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Citizen science in French-speaking Belgium within environmental and natural sciences

Landscape inventory and projects characterization

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II Résumé

La *citizen science* désigne la participation du public à la recherche scientifique. Elle s'est considérablement développée au cours des dernières décennies, avec un nombre croissant de projets et de publications dans le domaine. Les attentes à l'égard de cette approche sont diverses, allant de l'extension de la recherche traditionnelle à des échelles géographiques ou temporelles plus larges, à la résolution de défis environnementaux complexes, jusqu'au renforcement de la confiance du public dans la science.

Cependant, aucune exploration actualisée et complète n'existait jusqu'à présent, spécifiquement sur la Belgique francophone dans le domaine des sciences environnementales et naturelles. Ce travail contribue à combler cette lacune en combinant une revue systématique et une enquête. Cela permet de dresser un inventaire des initiatives et des projets de *citizen science* et de caractériser les projets sur base des réponses à l'enquête.

Les 86 projets et initiatives inventoriés étudient majoritairement la biodiversité, et dans une moindre mesure les éléments abiotiques de l'environnement. L'observation d'espèces est la forme la plus répandue de contribution de la part des citoyens. Parmi les 39 projets qui ont répondu à l'enquête, plus de la moitié sont menés par des organisations gouvernementales, la plupart dépendent de financements régionaux et environ la moitié impliquent entre 21 et 500 participants. Les difficultés les plus fréquemment rencontrées par les projets sont de recruter des participants ainsi que de garantir la qualité des données. Les approches contributives prédominent sur les approches collaboratives et co-créatives. Il n'existe pas de consensus parmi les praticiens de la *citizen science* quant à la signification ou à l'utilisation des termes *science citoyenne* et *science participative* en français.

Cette recherche exploratoire fournit une première vue d'ensemble sur le paysage de la *citizen science* en Belgique francophone dans le domaine des sciences environnementales et naturelles, et édifie les bases pour de futures recherches dans ce contexte.

III CRediT

The use of generative AI was made according to the guidelines in application within UCLouvain (UCLouvain 2024). AI is used in this work in a responsible, authentic and transparent way. The author takes full responsibility of all information given in this work. AI was only used as a tool to unleash new potentials. Table III.1 credits all contributions made to this work, using the Contributor Roles Taxonomy (CRediT).

Table III.1: Roles of contributors according to the CRediT taxonomy

	Amandine Raucq	Other contributors	Artificial Intelligence
Conceptualization	X		
Methodology	X	Scivil	
Investigation	X	Scivil	
Formal analysis	X		X
Data curation	X	Scivil	
Writing - Original Draft	X		
Writing - Review and Editing	X		X
Visualization	X		X
Supervision		Caroline Michellier, Christine Farcy	

The Scivil team involved in this work is composed of Annelies Duerinckx, Karen Verstraelen, Jef Van Laer, and student jobists. They contributed in conducting the systematic review for the national scope, and by sharing the Citizen Science Scan survey on their side as well (emails, posts on social media, newsletters, website, acquaintances and their extended networks). They contributed in the making of the survey, through the data curation of the survey results, and by providing feedback on an early draft of this document.

The AI tools used are M365 Copilot, DeepL, and Perplexity. Copilot was used to assist with the coding and debugging of the Python script and the LaTeX document on Overleaf (Formal analysis and Visualization). Copilot and DeepL were used for translations and reformulations, always with the aim of improving the author's writing, rather than creating new content (Writing - Review and Editing). Perplexity was used to find relevant sources in specific and necessary situations.

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IV Abbreviations

AAPS - Association for Advancing Participatory Sciences

ACSA - Australian Citizen Science Association

BELSPO - Belgian Science Policy Office

BRISTI - Belgian Report on Science, Technology and Innovation

CNB - Cercles des naturalistes de Belgique

CSS 2023 - Citizen Science Scan of 2023

CSS 2025 - Citizen Science Scan of 2025

ECSA - European Citizen Science Association

GT - Groupe de travail (working group)

ICT - Information and communications technology

IRSNB - Institut Royal des Sciences Naturelles de Belgique

ISSeP - Institut Scientifique de Service Public

PPSR - Public Participation in Scientific Research

SC - Science citoyenne

SP - Science participative

ULB - Université Libre de Bruxelles

ULiège - Université de Liège

1 Introduction

We currently face environmental and global challenges: six out of the nine planetary boundaries have been transgressed past their safe operating space (Richardson et al. 2023). Knowledge is needed to tackle such issues; otherwise, no wise decision can be made and no effective action can be taken. When environmental systems are highly complex and when chance intervenes, uncertainties may appear. Additional difficulties emerge when tackling such issues, as each challenge cannot be considered as a single unit due to interdependencies. Richardson et al. (2023) argue that a systemic framework is needed for addressing global anthropogenic impacts on the Earth system.

The United Nations has tried to set a roadmap towards a more sustainable and equitable future through the sustainable development goals (SDGs), which have societal, environmental, political, and economic dimensions (Gharesifard et al. 2025). But actions taken to achieve one of the SDGs might positively or negatively impact the progress towards other goals, within the same dimension or across dimensions. Gharesifard et al. (2025) argue that in order to better understand complex environmental and societal challenges, and to promote more effective and inclusive solutions, the involvement of citizens in various stages of scientific research may be a solution.

One of the nine identified planetary boundaries relates to biosphere integrity (Richardson et al. 2023), subdivided into genetic diversity and functional biosphere integrity. In both cases, the boundary delineating the safe operating space has been transgressed. The indicator used to assess genetic diversity is based on estimated extinction rates. Biodiversity monitoring is necessary for the management of biodiversity loss. At a global scale, information on biodiversity change is relatively scarce, and three ways may be considered to fill this gap: remote sensing, eDNA, and citizen science (Pocock, Chandler, et al. 2018).

Citizen science refers to the notion of the public participating in an activity called scientific research (Haklay, Dörler, et al. 2021). Many definitions exist for this term, and most are broad and open to interpretation. Such involvement would not only help tackle complex issues and uncertainties, or enlarge the spectrum of perspectives and peers. It is also expected to help science meet the expectations, values, and needs of civil society, as well as increase public confidence in science (European Commission 2020). Still another argument for the involvement of citizens is its potential to enable traditional methodologies to reach larger scales than ever, by involving citizens in data gathering (Eitzel et al. 2017). In addition to these expectations, the current European context is particularly favorable for citizen involvement in science: the evolution and democratization of technologies, the overall rise in education levels, the increase in individuals' free time (Haklay 2015), and a growing

awareness of environmental challenges (Kobori et al. 2015). However, public involvement in scientific research implies challenges and difficulties, such as recruiting and motivating participants (Poetz and Sauermann 2024), ensuring the quality and legitimacy of data (Dias da Silva et al. 2017), legal and ethical issues like intellectual property (OECD 2025), among others.

Over time, networks of citizen science actors have been built at different scales, both European and national. In Belgium, a central hub for citizen science is Scivil, the Flemish knowledge centre for citizen science (Scivil 2025). In 2023, they conducted the Citizen Science Scan for the first time and found that Belgian citizen science is largely represented by the Dutch language, and that French-speaking projects are far fewer (Duerinckx et al. 2024). Knowing that an increase over time in the total number of citizen science projects was observed on a Belgian national scale (Duerinckx et al. 2024), on a European scale (Hecker et al. 2018), and on a worldwide scale (Pocock, Tweddle, et al. 2017), it is very likely that new projects were created in French-speaking Belgium two years after the Citizen Science Scan of 2023. To our knowledge, no genuine effort has yet been made to inventory citizen science, specifically in French-speaking Belgium.

This master's thesis seeks to deepen the current understanding of the citizen science landscape in French-speaking Belgium within environmental and natural sciences. This general objective is subdivided into three: (1) to identify active, inactive, and completed citizen science projects and initiatives, (2) to highlight trends and particularities of this landscape, and (3) to examine in more detail the characteristics of citizen science projects.

2 State of the Art

2.1 Origin and evolution of citizen science

Environmental issues are not new, and the involvement of citizens in science is a possible approach to address them, as shown in the following examples.

Addressing issues such as acid rain first requires reliable monitoring. In the United States, the National Audubon Society launched a project in the late 1980s in which volunteers collected and analysed the acidity levels of rain samples (Cooper and Lewenstein 2016). In 1989, this initiative was described as *citizen science*, a newly introduced term (Oxford University Press n.d.).

Frank von Hippel, an American physicist, became increasingly disillusioned during his career with government decisions regarding technological development, which he felt were driven by political calculations rather than by public interest or effectiveness (von Hippel and Kurokawa 2020). This experience prompted him to question the role of science and scientists in society. His concerns centred notably on nuclear power, atomic weapons, and energy policy. In response, he advocated for greater scientific engagement in public life and encouraged scientists to "make trouble", as developed in his book *Citizen Scientist* (von Hippel 1991).

The 1990s were marked by a global context of sanitary and environmental crises, which intensified public debate about the supposed monopoly of scientific experts over risk assessment and risk management (Luneau et al. 2021). As an example, AIDS activists engaged directly with biomedical research, in the early 1990s in the United States, accelerating studies and influencing the design, conduct, and interpretation of clinical trials (Cooper and Lewenstein 2016). This global context prompted Alan Irwin to advocate for a democratization of science, and he developed this perspective in his book *Citizen Science: A Study of People, Expertise and Sustainable Development* (Irwin 1995).

On Christmas 1900, a movement was launched in the United States to conduct an annual bird census in response to growing concerns about declining bird populations, and to replace the traditional Christmas Side Hunt (National Audubon Society 2025). A century later, the project still exists and its datasets continue to be used by conservationists and in reports evaluating bird population health and long-term conservation status. This long-standing initiative motivated Rick Bonney, a researcher at the Cornell Lab of Ornithology, to publish his article *Citizen Science: A Lab Tradition* (Bonney 1996), apparently without being aware of Irwin's earlier work (Bonney et al. 2009). Although both authors addressed citizen involvement in science and proposed definitions of citizen science, they

approached the concept in different ways (Table 2.1).

The comparison of these two early approaches to citizen science reveals a range of interpretations. Cooper and Lewenstein (2016) argue that citizen science as defined by Irwin can be seen as a broader context in which citizen science as defined by Bonney can reside. Eitzel et al. (2017) view the two perspectives as representing the two ends of a spectrum. According to Luneau et al. (2021), Irwin's citizen science functions as a way for transforming existing scientific institutions in favor of epistemic pluralism, whereas Bonney's approach extends the dominant scientific methodology.

Table 2.1: Comparison of the two strands of citizen science as described by Cooper and Lewenstein (2016) and Eitzel et al. (2017) from Irwin (1995) and Bonney (1996).

Author and year	Alan Irwin 1995	Rick Bonney 1996
Later given name	Democratic citizen science	Participatory citizen science
Emphasis	Responsibility of science to society	Participation of the public mostly as observers or to put efforts in scientific research
View	Movement	Method, tool
Expected benefits	Democratization of science, restoring public trust in science, orienting science towards complex environmental problems	Bring traditional scientific research to larger scales, improving participant's scientific literacy (educational objective)

The term *citizen science* has evolved since then, and many other definitions have been proposed with varying degrees of connection to these early conceptual roots (Eitzel et al. 2017). After the publication of the two books, Bonney's definition of citizen science gradually overshadowed Irwin's, becoming the more widely used and popular one (Cooper and Lewenstein 2016). Over time, however, the term broadened to include projects in which participants engaged in tasks beyond data collection, and some initiatives involving co-creation or collaboration even came to be labeled as citizen science.

In 2009, the umbrella term Public Participation in Scientific Research (PPSR) was introduced to describe the rapidly expanding field of citizen science and related areas such as community science, participatory action research, and volunteer monitoring (Bonney et al. 2009). Despite this effort, *citizen science* remained the dominant term (Cooper and Lewenstein 2016). By the 2010s, the meaning of citizen science continued to expand, eventually encompassing Irwin's more democratic vision (Cooper and Lewenstein 2016; Luneau et al. 2021). Contemporary understandings of citizen science in literature therefore integrate both democratic and contributory dimensions. However, Van Oudheusden et al. (2024) argue that in practice, citizen science remains largely dominated by contributory models: citizens' roles are still often restricted to data collection.

Although the term *citizen science* is relatively recent, first appearing in 1989 according to Oxford University Press (n.d.), the involvement of non-professional scientists in research is much older. Many initiatives now labeled *citizen science* long predate the term itself, and even the specific act of public participation in data collection had no dedicated name until recently (Cooper and Lewenstein 2016). Before the institutionalization of science, knowledge production was largely driven by amateurs, who were gradually marginalized over the past 150 years (Miller-Rushing et al. 2012). Yet in fields such as

archaeology, astronomy, and natural history, volunteer contributions to data gathering have persisted despite this institutionalization (Silvertown 2009).

Several projects illustrate this history, such as the aforementioned Christmas Bird Count (National Audubon Society 2025). The Royal Observatory of Belgium programme called *Did you feel it?* has collected macroseismic observations since 1932 through public inquiries following felt earthquakes. Since 2002, these reports have also been gathered online, and the database has been expanded with historical evidence of earthquakes predating 1932 (ROB n.d.).

2.2 Common ground in the concept of citizen science

Although the numerous descriptions of citizen science that exist today mostly remain broad and open to interpretation, a general consensus appears to have emerged around one core feature: citizen science involves "a notion of the public that participates in an activity called scientific research" (Haklay, Dörler, et al. 2021).

The European Citizen Science Association (ECSA), created in 2014, aims to foster the growth of citizen science in Europe, promote the democratization of science, and support the participation of the general public in research processes (ECSA n.d.). ECSA expresses its vision through 10 principles (ECSA 2015), whose first sentence reads: "Citizen science projects actively involve citizens in scientific endeavour that generates new knowledge or understanding". Beyond offering a flexible description, these principles set out what citizen science projects should strive to achieve: citizen science initiatives should produce genuine scientific outcomes, benefit both professional and citizen scientists, offer citizens opportunities to engage in multiple stages of the scientific process (if they wish), provide feedback and acknowledge their contributions, address limitations and biases, ensure open access to data and publications when possible, undergo evaluation, and consider legal and ethical issues such as intellectual property and confidentiality.

ECSA's 10 principles combine practical expectations with guidance for the ethical conduct of citizen science projects (Haklay 2022). However, their broad nature can make them difficult to apply in contexts such as funding applications. To address this, a study was conducted to identify factors that help characterize citizen science and to identify areas of agreement and disagreement within the community regarding what counts as citizen science (Haklay, Fraisl, et al. 2021). Building on these findings, ECSA published its characteristics of citizen science (Haklay, Motion, et al. 2020a), and the accompanying explanatory notes (Haklay, Motion, et al. 2020b). These characteristics are not intended to be universal, but rather aim to support the adaptation of citizen science to diverse cultural and research contexts (Haklay 2022).

2.3 Citizen science is still on the rise

Scientometrics analyses consistently show an increasing number of citizen science related publications in recent decades (Figure 2.1; Houllier and Merilhou-Goudard 2016; Kullenberg and Kasperowski 2016; Pelacho et al. 2021). Ecology and environmental sciences dominate the field, with the highest

publication counts (Kullenberg and Kasperowski 2016; Pelacho et al. 2021). At the national level, the United States, the United Kingdom, and Australia are the three most productive countries in terms of cumulated number of publications (Pelacho et al. 2021). Similarly, the 20 most productive universities are all from the USA, but two from Canada (Houllier and Merilhou-Goudard 2016).

All these scientometric studies should be interpreted cautiously, as they are based on the Web of Science database, which has documented biases against non-English publications, non-Western countries, and humanities and social sciences research (Tennant 2020). The growth of citizen science nevertheless appears robust, as non-scientometric approaches lead to the same conclusion. National assessments conducted in countries such as Australia (Golumbic 2024) and Belgium (Duerinckx et al. 2024) report steadily increasing numbers of initiatives. Similar trends emerge from European-wide (Hecker et al. 2018) and global research (Pocock, Tweddle, et al. 2017).

Several factors help explain this rapid expansion. Advances in digital technologies, particularly of mobile devices and web-based platforms, have enabled large-scale data collection that was previously unfeasible (Haklay 2015; Dias da Silva et al. 2017). Societal changes in Europe, including higher education levels, increased leisure time, greater familiarity with scientific concepts, and a growing population of healthy retirees, have further supported public engagement in research (Haklay 2015). Rising concern about biodiversity and environmental issues has also fuelled participation in citizen science (Kobori et al. 2015).

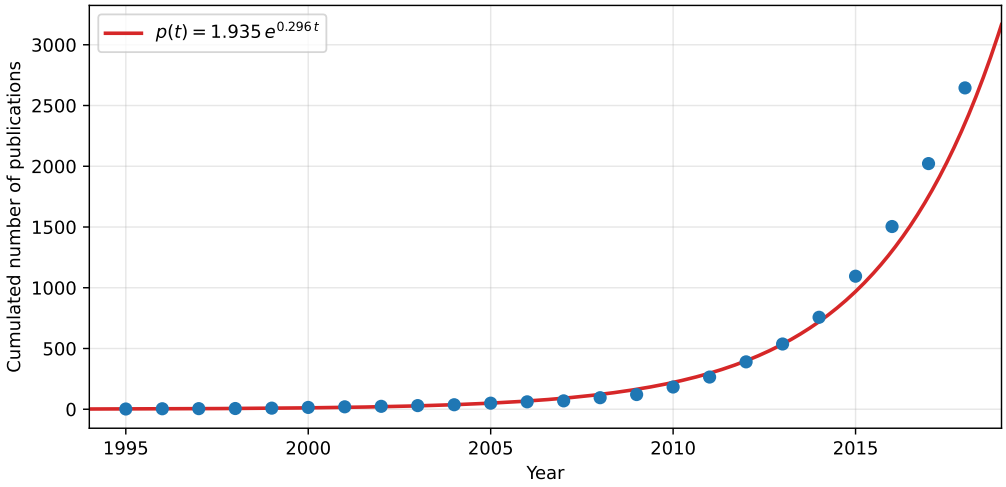


Figure 2.1: Cumulated number of citizen science publications on the Web of Science from 1995 to 2018 (in blue) with a fit curve (in red), adapted from Pelacho et al. (2021). The set of publications was created using the searching terms *citizen science* and 17 closely related terms.

2.4 Expectations, benefits, and challenges

It is one thing to identify the factors that enable the rise of citizen science, and another to understand the reasons behind it. Part of the explanation may lie in the varied expectations and benefits associated with citizen science. Given the diversity of practices, the list below is not exhaustive, but it provides an initial overview of the main anticipated advantages. Turrini et al. (2018) highlight the production of new scientific knowledge, increased public awareness of specific issues, environmental

protection, nature conservation, and citizen empowerment. Turbé et al. (2019) add the expectation that citizen science can inform policy processes, while Sauermann et al. (2020) emphasize its potential to bridge the gap between science and society and to contribute to public education.

The literature identifies three main policy rationales for promoting citizen science: (1) accelerating research and expanding the scope of data collection or analysis, (2) responding more effectively to societal needs and challenges, and (3) enhancing the uptake of evidence-based policies while supporting their democratization and legitimacy (OECD 2025).

Despite the many expected benefits, citizen science also faces a number of challenges. Although the literature offers differing views on which challenge is most pressing, several difficulties appear repeatedly across studies: to motivate participants or to understand their motivations to take part is citizen science initiatives (Dias da Silva et al. 2017); to recruit participants (Golumbic 2024); to keep participants engaged over time (Poetz and Sauermann 2024); to communicate with participants (Golumbic 2024); to manage different types of expertise within single platforms or projects (Dias da Silva et al. 2017); the legitimacy of the data and of its quality (Dias da Silva et al. 2017), for the integration of citizen-collected data in policy (Turbé et al. 2019), or to the eyes of traditional institutions or academic science (Hecker et al. 2018; Sauermann et al. 2020); to ensure data quality (Dias da Silva et al. 2017; Hecker et al. 2018); legal and ethical issues such as intellectual property, confidentiality, privacy, and safety (OECD 2025); distrust between actors (OECD 2025); to find funding sources (Hecker et al. 2018; Perelló et al. 2021; Golumbic 2024); and time management for organizers (Hecker et al. 2018).

2.5 Diversity of citizen science approaches and definitions

2.5.1 A valuable or challenging diversity?

Citizen science has varying descriptions and many are open to interpretation (Haklay, Dörler, et al. 2021). No single formulation can capture all cases, given the diversity of purposes, approaches, and contexts. Overly narrowing the concept could hinder methodological innovation, limit its expansion into scientific fields where it is currently under-represented, reduce cross-disciplinary exchange, and ultimately constrain the development of citizen science as an innovative research domain (Haklay, Motion, et al. 2020b; Haklay, Fraisl, et al. 2021). At the same time, more specific descriptions are sometimes required, for instance in funding calls or for citizen science inventories. This section therefore outlines why citizen science is difficult to delineate and highlights the characteristics for which consensus or debate currently exists.

A first reason explaining the difficulty of delineating citizen science is that both *science* and *citizen* can be interpreted in multiple ways. *Science* is itself difficult to define, and fields such as the social sciences and humanities are sometimes included or excluded depending on interpretation (Haklay, Dörler, et al. 2021). The term *citizen* can also be problematic and therefore avoided, as it may imply an exclusive criterion for participation. In some contexts, such as the United States, *citizen* excludes individuals without formal citizenship status. Indigenous communities may also reject the

term because notions of national and official citizenship are linked to histories of dispossession and loss of sovereignty (Ellwood et al. 2023). For reasons such as these, the former "Citizen Science Association" in North America changed its name to the "Association for Advancing Participatory Sciences" (AAPS 2023).

A second reason relates to the diversity of contexts in which citizen science operates: scientific disciplines, project forms, expectations, and cultural and linguistic settings. Citizen science spans a wide range of fields and therefore crosses conventional academic boundaries (Haklay, Dörler, et al. 2021). The term functions as an umbrella for multiple approaches, such as participatory action research, biodiversity monitoring, and volunteered geographic information (Haklay, Motion, et al. 2020b). Definitions also vary depending on whether they include citizens in setting research agendas and policies (European Commission 2020) or not (OECD 2025). The meaning of citizen science shifts with geographic context and language, and direct translation between languages can alter its interpretation (Dias da Silva et al. 2017; Eitzel et al. 2017). The term citizen science is also relatively young and refers to a rapidly evolving and dynamic field (Dias da Silva et al. 2017). In some cases, it is even defined by what it is not, reflecting the field's ongoing conceptual development.

A first example of negative criteria comes from Miller-Rushing et al. (2012), who argue that projects not generating new knowledge, not analyzing the data they collect, or not communicating results beyond participants should not be considered citizen science. A second negative criterion appears in definitions that describe participants as "volunteers", which implies that citizens cannot be compensated for their contributions (Haklay, Dörler, et al. 2021).

Although such specific criteria seem clear in some articles, many factors used to describe citizen science are subject to debate. Haklay, Fraisl, et al. (2021) aimed to identify, through a survey, areas of agreement and disagreement over what can be considered citizen science or not. They identified the strongest consensus around the facts that (1) participants must knowingly and willingly engage in the activity, (2) the more actively they take part in the scientific process, the less ambiguous the project's status becomes, (3) projects in which citizens collect data as their core activity tend to achieve broader agreement, and (4) those offering little participant learning or involving minimal engagement are more often contested. Haklay, Fraisl, et al. (2021) identify several "grey areas" among the factors and subfactors used to describe citizen science over which disagreements among respondents are most frequent. In situations where several factors are interplaying, delineating citizen science can be particularly ambiguous. Referring to ECSA's 10 principles and demonstrating transparent adherence to them can strongly influence whether a project is accepted as citizen science, especially in grey areas. All factors, whether generating consensus or disagreement, were grouped into five categories and are further detailed in Haklay, Motion, et al. (2020b):

- **Core concepts:** This category covers the conceptual issues that arise when determining whether a project qualifies as citizen science. Defining citizen science quickly leads to broader questions about what counts as *science*, *research*, or *scientific research*. There is general agreement that citizen scientists may take on diverse activities and levels of responsibility, and that they must participate knowingly and intentionally. Ambiguity often appears in fields like social or medical sciences, where citizens are traditionally involved as research subjects and not always as active

contributors. In such cases, project leaders' intentions and how the project is framed (e.g., referencing ECSA's 10 principles) play an important role in establishing whether the project constitutes citizen science.

- **Disciplinary aspects:** Some research fields are particularly prone to ambiguity when determining whether a project qualifies as citizen science. Medical and health sciences raise uncertainties for various reasons. In the arts and humanities, the diversity of approaches and methods broadens the possible roles and activities of citizens, making definitions harder to pin down.

- **Leadership and participation:** This category focuses on the implications of who owns or leads a project. Citizen science initiatives may be run by organizations (NGOs, government bodies, research institutions), communities, or individual citizens. Disagreements often arise when citizens participate in only one or a few phases of the research process, or when participation requires little cognitive effort. Additional ambiguity appears in projects that border on commercial activities. Because the terms *voluntary* and *professional* are understood differently across cultures and contexts, the idea of citizen science as a collaboration between volunteers and professional scientists is interpreted in various ways.

- **Financial aspects:** When participants contribute only financially, the activity is not considered citizen science. (1) Projects requiring citizens to pay to participate, such as purchasing measurement kits, and (2) projects where participation is incentivized rely on the context and additional characteristics to determine whether they can be classified as citizen science.

- **Data and knowledge:** This category of project characteristics mainly concerns data use, ownership, quality, sharing, and generation. Among the issues discussed, there is agreement that knowledge produced by citizen science projects should meet disciplinary standards and standards that are appropriate to its context and purpose.

The diversity of citizen science initiatives is so broad that some authors propose using the plural *citizen sciences* (Van Oudheusden et al. 2024). Approaches to problem-solving and participant engagement must adapt to different contexts, issues, and communities, and no single model fits all situations.

2.5.2 Typologies of citizen science projects

Citizen science projects are highly diverse, and many typologies have been proposed to classify them. These classifications may focus on the steps in which citizens are involved, the project's goals, the nature of participation (such as individuals, groups, etc), the target audience, geographic or temporal scale, protocol type, the project initiators, or expected outcomes (Houllier and Merilhou-Goudard 2016; Dias da Silva et al. 2017). However, categories often overlap, and definitions are interpreted differently, making real-world projects difficult to classify (Heaton et al. 2016). Despite these challenges, typologies remain useful for highlighting the field's diversity and identifying major trends.

A commonly used typology is that of Bonney et al. (2009) that divides citizen science projects

according to the steps of scientific research in which citizen scientists are included:

- **Contributory** projects are driven by researchers and involve citizens in data collection, often over wide geographic areas and/or long time spans.

- **Collaborative** projects are also driven by researchers and citizens may contribute through data gathering and other activities such as data analysis.

- **Co-created** projects are initiated by members of the public who come up with a question or issue and work with scientists to address it. Citizens can participate in all possible steps of the scientific research.

Shirk et al. (2012) tried to refine this previous typology by adding two categories that can be interpreted as the two ends of the spectrum first created by Bonney et al. (2009):

- **Contractual** projects in which citizens only report their questions and needs to scientists, who then answer them through research.

- **Collegial** projects are entirely led and conducted by citizens, who thereby contribute to the advancement of scientific knowledge.

Wiggins and Crowston (2011) classify citizen science projects into five categories, based on their primary goal and the importance of the physical environment for participation: Action, Conservation, Investigation, Virtual, and Education (Table 2.2).

Table 2.2: Citizen science typology based on its primary goal and the importance of the physical environment for participation, based on Wiggins and Crowston (2011).

Type	Primary goal	Descriptive attributes	Geographic scope
Action	Meet civic agendas and intervene in local concerns	Initiated by volunteers, usually involve long-term engagement in local environmental concerns	Local
Conservation	Data generation for natural resource management (and promotion of volunteer stewardship and awareness)	Citizens mainly involved in data collection for a matter of outreach and practicality, location matters	Mainly regional
Investigation	Focus on scientific research goals	Require data collection from the physical environment, often initiated by academics or NGOs	From regional to international
Virtual	Focus on scientific research goals	Entirely ICT-mediated (no physical element needed)	Not relevant
Education	Explicitly and primarily education-oriented	/	/

2.5.3 Quantified diversity and its evolution

Pocock, Tweddle, et al. (2017) examined the diversity and evolution of citizen science in environmental and ecological research. Their repeatable method involved Google searches using terms such as *citizen science* and *public participation in scientific research*, reviewing the first 100 results for each query and all linked pages. Their systematic review (2012 and 2014) identified 509 projects and analyzed their attributes. Although intended to be global, the dataset may be biased toward UK and European initiatives. Most projects (77%) focused on biodiversity, and the vast majority (93%) involved limited volunteer roles, mainly restricted to data collection.

A multiple factor analysis of project attributes revealed three axes structuring citizen science approaches. The first ranges from hands-on participation to fully computer-based projects; only this axis showed uneven distribution, forming a distinct cluster of entirely computer-based projects. The second axis spans methodological approaches from mass participation (open to anyone, anywhere) to systematic monitoring (requiring specialized equipment and repeated visits to pre-defined sites). The third axis reflects activity complexity, from simple tasks with minimal protocol to elaborate designs with complex procedures. Projects were evenly distributed along the second and third axes, highlighting the variety of approaches and the overall diversity of the citizen science landscape, as only one clear cluster emerged.

Pocock, Tweddle, et al. (2017) also investigated temporal trends of citizen science within ecology and environmental sciences. They found that projects have become increasingly differentiated over time, with overall diversity rising. The cumulative number of projects follows an exponential growth pattern.

2.6 Citizen science in the French language

How can *citizen science* be translated into French? The French version of the European Citizen Science Association's (ECSA) *10 Principles of Citizen Science* uses the term *sciences participatives* (ECSA 2015). In France, the existence of the Association Sciences Citoyennes also shows that the term *science citoyenne* is in use. To explore this further, here is a brief history of citizen science in French-language peer-reviewed literature, focusing on influential publications and on articles related to environmental and natural sciences in French-speaking Western Europe.

The Association Sciences Citoyennes, founded in 2002, aims to promote and expand movements advocating for citizen and democratic control over science, in order to place scientific activity at the service of the common good (Association Sciences Citoyennes 2024). Its core objectives align with the Irwin-strand of citizen science.

Boeuf et al. (2012) identified three terms to describe public participation in science: (1) *science participative*, when the research is initiated by a research institution; (2) *science citoyenne*, when the research is initiated by citizens, either individually or through associations; and (3) *science collaborative*, when a genuine partnership is established between the research institution and participating citizens through data collection, with continuous reciprocal information exchange. Despite these distinctions,

the authors note that no formal definitions or clear boundaries exist between these terms.

Storup et al. (2013) identified *sciences participatives*, *sciences citoyennes*, and *sciences naturalistes* to refer to the same type of scientific activity: research projects in which citizens collect data following protocols defined by professional scientists. This mode of knowledge production enables the creation of citizen networks capable of acting as early-warning systems, and it is viewed as a subtype of *recherche participative*. The latter is described as a partnership between academia and civil society, such as associations or groups of local residents. The authors emphasize the plurality and diversity of terminology in the field: the literature contains multiple definitions for a single term, and different terms may share the same definition.

In a report commissioned by the French ministers responsible for National Education, Higher Education, and Research, Houllier and Merilhou-Goudard (2016) define *sciences participatives* as *forms of scientific knowledge production in which non-professional scientists, whether individuals or groups, participate actively and deliberately*[1]. They highlight the unstable terminology and plurality of *sciences participatives*, reflecting the diversity of topics, actors, methods, goals, and scientific domains involved. Part of the report is devoted to a scientometric analysis of publications on *sciences participatives* retrieved from the Web of Science. Using English terms in their search queries and reporting the results in French, they distinguished three main families of *sciences participatives*: *community-based research*, *recherches participatives*, and *sciences citoyennes*. The latter is used mainly in environmental, astrophysics, and biodiversity-related fields and largely consists of amateur citizen contributions through data collection and analysis.

Dias da Silva et al. (2017) identified four terms as potential equivalents of citizen science: *science citoyenne*, *crowdsourcing*, *science participative*, and *recherche participative*. Their systematic review aimed to bring together these concepts, their definitions, and the various perspectives used to study non-professional participation in the natural sciences. Among the terms discussed, they note that *science participative* is often recommended as the French equivalent of *citizen science*. Both terms describe processes in which researchers examine the nature of relationships, objectives, and forms of citizen involvement in science. Despite this recognition, the authors primarily use *science citoyenne* as a direct translation of *citizen science* in their own article. Dias da Silva et al. (2017) acknowledge the absence of clear definitions for both *science participative* in French and *citizen science* in English, emphasizing the lack of conceptual maturity in these fields.

Legrand et al. (2018) argue that no clear boundaries exist between *sciences participatives* and *recherches participatives*, despite the commonly cited differentiation between the two; namely, large-scale data collection for the former and community-anchored local research for the latter.

Luneau et al. (2021) highlight the democratic turn taken by the *sciences participatives*. They note that citizen science was initially and mainly associated with knowledge production on one hand, and public education and raising awareness on the other, following the Cornell Lab of Ornithology's (Bonney-strand) definition. Since the 2010s, however, the citizen science movement has integrated

[1]Translated from: "Dans ce rapport, les sciences participatives sont définies comme les formes de production de connaissances scientifiques auxquelles des acteurs non-scientifiques-professionnels, qu'il s'agisse d'individus ou de groupes, participent de façon active et délibérée." (Houllier and Merilhou-Goudard 2016).

elements of Irwin's vision by adopting a third goal alongside the first two: the democratization of science. This shift implies a more open and inclusive scientific practice, positioning citizen science as a tool for social progress, fostering civic engagement, and contributing to broader societal progressivism.

2.7 Citizen science on different geographic scopes

2.7.1 Citizen science in Europe

Because barriers limit the re-use and cross-border integration of citizen-collected data, a study was conducted to examine how data are managed in citizen science projects in Europe (Schade and Tsinaraki 2016). The survey of these projects indicated a high diversity in scientific fields, funding mechanisms, and geographic scope.

The first large-scale explorative study of the European citizen science landscape, based on an online survey with closed questions, began in 2016 and was published two years later (Hecker et al. 2018). Its aim was to establish an initial basis for monitoring Open Science initiatives such as citizen science, at a time when Open Science was becoming increasingly important in European Commission research policy. The study reports that 76% of citizen science projects focus on ecology, biology, and environmental sciences. Beyond these dominant fields, the remaining projects span a wide range of scientific domains. Most citizen scientists participate in data collection, as more than two thirds of the projects are contributory or collaborative. The number of participating citizens and the amount of funding per project varied widely among respondents. Regarding project impacts, around three quarters of respondents selected *enhancement of science-community interaction* and *education*.

A subsequent study conducted at the European scale aimed to assess the impacts of citizen science projects on environmental policy and to characterize the projects that successfully contribute to policy (Turbé et al. 2019). Their inventory methodology consisted of three steps: (1) launching an EU-wide online survey, (2) reviewing selected databases of EU-funded projects, and (3) carrying out a desk study based on relevant citizen science directories and three systematic reviews. They emphasized that their inventory was not exhaustive but rather representative. The study reports that the most common barrier preventing citizen science initiatives from influencing policy is a lack of trust in data quality. As also noted by Hecker et al. (2018), projects focused on biology and biodiversity are more numerous than those addressing environmental sciences related to abiotic elements.

What is the European Union's Open Science policy that leads to such monitoring of citizen science? According to the EU's Open Science webpage (European Commission 2025c), the EU aims to *open up European science and research to make them more efficient and productive, seamless, transparent and robust, as well as responsive to policy and society needs and expectations*. Among its various practices and objectives, one in particular helps explain why the three previously cited publications were produced: *promoting public engagement in research and innovation, bolstering citizen science and enhancing public trust in science*. Open Science in the EU encompasses multiple goals, and citizen science is expected to contribute to achieving them.

In practice, how was citizen science promoted through the EU's research and innovation funding

programmes? Two programmes are relevant here: Horizon 2020, which ran from 2014 to 2020, and Horizon Europe, from 2020 to 2027 (European Commission 2025a; European Commission 2025b). Horizon 2020 included dedicated funding calls for citizen science under its *Science with and for Society* component (European Commission 2020). During this period, citizen science was promoted not only in environmental research but also as a means of strengthening interactions between science and society (Haklay 2022). Horizon Europe continues to support citizen science, for example through its *Widening Participation & Strengthening the European Research Area (ERA)* component (European Commission 2025b). Open Science is central to Horizon Europe, and citizen science is one of the eight pillars of the EU's Open Science framework. The programme mainstreams ideas such as co-design, co-creation, and the engagement of citizens and civil society organizations (Haklay 2022).

2.7.2 National citizen science landscapes

Assessments of national citizen science landscapes have been conducted in several countries, and two are particularly relevant for this master's thesis. In Ireland, all active citizen science projects were inventoried at the national scale (Roche et al. 2021). Data were gathered from publicly available sources, including social media, websites, and national organizations. The authors note that grassroots projects without an online presence or not linked to educational or research institutions may be missing. Citizen science in Ireland focuses mainly on environmental conservation, and most projects fall under the *crowdsourcing* category described by Haklay (2013), meaning that participation is largely limited to providing resources with minimal cognitive engagement, such as passive sensing. Roche et al. (2021) argue that Ireland is at a critical point and has the potential to become a model of best practice for countries at a similar stage of citizen science development.

In Australia, Golumbic (2024) conducted a study with several aims: to characterize the national landscape of citizen science projects, identify project goals and objectives, and explore the trade-offs, benefits, and challenges perceived by project leaders. A survey was distributed to the authors' contacts, to project representatives listed in the Australian Citizen Science Association (ACSA) database, and via ACSA's newsletter, mailing list, and social media. This study therefore benefited from an existing network and project database. Pelacho et al. (2021) identify Australia as the third largest contributor to citizen science publications in the Web of Science, after the USA and the UK; Belgium ranks 17th. Among many attributes examined, Golumbic (2024) report that most Australian projects focus on ecology and biodiversity, involve relatively limited numbers of participants, and operate at a local scale. Their three most common goals are collecting scientific data, education, and raising awareness. The study highlights the plurality of goals and outcomes of citizen science across science, society, and individual participants. It also suggests the importance project leaders place on community-oriented goals, sometimes above scientific ones.

2.7.3 Citizen science in Belgium

Main findings of the Citizen Science Scan 2023

Scivil, the Flemish knowledge centre for citizen science, was launched on January 30, 2019 (Scivil 2025). In 2023, it carried out its first Citizen Science Scan to inventory and characterize citizen

science projects in Belgium, with the intention of repeating the scan regularly to keep their fingers on the pulse of citizen science (Duerinckx et al. 2024). The methodology combined online searches (Google, citizen science platforms, funding lists, social media) and multilingual keywords in Dutch, English, and French (more specifically *sciences participatives* and *sciences citoyennes* in French). Three student assistants supported the data collection. To further document the landscape, Scivil sent a survey to all identified projects and shared it via social media and its October 2023 newsletter.

The 2023 scan identified 150 active citizen science projects in Belgium, with a noticeable growth in numbers observed from 2011 to 2023. The most common scientific field was *Biodiversity and Biology* (one third of active projects), followed by *Archaeology, History, and Heritage* (one quarter). *Climate and Environment* and *Human Behaviour and Well-being* each accounted for roughly one fifth of projects. Dutch was the dominant language: 89% of all active projects were accessible to Dutch-speaking participants, compared with 39.3% for French, 34% for English, and 15.3% for German. Over half of the projects (56%) were monolingual, typically in Dutch. The report highlights a significant imbalance between the number of projects available to Dutch- and French-speaking participants. Scivil suggests this may reflect the Flemish government's policy support for citizen science, and cannot only be attributed to methodological biases.

Citizen science in Belgian policies

Belgian Reports on Science, Technology and Innovation (BRISTI) provide an overview of major institutions, actors, and policies in Belgium. They were published by the Belgian Science Policy Office (BELSPO) in 2001 (updated in 2005), 2010, and 2021 (OSTC 2001; BELSPO 2010; BELSPO 2021). The terms *citizen science*, *science citoyenne*, and *science participative* and their plural were absent from the English and French two first editions. In 2021, *citizen science* and its direct translation *science citoyenne* appear for the first time. In its section on the Walloon Region, however, citizen science is not mentioned. The Wallonia-Brussels Federation refers instead to its 2018 Open Access Decree (Communauté française 2018) and to a working group on open science, and not directly to citizen science.

The Flemish Government explicitly integrates citizen science into its Science, Technology and Innovation policy (EWI 2024). The policy aims, among other objectives, to position Flanders among the EU's top five innovative regions as ranked by the EU Regional Innovation Scoreboard, and to implement the quadruple-helix innovation model. Within its Science Communication Policy, Flanders aims to promote citizen science and STEM careers. Dedicated funding calls were launched in 2018 and 2019, followed by more thematic programs, such as support for food-environment mapping under the Flemish Food Strategy and the "amai!" initiative for AI-focused citizen science (VLAIO 2023; Artificial Intelligence Flanders 2025).

Although the Walloon Region does not provide dedicated funding for citizen science, it supports initiatives that popularise science and technology, promote scientific education and careers, and strengthen scientific culture (Walloon Region 2025). These calls are not specifically aimed at citizen science, but such projects may eventually apply if their objectives align with the program. The Wallonia-Brussels Federation similarly promotes events such as the *Printemps des Sciences*, where

citizen science initiatives can be showcased as part of broader STEM-promotion policies. In the Brussels-Capital Region, citizen science can receive direct support through the Co-Create program of Innoviris (Innoviris n.d.). Overall, targeted public funding for citizen science is available in the Flemish Region and the Brussels-Capital Region.

Gaps on current knowledge on citizen science in French-speaking Belgium

Besides the Citizen Science Scan 2023, several other attempts have sought to inventory citizen science projects within French-speaking Belgium, but all have had very limited reach. BELSPO maintains a dedicated website showcasing citizen science initiatives within federal scientific institutes, most of which are multilingual (BELSPO 2025). In 2016, the Ecoconso association published an online article introducing citizen science and listing a small number of projects accessible to French-speaking Belgian citizens (Ecoconso asbl 2016). A 2017 report commissioned by the Ligue d'Enseignement et d'Éducation permanente also presented a few Belgian examples, though without aiming to be exhaustive (Hanoteaux 2017). In 2019, an article in the *Carnet des espaces naturels* of the Ardennes & Gaume asbl focused on citizen science in Wallonia, mainly through naturalistic data and species-observation platforms (Carbonnelle et al. 2019). A few associations hosting citizen science projects also provide listings on their websites, either covering activities within their own organization (CNB n.d.) or presenting a selection of their projects alongside a handful of initiatives from other associations (Natagora 2017; Natagora n.d.(c)).

The number of citizen science projects appears to be increasing at the global, European, and Belgian levels (Houllier and Merilhou-Goudard 2016; Hecker et al. 2018; Duerinckx et al. 2024). Moreover, it is likely that more initiatives exist in French-speaking Belgium than are currently reported, and no specific, up-to-date, and comprehensive inventory is yet available for citizen science in French-speaking Belgium within the environmental and natural sciences.

3 Objectives

The general objective of this work is to further our understanding of the citizen science landscape in French-speaking Belgium within environmental and natural sciences.

To achieve this objective, the following research questions will be answered:

1. How does the citizen science landscape appear?
   (a) What are the active, inactive, or completed citizen science projects and initiatives?
   (b) What are the main trends and particularities within this landscape of projects and initiatives?
2. What are the characteristics of these citizen science projects?
   This characterization deepens our understanding and relates to each project's topic, scientific field, degree of citizen involvement, tasks completed by the citizens, financial support, languages, goals, consequences, difficulties, use of the terms *science participative* and *science citoyenne*, starting year (and ending year, if applicable), collaboration with schools, type of organizers, partnerships, geographic scope, number of participants, and more.

In this master's thesis, a project is defined as *a piece of planned work or an activity that is completed over a period of time and intended to achieve a particular purpose* (Cambridge Online Dictionary n.d.(b)). An initiative is defined as *a new plan or action to improve something or solve a problem*, without a specific time limit and potentially continuing in the long term (Cambridge Online Dictionary n.d.(a)). The terms *citizens* and *citizen scientists* are used for convenience to refer to any non-professional scientist participating in citizen science activities, regardless of the legal meaning of the term *citizen*. Scientific fields related to environmental and natural sciences include biology, weather and climate research, physics, astronomy, biodiversity, agricultural and horticultural sciences, geology and paleontology, geography, and environmental topics such as air quality, soil quality, water quality, noise pollution, light pollution, environment and public health, plastic litter pollution, and others.

To address the research questions, a systematic review was first conducted to identify all active, inactive, and completed citizen science projects and initiatives in French-speaking Belgium within environmental and natural sciences. Next, as many projects as possible were contacted to distribute the Citizen Science Scan 2025 survey. The raw data collected through the review and the survey were analyzed in two ways: (1) an inventory of the citizen science landscape and (2) a characterization of the identified projects.

4 Methods

4.1 Choice of methods

This master's thesis follows the methodology structure shown in Figure 4.1.

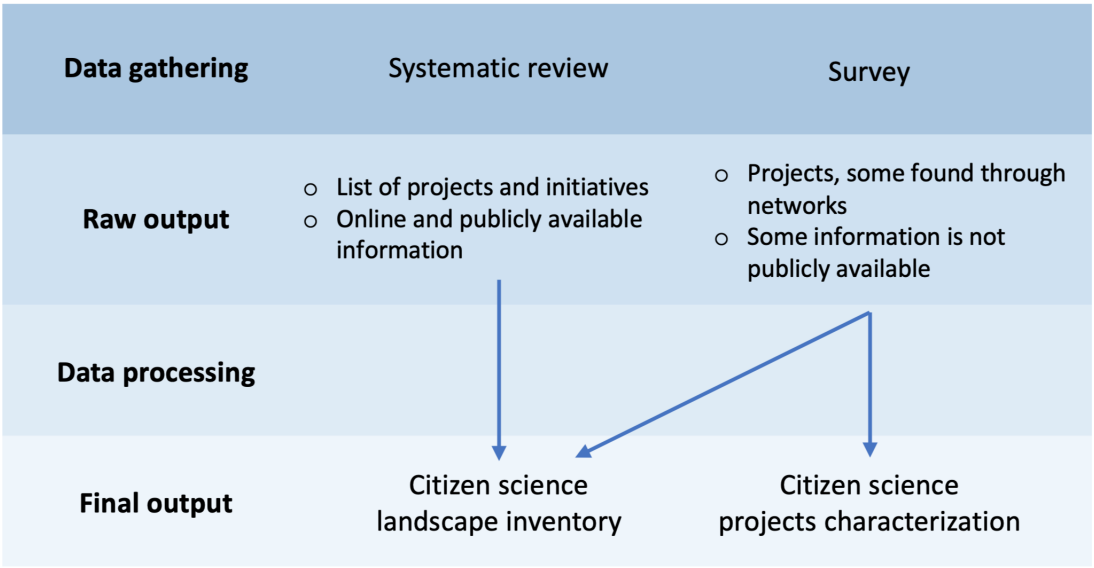


Figure 4.1: Overview of methods' structure

Identifying the active, inactive, and completed citizen science projects and initiatives in French-speaking Belgium within environmental and natural sciences is a necessary preliminary step for obtaining an overview of the citizen science landscape and characterizing the projects. Scientific literature identifies three main approaches for identifying citizen science projects: (1) systematic reviews conducted on the internet (including citizen science platforms), social media, and funding lists; (2) networks of citizen science associations (associations' newsletters, social media, and contacts) and personal acquaintances; and (3) existing inventories such as citizen science directories and previous systematic reviews (Pocock, Tweddle, et al. 2017; Turbé et al. 2019; Roche et al. 2021; Duerinckx et al. 2024; Golumbic 2024).

For this master's thesis, the method selected to inventory citizen science projects and initiatives in French-speaking Belgium in environmental and natural sciences consists of (1) a systematic internet review conducted through Google using selected keywords, and (2) mobilizing networks through the dissemination of a survey. The assumption is that the systematic review identifies all projects that would also appear in funding lists.

A scientometric approach was excluded, which could have been used to identify trends in scientific publications without listing completed, active, and inactive projects. This method has been applied mainly on scales larger than the national level (Houllier and Merilhou-Goudard 2016; Pelacho et al. 2021). Given the relatively recent expansion of citizen science in Belgium and the expectation that French-speaking projects are few in number (Duerinckx et al. 2024), a representative volume of scientific articles was unlikely to be available. In addition, this approach would require the use of both French and English keywords, thereby increasing data-collection noise.

To identify the main trends and particularities within the landscape of projects and initiatives, an inventory was first created using data obtained through the review and survey. Publicly available online information was added when needed. Each item in the inventory was then tagged, primarily according to topic and methodology, to highlight patterns and diversity within the landscape. This component of the master's thesis is referred to as the **citizen science landscape inventory**. The term *inventory* is used for clarity, even though the results extend beyond a simple list.

To examine the characteristics of the citizen science projects, all projects meeting the admission criteria were contacted and invited to complete the Citizen Science Scan survey. Contact attempts were made using email addresses found through the review as well as networks, including research institutions, acquaintances, social media posts, and newsletters. The characterization of the projects is based on the analysis of the survey responses. This approach has been used previously (Hecker et al. 2018; Duerinckx et al. 2024; Golumbic 2024). This part of the master's thesis is referred to as the **citizen science projects characterization**.

4.2 Data gathering

This section explains how raw data were gathered through (1) a systematic internet review and (2) a survey.

4.2.1 Systematic review

For the systematic review, Firefox was used in private browsing mode to avoid the influence of prior search history on the results. The keywords selected for the review were: *science participative*, *sciences participatives*, *science citoyenne*, and *sciences citoyennes*, each combined with *Wallonie*, *Bruxelles*, or *Belgique*. The geographic terms were necessary to avoid results from France and other French-speaking countries.

A random order was used for the different search equations, with the option to stop the review in case of a **saturation effect**. This effect occurred when search results became increasingly redundant and relevant findings decreased. Due to this, six equations were used in total, and the first 100 links from each were examined (Table 4.1). A second phenomenon, the **snowball effect**, occurred when websites included links or references to additional relevant sources. As a result, each search equation produced both direct and indirect findings. More than 600 websites were consulted in total between 22 April and 1 September 2025.

The entire review process was tracked in an Excel file, recording project names, websites, contact information, comments, descriptions when useful, the search equation that led to each item, and the periods during which each equation was used. This made it possible to determine how many results were produced by each equation. For privacy reasons, no contact information will appear in this master's thesis. The Excel file itself is not displayed but was used to produce the landscape inventory whose data appear in the appendices (Table 8.1).

Table 4.1: Search equations used in the systematic review and the corresponding periods of use.

Search equations	Start	End
science participative Wallonie	22/04/25	06/06/25
science citoyenne Wallonie	07/06/25	22/07/25
sciences participatives Belgique	22/07/25	13/08/25
sciences citoyennes Bruxelles	14/08/25	14/08/25
science citoyenne Belgique	15/08/25	15/08/25
science participative Bruxelles	31/08/25	01/09/25
	22/04/25	01/09/25

4.2.2 Citizen Science Scan survey 2025

In spring 2025, collaboration was initiated with Scivil, which had planned to launch its Citizen Science Scan 2025 (CSS 2025). Both efforts aimed to characterize the citizen science landscape at the same time. Although the scope of this master's thesis is more limited than Scivil's nationwide report, combining efforts was beneficial, primarily because it prevented citizen science projects from receiving two similar surveys during the same period.

The CSS 2025 survey is based on the CSS 2023 survey, with improvements informed by experience and new contributors. Seven questions specific to this master's thesis were added and were displayed only when respondents confirmed involvement in a project for which French is (one of) the organizational language(s). The survey, developed in Microsoft Forms, was available in French, English, and Dutch. Most questions were multiple-choice. Some allowed only one answer, while others allowed several. A few open-ended questions were included, primarily to gather details when respondents selected "other". The survey addressed several topics, organized into sections: (1) general project information (project name, website, start and end year, project status, language), (2) lead organizations, organizing partners, and funds (including geographic scope and number of participants), and (3) project topics (main and secondary scientific fields, involvement, and tasks performed by citizen scientists). Before distribution, members of the Scivil team and independent testers completed the survey to validate it.

The survey was emailed to all citizen science projects identified through the systematic review. Initiatives that substantially differed from recognized project criteria and from typical citizen science frameworks were not contacted, given that the survey was not designed for such cases. All email addresses were found online. Recipients were asked to share the survey with additional projects within their organizations that had not yet been contacted. One or two follow-up reminders were sent to projects that did not respond. All contacted projects and email dates were recorded in an Excel file to track the process. The survey was open from 18 August to 11 November 2025.

Special attention was given to ethics and privacy. Respondents were required to give consent for the storage and analysis of their data, and for its use in this master's thesis and the CSS 2025 report. All procedures followed Scivil's privacy policy, which was explicitly linked in the survey (Scivil n.d.(a)).

Separately, Scivil employed student assistants to identify active, completed, or inactive citizen science projects online. Searches were carried out during two periods: 15–24 July and 6–15 October 2025. Keywords included *citizen science*, *burgerwetenschap*, *participatief onderzoek*, *(participatory) action research*, *co-creatie*, *crowdsourcing*, *fablab*, *DIY lab*, *open biolab*, *citizen engagement in science*, *community science*, *crowd science*, *citizen sensing*, *citizen observatory*, *samen meten*, *monitoring, smart city*, *IoT - sensoren*, *grassroots science*, *science participative*, *science citoyenne*, *recherche participative*, *(urban) living labs*. Results were recorded in a separate Excel file. Scivil then emailed survey invitations to all identified project leaders. The survey was also distributed through Scivil's network via their newsletter, website, social media, and partner networks.

Close coordination with Scivil ensured that projects were not contacted twice, as some were identified by both their systematic review and the one conducted for this master's thesis. During the systematic review, any citizen science project or initiative unrelated to environmental and natural sciences or not offering French as a participant language was communicated to Scivil so it could be handled on their side.

4.3 Data analysis

This section explains the raw data collected through the review and survey was processed, in order to (1) get an overview of trends and particularities in the landscape of citizen science projects and initiatives and to (2) characterize citizen science projects within the scope of this research.

4.3.1 Citizen science landscape inventory

A preliminary table resembling an inventory is created using the raw results from the systematic review, with fewer restrictions on project eligibility. These raw results are then supplemented with additional projects that responded to the CSS 2025 survey but were not identified during the review. A second version of the inventory is produced after cleaning the raw results by (1) verifying that each project meets the admission criteria and (2) completing missing information with publicly available online sources.

To be admitted to the landscape inventory, citizen science projects or initiatives must meet the following criteria:

1. Potential project participants live in Belgium.
2. Have a dedicated website or an online article referring to it.
3. Be led by at least one Belgian (partner) organization.
4. Be related to environmental and natural sciences.

5. Correspond to Scivil's definition of *citizen science* or identify as *science citoyenne* or *science participative* with a definition similar to Scivil's:

   Citizen science is scientific research that is entirely or partially conducted by non-scientists (citizens), often in collaboration with or supervised by professional scientists (Scivil n.d.(b)).

Raw results from the review that did not meet these criteria included, for example, international projects not organized by at least one French-speaking Belgian organization and initiatives that labeled themselves *citizen science* but used a definition significantly different from Scivil's. A few of the cases that did not meet the criteria were still recorded because some were eligible for the Citizen Science Scan 2025, which primarily includes projects outside the environmental and natural sciences, projects without French as an organizational language, and projects conducted outside Belgium but led by Belgian organizers.

The final output is a dataset in Excel 16.77.1 listing as many citizen science projects and initiatives as possible that meet the admission criteria, with additional information for each item: identified lead and partner organizations, whether the item was found through the survey or the review (and the search equation used, if applicable), whether the survey was answered, the corresponding website, whether the item relates to environmental and natural sciences, whether French is one of the organizational languages, and whether the item is a project or an initiative.

It is debatable whether items such as naturalist working groups qualify as citizen science actors or initiatives, as the boundary between actors and initiatives is even more unclear than the boundary between projects and initiatives. These items were counted as initiatives to include them in the inventory and allow their analysis as part of the citizen science landscape.

Online research was conducted when additional information was required, but data retrieved from websites can sometimes be misleading: (1) identified partners on webpages may refer to both organizational and financial partners; only organizational partners were retained, and (2) webpages may appear fully bi- or multilingual even when organizers primarily use one language, which may not be French; this is particularly common for projects led by federal research institutes. When it was unclear whether an item met the admission criteria, an asterisk was added to the item's name in the inventory (Table 8.1), and a comment explaining the uncertainty was included.

The dataset was analyzed with Python in Spyder 5.1.5 and consists mainly of counting the occurrences of items' qualitative characteristics. As demonstrated by Pocock, Tweddle, et al. (2017), citizen science displays a high level of diversity that is difficult to capture comprehensively. Each item was therefore tagged according to its topic and methodology to support the analysis by highlighting trends and diversity within the landscape. This process represented the best compromise between rigor and flexibility.

4.3.2 Citizen science projects characterization

To characterize citizen science projects in French-speaking Belgium within environmental and natural sciences, a survey was sent to the projects identified beforehand and disseminated through selected

networks (Scivil's newsletter, posts on social media, emails to research institutes). The data were then curated in an Excel file and analyzed using Python. To be admitted to the Citizen Science Scan 2025, projects were required to meet the following criteria, which are less restrictive than those used for the citizen science landscape inventory:

1. The project fits the following definition of citizen science, or identifies as citizen science according to a definition closely aligned with it:

   Citizen science is scientific research that is entirely or partially conducted by non-scientists (citizens), often in collaboration with or supervised by professional scientists (Scivil n.d.(b)).

2. At least one of the organizers or organizing partners is Belgian.

3. Projects may be active, inactive, or completed.

Scivil's admission criteria changed in one respect between the CSS 2023 and CSS 2025 editions. The 2023 survey accepted only projects in which citizen scientists could contribute from Belgium, or projects whose research setup was relevant to part or all of Belgium. The 2025 survey, however, was open to research projects organized by at least one Belgian (partner) organization, even if the research setup was located abroad.

Admission criteria were explicitly displayed in the email sent to all inventoried email addresses identified in the systematic review. The definition of *citizen science* used to frame the study was repeated at the beginning of the survey. Some criteria were incorporated directly into survey questions, such as whether the lead organization is Belgian and which partner organizations are involved, if any. During data cleaning, the Scivil team reviewed the collected projects to ensure that all were eligible. Together, these filters ensure the eligibility of the entire studied population.

A few additional admission criteria were added to the CSS 2025 criteria to limit the scope of the population to that of this master's thesis, and they are:

1. The project has French as (one of) its organizational language(s), meaning the language used among organizers.

2. The project falls within the fields of environmental or natural sciences.

3. Potential project participants live in Belgium.

The data analyzed for the part of this work referred to as *citizen science projects characterization* consist only of the survey results. The results of the systematic review were used to contact project leaders and invite them to respond. The outputs of the review are analyzed in the section devoted to the *citizen science landscape inventory*, not in the section on the *citizen science projects characterization*.

Respondents' privacy was protected by anonymizing responses in two ways: the names of the project representatives completing the survey were not collected, and identification letters were used in the analysis and results whenever relevant.

5 Results

As illustrated in Figure 5.1, this chapter is divided into two parts: (A) the results of the citizen science landscape inventory, which comprises 86 items, and (B) the results of the characterization of citizen science projects, based solely on the survey data. This second part is further divided into four subsections: (1) results at the national level, across all scientific fields, based on 173 items; (2) results focusing on projects in the environmental and natural sciences carried out in French-speaking Belgium, covering 39 items; (3) an examination of how practitioners whose organizational language includes French use and understand the terms *science participative* and *science citoyenne*; and (4) a comparison between monolingual Dutch-speaking and French-speaking projects, based on 56 and 20 items respectively.

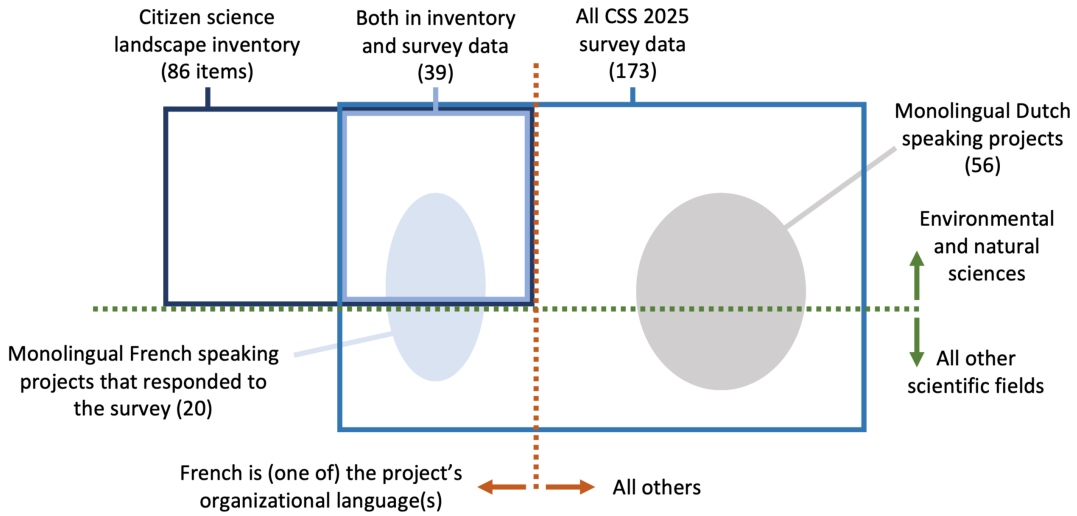


Figure 5.1: Simplified overview of the data populations used in this work. The relative sizes of the populations are not to scale.

5.1 Citizen science landscape inventory

The citizen science landscape in French-speaking Belgium within the environmental and natural sciences is diverse and complex. General results from the citizen science landscape inventory are presented first. This inventory includes all past and current citizen science projects and initiatives available to French-speaking participants living in Belgium, organized by at least one Belgian partner, conducted in French as (one of) the organizational language(s), and related to the environmental and

natural sciences. The aim is not exhaustive coverage, but rather a representative overview. Clusters of projects and initiatives are then derived from the inventory.

The final citizen science landscape inventory includes 86 projects and initiatives (Table 8.1). Of these, 65 were identified during the systematic review (Table 5.1), and 21 additional projects responded to the Citizen Science Scan survey despite not appearing in the review results. These projects likely learned about the survey through professional networks, such as Scivil's social-media posts, word-of-mouth dissemination, or emails sent to research institutions rather than directly to project leaders.

Table 5.1: Search equations of the systematic review, the number of raw results obtained for each, and the number retained for the inventory (projects and initiatives that met the admission criteria). The third search equation produced more results than the second because naturalist working groups were ultimately included as citizen science initiatives.

Search equations of the review	Raw results	Of which selected for the landscape inventory
science participative Wallonie	61	39
science citoyenne Wallonie	9	5
sciences participatives Belgique	23	19
sciences citoyennes Bruxelles	4	1
science citoyenne Belgique	8	1
science participative Bruxelles	1	0
Total	106	65

Out of the 86 inventoried projects and initiatives, 40 responded to the survey and 46 did not (Table 5.2). Among the 65 projects identified through the review, 27 responded to the survey. Eight additional projects were identified through networks but did not submit a survey response. These eight were discovered through encounters at citizen science events, word-of-mouth communication, and email exchanges following outreach to organizations potentially involved in citizen science, although they did not complete the survey.

Table 5.2: Overview of the landscape inventory: counting projects which responded to the survey and counting projects according to how they were found (review or network).

	Responded to the survey	Did not respond to the survey	*Total*
Found through the review	27	38	*65*
Found through networks	13	8	*21*
Total	*40*	*46*	*86*

The item *Réseau Telraam Liège Métropol*e is included in the landscape inventory but excluded from the Citizen Science Scan results. It is treated as a sub-project of *Telraam*, making it unsuitable for inclusion in the national dataset used for project characterization. This explains why the number of projects considered is 39 in Figure 5.1 but 40 in Table 5.2.

Within the inventory, 47 elements are classified as projects and 39 as initiatives. Although the distinction between initiatives and projects is somewhat porous and open to interpretation, these

figures still illustrate the composition of the citizen science landscape: slightly fewer than half of the inventoried elements do not fully align with a strict definition of a project, as they operate over long periods or for as long as circumstances allow.

The full inventory includes 135 distinct organizations and partner organizations (Table 8.1). The most frequently represented are Natagora, cited 18 times, and ISSeP, cited 16 times. Several other organizations can be considered prominent actors in citizen science, each cited eight or nine times: Cercles des Naturalistes de Belgique (CNB), Sciensano, Natuurpunt, ULB, UCLouvain, ULiège, IRSNB, and Bruxelles Environnement. All remaining organizations appear five times or fewer.

Projects and initiatives can be grouped into clusters to highlight overall trends, although this approach also underscores the diversity and exceptions inherent to a complex citizen science landscape. Each item in the inventory is assigned one or more tags based on its topic or nature. The number of projects associated with each tag is summarized in Table 5.3, and the project names corresponding to each tag are listed in Table 8.2.

Table 5.3: Number of projects per given tag, in the landscape inventory. Each of the 86 projects could have one or more tags.

Tag	Number of projects
Species observations	48
Environment-health	20
Naturalist working group	15
Unique	12
Air quality	10
Soil study	7
Bioblitz	7
Human biomonitoring	7
Monitoring or control of harmful species	6
Biodiversity monitoring platforms	5
Pole	3
Association	2
Meteorology	2
Seismology	2

'Species observations' is tagged 48 times, out of the 86 inventoried projects and initiatives. Most of the items are directly related to biodiversity, as part of environmental and natural sciences.

'Environment-health' is tagged 20 times. This cluster contains all seven human biomonitoring projects led by ISSeP, seven projects led by ISSeP and mostly on air quality, three projects related to air quality led by Canopea, and three distinct other projects. Not all projects tagged as 'Air quality' were also tagged as 'Environment-health' because some did not seem to have human health protection as their main goal.

'Naturalist working group' is tagged 15 times, among which three were also tagged 'Pole'. These groups generally share three traits: they target a specific taxon, rely on volunteers, and operate within associations. Each group was counted as a single item to avoid inventorying all their individual

atlases and publications separately. Poles are all part of Natagora, and each consists of several working groups. Four of the 15 working groups are led by Les Naturalistes Belges asbl, eight by Natagora, and two by the CNB. It was hard to identify the organization behind 'GT Lycaena'. The priority given to knowledge production varies across groups. Some were marked with an asterisk in the inventory because their websites suggested a lower focus on scientific activities compared to others.

'Unique' is tagged 12 times. This cluster includes all projects that are too different from the other categories to fit within them. Among these 12 items is the 'Boutique des Sciences', which is part of the Brussels Open Lab hosted by the VUB and ULB. The Boutique welcomes stakeholders (associations, citizen groups, administrations, businesses, etc.) in the Brussels-Capital Region to raise questions or issues they face. These social needs are then translated into research questions that are assigned to students from all faculties as part of their training. What makes this initiative stand out from the crowd is that citizens have a limited role which does not consist of data gathering but rather of research question formulation, which is among the first steps of the scientific method.

'Air quality' is tagged 10 times. These projects differ widely in the pollutants or indicators they target, their geographic coverage, and the methodologies they employ. Some operate at a local scale, such as Particul'air, which focuses on the city of Liège. At the opposite end of the spectrum, Lichens GO is open to participation from any French-speaking citizen living in Belgium.

'Soil study' is tagged seven times. The term 'Soil quality' is avoided as the Archisols project among them focuses on soil history.

'Bioblitz' is tagged seven times. A bioblitz aims to record as many species as possible in a defined area within a limited time. Six bioblitzes appear in the inventory because their web pages contained the keywords *science participative* or *science citoyenne*. Additional bioblitzes likely exist and have an online presence, but they were not searched for during the systematic review process. One inventoried bioblitz, held in Anderlecht in April 2025 as part of a Biodiversity and Conservation course at ULB, involved students identifying species. This raises questions about whether participation was voluntary, and therefore whether the activity falls within citizen science. The online information on Biorama's two bioblitzes was insufficient to determine whether they primarily generated scientific data or served mainly as outreach and education events. For its part, the bioblitz Objectif 1000 clearly aligns with both the structure of a project and the criteria of citizen science.

'Human biomonitoring' is tagged seven times and refers to projects conducted by ISSeP. All are also classified under 'Environment–health'. These initiatives aim to safeguard human and ecosystem health by analysing pollutants present in biological samples of human origin.

'Monitoring or control of harmful species' is tagged six times. Some projects aim to protect human health by monitoring certain species, such as exotic mosquitoes or ticks. Others focus on safeguarding ecosystem health, for example through flatworm monitoring.

'Biodiversity monitoring platforms' is tagged five times. This cluster includes online platforms that allow citizens to report naturalistic observations (fauna, flora, fungi) without being limited to single species or taxa. The accessibility of both data entry and existing datasets varies across platforms:

for instance, Observation.org is open to all users, whereas OFFH is limited to professionals and trained amateurs through password-protected accounts. Two initiatives differ slightly from the others but remain part of the cluster. Data Fauna-Flora is a free software developed by Belgian scientists to manage biogeographic databases and functions primarily as an enabling tool for citizen science projects. 'Enquêtes données d'observations d'espèces' is a portal for reporting targeted observations, such as wolf sightings or bird carcasses, in line with ongoing research at DEMNA (SPW). In addition to the five inventoried platforms, other international tools used in Belgium (e.g., iNaturalist, eBird, Pl@ntNet) are excluded from the inventory because they do not meet the admission criteria. This cluster raises questions about the definition of citizen science, as these platforms often act more as long-term infrastructures supporting scientific projects than as projects in themselves. Their inclusion demonstrates the value of a citizen science landscape inventory that covers both projects and enabling initiatives, since excluding such biodiversity-monitoring platforms would leave the landscape incomplete.

'Association' is tagged twice and includes OpenStreetMap Belgium and Lacyme, listed as single items to avoid inventorying each of their individual initiatives. OpenStreetMap Belgium, a local chapter of the OpenStreetMap Foundation, was added after responding to the CSS 2025 survey. It maintains a free, editable, volunteer-built world map under an open-content license. Lacyme is a citizen-led collaborative ecology laboratory that aims to enhance people's ability to observe and interact with their environment by carrying out various outreach, awareness-raising and citizen science activities such as bioblitzes. Repair Together was excluded despite answering the survey, as its eco-design research activities contribute to 'engineering and design' knowledge rather than environmental sciences, even though it upholds environmental goals.

All other tags are cited once and refer to item-specific descriptors associated with projects already labelled as 'Unique'. They serve as quick identifiers of each initiative's focus in Table 8.1. The inventory reveals a notable lack of water-quality related projects. The systematic review identified only one such initiative, the international project Drinkable Rivers, which was excluded because its sole Belgian actor, VivaSciences, serves only as a dissemination and recruiting partner rather than an organizational partner. Two inventoried projects address water-related topics without focusing on water quality: the Laboratoire Vivant du Campus Arlon Environnement, which co-creates water management systems in vegetable gardens, and WaterCitiSense in Brussels, which studies water fluxes on local scales.

Some types of citizen science initiatives are likely missing from the inventory. The systematic review identified an online article mentioning *astroamateurs* collaborating with professional astronomers for research and discoveries (Theunis 2020). It is also likely that scientific publications exist based on data from platforms such as Observation.org, and for which no specific data-collection campaign was organized. Although such studies rely on citizen-generated data, this contribution remains indirect, as observers do not know whether or how their records will be used.

5.2 Citizen science projects characterization

This section begins with an overview at the national level across all scientific fields, then focuses on projects in the environmental and natural sciences that use French as (one of) their organizational language(s). It is followed by results on how practitioners interpret and use the terms *science participative* and *science citoyenne*, and ends with a comparison between monolingual Dutch-speaking and French-speaking projects, regardless of scientific field.

5.2.1 Projects on a national scope and for all scientific fields

After cleaning the dataset resulting from the survey and removing duplicates, a total of 173 projects were identified as meeting the eligibility criteria. Their names are listed in the appendices. Among these, 128 reported being active at the time of response, while 45 indicated that they were inactive or completed. The survey itself remained open from 18 August to 11 November 2025. As there is a distinction between activity status at the time of response and activity status during the calendar year, 141 projects were identified as active during the year 2025, based on the start and end years provided by respondents (Figure 5.2). Overall, the number of active citizen science projects seems to increase over time.

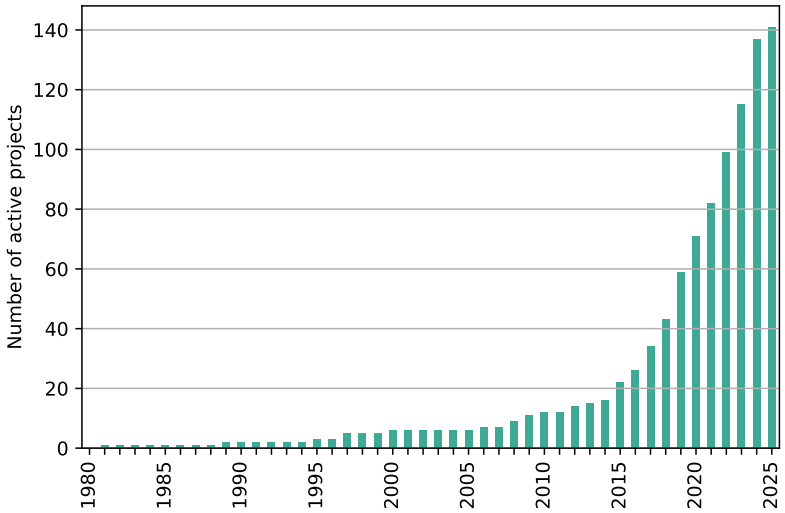


Figure 5.2: Number of active projects per year, based on the start and end years of each project as reported by respondents (168 projects out of 173). The project beginning in 1925 and the four beginning in 2026 are excluded.

Around 74% of the projects are available to Dutch-speaking citizens, around the half (49%) to English speakers, and 40% to French speakers (Figure 5.3). German comes last with 11% of the projects being available in that language. In 'Other', Spanish is the most cited language. Dutch is the dominant language of citizen science in Belgium and more projects are available in English than in French. 88 projects are monolingual (51% out of 173): 56 in Dutch, 20 in French, and 12 in English. Around a quarter of the 173 projects are bilingual and the last quarter is made of projects available in 3 or more languages.

The most frequent main scientific field is 'Biodiversity and biology', followed by 'Healthcare and

biomedical sciences' and then by 'Archeology, history, heritage' (Figure 5.4). More projects are dedicated to the study of air quality (14 projects) than to soil quality (4) or water quality (4). If combined, environmental topics represent 39 projects. Depending on the categorization in Figure 5.4, 'Environment' could be above 'Healthcare and biomedical sciences'.

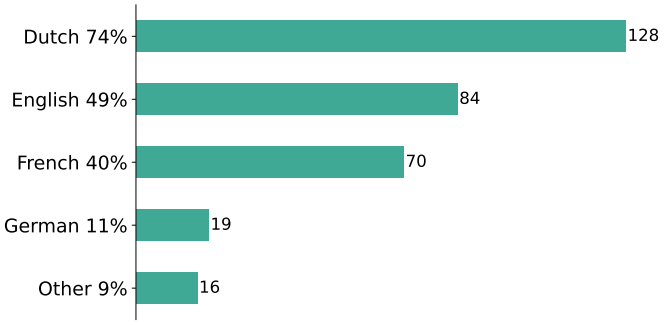


Figure 5.3: Number and percentages of projects available to participants in each language. Percentages are calculated over the total number of projects (173).

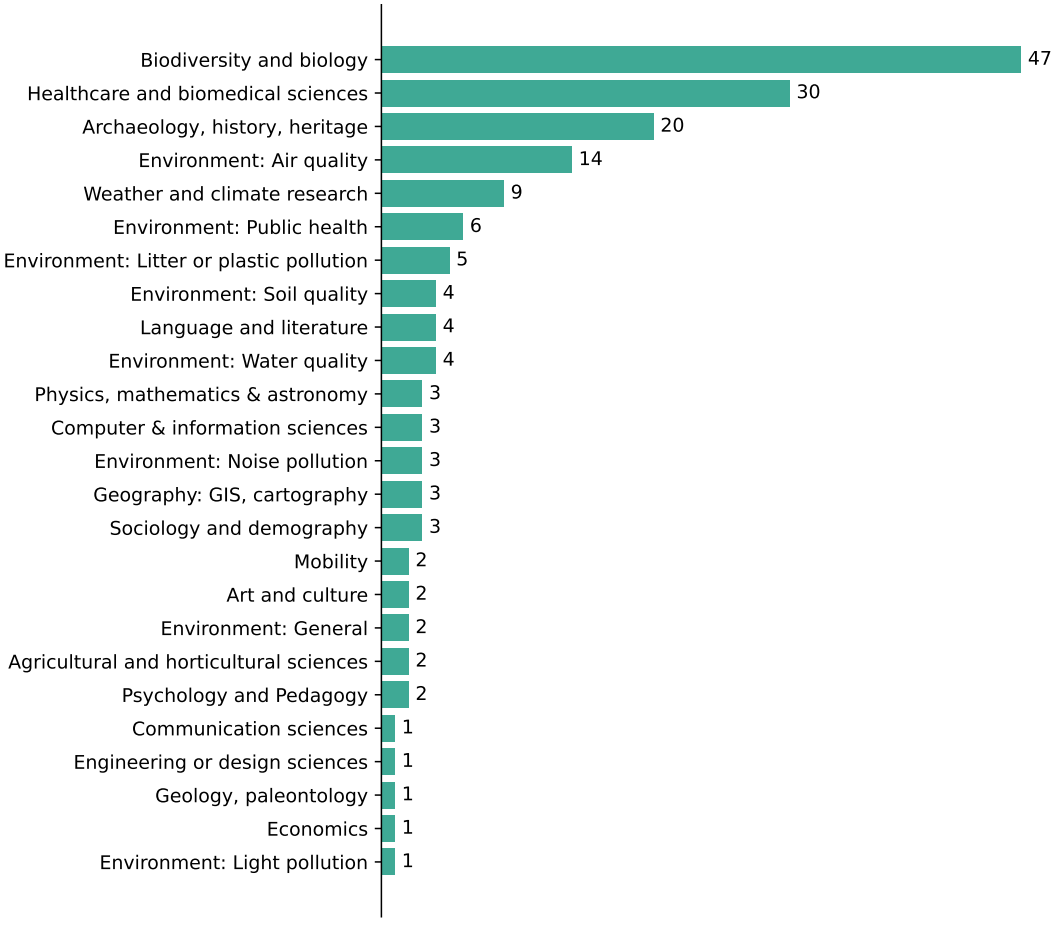


Figure 5.4: Number of projects per main scientific field they contribute to. Each of the 173 projects could only choose one option.

5.2.2 Projects in French-speaking Belgium within environmental and natural sciences

This master's thesis focuses on a specific sample of 39 projects. Projects in this sample may be active, inactive, or completed; are led by at least one Belgian partner organization; has French as (one of) its organizational language(s); are accessible to French-speaking citizens living in Belgium; and fall within the environmental and natural sciences. The item 'Réseau Telraam Liège Métropole' is excluded because it is considered a subproject of the broader project Telraam. This exclusion accounts for the difference between the 39 projects analyzed here and the 40 projects that appear in the inventory as respondents to the CSS survey (Table 5.2). A detailed list of project names is provided in the appendices.

Within the sample of 39 projects, 27 report being active and 12 report being inactive or completed. The total number of active projects per year shows an increase over time (Figure 5.5). Their emergence occurs later than that of citizen science projects considered at the national level (Figure 5.2).

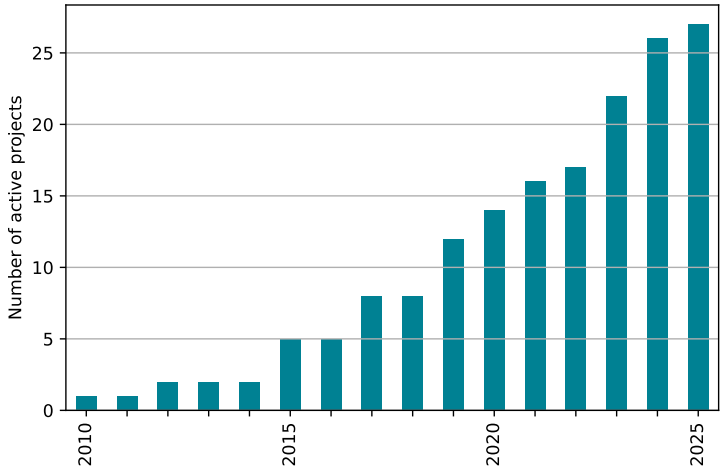


Figure 5.5: Number of active projects per year, based on start and end years of each project as reported by respondents (36 projects out of 39). The project beginning in 1925 and two beginning in 2026 are excluded.

Languages

Within the sample of 39 projects, 19 are monolingual and available only in French (49%), while the other half is multilingual: ten projects are available in two languages (26% out of 39), six projects in three languages (15%), and four projects in four or more languages (10%). Almost all multilingual projects include Dutch as an available language, with 17 of the 20 using it. English appears as an option in ten projects, and German in seven.

Main and secondary scientific fields

Biodiversity and biology is the dominant field of study among the 39 projects (Figure 5.6). When combined, environmental scientific fields include 14 projects. Within these, studies related to the environment and public health appear most frequently (six projects), followed by air quality (four) and soil quality (four). Water quality does not appear in this restricted sample, although one project

addresses water management in vegetable gardens and thus categorizes itself within agricultural sciences. *Engineering or design sciences* is retained as an eligible field because it concerns only one project, AcceleROB, which also falls within seismology. This project deploys accelerometric stations to measure real ground motion in Belgium, linking it to the natural sciences. *Healthcare and biomedical sciences* is also included, as it concerns three projects (Humus, Zitten er teken in jouw tuin? – Des tiques dans votre jardin ?, and TekenNet – TiquesNet) each closely connected to biodiversity, biology, and health-environment topics.

In addition to their primary scientific fields, several projects contribute to additional topics, sometimes outside the environmental and natural sciences (Figure 5.7). Within the sample of 39 projects, 14 contribute to only one primary scientific field (36%), while 25 contribute to at least two (64%): 18 projects (46% out of 39) contribute to two or three scientific fields overall, and seven contribute to four or more fields (18% out of 39).

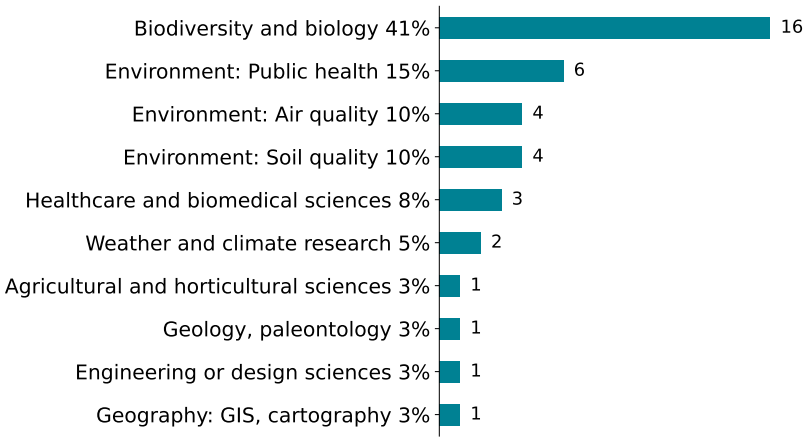


Figure 5.6: Number and percentages of projects per main scientific field they contribute to. Each of the 39 projects could only choose one option.

Lead and partner organizations

In the sample of 39 projects, 64% are led by a governmental organization, 21% by a university or college, and 15% by a non-profit organization. These proportions differ from the full dataset of 173 projects, in which approximately one third are led by governmental organizations, another third by universities and colleges, 27% by non-profit organizations, and small minorities by informal associations (3%) and private organizations (4%). Among the 39 lead organizations, 74% are research organizations and 26% are not. The most frequently cited lead organizations are ISSeP (9 projects), UCLouvain (4), Sciensano (4), and ULiège (3). All remaining organizations appear once or twice. One project, Cap Biodiversité, did not report having a Belgian lead organization but does have Belgian partner organizations.

Within the sample, 33 of the 39 projects have one or more partner organizations. These partners are most often research-performing organizations (in 19 projects), non-profit organizations (in 16), and governmental organizations at the local, regional, national, or international level (in 13).

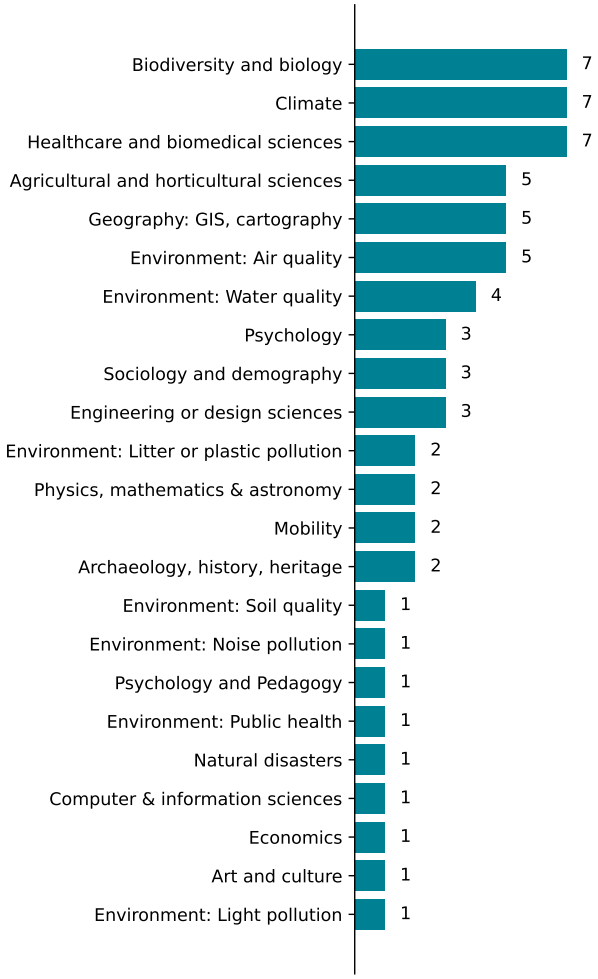


Figure 5.7: Number of projects per secondary scientific fields they contribute to. Each project could choose one, more than one or no option. Within the 39 projects, 25 responded to the question as 14 others did not as they fall within a single primary scientific field.

Funding sources

Most projects (59%, 23 of 39) rely on regional funding sources (Figure 5.8). The second most common source is the direct financial contribution of the involved organizations (33%). Respondents were asked to specify the names of their funders. Most funding sources appear only once in the dataset; however, several appear multiple times: Plan de Relance de la Wallonie (3 projects), Gouvernement Wallon (3), Région Wallonne (2), SPW-ARNE (2), Departement Zorg (2), Sciensano (2), and AVIQ (2). The last three funders support two projects led by Sciensano. Within the sample, 67% of the 39 projects rely on a single type of funding source, while 33% draw on two types of funding sources.

Geographic scopes

A majority of projects (71%, 28 of 39) operate at a regional or national geographic scope (Figure 5.9). Three projects have an international scope: Lichens GO, Cap Biodiversité, and Heeft U een aardbeving gevoeld / Avez-vous ressenti un séisme / Did You Feel an Earthquake?. The first two involve partnerships between Belgian and French organizations. The last project, led by the Royal Observatory of Belgium, reports no formal partnerships but may consider itself international because its standardized data are shared with neighboring countries. Two projects have a global scope,

OpenStreetMap Belgium and WOW-BE, both functioning as national sub-entities of broader citizen science communities. Overall, only a small number of projects are limited to a neighborhood or a few cities, and few extend beyond the national level.

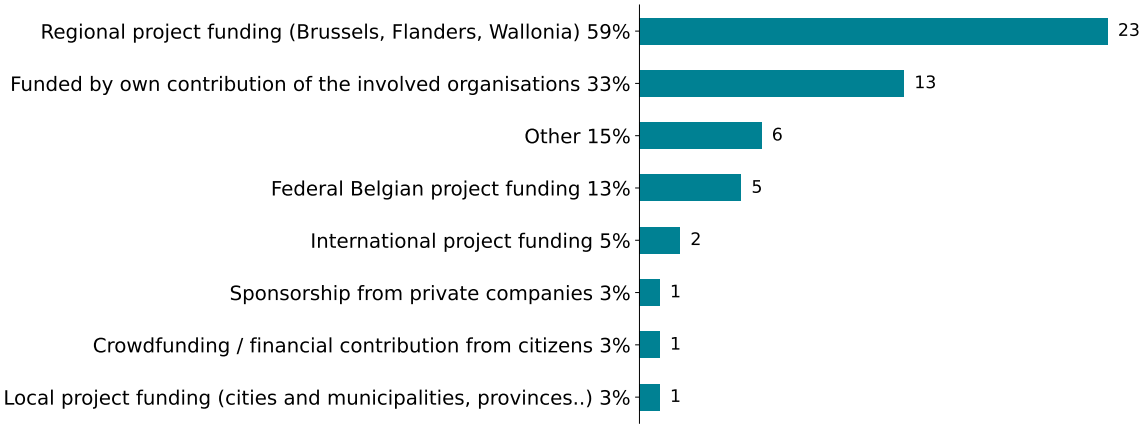


Figure 5.8: Number and percentages of projects per type of funding sources. Each of the 39 respondents could choose more than one option. Percentages are calculated over the total number of projects (39).

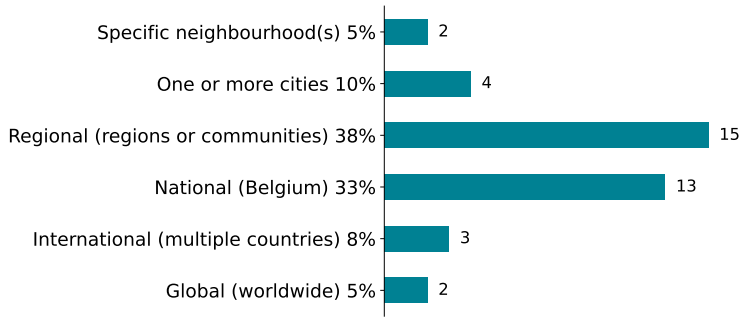


Figure 5.9: Number and percentages of projects per geographic scope. Percentages are calculated over the total number of respondents to this question (39).

Participant numbers and contribution types

More than half of the projects (59%, 23 of 39) involve 21 to 500 participants (Figure 5.10). Approximately half of the projects (19 of 39) fall into a cluster characterized by a regional to national geographic scope and between 21 and 500 participants (Figure 5.11). No projects combine a global scope with very few participants, and none combine a very small geographic scope with a very high number of participants. Determining a statistical association between geographic scope and total number of participants is not feasible here. The χ^2 test cannot be applied to the contingency table because the sample is too small relative to the number of categories. A valid χ^2 test requires at least one observation in every cell and a minimum expected frequency of five in at least 80% of the cells (Kent State University Libraries 2025).

Data collection is the most common form of citizen contribution and appears in 38 of the 39 projects (Figure 5.12). The only exception is Fabrique écocitoyenne, in which citizens engage through democratic deliberation, opinion submission, and collective discussion of priorities and values. "Co-creation or co-design activities" occur in 9 projects (23%). *Data analysis* and *communication and dissemination* follow, involving seven and six projects, respectively.

Participation formats vary: 23% of the projects rely on online participation, 26% rely on offline participation, and 51% use a hybrid online-offline approach. Collaboration with schools occurs in 23% of the 39 projects, while 77% do not engage in such partnerships.

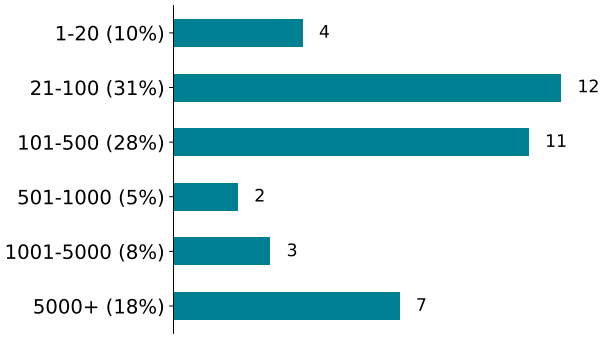


Figure 5.10: Number and percentages of projects per category of number of participants (39 projects).

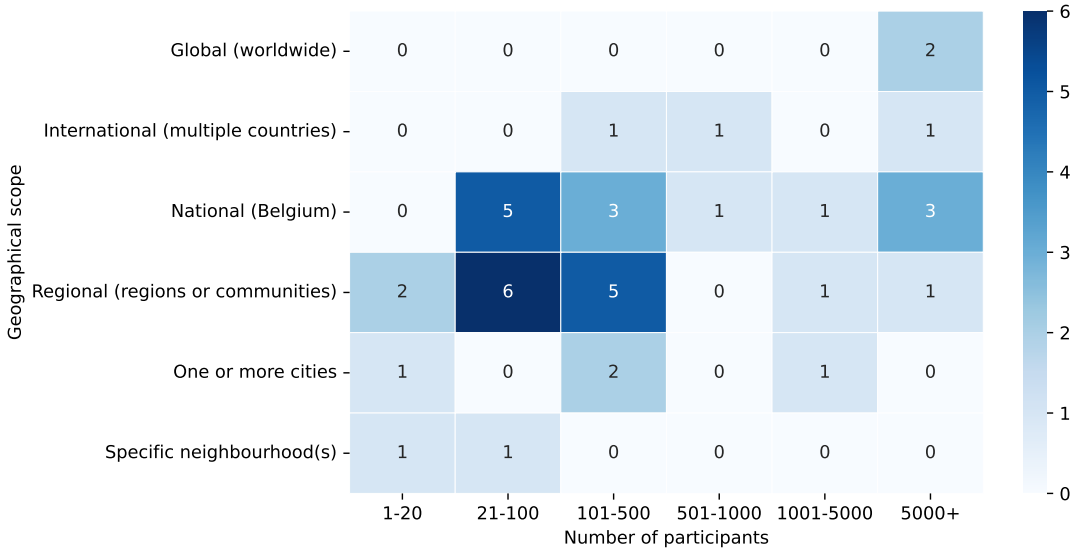


Figure 5.11: Contingency table of the projects' geographic scope by the category of number of participants (39 projects).

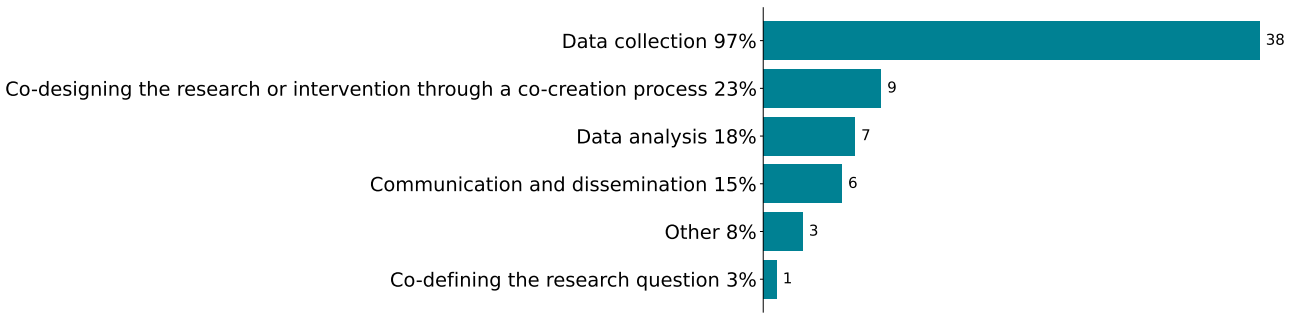


Figure 5.12: Number and percentages of projects per type of contribution from participants. Each of the 39 respondents could choose more than one option. Percentages are calculated over the total number of respondents to this question (39).

Goals, impacts, and challenges

Within the sample of 39 projects, 26 identify the *production of new scientific knowledge* as a primary goal (Figure 5.13), and 33 identify it as one of their impacts (Figure 5.14). Among the 39 projects, six did not initially report the production of new knowledge as either a goal or an impact. These projects were contacted by email to clarify whether they could be considered scientific research. All but one confirmed that knowledge production constitutes an impact of the project. The remaining project did not respond, but its online description clearly indicates that it produces knowledge.

The second and third most frequently cited goals are to *raise public awareness of an issue*, followed by *environmental protection and nature conservation* (Figure 5.13), despite biodiversity-, biology-, and environment-related projects being the most (or only) represented in the CSS 2025 and the landscape inventory. The category *protection of human health by invasive species or pollution monitoring* was added afterward because several projects reported similar answers in the open "Other" field.

To *bring academia and civil society together* and to *educate the public about scientific culture* are among the least frequently selected impacts (Figure 5.14), even though these characteristics are often used to promote citizen science. The *protection of human health* impact category was also added afterward, as two projects mentioned it in the open "Other" space. This likely explains its limited frequency (5%, two of 39) compared to the number of projects and initiatives tagged as *Environment-health* in the citizen science landscape inventory (Table 5.3), or compared to the number selecting *protection of human health by invasive species or pollution monitoring* as a goal (Figure 5.13).

Approximately half of the 39 projects identify that to *recruit new participants* and to *ensure data quality* are challenges (Figure 5.15). *Finding funds* follows, reported by 36% of the projects. This question generated a notably high number of open responses. These were grouped under the category "Other" and include the following eight distinct items: *IT developments*, *Management of rights over produced results*, *Communicating results to participants when outcomes differ from expectations*, *COVID and how schools operated during lockdowns*, *Assessing representativeness across Belgian regions*, *Making citizens understand the importance of the protocol*, *I don't know*, and *Implementation of data protection policy*. All these eight responses with a frequency of one were manually written by respondents, except *implementation of data protection policy*.

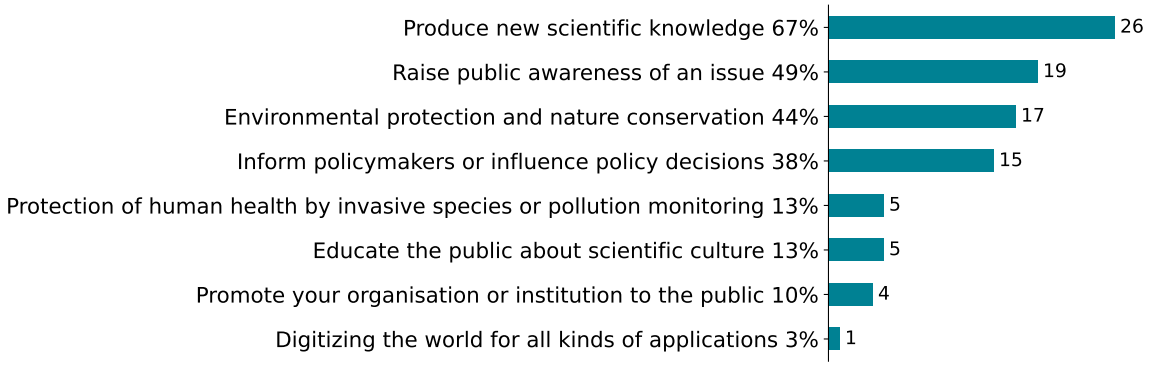


Figure 5.13: Number and percentages of projects per possible **main goal**. It was asked not to tick secondary goals, but only the main ones. Each of the 39 respondents could choose more than one option. Percentages are calculated over the total number of respondents to this question (39).

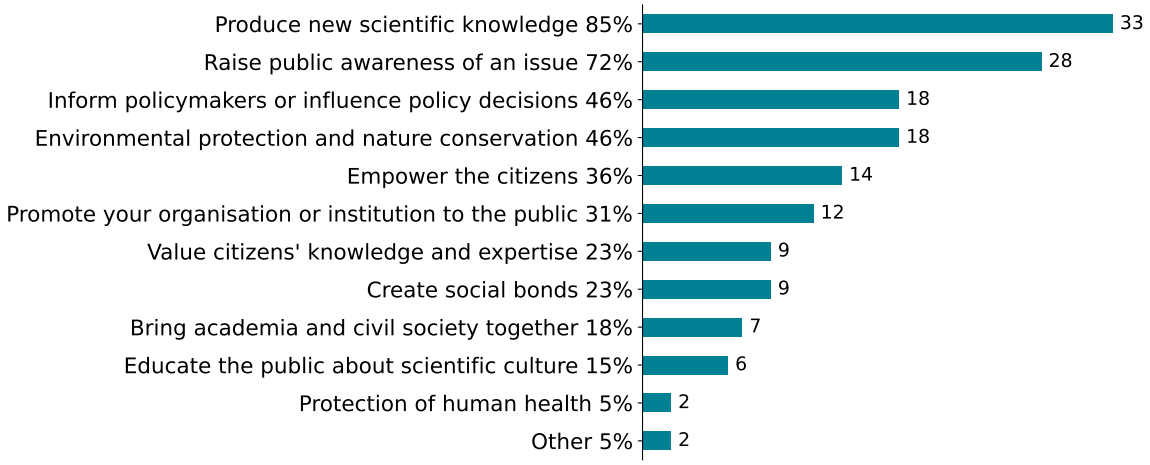


Figure 5.14: Number and percentages of projects per real consequences of the project. **Main and secondary impact** of the project were asked. Each of the 39 respondents could choose more than one option. Percentages are calculated over the total number of respondents to this question (39).

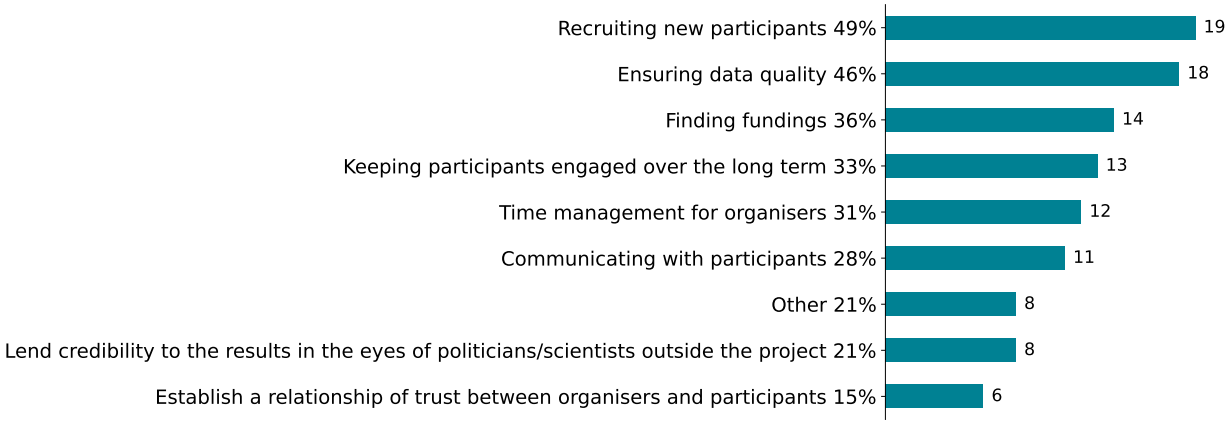


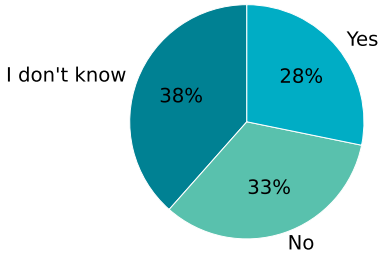
Figure 5.15: Number and percentages of projects per main **difficulties** projects had to deal with. Each of the 39 respondents could choose more than one option. Percentages are calculated over the total number of respondents to this question (39).

5.2.3 Use and understanding of *science participative* and *science citoyenne* by practitioners

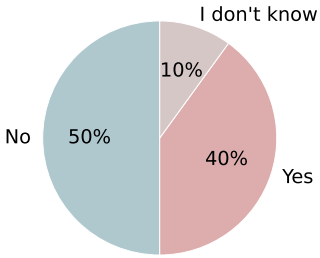
As definitions for *science participative* (SP) and *science citoyenne* (SC) vary widely in the literature, respondents were asked to describe their own project (Figure 5.17a). All respondents are assumed to be citizen science project leaders or organizers, and only projects using French as (one of) its organizational language(s) could answer this question. Half of these citizen science practitioners use the term SP rather than SC. More than a third (36%) use both terms, while 14% primarily use SC. One project describes itself as *citizen deliberation*. Overall, SP appears to be the most commonly used term (83% of the 36 projects, combining 47% and 36%).

Additional information on terminology use was obtained by asking respondents whether they perceived a difference between SP and SC (Figure 5.16a). No clear consensus emerges, as roughly one third of project leaders selected each of the three options: *Yes*, *No*, and *I don't know*. A contingency table was generated to explore trends and diversity of opinions (Figure 5.18). Even so, the sample remains inconsistent, and the small number of responses prevents reliable statistical conclusions.

To further examine patterns in the use of SP and SC, the analysis isolated projects that are monolingual and exclusively French-speaking, since some respondents were organizers of multilingual projects and did not themselves speak French (Figures 5.16b and 5.17b). This reduced sample does not consider scientific field, as doing so would make it too small. No meaningful change appears in how respondents describe their project (Figure 5.17). The proportion of respondents who do not know the difference between SP and SC decreases from 37% to 10% (Figure 5.16). Yet again, neither consensus nor sample size is sufficient to support firm interpretations. The contingency table for this restricted sample provides additional detail but still does not permit reliable conclusions (Figure 5.19).

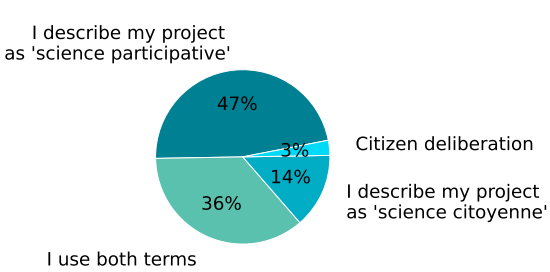


(a) French as (one of) their organizational language(s), in environmental and natural sciences

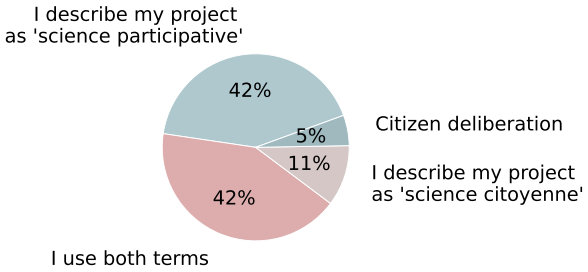


(b) Monolingual French-speaking, all scientific fields.

Figure 5.16: Percentage breakdown of respondent's opinion on whether they perceive a difference between 'science participative' and 'science citoyenne' or not, in the French language, (a) for all 39 projects having French as (one of) their organizational language(s), in environmental and natural sciences (no missing value), and (b) for all 20 monolingual French-speaking projects, regardless of the scientific field they contribute to (no missing value).



(a) French as (one of) their organizational language(s), in environmental and natural sciences.



(b) Monolingual French-speaking, all scientific fields.

Figure 5.17: Percentage breakdown of how project leaders describe their own project, (a) for 36 projects having French as (one of) their organizational language(s), in environmental and natural sciences (3 missing values among the 39 projects), and (b) for 19 monolingual French-speaking projects, regardless of the scientific field they contribute to (1 missing value among the 20 monolingual French-speaking projects). "Both" refers to *science participative* and *science citoyenne*.

The next survey question provided an open field for respondents to elaborate on their previous answer regarding whether they perceived a difference between SP and SC. Eighteen comments were collected, mostly in French and a few in Dutch or English (Table 8.3). All responses are anonymized and labeled with letters. The analysis focuses on identifying the criteria used to distinguish SP from SC in each comment. Responses I, M, and O were excluded. I ends with the statement "I don't know". M appears to have mistakenly written *science participative* instead of *science citoyenne* at some point. O expresses uncertainty, suggesting the response was a guess. According to the data presented in Table 8.3, distinctions between SP and SC rely on different criteria depending on the respondent.

Three respondents refer to **tasks and the degree of citizen involvement**. B and C view SP as more restrictive, while SC encompasses a broader set of tasks. N uses a similar criterion but focuses on involvement in decision making: in SP, citizens may influence the project, while in SC, citizens contribute in ways that do not involve project governance. B and N reflect opposing interpretations, and both are among the few Dutch responses.

Four respondents refer to the **type of participants**. A sees SP as collaboration between academics and any non-academic actor, such as a private company, while SC is open to anyone who wishes to contribute. D and H view SP as limited to skilled and knowledgeable naturalists, while SC remains open to all. L contrasts with A, D, and H by describing SP as open to anyone, while SC relies on citizens' expertise.

Three respondents distinguish SP and SC by **who is the project's initiator**. J, Q, and R state that SP projects are initiated by professional scientists, while SC projects are initiated by citizens. Depending on how L is interpreted, it may also belong to this group.

Two respondents focus on the **purpose of the project**. K and P describe SP as conventional research that involves citizens outside academic settings, while SC has an explicit democratic purpose.

Two responses, F and G, use SC as a direct translation of *burgerwetenschap*. The similarity of the answers and the close timing of their submissions suggest they may originate from the same individual.

Only a few respondents explicitly address the relationship between the two terms. E considers SP and SC equivalent. N views SP as a specific form of SC.

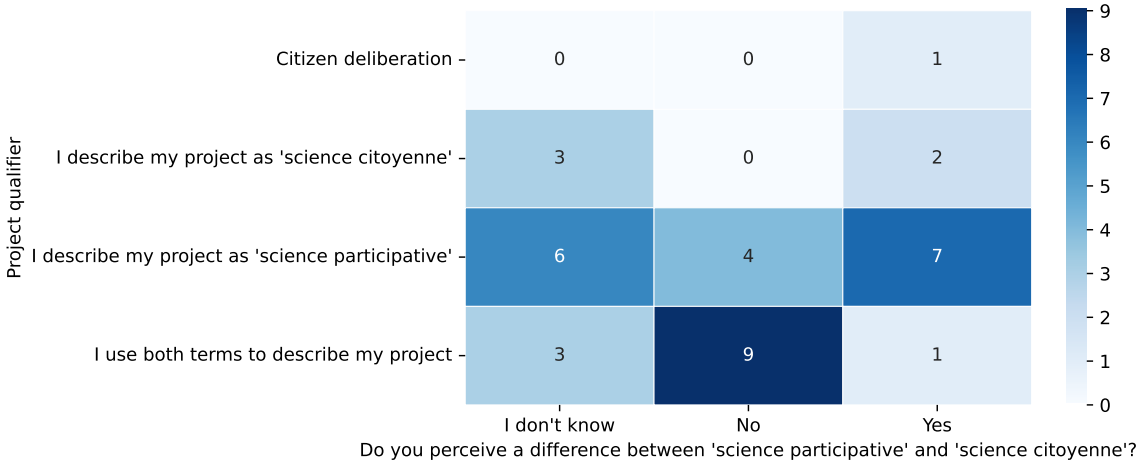


Figure 5.18: Contingency table of the terms used to describe the project by the difference perceived between 'science participative' and 'science citoyenne' in the French language, for 36 projects having French as (one of) their organizational language(s), in environmental and natural sciences (3 missing values among the 39 projects).

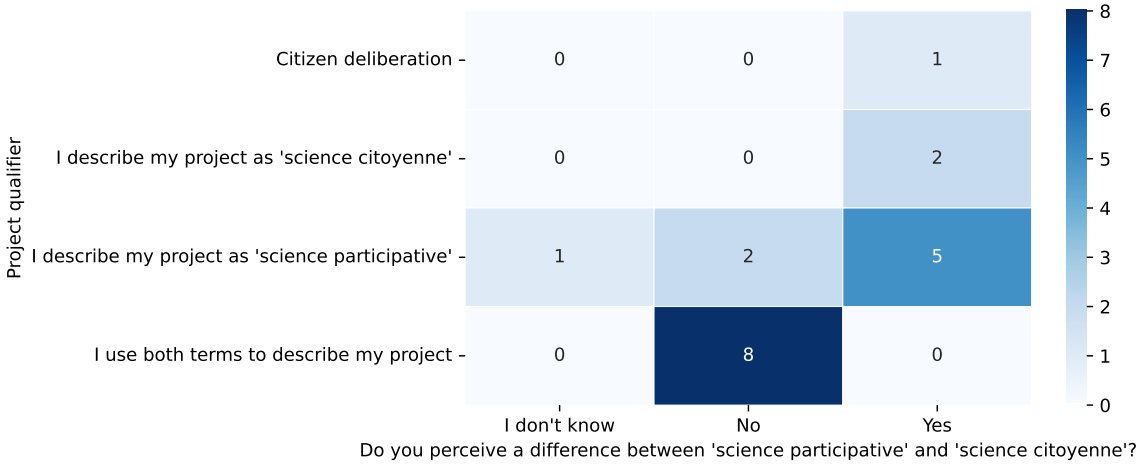


Figure 5.19: Contingency table of the terms used to describe the project by the difference perceived between 'science participative' and 'science citoyenne' in the French language, for 19 monolingual French-speaking projects, regardless of the scientific field they contribute to (1 missing value among the 20 monolingual French-speaking projects).

5.2.4 Comparison of monolingual Dutch- and French-speaking projects

It is a fact that projects are more numerous in the northern part of the country (Figure 5.3), and that no equivalent of Scivil exists in the southern part. To better understand differences, two samples of projects were created, the first restricted to the 56 monolingual Dutch-speaking projects, the second to the 20 monolingual French-speaking projects, both regardless of the scientific field of study. Two characteristics of the projects visually seem to stand out as key differences between the two samples: monolingual Dutch-speaking projects present a higher percentage of projects collaborating with schools and offer more often a full online participation compared to only French-speaking projects (Figures 5.20 and 5.21).

Is there a way to evaluate whether the difference in online, offline, and hybrid participation between monolingual Dutch- and French-speaking projects could be due to chance? The χ^2 test might answer this question. However, as the number of monolingual French-speaking projects is small and as one of the cells in the related contingency table contain fewer than five observations, this violates the assumptions of the χ^2 test and results in very low statistical power. Consequently, the null hypothesis that the mode of participation (online, offline, and both) is independent of the project language cannot be reliably tested. In practical terms, the observed difference in the percentage of fully online participation between monolingual Dutch- and French-speaking projects cannot be distinguished from random sampling variation.

To evaluate whether the difference in collaboration with schools between monolingual Dutch- and French-speaking projects projects could be due to chance, a Fisher's exact test was conducted. This test is well suited for 2×2 contingency tables and remains reliable even when some cells contain small numbers of observations. Under the null hypothesis that collaboration with schools is independent of project language, the analysis yields a two-sided p-value largely superior to 0.05. Because the French-speaking sample is small, the test has limited power, making it difficult to detect moderate differences between groups. As a result, the hypothesis of independence cannot be rejected. However, this absence of statistical significance should not be interpreted as evidence of no association.

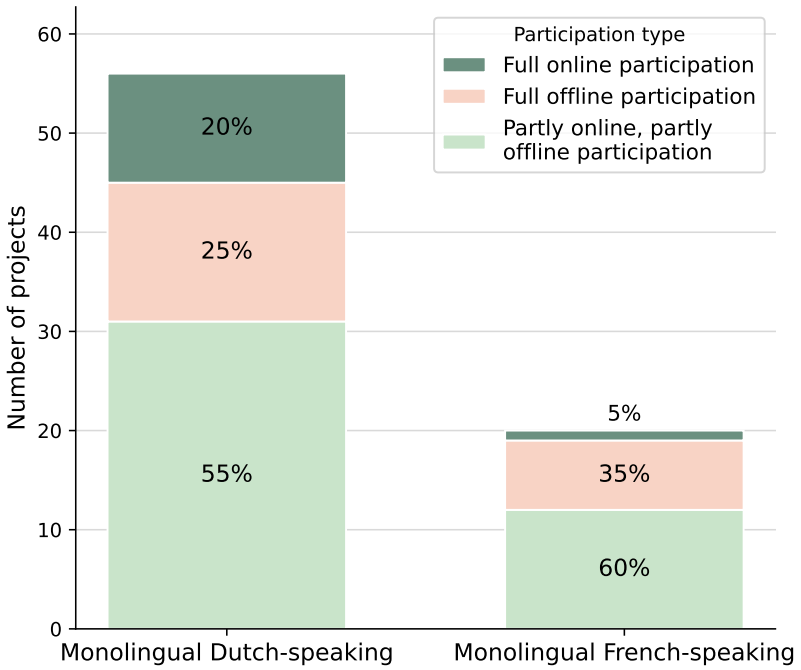


Figure 5.20: Comparison of the total number of responses and percentage breakdown for each three types of citizen participation (full online participation, full offline, or both), between the 56 Dutch-speaking and 20 monolingual French-speaking projects. Monolingual samples are regardless of the scientific fields projects contribute to.

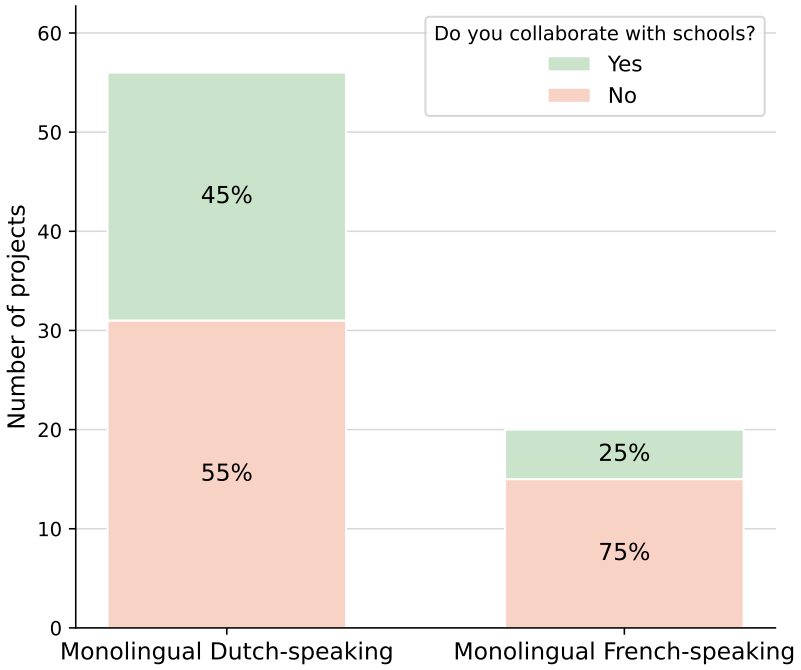


Figure 5.21: Comparison of the total number of responses and percentage breakdown for projects collaborating with schools (Yes) or not (No), between the 56 Dutch-speaking and 20 monolingual French-speaking projects. Monolingual samples are regardless of the scientific fields projects contribute to.

6 Discussion

This chapter begins with a section discussing the challenges encountered when attempting to monitor citizen science, as the used definition of citizen science is broad and open to interpretation. At the end of this first section, we address the diversity of uses and meanings of *science participative* and *science citoyenne* among practitioners in the field. The second section compares and discusses the findings of this work with citizen science in other or broader contexts, as described in the scientific literature. The third section is dedicated to the classification of projects based on existing typologies. The chapter concludes with recommendations for future citizen science monitoring efforts, limitations of this work, and perspectives for future research.

6.1 Challenges of monitoring with a broad definition

6.1.1 Item admission was regularly questioned

There are multiple definitions of *citizen science*, and many are broad and subject to interpretation (Haklay, Dörler, et al. 2021). The definition used in this work[1] can also be interpreted in different ways, which consequently creates grey areas regarding what should be included. Do all inventoried and surveyed items fit the definition of citizen science? As boundaries used for inclusion remain porous, the citizen science landscape inventory presented here cannot claim to be exhaustive.

Haklay, Fraisl, et al. (2021) identify several project attributes that often generate disagreement about whether a project should be considered citizen science. Several of these grey areas, italicized in the following sentences, appear in the landscape described in this master's thesis. OFFH illustrates the issue of *targeted participants*, as identifiers and passwords are required prior to contributing, and contributors are largely public servants and knowledgeable naturalists. In the case of the bioblitz in Anderlecht, participants were *students taking part in a compulsory activity* as part of their curriculum at ULB. *The project's main focus is education rather than scientific advancement*: this may apply to the two bioblitzes organized by Biorama, although the available online information is insufficient to confirm this. Based on descriptions of AcceleROB and Réseau Telraam Liège Métropole, *citizen contribution is passive* and does not go beyond set-up. In the Boutique des Sciences, citizen *involvement is limited to issue or topic identification* or to research-question setting. For DASA, contributions appear to be *restricted to data sharing*. Finally, some projects require *substantial prior*

[1] *Citizen science is scientific research that is entirely or partially conducted by non-scientists (citizens), often in collaboration with or supervised by professional scientists* (Scivil n.d.[b]).

training, such as bird ringing in the Bebirds programme, where volunteers must complete a training and certification process lasting at least four years before becoming active contributors.

During the development of this master's thesis, several conceptual questions emerged. The definition of citizen science depends on other concepts that are themselves open to debate, including *scientific research*, *non-scientists (citizens)*, and *professional scientists*. For instance, if a project or initiative is limited to data production, as is the case for certain biodiversity monitoring platforms, can it still be considered scientific research? Or should knowledge production or formal publication be required for a project to qualify as scientific research?

Similar ambiguities arise when attempting to distinguish between non-professional scientists, citizens, and professional scientists. How should we classify students, scientists who volunteer in associations outside their employment, or highly skilled "amateur" naturalists who are widely recognized as experts in their field? In this work, four main factors were identified as relevant to defining what constitutes a professional scientist: remuneration, academic degree, role within the project, and employment in an official research institution. Depending on the context and on how one conceptualizes the notion of a scientist, some or all of these criteria may be required to determine whether an individual should be considered a professional scientist.

6.1.2 Assessing whether naturalist working groups qualify as citizen science

In this work, naturalist working groups (GT) were considered citizen science initiatives in order to acknowledge their naturalist expertise and their contribution to scientific advancement. This categorization can nevertheless be questioned because (1) they may be viewed as actors or groups of actors rather than projects, (2) there is considerable heterogeneity among groups regarding the priority given to producing new knowledge, (3) they rarely identify themselves, or are identified by others, as *citizen science*, and (4) some groups consist mainly or exclusively of knowledgeable amateurs or experts, meaning that participation is not open to everyone.

Despite these considerations, naturalist working groups clearly contribute to the preservation, dissemination, and production of naturalist knowledge. They observe and collect data on species, habitats, phenology, and other aspects of biodiversity. Their outputs include species and biodiversity atlases, habitat inventories, and contributions to updates on conservation status. In certain cases, they lead entire projects, such as the atlas of dragonflies in Belgium produced by the GT Gomphus (Goffart et al. 2006). In others, their role is limited primarily to data collection, as with GT Hirondelles and Martinets, whose websites highlight their census activities (Natagora n.d.(b); Natagora n.d.(a)).

Whether or not to include naturalist working groups mainly depends on the definition of citizen science used in this work. While these groups fit the adopted definition, they may be included or excluded depending on how strictly one defines scientific research.

It is difficult to determine whether members of these groups consider themselves as participating in citizen science. We attempted to contact the groups that appeared to prioritize the production of new scientific knowledge, but they did not respond to the survey. One possible hypothesis is that their understanding of *citizen science* and related French terms differs from the meaning adopted in

this master's thesis, although this hypothesis would require further study and verification.

6.1.3 Various conceptualizations of citizen science among practitioners

As with the English term *citizen science*, no clear consensus exists on the meaning or use of the French terms *science participative* (SP) and *science citoyenne* (SC). The diversity of interpretations was examined in the Results chapter, which showed that respondents, when they perceived a distinction, used four main types of criteria to differentiate SP from SC: (1) the tasks and degree of citizen involvement, (2) the type of participants, (3) the identity of the project initiator, and (4) the project's purpose.

One possible explanation for the variety of meanings attributed to SP and SC in French-speaking Belgium is that this citizen science landscape is shaped simultaneously by English-speaking influences (through scientific literature and international collaborations), by French cultural and linguistic influences (through the shared language and Franco-Belgian projects), and by Dutch-speaking influences (through national and inter-regional initiatives). Two respondents to the CSS 2025 survey, for instance, indicated that they used *science citoyenne* rather than *science participative* for their multilingual project because they directly translated the term from Dutch (Table 8.3). The French-speaking citizen science landscape in Belgium thus lies at a crossroads of several cultural and linguistic backgrounds, potentially making it particularly diverse in how citizen science is understood.

This hypothesis is consistent with findings in the literature, even if the following sources do not focus specifically on Belgium. Eitzel et al. (2017) note that the meaning of citizen science varies according to geographical and linguistic contexts, and that direct translations can alter the meaning of the term. Furthermore, different countries and communities across Europe use distinct criteria and starting points to define citizen science, depending on their contexts and objectives (Haklay, Dörler, et al. 2021).

6.2 French-speaking Belgian citizen science compared to other contexts

6.2.1 Why some items are not in both the inventory and survey data

Why are some projects or initiatives part of the inventory but not in the survey data? First, potential respondents do not consider themselves involved in citizen science or do not align with the definition of citizen science used in this work. Second, contacted respondents lacked interest and/or time to respond to the survey. Third, contact addresses of older projects are no longer valid. Fourth, emails inviting project leaders to respond to the survey ended up in their spam.

Why did some projects respond to the survey without being found through the systematic review? The assumption is made that these projects learned about the survey through networks (newsletters, social media posts, word of mouth, or emails sent to institutions). Some may have limited online presence or visibility, which is likely the case for very small or grassroots initiatives. In addition,

the keywords *science participative* or *science citoyenne* may be absent from the webpages of some initiatives, making them difficult to identify through keyword-based searches.

6.2.2 Citizen science is on the rise, as in other contexts

A key finding of this work is that the total number of citizen science projects appears to be increasing over time, both among all respondents to the Citizen Science Scan 2025 (CSS 2025) and within the restricted sample of 39 projects in focus. This trend has already been noted in the CSS 2023 (Duerinckx et al. 2024). Similar patterns are observed elsewhere: at the European level (Hecker et al. 2018), in Australia (Golumbic 2024), and in English-speaking and global contexts (Pocock, Tweddle, et al. 2017). Likewise, the number of publications related to citizen science continues to grow (Houllier and Merilhou-Goudard 2016; Kullenberg and Kasperowski 2016; Pelacho et al. 2021).

Although these results align with external observations, they must be interpreted with caution. Recent or ongoing citizen science projects may be more likely to respond to surveys than older ones. Furthermore, the apparent rise might reflect increased use and recognition of the term *citizen science*, rather than an actual growth in the underlying practices. As highlighted in the State of the Art, citizen science activities existed long before the term itself became widespread.

The slower increase in the number of active projects between 2024 and 2025, compared with the stronger rises observed between 2022 and 2023, and between 2023 and 2024 (Figure 5.2) may be explained by two factors. First, the systematic review and the survey were conducted in the second half of 2025, meaning that the year was not yet complete at the time of data collection. Second, very recent initiatives often have limited online visibility, with fewer webpages or publications, making them more difficult to identify than projects established for over a year.

6.2.3 Evolution of Belgian citizen science between 2023 and 2025

The CSS 2023 report focuses on projects that were active at the time, and some of the report's findings relate strictly to projects that responded to the survey, while other findings relate to projects that were surveyed and/or inventoried through their review (Duerinckx et al. 2024). In this master's thesis, the graphs and numbers **mainly** focus on a more specific set of 39 projects, which can be active, inactive, or completed, and that strictly answered the CSS 2025 survey. However, as some data were still analyzed on a national scale from the CSS 2025 survey, the following comparisons can be drawn.

The percentage of projects available to French-speaking participants remained stable between the 2023 and 2025 results, increasing only slightly from 39.3% to 40.5% (Figure 5.3; Duerinckx et al. 2024). In absolute numbers, this corresponds to 59 out of 150 projects in 2023 and 70 out of 173 in 2025. In 2023, six monolingual French-speaking projects were inventoried, and two of them responded to the CSS 2023 survey, whereas 20 monolingual French-speaking projects responded to the CSS 2025 survey, with even more identified in the inventory. According to the CSS 2025 survey, nine monolingual French-speaking projects were active in 2023, and 11 existed or had existed when aggregating all data prior to 2023.

A noticeable difference between the 2023 and 2025 results is a shift in the two main types of funding sources. In 2023, most citizen science projects relied on their own resources (61.7%), with regional funds as the second most common source (43.2%). In 2025, however, most projects relied on regional funds (42%), while a smaller proportion depended on their own contributions (34%). The same inversion is observed in the restricted sample of projects examined in this master's thesis (Figure 5.8).

6.2.4 Biology and then environmental sciences dominate despite the overall diversity of fields

On a national scale and across all scientific fields, the findings of this work indicate that most citizen science projects in Belgium contribute to environmental sciences (39 projects out of 173), and to biodiversity research and biology (47 of 173; Figure 5.4). This pattern mirrors observations in other contexts, such as Australia (Golumbic 2024) and Ireland (Roche et al. 2021), and is consistent with European-level analyses showing that 76% of projects relate to ecology, biology, or environmental sciences (Hecker et al. 2018).

Furthermore, projects focused on biodiversity, ecology, and biology are more numerous than those addressing abiotic environmental factors. The inventory supports this, as 48 out of 86 items involve species observations. Turbé et al. (2019) similarly report that 69% of European **environmental** projects focus on "biodiversity, nature, and landscape." In their classification, biodiversity research falls under environmental sciences, this last including both biotic and abiotic factors. On a global scale, Pocock, Tweddle, et al. (2017) found that 77% of inventoried environmental and ecological citizen science projects study biodiversity, while only a minority focus on the abiotic environment.

In French-speaking Belgium, the findings of this work indicate that no citizen science project among the 39 in focus is dedicated to the study of water quality and uses French as one of its organizational languages, whereas four projects focus on air quality and another four on soil quality (Figure 5.6). The citizen science landscape inventory confirms the same absence of projects centred on water quality. The balance among the three subdisciplines (water, air, and soil quality) varies by geographic context. At the Belgian national level, four projects focus on water quality (Figure 5.4). At the European scale, 6% of environmental citizen science projects study water quality, a proportion similar to those focused on air quality, while none were identified that examine soil quality (Turbé et al. 2019).

At the European scale, and despite the predominance of a few major domains, the scientific fields covered by citizen science projects are overall highly diverse (Hecker et al. 2018). National-level findings in Belgium align with this pattern (Figure 5.4). For projects in French-speaking Belgium, which mainly contribute to environmental and natural sciences, similar diversity appears in the secondary scientific fields they address (Figure 5.7). Among these 39 analyzed projects, 25 (64%) contribute to at least two different scientific fields, with secondary domains ranging from art and culture to archaeology, history and heritage, and sociology and demography. This disciplinary diversity has two implications: (1) it increases the complexity of defining what citizen science encompasses, and (2) it may hinder projects in securing appropriate funding, as they span multiple subdisciplines (Haklay, Dörler, et al. 2021; Haklay, Fraisl, et al. 2021).

6.2.5 Mostly small to medium projects led by governmental organizations

The results indicate that, among citizen science projects in French-speaking Belgium within environmental and natural sciences, 64% are led by a governmental organization, 21% by a university or college, and 15% by a non-profit organization. This contrasts with the national-scale findings of this work, which show a more even distribution, with approximately one-third of projects in each category of lead organization. No comparison is made with other citizen science landscapes described in the literature, as the categories used to classify lead organizations vary across contexts and studies. Comparing the systematic review with the survey responses reveals low responsiveness from certain associations and high responsiveness from several governmental organizations. Although the cause is unclear, this imbalance may have influenced the results. Among the 39 projects in focus, the governmental organizations that responded include Walloon public research services such as DEMNA, research institutes such as ISSeP and CRA-W, federal research bodies such as Sciensano, federal research institutes such as the Royal Meteorological Institute of Belgium and the Royal Belgian Institute of Natural Sciences, as well as two public services of the Brussels-Capital Region (Bruxelles Environnement and urban.brussels).

Most citizen science projects in French-speaking Belgium within environmental and natural sciences are small to medium in size: 68% involve fewer than 500 participants. This pattern is consistent with the Australian citizen science landscape, where half of the projects include fewer than 200 participants (Golumbic 2024). The admission criteria for the restricted sample of 39 projects may partly explain the very low number of large-scale initiatives in this study.

6.2.6 The Walloon Region supports citizen science through non-targeted programs and policies

It is difficult to compare this work's findings on geographic scope and funding types with those of Hecker et al. (2018), whose dataset is biased toward EU-funded, national, and international European citizen science projects. Comparisons with Golumbic (2024) are also limited, as the Australian mainland and islands cover a land area approximately 250 times larger than Belgium (Geoscience Australia 2014; Statbel 2023). However, results emerge from this master's thesis, and can be discussed.

As explained in the State of the Art, the Flemish government supports citizen science in several ways, such as through funding calls embedded in the Flemish Science Communication Policy or through the 'amai!' program dedicated to citizen science and AI (EWI 2024; Artificial Intelligence Flanders 2025). The Flemish Science, Technology and Innovation policy also aims to promote STEM careers (EWI 2024). It might partly explain why citizen science projects are more numerous in Flanders compared to the rest of the country, and why monolingual Dutch-speaking projects collaborate more often with schools and imply more often full online participation, when compared to monolingual French-speaking projects (Figures 5.20 and 5.21). However, caution is needed when comparing: because the French-speaking sample is small, the data do not yield strong statistical evidence in favour of either independence or association between variables.

Although no funding calls or policy objectives specifically dedicated to citizen science were identified

for the Walloon Region, the findings for French-speaking Belgium indicate that (1) more than half of the projects are led by governmental organizations, and (2) most projects are funded either by the regional government or through the organization's own resources. While this may initially appear contradictory, a plausible explanation is that the Walloon Region does fund citizen science projects, but through broader programmes that are not explicitly labelled as citizen science.

6.2.7 Goals, impacts, and challenges

In French-speaking Belgium, and within environmental and natural sciences, the most common goals of citizen science projects are generating new scientific knowledge (67%), raising public awareness (49%), and supporting environmental protection and nature conservation (44%; Figure 5.13). These priorities broadly mirror findings from Australia (Golumbic 2024), although that study named its leading category *scientific data collection*, rather than *scientific knowledge production*, as in this master's thesis. To a lesser extent, our results also echo the Irish citizen science landscape, which is similarly characterized by a strong emphasis on environmental conservation (Roche et al. 2021).

"Protection of human health" was not offered as a predefined response option for questions on project goals or impacts in the CSS 2025 survey (see appendices for the full questionnaire). Nevertheless, five of the 39 respondents listed it as one of their main goals or impacts in the open "Other" field, which is why this category appears in Figures 5.13 and 5.14. It is likely that more projects would have selected this option had it been explicitly included, especially given that ten projects identified "Healthcare and biomedical sciences" as their main or secondary scientific field (Figures 5.6 and 5.7). Similarly, higher proportions might have been expected for "environmental protection and nature conservation", considering that this study focuses on environmental and natural sciences. Overall, the presence of several health-related projects helps explain why only a modest proportion of projects (44%) report environmental protection and nature conservation as a goal, despite this study's thematic focus.

Although some impacts are reported more frequently in the survey, these frequencies do not allow us to draw reliable conclusions about the relative ability of citizen science to achieve certain impacts over others. Frequency does not equal severity: a more commonly reported impact is not necessarily a more significant one.

Our findings indicate that the three most common challenges faced by citizen science projects in French-speaking Belgium, within environmental and natural sciences, are (1) recruiting new participants, (2) ensuring data quality, and (3) securing funding. The first two difficulties are reported by about half of the 39 projects (Figure 5.15). These challenges have also been highlighted in previous studies as being among the most important (Dias da Silva et al. 2017; Perelló et al. 2021; Poetz and Sauermann 2024).

At the European scale, similar issues emerge: 75% of projects report insufficient funding and 70% express concerns about data quality (Hecker et al. 2018). The difference between this last study's findings and the ones of this master's thesis regarding participant recruitment stems from the fact that this option was not offered to respondents in the European-wide study.

Results also partially align with findings from Australia, where the most common challenge is

"recruiting, retaining, and communicating with citizen scientists", followed by "finding funding sources". In contrast, data quality is reported as a challenge by only 9.5% of Australian projects. Notably, Golumbic (2024) define data quality as *assuring and assessing data quality, credibility questioned*. This difference suggests an avenue for further research.

Why is ensuring data quality such a widespread challenge, affecting 46% of the 39 projects? One explanation may relate to the perceived legitimacy of citizen science results among external stakeholders such as policymakers and scientists. This issue was reported by 21% of respondents. When the credibility of citizen-generated data is questioned, project teams may feel prompted to invest additional effort in validating and demonstrating data quality. However, this factor alone cannot fully explain the prevalence of the challenge; if it did, concerns about legitimacy would likely be more common. A second explanation is that involving the public in data collection inevitably reduces researchers' direct control over how data are gathered. As a result, additional validation steps become necessary to ensure that volunteers collect and report data consistently and accurately.

6.3 Applied typologies to understand trends and particularities

Is French-speaking Belgian citizen science in environmental and natural sciences the heir of the Bonney-strand of citizen science, or of the Irwin-strand (Table 2.1; Irwin 1995; Bonney 1996)? The results display characteristics of both strands, although the Bonney-strand appears to be more firmly rooted.

The main Bonney-strand characteristics highlighted in the State of the Art are that the public contributes mainly as observers, and that citizen science is used as a method or tool to scale up traditional scientific research. We found through the landscape inventory that most projects and initiatives involve citizens in species observations. Moreover, the survey results suggest that most projects involve citizens in data collection rather than in other steps of the scientific research process. Another key characteristic of the Bonney-strand is the educational goal combined with the aim of improving participants' scientific literacy. This latter aspect is less represented, as only a minority of the 39 citizen science projects report "educating the public about scientific culture" as a goal (13%; Figure 5.13) or as an impact (16%; Figure 5.14).

The Irwin-strand emphasizes the responsibility of science to society. Citizen science is considered a movement aiming to democratize science, restore public trust in science, and orient scientific practice toward complex environmental problems. These characteristics are generally more abstract than those of the Bonney-strand and therefore harder to assess. We can nonetheless consider the impact of "bringing academia and civil society together" as a possible indicator of the Irwin-strand. This impact is reported by a minority of 18% of the projects (Figure 5.14). Another indicator, although anecdotal, that the Irwin-strand is present within the Belgian citizen science landscape is that two respondents (K and P) noted that the perceived difference between *science participative* and *science citoyenne* can be interpreted as *science participative* aligning with the Bonney-strand and *science citoyenne* with the Irwin-strand (Table 8.3). Within both the landscape inventory and survey results, one project stands out clearly and falls within the Irwin-strand: the Fabrique écocitoyenne. This

project reported involving citizens in democratic deliberative processes in which they express opinions and discuss priorities and values.

Luneau et al. (2021) argue that the two strands of citizen science have been merging since the 2010s. In contrast, Van Oudheusden et al. (2024) argue that, in practice, citizen science remains dominated by the contributory (and thus Bonney-) strand. This interpretive framework aligns with the findings of this master's thesis.

As detailed in the State of the Art, the typology proposed by Bonney et al. (2009) is commonly used (Haklay 2022). Citizen science projects can be classified into three categories based on the stages of the research process in which citizen scientists participate: contributory, collaborative, and co-created. Applied to the 39 projects that responded to the survey and met the admission criteria of the landscape inventory, the results suggest that most are contributory, with 24 involving citizens only in data collection. Six projects are collaborative, as they involve citizens in data collection as well as additional stages of the research process. Nine are co-created, as they co-design the research or intervention together with citizens. These findings align with the broader literature, which consistently shows that contributory projects remain proportionally dominant compared to collaborative and co-created ones. It is valid in the Irish (Roche et al. 2021), Australian (Golumbic 2024), European (Hecker et al. 2018; Turbé et al. 2019), and worldwide contexts (Pocock, Tweddle, et al. 2017; Van Oudheusden et al. 2024).

Shirk et al. (2012) also developed a typology of citizen science based on Bonney et al. (2009), adding two additional categories: contractual and collegial projects. In contractual projects, citizens communicate their questions or needs to scientists, who then conduct the research. No such example appears among the 39 projects examined in this study, although one instance, the Boutique des sciences, was identified in the broader landscape inventory. In collegial projects, research is conducted entirely by citizens. The only example found among the 39 projects is the Atlas de la biodiversité communale d'Arlon. OpenStreetMap Belgium may also qualify as collegial, although further information would be required to confirm this. Within the landscape inventory, several activities carried out by naturalist working groups may likewise be considered collegial.

Pocock, Tweddle, et al. (2017) aimed to quantitatively assess the diversity of approaches in citizen science projects in the fields of environmental and ecological sciences and how this diversity evolved over time. The only distinct cluster of projects that was clearly identified consisted solely of computer-based citizen science projects. For all other project attributes, the data were too continuously distributed to allow clear clustering. This computer-based cluster is absent from the 39 projects in focus. In fact, the 23% of the 39 projects that reported requiring full online participation are all projects in which citizen scientists collect data in their environment and report it through an online portal (species observations, sensed small-scale earthquakes, observed weather, etc.). A small minority of these fully online projects even require citizens to follow a field-based data-collection protocol. There is thus a difference between "full online communication", as understood by most survey respondents, and "entirely computer-based activities of participants", as understood by Pocock, Tweddle, et al. (2017).

Similarly, no *virtual* citizen science project has been identified in the French-speaking citizen science

landscape within environmental and natural sciences, according to the typology of Wiggins and Crowston (2011). By *virtual*, the latter authors refer to projects that are entirely ICT-mediated and do not require participants to engage with physical elements from their environment (aside from the digital devices they use). Within the same typology, it is difficult to determine whether the *education* category is represented in the landscape. Among the 39 projects that responded to the survey, none identified "educating the public about scientific culture" as their sole and primary goal. Capteur CO2 reported its primary goal as "raising public awareness of an issue". Still, a distinction exists between raising awareness and educating, even if awareness can sometimes be considered a form of education. The remaining three citizen science categories in the typology are present in the current landscape: *action* (such as the Atlas de la biodiversité communale d'Arlon), *conservation* (such as IQSW), and *investigation* (such as AcceleROB or Humus).

6.4 Recommendations for future citizen science monitoring efforts

How can we keep our fingers on the pulse of citizen science within a delimited geographic and temporal scope? Results suggest a high level of diversity in the citizen science landscape. This substantial diversity can make monitoring citizen science complex. Citizen science does not exist only in the form of time-bound projects aiming to achieve specific goals. It also appears as long-term initiatives, such as biodiversity monitoring platforms or naturalist working groups studying specific taxa. A trade-off exists between creating a survey flexible and general enough to include all projects and initiatives, and designing a survey specific to projects, which then allows deeper investigation into particular topics and characteristics. Two complementary methods can help overcome this trade-off: (1) inventorying the citizen science landscape on a broader scale, including both projects and initiatives and using a more qualitative approach, and (2) surveying more specific citizen science projects using a more quantitative approach. Only by combining these approaches can we truly grasp the citizen science landscape in all its trends and diversity.

This trade-off has also been encountered in previous publications seeking an overview of citizen science landscapes. Duerinckx et al. (2024) gave special attention to local history groups. Although these groups do not often consider themselves part of citizen science, they fall within Scivil's understanding of the term. They were not included in the Citizen Science Scan 2023 survey because of their *uniqueness and large numbers*. Golumbic (2024) similarly highlighted *ad hoc citizen science observations*, such as naturalist observations reported through online platforms and applications. These were excluded from their survey because they are largely not project-based, even though they constitute a significant source of citizen science data used in scientific publications.

Further recommendations for future monitoring efforts, based on the CSS survey, relate to survey questions whose ambiguities became apparent only through practical experience. Some questions can be interpreted differently depending on the respondent's profile, or the suggested answer options may not be appropriate for all respondents. For example, when asking about the tasks performed by citizen scientists, should co-created projects also select other proposed options such as *data gathering*, *data*

analysis, and so on? When asking respondents from governmental research institutes about funding sources, should they select only the categories related to governmental funds, or should they also select *funded by own contribution*? Some projects involve fully online communication between organizers and participants, yet require participants to collect data in the field while following a protocol. Should these projects report full online participation, or a mix of online and offline participation? Finally, asking in a separate question about the number of languages in which a project is available would facilitate the analysis of survey results.

6.5 Limitations of the work

As with most studies, this work is subject to certain limitations. Two possible biases relate to the choice of a systematic review as a data-gathering method. First, projects and initiatives without their own website or without any online reference may not be identified, except through the complementary approach of distributing the survey via networks. Second, projects and initiatives that do not refer to themselves, or are not referred to, as *science participative* or *science citoyenne* cannot be captured through the review.

The keywords used for the review were restricted to *science participative* and *science citoyenne*, although other French translations of *citizen science* exist. These two terms were chosen because they appear to be the most commonly used in environmental and natural scientific fields. Monolingual German-speaking Belgian projects might be missing from the Citizen Science Scan 2025, as no German keywords were used in the review. The results presented in this work, based on the full set of data collected through the survey, may therefore not have the national scope originally intended.

Currently active and recently completed projects may have been more likely to respond to the survey compared to older, completed projects. There may also be self-reporting bias, as project data were collected through a survey. For example, respondents from the same organization sometimes categorized their organization differently. Comparable inconsistencies were identified in the way participants reported their project's funding sources.

6.6 Perspectives for future research

This work aimed to improve our understanding of the citizen science landscape in French-speaking Belgium within the fields of environmental and natural sciences. Although the methods employed are not new, as they draw on established approaches in the scientific literature, this is, to our knowledge, the first time they have been specifically applied to this geographic and disciplinary context. Because the landscape was not yet fully explored, a broad range of dimensions were analyzed: projects and initiatives, diversity, trends, scientific fields, geographic scope, participant numbers, tasks performed by citizens, challenges, impacts, goals, and more. We consider to have achieved our objective and laid the groundwork for future research on citizen science in French-speaking Belgium within environmental and natural sciences.

Many questions remain for further characterizing citizen science in this context: Who are the citizens

participating in these research processes? Do the expectations surrounding citizen science align across funders, project leaders, participants, and policymakers? Which of these expectations are actually met when considering the concrete impacts of citizen science projects? What resources exist or could be created to reduce barriers to project development in this geographic context? Do citizen science projects truly redefine relationships between citizens and scientific experts, given the continued dominance of contributory models? Similarly, what does this imply for the broader relationship between science and society? And do citizen science projects effectively meet the expectations set by Open Science policies?

Further research could also explore the meanings and historical evolution of the terms *science participative* and *science citoyenne* in French, as their usage and interpretation vary across time, region, and context. This investigation could be expanded to related terms or extended beyond environmental and natural sciences. Another possible research direction would be to test the hypothesis that the use and understanding of citizen science in French-speaking Belgium is influenced by Dutch, French, and English through culture, scientific literature, and multilingual projects. As noted earlier, the reason why "ensuring data quality" is reported as a less common challenge in Australian citizen science projects than in Belgian ones remains unclear. Overall, these questions span multiple disciplines, including psychology, philosophy of science, political science, and linguistics, thus highlighting the richness and complexity of citizen science as a field of study.

7 Conclusion

This work advances the understanding of the citizen science landscape in French-speaking Belgium within the environmental and natural sciences. Until now, no up-to-date, specific, and comprehensive overview has been available. To address this gap, a systematic review and a survey were employed to produce both a landscape inventory of existing initiatives and projects, and a characterization of their main features. Collaboration with Scivil, the Flemish knowledge centre for citizen science, made it possible to combine efforts and extend the research to a national scale. In-depth results and analysis on a national scale will be published in the Citizen Science Scan 2025 report. Overall, the exploratory research of this master's thesis establishes an initial foundation upon which future studies on citizen science in the context of French-speaking Belgium within the environmental and natural sciences can be developed.

Limitations of the systematic review include the potential exclusion of projects with little or no online presence and initiatives that fit the definition of citizen science but are not labeled as *science citoyenne* or *science participative*. For the survey, limitations include self-reporting bias and bias introduced by closed questions.

Results suggest a growing number of citizen science initiatives over time. Most projects focus on biodiversity, followed by studies on abiotic components of the environment, and involve citizens primarily in data collection, particularly species observation. These patterns are consistent with existing national and European findings. Results confirm the predominance of contributory projects and the persistence of the Bonney-strand of citizen science over more democratic, Irwin-type approaches.

Projects are generally small to medium in scale concerning the total number of participants, more than half are led by governmental organizations, and many rely on regional funding or internal resources. Their most common main goals are the production of scientific knowledge, followed by the raising of public awareness of an issue, environmental protection and nature conservation, and to inform policymakers or influence policy decisions. The main challenges identified are recruiting participants and ensuring data quality. No consensus emerged among respondents of projects having French as (one of) their organizational language(s) regarding the meaning or use of *science citoyenne* and *science participative*.

At the national scale and across scientific fields, Dutch remains the dominant language of citizen science in Belgium, followed by English and French. Unlike in the Flemish Region, the Walloon Region does not provide targeted funding calls for citizen science, although French-speaking projects

may still obtain financial support through broader public programs.

The research process showed that because the notion of citizen science remains broad and open to interpretation, the admission criteria used in monitoring efforts are necessarily flexible, creating grey areas. Naturalist working groups, despite their major contribution to natural sciences and biodiversity monitoring, exemplify the classification challenges encountered in this context.

Several questions emerge for further characterizing citizen science in this context of French-speaking Belgium, within environmental and natural sciences, and each feature warrants a more in-depth investigation. First, further investigation is needed to understand why ensuring data quality appears to be a more prominent challenge for French-speaking Belgian projects than for Australian ones. Second, the lack of consensus on what constitutes *science citoyenne* and *science participative* highlights the need for semantic research in French. Extending such work to the historical evolution of these terms may clarify the influence of Dutch, French, and English scientific and cultural contexts on citizen science in French-speaking Belgium. Another promising direction would be to examine whether expectations toward citizen science align across different stakeholders, including citizens, project leaders, researchers, and funding bodies at both national and European levels.

As noted in the Introduction, six of the nine planetary boundaries have been transgressed past their safe operating space (Richardson et al. 2023). Biosphere integrity, one of the transgressed boundaries, is closely linked to biodiversity loss. Many projects in the citizen science landscape inventory address this challenge by generating knowledge through public participation in species observations. Other environmental issues are also tackled, including the monitoring of invasive alien species and various pollutants. Yet environmental concerns are not the sole drivers of citizen science in the natural and environmental sciences: several projects aim to protect human health, as shown in both the landscape inventory and survey results. Three projects also contribute knowledge relevant to natural-disaster risk management (earthquakes and floods). Finally, a small cluster of projects is curiosity-driven, seeking to advance scientific understanding of the natural world.

Examples from the landscape inventory show that citizen science offers several advantages. For instance, it enables the production of knowledge that responds to societal needs and concerns, supports research across large geographic areas, and increases public awareness of specific issues. When the resulting knowledge informs policy making, citizen participation can bring diverse perspectives and values, thus allowing more democratic and relevant policies that take into account the complexity of various realities and the interdependencies between environmental, political, social, and economic dimensions. For instance, air-quality monitoring can influence urban transport planning, as well as human and ecosystem health. Biodiversity monitoring can influence urban development in a given area by reintroducing environmental protection into the agendas of local politics, which might in turn impact the locality's economic development plan.

However, citizen science also presents challenges, particularly in recruiting participants and ensuring data quality. Moreover, the field is still conceptually evolving (Dias da Silva et al. 2017), as reflected in the persistent lack of consensus among practitioners regarding the meanings and uses of *science citoyenne* and *science participative*. The field will undoubtedly continue to evolve in the future.

References

AAPS - Association for Advancing Participatory Sciences (2023). *Announcing a new name for this Association*. Retrieved December 20, 2025. URL: https://participatorysciences.org/2023/07/14/announcing-a-new-name-for-this-association/.

Artificial Intelligence Flanders (2025). *Flanders Artificial Intelligence Policy Plan*. Retrieved December 29, 2025. URL: https://www.flandersai.be/en/beleidsplan-artificiele-intelligentie.

Association Sciences Citoyennes (2024). *L'association - Qui sommmes-nous?* Retrieved November 10, 2025. URL: https://sciencescitoyennes.org/l_association/.

Belgium, ROB - Royal Observatory of (n.d.). *Macroseismic inquiries*. Retrieved December 22, 2025. URL: https://www.erdbeben.be/en/seismology/internet-macroseismic-inquiries.

BELSPO - Belgian Science Policy Office (2010). *Belgian Report on Science, Technology and Innovation*. Brussels, Belgium.

BELSPO - Belgian Science Policy Office (2021). *Belgian Report on Science, Technology and Innovation*. Brussels, Belgium. DOI: 10.5281/zenodo.7225563.

BELSPO - Belgian Science Policy Office (2025). *Citizen Science (CS) initiatives of the Federal Scientific Institutes (FSI)*. Retrieved December 13, 2025. URL: https://www.belspo.be/belspo/CitizenScience/index_en.stm.

Boeuf, Gilles, Yves-Marie Allain, and Michel Bouvier (2012). "L'apport des sciences participatives à la connaissance de la biodiversité en France". In: *La Lettre de l'OCIM* 144, pp. 8–18. DOI: https://doi.org/10.4000/ocim.1119.

Bonney, Rick (1996). "Citizen science: A lab tradition". In: *Living Bird* 15.4, pp. 7–15.

Bonney, Rick, Heidi Ballard, Rebecca Jordan, Ellen McCallie, Tina Phillips, Jennifer Shirk, and Candie C. Wilderman (2009). *Public Participation in Scientific Research: Defining the Field and Assessing Its potential for Informal Science Education. A CAISE Inquiry Group Report*. Washington, D.C.

Cambridge Online Dictionary (n.d.[a]). *Meaning of initiative in English*. Retrieved October 30, 2025. URL: https://dictionary.cambridge.org/dictionary/english/initiative.

Cambridge Online Dictionary (n.d.[b]). *Meaning of project in English*. Retrieved October 30, 2025. URL: https://dictionary.cambridge.org/dictionary/english/project.

Carbonnelle, Sébastien, Marc Dufrêne, and Jean-François Godeau (Apr. 2019). "Les sciences participatives et citoyennes : Contexte, enjeux et perspectives". In: *Carnets des espaces naturels* 2. Ed. by Ardenne & Gaume : Espaces naturels en Wallonie, pp. 6–21.

CNB - Cercles des Naturalistes de Belgique (n.d.). *Sciences participatives*. Retrieved July 23, 2025. URL: https://cercles-naturalistes.be/cnb/nos-projets/sciences-participatives.

Cooper, Caren B. and Bruce V. Lewenstein (2016). "Two meanings of citizen science". In: *The Rightful Place of Science: Citizen Science*. Ed. by Darlene Cavalier and Eric B. Kennedy. Tempe, AZ: Consortium for Science, Policy and Outcomes. Chap. 2, pp. 51–62. ISBN: 0692694838.

Décret du Gouvernement de la Communauté française du 03 Mai (2018). *visant à l'établissement d'une politique de libre accès aux publications scientifiques (open access), M.B. du 28/05/2018*. Retrieved via Gallilex. URL: https://gallilex.cfwb.be/sites/default/files/imports/45142_000.pdf.

Dias da Silva, Patrícia, Lorna Heaton, and Florence Millerand (2017). "Une revue de littérature sur la « science citoyenne » : la production de connaissances naturalistes à l'ère numérique". In: *Natures Sciences Sociétés* 25.4, pp. 370–380. DOI: https://doi.org/10.1051/nss/2018004.

Duerinckx, Annelies, Charlotte Hens, Sanne Strouven, Jef Van Laer, Isaak Vandermaesen, and Karen Verstraelen (2024). *Citizen Science Scan 2023: Landscape and evolution of citizen science in Belgium*. Leuven, Belgium: SCIVIL. DOI: 10.5281/zenodo.13382908.

Ecoconso asbl (2016). *Focus: les sciences participatives*. Retrieved December 13, 2025. URL: https://www.ecoconso.be/fr/content/les-sciences-participatives.

ECSA - European Citizen Science Association (2015). *Ten Principles of Citizen Science*. Berlin. DOI: http://doi.org/10.17605/OSF.IO/XPR2N.

ECSA - European Citizen Science Association (n.d.). *About ECSA*. Retrieved January 02, 2026. URL: https://www.ecsa.ngo/ecsa/.

Eitzel, M. V. et al. (2017). "Citizen Science Terminology Matters: Exploring Key Terms". In: *Citizen Science: Theory and Practice* 2.1, pp. 1–20. DOI: 10.5334/cstp.96.

Ellwood, Elizabeth R., Gregory B. Pauly, June Ahn, Kate Golembiewski, Lila M. Higgins, Miguel A. Ordeñana, and Matt von Konrat (2023). "Citizen science needs a name change". In: *Trends in Ecology and Evolution* 38 (6), pp. 485–489. DOI: https://doi.org/10.1016/j.tree.2023.03.003.

Entrepreneurship, VLAIO - Flanders Innovation & (2023). *Citizen scientists map food environments*. Retrieved December 29, 2025. URL: https://www.vlaio.be/nl/nieuws/burgerwetenschappers-brengen-voedselomgevingen-kaart.

European Commission (2025a). *Horizon 2020*. Retrieved December 22, 2025. URL: https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-2020_en.

European Commission (2025b). *Horizon Europe*. Retrieved December 22, 2025. URL: https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en.

European Commission (2025c). *Open Science*. Retrieved December 09, 2025. URL: https://research-and-innovation.ec.europa.eu/strategy/strategy-research-and-innovation/our-digital-future/open-science_en.

European Commission: Directorate-General for Research and Innovation (2020). *Citizen Science: elevating research and innovation through societal engagement*. Publications Office of the European Union. DOI: https://data.europa.eu/doi/10.2777/624713.

EWI - Department of Economy, Science and Innovation (2024). *STI in Flanders - Science, Technology and Innovation: Policy and key figures*. D/2023/3241/407. Flemish Government. URL: https://publicaties.vlaanderen.be/view-file/62898.

Geoscience Australia - Australian Government (2014). *Area of Australia - States and Territories*. Retrieved December 29, 2025. URL: https://www.ga.gov.au/scientific-topics/national-location-information/dimensions/area-of-australia-states-and-territories.

Gharesifard, Mohammad, Luigi Ceccaroni, Margaret Gold, Anna Bert Suman, and Kaushiki Das (2025). "Citizen science and the nexus approach: unlocking synergies for sustainable development". In: *Sustainability Nexus Forum* 33.4. DOI: https://doi.org/10.1007/s00550-025-00562-4.

Goffart, Philippe, Geert De Knijf, Anny Anselin, and Marc Tailly (2006). *Les libellules (Odonata) de Belgique. Répartition, tendances et habitats*. Faune - Flore - Habitat 1. Gembloux, Belgique: Groupe de Travail Libellules Gomphus et Centre de Recherche de la Nature, des Forêts et du Bois. ISBN: 2-87401-204-1.

Golumbic, Yaela N. (2024). "Where does the balance lie? Scientific, societal, and individual goals of citizen science projects". In: *Environmental Science and Policy* 159. DOI: https://doi.org/10.1016/j.envsci.2024.103828.

Haklay, Muki (2013). "Citizen Science and Volunteered Geographic Information – overview and typology of participation". In: *Crowdsourcing Geographic Knowledge: Volunteered Geographic Information (VGI) in Theory and Practice*. Ed. by Daniel Sui, Sarah Elwood, and Michael Goodchild. Springer Dordrecht, pp. 105–122. DOI: 10.1007/978-94-007-4587-2_7.

Haklay, Muki (2015). *Citizen Science and Policy: A European Perspective*. Ed. by Elizabeth Tyson, Anne Bowser, and David Rejeski. Vol. 4. Case study series. Washington, DC: Woodrow Wilson International Center for Scholars.

Haklay, Muki (2022). *Mutual Learning Exercise on Citizen Science Initiatives - Policy and Practice. First Topic Report: Introduction and Overview on Citizen Science*. European Commission: Directorate-General for Research and Innovation. Luxembourg: Publications Office of the European Union. DOI: https://data.europa.eu/doi/10.2777/29886.

Haklay, Muki, Daniel Dörler, Florian Heigl, Marina Manzoni, Susanne Hecker, and Katrin Volhand (2021). "What is Citizen Science? The challenges of Definition". In: *The Science of Citizen Science*. Ed. by Katrin Volhand, Daniel Dörler, Florian Heigl, Marina Manzoni, and Susanne Hecker. Springer. Chap. 2, pp. 13–33. DOI: https://doi.org/10.1007/978-3-030-58278-4_2.

Haklay, Muki, Dilek Fraisl, et al. (2021). "Contours of citizen science: a vignette study". In: *Royal Society Open Science* 8.8 (202108). DOI: https://doi.org/10.1098/rsos.202108.

Haklay, Muki, Alice Motion, et al. (2020a). *ECSA's characteristics of citizen science*. ECSA - European Citizen Science Association. DOI: 10.5281/zenodo.3758555.

Haklay, Muki, Alice Motion, et al. (2020b). *ECSA's Characteristics of Citizen Science: Explanation Notes*. Version 1, April 2020. DOI: https://doi.org/10.5281/zenodo.3758554.

Hanoteaux, Sven (2017). *Les sciences participatives : Collaboration entre citoyens et scientifiques*. Ed. by Roland Perceval. La Ligue de l'Enseignement et de l'Éducation permanente, asbl. Bruxelles, Belgique.

Heaton, Lorna, Florence Millerand, Xiao Liu, and Élodie Créspel (2016). "Participatory Science: Encouraging public engagement in ONEM". In: *International Journal of Science Education* 6.1, pp. 1–22. DOI: https://doi.org/10.1080/21548455.2014.942241.

Hecker, Susanne, Lisa Garbe, and Aletta Bonn (2018). "The European citizen science landscape - a snapshot". In: Hecker, Susanne, Muki Haklay, Anne Bowser, Zen Makuh, Johannes Vogel, and Aletta Bonn. *Citizen Science: Innovation in Open Science, Society and Policy*. UCL Press. Chap. 13, pp. 190–200. DOI: https://doi.org/10.14324/111.9781787352339.

Houllier, François and Jean-Baptiste Merilhou-Goudard (2016). *Les sciences participatives en France: État des lieux, bonnes pratiques & recommendations*, hal-02801940, p. 63.

Innoviris (n.d.). *Co-Create*. Retrieved December 12, 2025. URL: https://www.innoviris.brussels/sites/default/files/2025-01/Co-Create25_Reglement.pdf.

Irwin, Alan (1995). *Citizen Science: A study of people, expertise and sustainable development*. Environment and Society. London: Routledge. ISBN: 0-415-11548-5.

Kent State University Libraries (2025). *SPSS Tutorials: Chi-Square Test of Independence*. Retrieved December 27, 2025. URL: https://libguides.library.kent.edu/spss/chisquare.

Kobori, Hiromi, Janis Dickinson, Izumi Washitani, Ryo Sakurai, Tatsuya Amano, Naoya Komatsu, and Wataru Kitamura (2015). "Citizen science: a new approach to advance ecology, education and conservation". In: *Ecological Research* 31, pp. 1–19. DOI: 10.1007/s11284-015-1314-y.

Kullenberg, Christopher and Dick Kasperowski (2016). "What Is Citizen Science? – A Scientometric Meta-Analysis". In: *PLoS ONE* 11.1, e0147152. DOI: https://doi.org/10.1371/journal.pone.0147152.

Legrand, Marine, Anne Dozières, Hélène Dupont, Julie Scapino, and Frédérique Chlous (2018). "Étude comparée des dispositifs participatifs du Muséum national d'histoire naturelle". In: *Natures Sciences Sociétés* 25.4, pp. 393–402. DOI: https://doi.org/10.1051/nss/2018009.

Luneau, Aymeric, Élise Demeulenaere, Stéphanie Duvail, Frédérique Chlous, and Romain Julliard (2021). "Le tournant démocratique de la citizen science : sociologie des transformations d'un programme de sciences participatives". In: *Participations* 31.3, pp. 199–240. DOI: https://doi.org/10.3917/parti.031.0199.

Miller-Rushing, Abraham, Richard Primack, and Rick Bonney (2012). "The history of public participation in ecological research". In: *Frontiers in Ecology and the Environment* 10.6, pp. 285–290. DOI: https://doi.org/10.1890/110278.

Natagora (2017). *Sciences participatives : la force du nombre au service de la science*. Retrieved June 19, 2025. URL: https://volontariat.natagora.be/articles/sciencesparticipatives.

Natagora (n.d.[a]). *Le groupe de travail Hirondelles*. Retrieved January 04, 2026. URL: https://www.natagora.be/hirondelles.

Natagora (n.d.[b]). *Le groupe de travail Martinets*. Retrieved January 04, 2026. URL: https://www.natagora.be/martinets.

Natagora (n.d.[c]). *Sciences citoyennes : nouveau moteur de mobilisation ?* Retrieved June 19, 2025. URL: https://volontariat.natagora.be/articles/sciences-citoyennes-nouveau-moteur-de-mobilisation.

National Audubon Society (2025). *Community Science: Christmas Brid Count: History of the Christmas Bird Count*. Retrieved June 14, 2025. URL: https://www.audubon.org/community-science/christmas-bird-count/history-christmas-bird-count.

OECD (2025). *Embedding citizen science into research policy*. OECD Science, Technology and Industry Policy Papers 175. Paris: OECD Publishing. DOI: https://doi.org/10.1787/a1cfb1a8-en.

OSTC - Belgian Federal Office for Scientific, Technical and Cultural Affairs (2001). *Belgian Report on Science, Technology and Innovation*. Brussels, Belgium.

Oxford University Press (n.d.). *Citizen science, n.* In Oxford English dictionary. Retrieved December 19, 2025. DOI: https://doi.org/10.1093/OED/6784505301.

Pelacho, M., G. Ruiz, F. Sanz, A. Tarancón, and J. Clemente-Gallardo (2021). "Analysis of the evolution and collaboration networks of citizen science scientific publications". In: *Scientometrics* 126, pp. 225–257. DOI: https://doi.org/10.1007/s11192-020-03724-x.

Perelló, Josep, Andrzej Klimczuk, Anne Land-Zandstra, Katrin Volhand, Katherin Wagenknecht, Claire Narraway, Rob Lemmens, and Marisa Ponti (2021). "The Recent Past and Possible Futures of Citizen Science: Final Remarks". In: *The Science of Citizen Science*. Ed. by Katrin Volhand, Anne Land-Zandstra, Luigi Ceccaroni, Rob Lemmens, Josep Perelló, Marisa Ponti, Roeland Samson, and Katherin Wagenknecht. Springer. Chap. 26. ISBN: 978-3-030-58278-4. DOI: https://doi.org/10.1007/978-3-030-58278-4_26.

Pocock, Michael, Mark Chandler, et al. (2018). "Chapter Six - A Vision for Global Biodiversity Monitoring With Citizen Science". In: *Advances in Ecological Research* 59, pp. 169–223. DOI: https://doi.org/10.1016/bs.aecr.2018.06.003.

Pocock, Michael, John Tweddle, Joanna Savage, Lucy Robinson, and Helen Roy (2017). "The diversity and evolution of ecological and environmental citizen science". In: *PLoS ONE* 12.4, e0172579. DOI: https://doi.org/10.1371/journal.pone.0172579.

Poetz, Marion and Henry Sauermann (2024). *How and when to involve crowds in scientific research*. Cheltenham, UK: Edward Elgar Publishing Limited, p. 230. ISBN: 9781802204315. DOI: https://doi.org/10.4337/9781802204315.

Richardson, Katherine et al. (2023). "Earth beyond six of nine planetary boundaries". In: *Science Advances* 9.37. DOI: https://doi.org/10.1126/sciadv.adh2458.

Roche, Joseph, Aoibhinn Ni Shuilleabhain, Peter Mooney, Gillian Barber, Laura Bell, and Cliodhna Ryan (2021). "Citizen Science in Ireland". In: *Frontiers in Communication* 6. DOI: https://doi.org/10.3389/fcomm.2021.629065.

Sauermann, Henry et al. (2020). "Citizen science and sustainability transitions". In: *Research Policy* 49 (5). DOI: https://doi.org/10.1016/j.respol.2020.103978.

Schade, Sven and Chrysi Tsinaraki (2016). *Survey report: data management in Citizen Science projects*. EUR 27920, JRC101077. Luxembourg: Publications Office of the European Union. DOI: https://dx.doi.org/10.2788/539115.

Scivil (2025). *About Scivil*. Retrieved December 11, 2025. URL: https://www.scivil.be/en/about-scivil.

Scivil (n.d.[a]). *Disclaimer/privacy*. Retrieved November 27, 2025. URL: https://www.scivil.be/disclaimerprivacy.

Scivil (n.d.[b]). *What is citizen science?* Retrieved June 09, 2025. URL: https://www.scivil.be/en/book/citizen-science-something-me.

Shirk, Jennifer L. et al. (June 2012). "Public Participation in Scientific Research: a Framework for Deliberate Design". In: *Ecology and Society* 17.2 (29). DOI: http://dx.doi.org/10.5751/ES-04705-170229.

Silvertown, Jonathan (2009). "A new dawn for citizen science". In: *Trends in Ecology and Evolution* 24.9, pp. 467–471. DOI: https://doi.org/10.1016/j.tree.2009.03.017.

Statbel (2023). *An overview of Belgium with figures - Key figures 2023*. Retrieved December 29, 2025. URL: https://statbel.fgov.be/sites/default/files/files/documents/EN_Kerncijfers2023_web.pdf.

Storup, Bérangère, Glen Millot, and Claudia Neubauer (2013). *La recherche participative comme mode de production de savoirs : Un état des lieux des pratiques en France*. Fondation Sciences Citoyennes supported by Fondation de France.

Tennant, Jonathan P. (2020). "Web of Science and Scopus are not global databases of knowledge". In: *European Science Editing* 46 (e51987). DOI: https://doi.org/10.3897/ese.2020.e51987.

Theunis, Laetitia (2020). *Les citoyens, des scientifiques amateurs qui font toute la différence*. Daily Science, online article published on April 04, 2020. Retrieved November 08, 2025. URL: https://dailyscience.be/06/04/2020/les-citoyens-des-scientifiques-amateurs-qui-font-toute-la-difference/.

Turbé, Anne, Jorge Barba, Maite Pelacho, Shailendra Mudgal, Lucy D. Robinson, Fermin Serrano-Sanz, Francisco Sanz, Chrisa Tsinaraki, Jose-Miguel Rubio, and Sven Schade (2019). "Understanding the Citizen Science Landscape for European Environmental Policy: An Assessment and Recommendations". In: *Citizen Science: Theory and Practice* 4.1, pp. 1–16. DOI: https://doi.org/10.5334/cstp.239.

Turrini, Tabea, Daniel Dörler, Anett Richter, Florian Heigl, and Aletta Bonn (2018). "The threefold potential of environmental citizen science - Generating knowledge, creating learning opportunities and enabling civic participation". In: *Biological Conservation* 225, pp. 176–186. DOI: https://doi.org/10.1016/j.biocon.2018.03.024.

UCLouvain (2024). *Utilisation responsable de l'intelligence artificielle générative - Rapport du groupe de travail*. Retrieved November 15, 2025. URL: https://oer.uclouvain.be/jspui/bitstream/20.500.12279/1079/1/IAGenerative_Groupe_de_Travail_UCLouvain_2024_06.pdf.

Van Oudheusden, Michiel, Anna Berti Suman, Tine Huyse, Huib Huyse, and Fabien Medvecky (2024). "The Valuable Plurality of the Citizen Sciences". In: *Science and Technology Studies* 37.1, pp. 10–20. DOI: https://doi.org/10.23987/sts.126210.

von Hippel, Frank (1991). *Citizen Science. Collected Essays of Frank von Hippel*. Melville, NY: American Institute of Physics. ISBN: 978-0-88318-709-8.

von Hippel, Frank and Tomoko Kurokawa (2020). "Citizen Scientist: Frank Von Hippel's Adventures in Nuclear Arms Control". In: *Journal for Peace and Nuclear Disarmament* 1, pp. 1–37. DOI: https://doi.org/10.1080/25751654.2019.1698501.

Walloon Region (2025). *Receiving aid for a project to popularise science, research and innovation - DIFST*. Updated November 20, 2025. Retrieved December 12, 2025. URL: https://www.

wallonie.be/en/demarches/receiving-aid-project-popularise-science-research-and-innovation-difst.

Wiggins, Andrea and Kevin Crowston (2011). "From Conservation to Crowdsourcing: A Typology of Citizen Science". In: *Proceedings of the 44th Hawaii International Conference on System Sciences*. Kauai, HI, USA, pp. 1–10. DOI: 10.1109/HICSS.2011.207.

8 Appendices

8.1 Citizen Science Scan 2025 survey

Here below is a copy of the Citizen Science Scan 2025 survey.

Inventory of Belgian citizen science projects - 2025.

As the Flemish Knowledge Center for Citizen Science, Scivil wants to keep its finger on the pulse of the Flemish Citizen Science landscape. Additionally, as part of a master's thesis UCLouvain is working on a study of French-speaking citizen science projects in Belgium. We joined forces to create our second inventory of Belgian citizen science projects. In collaboration with students we created a first list of projects over the summer. We would like to deepen this rich dataset of projects in order to gain a better understanding of the number and types of citizen science projects being rolled out in Belgium. By completing the survey below about your project, you will help us take a big step forward. Completing the survey takes about 5 minutes. Perhaps you already completed this questionnaire during our inventory in 2023. If so, please fill it out again! We would very much like to include your project(s) in the inventory again.. Thank you in advance!

Contact details: info@scivil.be and `www.scivil.be/en`

What is citizen science? Citizen science is scientific research conducted in whole or in part by non-scientists (citizens), often in collaboration with or under the guidance of professional scientists. Find out more at `https://www.scivil.be/en/book/citizen-science-something-me` Interested to read the results of the previous citizen science scan? You can read the report here: `https://www.scivil.be/en/news/scivil-releases-citizen-science-scan-2023`

Section 1: General information

1. Name of the project
2. Project website (URL)
   In case the project does not have its own website, you can refer to an external website, platform or article in which the project is mentioned.
3. Start year of the project
4. End year of the project (if applicable)
5. Status of the project
   - Active

- Inactive/Completed

6. Languages in which the project is/was available
   - Dutch
   - French
   - German
   - English
   - Other (clarify in next question)
7. Clarify 'other'

Section 2: Project partners and funding

8. Lead organization
   Name of the organization that leads the project
9. Is this a Belgian organization?
   Does the lead organization have a branch or registered office in Belgium?
   - Yes
   - No
10. Which category fits best with the lead organization?
    - Governmental organization
    - Not-for-profit organization
    - Private organization
11. Is the lead organization a research performing organization?
    Is conducting research part of the main activities of this organization?
    - Yes
    - No
12. Are there other partners involved in the project? If yes, which type?
    - Research performing organization
    - Policy (local, regional, national, international)
    - Not-for-profit organizations (NGOs, civil movements, CSOs...)
    - Companies (SMEs, industry...)
    - Educational organizations and/or schools
    - Cultural organizations (libraries, museums...)
    - Unincorporated group or association
    - Other (clarify in next question)
13. If applicable, clarify 'Other'
14. Please provide the name of any Belgian partner(s) involved in the project
15. What are the main sources of funding for the project?
    - International project funding
    - Federal Belgian project funding
    - Regional project funding (Brussels, Flanders, Wallonia)
    - Local project funding (cities and municipalities, province)

- Crowdfunding/financial contribution of citizens
- Funded on in-kind contributions of partner organizations
- Sponsoring of private organizations
- Other (clarify in next question)

16. If applicable, clarify 'Other'
17. Specify the main source of funding (e.g. FWO, King Baudouin Foundation, own resources...)
18. Geographical reach of the project
    What is the geographical distribution of the participants participating in the project?
    - Global (worldwide)
    - International (multiple countries)
    - National (Belgium)
    - Regional (Regions or communities)
    - One or more cities or municipalities
    - Specific neighbourhoods
19. Total number of citizens involved?
    - 1-20
    - 21-100
    - 101-500
    - 501-1000
    - 1001-5000
    - 5000+
20. Do you know the exact number or participants (taking part until now)? If so, please fill in below.

Section 3: Topic of the citizen science project

21. What is the main scientific theme to which the project contributes?
    - Archeology, history, heritage
    - Biodiversity and biology
    - Computer and information sciences
    - Economy
    - Geography: GIS, Cartography
    - Geology, paleontology
    - Engineering
    - Climate research
    - Art and culture
    - Agriculture and Horticulture
    - Environment: noise pollution
    - Environment: light pollution
    - Environment: air quality
    - Environment: water quality

- Environment: Litter or plastic pollution
- Mobility
- Physics, math and astronomy
- Psychology
- Sociology and demography
- Language and literature
- Health and medical sciences
- Others (clarify in next question)

22. If applicable, clarify 'Other'
23. What other scientific topics does the project contribute to, in a secondary way? (if applicable)
    - Archeology, history, heritage
    - Biodiversity and biology
    - Computer and information sciences
    - Economy
    - Geography: GIS, Cartography
    - Geology, paleontology
    - Engineering
    - Climate research
    - Art and culture
    - Agriculture and Horticulture
    - Environment: noise pollution
    - Environment: light pollution
    - Environment: air quality
    - Environment: water quality
    - Environment: Litter or plastic pollution
    - Mobility
    - Physics, math and astronomy
    - Psychology
    - Sociology and demography
    - Language and literature
    - Health and medical sciences
    - Others (clarify in next question)
24. What other scientific topics does the project contribute to, in a secondary way? (if applicable)
25. Briefly describe what scientifc activity(ies) the citizens carry out in the project?
26. In which way(s) do participants contribute to the project?
    - Defining research questions
    - Shaping the research design or intervention through a co-creation process
    - Data collection: e.g. executing a scientific protocol with multiple steps, measuring with sensors, counting or identifying, providing data, filling out a questionnaire, taking a sample...

- Data analysis: e.g. annotating, transcribing or interpreting data
- Communication and dissemination: e.g. formulating recommendations, communicating results
- Other (clarify in next question)

27. If applicable, clarify 'other'
28. Does the participation take place online or offline?
    - Yes
    - No
29. Does the project collaborate with schools?
    - Yes
    - No

A few last questions

30. If French is the main language of your project, we would like to ask you a few more questions as part of a master's thesis at UCLouvain. Could you indicate if this applies to you?
    As the main language, we consider the language spoken between the project organisers.
    - Yes, the main language is French or the project is fully bilingual and includes French as one of its two main languages
    - No, the main language is English, Dutch or another language
31. What is the main purpose (or main purposes) for which the project was created?
    Be sure not to tick the secondary objectives, but only the main ones.
    - The production of new scientific knowledge (as an end in itself and not as a means)
    - Raising public awareness of an issue
    - Promoting your organisation/institute to the public
    - Educating the public about scientific culture
    - Inform or influence policies/political decisions
    - Environmental protection and nature conservation
    - Other:...
32. What are the real consequences of the project?
    Main and secondary consequences
    - The production of new scientific knowledge
    - Raising public awareness of an issue
    - Educating the public about scientific culture
    - Inform or influence policies/political decisions
    - Environmental protection and nature conservation
    - Promoting your organization/institute to the public
    - Empowering citizens
    - Creating social ties
    - Bringing academia and civil society together
    - Valuing citizens' knowledge and expertise

- Other:...

33. How would you describe your project?
    - I describe my project as 'science participative'
    - I describe my project as 'science citoyenne'
    - Both
    - Other:...
34. Do you consider that there is a difference between 'science participative' and 'science citoyenne' in the French language?
    - Yes
    - No
    - I don't know
35. If you wish, please clarify or explain your previous answer. If you answered 'yes', explain in your own words the difference you perceive between 'science participative' and 'science citoyenne'.
36. The major difficulties that the project has or had to deal with are related to...
    - Ensuring data quality
    - Recruiting new participants
    - Keeping participants engaged over the long term
    - Finding funds
    - Communicating with participants
    - Lend credibility to the results in the eyes of politicians/scientists outside the project
    - Establish a relationship of trust between organisers and participants.
    - Time management for organizers
    - Implementation of data protection policy
    - Other:...
37. May we contact you for an in-depth discussion as part of this study?
    - Yes
    - No
38. Would you like to be kept informed about the results of this study?
    - Yes
    - No
39. What email address can we contact you at? (for results and/or in-depth discussion)
40. Finally, would you like to share any other comments or feedback with us?
41. Thank you very much for your participation!
    With your participation, you agree that your answers will be used for Scivil's Citizen Science Scan 2025. For projects with French as the main language (or as one of the two main languages for perfectly bilingual projects), the data will also be used for a master's thesis at UCLouvain on Citizen Science in French-speaking Belgium. You can read more about how we handle your data in our privacy policy: `https://www.scivil.be/disclaimerprivacy`

8.2 Citizen science landscape inventory

The inventory gathers all past and current citizen science projects and initiatives available to French-speaking participants living in Belgium, organized by at least one Belgian partner organization, with French as (one of) its organizational language(s), and within environmental and natural sciences. It does not aim to be exhaustive, but rather representative. The citizen science landscape inventory contains data from this master's thesis' systematic review (items labelled as "Systematic review") and from the Citizen Science Scan 2025 (items labelled as "Network"). Items are alphabetically sorted by the name of the first identified organization. Asterisks were added to the name of every project or initiative for which it is not entirely certain that they fit within the admission criteria, because (1) some characteristics used to define citizen science can cause disagreements and discussions within the citizen science sphere itself, and (2) some attributes could not be clearly determined from online and publicly available information.

Table 8.1: Citizen science landscape inventory

Name	**Identified organizations**	**How it was found**	**Tags**	**Answered CSS**	**Website**	**Uncertain and possibly exclusive characteristics**
CRESCO	AfricaMuseum; IRSNB	Systematic review	Unique; Collection tending	Yes	https://www.africamuseum.be/en/get_involved/citizen_science/CRESCO	
Teste ton sol	Bruxelles Environnement	Systematic review	Soil study	Yes	https://environnement.brussels/teste-ton-sol	
Atlas des oiseaux nicheurs et hivernants de la Région bruxelloise	Bruxelles Environnement; Natagora; Aves; Natuurpunt	Systematic review	Species observations	No	https://atlas-oiseaux-bruxelles.be/atlasbe/meedoen	
Transparence	Canopea	Network	Environment-health	No	https://www.canopea.be/projet-transparence-dou-viennent-les-pesticides-retrouves-dans-les-maisons/	
CAPT'Action	Canopea; Fédération des Maisons Médicales; ISSeP; AWAC	Network	Environment-health; Air quality	No	https://www.canopea.be/captaction/pollution-air/	
Particul'air	Canopea; ISSeP	Systematic review	Environment-health; Air quality	No	https://www.canopea.be/oufti-les-liegeois-ne-manquent-pas-dair-le-projet-particulair-prend-son-envol-participez/	

Name	Identified organizations	How it was found	Tags	Answered CSS	Website	Uncertain and possibly exclusive characteristics
GT Punaises	CNB	Network	Naturalist working group; Species observations	No	https://www.facebook.com/photo.php?fbid=510043153001913&id=246506266022271&set=a.246506446022253	
GT Galles	CNB	Network	Naturalist working group; Species observations	No	https://gtgalles.wordpress.com/	
Atlas de la biodiversité du Pays d'Arlon	CNB; Observatoire de l'environnement	Network	Species observations	Yes	https://obse.be/actions/atlas-de-la-biodiversite-communale/	
FrichNat 1	CNB; ULiège	Systematic review	Species observations	Yes	https://cercles-naturalistes.be/les-cnb-lancent-un-guide-methodologique-pour-les-inventaires-participatifs-en-belgique	
FrichNat 2	CNB; ULiège	Systematic review	Species observations	Yes	https://cercles-naturalistes.be/frichnat-revient-pour-un-deuxieme-volet	
Campagne de piégeage de printemps du frelon asiatique	CRA-W	Systematic review	Unique; Monitoring or control of harmful species	Yes	https://www.cra.wallonie.be/fr/campagne-de-piegeage-de-printemps-2025	
Groupe de Travail Lycaena	DEMNA; SPW; possibly others	Systematic review	Naturalist working group; Species observations	No	https://biodiversite-old.wallonie.be/fr/groupe-de-travail.html?IDC=3339	
WaterCitiSense (Brusseau)	EGEB-SGWB; VUB; ULB; HABITER - Centre d'Études en Développement, Territoire et Paysages; Latitude Platform; Arkipel; Ecotechnic	Systematic review	Unique; Flood management	No	https://brusseau.be/les-approches/	

Name	Identified organizations	How it was found	Tags	Answered CSS	Website	Uncertain and possibly exclusive characteristics
Pestfly	ILVO; AfricaMuseum; CRA-W	Network	Species observations; Monitoring or control of harmful species	Yes	https://ilvo.vlaanderen.be/nl/onderzoeksprojecten/post-entry-surveillance-of-the-oriental-fruit-fly-bactrocera-dorsalis-via-citizen-science-and-pathway-based-trapping	
Humus	Institut de Duve; UCLouvain; others to come in the future, schools or educative organizations	Systematic review	Unique; Antibiotics from soil samples; Soil study	Yes	https://www.instagram.com/humusforscience/	
*Bebirds	IRSNB	Systematic review	Species observations; Unique; Bird ringing	No	https://odnature.naturalsciences.be/bebirds/fr/become-a-ringer	Requires significant training from participants
BioBlitz du Parc Léopold	IRSNB	Systematic review	Species observations; Bioblitz	No	https://www.naturalsciences.be/fr/decouvrir-participer/sciences-participatives/ditos	Bilingual website. Mostly French, or Dutch-speaking, or both?
Objectif 1000 : inventaire des arthropodes du jardin botanique Jean Massart	IRSNB	Systematic review	Species observations; Bioblitz	Yes	https://citizenscience.eu/project/270	
*XperiBIRD	IRSNB	Systematic review	Species observations; Unique; Monitoring bird nests with cameras	No	https://www.naturalsciences.be/en/science/research/biodiversity-in-a-changing-world/projects/xperibird.be	Older project, its official website could not be found but articles referring to it were found.
FlatwormWatch Project	IRSNB; Jardin botanique de Meise; INBO; UHasselt	Systematic review	Species observations; Monitoring or control of harmful species	Yes	https://www.iasregulation.be/fr/817/	
*DASA	IRSNB; Natuurpunt; Natagora	Network	Unique; Animal sounds database	No	https://mareco-odnature.naturalsciences.be/project/dasa/	Platform for data sharing

Name	Identified organizations	How it was found	Tags	Answered CSS	Website	Uncertain and possibly exclusive characteristics
EDIT	ISSeP	Systematic review	Environment-health; Air quality	No	https://www.wallonair.be/fr/c-est-dans-l-air/329-edit-projet.html	
BMH-Agri	ISSeP; Agricultural unions; University laboratories	Network	Environment-health; Human biomonitoring	Yes	https://www.issep.be/bmh-agri/	
BIOBRO	ISSeP; ARNE; ULiège; UCLouvain; Clinique Universitaire de Saint-Luc; Sciensano	Network	Environment-health; Human biomonitoring	Yes	https://www.issep.be/biobro/	
BMH-PFAS	ISSeP; ARNE; University laboratories	Network	Environment-health; Human biomonitoring	Yes	https://www.issep.be/biomonitoring-sur-les-pfas/	
OIE	ISSeP; AWAC; Bruxelles Environnement; CECOTEPE; CENAERO; IMOB; VITO	Systematic review	Environment-health; Air quality	No	https://www.issep.be/wp-content/uploads/Projet-OIE.pdf	
BMH-SANISOL	ISSeP; CHU-Liège; DEMNA; DSD	Network	Environment-health; Human biomonitoring; Soil study	No	https://www.issep.be/en/sanisol/	
BMH-Wal	ISSeP; CHU-Liège; UCLouvain; Clinique Universitaire de Saint-Luc; Sciensano	Network	Environment-health; Human biomonitoring	Yes	https://www.issep.be/bmh-wal/	
SuRiPest	ISSeP; CRA-W	Network	Environment-health; Air quality; Soil study	Yes	https://www.issep.be/suripest/	
Aéro-Sols	ISSeP; Eco-Impact asbl	Network	Environment-health	Yes	https://www.issep.be/aero-sols/	
Capteur CO2	ISSeP; Hypothèse asbl	Systematic review	Environment-health; Air quality	Yes	https://www.issep.be/capteur-co2/	
BMH-PARC	ISSeP; Sciensano; CHU-Liège; Clinique Universitaire de Saint-Luc	Network	Environment-health; Human biomonitoring	Yes	https://www.issep.be/bmh-parc/	
ExpoComm & Envi-EHS	ISSeP; Sciensano; ULiège; ULB	Systematic review	Environment-health	Yes	https://www.sciensano.be/fr/projets/etude-de-lelectrohypersensibilite-sur-la-base-dun-protocole-dexposition-cree-en-collaboration-avec	

Name	Identified organizations	How it was found	Tags	Answered CSS	Website	Uncertain and possibly exclusive characteristics
AIR-ECOLE	ISSeP; Service d'Analyse des Milieux Intérieurs; Hypothese asbl	Systematic review	Environment-health; Air quality	Yes	https://www.issep.be/wp-content/uploads/Rapport-final_AIR-ECOLE-vf-00000002.pdf	
BMH-BIOSOL	ISSeP; UCLouvain; Earth and Life Institute; Sciensano	Network	Environment-health; Human biomonitoring; Soil study	No	https://www.issep.be/wp-content/uploads/Synthese_etude_BIOSOL_04112024.pdf	
Lacyme	Lacyme	Network	Association; Species observations; Bioblitz	No	https://lacyme.org/	
GEF - Groupe de Travail d'Études Floristiques	Les Naturalistes belges	Systematic review	Naturalist working group; Species observations	No	https://naturalistesbelges.be/index.php/association/groupes-de-travail/	
Gomphus	Les Naturalistes belges	Systematic review	Naturalist working group; Species observations	No	https://naturalistesbelges.be/index.php/association/groupes-de-travail/	
Groupe de Travail Orthoptères	Les Naturalistes belges	Systematic review	Naturalist working group; Species observations	No	https://naturalistesbelges.be/index.php/association/groupes-de-travail/	
Section Orchidées d'Europe	Les Naturalistes belges	Systematic review	Naturalist working group; Species observations	No	https://naturalistesbelges.be/index.php/association/groupes-de-travail/	
*Réseau Telraam Liège Métropole	Liège Métropole; AWAC	Network	Environment-health; Air quality	Yes	https://liege-metropole.be/actions/votre-fenetre-compte-reseau-telraam-liege-metropole/	This project is about traffic monitoring, which is not directly an environmental subject but it is a first step before studying air quality (AWAC is involved). This project was not included in the results of the CSS 2025 as they were considered as a sub-project of Telraam. Contribution from participants might be limited to passive sensing

Name	Identified organizations	How it was found	Tags	Answered CSS	Website	Uncertain and possibly exclusive characteristics
Suivi Hérisson	LRBPO; Vogelbescherming Vlaanderen; Jardin Extraordinaire; CNB; Ardenne & Gaume; Jeunes & Nature; Canopea; Bruxelles Nature asbl; CEBE-MOB; UGent	Systematic review	Species observations	Yes	https://suiviherisson.be/	
*GT Castors	Natagora	Systematic review	Naturalist working group; Species observations	No	https://castor.natagora.be/	Hard to tell how much the production of knowledge is part of their priorities
GT Hérissons	Natagora	Systematic review	Naturalist working group; Species observations	No	https://www.natagora.be/herissons	
GT Hirondelles	Natagora	Systematic review	Naturalist working group; Species observations	No	https://www.natagora.be/hirondelles	
*GT Loups	Natagora	Systematic review	Naturalist working group; Species observations	No	https://loup.natagora.be/	Hard to tell how much the production of knowledge is part of their priorities
GT Martinets	Natagora	Systematic review	Naturalist working group; Species observations	No	https://www.natagora.be/martinets	
Le Grand Recensement des papillons de jardin	Natagora	Systematic review	Species observations	No	https://papillons.natagora.be/	
Plecotus	Natagora	Systematic review	Pole; Naturalist working group; Species observations	No	https://plecotus.natagora.be/	
Aves	Natagora; Aves	Systematic review	Pole; Naturalist working group; Species observations	No	https://aves.natagora.be/nos-actions	
Le Grand Recensement des oiseaux de jardin	Natagora; Aves	Systematic review	Species observations	No	https://www.natagora.be/le-grand-recensement-des-oiseaux-de-jardin	
Florabru	Natagora; Natuurpunt	Systematic review	Species observations	Yes	https://florabru.natagora.be/	
Raînne	Natagora; Raînne	Systematic review	Pole; Naturalist working group; Species observations	No	https://rainne.natagora.be/simpliquer/encodage-des-donnees	

Name	Identified organizations	How it was found	Tags	Answered CSS	Website	Uncertain and possibly exclusive characteristics
Plonger dans la nature	Natuur en Bos; Belgium for Biodiversity; Natuurpunt; Natagora; INBO; Sonian Forest Foundation; Natagriwal; ELO; Bruxelles Environnement; Inverde; Departement Omgeving; Vlammse Land Maatschappij; SPW; Natura 2000; Life; Eurosite; FPS Public Health, Food Chain Safety and Environment	Systematic review	Species observations; Bioblitz	No	https://www.lifeb4b.be/fr/la-campagne-de-la-semaine-de-la-biodiversite-ete-un-grand-succes	
Observation.org	Observation.org Association; Naturalis; Natuurpunt; Natagora; Zostera	Systematic review	Biodiversity monitoring platform; Species observations	No	https://observation.org/	Waarnemingen.be responded to the CSS 2025 survey and did not consider to have French as (one of) their organizational language.
OpenStreetMap Belgium	OpenStreetMap; Anyways; Champs-Libres; Toerisme Vlaanderen; TomTom; Nationaal Crisiscentrum; Routeyou	Network	Association	Yes	https://openstreetmap.be/	They produce data and knowledge that can be further used for other research projects.
Interreg Cap Biodiversité	Parc Naturel Régional Scarpe-Escaut; Groupe Ornithologique et Naturaliste; Parc Naturel des Plaines de l'Escaut; CNB	Systematic review	Species observations	Yes	https://www.cap-biodiversite.eu/	
The climatological observation network	Royal Meteorological Institute	Systematic review	Meteorology	Yes	https://www.meteo.be/en/about-rmi/observation-network/klimatologisch-netwerk	
WOW-BE reboot	Royal Meteorological Institute	Systematic review	Meteorology	Yes	https://wow.meteo.be/fr/a-propos-de-wow-be/the-weather-together/	
*AcceleROB	Royal Observatory of Belgium	Systematic review	Seismology	Yes	https://seismologie.be/accelerob/index_FR.html	Contribution from participants might be limited to passive sensing
Did you feel it?	Royal Observatory of Belgium	Systematic review	Seismology	Yes	https://seismologie.be/en/seismology/internet-macroseismic-inquiries	

Name	Identified organizations	How it was found	Tags	Answered CSS	Website	Uncertain and possibly exclusive characteristics
Val-u-Sun	Royal Observatory of Belgium	Systematic review	Unique; Astronomy; Sunspots study	No	https://www.sidc.be/valusun/citizenscience/index-fr.php	
Des tiques dans votre jardin? - Zitten er teken in jouw tuin?	Sciensano; Departement Zorg; Agence pour une Vie de Qualité (AVIQ)	Network	Species observations; Monitoring or control of harmful species	Yes	https://tekennet.sciensano.be/studie-tuinen/het-project	
TekenNet - TiquesNet - ZeckenNet	Sciensano; Departement Zorg; Agence pour une Vie de Qualité (AVIQ)	Systematic review	Species observations; Monitoring or control of harmful species	Yes	https://tiquesnet.sciensano.be/	
MEMO+	Sciensano; Institute of Tropical Medecine Antwerp; Bopco	Systematic review	Species observations; Monitoring or control of harmful species	Yes	https://mosquitosurveillance.be/	
Trektellen	Sovon; Vogelbescherming Nederland; Natuurpunt; Natagora; Aves; BTO; Catalan Ornithological Institute	Systematic review	Species observations	No	https://www.trektellen.nl/	
*Blob	SparkOH!; CNRS	Systematic review	Unique; Raising a blob under controlled conditions to assess the impact of global warming on it	No	https://sparkoh.be/adopte-un-blob-science-participative/	Blob has a French-speaking partner in Belgium for the 'spread' of the research, hard to tell how much of an 'organizational' partner SparkOH! is.
Enquêtes données d'observations d'espèces	SPW; DEMNA	Network	Biodiversity monitoring platform; Species observations	Yes	https://observatoire.biodiversite.wallonie.be/enquetes/	
*OFFH	SPW; DEMNA	Systematic review	Biodiversity monitoring platform; Species observations	No	https://observatoire.biodiversite.wallonie.be/encodage/	Targeted audience, not anyone can participate
*BioBlitz de Saint-Gilles	Studio Biorama	Systematic review	Species observations; Bioblitz	No	https://biorama.org/bioblitz2021/	Is French (one of) their organizational language? Online information is not enough to ensure this.
*BioBlitz "MEETING INSECT/HUMAN Becoming humanoptera"	Studio Biorama; WWF; ULB; VUB; KU Leuven; Bruxelles Environnement; Civis; OpenLab Brussels	Systematic review	Species observations; Bioblitz	No	https://biorama.org/biorama-x-beesofjosaphat-a-schaerbeek/	Is French (one of) their organizational language? Online information is not enough to ensure this.

Name	Identified organizations	How it was found	Tags	Answered CSS	Website	Uncertain and possibly exclusive characteristics
B@seball	UAntwerp; INBO; UA; UCLouvain; GoodPlanet Belgium; MOS; Sciensano	Network	Environment-health	Yes	https://www.uantwerpen.be/nl/projecten/baseball/	
*CurieuzenAir	UAntwerp; BRAL; ULB; Bloomberg Philanthropies; Bruxelles Environnement; De Standaard; Le Soir; BRUZZ	Systematic review	Environment-health; Air quality	No	https://curieuzenair.brussels/fr/acceuil/	Some organizational partners are or could be French-speaking, so admitted, but uncertain.
Pollin'Div	UCLouvain; CNB	Systematic review	Species observations	Yes	https://cercles-naturalistes.be/cnb/nos-projets/sciences-participatives	
IQSW	UCLouvain; CRA-W; ARIES Consultants; CRIE	Systematic review	Soil study	Yes	https://www.iqsw-citoyen.be/	
Lichens GO	UCLouvain; PartiCitaE; Vigie-Nature École; Association française de lichénologie; Tela Botanica; Sciences.be	Systematic review	Air quality; Species observations	Yes	https://www.lichensgo.eu/	
WildBnB	ULB; Bruxelles Environnement; Natagora; Natuurpunt; IRSNB	Systematic review	Species observations	No	https://document.environnement.brussels/opac_css/index.php?lvl=notice_display&id=13261	
*BioBlitz à Anderlecht	ULB; CNB; CCN Vogelzang; LRBPO	Systematic review	Species observations; Bioblitz	No	https://sciences.ulb.be/la-recherche/actualites/explorer-la-biodiversite-%C2%AB-du-coin-de-la-rue-%C2%BB-un-bioblitz-scientifique-et-collaboratif-au-coeur-danderlecht	Could the students take part in the project in a deliberate way?
*Brussels Open Lab and its Boutique des Sciences	ULB; VUB	Systematic review	Unique; Boutique des sciences	No	https://openlab.brussels/en/hosted-projects/boutique-des-sciences	Worth noting though might not always fit within environmental and natural sciences, and thought the contribution form citizens seems limited to identifying research questions and topics.
BioGeo.net	ULiège; Natagriwal	Systematic review	Biodiversity monitoring platform; Species observations	No	https://www.biogeonet.ulg.ac.be/	

Name	Identified organizations	How it was found	Tags	Answered CSS	Website	Uncertain and possibly exclusive characteristics
*Fabrique Ecocitoyenne	ULiège; SEED	Network	Unique; Citizen deliberation	Yes	https://www.seed.uliege.be/lafabriqueecocitoyenne/	Responded to the CSS 2025 survey and defines itself as citizen science, though their definition seems to differ a little from the definition used in this master's thesis. In the Fabrique, citizens seem to take part in deliberation processes rather than in the production of new scientific knowledge.
Laboratoire Vivant du Campus Arlon Environnement	ULiège; SEED; Jardins partagés d'Arlon	Network	Unique; Water management for food production	Yes	https://www.facebook.com/luxembourgcreative/posts/-le-laboratoire-vivant-se-lance-bient%C3%B4t-au-uliege-arlon-campus-environnementbonn/996861005922510/	
*Data Fauna-Flora	UMons; SPW; DEMNA	Systematic review	Biodiversity monitoring platform; Species observations	No	http://zoologie.umons.ac.be/dff/	Tool for citizen science rather than a project in itself. Still worth noting that it exists.
*Sapoll	UMons; ULiège; Natagora; Natuurpunt; Conservatoire d'espaces naturels Nord-Pas-de-Calais; EDEN62; Département du Pas-de-Calais; GON	Systematic review	Species observations	No	https://sapoll.eu/sapoll/les-actions-du-projet/	One of the three main actions of the project is to 'mobilize a network of observers', but unclear if they rely on the network to monitor the pollinators or if they just educate the naturalists to better identify pollinators species.
ArchiSols	urban.brussels; Archives de l'Etat à Bruxelles; ULB; Bruxelles Environnement; Commune d'Anderlecht; Commune d'Uccle; Commune de Woluwe-Saint-Lambert; ABV Environment; SGS Belgium; IHOES; Histoire de Familles; Wolu-Inter Quartiers; Anderlechtensia	Systematic review	Soil study	Yes	https://www.archisols.brussels/	

8.3 Names of projects and initiatives per tag

Table 8.2: Projects by tags, based on the citizen science landscape inventory. The table does not display tags that are cited once, but only the tags that are cited at least twice.

Category	**Projects**
Species observations	Lichens GO, Le Grand Recensement des oiseaux de jardin, Le Grand Recensement des papillons de jardin, *OFFH, BioGeo.net, Observation.org, Enquêtes données d'observations d'espèces, *Data Fauna-Flora, BioBlitz du Parc Léopold, *BioBlitz de Saint-Gilles, *BioBlitz "MEETING INSECT/HUMAN Becoming humanoptera", *BioBlitz à Anderlecht, Lacyme, Gomphus, Section Orchidées d'Europe, GEF - Groupe de Travail d'Études Floristiques, Groupe de Travail Orthoptères, Groupe de Travail Lycaena, Aves, Raînne, Plecotus, *GT Castors, GT Hérissons, GT Hirondelles, *GT Loups, GT Martinets, GT Punaises, GT Galles, FrichNat 1, FrichNat 2, Objectif 1000 : inventaire des arthropodes du jardin botanique Jean Massart, Pollin'Div, Interreg Cap Biodiversité, *Sapoll, Suivi Hérisson, Atlas des oiseaux nicheurs et hivernants de la Région bruxelloise, Florabru, WildBnB, Atlas de la biodiversité du Pays d'Arlon, *Bebirds, FlatwormWatch Project, *XperiBIRD, MEMO+, TekenNet - TiquesNet - ZeckenNet, Trektellen, Plonger dans la nature, Pestfly, Des tiques dans votre jardin? - Zitten er teken in jouw tuin?
Environment-health	Transparence, Particul'air, CAPT'Action, Capteurs CO2, OIE, ExpoComm & Envi-EHS, EDIT, Aéro-Sols, AIR-ECOLE, BIOBRO, BMH-Agri, BMH-PARC, BMH-Wal, SuRiPest, BMH-PFAS, BMH-BIOSOL, BMH-SANISOL, *Réseau Telraam Liège Métropole, *CurieuzenAir, B@seball
Naturalist working group	Gomphus, Section Orchidées d'Europe, GEF - Groupe de Travail d'Études Floristiques, Groupe de Travail Orthoptères, Groupe de Travail Lycaena, Aves, Raînne, Plecotus, *GT Castors, GT Hérissons, GT Hirondelles, *GT Loups, GT Martinets, GT Punaises, GT Galles
Unique	Humus, WaterCitiSense (Brusseau), Campagne de piégeage de printemps du frelon asiatique, *DASA, *Fabrique Ecocitoyenne, Laboratoire Vivant du Campus Arlon Environnement, *Bebirds, *XperiBIRD, CRESCO, Val-u-Sun, *Brussels Open Lab and its Boutique des Sciences, *Blob
Air quality	Lichens GO, Particul'air, CAPT'Action, Capteurs CO2, OIE, EDIT, AIR-ECOLE, SuRiPest, *Réseau Telraam Liège Métropole, *CurieuzenAir
Soil study	Humus, Teste ton sol, IQSW, SuRiPest, BMH-BIOSOL, BMH-SANISOL, ArchiSols
Bioblitz	BioBlitz du Parc Léopold, *BioBlitz de Saint-Gilles, *BioBlitz "MEETING INSECT/HUMAN Becoming humanoptera", *BioBlitz à Anderlecht, Lacyme, Objectif 1000 : inventaire des arthropodes du jardin botanique Jean Massart, Plonger dans la nature
Human biomonitoring	BIOBRO, BMH-Agri, BMH-PARC, BMH-Wal, BMH-PFAS, BMH-BIOSOL, BMH-SANISOL
Monitoring or control of harmful species	Campagne de piégeage de printemps du frelon asiatique, FlatwormWatch Project, MEMO+, TekenNet - TiquesNet - ZeckenNet, Pestfly, Des tiques dans votre jardin? - Zitten er teken in jouw tuin?
Biodiversity monitoring platform	*OFFH, BioGeo.net, Observation.org, Enquêtes données d'observations d'espèces, *Data Fauna-Flora
Pole	Aves, Raînne, Plecotus
Association	Lacyme, *OpenStreetMap Belgium
Meteorology	WOW-BE reboot, The climatological observation network
Seismology	Did you feel it?, *AcceleROB

8.4 List of projects that responded to the Citizen Science Scan 2025

List of all 173 projects that are part of the Citizen Science Scan 2025

ACCELEROB; AIR-ECOLE; Action Towards Reducing Aquatic snail-borne Parasitic diseases (ATRAP); ArchiSols; Are you daydreaming?; AstroSounds; Atlas de la biodiversité communale d'Arlon; Aéro-Sols; B@seball; BE.Amycon; BELpREG zwangerschapsregister; BESOCIAL; BIO-BRO; BMH-Agri; BMH-PARC; BMH-PFAS; BMH-Wal; BUGS: Benefits of Urban Green Spaces; Bankzitters; Be-Music; Beetlehangers; Best practice model voor burgerparticipatie in het beheer van gezondheidsdata; BioFutures Living Lab: het verbeelden van duurzame energietoekomsten vanuit een bio-artistiek perspectief; Biodiversiteit in kaart brengen via Waarnemingen.be; Blik op bodem; BrusselAVenir; Bugs in the Dark; Burgerpraat; Buzzwatch; CAIRE - AI als Gids doorheen het Nazorgtraject van Kankeroverlevers; CITREE Gent (City Tree Citizen Science); COLLECT – Citizen Observation of Local Litter in Coastal ECosysTems; CRESCO Citizen Rescuers for Collections; Campagne de piégeage de printemps du frelon asiatique; Cap biodiversité; Capteur CO2; CitizenHeritage; Co-creatie van een publieke campagnestrategie om onwetendheid, misverstanden en stigma rond palliatieve zorg te doorbreken; CoastSnap Belgium; CompAIR; Compass; Craywatch; Database Akten West-Vlaanderen; De Grote Voedselkaart; De Oorzaak; De Strandwergroep België; De invloed van levensstijl op het ontwikkelen van tinnitus klachten: Een bevolkingsonderzoek.; DeepSun; Dieren onder de wielen; DoeDat; Drinkable Rivers; ENFORCE; ERASMOS; Enquêtes données d'observations d'espèces; European stag beetle monitoring network; ExpAIR; ExpoComm & ENVI-EHS; FOUR-CAST; Fabrique Ecocitoyenne; Fietsbarometer; FlatwormWatch; FloraBru; FrichNat 1; FrichNat 2; From Monitoring to Managing Soil and Water Degradation in Tanzanian Gullies; Gebruikersrapporten met de KMI smartphone-app; GezelleBrOn: Guido Gezelles online brieven, een participatieproject; Groene Longen; Grote Schelpenteldag; HARISSA; HealthFerm; Heeft U een aardbeving gevoeld / Avez-vous ressenti un séisme? / Did You Feel an earthquake; Het optimaliseren van openbare parken ter promotie van actief en gezond ouder worden: een participatieve aanpak; Houtstookproject; Humus; IQSW; Infectieradar; InfluencAir; Isala project; Itinera Nova; Jeugd, Ethiek en Participatie (JEP); Kapelletjes in Vlaanderen; Karelvanwijnendaele.be; Kiekjes van de kermis; KlimaatTrappers; LIFE CityTRAQ; Laboratoire Vivant du Campus Arlon Environnement; Lentevallen Aziatische hoornaar; Leuven.cool; Lichens GO; Lili-app project; Luchtpijp; MARIN; MEMO+; MOMENT-GPS; Meetnet Agrarische Soorten (MAS); Meetnetten; MerovingerDNA; Mijn Tuinlab; MonitAnt; Monitoring van het visbestand in de Schelde en de Rupel; Mortselair; Nachtvlinderrmeetnet; Notarius; ODIS; ONEKANA; OUTLAW; Onder de Radar; Onderbroek Ondergronds; Ontwikkeling, implementatie en evaluatie van een gedragsinterventie ter verbetering van communicatie over palliatieve zorg tussen personen met kanker en hun arts; OpenStreetMap Belgium; PARTIMAP; PESTFLY PATROL; PID 1.0; PID 2.0; PIO Geluid - omgevingsgeluid in Vlaanderen; PLONS; POEMBAKterie; POL; Pardons; Plastic Pirates Belgium; Platvis ziekten; Pollin'div; Project Sleep; Projet Objectif 1000: inventaire des arthropodes du jardin botanique Jean Massart; Punt Transect Telling (PTT); Radio Meteor Zoo; Registers van de vogelcollectie van het AfrikaMuseum; Repair Together ASBL; SAPEX (Citizen science, experimental archaeology, and plant working (SAPEX)); STAGE Horizon EU; STUK; Sabofleur;

Saving Private Orion; SeaWatch-B; Slimme signaalfunctie Smartschool; Small world of words; Social Purrspectives Kattenonderzoek; Spartacus; Spinicornis; Spoon - Food Systems in transition – Participatory, Open citizen research for sustainable Nutrition; Sport en recreatie-activiteiten als middel voor rookpreventie bij kwetsbare jongeren: ontwikkelen en testen van een nieuwe preventie-aanpak voor jongeren die moeilijk te bereiken zijn; Straatvinken; SuRiPest; Suivi hérisson; TESTEREP; TETTRIs: Transforming European Taxonomy through Training, Research and Innovations; Teek a Break; TekenNet - TiquesNet; Teste ton sol; Titan; Transf'AIr; Truffulales; Urbaan mezenproject in verschillende steden; VISAVIS; VOSS; Van omstaander tot held; Van ontwerp tot weefsel: kleurrijk achter de schermen!; VanHarte (CS-Heart); Vespa-Watch; Viadkukaduk Meetactie; Vierkante meter: Iedereen archeoloog!; Vyakulani Africa; Vyakulani Diaspora Women; Wat Gebaar jij?!; WOW-BE; Waselucht; Watermonsters; WeAre#EuropeForCulture; Zitten er teken in jouw tuin? - Des tiques dans votre jardin ?; amai!; de Meetnetten; « En quoi le parcours éducatif des jeunes influence leur représentation sociale de la citoyenneté et leur sentiment d'efficacité par rapport à celle-ci ? »

List of the 39 projects in focus (French is an organizational language of the project, available to French speakers living in Belgium, within environmental and natural sciences)

ACCELEROB; AIR-ECOLE; ArchiSols; Atlas de la biodiversité communale d'Arlon; Aéro-Sols; B@seball; BIOBRO; BMH-Agri; BMH-PARC; BMH-PFAS; BMH-Wal; CRESCO Citizen Rescuers for Collections; Campagne de piégeage de printemps du frelon asiatique; Cap biodiversité; Capteur CO2; Enquêtes données d'observations d'espèces; ExpoComm & ENVI-EHS; Fabrique Ecocitoyenne; FlatwormWatch; FloraBru; FrichNat 1; FrichNat 2; Gebruikersrapporten met de KMI smartphone-app; Heeft U een aardbeving gevoeld / Avez-vous ressenti un séisme? / Did You Feel an earthquake; Humus; IQSW; Laboratoire Vivant du Campus Arlon Environnement; Lichens GO; MEMO+; OpenStreetMap Belgium; PESTFLY PATROL; Pollin'div; Projet Objectif 1000: inventaire des arthropodes du jardin botanique Jean Massart; SuRiPest; Suivi hérisson; TekenNet - TiquesNet; Teste ton sol; WOW-BE; Zitten er teken in jouw tuin? - Des tiques dans votre jardin ?

8.5 Anonymized responses on the difference perceived between *science participative* and *science citoyenne*

Table 8.3: Explanations of the difference perceived between *science participative* and *science citoyenne* by respondents of projects having French as (one of) their organizational language(s). Responses are anonymized by using letters as identifiers.

ID	Responses in their original language	Translated responses into English
A	Personnellement, j'entends science participative comme impliquant plus de 2 types d'acteurs travaillant rarement ensemble (ex. académiques, administrations publiques, entreprises privées, citoyens). La science citoyenne semble cibler quant à elle principalement des citoyens, avec par exemple 1 acteur institutionnel chapeautant le projet.	Personally, I understand 'science participative' as involving more than two types of actors who rarely work together (e.g., academics, public administrations, private companies, citizens). 'Science citoyenne' seems to mainly target citizens, with for example one institutional actor overseeing the project.
B	De tweede term gaat verder. Hier wordt ook de onderzoeksvraag of andere mee vormgegeven door burgers.	The second term (*'science citoyenne'*) goes further. Here, the research question or other aspects are also shaped by citizens.
C	Une science participative fait participer le citoyen à une question de recherche sans que ceux-ci n'aient pu intervenir dans la définition de la question de recherche ou l'analyse des résultats (en résumé, ils ne font que participer à la collecte de données). Alors que dans la science citoyenne, le citoyen intervient dans la définition de la question de recherche, dans l'analyse des résultats, dans la diffusion des résultats auprès des politiques et/ou du public	'Science participative' involves citizens in a research question without them having contributed to defining the question or analyzing the results (in short, they only participate in data collection). Whereas in 'science citoyenne', the citizen contributes to defining the research question, analyzing the results, and disseminating them to policymakers and/or the public.
D	Science participative = naturalistes déjà compétences et investis et convaincus pour la cause. Science citoyenne = le grand public, personne lambda.	'Science participative' = naturalists already skilled, committed, and convinced of the cause. 'Science citoyenne' = the general public, ordinary individuals.
E	Science participative et science citoyenne implique le public dans la recherche. Je n'y vois pas de différence particulière.	'Science participative' and 'science citoyenne' both involve the public in research. I don't see a particular difference.

ID	Responses in their original language	Translated responses into English
F	Ik ben zelf niet franstalig dus kan dit niet inschatten. Wij gebruiken science citoyenne als vertaling van burgerwetenschap	I am not a French speaker myself so I cannot assess this. We use 'science citoyenne' as a translation of 'burgerwetenschap' (citizen science).
G	Ik ben zelf niet franstalig, wij gebruiken de term 'science citoyenne' in onze vertalingen.	I am not a French speaker myself, we use the term 'science citoyenne' in our translations.
H	Sciences participatives = naturalistes volontaires sont nécessaires, par leur compétence et leur investissement dans les inventaires menés. Sciences citoyennes = grand public joue un rôle important dans plusieurs l'acquisition de connaissances.	'Sciences participatives' = volunteer naturalists are necessary due to their skills and commitment in conducting inventories. 'Sciences citoyennes' = the general public plays an important role in several (*missing word?*) the knowledge acquisition.
I	Je dirais que le projet pourrait être dans le champ de la science participative, dans le sens tout simplement ou les personnes ont participé à l'élaboration du projet. Je vois la science citoyenne peut-être plus active de la part des citoyens, dans le sens où ces derniers seraient à l'origine de la recherche. Mais d'un autre côté, dans ce projet, nous avons tenté de répondre à un besoin identifié d'un certain groupe de citoyen. Bref, je ne sais pas.	I would say the project could fall under 'science participative', simply because people contributed to its development. I see 'science citoyenne' as perhaps more active on the part of citizens, in the sense that they would be the originators of the research. But on the other hand, in this project, we tried to respond to a need identified by a certain group of citizens. In short, I don't know.
J	Selon moi, la science participative sous entend la participation des citoyens dans un processus scientifique déjà plus ou moins mis en place par les scientifiques tandis que sciences citoyennes aurait plus le sous-entendu d'un projet émanant des citoyens et construits par ceux-ci en collaboration (plus équitable) avec les scientifiques. Cependant, j'ai l'impression que les 2 expressions sont souvent utilisées comme des synonymes et que peu de distinction est faite.	In my opinion, 'science participative' implies citizen involvement in a scientific process already more or less set up by scientists, whereas 'science ciotyenne' suggests a project initiated by citizens and built by them in collaboration (more equitably) with scientists. However, I feel the two expressions are often used as synonyms and little distinction is made.

ID	Responses in their original language	Translated responses into English
K	Science participative est principalement utilisée pour la collecte des données qui sont traitées et inteprétées par des scientifique, les sciences citoyennes si elle vont au delà de l'approche consultative peuvent avoir une dimension politique et démocratique (cfr typo de conrad sur consultatif, collaboratif et transformatif)	'Science participative' is mainly used for data collection, which is processed and interpreted by scientists. 'Science citoyenne', if they go beyond the consultative approach, can have a political and democratic dimension (cf. Conrad's typology on consultative, collaborative, and transformative).
L	A mon sens, la science participative implique n'importe quel citoyen.ne dans une recherche, quel que soit son rôle, alors que la science citoyenne se construit sur la base d'expertises citoyennes et est centrée sur les citoyen.ne.s participants.	In my view, 'science participative' involves any citizen in research, regardless of their role, whereas 'science citoyenne' is built on citizen expertise and centers on the participating citizens.
M	La science participative est un terme plus large, regroupant un ensemble de cas avec des implications variables des citoyens faisant part au projet. En science participative, le citoyen est plus impliqué et notamment dans la définition des objectifs de l'étude.	'Science participative' is a broader term, encompassing a range of cases with varying levels of citizen involvement in the project. In 'science participative', the citizen is more involved, particularly in defining the study's objectives.
N	Burgerwetenschap is voor mij van toepassing op alle vormen van vrijwilligersbijdragen aan wetenschapsprojecten. Het is een brede term. Burgerparticipatie impliceert voor mij een grotere invloed op het project, gaande van mee bepalen wat het opzet is, tot de gebruikte methodes als de manier waarop de resultaten worden gedeeld. Burgers sturen bij participatie mee op project. Burgerparticipatie is voor mij dus een specifieke vorm van burgerwetenschap waarbij de burgers/vrijwilligers een grotere rol toebedeeld krijgen.	For me, 'burgerwetenschap' (*citizen science*) applies to all forms of volunteer contributions to scientific projects. It is a broad term. 'Burgerparticipatie' (*citizen participation*) implies greater influence on the project, from helping define its purpose to the methods used and how results are shared. Citizens help steer the project. So burgerparticipatie is a specific form of burgerwetenschap where citizens/volunteers are given a larger role.
O	La différence repose selon moi dans l'interprétation du terme "citoyenne". Bien que cela ne soit pas le cas, le terme "citoyen" semble impliquer un devoir là où le terme "participatif" invite à agir.	The difference, in my opinion, lies in the interpretation of the term 'citoyenne'. Although this may not be the case, the term 'citoyen' seems to imply a duty, whereas 'participatif' invites action.

ID	Responses in their original language	Translated responses into English
P	Par exemple: `https://www.causecommune-larevue.fr/science_participative_et_science_citoyenne`	For example: `https://www.causecommune-larevue.fr/science_participative_et_science_citoyenne` (*Retrieved and translated from the website: "'Science participative' is the opening up of knowledge and expertise production processes to non-specialists. 'Science citoyenne', on the other hand, refers more to the goals and expectations regarding research, and to the ability of science to adequately respond to society's needs."*)
Q	Science participative = la société est invitée à participer à un projet initié par le monde académique ou par le monde de la recherche. Science citoyenne = le projet de recherche est initié par des citoyens ou par des membres de la société civile. Le monde académique peut être partenaire ou pas.	'Science participative' = society is invited to participate in a project initiated by academia or the research world. 'Science citoyenne' = the research project is initiated by citizens or members of civil society. Academia may or may not be a partner.
R	For me, science participative means that citizens are engaged in science processes that are designed by scientists, while with science citoyenne the initiative comes from the citizens.	For me, 'science participative' means that citizens are engaged in science processes that are designed by scientists, while with 'science citoyenne' the initiative comes from the citizens.

Citizen science in French-speaking Belgium within environmental and natural sciences

Landscape inventory and projects characterization

Amandine Raucq

Citizen science refers to the participation of the public in scientific research and has expanded significantly over recent decades, with a growing number of related projects and publications. Expectations toward this approach are various, including extending traditional research to wider geographic or temporal scales, addressing complex environmental challenges, and strengthening public trust in science.

However, no up-to-date, specific, and comprehensive assessment has existed until now for French-speaking Belgium within the environmental and natural sciences. This work contributes to filling this gap by combining a systematic review with a survey to produce both an inventory of citizen science initiatives and projects, and a characterization of project features based on survey responses.

The 86 identified projects and initiatives indicate a strong focus on biodiversity, whereas abiotic environmental topics remain less represented. Species observations constitute the dominant form of citizen contribution. Among the 39 projects that responded to the survey, more than half are led by governmental organizations, most rely on regional funding, and about half involve between 21 and 500 participants. Many projects report challenges in recruiting participants and ensuring data quality. Contributory projects clearly predominate over collaborative and co-created approaches. No consensus exists among practitioners regarding the meaning or use of the terms *science citoyenne* and *science participative*.

This exploratory overview provides the first baseline of the citizen science landscape in French-speaking Belgium within the environmental and natural sciences and lays the groundwork for future research in this context.

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