Overview of Citizen Science Projects Contemplated in the Civis Platform

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Abstract. The idea of Citizen Science in the context of Open Science stems from the implicit recognition of the importance between science and democracy. This connection implies that knowledge is shared among evebody and that science is its institutional form. However, running counter to this idea of democratically shared knowledge is the historical process of institutionalization that has almost always assumed the exclusion of the lay citizen. This is the fundamental tension that historically underlies all the polarities between science and curious and literate citizens, novices and experts, laymen and professionals. **Proposal:** In the present research we will deal with the possibilities and analysis of participatory science, represented by Civis Portal: Citizen Science Platform, desenvolvida pelo Instituto Brasileiro de Informação em Ciência e Tecnologia (Ibict). **Methodology:** The study presents a qualitative approach, with the use of documental research and with a descriptive character, in order to verify the projects in Citizen Science developed in Brazil. The research includes consulting the website of the Civis platform, in the topic Initiatives, in order to retrieve the registered projects. The next step was to verify the models of citizen participation, defined as contributive, collaborative and co-created and establish a categorization for analysis of the projects from the elements area data collection, social participation, open data and scope. **Results:** As results of the research, it is understood that most of the projects are collaborative, developed in the area of Biological Sciences, use mobile data collection, encourage social participation, are national in scope, and do not specify the issue of open data within the projects.

Keyword: Citizen science · Open science · Citizen participation · Engagement of volunteers · Biological sciences

1 Introduction

Within the framework of the European project Socientize, in 2013 the Green Paper on Citizen Science [1] was prepared, which refers to the participation of the general public in scientific research activities in where citizens actively contribute, is supported by their intellectual effort or knowledge of their environment or by contributing their own tools and resources" [1]. These types of projects, in which citizens and experts (researchers,

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scientists, etc.) are connected and interact, are open, cross-cutting, networked, interdisciplinary and participatory, and enhance the correlation between science, society and policy, which enables research and the "collaborative construction of knowledge", which is why Citizen Science is also known as "Collaborative Science".

In this context, a new "scientific culture" is created as participants levels of collaboration vary: they collect data, offer new perspectives through their expertise, and add value to research. In addition, these volunteers develop skills and acquire knowledge about the scientific method. In turn, scientists contribute with methodologies to perform data processing and subsequent analysis, favoring the increase of collective creativity and the potential for scientific innovation, as a consequence of the greater number and variety of collaborators, and the adoption of values typical of responsible research. Along the same lines, Civis: Plataforma de Ciência Cidadã [2], developed by the Instituto Brasileiro de Informação em Ciência e Tecnologia (IBICT) states that its goal is to offer an infrastructure and content aimed at understanding Citizen Science, disseminating its use and providing the basis for the development of initiatives and methodologies in this area. It is an initiative to increase visibility and citizen participation in scientific research, enabling greater engagement of volunteers. It is worth mentioning that the Brazilian Civis platform was developed in open source from the EU-Citizen.Science platform [3], which was funded by the European Commission's Horizon 2020 program, in the "Science with and for Society" work program.

For all these reasons, it is convenient to take into account both the ten key principles necessary for good practices in Citizen Science published by the European Citizen Science Association (ECSA) [4], and the benefits for science, society and citizenship. The objective of this research is to examine the Citizen Science initiatives registered in the Brazilian platform Civis in order to understand this scenario in contemporary Brazil. It is known that Citizen Science is still relatively recent in the country, so it is important to verify the participation models adopted by the projects and the main characteristics inherent to each one of them.

2 Citizen Science

The open science movement mirrors new ways of thinking about and practicing scientific research, resonating directly with traditional institutional guidelines and norms for doing research. This interferes with the process of doing science and how it relates to society at large. Open development is guided by open models and knowledge production in which collaboration is a crucial element, made possible by available and constantly evolving technologies and alternative license regimes, different from traditional ones.

In the context of the Foster Project [5], citizen science is both a goal and an enabling tool for open science. Therefore, it can refer to a) the active and open participation of citizens in the research process itself, through crowdsourcing-type activities, encompassing data collection and analysis, voluntary monitoring, and distributed computing, and b) the increasing public understanding of science, facilitated by better access to information about the research process, notably by the possibility of using open data and having access to open publications.

The Socientize Consortium [1] points out a set of factors that characterize experiences in citizen science: public participation in scientific research with their intellectual effort,

local knowledge or tools and resources. According to Parra [6], with citizen science we have the reinvention of science, changing more than the relations between amateurs and professionals, as well as the dynamics of production, validation, dissemination and appropriation of the knowledge created. Its initiatives enable the participation in formal research activities carried out in large research centers, boosting a greater engagement with science, which later converts into benefits for the whole society in general [6].

The broad spectrum of meanings that encompass citizen science initiatives can be classified into two strands, according to Albagli's study [7]. The first is the pragmatic or instrumental one, in which there is not necessarily openness of data or participation of volunteers in the design and results of the research. The second is the democratic aspect, which incorporates the opening and conformation of new spaces and existing institutional mechanisms, giving rise to greater participation, intervention and empowerment of citizens, towards democratization and appropriation of science and technology aimed at social innovation.

In Brazil, studies in the field of citizen science are still relatively recent and the projects in the Biological Sciences area stand out, covering subjects such as biodiversity and environmental conservation. One of the oldest known is the Atlas of Brazilian Bird Records (ARA) [8], an interactive portal that gathers data on the occurrence of wild birds. A milestone in Citizen Science in Brazil was the creation, in March 2022, of the Rede Brasileira de Ciência Cidadã (RBCC) [9], uniting a group of scientists and science stakeholders, enthusiasts and practitioners of citizen science, result of the debates following the I Workshop Rede Brasileira de Ciência Cidadã; another one was the creation and dissemination of the Plataforma Civis in this year 2022.

2.1 Models of Citizen Participation

The literature review on Citizen Science presents several typologies to understand which activities and under which conditions should be considered citizen science. We will highlight three main categories [10]:

- Contributing projects: citizens often provide data for research created by scientists.
- Collaborative projects: collaboration between scientists and participants in more than one stage of the project.
- Co-created projects: joint proposition between scientists and citizens, where citizens act in the directions and definitions of a project and in various stages.

The document "Ten principles of citizen science" published in 2015 by the European Citizen Science Association (ECSA) [4], sets out the key principles necessary for good practice in Citizen Science. In it, it advocates a partnership relationship between citizens and professional scientists, in which the basic assumptions of science are guaranteed, because according to the European Citizen Science Association Citizen Science configures a research approach like any other, with its limitations and biases that must be considered and controlled during research. Moreover, citizen science programs are evaluated by several aspects: scientific results, data quality, experience for participants, and scope of social and political impacts [4].

3 Methodology

The diversity and multiplicity of national and international projects launched in the context of Citizen Science make it difficult to choose models. However, we will analyze how the selection of projects available on the portal Civis: Citizen Science Platform provides information about the contemplated projects and natural phenomena in different major areas of knowledge, such as Astronomy, Biological Sciences, and Education. Initially we conducted a survey of all the projects gathered in the portal. Then we analyzed the set of information for each project, subdivided into 5 main axis:

Area: description of the Great Areas of Knowledge according to the typology of the Table of Knowledge areas elaborated by the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) [11] of Brazil for the framing of the projects and the main disciplines contemplated
Data Collection: procedure for uploading or making data available
Social Participation: broad description of the project scope to promote volunteer engagement
Open Data: levels of openness and access to data
Scope: territorial space of the data

The establishment of the axes occurred because they are relevant aspects to verify the initiatives. The grouping by area of knowledge provides a general picture of the most important areas in Citizen Science. The issue of scientific data is another important element in citizen science. According to the document "Ten Principles in Citizen Science" [4], data collection is one form of citizen participation in projects, but not the only one, i.e. citizens can participate in several stages of research. In this sense, it is worth investigating how this collection can be done and if the projects mention other forms of participation besides data collection. Moreover, it is necessary to consider that citizens' participation is voluntary. Therefore, this question seeks to verify the ways in which the projects seek the participation of society in general in their research. The scope of territorial coverage of these projects allows a better understanding of the conjuncture of Citizen Science in Brazil.

4 Results

The Civis Platform, object of this study, is still under development (Beta version). Users are called to contribute with observations and suggestions. The figure shows the user interface of the platform (see Fig. 1):

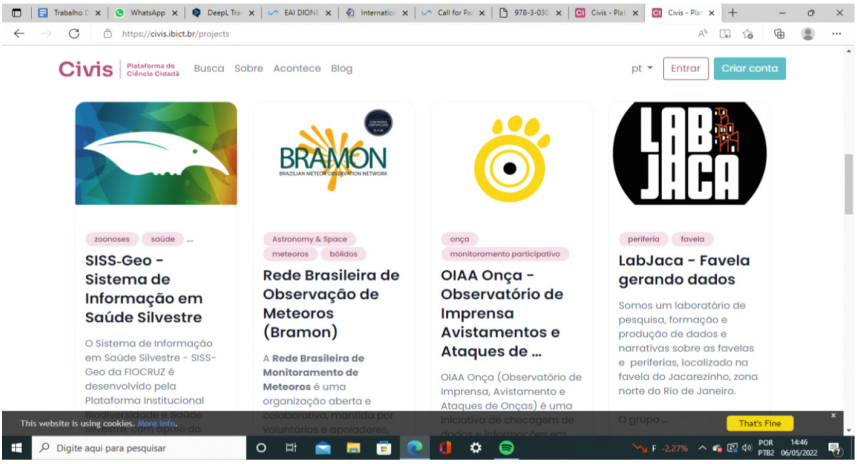

Fig. 1. Visualization of the civis platform interface. 2022

In the topic "Initiatives" in the Civic Platform, 20 projects in Citizen Science were located, which are presented in the table below (Table 1):

Table 1. Citizen science initiatives in Brazil. Source: authors based on Plataforma Civis. 2022

Project	Description
MIND.Funga - Ciência Cidadã	Registration of macrofungi through images collected by citizen volunteers. The project seeks to capture photos of fungi in high-altitude environments in order to improve the digital database of the UFSC [12]
Ciência Cidadã para a Amazônia	This is a network of organizations that work towards the empowerment of citizens and the generation of knowledge about the fish and aquatic ecosystems of the Amazon Basin [13]
Projeto Budiões	It aims to elaborate a database that will help map and monitor the presence of the Buddion fish species along the Brazilian coast [14]
Portal de Zoologia de Pernambuco	It uses Internet and cartography tools, allowing inhabitants, students, teachers, researchers, and university students to contribute with information about the wild animal species found in the State of Pernambuco [15]
SISS-Geo - Sistema de Informação em Saúde Silvestre	Available on smartphones and on the web, it allows monitoring the health of wild animals in various environments: natural, rural, and urban. It acts in the prevention and control of zoonoses, aiming at the conservation of the Brazilian biodiversity [16]

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Table 1. (*continued*)

Project	Description
Rede Brasileira de Observação de Meteoros (Bramon)	It is a non-profit, open and collaborative organization, maintained by volunteers and supporters. Its mission is to develop and operate a network for monitoring meteors [17]
OIAA Onça - Observatório de Imprensa Avistamentos e Ataques de Onças	It aims at checking data and information on jaguar occurrences from the Friends of the Jaguar university extension action and collaborative research in citizen science [18]
LabJaca - Favela gerando dados	It is a laboratory for research, training, and production of data and narratives about the favelas and the peripheries, and is made up 100% of young black people. It uses the audiovisual media to disseminate scientific data and make research accessible to the population, in addition to outlining representative actions of the demands of the territory [19]
Eu vi uma ave usando pulseiras!?	It is based on promoting the monitoring of birds with the participation of the general population. Brazilian ornithologists mark birds with colored rings in their research, and afterwards these birds can eventually be observed from a distance by anyone [20]
Do Pasto ao Prato	Through an application it has the purpose of revealing where meat products come from, aiming to improve the transparency of the supply chains in Brazil and worldwide. It makes it possible to clarify to the consumer the negative impacts of these products [21]
BioTiba - Projetos de Biodiversidade	It proposes to make the population aware of the relevance of knowing and preserving biodiversity, promoting the engagement in bioblitz actions - a short duration event that allows recording as many species as possible in a certain area [22]
BeeKeep	It is a citizen science project for participatory bee research. It covers flight activity monitoring in stingless bees and meliponiculture [23]
Cemaden Educação	It works with a network of schools and communities for disaster risk prevention. The goal is to contribute to the development of a culture of disaster risk perception within the scope of Environmental Education, contributing to the sustainability and resilience of society [24]
EXOSS	It works in partnership with scientific institutions, oriented towards the analysis of meteors and bolides, aiming to unveil their origins, natures, and characterization of their orbits. The acronym EXOSS is pronounced [ézus] ɛzʊs) and the slogan means “Exploring the Southern Sky” [25]

(*continued*)

Table 1. (*continued*)

Project	Description
Blue Change - Ciência Cidadã em ambientes marinhos e costeiros	Initiative focused on the development of Citizen Science projects in Brazil associated with the conservation of marine and coastal environments. It develops the project within the framework of Citizen Science and carries out the management of the entire project, publicizing the projects and results obtained [26]
Brydes do Brasil	A network of voluntary studies on Bryde's whale in Brazilian jurisdictional waters with the purpose of gathering the largest possible number of records of these individuals by means of photos. The objective is to create a database to gather records that will allow us to understand the movements of the species along the Brazilian coast [27]
Projeto Cidadão Cientista - Save Brasil	This is a SAVE Brasil project that aims to carry out participatory monitoring of birds in Conservation Units and urban parks. It develops regular activities, which are open to people of all ages and levels of knowledge about birds [28]
Guardiões da Chapada	The project model is based on the voluntary and conscious participation of citizens, aiming to produce scientific knowledge and raise awareness among the general public about the relevance of the services provided by pollinators with regard to the conservation of the natural heritage of the Chapada Diamantina [29]
Onde estão as Baleias e Golfinhos?	It aims to collaborate with research and the maintenance of cetaceans and their respective habitats through photos and videos of cetaceans - whales, porpoises, and dolphins - in coastal waters of Rio de Janeiro. Its premise is to form a database with the records of sightings [30]
WikiAves	It is a site with interactive content, aimed at the Brazilian community of birdwatchers with voluntary financial contribution from collaborators. It aims to support, publicize and promote the activity of birdwatching. It provides free advanced tools for controlling photos, sounds, texts, species identification, and allowing communication among birdwatchers [31]

Based on the analyses of the website of each project mentioned above, the data collected was analyzed according to the proposed axis:

Area: We identified a predominance of projects in the area of Biological Sciences (80%), with emphasis on the subjects extracted from the keywords associated with each initiative on the platform: biodiversity, ecology, conservation, aquatic ecosystems, marine and coastal environments, oceans, zoology, zoonoses, health, jaguar, participatory monitoring, ornithology, birds, bees, meliponiculture, animals, climate and weather, meat consumption and food; followed by the areas of Astronomy and Education with 10%

each, whose emphasis falls on the subjects space, meteors, bolides, periphery, slum and education (see Fig. 2).

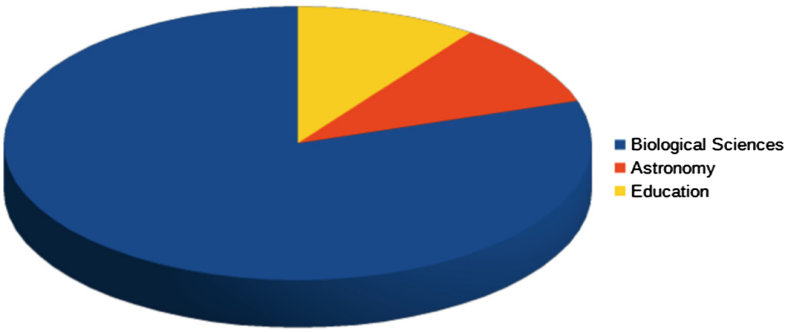

Fig. 2. Great areas of knowledge. 2022.

In the early days of humanity, what was known as the Universe was restricted to a few planets, stars, the Sun, and the Moon. The evolution of human thought over time, and the development and improvement of astronomical instruments, allowed astronomy to reach higher levels. Nowadays, satellites and space probes allow the collection of a massive amount of data and information about the Universe [32]. Astronomy is a multidisciplinary field that involves the study of celestial bodies and phenomena occurring outside the Earth. In this field, research covers the universe and its constituent elements, such as planets, stars, galaxies, among others. For purposes of understanding an area, divisions are made into subareas, as is the case of the Table of Knowledge Areas of CNPq [11], which subdivides Astronomy into: Position Astronomy and Celestial Mechanics; Stellar Astrophysics; Extragalactic Astrophysics; Solar System Astrophysics and Astronomical Instrumentation.

Education can be divided into topics, such as educational administration, planning and evaluation, as well as teaching-learning aspects, curriculum, guidance and counseling, and specific topics of Education [11]. Education, in terms of training and learning, is an activity that takes place in all spheres of life, which as a policy or strategy, cannot be limited to a formal education system. Therefore, it must be based on actions that aim at the development of a nation and its citizens [33].

Biological Sciences have a singularity as an area of knowledge and its own characteristics that distinguish it from other sciences. Until the beginning of the last century it remained more connected to the traditions of Natural History and its organization consisted of branches, more descriptive, such as zoology and botany, and experimental, such as cytology, embryology and human physiology [34, 35]. Added to this is its strengthening as a science with the emergence of genetics, among other factors [34, 35]. Biological Sciences cover subjects of biology in general: genetics, botany, zoology, ecology, morphology, physiology, biochemistry, biophysics, pharmacology, immunology, microbiology and parasitology [11]. The field of Biological Sciences is developed

in Brazil. In the Diretório de Grupos de Pesquisa do CNPq [36], for example, in the field "parametrized query" one can see 20 research groups registered in the area of Biological Sciences in Brazil, besides 34 registers of research lines and the occurrence of 17 registers of the term in keywords of the research lines.
Data collection: We verified that within the scope of the projects the uploading of collected data is done in different ways, as well as we verified a diversity of types of collected documents, according to Table 2:

Table 2. Data upload.

Upload	Projects
Site	9
Application	8
Application and Website	1
Social Networks (Facebook and Instagram)	2

We found that two projects do not have a website or application, and the social networks Facebook and Instagram are the most used form of communication with volunteers. Regarding the documentary typology, photos predominate, and are mentioned in 14 projects. The other types of documents produced were categorized into: video;photo and video; photo and sound, and finally, barcode - all with one occurrence. Another interesting aspect is that three of the analyzed projects promote face-to-face activities to collect materials, as is the case of a project that collects plastic materials on the beach, with the purpose of promoting greater environmental awareness.
Social Participation: Regarding the question about how the engagement of participants is promoted and if they are informed about their possibilities of acting in the project, we obtained as a result that the vast majority of projects practice actions in this direction: 17 of them.
It is noteworthy that four projects mention the possibility of individualized face-to-face or remote service. One of the projects has on its website a topic of orientation for volunteers with clarifications on how to make a good photo, but there is no content, as the site is still under construction. The practices developed by ECSA [4] reveal that Citizen Science initiatives need to actively involve citizens in the activities, providing the generation of new knowledge and understanding about a certain object of investigation. In this sense, it is crucial that the participants are educated so that they can actively participate in the initiatives.
Open Data: Of the twenty projects described, it can be seen that:
Nine mention the issue of open data, with one project showing concern about the data that will be released and stressing the need for constant reflection about what will be shared, when and how; another points out that the data will be open to the public without identifying those responsible for collecting it;

One asserts that the data authors will inform the types of data that can be made available online. The rest, which are eleven projects, make no mention about open data and their level of openness.
Project owners need to keep in mind the ethical and legal issues involved, and the data and metadata resulting from the projects should be made publicly available in open access mode whenever possible ([4]).
Scope: Regarding the scope of the territory in which the data is collected, we infer that seven projects have local data collection scope; twelve are national and one is international.

In the current globalized scenario characterized by an economic, social and technological gap between nations, there is a growing need to take advantage of the maximum possible resources for the creation of solutions, encompassing various types of knowledge, resources, means of participation as well as collaboration, enabling the achievement of positive results with long-term sustainability. Society in general reaps the benefits of Citizen Science, because the initiatives allow the resolution of local, regional, national, or even international problems through agreements and partnerships. In the case of the citizen scientists, they can acquire skills related to the scientific process, professionalization in the area of the project, and satisfaction in acting to solve issues that are tangential to their reality. These are initiatives that do not aim at unilateralism, demonstrating the reciprocal character that Citizen Science is based on [4].

5 Discussion

In our analysis we have seen that the initiatives in citizen science published in the Civic Platform reveal a scenario where there is still no consensus on the use and availability of open data, despite the fact that citizen science has developed in the context of open science. The participation of volunteers, amateur scientists and those interested in general in the themes contemplated by the projects in Citizen Science is beneficial to all. It allows the exchange of knowledge and experiences between academia and society, enriches and improves the volunteers' skills in scientific research, and contributes to the optimization of the time and resources of a research project. However, one must keep in mind that it is necessary to provide volunteers with the opportunity to participate in all phases of the research, without limiting them only to data collection.

Most of the project initiatives come from Research Institutions and Centers, and are predominantly grouped in the axis of Contributive and Collaborative projects. The initiative Do Pasto ao Prato, according to the analysis models used, is not a Citizen Science project, but a tool, because it is an application. Regarding the participation models, it can be seen that most of the projects adopt the contributive perspective, in which citizens act in the collection of data for the research, but without involvement in other stages of the projects. Initiatives such as the Rede Brasileira de Observação de Meteoros (Bramon) and CEMADEN seem to adopt the collaborative model, because in the former it is possible to act as an operator of one or more stations or to collaborate in several important activities for the maintenance of the project, such as training, dissemination, documentation, support, among others; in the latter, students from the schools that are members

of the project can, besides collecting data, guide the community to make a participatory diagnosis of the place where they live, based on a "learning by doing" methodology. Therefore, we can see a collaborative bias in these initiatives.

Projects such as Ciência Cidadã para a Amazônia and LabJaca - Favela gerando dados, present characteristics of co-created models. The latter is a project created in a Brazilian slum, by local residents, to deal with the difficulties caused by the Covid-19 pandemic, in which experts, institutions and citizens act together to solve problems that afflict them as well as to engender public policies; the former offers the possibility of implementing research proposals based on citizens' interests, with the aim of strengthening citizenship and environmental culture in the Amazon of Puno, Peru.

6 Preliminary Conclusions

The platform was recently launched and is still in the testing phase. Moreover, the registration of projects is voluntary and a wide dissemination of the tool is necessary to promote the registration of projects. This will enable a broad and deep knowledge about what is being done in terms of Citizen Science in Brazil, following the example of other countries that use similar platforms. It is suggested to expand the analysis to international Citizen Science platforms from a comparative view, looking for similarities and divergences that enrich the debate in this field and broaden the understanding why some areas arouse greater public interest, both from researchers and society in general.

In general, anyone has knowledge, tools, and resources that can contribute to the advancement of science. Under this paradigm, Civis aims to strengthen the development of a multidisciplinary platform to promote Citizen Science and collective learning based on experience and good practices.

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