

Analysis of citizen science in Brazil: A study of the projects registered in the Civis platform

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ABSTRACT

Objective. In 2022, the Civis platform of the IBICT (Brazilian Institute for Information in Science and Technology) was created. It aimed to provide infrastructure and content for understanding and to disseminate the use of Citizen Science in Brazil. It also aimed to provide the basis for developing initiatives and methodologies in this area. This study analyses the implementation of citizen science in the context of open science. The study seeks to understand how the platform promotes the participation of society in various stages of the scientific process and not only in data collection

Research/Methodology/Approach. The citizen science projects available on Civis: Citizen Science Platform will be surveyed and analyzed. The data collected in October 2022 are subdivided into five main categories: (1) area, (2) data collection, (3) social participation, (4) open data, and (5) scope. These categories are relevant to understand the current stage of citizen science projects in the Brazilian scenario, including the essential knowledge areas, data collection procedures, levels of openness and access to scientific data, and the territorial coverage of these projects..

Results/Discussion. 24 citizen science projects were registered on the Civis platform, most of which are contributive. The primary area of emphasis is Biological Sciences, and they use technological infrastructure for mobile data collection.

Conclusions. Civis is a multidisciplinary platform to promote citizen science in Brazil. The registration of projects is voluntary, which may explain the low adhesion to the platform, besides its recent launch.

Originality/Value. Civis is an essential first-approach tool that enables the understanding of citizen science in Brazil.

Keywords: citizen science; social participation; public understanding of science; open data.

INTRODUCTION

THIS STUDY examines the citizen science initiatives registered on the Brazilian Civis

platform, by which we aim to understand the current scenario of citizen science in Brazil. Despite being a relatively new concept in the country, citizen science has recently gained

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momentum, with many vital initiatives being developed in Biological Sciences. The proposed research will focus on understanding the initiatives and the main characteristics of each citizen science project.

In Brazil, citizen science is a relatively new approach, and projects in the area of biodiversity stand out. One of the oldest ones is the Atlas de Registros de Aves Brasileiras (ARA). This interactive portal gathers data on the occurrence of wild birds. In March 2021, the *Rede Brasileira de Ciência Cidadã* (RBCC) was created, gathering a group of scientists, science stakeholders, enthusiasts and citizen science practitioners. While in 2022, the Brazilian Institute for Information, Science and Technology (IBICT, in Portuguese), an agency of the Ministry of Science, Technology and Innovations of Brazil, created the Civis: Citizen Science Platform (Civis: Plataforma de Ciência Cidadã, in Portuguese), following the molds of the European digital platform *EU-citizen.science*, developed by the European Citizen Science Association (ECSA). This network of researchers, citizen scientists, companies, and political and civil society organizations aims to promote citizen science across Europe through joint actions and exchanges between professionals.

The creation of citizen science associations and networks, which started in the United States and Germany, respectively, with the Citizen Science Association (CSA) and the European Citizen Science (ECSA), is now having a presence in other parts of the world. This is the case of the Iberoamerican Network of Participatory Science (RICAP). This entity aims to raise the impact of citizen science and facilitate the exchange of knowledge among those who make up the network to solidify its capabilities in the Iberoamerican scenario. These digital platforms in citizen science aim to provide infrastructure and content that favor broadening the understanding of citizen science, disseminating its use and providing support for developing initiatives and applying methodologies in this area. The menus offered by Civis are initiatives (projects), resources (technological, such as applications), training (courses in the area), organizations, platforms, and registered users.

This study highlights the growing importance of citizen science in fostering greater collaboration between scientists and the general

public. The European project Societize Consortium (2013) has emphasized the potential of citizen science in increasing the correlation between science, society, and policy, enabling research and “collaborative knowledge building”. By examining the citizen science initiatives registered on the Brazilian Civis platform, this research will:

- provide valuable insights into how this collaboration is being implemented in Brazil,
- examine how these volunteer contributions are used to foster more significant innovation and creativity in scientific research,
- provide insights into how citizen science is promoting greater public engagement in scientific research,
- examine the platform’s benefits in improving citizens’ visibility and participation in scientific research,
- analyze each project’s participation models and critical characteristics, and identify any trends or patterns in the data,
- understand how these initiatives impact the country by assessing their potential to promote scientific literacy, foster community engagement and empower citizens to contribute to scientific research, and
- assess the potential for future growth and expansion of these initiatives and make recommendations for enhancing their impact.

It is worth mentioning that the social participation identified in citizen science projects in IBICT’s Civis platform occurs through citizens’ active and voluntary involvement in scientific data collection, processing and analysis stages. Citizens can get involved in citizen science projects in several ways, such as through mobile applications, web platforms, and face-to-face events. Projects registered on the Civis platform are generally open and interdisciplinary, seeking to increase citizen participation in scientific research and promote collaboration between citizens and experts (scientists, researchers, etc.). In addition, the projects aim to improve the correlation between science, society and politics, allowing the construction of collaborative knowledge. Citizens participating in the projects on the platform develop skills and acquire knowledge about the scientific method. At the same time, scientists contribute

with data processing and analysis methodologies, stimulating collective creativity and potential for scientific innovation.

CITIZEN SCIENCE: A BRIEF OVERVIEW

The open science movement mirrors new ways of thinking and practising 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. Open models and knowledge production guide open development. Collaboration is a crucial element, made possible by available and constantly evolving technologies and alternative licensing regimes different from traditional ones. Therefore, the so-called open science can be understood as an umbrella term that includes, besides the elements of free and open access to scientific publications, other initiatives such as open data, tools, hardware, notebooks, education and, finally, Science (Albagli, 2015). This advocates the participation of society in general in scientific research conducted by professional scientists, aiming at the democratization of research and the development of research skills. The development of scientific projects through social participation is not new in the scientific world. The involvement of society in scientific processes is not recent. Martins & Cabral (2021) state that the term citizen science was coined in the 1990s by researchers Alan Irwin and Richard Bonney.

In the Foster Project (Bezjak *et al.*, 2018), citizen science is both a goal and an enabling tool for open science. Therefore, it refers to:

- a) citizens' active and open participation in the research process through crowdsourcing-type activities or collaborative contributions. By this, it is combined the efforts of volunteers in an environment in which each employee contributes a small part toward a more significant result, for example, encompassing data collection and analysis, voluntary monitoring, and distributed computing
- 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 available publications.

Chan *et al.* (2015) note that crowdsourcing experiments have been used to monitor deforestation in Brazil and Indonesia, natural disasters in Haiti and Pakistan, and gender-based violence in Egypt. Furthermore, they warn that the right to participate in leveraged knowledge production must be for topics of local relevance to people rather than carried out according to a research agenda set elsewhere or imposed from the top down. In the same like, Machado (2015) expresses that opening scientific data in the context of open data principles implies advantages for society and not only for academia.

The White Paper (Serrano-Sanz *et al.*, 2014) is a publication that presents an overview of the concept and practice of citizen science. The book highlights the important values and attributes that characterize citizen science. This book provides a theoretical and practical basis for developing projects and initiatives in this area. The essential values and characteristics mentioned in the white paper include the following:

- Openness. Creation of a culture of openness, unlike the traditional model of science that is closed and restricted to research institutes and centers.
- Social. Citizen science has a social character since it is performed by all and for all. Anyone interested in science can contribute, and research benefits should be distributed to society in general, solving problems or difficulties afflicting the social environment.
- Digital. The constant improvement of digital infrastructures allows the formation of research networks, dissemination of initiatives, and attraction of interested citizens. Technology is essential to citizen science by allowing real-time interactions without geographical barriers. It makes it possible to participate in scientific research from anywhere worldwide.
- Research: driving innovation. It brings into play citizens who, until now, were not involved in scientific processes. The citizens enable the investigation of issues of interest by using their skills, experiences and worldview.

The Societize Consortium (2013) points out a set of factors that characterize the experiences

in citizen science, like public participation in scientific research with their intellectual effort, local knowledge or tools, and resources. According to Parra (2015), with citizen science, we have the reinvention of science, as we are more than the relationships between amateurs and professionals. We also change the dynamics of production, validation, dissemination and appropriation of the knowledge created. Such initiatives allow participation in formal research activities in large research centers, boosting a greater engagement with science, which later converts into benefits for the entire society (Albagli, 2015).

Citizen science can revolutionize scientific research by involving the general public in data collection and analysis. However, the reality is that open data is not the norm in citizen science, and access to citizen science datasets is often restricted. This is particularly true for datasets in the Global Biodiversity Infrastructure Facility (GBIF), which are among the most limited access due to default copyright licenses (Groom *et al.*, 2017). The lack of open data in citizen science is a significant concern, as it limits the potential for collaboration and innovation. When data is restricted, scientists cannot build on the work of others, and the public cannot access the information they have helped collect. In addition, the absence of open data also undermines the democratic nature of citizen science, as the public cannot see the fruits of their labor. The problem is that scientists did not go to the effort of creating creative commons licenses, which allow for the free use, distribution and modification of data (Bowser *et al.*, 2020). However, there are other reasons for the lack of open data in citizen science, such as concerns about data privacy and security (Ganzevoort *et al.*, 2017) and data misuse (Fox *et al.*, 2019). The solution is to encourage scientists to adopt open data policies and to provide education and support for the public on the importance of open data.

Furthermore, it is also essential to address the concerns of citizen scientists regarding data privacy and security, as well as the proper usage of data (Pearce-Higgins *et al.*, 2018). While citizen science can revolutionize scientific research, the lack of open data is a significant concern that undermines the potential for collaboration and innovation. It is crucial to encourage scientists to adopt open data policies

and address citizen scientists' concerns regarding data privacy and security.

SOCIAL PARTICIPATION IN CITIZEN SCIENCE

The literature on citizen science highlights several typologies for understanding which activities and under what conditions should be considered citizen science. These are the three main categories (Bonney *et al.*, 2009):

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

The document "Ten principles of Citizen Science" developed in 2015 by the working group "Sharing best practice and building capacity" of the European Citizen Science Association (ECSA), does not determine a model of social participation to be adopted by citizen science initiatives; but sets out the fundamental principles necessary for good practice in this regard. The document advocates a partnership relationship between citizens and professional scientists. The document guarantees the basic premises of science because, according to the European Citizen Science Association, citizen science is a research approach like any other, with its limitations and biases that must be considered and controlled during research. Moreover, several aspects of citizen science programs are evaluated: scientific results, data quality, participants, experience, and scope of social and political impacts (European Citizen Science Association, 2015).

The above categorization shows that citizen participation is a central element of citizen science. However, there are different layers in which this action can develop. It can be more instrumental or pragmatic, as defined by Albagli (2015), as citizens act in a predefined stage, usually data collection or democratic, in which they can participate in several stages of the scientific process, including decision-making. Ribeiro & Rocha (2021) consider that the

inclusion of the public in scientific research through citizen science actions may represent the most remarkable development in science communication in recent years. Science projects that provide volunteers with levels of participation that go beyond data collection and that pay attention to the quality of their participation identifying the motivations for their involvement in citizen science can make a decisive contribution to the greater engagement of Brazilians in science (Ribeiro & Rocha, 2021).

It is understood that the democratic aspect recommended by Albagli (2015) allows citizen scientists to participate in more than one stage and not only in data collection. However, this is possibly the most remembered activity when considering citizen science. According to Albagli (2015), the idea is to constitute new institutional spaces and mechanisms, giving way to greater participation, intervention, and empowerment of citizens toward the democratization and appropriation of science and technology aimed at social innovation.

In the academic context, Silva (2019) asserts that the exchange of scientific data, which is the data collected during the scientific investigation, is fundamental for science since it enables the researcher to use, analyze, and reproduce other research results. This data exchange helps either to replicate them or to refute them, subsidized by the knowledge obtained from the access to the data that provide support for a study. They allow for saving time and financial resources for the projects, accelerating the development of scientific processes. Ries & Oberhauser (2015) found that 17% of the papers published since 1940 on monarch butterflies used data from citizen science projects or another form of public participation. This has shed light on what was happening to the species during the winter. In addition, the initiatives increased the public interest in monarch butterflies and their conservation.

Ries & Oberhauser (2015) also state that data accumulated from the analyzed citizen science programs are still underutilized. They were never used or were not used on a large scale to take advantage of their comprehensive coverage. It is evidenced that many of these data were unknown or would be unavailable to researchers until recently. The situation has changed with the entry on the scene of MonarchNet: The

North American network of monarch butterfly monitoring programs and the North American Butterfly Monitoring Network (Ries & Oberhauser, 2015) that configure a network of volunteer-based monitoring programs seeking to develop approaches regarding the use, sharing, and management of scientific data. Another example brought by the authors is that of the eBird platform, which has accumulated 500 million biodiversity records during its brief history, and its data have been used in more than 120 peer-reviewed publications (Ries & Oberhauser, 2015).

The Brazilian Action Plan of the Partnership for Open Government (Brasil *et al.*, 2021), in its milestone number 5, titled: "Proposed Citizen Science Indicators" evidences the government's interest in citizen science in Brazil. In the current globalized scenario, characterized by an economic, social and technological gap between nations, there is a growing need to make available resources to create solutions. These solutions should encompass various types of knowledge, resources, means of participation and collaboration, allowing positive results with long-term sustainability. However, citizen science does not yet have a portal or directory that brings together all its initiatives, projects, resources and tools. The Civis platform is an essential means to understand the current stage of Brazilian citizen science, as it aims to understand aspects such as social participation and data collection development, among others.

METHODOLOGY

We selected the citizen science initiatives available on the Brazilian Civis platform using the search tool provided by the portal. Data collection occurred in October 2022 and included a survey of all projects registered on the platform. The collected data was then analyzed using five main categories:

1. Area. According to the typology of the Table of Knowledge Areas established by the National Council for Scientific and Technological Development (CNPq), the major areas of knowledge are linked to the Ministry of Science, Technology and Innovations to encourage research in Brazil. This classification provided a broad understanding of the

Brazilian scenario's current state of citizen science projects.

2. Data collection. The procedure for uploading or making scientific data available.
3. Social participation. The scope of the project is to promote voluntary engagement.
4. Open data. Levels of openness and access to scientific data.
5. Scope. The territorial space of the data.

In the Civis platform, on the topic of “initiatives”, the registered projects were surveyed. Then, each project's website, available on the platform, was consulted to collect the study data referring to the categories mentioned

above. The mapping of the projects, along with their characterization, was presented in a table. The grouping by knowledge area provided a general picture of the most critical areas of citizen science. At the same time, the data collection and social participation issues offered insight into how the projects involve citizens in their research.

RESULTS

The Civis Platform is still under development (Beta version). Users are called to contribute with observations and suggestions. Figure 1 shows the main interface of the platform:



Figure 1. The main interface of the website of Civis: Citizen Science Platform.

The 24 identified projects are described in Table 1.

Based on the analysis of each project, we identified the following:

- 1) Area: the initiatives are categorized according to CNPq's Great Areas of Knowledge: Biological Sciences, Exact and Earth Sciences, Human Sciences, and Applied Social Sciences. In that sense, we identify a predominance of projects in Biological Sciences (79%), followed by Exact and Earth Sciences (8%), Humanities (8%), and Applied Social Sciences (4%). Among the most highlighted themes, we found:
 - a) Biological Sciences: biodiversity, ecology, conservation, aquatic ecosystems, marine and coastal environments, oceans, zoology, zoonoses, health, jaguar, participative monitoring, ornithology, birds, bees, meliponiculture, animals, climate and weather; urban plague, butterflies, traditional communities, and climate change;
 - b) Exact and Earth Sciences focus on Astronomy with emphasis on the themes of space, meteors, and solids;
 - c) Human Sciences: periphery, slum, education, and Citizen Science;
 - d) Applied Social Sciences: meat consumption and food.
- 2) 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 confirmed a diversity of types of collected documents, according to Table 2.

PROJECT	DESCRIPTION
Laboratório de Ciência Cidadana (Citizen Science Laboratory)	LabC-ULAGOS is an interactive platform between science and society to construct knowledge to solve problems and meet citizens' demands.
Listas Ecológicas de Espécies de Borboletas (LEEB) - Curitiba e Paraná (Ecological Lists of Butterfly Species, Curitiba City and Paraná State)	The initiative of the Museu Aberto de Biodiversidade does Instituto de Ciência e Tecnologia em Biodiversidade ICTBIO. Its goal is to make available the dynamic listing of butterfly species recorded in Curitiba and Paraná.
Tem Cupim lá em Casa (There's a termite in the house)	It seeks to map the distribution and occurrence of termites in the urban environment, aiming to guide the best strategy to solve the situation of termites located in the participants' homes.
CoAdapta Litoral (CoAdapta Coast)	Its pillar is the integration of local observations with scientific knowledge. It encompasses the participation of local and traditional communities in coastal areas.
MIND.Funga - Ciência Cidadã (MIND.Funga - Citizen Science)	It registers macrofungi through images collected by citizen volunteers. The project seeks to capture photos of fungi in high-altitude environments to improve UFSC's digital database.
Ciência Cidadã para a Amazônia (Citizen Science for the Amazon)	Network of organizations that work for citizen training and the generation of knowledge about the fish and aquatic ecosystems of the Amazon Basin.
Projeto Budiões (Buddions Project)	The goal is to elaborate a database that will help map and monitor the presence of Buddion fish species along the Brazilian coast.
Portal de Zoologia de Pernambuco - (Pernambuco Zoology Portal)	It uses Internet and cartography tools, allowing inhabitants, students, professors, researchers, and university students to contribute information about the wild animal species found in the State of Pernambuco.
SISS-Geo - Sistema de Informação em Saúde Silvestre (SISS-Geo - Wild Health Information System)	Available on smartphones and the web, it allows monitoring of 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 Brazilian biodiversity.
Rede Brasileira de Observação de Meteoros (Bramon) (Brazilian Meteor Observation Network)	It is a non-profit, open, collaborative organization maintained by volunteers and supporters. Its mission is to develop and operate a meteor monitoring network.
OIAA Onça - Observatório de Imprensa Avistamentos e Ataques de Onças - (Press Observatory Jaguar Sightings and Attacks)	The goal is to verify data and information about jaguar occurrences from the Friends of the Jaguar university extension action and collaborative research in citizen science.
LabJaca - Favela gerando dados - (LabJaca - Slum generating data)	It is a laboratory for research, training, and production of data and narratives about the favelas and the peripheries and is composed of 100% young black people.
Eu vi uma ave usando pulseiras!?! - (I saw a bird wearing bracelets!)	It is based on promoting bird monitoring with the general population's participation. Brazilian ornithologists mark birds with colored rings in their research, and then these birds can eventually be observed from afar by anyone.
Do Pasto ao Prato (From Pasture to Plate)	Through an application, it aims to reveal where meat products come from, improving the transparency of the supply chains in Brazil and worldwide. It allows clarification to the consumer of the negative impacts of these products.
BioTiba-Projetos de Biodiversidade (BioTiba-Biodiversity Projects)	It aims to make the population aware of the relevance of knowing and preserving biodiversity, promoting engagement in bioblitz actions - a short-duration event that allows recording as many species as possible in a particular area.
BeeKeep	It is a citizen science project for participatory bee research. It covers the monitoring of flight activity in stingless bees and meliponiculture.
Cemaden: Centro Nacional de Monitoramento e Alerta de Desastres Naturais - (Cemaden: National Center for Natural Disaster Monitoring and Alert)	Known as Cemaden Education, it works with a network of schools and communities for disaster risk prevention. The goal is to contribute to developing a culture of disaster risk perception within Environmental Education, contributing to the sustainability and resilience of society.
EXOSS (Exploring the Southern Sky): Citizen Science Project	It works in partnership with scientific institutions, oriented towards analyzing meteors and solids, aiming to reveal their origins, natures, and characterization of their orbits.

PROJECT	DESCRIPTION
Blue Change - Ciência Cidadã em ambientes marinhos e costeiros (Blue Change - Citizen Science in marine and coastal environments)	The initiative focused on developing Citizen Science projects in Brazil associated with conserving the marine and coastal environment.
Brydes do Brasil (Brazil Brydes)	Network of volunteer studies on Bryde's whale in Brazilian jurisdictional waters. It aims to create a database to gather records to understand the movements of the species along the Brazilian coast.
Projeto Cidadão Cientista - Save Brasil (Citizen Scientist Project - Save Brasil)	It aims at the participative monitoring of birds in Conservation Units and urban parks.
Guardiões da Chapada (Guardians of the Chapada)	Its basis is to produce scientific knowledge and raise awareness about the relevance of pollinators' services in conserving Chapada Diamantina's natural heritage in Brazil.
Onde estão as Baleias e Golfinhos? (Where are the Whales and Dolphins?)	Its goal is to collaborate with research and the maintenance of cetaceans and their respective habitats in the coastal waters of Rio de Janeiro. Its premise is to form a database with the records of sightings.
WikiAves (WikiBirds)	Site with interactive content aimed at the Brazilian community of birdwatchers with voluntary financial contributions from collaborators. Its objective is to support, divulge and promote the activity of birdwatching.

Table 1. Citizen science projects registered in the Civis Platform.

(Source: The authors, based on the Civis Platform, 2022).

Upload	Projects
Website	10
Application	11
Application and Website	1
Social Networks (Facebook and Instagram)	2

Table 2. Data loading. (Source: The authors, 2022).

It was found that the two projects do not have a website or app. Meanwhile, Facebook and Instagram are the most used forms of dissemination. Regarding the documentary typology, photos predominate and are mentioned in 16 projects. The other types of documents produced were categorized into video, photo and sound, and barcode - all with one occurrence and photo and video (two occurrences). Another exciting aspect is that four 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, intending to promote greater environmental awareness. There are termites at home to fill out a form at each sighting and upload photos.

3) Social participation: Great majority of the projects practice actions in the following direction:

- Of the total of 24 projects, 21 of them provide clarification to participants;
- Two projects do not provide further clarification on citizen participation;

- One of the projects has on its website an orientation for volunteers with clarifications on how to make a good photo, but there is no content because the site is still under construction.

Moreover, from the total of 21 projects, four also mention the possibility of individualized face-to-face or remote service.

- 4) Open Data: 11 initiatives mention this issue. One of the projects reveals a concern about disclosed data. It emphasizes the need for constant reflection on what will be shared, when and how. Another, in turn, points out that the data will be open to the public without identifying those responsible for its collection. The rest of the projects make no mention of open data or another level of openness.
- 5) Scope: 8 projects have a local scope of data collection; 14 are national, and 2 are international.

DISCUSSION

This study analyzed the projects registered in Civis: Citizen Science Platform, Brazil, from five main categories. Regarding the knowledge area, Biology is the most representative one. This is a growing field in Brazil. In the CNPq Directory of Research Groups (2022), for

example, in the field “parametrized query”, 20 research groups registered projects in this area. Until the beginning of the xx century, it remained more linked to the traditions of Natural History. Its organization consisted of branches such as zoology, botany, cytology, embryology, and human physiology. It is added that it is strengthened as a science with the emergence of genetics, among other factors (Marandino, 2009; Campos, 2018). Biological Sciences cover biology topics in general: genetics, botany, zoology, ecology, morphology, physiology, biochemistry, biophysics, pharmacology, immunology, microbiology and parasitology, according to the CNPq Table.

Balázs *et al.* (2021) state that citizen science has provided insights into essential fields of knowledge, such as biology and biodiversity, and can contribute to monitoring the Sustainable Development Goals (SDGs). In Brazil, studies in citizen science are still relatively recent, and projects in the Biological Sciences stand out, covering topics such as biodiversity and environmental conservation. Brazil is a signatory country of the 2030 Agenda for Sustainable Development, which includes 17 Sustainable Development Goals (SDGs) and 169 targets. In 2015, the United Nations Organization proposed to its member countries this agenda aimed at sustainable development for the next 15 years, and, therefore, Brazil is committed to its fulfilment (Organização das Nações Unidas, 2015). Fritz *et al.* (2019) found that traditional data sources are insufficient to measure Sustainable Development Goals. Thus, new and non-traditional data sources are needed. For the authors, citizen science is an emerging example of this and is already contributing. Data collected by citizens can complement and ultimately even improve the SDG reporting process.

The Human Sciences perspective includes Philosophy, Sociology, Anthropology, Archeology, History, Geography, Psychology, Education, Political Science and Theology (CNPq). The LabChile and LabJaca initiatives can be framed in this area of knowledge because they involve aspects related to the social environment and the construction of citizenship of those involved. They also have an educational bias. The LabJaca project, for example, consists of a laboratory created by young black men from

the *Jacarezinho slum* in Rio de Janeiro, Brazil, who, upon realizing the problems caused by Covid-19 in their community, acted to mitigate its effects. 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 to develop a nation and its citizens (Ireland, 2019).

Applied Social Sciences, Administration, Law, and Economics, among others, stand out in this major area. The project *Do Pasto ao Prato* is understood here as belonging to the large area of Applied Social Sciences due to its focus on management, more specifically, on the logistics of the meat sector, from its production to its arrival on supermarket shelves. The field of Exact and Earth Sciences covers the areas of Mathematics, Computer Science, Astronomy, Physics, Chemistry, Geosciences and Oceanography. The two projects analyzed in this study are inserted in the Astronomy area and subdivided into subareas, such as Position Astronomy and Celestial Mechanics; Stellar Astrophysics; Extragalactic Astrophysics; Solar System Astrophysics and Astronomical Instrumentation (CNPq). The evolution of human thought over time, and the development and improvement of astronomical instruments, have allowed astronomy to reach higher levels. Satellites and space probes will enable the collection of enormous amounts of data and information about the Universe (Borges & Rodrigues, 2022). Thus, Astronomy is a multidisciplinary field that studies the Universe and its constituent elements, the celestial bodies and the phenomena that occur outside the Earth.

Regarding data collection, 22 projects use technological infrastructure to perform this activity (websites or applications), and only two projects have no such means, using social networks for this purpose. However, they do not explain how the collected data is managed. Society reaps the benefits of citizen science because the initiatives enable the resolution of local, regional, national, or even international problems through agreements and partnerships. In addition, the requirement to make research data available in open mode is gaining momentum from research funding agencies (Silva, 2019). It is worth noting that those responsible for the projects should 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, as advocated by the Ten Principles of Citizen Science (European Citizen Science Association, 2015). It is inferred that the initiatives in citizen science published on the Civic Platform reveal a scenario where there is still no consensus on the use and availability of open data, even though citizen science has developed in the context of open science.

Out of 24 projects, 21 offer training and procedural tutorials to guide citizens on how to proceed in their actions. One of the projects has instructions on the website, which is still under construction, and only one does not provide any instructions. In addition, four also mention the possibility of individualized face-to-face or remote service. The practices developed by ECSA reveal that citizen science initiatives must actively involve citizens in the activities, generating new knowledge and understanding about a given object of investigation. In this sense, participants must be educated to participate actively in the initiatives.

Regarding the models of social participation, the projects mainly come from institutions and research centers, in which citizens act in data collection without involvement in other stages of research. Initiatives such as the Brazilian Meteor Observation Network (Bramon) and Cemaden Education seem to adopt the collaborative model. In the first one, it is possible to act as an operator of one or more stations or to collaborate in several vital activities for the maintenance of the project, such as training, dissemination, documentation, and support, among others. In the second one, students from schools participating in the project can, in addition to data collection, guide the community to make a participatory diagnosis of the place where they live from a “learning by doing” methodology. Citizen science projects for the Amazon and LabJaca, for example, present co-created models’ characteristics because they favour citizen scientists’ participation in all stages of the scientific process. Citizen science for the Amazon offers the possibility of implementing research proposals based on citizens’ interests to strengthen citizenship and environmental culture in the Amazon of Puno, Peru and LabJaca, which is based on solving

local issues and problems in its community by actively involving citizens.

Citizen scientists can acquire skills related to the scientific process, professionalization in the project area, and satisfaction in acting to solve problems that are tangential to their reality. These initiatives do not aim at unilateralism, demonstrating the reciprocal character on which citizen science is based (European Citizen Science Association, 2015). Ries & Oberhauser (2015) affirms that the potential for embracing citizens in scientific processes has not yet been fully explored in this age of digital information and crowdsourcing. The participation of volunteers, amateur scientists, and those generally interested in the topics covered by the projects in citizen science is beneficial to all. It allows the exchange of knowledge and experience between academia and society, enriches and improves the volunteers’ skills in scientific research, and contributes to optimizing the time and resources of a research project. However, we must remember that volunteers must be allowed to participate in all phases of research, not just in data collection.

As far as the territorial levels in which the activities are developed are concerned, it can be seen that most of them are national, followed by local actions, and, finally, only two projects are international. There is still a long way to go in terms of making efforts to establish international partnerships. This is possible in contemporary society because of the use of technological infrastructure such as apps, which allows collecting and downloading scientific data in various locations worldwide.

CONCLUSIONS

The platform was recently launched and is still in the testing phase. In addition, the registration of projects is voluntary, and wide dissemination of the tool is necessary to promote the registration of projects. This will allow a broad and deep knowledge about what is being done regarding citizen science in Brazil, following the example of other countries that use similar platforms. 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, as citizen science can generate benefits for:

- a) Citizens: including them in scientific research allows the development of skills in scientific processes, the taste for learning as well as learning to learn for life (insert a note on), the autonomy, training, an understanding of citizens as such by themselves, strengthening their sense of citizenship and belonging to the place where they live, and the resolution of problems that affect their surroundings, and the initiative may come from them.
- b) Scientists: obtaining scientific data collected by citizens, either through digital applications or other instruments - which can be done in large volumes, including different countries and places of difficult access; aid in the analysis of data and images; shared resources and exchange of knowledge and experiences; reduction of time, and optimization of human and financial resources for research;
- c) Society, in general: benefited from the initiatives in citizen science, such as scientific publications that support the decision-making and formulation of public policies on issues of collective interest and the innovations generated by scientific research, which boost scientific and technological development.

The low adhesion to the registration of projects seen so far, 24 in total, may be due to the recent launch of the Civis platform (April 2022). Moreover, the predominant knowledge area in the projects registered in Civis is Biological Sciences; but it is worth mentioning the presence of other fields like Applied Social Sciences, Exact and Earth Sciences, and Human Sciences.

The vast majority of projects use technological infrastructure, such as applications for data collection, and instructions for carrying out the activity are also provided. However, most of the projects adopt an attitude of citizen participation restricted to one stage of scientific research, the data collection stage, showing the predominance of the practical aspect in citizen science to the detriment of the democratic element. The availability of scientific data in an open format allows its use by other scientists. It

also avoids duplication of data collection, saving time and resources. In this study, the evidence is that some projects make no mention of opening their data.

For future studies, it is suggested to expand the analysis to international citizen science platforms from a comparative view. By this, we might seek similarities and divergences that enrich the debate in this field and broaden the understanding of why some areas arouse greater public interest, both from researchers and society in general.

Contribution statement

Conceptualization, Visualization: Witt, A. S. Investigation: Witt, A. S. & Silva, F. C. C. da Methodology, Methodology, Project administration, Writing —original draft, Writing— review & editing: Witt, A. S. & Silva, F. C. C. da

Conflict of interest

The authors declare that there is no conflict of interest.

Statement of data consent

No data have been generated during the development of this study. ●

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