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The bibliometric survey of the valuation of environmental and heritage resources

Levantamento bibliométrico da valorização dos recursos ambientais e patrimoniais

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ABSTRACT

Natural resources are essential for the development of capitalist societies, and for a long time, there was a belief that, due to their abundance and the false notion that they were inexhaustible, the scientific production concerning the limits of their use was neglected. Environmental valuation emerges as a tool to assign economic value to natural resources and ecosystem services, facilitating financial compensation for their degradation and encouraging sustainable practices. This article analyzes the methods of environmental and heritage valuation, focusing on scientific publications between 2012 and 2022, using data from CAPES and BDTD. The research employs keywords to identify and analyze relevant publications, offering a comprehensive overview of techniques and trends in the field.

Keywords: Bibliometric study; Environmental valuation; Heritage valuation.

RESUMO

Os recursos naturais são essenciais para o desenvolvimento das sociedades capitalistas e por muito tempo houve uma crença de que por sua abundância e noção falsa de que eram inesgotáveis, foi negligenciado a produção científica de limites de uso desses recursos. A valoração ambiental surge como uma ferramenta para atribuir um valor econômico aos recursos naturais e aos serviços ecossistêmicos, facilitando a compensação financeira por sua degradação e motivando práticas sustentáveis. Este artigo analisa os métodos de valoração ambiental e patrimonial, focando em publicações científicas entre 2012 e 2022, utilizando dados da CAPES e da BDTD. A pesquisa emprega palavras-chave para identificar e analisar as publicações relevantes, oferecendo uma visão abrangente das técnicas e tendências na área.

Palavras-chave: Valoração ambiental; Valoração patrimonial; Estudo bibliométrico.

INTRODUCTION

Natural resources are a key piece for prosperity in a capitalist society. However, for many years there was little concern about these resources. Besides being abundant, they had low intensity of use due to the still-developing technology and the mistaken belief in the impossibility of their exhaustion and scarcity.

With investments in socio-environmental studies, science, and consequently the significant evolution of industry and agricultural mechanization, the environment has suffered and continues to suffer from imbalances. This has brought forth various hypotheses about what is causing this disharmony in environmental, social, and economic resources (Cavalcanti, 1995).

With the increased understanding of the environment and how our interactions with it can cause irreversible damage to our lives as a society, it has been discovered that natural resources are limited and many are non-renewable. Furthermore, animal and plant species depend on ecosystem services for their existence, which is essential for the existence of *Homo sapiens*.

Due to the importance of media attention and global advocacy for the environment, and as a consequence of discussions on more sophisticated and comprehensive environmental policies, with international agreements and treaties aimed at restoring degraded areas and new ways to ensure compensation for environmental damages caused by individuals or companies, the monetary valuation of the environment has become a focal point in discussions.

Known as environmental valuation, this approach seeks to economically assess the value of a natural resource. Through this financial exchange, we would be inclined to relinquish it. This article clarifies the concepts of all environmental and patrimonial valuation methods and thus allows us to better visualize the analysis of data on publications between 2012 and 2022 from the Coordination for the Improvement of Higher Education Personnel (CAPES) and the Brazilian Digital Library of Theses and Dissertations (BDTD).

The data analyzed in this article were gathered using keywords that describe each valuation method, providing a more accurate reference in each search and also delimiting the research period.

ENVIRONMENTAL AND HERITAGE VALUATION METHODS

Environmental and heritage valuation are fundamental tools for decision-making in public policies, urban planning, and the conservation of natural and cultural resources. With the spread of information related to sustainability and the safeguarding of environmental and cultural heritage, there is a growing need to objectively quantify the costs and benefits of preservation versus degradation of resources.

Different methods have been developed and employed to estimate the economic value of assets, given their plurality and multidimensionality. This chapter aims to present a review of the main methods of environmental and heritage valuation, discussing their theoretical foundations, practical applications, and the inherent limitations of each approach.

We can begin the discussion on environmental valuation by considering the concept of value. Castro and Nogueira (2019) state that "value only exists if the good or service provides some benefit to the individual (some utility for him or her)." They further complement that value is not the good or service itself but something assigned to that good or service by individuals' perceptions; that is, each person will have a unique relationship and perception.

Heritage valuation is defined by Iudícibus (2014) as "a process that seeks to assign economic value to the elements that make up an entity's heritage, in order to reflect as accurately as possible the financial and patrimonial situation of that entity." This process thus enables the creation of precise financial statements, providing tools for decision-making.

According to Castro and Nogueira (2019), there is no comprehensive method for evaluating an environmental asset, but one characteristic of existing methods is their classification, so to speak, by the presence or absence of the "demand function" in their theoretical framework. Methods that use the demand function as a basis aim to reveal user preferences, while methods that do not use the demand function reveal the preference for the production function.

We will identify the following valuation methods: contingent valuation, travel cost valuation, hedonic pricing, dose-response method, avoided cost, and opportunity cost. The goal is to define in a simple and understandable manner what each valuation method encompasses and how it is, and can be, applied.

The Contingent Valuation Method (CVM) is conducted through surveys aimed at revealing environmental impacts and estimating individuals' willingness to pay (WTP) or

willingness to accept compensation (WTA). According to Haley, Shogren, and White (1997) cited in Castro and Nogueira (2019), there are five essential components for developing a CVM application:

> 1. Establish a scenario in a questionnaire: designing a hypothetical market, which involves describing the good or service to be evaluated; 2. Apply the questionnaire: obtaining data, capturing attitudes through interviews; 3. Estimate the demand function and willingness to pay for the good or service; 4. Assess the statistical properties of the generated demand function; 5. Infer from the sample's willingness to pay value: from which, based on the model, inferences are made for the population. (CASTRO & NOGUEIRA, 2019, p. 37. Our translation)

The Travel Cost Valuation Method (TCM) is used to calculate "the value of recreational benefits generated by ecosystems," according to Nogueira and Castro (2019). This method aims to determine how much people are willing to pay to visit and enjoy a recreational site, using real choice behavior to reach a value, which will be the average of various values.

For this calculation, several elements are considered, such as admission fees (if any), the monetary cost of traveling to the recreational site, the opportunity cost of travel time, the opportunity cost of time spent at the site, expenses incurred at the site, and the monetary cost of returning home. (Nogueira e Castro, 2019, p. 63)

The Hedonic Pricing Method (HPM), according to Castro and Nogueira (2019), is used to determine the values of goods, services, and environmental assets that are affected by external market prices. This method can obtain the direct use value of an environmental asset but does not capture the total economic value.

HPM is useful for environmental valuation as it allows for the determination of the value of environmental characteristics such as noise pollution, proximity to parks, and air quality through their impacts on property prices, for example.

Another method of environmental valuation is the dose-response method. Motta (1997) states that "dose-response functions depend on a deep understanding of ecosystem interactions and, therefore, rely on reliable data. " This method is widely used to expose, through a curve or mathematical function, how the response (or effect) varies with different levels of exposure (dose) to a given issue.

> According to Esperancini (2001), the dose-response method is applied when: 1. People are unaware of the effects that pollution causes and thus do not adjust to improve their well-being. It may be that no significant relationship is found between increased pollution and health effects because individuals are already adjusting preventively to the effects of pollution. 2. It is not

> possible to elucidate preferences using any of the direct methods due to the unavailability of data or the lack of market sophistication among the affected population. (ESPERANCINI, 2001, p. 5. Our translation)

Another environmental valuation method is avoided cost, which seeks to optimize the use of natural resources and inputs to prevent greater environmental impacts in the future. According to Castro and Nogueira (2017), avoided cost (AC) is a valid tool for rationalizing decisions, whether in public or private environments related to the use and conservation of natural capital.

The final method to be discussed is opportunity cost, which according to Motta (1998), is used to measure the consumption of goods and services that were at some point forgone. For him, the main purpose of this method is "to represent the costs incurred by different agents involved in environmental protection to assist in the political process of setting priorities."

SCIENTIFIC PRODUCTION ON EXISTING VALUATION METHODS

Scientific publications provide guidance on the state of research within the academic realm and the development of human capital prepared for the labor market. Additionally, they variably guide economic aspirations and sectors related to social demands.

This study aimed to survey articles, theses, and dissertations on environmental and heritage valuation from the last ten years to quantify scientific production on these topics. Togather the articles, a search was conducted on the CAPES Journal Portal, linked to the Ministry of Education through CAFe, the Federated Academic Community, of which the State University of Goiás is a part. Another filter applied was peer review; articles that had not undergone this process were not included.

For the theses and dissertations, the search was conducted through the Brazilian Digital Library of Theses and Dissertations (BDTD), which is affiliated with IBICT, the Brazilian Institute of Information in Science and Technology.

The data collected covered works from 2012 to 2022. Keywords related to environmental and heritage valuation were used to search in titles and subjects of the works. Boolean search tools using "quotes" were also employed, with parentheses restricting terms/expressions to ensure exact matches.

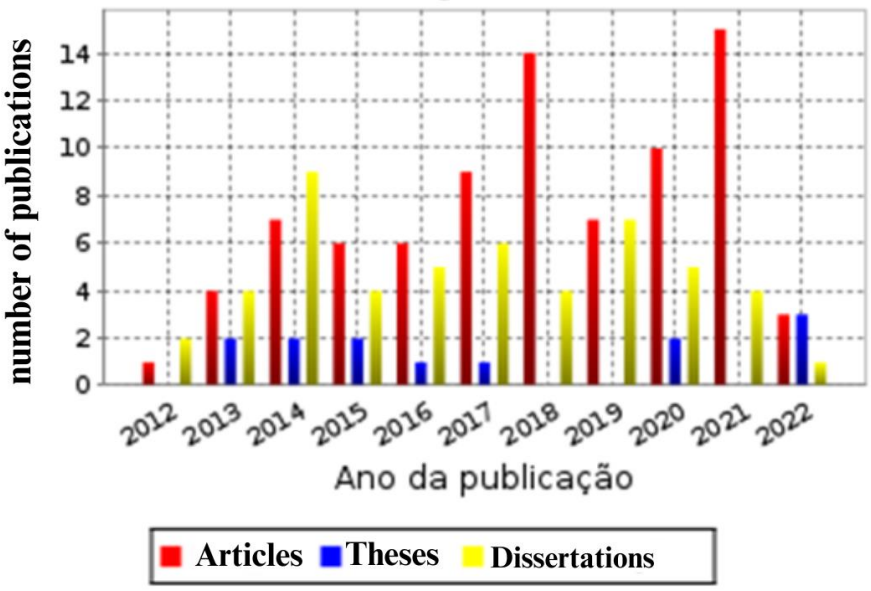
Eight keywords and expressions were defined for the research: 1. environmental valuation; 2. heritage valuation; 3. contingent valuation; 4. travel cost valuation; 5. hedonic pricing; 6. dose-response method; 7. avoided cost; 8. opportunity cost. It is believed that these terms encompass a wide range of areas and methods for developing environmental and material valuation.

The search was conducted using these general terms without restricting the search to only specific terms, meaning there could be intersections between terms, and publications might appear in multiple searches. The following graphs illustrate the results of the research.

The first graph shows the results for the term "environmental valuation" as a result, we found one hundred fifty-one publications produced in the last ten years related to this term. This includes eighty-two articles in the CAPES Journal Portal, thirteen doctoral theses, and fifty-one master's dissertations from all regions of Brazil.

Most articles are associated with the content of theses and dissertations, indicating that research is predominantly occurring within the academic environment. This could potentially strengthen legislation and the implementation of programs and projects based on scientific support.

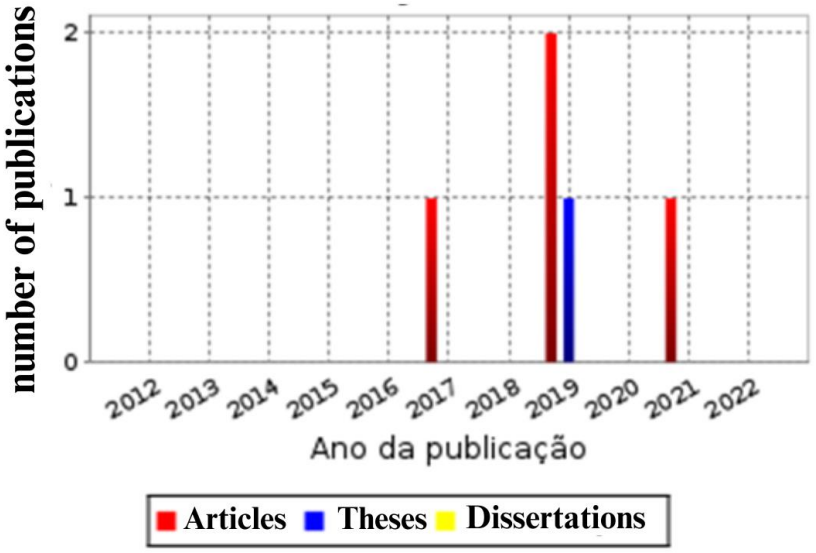
Graph 1 – Term: Environmental Valuation



Source: Research data, 2023

The second term researched was “heritage valuation” the search returned only four articles published in the last ten years, with two of them in Spanish. In the search within the Brazilian Digital Library of Theses and Dissertations, only one thesis was found related to the term, and no dissertations were identified. This leads us to consider the lack of research in this field and how it might impact public policies concerning material and immaterial heritage.

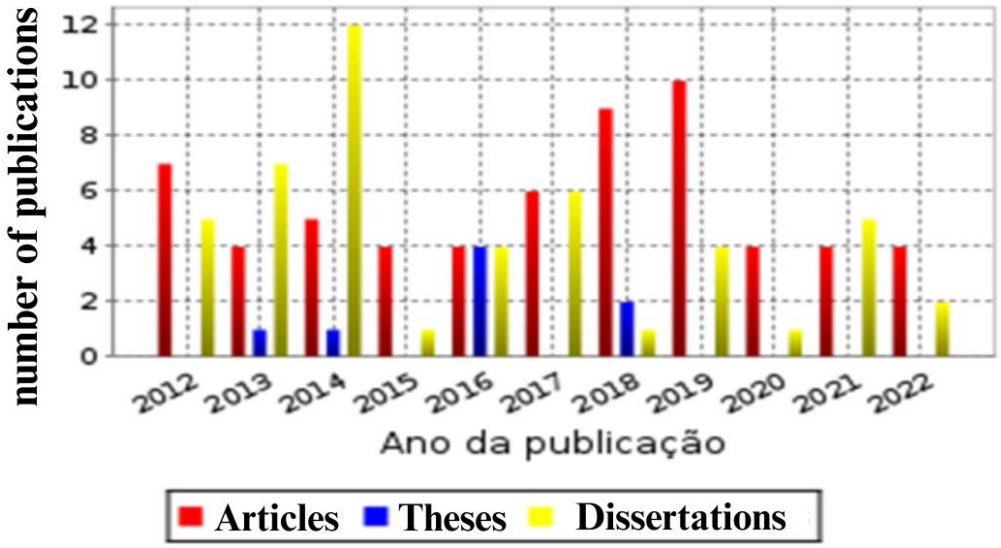
Graph 2 – Term: Heritage Valuation



Source: Research data, 2023

The next term researched was “contingent valuation” the search revealed sixty-one articles published in CAPES over the last ten years. In the BDTD, eight theses and forty-eight dissertations related to the term were found. We can observe once again that the number of articles on this topic is substantial.

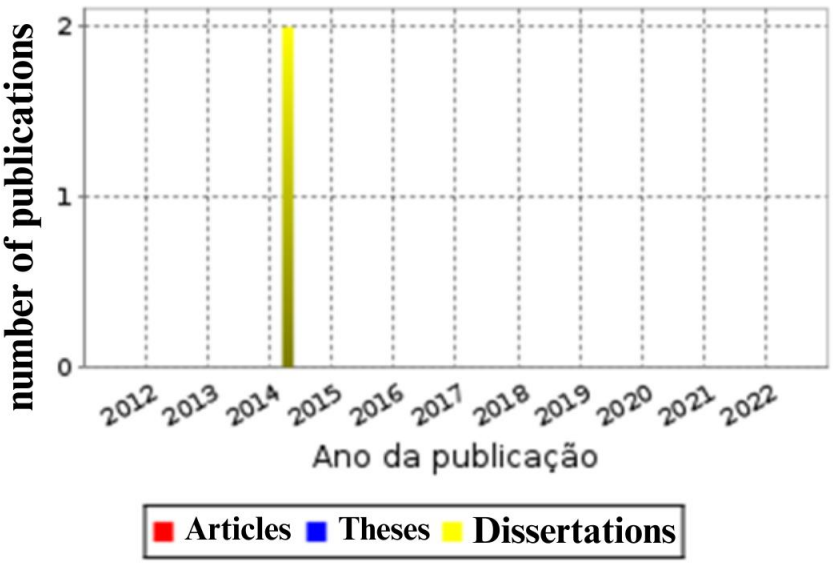
Graph 3 – Term: Contingent Valuation



Source: Research data, 2023

Next, we researched the term "travel cost valuation" and found no publications in the last ten years, including articles, theses, or dissertations. The search was then revised to "travel cost," yielding only two dissertations from 2014. Despite the term being widely used in the literature, the reason for the low number of studies in this area remains inconclusive.

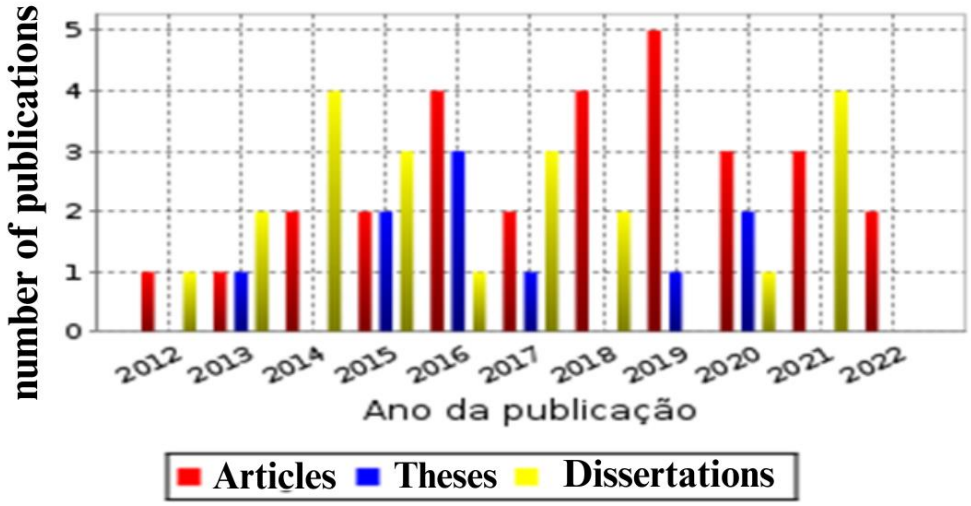
Graph 4 – Term: Travel Cost



Source: Research data, 2023

The search continued with the term “hedonic pricing” which returned many results. In the last ten years, twenty-eight articles with this term in the subject or title were published, one of which is not related to environmental valuation research. In the BDTD, ten theses and twenty-one dissertations addressing hedonic pricing were found. It can be concluded that the hedonic pricing method is extensively studied, likely due to its strong association with the real estate market.

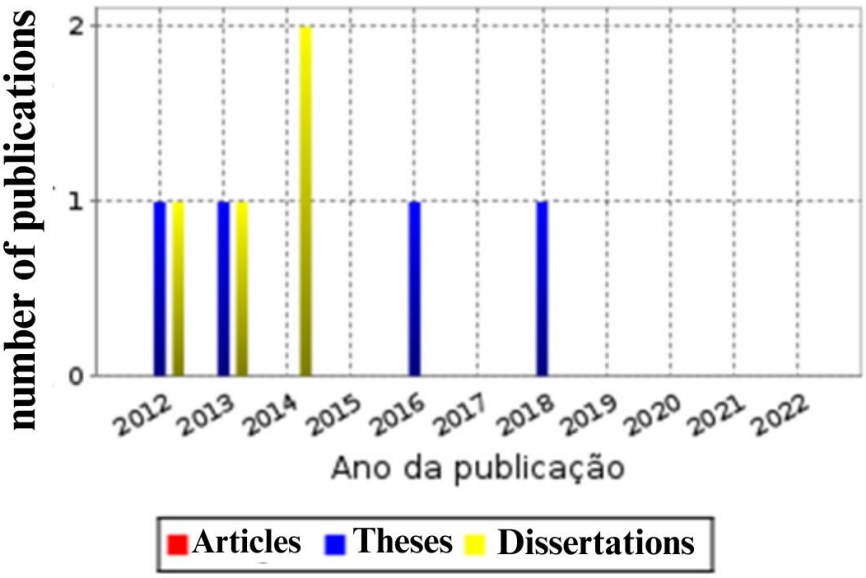
Graph 5 – Term: Hedonic Pricing



Source: Research data, 2023

The next term researched was “dose-response method” from the analysis of theses and dissertations, it is evident that this term is widely used in veterinary, biological, and agronomic sciences, which skewed the data related to environmental valuation. No articles were found with this term. However, one thesis and four dissertations were identified.

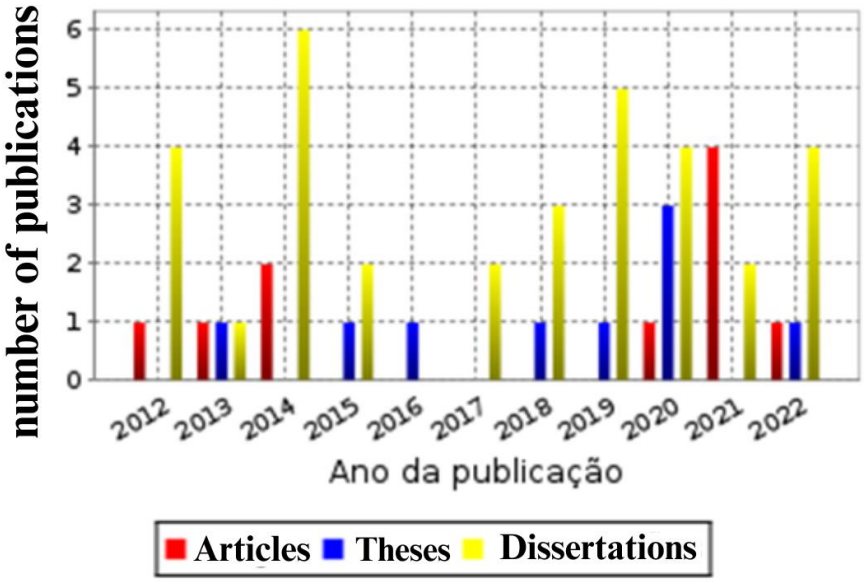
Graph 6 – Term: Dose-Response Method



Source: Research data, 2023

Another term researched was “avoided cost” which yielded fifty-two publications. The CAPES database returned ten articles published between 2012 and 2022. In the BDTD, nine theses and thirty-three dissertations related to the term were found during the same period.

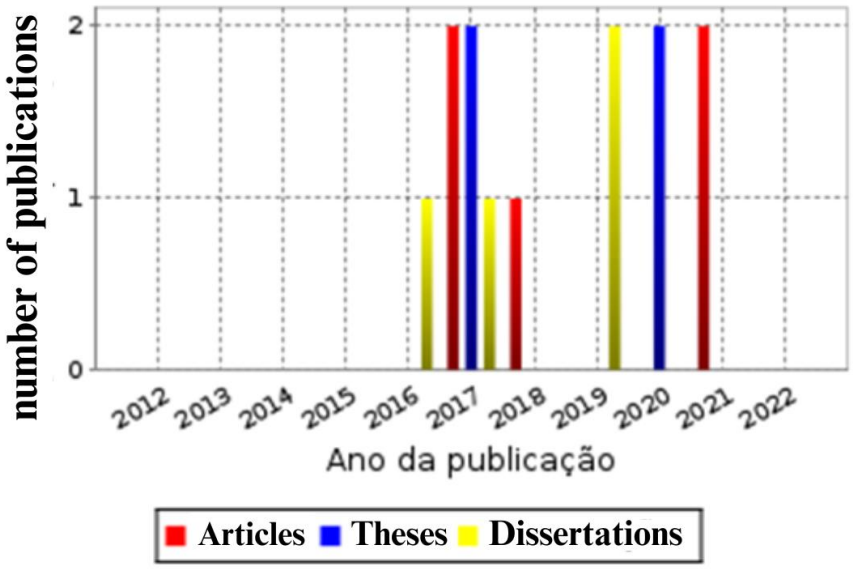
Graph 7 – Term: Avoided Cost



Source: Research data, 2023

The last term researched was “opportunity cost” which is also frequently found in the literature. In CAPES, five articles referencing the term were found. In the BDTD, there are four theses and four dissertations on the subject.

Graph 8 – Term: Opportunity Cost



Source: Research data, 2023

FINAL CONSIDERATIONS

The topic of environmental and heritage valuation is of utmost importance to our society. These studies are essential for guiding the costs, damages, and ways to contribute to a less unequal society, with a focus on sustainable environmental conservation. The need for this process arises from the excessive use of natural resources and the necessity to mitigate the damages that certain engineering projects can cause over time, such as the impact of sewage systems near springs or forests, resulting in harm not only to the local flora but also to the fauna.

Studies from the past decade highlight the importance of analyzing various perspectives and objects, such as ponds, lakes, parks, forests, rivers, and air quality. These studies have opened doors for contributions to environmental preservation by adopting an economic approach and strategies to mitigate damage and species loss, or even promote their increase.

For example, in Recife, the creation of a port altered the breeding patterns of sharks. In other locations, increased agriculture has modified soil structure and climate. With this new focus on environmental valuation, it is possible to contribute to improving the quality of life for Brazilians.

Disseminating these research findings is crucial for demonstrating the diverse methods of pricing goods that lack market value. It is of utmost urgency that multidisciplinary approaches be extensively explored in this context, as the mosaic to be constructed is vast and there are many discrepancies within capitalist sectors.

The research also reveals that heritage valuation is falling short of its potential, and its contribution needs to be better explored. It is necessary to introduce these methods to places where they are not yet utilized, both to raise public awareness and to guide governments seeking the expansion of commodities, who often overlook the resulting damages. Once lost, some heritage cannot be reconstructed. Therefore, economic sciences, along with other fields of knowledge, need to unite to pave the way forward.

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