this article aims to analyze and ensure consistency of the data on the purpose of water resource grants in the State of Tocantins available in the CNARH40 system. By investigating the accuracy and integrity of this data, we sought to identify possible flaws and propose improvements that could contribute to more efficient and sustainable management of water resources in the Tocantins.

METHODOLOGICAL PROCEDURES

Initially, the interferences of Tocantins were selected on the CNARH40 platform, and the data was exported to an information spreadsheet. The first analysis involves applying filters and establishing a classification gradient for the situations of interference declared to the agency. Interference points are categorized considering the situation in which each is found until data collection. They are categorized as:

• **Under analysis:** the interference point has not yet been evaluated, and there may be no open process on the given point or duplicate data,

• **Rejected and not grantable:** refers to interferences already assessed, and the analysis found that it was impossible to grant the point,

• **Invalid:** applies to data that was invalidated because it did not show a point of interference in a watercourse or divergent information,

• **Granted and authorized:** refer to manually analyzed and authorized interferences that have a valid license during the authorization period,

• **Insignificant use:** these are self-declared authorizations that have low volume capture, less than 21.6 m³/day,

• **Others:** refers to a point uncategorized in any of the other classes, which could be an error by the analyst.

This research only analyzed and included data related to interferences with the concession status and insignificant use, which are interventions with a valid authorization act with the environmental agency.

Immediately afterward, the purposes of the selected interferences were separated, which are the data subject to the consistency of this study. This selection also covers the initial period of data on interferences declared in the CNARH up to the moment of the research (between January 2017 and June 2024).

After establishing the data and the period to be investigated in the research, the next step is the inconsistency analysis, which is the process of identifying, evaluating, and correcting discrepancies through the point-by-point verification of each of the authorized acts, ratifying them and reclassifying them for the other categories of purpose that already exist and are consolidated. To do this, each administrative act to which the interference point refers is consulted in the Naturatins database, the Integrated Environmental Management System (SIGAM), where the administrative acts, processes, and other technical documents are managed and stored. In summary, **Figure 1** presents the methodological process of this research.

Figure 1. Visual description of the methodological analysis process of CNARH interferences.
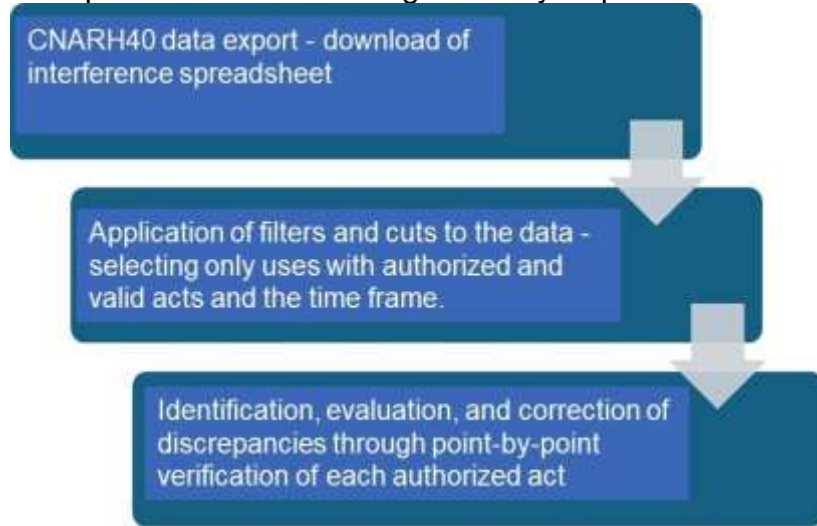
RESULTS AND DISCUSSIONS

As shown in **Graph 1**, it is possible to observe the different situations in which each data is found by selecting the CNARH interference data from January 2017 to June 2024. The categories represented there are part of the reality of the agency, where the procedures for obtaining a water resource grant go through analysis, invalidation, and granting or not granting.

Graph 1. Status of grants declared to Naturatins

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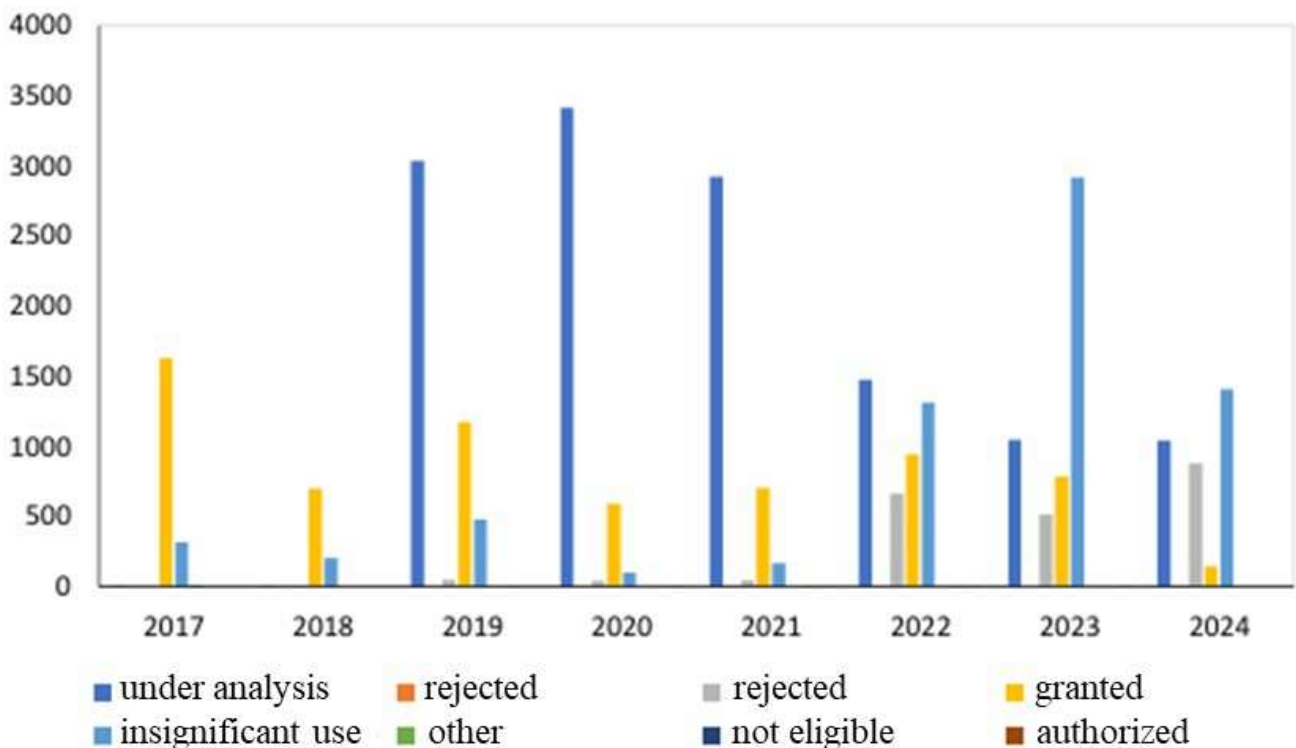
From the data presented in **Graph 1**, it is possible to observe a significant volume of interferences under analysis from 2019 to 2021, a period in which there is a decrease in verifications at the points where declared water interferences occur.

Another highlight is the insignificant use in all years, which increased significantly in 2023, surpassing the other classes by almost 3000 interference points. This event may be related to the fact that, as of 2019, the Declaration of Insignificant Use (DUI) began to have its procedure online and self-declaratory, as regulated by the Naturatins Regulation No. 1 of May 10, 2017 (Naturatins, 2017). Another highlight is the interference granted. As seen in the graph, 2017 had the highest number of grants issued and evaluated. In the following years, the number of points with regularized and valid grants stabilized somewhat from one year to the next, with data above 500 and just below 1000 interferences.

These last two highlights (of insignificant use and granted) are those that have administrative acts (current licenses), and the data of these interferences were validated by analysts from the Naturatins agency. This data enables us to evaluate the consistency of what the user declared on the CNARH platform and has an administrative act according to its nature or purpose.

After understanding the nature of the data available on the platform, we proceeded to analyze the purposes, that is, to analyze the use requested by the user of water resources, between insignificant use and granted, in each of the years. **Table 1** shows the purposes of use with 13 distinct categories. Each category refers to a different use of water resources already foreseen by the categories present on the CNARH platform. For these established categories, the user must choose which one fits the purpose of use to proceed with the registration of the interference point.

Table 1. Purposes of the uses of water resources declared on the CNARH platform for Granting and Insignificant Use data. Classes of water uses and total quantity for each year

	2017	2018	2019	2020	2021	2022	2023	2024	Total
Public Supply	67	29	30	46	73	58	9	-	312
Hydroelectric Use	1		5	7	8	2	3	1	27
Aquaculture	79	28	43	7	10	51	7	5	230
Human Consumption	331	59	64	10	23	65	67	20	639
Animal Husbandry	204	166	567	178	206	1086	2174	1119	5700
Sanitation	5	1	5	4	1	7			23
Industry	76	31	41	18	16	22	18	7	229
Irrigation	205	99	99	63	89	109	62	16	742
Mining	34	15	27	4	3	11	5	2	101
Hydraulic Works	492	62	84	106	21	17	71	11	864
Others	153	238	322	35	79	280	692	251	2050
Reservoir / Dam	276	146	345	200	324	481	557	99	2428
Services	15	19	6	5	12	54	21	12	144

Note: The numbers presented refer to the amount of interference for each declared water use class.

In this study, to facilitate understanding and better arrangement of the data extracted from CNARH, which are sometimes less expressive, some categories of classes were

grouped, such as Aquaculture in Excavated Tanks and Aquaculture in Net Tanks, becoming one, the Aquaculture class, as shown in the **Table 1**. The same procedure occurred for mining interferences: Mining - Extraction of Sand and Gravel in Riverbeds and Mining - Other Extractive Processes become the Mining class. This merging procedure aims to facilitate the reader's understanding.

The different purposes on the platform reflect the categories established by Conama Resolution No. 357 of March 17, 2005 (Brasil, 2005) for freshwater use. However, the "Others" class does not derive from a specific use of water resources but rather from a purpose not specified or not included in any of the options.

When discriminating between the categories of granting status for insignificant use and granting for "others," a large number of this category is observed, as in the study by Naturantis (2024). Especially for the last year, the purpose of "others" has a high number, as shown in **Graph 2**, in declarations of insignificant use.

When comparing **Graph 1** and **Graph 2**, it is possible to observe that in 2023, among the granting situations and the purpose "Others," for both purposes, there is a significant number of interferences of insignificant use. The insignificant use class refers to the use of surface or groundwater that requires up to 21.6 m³/day, which does not require a grant but rather a declaration filed with the agency, as recommended by Naturatins Ordinance No. 156, of May 31, 2019 (Naturatins, 2019).

When checking the purposes of use of the issued grants and the declarations of insignificant use, highlighting each of the interferences, and analyzing the administrative act documents, it is possible to observe that the external user does not distinguish between the different categories of purposes of water use, which are registered in the same way. In several cases where the purpose was "others," it could be classified as one of the other categories.

Graph 2. The number of interferences declared in the CNARH, with the purpose of Granting and Insignificant Use between 2017 and June 2024
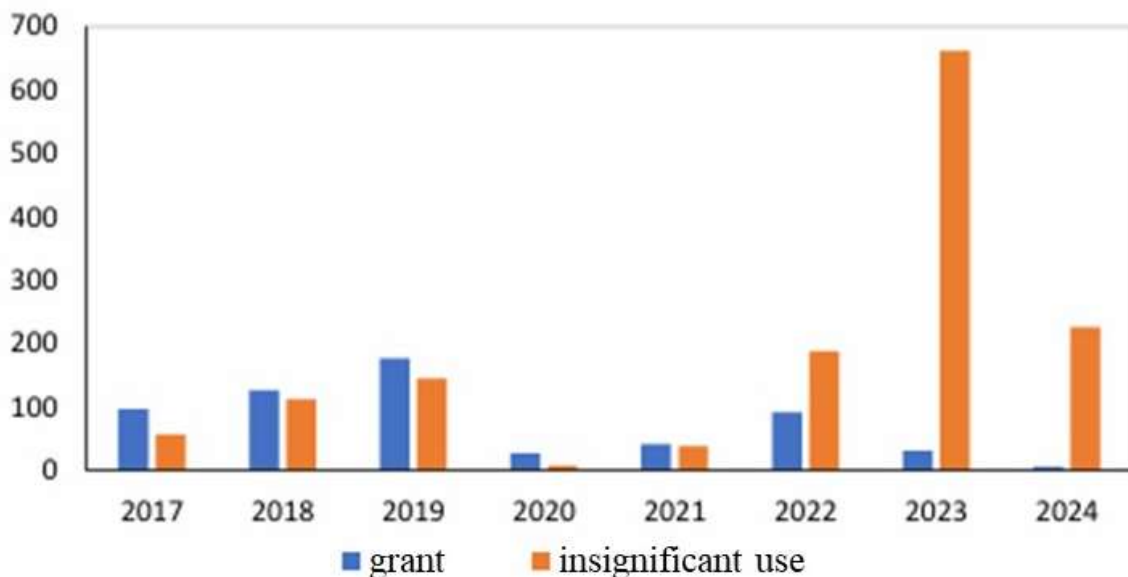

Table 2 shows how the analysis of inconsistencies in these data has a significant impact, given that the process of analysis and verification point by point leads to greater certainty and an effective response to the use of water resources.

Table 2. The purposes of the uses of water resources declared on the CNARH platform for Grant and Insignificant Use data after reclassifying the water use classes with the total and final quantity for each year

	2017	2018	2019	2020	2021	2022	2023	2024	Total
Public Supply	67	29	30	46	73	59	9	-	313
Hydroelectric Use	1	-	8	7	9	5	6	1	37
Aquaculture	79	31	45	7	11	52	7	5	237
Human Consumption	335	91	101	11	26	67	85	26	742
Animal Husbandry	208	178	595	179	211	1103	2235	1144	5853
Sanitation	6	1	8	4	1	10	-	-	30
Industry	76	39	51	19	18	34	27	8	272
Irrigation	206	102	101	64	91	118	67	19	768
Mining	34	16	27	4	3	13	6	4	107
Hydraulic Works	492	62	84	106	21	17	71	11	864
Others	-	-	-	-	-	-	-	-	0
Reservoir / Dam	276	146	345	200	324	482	557	99	2429
Services	158	198	243	37	77	283	616	226	1838

Note: As in Table 1, the numbers refer to the amount of interference for each declared water use class.

When comparing the data and values in **Tables 1** and **2**, it is possible to observe that with the data processing and reclassification of the "Others" category, several classes increased over time, with the Services category being especially significant. The classes of Public Supply (1), Hydroelectric Use (10), Aquaculture (7), Sewage (7), Mining (6) and Reservoir/Dam (1) had a slight difference in increase over the years, varying from 1 to 10 interferences.

The Human Consumption class presents 103 more interferences, a considerable increase, considering that between 2018 and 2019, this increase represented 32 and 37 more interferences, respectively, and in 2023, there was also a significant increase of 18 interferences.

For Industry and Irrigation, the increase was 43 and 26 interferences, respectively. This increase also reflects an interesting aspect: during the analysis of the administrative acts issued, it is observed that there are cases in which there is more than one type of use of water resources in the administrative act. For these cases, the reclassified purpose was the one for which there was predominant use, that is, the one that has the most weight in relation to water consumption, since, in these cases, classifying more than one use for the same point would result in duplication of data and interference at the same point.

A class of purposes that increased significantly with the reclassification was "Animal Husbandry." When comparing the total of the two tables for the class, there was an increase of 153 interferences. Being the largest class, it reflects that livestock farming is increasingly evolving in the State of Tocantins, being representative of its agricultural production, as shown in the study by Sobrinho, Aragão and Bracarense (2023).

For all years (from 2017 to June 2024), "Services" was the category with the highest increase in data. The increase is especially due to the general expression of a diverse range

of services that do not fit into the other categories and may even have low-impact services, such as agricultural spraying, which does not have a significant impact on water consumption like irrigation, but which serves as an essential practice for crop management. The use of water for cleaning services, domestic use, non-primary use, wetting of roads, and other uses can also be characterized as services, in addition to the same fact described in which the reclassified purpose was that for which there was predominant use, with "Services" being the predominant use.

CONCLUSIONS

The Brazilian National Registry of Water Resources Users (CNARH) has a crucial role in water resources management in Brazil, facilitating the integration and organization of information and data on the users of these resources. Analysis of the data available on the platform reveals a series of challenges and opportunities to improve water resources management.

The data presented demonstrate that the purpose category "Others," representing a significant portion of the declarations of insignificant and granted use, has not accurately reflected the uses of water resources. This non-conformity can be attributed to the self-declaratory nature and the lack of a more precise categorization or interpretation by users, a fact that is evidenced by the increases and variations in the recorded interferences.

When explaining the purposes of use previously categorized as "Others," a general increase is revealed in the categories of Human Consumption, Industry, and Irrigation, with emphasis on the Services category, which, despite encompassing a wide range of activities, has shown a notable increase. This growth reflects the growing demand for water in various sectors and the need for more detailed and specific management for each type of use.

Therefore, to enhance the efficiency and sustainability of water resources management, it is essential to implement measures that improve the accuracy of registration data. Periodic audits, review of usage categories, and improvement of declaration and validation processes are recommended. These actions will contribute to more transparent and effective management, ensuring that public policies and resources are allocated appropriately and responsively.

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