The Impact of Citizen Science in Archaeological Projects. A Comparative Study on Impact and Contributions of Dutch Citizen Science Initiatives.

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A Comparative Study on Impact and Contributions of Dutch Citizen Science Initiatives

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Preface

Before you lies my master's thesis on the impact of citizen science in archaeological projects in the Netherlands. This research is the result of months of reading, analysing, writing, rewriting and inspiring conversations with stakeholders from the field. It was an intensive, but above all inspirational process in which I not only learned a lot about citizen science and archaeology, but developed a true passion for involving people in archaeology. I am amazed by the possibilities that citizen science has to offer, and look forward to seeing citizen participation grow in the future.

First of all, I would like to thank my supervisors, Dr. Quentin Bourgeois and Dr. Gül Aktürk Hauser, for their critical eye, clear feedback and continuous support during the writing process. Their expertise, patience and encouragement were of great value in shaping this thesis.

I would also like to thank Leiden University for the five years of great education, passionate professors and supporting environments. I am especially grateful for the study space in the Arsenaal: under the wooden beams, with a view of the sky through the windows and surrounded by plants, most of this thesis was written.

Additionally, I am very grateful for the openness and involvement of all interviewees. Their insights, experiences and stories not only gave this research depth in terms of content, but also showed how citizen science takes shape and lives in practice. The passion that each interviewee had for their project, involvement and the overall concept of citizen science really drove me in writing this thesis. Without their willingness to share their time and knowledge, this research would not have been possible. Especially a big thank you to the organisations and participants of the four main case studies, Heritage Quest, Heel Heerlen Graaft, Wyldemerck and Waterloo Uncovered, for massively inspiring me and being great examples of citizen science for the future.

Finally, I would like to thank my environment for their continuous support, critical feedback and overall positivity.

I hope that this thesis contributes to a better understanding of citizen science within archaeology, and inspires others to further strengthen the collaboration between science and society.

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Chapter 1. Introduction

Archaeology has a long history of capturing the public imagination and enticing people with romanticised images of excavations, ancient civilisations and lost relics. Beyond merely attracting interest, archaeology should become a participatory discipline. With an emphasis on the advantages for participants as well as the contributions to archaeological research and -policy making, this thesis examines the impact of citizen science in archaeological projects. Citizen science is defined as the application of science by volunteers who are not affiliated with a research organisation as professional researchers, who work together with researchers to co-produce new knowledge (Prats López, 2017, p. 1). The incorporation of citizen science into archaeological research has created new opportunities for scientific advancement and public involvement in recent years. Enhancing public engagement, data collection and scientific discovery, citizen science has proven to be a powerful tool in archaeological research (Bourgeois et al., 2024, p. 1). Within archaeology, citizen science has been especially successful in enabling extensive data collection and analysis, connecting people to their heritage and each other and increasing the public understanding and interest in archaeology (Bourgeois et al., 2024, p. 14).

Despite its growing popularity, the actual effects and effectiveness of citizen science in archaeology remain underexplored (Nationaal Programma Open Science, 2020, p. 4). This thesis explores how citizen science can become more meaningful within archaeology, both for participants and researchers, through a comparative study of archaeological citizen science initiatives across the Netherlands. By knowing how participation affects individuals and the research process, initiatives can be created that strengthen the connection between communities and their heritage while also contributing to archaeological work to increase scientific value and improve research methods. Finding what works (and what doesn't) can help in designing future projects more effectively, possibly even influencing policy or funding choices. Additionally, by concentrating on archaeology, this study adds a fresh perspective to the broader field of citizen science.

1.1 Research Problem

The underlying research problem that forms the basis of this thesis is twofold. Firstly, although citizen science is being used increasingly, not enough is known about the specific impacts on both the research results and the experiences of the participants. Anecdotal evidence of the advantages for participants exists, like strengthening ties to one's ancestry and heritage, expanding knowledge and creating a sense of community, but systematic research on these effects is scarce (Lillemark et al., 2022, pp. 4-5; Fairclough et al., 2014, p. 17; Nationaal Programma Open Science, 2020, pp. 31-32). Likewise, previous

research on the benefits for archaeological research and academia suggests that citizen science is advantageous in increasing public support, data collection, educational opportunities, innovation, and efficiency (Bourgeois et al., 2024, p. 14; Smith, 2014, p. 758). Reassessing these predetermined assumptions makes room for archaeology to combine the proposed advantages and to suggest new ideas to maximise the impacts of citizen science on both parties. Secondly, a thorough examination of key factors that contribute to the success of citizen science projects in archaeology is lacking. The first step is determining when an archaeological citizen science project is deemed 'successful'? Combining academic accomplishments, public fulfilment, and bigger societal impacts, success in this context is inherently subjective. Successful projects are hard to duplicate or build upon without a thorough grasp of the defining elements, both positive and negative.

Silvertown (2009), unintentionally, perfectly expressed the core of the problem that this thesis centres around:

> Today, most citizen scientists work with professional counterparts on projects that have been specifically designed or adapted to give amateurs a role, either for the educational benefit of the volunteers themselves or for the benefit of the project (p. 467; emphasis placed by me).

Citizen science projects are currently seen as either beneficial for the volunteers or for the project. Leading to the benefits of citizen science often being experienced as one-sided, and citizen science not being used in its full potential.

Archaeology has yet to fully realise the potential of citizen science. In recent years there has been a rapid growth of citizen science as a means of engaging large groups of people in scientific research, even though archaeology has a long history of involving people it has not always been called or been shaped as citizen science (Bonney et al., 2016, p. 1; Bevan et al., 2014, p. 183). Citizen science in archaeology is fundamentally people-centred, aimed at comprehending past human activity through active citizen contributions. However, little is known about how citizen science impacts non-specialists involvement in archaeology. Research on citizen science has been predominantly conducted within the field of natural sciences, with historical and humanitarian projects recently being studied more. Archaeology will also need a different framework for assessing the quality of citizen science than the natural sciences do. Within archaeology, citizen science will have to be assessed through subjective, descriptive, and symbolic factors that are sometimes based on emotion. This qualitative approach takes elements like community impact, cultural relevance, and emotional engagement into account, while the natural sciences mostly employ empirical, objective observations where quantitative measures and statistics can assess their worth (Pratz López, 2017, p. 5).

The landscape of scientist's attitudes towards public participation is complicated (Collins et al., 2022, p. 1). Even while a lot of scientists are open to conventional outreach initiatives, like media appearances or public lectures, they might not consider public involvement in their work to be an engagement strategy. According to this research, scientists' interest in using participatory engagement techniques in citizen science initiatives, may be influenced by their opinions about the public's scientific literacy (or lack there off). Project design and management have a major role in the effectiveness of citizen science as a tool for public engagement. Therefore, it is essential to recognise the perceptions of public involvement that are used by scientists working in citizen science efforts. Vice versa it is crucial to understand how citizens perceive scientists, and whether that perception is something they would want to work with. This knowledge can be used to create more inclusive and successful citizen science initiatives (Collins et al., 2022, pp. 1-2).

1.2 Research Questions

To find out what impact citizen science has in archaeology the primary research question guiding this thesis is: What is the impact of citizen science on both participants and archaeological research?

In order to answer this main research question, this research is divided into three sub-questions:

- What is the impact of citizen science for participants?
- How does citizen science impact archaeological research, projects and policy making?
- What are the guidelines for successful citizen science in archaeology?

1.3 Objectives

The objectives of this thesis are threefold: to evaluate the contributions of citizen science to both participants and research, to compare different archaeological projects that utilized citizen science, and to identify best practices and key success factors for future citizen science initiatives in archaeology.

1.4 Practical Relevance

In this thesis I will provide a comprehensive analysis of citizen science in archaeology in the Netherlands. Theoretically, this thesis contributes to a better understanding of citizen science: how it can be analysed, what implications it has within archaeology, and how it can be further developed and improved. This

thesis can be used as an analysing framework for volunteer participation, project management and institutional regulations.

In addition to this theoretical contribution, it is important to consider the practical relevance of this research. Practically, this thesis can enhance citizen science efforts, strengthen public engagement, maximise scientific value, help to guide upcoming initiatives, inform policy decision making and resource allocation, and ultimately help in advancing the field of citizen science within archaeology. One of the main aims outlined in this thesis is to contribute to the development of more successful citizen science projects that benefit volunteers and archaeological research, practically this will lead to a thorough analysis of the effects on participants and research outputs. This helps to strengthen the bonds between the general public and their cultural heritage. It also enhances participation- and research techniques and raises the scientific value of citizen science initiatives. Future citizen science projects in archaeology will benefit from the identification of success criteria and best practices that will result from this study. The results may also have an impact on the creation of policies and the distribution of resources, which could help in nationally raising the awareness, interest and especially availability of citizen science. This study can make a disciplinary contribution to the larger field of citizen science by providing valuable insights from archaeological efforts.

1.5 Research Approach

This research consists of three parts: a literature study on citizen science within and outside Dutch archaeology, semi-structured interviews with those involved in archaeological citizen science projects in the Netherlands, and a thematic analysis of these interviews. This combination makes it possible to test existing theoretical frameworks as well as to gain new insights from the work field.

In support of the subsequent interview data, this thesis will also be based on previous qualitative and quantitative data, literature and project documentation, which includes publications, reports and sometimes post-project evaluations.

Semi-structured interviews with a wide range of stakeholders, including citizen participants, project coordinators and professional archaeologists, will form the basis for the data collection process. The purpose of these interviews is to gather in-depth perspectives of the difficulties, benefits and experiences of participating in citizen science. The semi-structured method strikes a balance between maintaining uniformity and consistency throughout the interviews, while also allowing for flexibility to go deeper into unexpected insights and opinions.

An essential part of the analysis will be a qualitative, cross-case comparison between four diverse archaeological projects in the Netherlands that have each used citizen science in their unique ways. Which will enable me to identify recurring key success factors, challenges and patterns across varying projects. This method of analysis will be especially valuable in helping to answer the third sub-research question, seeking to identify a list of possible guidelines for more successful citizen science in archaeology (Collins et al., 2022, p. 4; Pratz López, 2017, pp. 5 & 23). Additionally, this thesis will employ triangulation techniques, understanding a concept through qualitative research from multiple data sources and through different methods (Pratz López, 2017, p. 110). This will be used to cross-reference information from project documentation, interviews, and previous research to guarantee the reliability and validity of the conclusions. This approach will help in minimising potential biases and provides a stronger foundation for recommendations, conclusions and final advice.

It is important to note that, in this thesis the words 'science' and 'research' refer to all academic research, the addition of the word 'archaeological' will imply its meaning within archaeology. Likewise, the terms 'scientist', 'scholar' and 'researcher' will be used interchangeably, as will the terms 'volunteer', 'citizen scientist' and 'participant'. In this thesis, participation (with and by citizens) is distinguished from public outreach (for citizens) (van Londen et al., 2021, p. 7).

1.6 Thesis Structure

This thesis is structured into seven chapters. This introduction outlines the research problem, the central questions and defines the objectives that will guide the rest of the research. Chapter 2 provides a literature review and theoretical framework, focusing on the definition, criticism and the relations between participation and science to archaeology. Chapter 3 contextualises this thesis by placing it in a broader framework, showing how participation in archaeology developed, how it has been incorporated in policies and regulations, and showing the current role of citizen science within and outside archaeology in different geographical areas. Following this, Chapter 4 explains the qualitative research methodology, explaining the interview set-up, questions and analysis. In Chapter 5 the results from the interviews will be presented, alongside a comparison between the four Dutch archaeological projects, which will be the empirical backbone of this research. Before making comparisons, each case study is examined separately to identify common pitfalls, success and best practices, while also giving information about the project, its participants and goals. The results from the case study comparisons will be interpreted in the discussion in Chapter 6, which will relate the answers to the research questions and will place these findings in the context of larger scholarly discussions on citizen science. Ending this thesis will be a conclusion in Chapter 7 that highlights the main takeaways from the study, considers its

implications for theory and practice, and provides practical suggestions for next citizen science projects and -research. It will also identify the shortcomings of this thesis and will offer suggestions for future research.

Chapter 2. Defining Citizen Science

Citizen science offers an participatory and open approach to science, bridging the gap between society and science. To realise the potential of citizen research, not only the generation of reliable data and the resolution of scientific issues should be considered, but also the potential stressors, motivators and effects on society and social innovation (Vohland et al., 2021, p. 7). This chapter will explore the concept of citizen science, it will define the term, show the ongoing critiques surrounding citizen science, shed light on the impact on participants and its contributions to archaeological research, and will explain the already existing frameworks of evaluating citizen science that can be built upon. The goal of this chapter is to provide a theoretical foundation on the concept of citizen science for further analysis in the remainder of this thesis.

2.1 Defining Citizen Science

Hakley *et al.* (2021, p. 15-18) compiled 34 definitions of citizen science into one comprehensive table, with sources from, for example, the Oxford English Dictionary, different worldwide citizen science associations, UNESCO, the United Nations, the European Union and different science associations. Combining these definitions results in broadly the following definition of citizen science: Citizen science is a type of scientific research in which the general population is actively involved in different areas and aspects of the scientific process. The participants in this process can range from trained individuals, to first time volunteers, to amateur enthusiasts. Data collecting, monitoring, analysing, hypothesizing, formulating, project planning and technically developing are just a few of the various ways that participants can help within scientific research. Frequently, this is in cooperation with academic institutions, government or non-governmental organisations, and professional scientists. The method of citizen science is an open, transparent and inclusive way of advancing scientific understanding, encouraging the public interest in science, and it gives communities the ability to participate in studies that tackle pressing issues. Citizen science projects can range from short-term data collection to long-term, collaborative research, and can vary from locally driven initiatives to being a part of world-wide projects. Citizen science projects aim to bridge the gap between society and academia, by encouraging open-access knowledge and evidence-based decision making. According to the White Paper on Citizen Science for Europe (Serrano et al., 2014, p. 10), citizen science centres around four core values: open, social, digital and research. These values encompass all attributes of citizen science, as can be seen in Figure 1.

Figure 1. The values and attributes of citizen science, according to the White Paper on Citizen Science. (Serrano et al., 2014, p. 10).

According to Silvertown (2009, p. 467) a citizen scientist can best describes as 'a volunteer who collects and/or processes data as part of a scientific enquiry'. A citizen scientist is inherently not professional, does not have a day-to-day occupation in the corresponding field, and is involved in citizen science out of their own free will. They are usually motivated, interested and curious. Their main motivations for participating are usually to contribute to new, important scientific research, to be part of a team and to gain new knowledge, expertise and experience (Raddick et al., 2009, p. 1; Raddick et al., 2013, p. 1; Nov et al., 2010, p. 743; Land-Zandstra et al., 2021, p. 251). Some participants could have previous experience, some might not, some might have more knowledge on a subject, some might not. It is in the nature of citizen science that every citizen scientist is different, and therefore each citizen science initiative is different, and can benefit from different people.

Citizen science initiatives include many different themes and tasks, often falling into one of two categories: experimentation and creative problem solving, and data analysis and collection. Access to a wide range of different knowledge pools that would otherwise not be available, is one of the advantages of including large numbers of citizens into ideation and experimentation projects. Moreover, the time

and resource efficiency that comes from citizen participation is advantageous for initiatives that concentrate on data collection and processing. By utilising the efforts of volunteers and their collective intelligence, both of these citizen science approached could improve scientific research across different regions, fields and groups (Pratz López, 2017, p. 2).

In short, citizen science in archaeology can be understood as a broad, inclusive approach that invites citizens to actively participate in the scientific process, often beyond traditional volunteering roles. The next section explores what this participation means for citizens themselves, what do they learn, what do they experience, and what motivates them?

2.2 Impact on Participants

In addition to data collection and study outcomes, the impact on participants is also essential to assess the value of citizen science in archaeology. Non-professionals' backgrounds, driving forces and learning outcomes influence not just the success of specific projects but also the long-term viability of citizen science as a sustainable method in archaeological practice. Participant impact comes in many forms, as illustrated in Figure 2. This section focusses on understanding the educational, social, and emotional effects that archaeological citizen science projects have on participants and how these results mirror wider societal advantages.

Figure 2. The formats and impacts of citizen science, according to the White Paper on Citizen Science. (Serrana et al., 2014, p. 11).

A genuine interest in archaeology appears to be a foundational motivation for citizen participation. A study by Mackinney (1994, as cited in Holtorf, 2007, pp. 57-58) found that 76% of visitors to the California Academy of the Sciences expressed an interest in the past, with 45% specifically interested in how people lived in the past. Only 14% cited excavations or discoveries as their primary association with archaeology. This suggests that not every citizen scientist would participate in archaeological projects for the excavation part, as is often thought, but that there is already some intrinsic motivation to learn about the past.

Aside from already having an intrinsic motivation, participants also want to gain something from their involvement. Important aspects of gaining new experiences include the joy of exploration and discovery, gaining knowledge, learning archaeological methods, identifying and analysing archaeological material, cooperating, sharing stories, connecting with a location, being active and outside, and applying creative skills (van Londen et al., 2021, p. 13).

'the purpose of engaging the public with archaeology is to encourage self-realisation, to enrich people's lives and stimulate reflection and creativity' (Merriman, 2004, p. 7).

Citizen science can facilitate a wide range of learning experiences. In addition to gaining topical knowledge, participants also develop their critical thinking and scientific process skills (Schaefer et al., 2021, p. 500). For example, the WTimpact project, where volunteers recorded biodiversity and air quality, showed how citizen science helped to improve scientific reasoning skills. According to project evaluations, participants gained a deeper understanding through participation and kept improving their capacity for scientific reasoning throughout the project (Schaefer et al., 2021, p. 506).

Within archaeology, the educational value lies in participants not only learning practical skills, like stratigraphic analysis, context interpretation, object identification etc., but also understanding the broad field of archaeology and its relevance to our contemporary society (van Londen et al., 2021, p. 13; Reilly et al., 2018, p. 31). Citizen science can support both individual learning and a more general understanding of science. Archaeological engagement projects, for instance, have noticed that people who visit excavations and hotspots form positive associations with archaeology. Additionally, it seems that people can contribute a surprisingly high level of expertise. According to experts, associations like the DDA (Dutch Association for Metal Detection) learn how to manage their operations responsibly through knowledge sharing, and volunteers can offer insightful information to each other and 'professionals' (van Londen et al., 2021, pp. 34-35). Utilising local knowledge is a crucial component of citizen science. Involving residents is seen by university organised archaeological projects as a means of obtaining important local knowledge (van Londen et al., 2021, p. 31).

It can be argued that society also benefits from citizens who can find a sense of purpose in being able to contribute to significant missions, like research, who can overcome obstacles, develop inquisitive minds, realise their aspirations and can ask larger existential questions. All of that can be done through enjoyable and fun projects, making archaeology not just an academic pursuit, but a vehicle for personal fulfilment and growth (Holtorf, 2007, p. 145).

Participants in citizen science initiatives can have a variety of social and experiential impacts. Citizen science can go beyond just acquiring knowledge, contributing to community development, -identity, -wellbeing, and social value. People gather in heritage communities to co-create meaning around their shared heritage and archaeological finds and -monuments, in doing so they bond over a mutual interest and increase their social cohesion. Even when projects are completed, these communities might continue to function, strengthening long-term social relationships and a sense of community (Reilly et al., 2018, pp. 30-31; van Londen et al., 2021, pp. 18 & 34).

For many participants, citizen science is calming and uplifting. They form a positive relation to archaeology, which enhances their wellbeing (van Londen et al., 2021, pp. 34, 65, 69). The feeling of identification and ownership is another crucial aspect. Participants in archaeological projects are citizens who wish to actively participate in interpreting and understanding their history and living environment. They view heritage as an important component of their living space and sense of (co-)ownership over finds. This emotional commitment enhances the significance of heritage in daily life and increases the impact of archaeological activity (Reilly et al., 2018, pp. 30-31; van Londen et al., 2021, pp. 11, 33, 37).

An undeniable aspect of participant impact is the hands-on nature of archaeological work. The tactile and immersive elements, working with artefacts, going on field trips and physically discovering the past can help participants feel more connected to the past (Reilly et al., 2018, pp. 30-31; van Londen et al., 2021, p. 13). As Merriman (1991, p. 106) points out, people love the adventurous, mysterious, exotic and romantic side of researching the unknown, of holding history and physically being a part of discovery.

Participants active in the field gain knowledge of new practical, archaeological skills, like documenting and analysing findings, using GIS, and conducting geophysical surveys. Workshops give them knowledge about procedures and legislation, like in Austria's ArchaeoPublica initiative, where citizens received instruction on fundamental archaeological conservation techniques and heritage preservation. Participants get a deeper comprehension of past contexts and the importance of heritage via hands-on engagement (Peter, 2019).

In short, the impact of citizen science on participants encourages education, self-improvement, social cohesion, and a stronger feeling of heritage ownership. Citizen science initiatives give participants a range of learning opportunities, from deepening their appreciation and understanding of science to improving their scientific abilities. In other words, the involvement benefits for the public include the better understanding of our origins and potential futures, the development of heritage based collective identities and the pleasure of witnessing historical stories (Holtorf, 2007, p. 120). But citizen science is not just about the participants; archaeology itself also benefits from their involvement, an aspect that will be central in the next paragraph.

2.3 Contributions to Archaeological Research

Citizen science also makes direct contributions to archaeological research. According to van Londen *et al.* (2021, pp. 34-35), citizen participation can boost credibility, public interest and overall support for the archaeological profession. Knowledgeable and enthusiastic volunteers can become true advocates for the profession and the academic field, raising awareness and attracting wider audiences (Rijksdienst voor het Cultureel Erfgoed [RCE], 2015, pp. 12 & 22; Bourgeois et al., 2024, p. 14). Additionally, those who take part in co-creation of an exhibition, antiquity room or new project, for instance, invite their network to see their work. This involves new audiences, people who might not otherwise be as inclined to attend. Because it is made by like-minded people, the threshold is lowered for others (van Londen et al., 2021, pp. 34-35).

One of the most important contributions of citizen science to archaeological research is increasing social support. Interest and curiosity about our past are the foundations of archaeology, these are also the drivers on which archaeology is financed. Knowledge about our history is not a basic necessity of life, so it is important to be publicly accountable and to continue explaining and showing why it is important to further study and finance archaeology (Smith, 2014, p. 759; Silvertown, 2009, p. 469). The best way for the public to understand and appreciate science is to involve them, and the best way to create a supporting foundation is to support cooperation.

Participants can also help broaden our way of thinking about archaeology and heritage, introducing new knowledge, discussion points and insights from other angles. Volunteers often possess a wealth of local knowledge that isn't necessarily always accessible through existing sources, and can become important in preliminary research. Consulting local volunteers during desk research and creation of the Program of Requirements (PvE) for excavations can help to include this local knowledge and also the wants and

needs of the community in the research area, while also helping archaeologists in understanding the full story and potential of an area before excavating (RCE, 2015, p. 22).

Archaeological volunteers can greatly increase the research capacity. They have the time, expertise, enthusiasm, and knowledge necessary to take part in archaeological research (RCE, 2015, pp. 4 & 12). Volunteers can also help in performing extra work that would otherwise not be done or would only get done in part. They can work alongside archaeologists in processing finds, both during and after fieldwork, including sorting, washing, counting, numbering, and sieving soil samples, as well as identifying, describing and drawing (RCE, 2015, pp. 12 & 23). In areas of the excavation where no professional archaeological research is needed, volunteers can help in observing, recording surface traces and searching for surface finds (RCE, 2015, p. 18). With the landowner's consent, volunteers can even carry out independent, non-excavating research like field surveys. Additionally, experienced volunteers are often eager to assist with the elaboration of old research and collections, frequently in municipal or provincial depots (RCE, 2025, pp. 22-23 & 32).

In sum, through growing public participation archaeology can broaden its intellectual horizons and expand its capacity for practical work. In addition to contributing their knowledge and expertise, volunteers help establish archaeological practice in the public eye, which ensures its ongoing relevance and support. Yet these enthusiastic contributions also raise critical questions about power relations, inclusivity and the real impact of participation, issues that will be addressed in the next section.

2.4 Critique on Citizen Science

Over the years, citizen science initiatives have produced an abundance of data, however the practice of using citizen scientists is not yet universally accepted as a legitimate approach to scientific research. Scientific articles that report data gathered by volunteers may struggle to get reviewed and are frequently relegated to journal outreach sections or scientific symposia' education tracks (Bonney et al., 2014, p. 1436). Why could that be? And what are the current critiques on citizens science?

'you can't assume that people know what they want' (Packard, 1960, p. 18).

Within citizen science there is a delicate balance between giving the participants as much space as possible and protecting the public against itself. On the one hand citizen science strives for broad public participation where self-realization and creativity is made possible for everyone, however

(archaeological) agencies must also ensure that people are making informed decisions as not to accidentally harm the public- and archaeological interests out of the lack of knowledge (Holtorf, 2007, p. 124).

The nature of citizen science evolves around an open and voluntary way of participation. Citizens are always free to choose when and whether they want to participate, making these projects very accessible but also creating a new problem. By making citizen science so approachable, accessible and convenient, research faces participation and retention uncertainty. The number of participants in a citizen science project, the amount of time they will devote, and the amount of effort they can and will put into completing a task are all uncertain. Due to this open nature, the skills and knowledge of participants in citizen science initiatives are usually unknown beforehand. Submitting citizens to lengthy, demanding and time consuming trainings would go a little against the grain of citizen science, as there is no employment contract between the volunteers and the researching organisation. Though diversity in knowledge is a big benefit of citizen science, it can also result in a knowledge uncertainty (Pratz López, 2017, pp. 3-4).

A common criticism of citizen science is that it mainly attracts people who are already interested in archaeology, science or volunteering, the so-called 'usual suspects'. These are often highly educated, older participants from higher socio-economic classes. Generally accessible recruitment tools, such as online calls or media attention, often only reach those who already have an affinity with the subject, a phenomenon that is also described as 'preaching to the converted' (Collins et al., 2022, pp. 2, 11 & 14; Hakley, 2013, p. 8). Although citizen science is intended as an inclusive and accessible form of scientific practice, in practice it proves difficult to involve a broader, more diverse group of citizens. Traditionally underrepresented groups, such as people with a migration background, a lower level of education or physical disabilities, are often not reached (Hakley, 2015, p. 48; Paleco et al., 2021, pp. 262-264). This raises another critical question on citizen science, of whether reaching broad, diverse audiences should always be a requirement for successful citizen science? Can projects that appeal primarily to one specific target group, such as the often-mentioned 'old, grey men', also be valuable and legitimate? Is an initiative less successful if it does not reach everyone, or does its strength lie in deepening engagement within existing networks (van Londen et al., 2021, p. 17)?

There is also an ongoing debate within citizen science on the scientific quality of citizen contributions. This goes beyond just the quality of data, but assesses whether citizens can improve upon initial ideas, methods and deeper knowledge. In most cases, there is already an established research question in place to which citizens can contribute, these questions are usually already steering participants in some directions and does not really allow for 'eureka moments' (Riesch & Potter, 2014, p. 8). Citizen science

should move past just answering a question, and should instead move towards deeper understanding of the discipline, its history, literature, methods and discourses. However, this takes time, more time than citizen science projects are usually given, can afford or can sustain. There is also the financial aspect, scientists are paid for their research, their knowledge and their time investment, while participants are not. Science cannot expect participants to invest enough time and energy into a deep dive of the whole field, but this would, long-term, help participants to be more involved and would help science to move past the answering of questions (Vohland et al., 2021, p. 5).

A larger discussion concerning accessibility versus preservation is highlighted by the building tension between professional archaeological expertise and public involvement. Encouraging public support and interest in heritage conservation can be achieved by making archaeology more accessible, but doing so requires careful supervision to prevent public participation from compromising the integrity of archaeological practices. Democratic decision-making will always face the risk of being influenced by superficial and personal preferences that are shaped by popular media (TV, Hollywood, or misinterpreted popular literature), which could lead to irreversible damage of valuable cultural heritage sites or artefacts and could limit the opportunities for others to engage with academic archaeology (Holtorf, 2007, p. 123).

The problem of genuinely appreciating citizens' input is still prevalent today, as evidenced by research that examined citizen science over time and pointed to the 'lack of recognition' of volunteers' contributions as a hurdle to participation in citizen science. With the increased use of specialised procedures and jargon, science became more and more 'professionalised,' making it harder for citizens to participate and to work with scientists on the same level. This widened the divide between science and the general public, increasing scepticism from both parties towards each other in the process (Suman & Alblas, 2023, pp. 4-5; Wiesman, 2019).

Hecker *et al.* (2018, pp. 190-197) conducted an online survey among citizen science projects throughout Europe. From this online survey numerous challenges for citizen science projects were revealed, as can be seen in Figure 3. Concerns about inadequate financing (75%) and data quality (70%) were mentioned by the vast majority of respondents when questioned about the difficulties facing citizen science. Additionally, concerns were also raised on the acceptance of citizen science in the professional spheres of researchers and coordinators, with the most urgent issues being the integration into education (68%) and a lack of recognition in academia (60%). Another issue was the time commitment of citizen science initiatives, which accounts for 65% of the total.

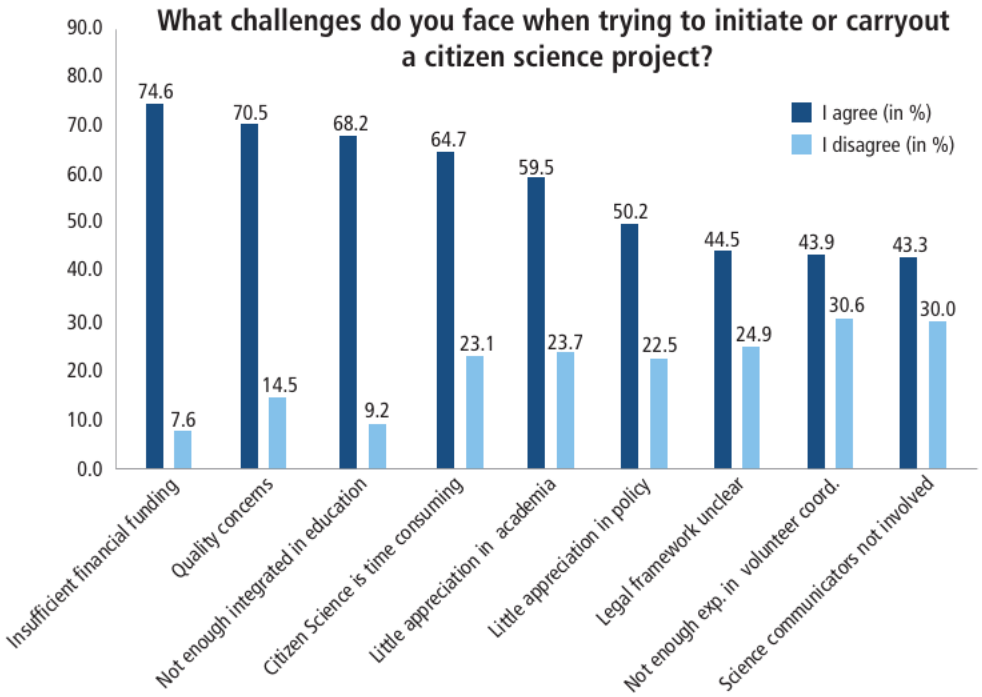

Figure 3. Challenges for citizen science projects. (Hecker et al., 2018, p. 197, Figure 13.7).

In short, citizen science has promising aspects, but the approach is also confronted with recurring criticism. Doubts about the scientific quality, inclusivity, dependence on motivated volunteers and the limited recognition within the academic world make it clear that citizen science is not a self-evident formula for success. The open, accessible nature of these projects leads to valuable participation, but also to uncertainties in terms of knowledge, involvement and representation. This criticism emphasises the need for conscious reflection on who participates, how participation is shaped and what expectations realistically belong to this. To answer these critical questions, it is necessary to look at how success in citizen science is measured and what existing evaluation frameworks are available for this.

2.5 Existing Frameworks for Evaluating Success

Although the previous sections have highlighted the impact and criticisms of citizen science, the question arises as to how success in these types of initiatives is actually assessed. The effectiveness of citizen science cannot be assessed using a single, all-encompassing framework, but instead uses a variety of approaches and methodologies, such as data quality, process flow, learning objectives of participants, or broader societal impacts. This subchapter explores the main existing evaluation frameworks and provides insight into how these can be used to assess the effectiveness and value of

citizen science in archaeology. In doing so, this section forms a bridge between the theoretical reflection on citizen science and its practical application in the case studies that follow.

A crucial management tool and part of many scientific projects is evaluation. Evaluation can serve multiple purposes, such as evaluating the scientific findings, the project process, participant effects and the wider social impact (Schaefer et al., 2021, pp. 495-497). An essential component of evaluating citizen science initiatives is determining the quality of the data. Because academics, policymakers, and individuals have various demands and motives, it is crucial to take into account data accuracy and data quality processes (Balázs et al., 2021, pp. 140-141).

Summative (outcome-oriented) and formative (process-based) evaluation are distinguished as two ways of approaching citizen science analysis. Summative evaluation examines the overarching objectives and benefits for participants, whereas formative evaluation concentrates on the programs' or activities' advantages and disadvantages (Schaefer et al., 2021, pp. 496-497).

Ensuring the standard of citizen contributions is a crucial component of evaluation. To improve knowledge certainty, volunteers might be specifically recruited (Pratz López, 2017, p. 38). To evaluate the accuracy of volunteer-classified LiDAR pictures in archaeological contexts, as can be observed in the Heritage Quest project, inter-user agreements were examined and findings were contrasted with fieldwork. This demonstrated that volunteer consensus is correlated with the probability of a correct barrow identification. Numerous prehistoric barrows that were previously unknown can be located even using 'messy' data (Bourgeois et al., 2024, pp. 9-10).

The evaluation may also concentrate on the learning objectives of the citizens participating. It is intended that participants gain knowledge of the subject area, methodological and practical skills, and an understanding of scientific methods (Kloetzer et al., 2021, p. 284). The impact on society might also be taken into consideration while evaluating citizen science. Social innovation, environmental management, policymaking, and raising public awareness of science can all be related to this. The societal benefits of participation initiatives, including social cohesion, politics, economy, and education, are taken into account in the context of citizen science in archaeology. Methods from psychology (for individuals) and sociology (for groups) are required for evaluating impacts and effects. Still, this is a relatively new area of study within the archaeological heritage sector and will need continuous refinement (van Londen et al., 2021, p. 18).

Silvertown (2009, p. 470) shared five principles that, almost 15 years ago, were guidelines to best outcomes in citizen science. These include: publicly collected data must be validated in some way; data

collection techniques must be well thought out and standardised; assumptions must be made clear, as many as possible; a hypothesis should ideally be in mind, even if it is just a simple query such as 'how is X changing?' or 'how is Y distributed?'; volunteers must be rewarded for their participation with feedback on their contributions.

To indicate different forms of participation, Bonney *et al.* (2016, p. 4) distinguish three levels: Contribution, here participants primarily contribute to data (collection and analysis) that follows the design of scientists; Collaboration, in which participants also help with other parts of the scientific process like the analysis, design and sharing of information; Co-creation, where the scientists and participants work together to make the project. Shirk *et al.* (2012, p. 5) add two more levels: in which a community hires a scientist to investigate a problem relevant to the community; Collegial, where a community conducts a scientific study without a scientist present. These five forms can be shown in the Figure below, which clearly shows how the role of participants varies from passive to intensive (see Figure 4).

Public action in each PPSR model	Members of the public...
Contract	... ask scientists to conduct a scientific investigation and report on results
Contribute	... are asked by scientists to collect and contribute data and/or samples
Collaborate	... assist scientists in developing a study and collecting and analyzing data for shared research goals
Co-create	... develop a study and work with input from scientists to address a question of interest or an issue of concern
Colleagues	... independently conduct research that advances knowledge in a scientific discipline

Figure 4. Table showing how participants interact with scientists. (Shirk et al., 2012, p. 5).

In addition, recent European studies provide insight into the perceived impact of citizen science (see Figure 5) and the level of participation in projects (see Figure 6). These show that the impact often extends beyond data yield alone, and that co-creative forms are relatively rare, despite their potential.

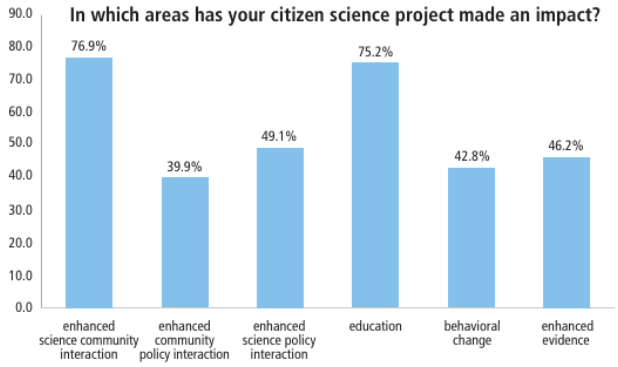

Figure 5. Areas of perceived impact of citizen science projects. The results of an European-wide survey among citizen science projects. (Hecker et al., 2018, p. 198, Figure 13.8).

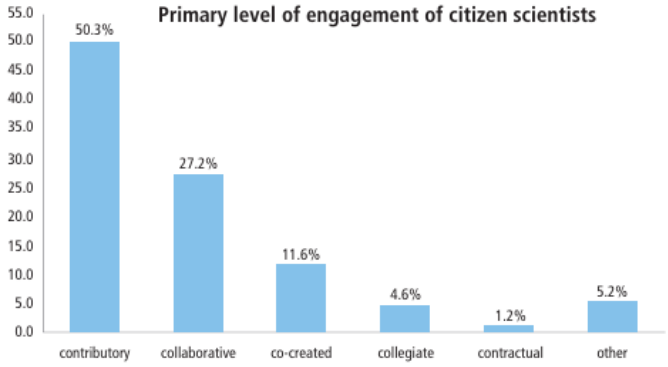

Figure 6. Level of engagement in European citizen science projects. The results of an European-wide survey among citizen science projects. (Hecker et al., 2018, p. 194, Figure 13.3).

Finally, Figure 7 shows how the level of involvement of both citizens and scientists relate to each other, and how together they can determine the success of projects (where contractual and collegial projects are grouped together into 'crowdsourced') (Collins et al., 2022, p. 3).

Evaluating citizen science requires customization. There is no universal framework, but there are certainly handles: from data quality to learning objectives, and from social impact to the nature of collaboration. Using multiple evaluation forms, as discussed above, makes it possible to make both scientific and personal and social effects visible. As such, evaluations are the key to sustainable, successful and meaningful citizen science in archaeology. Therefore, the focus in the next chapter shifts to the context in which these projects take place, historically, geographically and policy-wise, to better understand and evaluate how citizen science develops in practice.

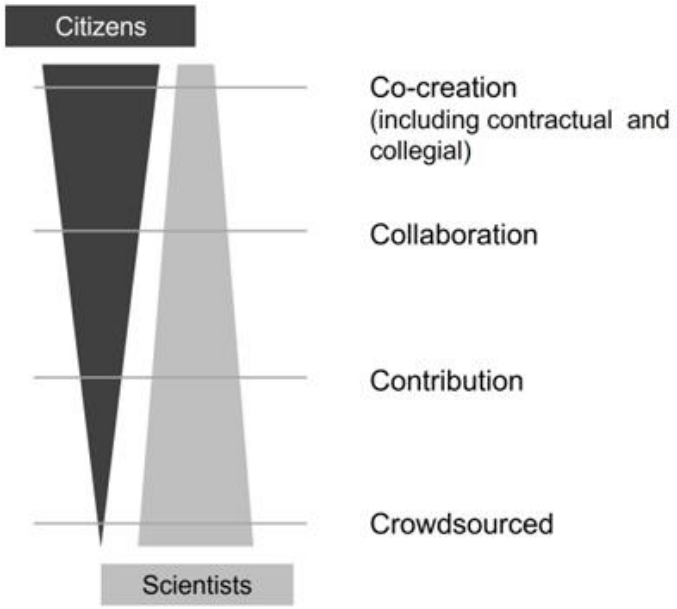

Figure 7. Diagram on the level of engagement for both scientists and citizens. (Collins et al., 2022, p. 3).

Chapter 3. Contextualising Citizen Science

The aim of this chapter is to place the previously discussed theory on citizen science in a broader context. The evolution of citizen participation in archaeology is explained through a historical, policy, and geographic overview. In doing so, the history of the origins of citizen science, the role of law and regulations, and how forms of participation are taking shape within and outside the Netherlands, and within and outside the discipline of archaeology. This contextualisation provides the necessary background and frameworks for the case analyses in the following chapters.

3.1 Historical Context

3.1.1 The Origins of Citizen Science

'citizens have been asked to help in solving organisational, societal and scientific problems for centuries' (Pratz López, 2017, p. 1).

Since the last part of the 19th century, science slowly became a paid profession. So historically, almost all scientists started out as citizen scientists as they made their living in other non-scientific professions. For example, Benjamin Franklin used to be a printer, and Charles Darwin sailed as an unpaid companion. From the 19th century onwards citizen science gained prominece, especially in sciences like natural history and astronomy the observational skills that citizens bring to research have historically been more important, and less expensive, than equipment (Silvertown, 2009, p. 467). The term 'citizen science', with its current meaning, was first recorded around three decades ago in 1989 when it starred in the MIT Technology Review article on Greenpeace community-based laboratories exploring environmental hazards in a 'citizen science' project (Haklay, 2021, p. 14). Equating citizen science to the movement of democratizing science is likely an idea formed in 1995 by Alan Irwin (Irwin, 1995; Bonney et al., 2016, p. 3). Irwin wanted to create a 'scientific citizenship' to bring science and the public closer together, create deeper dialogue and get more input into decision making, specifically for issues surrounding environmental threats.

Although citizen participation in science has existed for a long time, the way in which it is organised has undergone a clear transformation in recent decades. The following section discusses the recent growth of citizen science and the technological, institutional and societal factors that have contributed to it.

3.1.2 The Evolution of Citizen Science

''Science for the People' was a slogan adopted by activists in the 1970 s. 'Science by the people' is a more inclusive aim, and is becoming a distinctly 21st century phenomenon.' (Silvertown, 2009, p. 470).

According to Silvertown (2009, pp. 467-470), there are three factors that explain the recent increase in interest and activity around citizen science. Firstly, the use of technical tools that are readily available for public data collection and information dissemination. Secondly, the understanding of professional scientists that the general public is a free source of labour, expertise, computing power, and even funding. Lastly, the demand from research funders that science outreach is important and necessary. Grant organisations, like the RCE (Rijksdienst voor het Cultureel Erfgoed), the NWO (Nederlandse Organisatie voor Wetenschappelijk Onderzoek) and the Ministry of Education, Culture and Science (OCW), are starting to enforce involvement requirements which encourages public accountability for science.

The development of citizen science has benefited greatly from technological advancements and the internet. The rise of the internet has enabled researchers to organise citizen contributions on a large scale and at low cost, making citizen science more accessible and efficient. Initiatives such as GalaxyZoo.org and eBird.org show how technology simplifies data collection, reaches a wider audience, and enables remote collaboration and low-threshold participation (Pratz López, 2017, p. 2). As a result, citizen science projects have grown dramatically in size and number. This is not surprising, because citizen science and technology are essentially very similar: according to Volti (2009, p. 8), the definition of technology is a 'system created by humans that uses knowledge and organisation to produce objects and techniques for the attainment of specific goals'. Citizen science could likewise be defined as a principle created by humans for humans that uses citizen knowledge and scientific organisation to produce data for the attainment of specific goals (Suman & Alblas, 2023, pp. 5-7).

There are three main models that describe the relationship between science and society. The Education Model sees scientists as knowledge carriers who share their insights with an unknowing public. The Public Relations Model focuses on improving the image of science in order to gain public and political support. The Democratic Model, on the other hand, emphasises participation, in which citizens actively think about the social responsibility and sustainability of science (Holtorf, 2007, pp. 106-107; House of Lords, 2000; Elam & Bertilsson, 2003, pp. 233-235). Where the first two models view the public as passive and dependent, the Democratic Model recognizes the citizens' own thinking power and judgment. As with citizen science, the central idea here is that science must connect with people's needs and interests, and that citizens must be actively involved (Holtorf, 2007, pp. 108 & 119). In archaeology,

this means that professionals and citizens take each other seriously and work together on shared insights.

Citizen science has grown strongly in the 21st century due to technological innovations, changing scientific views and an increasing emphasis on public involvement. Within archaeology, this development has also led to renewed forms of collaboration between citizens and professionals, building on a long tradition of involvement.

3.1.3 Participation in Archaeology

Although archaeology has been involving the public for decades, until recently this has mainly been done in a superficial way, such as through public days or short field experiences. This subchapter explains what these traditional forms of participation looked like and how people have previously come into contact with archaeology. This provides the foundation of archaeological outreach and participation that citizen science can build upon.

In the Netherlands, it has a long history dating back to at least the 1820s, when volunteers sourced the first collections for the National Museum of Antiquities (RMO, 2015). According to Smith (2014, p. 749), there are four main ways that citizen science has traditionally benefited archaeological research: fieldwork that makes use of widely accessible technologies like mobile photography and data uploading, analysing crowdsourced imaging (for identifying and monitoring sites), digital input of heritage data, and crowdfunding initiatives. Field schools, amateur archaeology associations, donor-supported digs, and community-driven archaeology projects are typical ways that these strategies are put into practice (Smith, 2014, p. 752). These strategies are traditionally short-term, practical involvements in the form of locally organised Open Days, where archaeological field projects invite people to come see the excavation for a day. 'A Day on the Dig' is the more engaging version of an open day, here people are invited to actually join the excavation for the day and help in digging, documenting or cleaning material (Holtorf, 2007, p. 136). The European and nationwide Archaeology Days are also great examples of traditional public involvement in archaeology, with the national foundation, museums, archaeological companies and AWN (Archaeological Workgroup of the Netherlands) organising lectures, activities and all things archaeology every year for three days (Nationale Archeologie Dagen, 2025). Archaeological field schools do provide full immersion into scientific research, participants being a part of an archaeological team and involved in all aspects of research. However, only a small number of people can participate, there are often high financial costs for the participant and these projects are often quite hard on the archaeological supervisors (leading research, caring for participants, logistical issues, possible emergencies etc.) (Smith, 2014, pp. 752- 753). In archaeological volunteer work, amateur

associations are essential. Archaeological- and historical foundations and local working groups are active in nearly every municipality, and they frequently have a substantial number of dedicated members. One well-known example is the AWN, a nationwide organisation with over 2000 members and 24 local chapters. These volunteers support archaeological research and are dedicated to safeguarding and conserving the archaeological legacy of the Netherlands (AWN, 2018). Despite the enormous value of their work and discoveries, experienced archaeologists frequently have to verify and examine the results to assure scientific validity. This highlights the important relationship between experts and amateur archaeologists.

The history of citizen participation in archaeology shows that citizen science emerges from an existing practice of collaboration with volunteers. Understanding how the field has traditionally dealt with public involvement is an important reference point for how archaeology gives substance to citizen science today. In doing so, it provides a basis for investigating later in this thesis how this collaboration can be further strengthened and renewed.

3.2 Policies and Regulations

To understand how citizen science in archaeology is shaped today, it is crucial to look at the policy and legal frameworks in which these projects operate. Law, policies and regulations largely determine how much potential there is for citizen science, who can be involved and under what conditions. This subchapter explores how governments and institutions at different levels, from international, national to local, have stimulated or restricted participation.

Research (funding) institutions and government agencies recognise the importance of integrating non-experts into technological and scientific innovation processes, and recent conventions, policies, acts, notions and initiatives have changed the way that the archaeological field looks at participation (Giardullo, 2023, p. 2). The first major change came with the Valletta Convention (Council of Europe, 1992; Odding, 2024, p. 2), also known as the Malta Convention. This convention was created in response to the unprecedented scale of destruction of archaeological remains and aimed to protect archaeological heritage for science and society (Willems, 2014, p. 152). Before the Valletta Convention, archaeological volunteers were common practice in the field, with lots of well-organised and motivated groups and associations (like the AWN) being the 'ears and the eyes' of professional archaeology. There was mutual appreciation and cooperation between amateur archaeologists and professionals, until the new Malta-principles made archaeology focus on market forces, contract archaeology and quality standards, which made it bureaucratically difficult for volunteers to continue their previous ways. This top-down approach of the archaeological field and the strict regulations regarding the right to conduct

archaeological fieldwork stood in the way of participatory practices (Raad voor Cultuur, 2022, pp. 10-11; van Londen et al., 2021, p. 21; Uslu, 2022, pp. 8-9). Moreover, the Dutch government did not seem to attach much importance to participation by citizens, as article 9 of the Valletta Convention, which concerns public outreach and dissemination, was not included in Dutch legislation. Nor was there any funding for public outreach in the context of Malta archaeology, which had become the biggest voice in dictating archaeological practices since the late 1990s (van Londen et al., 2021, pp. 7-8 & 22).

In 2005, The Faro Convention (Council of Europe, 2005) introduces a new way of thinking about heritage, in which archaeology centres around our society rather than just the material aspects and focusses on why heritage should be protected, not how (Fairclough et al., 2014, p. 10). It emphasises the importance of participation and asks how heritage can contribute to society and social themes such as well-being and inclusiveness (van Londen et al., 2021, p. 7). The convention states that everyone, individually or collectively, has the right to enjoy the benefits of cultural heritage and to contribute to its enrichment (RCE, 2025, p. 6).

The RCE plays an important role in the implementation of the Faro Convention and stimulating participation in archaeology. This is done by, among other things, carrying out exploratory activities, appointing Faro connectors and offering subsidy schemes via the Fund for Cultural Participation. Through the Cultural Participation initiative, the government, in collaboration with municipalities and provinces, invests in equal opportunities for as many diverse groups to actively participate in culture (van der Horst et al., 2022, p. 54; van Londen, 2021, pp. 29-30).

The Heritage Act law regulates, among other things, the certification requirement for archaeological excavations, which affects the possibilities for volunteers to carry out independent fieldwork (conform Malta) (van Londen et al., 2021, pp. 31 & 41). Governments at various levels (national, provincial, municipal) all develop individual policies and have differing subsidy opportunities. Integrating citizen science in policy and funding is therefore highly dependent on the interest in archaeological citizen science within an authority (van Londen et al., 2021, pp. 29-30; van der Horst et al., 2022, p. 54; van Londen et al., 2021, pp. 7, 30 & 39).

Although there may be no overarching legislation or regulations in the Netherlands specifically for all forms of citizen science, sector-specific laws (such as the Heritage Act) and broader policies aimed at public involvement and the societal value of science and heritage (as inspired by the Faro Convention and the policy of the RCE) do influence how citizen science is shaped in practice (van Londen, 2021, pp. 7, 29-30). International developments and the positions of institutions such as the European Commission, which encourages public participation in research, can also indirectly influence the context of citizen science in the Netherlands (Brouwer & Hessels, 2019, pp. 606-607).

3.3 Dutch Archaeological Case Studies

To understand how citizen science is applied in practice within Dutch archaeology, this chapter provides an overview of various projects. These projects highlight the ways in which public participation is incorporated into various phases of outreach, research, and heritage management. Showing insight into how citizen science is actually applied in current Dutch archaeology, forming the bridge between theory, policy and the cases that will be analysed later in the thesis.

The importance of collaboration and sharing information is becoming more widely acknowledged in the archaeological sector. The goal of new platforms, like the Foundation Archaeology and Public (SAP) and joined initiatives like the highly popular National Archaeology Days and ArcheoHotspots, is to involve as many people as possible. According to van Londen *et al.* (2021, p. 22), ArcheoHotspots serve as easily accessible places (museums, depots etc.) for people to learn about archaeology, to further engagement and connection between archaeology and the public, and to give visitors the chance to freely participate in research by, for instance, sorting artefacts (van Londen et al., 2021, p. 51; ArcheoHotspots, 2023). ArcheoHotspots are part of the bigger Portable Antiquities of the Netherlands (PAN) network, where people can report and document their finds to then be included into a national database. PAN is a public archaeology initiative that aims to record archaeological finds from the public, cooperating with the public, while also improving the preservation and accessibility of archaeological data. It promotes responsible ways for finding and reporting artefacts and increases public awareness of cultural heritage (PAN, 2025; VU, n.d.).

Archaeological citizen science projects in the Netherlands show an overarching of actively involving citizens in data collection and archaeological fieldwork. This is demonstrated by initiatives like Community Archaeology in Rural Environments (CARE), who promote social cohesion by connecting people with their local heritage and provide access to research sites that would otherwise be difficult to reach. For instance, the CARE Schylge project on the Dutch island of Terschelling uses drones, metal detecting, surveys, and drillings to let locals learn about the island's past alongside academics and students (CARE, 2019; CARE Schylge, 2023). Other local community excavations include Expeditie Over de Maas, Garsthuizen, Katwijk 'Zanderij', Nijmegen Graaft!, and Westeremden. All of which excavated a specific site with the local community, showing the historical significance of their area, providing an accessible archaeological experience and new connection to their environment (van Londen et al., 2021, pp. 55-70). Digital archaeology also lends itself well to citizen science, as can be seen in different projects like Heritage Quest (Chapter 5), Scars of War and Zweefvliegers. In each project, large scale digital data, like LiDAR maps, satellite- and aerial imaginary, were made publicly available for people to scour for archaeological remains in the landscape (van Londen et al., 2021, pp. 55, 58 & 71). Digitally involving people in archaeology can also be done through virtual archaeology and gaming, as was the case with

the Romeincraft project where a roman spin-off on the popular game Minecraft was created to increase interest, involvement and knowledge on the Romans among the youth (van Londen et al., 2021, p. 64). Different citizen science projects have also catered themselves towards metal detection, like PAN, Metaaldetectie Groene Woud and Park Berg & Bos. In these projects, local metal detectorists can identify and register their finds and sometimes field explorations are organised (van Londen et al., 2021, pp. 60 & 63). In terms of material handling, special is the Zijden kousen project, where over 150 knitters participated in studying a shipwreck by re-knitting silk stockings from the 17th century (van Londen et al., 2021, p. 70). The Schokland project showed citizen science involvement in site management, actively involving stakeholders, including farmers, in the co-creation of a management plan (van Londen et al., 2021, pp. 65-66). The ArcheoBrigade project involves 25 volunteers into the upkeep of archaeological national monuments, together with archaeologists they preserve fragile heritage and in doing so stimulate involvement, knowledge and support towards archaeology (van Londen et al., 2021, p. 51). Museums, like the National Museum of Antiquities (RMO), also organise citizen science initiatives, although sometimes on a smaller scale. An example is the search for Doggerland artefacts on the Zandmotor beach in 2021, where volunteers searched the beach and recovered numerous artefacts that played a central role in the Doggerland exposition in the museum (RMO, 2024). Provinces and municipalities can also instigate citizen science projects, as can be seen in the province of Zeeland where the Beach Archaeology project works with volunteers to search for a possible Roman fort on the beaches of Walcheren through washed up Roman artefacts (RCE, 2023, pp. 2-3).

Together, these diverse projects demonstrate the possibilities of citizen science in Dutch archaeology. The role of citizens in conserving and investigating the past is becoming more important, whether through digital platforms, fieldwork, artefact analysis, or site stewardship. By making heritage more participatory, inclusive and significant for society as a whole, these initiatives not only enhance the scientific and social aspects of archaeological practice but also uphold archaeology's public importance.

3.4 European Case Studies

In addition to the Dutch examples, which are discussed in abundance in the rest of the thesis, this chapter provides insight into how citizen science in archaeology is shaped in other European countries. These international cases show which variants and approaches exist, and help to place the position and development of Dutch initiatives in a broader, comparative framework.

Citizen science in archaeology has gained momentum far beyond national borders, with many European and international projects highlighting the field's increasing appreciation for public involvement. Best practices are being developed through regional and international organisations like the European public Science Association (ECSA) and the Citizen Science Association (CSA) to guarantee that public involvement continues to be socially meaningful, scientifically rigorous, and ethically sound. From fieldwork, education, and heritage protection to digital platforms and crowdsourcing initiatives, citizen science initiatives throughout Europe and beyond show the variety of ways people can contribute to archaeological research (Bonney et al., 2014, p. 1437; Hakley, 2015, p. 33).

The importance of citizen science in recording, studying, and safeguarding archaeological heritage is demonstrated by a number of European initiatives, varying from digital data collection to participative fieldwork. For instance, the Caring for Rock Art project in the UK combines volunteer work with scientific research, education and heritage awareness by documenting and preserving vulnerable prehistoric rock art (Northumberland County Council, 2008; Scotland's Rock Art Project, 2018). The Swedish Södra Råda project shows how citizen science also promotes heritage processing and community recovery, with the aim of reconnecting people with their heritage and each other (Karlsson, 2004, p. 23). In Austria, ArchaeoPublica shows how citizens actively contribute to all aspects of field research, such as geophysics, fieldwork, finds processing and GIS training, which increases both data quality and engagement (Peter, 2019). The British TV programme Time Team made archaeology accessible to millions of viewers, illustrating how public outreach can go hand in hand with archaeology, although sometimes at the expense of scientific depth (Holtorf, 2007).

Digital platforms are also becoming more and more significant. Digital crowdsourcing makes it possible to gather and organise vast amounts of data, for instance when expanding, combining and organising Bronze Age datasets, as demonstrated by the British initiative MicroPasts (MicroPasts, 2017). A similar project is the Mediaeval Graffiti Survey, which documents mediaeval inscriptions in churches with the assistance of the public (Norfolk Medieval Graffiti Survey, 2011). These initiatives not only highlight the scientific benefits of public involvement, but they also indicate that individuals participate for reasons other than knowledge, such as pleasure, connection, and purpose, as supported by research by van Londen *et al.* (2021, p. 13) and Smith (2014, p. 754). The beforementioned Dutch PAN initiative is part of the European EPFRN network, which emerged from the British PAS programme (1997), which registered millions of finds by metal detectorists and others and promotes public-archaeologist cooperation and cultural heritage awareness, but also has risks such as loss of context and illegal excavations (PAN, 2025; The British Museum, 2019).

All these international examples demonstrate the broad scope and diverse characteristics of citizen science within archaeology. These initiatives show how public engagement enhances research and communities ties, ranging from practical preservation efforts to digital cooperation and educational outreach. They demonstrate the importance of citizen science as a way to raise awareness to heritage preservation, enhance archaeological knowledge, and increase public involvement with the past, despite all facing their unique challenges. The insights from this section provide a stepping stone to Chapter 3.5, which explores what archaeology can learn from citizen science in other scientific disciplines.

3.5 Citizen Science in other Disciplines

Finally, this chapter focuses on citizen science in other scientific disciplines, to show how participation is shaped and valued there. This broader perspective can provide valuable insights, methods and lessons that may also be applicable within archaeology.

Current applications of citizen science extend well beyond archaeology and are being used in many other fields and disciplines (Follet & Strezov, 2015, p. 10). This diversity in citizen science projects is illustrated in Figure 8 of Hecker *et al.* (2018, p. 193, Figure 13.2), which offers valuable starting points for archaeology, where there is room to learn from both the practical structures and the purposeful choices of other disciplines.

Despite being historically rooted in the natural sciences, the concept of citizen science is becoming more and more relevant and useful in the humanities, social sciences, engineering and even health sciences (Frigerio et al., 2021, p. 81). These multidisciplinary uses highlight how citizen science can be used to address all kinds of research issues. Through openness and involvement, it encourages

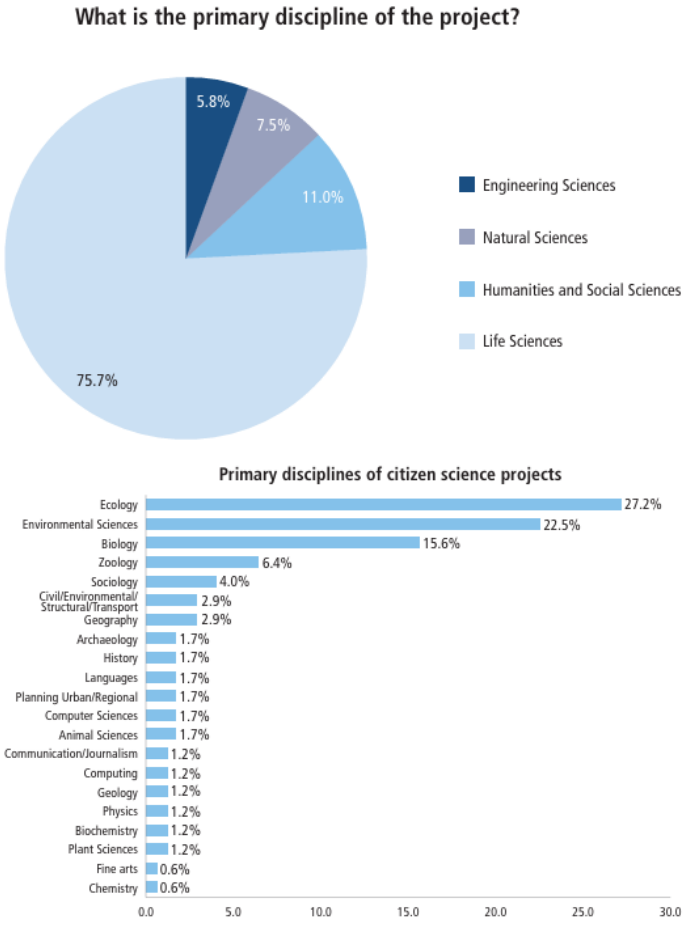

Figure 8. Primary discipline of citizen science projects. The results of an European-wide survey among citizen science projects. (Hecker et al., 2018, p. 193, Figure 13.2).

social innovation and can boost public confidence in science. A wide, encompassing definition of citizen science is therefore necessary due to the variety of research methodologies (Haklay et al., 2021, p. 22; Follet & Strezov, 2015, p. 10; Pelacho et al., 2021, p. 64).

Citizen science is quickly gaining traction in social sciences, geography and public health. Within geography through voluntarily given geographic information (VGI), and within public health residents gather data about their own living environment (Haklay, 2013, pp. 1-2). Themes like workplace learning and participatory reflection are also central to 'citizen social science' projects (Albert et al., 2021, pp. 120 & 125). The quantity of historical, linguistic, and literary initiatives in the humanities is continuously increasing and is usually connected to cultural heritage (Pratz López, 2017, p. 6).

Biology and biodiversity are important fields within the natural sciences, with the eBird project, for example, being a popular tool for bird observation. Another developing field is biomedical research, where consumers actively volunteer their health data on websites like PatientsLikeMe (Schaefer et al., 2021, p. 509). The engineering sciences also use forms of citizen science, frequently concentrating on data collecting or real-life test conditions.

Initiatives like iSPEX, De Grote Griepmeting (The Great Flu Survey), and Schone Rivieren (Clean Rivers) in the Netherlands can show how public participation can contribute to useful, large-scale, detailed data for environmental assessments, epidemiological studies, and pollution policymaking. While also raising public awareness, supporting policy formation and advancing scientific understanding (iSPEX, 2012; Universiteit Leiden, 2016; Schone Rivieren, 2017). European initiatives like Galaxy Zoo, Globe at Night and Fold.it demonstrate how extensive digital participation offers essential insights into astronomy and biology, while CyberTracker in Italy combines traditional knowledge with contemporary technologies for sustainable landscape management (Pratz López, 2017, p. 2; Silvertown, 2009, p. 467; Raddick et al., 2009, p. 8; Wiggins & Crowston, 2011, p. 4; EU citizen science, 2023; Zooniverse, 2025).

Furthermore, cultural heritage can also benefit from citizen participation. Like in the Austrian Zeit.shift and the British Transcribe Bentham. Through citizen participation in digitisation and monitoring, these initiatives provide more accessibility to heritage through a larger digital archive of sources (Frigerio et al., 2021, p. 88; EU citizen science, 2021; UCL, 2020). Through partnerships with other universities, the CitizenHeritage project promotes citizen science within the field of cultural heritage. It aims to improve information sharing between academics and society by using the digital environment and incorporating citizen science into higher education (CitizenHeritage, 2020). Even further, cutting-edge EU initiatives like CoAct for Mental Health and INCREASE emphasise inclusivity and co-creation, for instance in mental health treatment or genetic agriculture research (European Commission, 2024; The INCREASE Project, 2024; CoAct Project, 2020).

From astrophysics to the humanities, the Zooniverse platform provides a home for hundreds of citizen science initiatives, serving as a connecting thread within this entire system (Zooniverse, 2012). All of these initiatives show how citizen science is becoming a crucial component of 21st century interdisciplinary research and how it aids in data processing, teaching, awareness, and social involvement. Whether farmers are tracking biodiversity, galaxies are being categorised, or old newspapers are being recreated, these projects all advance science and foster social interaction. They demonstrate how citizen science fosters education, builds communities, and democratises science in addition to producing data.

Chapter 4. Methods

'Efforts to connect science to society require a flexible and adaptive set of methodologies and perspectives, which need to be deeper explored and constantly revisited' (Vohland et al., 2021, p. 7).

4.1 Research Design

This study examines the influence of citizen science in archaeological projects using a qualitative, comparative case study design. Through examining four different case studies, this study investigates how citizen science impacts participants and advances archaeological projects, research, and policy-making. An in-depth examination of the parallels and discrepancies across projects is made possible by the comparative approach, which also offers insights into more broad patterns and distinctive features within the field of archaeological citizen science research.

This research is framed within the wider framework of citizen science. This study aims to comprehend the systemic and individual effects of citizen science activities by putting itself at the centre of participatory science, public archaeology, and heritage studies.

The main technique used to gather data is semi-structured interviews, which allows for the recording of nuanced perspectives from a range of stakeholders, while also allowing the freedom and flexibility to look deeper into emerging themes or new issues. The qualitative design makes it ideal for investigating the intricate social dynamics and individualised experiences that are inherently present within citizen science initiatives (Collins et al., 2022, pp. 4-5; Wiggins & He, 2016, p. 1548).

4.2 Case Study Selection

New data in analysing citizen science will be obtained from four citizen science-integrated archaeological projects: Heritage Quest (Erfgoed Gezocht), Heerlen Digs (Heel Heerlen Graaft), Wyldemerck, and Waterloo Uncovered (Recovery on the Battlefield). These initiatives were chosen because they varied in terms of their scale (local vs national), geographic location (urban vs rural), and methods for involving participants. Every project provides a different perspective on how citizen science can be structured into a project, and how citizen science functions within different settings.

- Heritage Quest: this initiative uses field surveys and LiDAR data to help citizens locate prehistoric burial mounds and Celtic fields. It is a great example of fusing new technology with community involvement, since it blends digital tools with active, hands-on participation. Heritage Quest also demonstrated how citizen science can be done on a large, nation-wide scale. Over 6500 participants

worked together to scour over 2350 km² of LiDAR maps, and found almost a thousand new burial mounds across the Veluwe- and Utrechtse Heuvelrug National Parks. The focus of this project was on large-scale data collection and broad public involvement (Bourgeois et al., 2023, pp. 1-3; Bourgeois et al., 2024, pp. 2-5; Lambers et al., 2019, p. 11-15; Universiteit Leiden, 2020; van Westerveld, 2023, pp. 14-17).

- Heerlen Digs: this project, focussed on urban archaeology, allowed locals to excavate the possible Roman remains within the town of Heerlen. Its focus on community involvement and local history demonstrates how archaeology can play an integral part in shaping cultural identity. The project was personal and local, not only concentrating on archaeological results, but also on building community, creating interest and understanding for archaeology and allowing people to be involved in their heritage (Constructing the Limes, 2023; NWO, 2023).
- Wyldemerck: this local initiative is fully organised by the Moluccan community in Friesland, who set out into excavate part of their collective past. This initiative came from the intrinsic motivation of the previous residents of the village 'Wyldemerck' to find out more about their past, their site and their people. Being fully co-created with archaeologists, this project is not only an ideal case study on citizen science, but also on placemaking, involving diverse communities, and as an exemplary Faro project (Samenwerkingsverband Moluks Erfgoed, 2023, pp. 5-11; Moluks Erfgoed, 2022; RCE, 2023a; Wijnen, 2022).
- Waterloo Uncovered: this project focuses on the wellbeing of veterans and how archaeology can help in their rehabilitation, building of social contacts, connection to the site and its history, their sense of belonging, community and purpose, and overall happiness. As part of the Recovery on the Battlefield (ROTB) initiative, this excavation takes place on the Waterloo battlefield and feeds of the battlefield experiences of the volunteering veterans to better understand the site and its significance (RCE 2023b; Nederlands Veteranen Instituut, 2024; Recovery on the Battlefield, 2021).

4.3 Interview Data Collection

Semi-structured interviews will form the basis for gaining insight into the perspectives of these main stakeholder groups: citizen participants, archaeologists, project coordinators and policy advisors. This approach makes it possible to examine opinions about the influence of citizen science from different angles (Collins et al., 2022, pp. 4-5; Prats López, 2017, p. 8).

Each individual interview will be recorded, transcribed and coded, all can be requested through the author.

The objective is to understand the ways in which involvement impacts people, for example emotional engagement, skill development, advances in archaeological research, data quality, and policy influence.

4.3.1. Stakeholder Selection

The stakeholders that will be interviewed include:

- Participants: their experiences emphasise individual and community effects from projects.
- Project coordinators: they are in charge of organising, managing and supervising the project. Their observations can give insight into the organisational side of projects, and what the successes and difficulties are in that aspect.
- Archaeologists and archaeological researchers: they monitor the scientific integrity of projects. Their perspectives can tell us about the added value of citizen scientists for the research results and -quality, while offering insights from inside the field of archaeology.
- Archaeological/heritage advisors: this includes people from a number of overarching institutions, that range from policy advisors to heritage managers to leaders of volunteer groups. Their insights can help us to zoom out, to understand citizen science on a larger scale and to look at the societal elements of citizen science. Their input is of crucial importance because they play a decisive role in shaping policy, financing and framework conditions that directly influence the design, implementation and sustainability of citizen science projects in archaeology.

In order to provide equal representation, at least two interviewees from each of the four projects will be selected, totalling 18 interviewees consisting of 6 citizen scientists, 9 project coordinators and archaeologists and 3 policy advisors. All interviewees can be found in Table 1.

Interviewee	Initials	Gender	Relevant occupation	Organisation	Role	Project	Number of interviews	Interview duration
1	A. L.	Female	Archaeological policy advisor	RCE	Policy advisor		1	23 min
2	J. D.	Male	Archaeological policy advisor	RCE	Policy advisor		1	42 min
3	M. K.	Female	Archaeological policy advisor	OCW	Policy advisor		1	48 min
4	T. M.	Male	Projectcoordinator	AWN	Projectcoordinator		1	44 min
5	L. A.	Male	Professor Public Archaeology & Curator at the National Museum of Antiquities.	RMO & Leiden University	Archaeological, heritage and public advisor		1	29 min
6	E. K.	Female	Regional archaeologist	Het Oversticht	Projectleader & point of contact	Heritage Quest	1	39 min
7	A. C.	Male	Heritage manager	Landschap Erfgoed Utrecht	Project informant	Heritage Quest	1	31 min
8	W. K.	Male		AWN	Participant	Heritage Quest	1	36 min
9	G. H.	Male		AWN	Participant	Heritage Quest	1	12 min
10	S. S.	Female	Associate professor in Ancient History and Classical Civilisation	Utrecht University	Projectleader	Constructing the Limes & Heel Heerlen Graaft	1	37 min
11	H. V.	Female	Regional archaeologist	Municipality of Heerlen	Project archaeologist	Heel Heerlen Graaft	1	37 min
12	A. N.	Female	Projectleader Heerlen	Municipality of Heerlen	Projectleader	Heel Heerlen Graaft	1	27 min
13	P. S.	Male			Participant	Heel Heerlen Graaft	1	51 min
14	M. P.	Female			Participant	Heel Heerlen Graaft	1	16 min
15	J. W.	Male	Public archaeologist		Projectcoordinator	Wyldemerck	1	38 min
16	D. O.	Female			Participant	Wyldemerck	1	23 min
17	G. L.	Male	Former veteran	ROTB	Care and Intake Working Group	Waterloo Uncovered	1	21 min
18	W. D.	Male	Former veteran	ROTB	Participant	Waterloo Uncovered	1	24 min

Table 1. All interviewees interviewed for this thesis. Table made by author.

4.3.2. Interview Questions

The interview questions are formulated in three different sets, tailored to the role of the interviewees: project leaders (often with an archaeological background), project participants and representatives of facilitating or advisory institutions. This division takes into account the different motivations, perspectives and approaches to citizen science per target group, and prevents overly general answers by allowing room for nuance. Each set of questions follows a similar structure: the initial questions focus on the background and involvement of the interviewee, then the focus is on the experienced impact of the project, both personally (for participants) and professionally (for researchers and institutions), and on the contribution to archaeological research. Additionally, themes such as perceived benefits,

challenges and recommendations for improving future citizen science practices are questioned in the middle of the interviews. Finally, questions are asked about wishes, ideas and suggestions for future developments. The questions tie in with the sub-questions of this research, but also leave room for unexpected insights. The full sets of interview questions are included in Appendix A.

4.4 Analysis Framework

Thematic content analysis was used to analyse the interview data. This is a commonly used method in qualitative research to systematically identify, organise and interpret patterns (themes) in textual data. This approach is suitable for exploring complex, experience-based issues such as the impact and functioning of citizen science in archaeology (Riesch & Potter, 2014, pp. 3-4; Collins et al., 2022, pp. 4-5; Prats López, 2017, p. 8).

The analysis combined both deductive and inductive elements. Initially, a deductive approach was used with a codebook based on the three main themes of the research questions: (1) impact on participants, (2) contribution to archaeological research, and (3) success factors and points for improvement. Within these main themes, subcodes were developed inductively in the analysis based on recurring motives and statements from respondents, which created space for new insights (Collins et al., 2022, pp. 4-5).

The interviews were fully transcribed and manually coded. Initially, open codes were assigned, after which these were combined into overarching themes in consultation and based on recurring patterns. The final analysis was organised in a structure of main themes with underlying sub-themes. This structure can be seen in Chapters 5 and 6.

Table 2. shows an exemplary overview of some of the main themes, sub-codes and example quotes used (quotes are translated from Dutch to English):

Main Theme	Subcode	Example Quote
Participant Impact	Social connectedness	'This project has really brought us closer together again. We have seen each other much more often and shared many more things with each other' (Interviewee 16).
	Maintaining engagement	'That day was not about the results, but about our involvement. That was a huge show of appreciation for the volunteers.

		That was really appreciated' (Interviewee 8).
Contribution to Archaeological Research	Local knowledge	'But local, historical associations, groups, people with knowledge and skills, they can of course play a very important role in this, because they know where something might be or whether they have found something, so it is very important that they think along with those expectation maps' (Interviewee 1).
	Increasing research volume	'We have shown that with the help of citizen science we have been able to map an astonishing amount of archaeological data' (Interviewee 7).
Succesfactors and Pitfalls	Accessibility and communication	'So you have to anticipate that you will also bind a group of people to you who need that interaction. And that is a kind of investment that you have to make, otherwise you will lose them very quickly and there may even be negative press' (Interviewee 5).
	Anchoring in policy	'Well, one of the things is less bureaucracy. And clear rules. Yes, the Heritage Act is not set up for citizen science. So that is also very unclear and open to multiple interpretations, so that should actually be different' (Interviewee 2).

Table 2. Example of coding analysis used in this thesis, including the main themes, subcodes and quotes. Table made by author.

The analysis not only answered the predefined sub-questions, but also provided insight into where frictions, opportunities and blind spots lie within archaeological citizen science projects. These findings are presented per case in Chapter 5, and discussed thematically in Chapter 6.

4.5 Ethical Considerations

Ethical considerations are crucial to safeguard the rights and well-being of participants and to maintain the integrity of the research.

One of the core ethical considerations is informed consent. Interviewees have voluntarily consented to participate after being given clear and understandable information about the study's objectives, the interview process (including recording), the anticipated length of the interview, and the intended use, analysis, and potential publication of the data gathered. This is all compiled into a consent form (see Appendix B.), which is signed by all participants. There was also transparency on the goal and methods of this study, including how results will be used, and a guarantee that all interviewee's will receive the finished study.

It is crucial to stress that involvement is entirely voluntary and that individuals are free to withdraw their participation at any moment. Each interview is aimed to be a respectful and equal interaction. All participants were treated equally, with kind conversations that allowed space for the interviewee to communicate their wishes and boundaries (if necessary).

Participants' confidentiality and anonymity has been preserved in this research. This implies that interviewees' identities will not be directly connected to their responses in this thesis. Instead they will be numbered and be revered to as 'interviewee 1', 'interviewee 2' etc. In the previous table in the stakeholder section each numbered participant only has relevant information linked to them, such as which project they are a part of and their role in said project. The participants have agreed to this de-identification of data in the consent form. Transcribed interviews, the consent forms and the codebook with direct quotations are therefore not added in the appendix of this thesis, as some interviewees indicated that their direct quotations and full names should not be shared. This data can be requested through the author, who will ask permission to those interviewees in question (Tauginienė et al., 2021, pp. 398-399; Pratz López, 2017, p. 111).

Chapter 5. Results

5.1 Interview Results

The results of all 18 interviews will be presented and analysed in this chapter. It will focus on showing the experiences, motivations, and broader perspectives of policy and knowledge institutions and the participants and organisers in the citizen science initiatives. Using thematic analysis, the most significant recurring themes and trends have been identified and structured accordingly (van Londen et al., 2021, pp. 23, 26-27). This section provides an overview of the findings and thus forms the core of the empirical research.

5.1.1 Project 1: Heritage Quest (Erfgoed Gezocht)

A major citizen science initiative in Dutch archaeology was the Heritage Quest (Erfgoed Gezocht) project. Leiden University, local parties (landowners, municipalities, provinces, heritage organisations etc.) and interested citizens worked together on the large, nationwide project. The goal of Heritage Quest was to actively engage the public in heritage research (Bourgeois et al., 2024, pp. 2-5; Lambers et al., 2019, p. 11-15; Universiteit Leiden, 2020; van Westerveld, 2023, pp. 8 & 14-17; van Londen et al., 2021, p. 55).

Participating in the project were 6500 volunteers, a diverse group that included people from different regions, countries, ages, genders, interests, backgrounds etc. To find potential archaeological monuments, they used the Zooniverse platform to analyse LiDAR imaginary. Additionally, volunteers participated in validating fieldwork, assisting in corings, surveys and field observations. Clear procedures for data collection and validation were in place, and participants were made aware of the objectives, parameters and results of the research. As a result of Heritage Quest, tens of hectares of Celtic fields and hundreds of new burial mounds were found. (Bourgeois et al., 2024, pp. 2-5; Lambers et al., 2019, pp. 11-15; Universiteit Leiden, 2020; van Westerveld, 2023, pp. 8, 14-17 & 54-56).

Next to a specific focus on the Heritage Quest project, the interviews include a range of viewpoints on archaeological citizen science initiatives, with broader insights from general participation experiences and policy frameworks. While interviewee 8 and 9 participated in the project as citizen scientists, interviewee 7 and 6 were directly involved in the Heritage Quest organisation. Additionally, interviewee 3 provides a policy viewpoint on funding and engagement in citizen science.

Motivation

From the organisation's point of view, the primary motivation to organise Heritage Quest was digitally involving people in an accessible way to generate more archaeological data and improve our common understanding of the Dutch prehistoric landscape. Accompanying this was a second motivation to use existing historical knowledge to help people experience a sense of belonging and connection to their community and surroundings. Additionally, according to the organisers, participants gain knowledge and curiosity about their surroundings in a different way by actively participating in research. Another motivation was the involvement of people on a larger scale, going beyond local participation and employing the media to reach more diverse (demographically and geographically) audiences. There were also practical motivations regarding the archaeological workload, archaeologists cannot handle the volume of AHN (Actueel Hoogtebestand Nederland) data on their own, according to interviewee 6. Because professional archaeologists lack the necessary manpower, citizen science provides a means of producing and analysing large amounts of data. Allowing individuals to participate in a relatively easy way, as was the setup of Heritage Quest, can also help in making archaeology more accessible and can help to foster support for archaeology (Interviewee 3, personal communication, February 17, 2025; Interviewee 6, personal communication, February 24, 2025; Interviewee 7, personal communication, March 11, 2025).

Participant interviewee 9 was motivated to participate by curiosity and a love of exploring and working together with academic research. They thought it was fascinating to observe how various skills and knowledge, such as those of an archaeologist, a researcher with drilling experience, and a landscape expert, came together. Motivating factors for participant interviewee 8 included their passion for landscapes and wildlife as well as the initial favourable responses from organisers to their earlier work. Over time, they developed a deep connection with the area and its past (Interviewee 8, personal communication, February 24, 2025; Interviewee 9, personal communication, February 13, 2025).

Contributions and the role of citizen scientists

engagement of the participants shaped the projects course and its outcomes. Participants and the organisation collaborated to shape the research's direction, rather than merely taking part in a predetermined plan. On the Zooniverse platform, users could directly discuss and engage with each other via the forum. When the number of questions became too large for the organisation, so-called superusers were instructed to help with the management. This created a lively online community in which participants supported each other and exchanged information. Participants also influenced the content: after the initial research on the Veluwe, the project's focus was partially redirected to detecting

cart tracks after it was determined that looking for charcoal kilns was too challenging. Volunteers also requested further background knowledge, which resulted in well-attended lectures, webinars, drilling courses, and soil profile explanations. These modifications made in response to participant requests demonstrate that the project was not executed top-down but rather developed as a result of professional and citizen engagement (Interviewee 6; 7).

According to participant interviewee 9, everyone who takes part in Heritage Quest contributed something, as all the reports together paint a larger picture of what happened in the Veluwe and Utrecht Ridge decades ago. The reliability of the study increases when multiple people locate a monument on the map, adding value to the study with each individual click. They felt that, together with all participants, they helped in rewriting a piece of our common history (Interviewee 9).

Recruitment and training

Training was conducted using the Zooniverse platform, which provided online guidance on object recognition and marking. Lectures and webinars primarily aimed to pique participants' interest and deepen it. Numerous platforms were used for recruitment, including local newspapers, newsletters, social media, and pre-existing networks. Ten to twenty volunteers, ranging from AWN members to family members who had no prior knowledge, were chosen for the initial test phase. Although significant adjustments were not required, the manual was modified in response to their input (Interviewee 6; 7).

Maintaining engagement

The organisers understood that a multi-month project requires constant attention and communication. This included hosting webinars, publishing preliminary findings (which attracted interest and media coverage), and, above all, being actively available to respond to questions from volunteers. Responding to the discussion forum as soon as possible, ideally within 24 hours, is crucial, according to interviewee 6. It's also crucial to continuously express gratitude for volunteers' time and effort. Increasing support and more personal relationships with participants was also aided by using webinars and fieldwork to show the faces behind this project (Interviewee 6; 7).

Personal impact and social aspects

For many, participation had a significant personal impact. The interaction with people, the collaborative research, and the opportunity to learn from experts, particularly during the coring in fieldwork, were

mentioned by interviewee 9 as very personally impactful. According to interviewee 8, their perception of archaeology has changed significantly, evolving from boring and dusty to a broad, technological, and scientific field. For them, gaining knowledge is now also an experience. They learned to read the landscape differently and recognises archaeology in our landscape, for example the charcoal remains and pottery fragments. They feel more a part of the cultural and historical background of their environment as a result of this project. Additionally, they believe that citizen science has wider social benefits, such as motivating young people and integrating this new information into school curricula (Interviewee 8; 9).

Particularly in meetings and fieldwork, the project's social components were crucial. Participants valued getting to know people from other places and backgrounds, which resulted in new relationships and even agreements outside of the project. Additionally, a close-knit community developed online through the forum, which was then reinforced by in-person gatherings. It was felt that the project leaders were highly approachable and had good social skills; they could relate to the volunteers and share their expertise in an enthusiastic and understandable way. Involving participants in award ceremonies or media appearances was interpreted as by volunteers as a sign of recognition and trust (Interviewee 6; 7; 8; 9).

Agreements and differences

The interviews show that organisers and participants generally agree that Heritage Quest was a success. Both the scientific output and the social engagement are seen as very valuable. Everyone agrees that public participation in archaeology is important, but different people emphasise different things. For example, some emphasise the importance of large data collection, while others emphasise support, personal development, or added social value as being more important. Finding structural funding for follow-up research, sustaining involvement within established communities, and preserving outcomes in policy and management are just a few of the long-term issues that all parties signal as take-aways for future projects. Lastly, everyone stresses that effective communication and showing gratitude to volunteers are essential components of a successful citizen scientific initiative (Interviewee 6; 7; 8; 9).

Differences in viewpoints mainly lie in the perspectives on the obstacles within the project. Organisers highlight the difficulty in financing citizen science, and the absence of a policy framework. Participants, on the other hand, rarely saw challenges and mainly focused on their personal impact, like enjoying fieldwork and highlighting their feeling of belonging and purpose (Interviewee 7; 8; 9).

Lessons learned and improvements for the future

A key takeaway from Heritage Quest is that organisers must prioritise people over research goals. Carefully considering the needs of participants, how they remain engaged and appreciated, and what drives them, influences the way research is formulated, how it is communicated, and how feedback is incorporated. Ultimately, this makes projects more impactful for participants and research. Interviewee 6 underlined the significance of quick responses and engaging people in various ways (Interviewee 6; 7).

The organisers believe there is room for improvement in a number of areas, based on their experiences. Financially, there is a desire for a single party to make a sizable contribution rather than several smaller ones. While it may not always be possible, this would result in more effective budgeting that allows for start-up, guidance, and possible expansion. Additionally, it's important to already consider the follow-up of a project at the beginning: who handles what data, how are the wishes of all parties involved taken into consideration, and what happens to the results? It's frequently unclear how local governments, for instance, use and follow up on data (Interviewee 6; 7).

The absence of structural funding and policy for long-term involvement and follow-up is another area of improvement. The ministry provides tools and guidelines, but it is powerless to compel participation. A possible solution would be to make the consideration of participation obligatory in commercial requirement programs. This way, (commercial) archaeological research would always have to consider participation to be apart of their research. Not every project is suitable for participation, but making it mandatory to consider it might encourage more projects to start engaging volunteers. Additionally, interviewee 3 calls for more clarity in regulations and suggests that initiators or disruptors may bear some of the financial obligation, for instance through public-private partnerships (Interviewee 3; 7).

The significance of having clear agreements beforehand regarding the nature of the project, the expectations, and the extent of non-bindingness was also underlined by interviewee 3. Feeling as though they are truly making a difference is crucial for participants. However, it is important to acknowledge that some people participate only for social reasons and require a non-binding relationship, which can be challenging to balance with professional demands and work oriented towards production and results (Interviewee 3).

5.1.2. Project 2: Heel Heerlen Graaft

In the town of Heerlen in the province of Limburg, the citizen science project of Heel Heerlen Graaft (Heerlen Digs) was conducted. It was an initiative of the municipality of Heerlen and Utrecht University, from the overarching Constructing de Limes project of the National Science Agenda (NWO).

Digging 25 test pits in their backyards, Heerlen residents actively participated in researching the Roman past of Heerlen. The aim was to learn more about the Roman settlement Coriovallum, the predecessor of Heerlen, and to learn more about Roman border areas within the broader Constructing de Limes project. Heel Heerlen Graaft placed a strong emphasis on educating locals about their city's history and advancing scientific studies with the public. Citizen science was utilised to gather information and directly include the local population in the archaeological investigation. The project aimed to make history more than 'something out of dusty rooms', and into a story that is told together (Constructing the Limes, 2023; NWO, 2023; Banach, 2023; Arbouw, 2023; van der Steen, 2023).

Although the focus is on the Heel Heerlen Graaft project, the interviews also offer a broad range of perspectives on archaeological citizen science, supplemented with general experiences around participation. Interviewee 13 and 14 actively participated in the project as citizen scientists, while interviewee 10, 11 and 12 were closely involved in the organisation and implementation of Heel Heerlen Graaft.

Role of citizen scientists

One of the main aims of Heel Heerlen Graaft was that participants would play an active and multifaceted role in discovering more about their own past, both physically and figuratively. During planning, participants already had a say in where excavations would take place within the study region, volunteering their gardens as dig sites. During excavations, archaeologists supervised, guided and informed participants. Participants also undertook independent responsibilities, like cleaning and sorting the finds and documenting through photos and drawings. Outside of fieldwork, participants also took on additional roles. For example, a smaller group created an museum exhibition in Heerlen on their own finds, and another group helped create a book about the project. Interviewee 13, a graphic designer in their daily life, played a significant role in the creation of this book, specifically created as a memento for all participants. At times, the volunteers were even more precise and accurate than 'professional' archaeologists, according to interviewee 11. Interviewee 13 agreed with this, and also mentioned that volunteers were even enthusiastically preserving more modern and recent finds, being

careful not to lose anything (Interviewee 10, personal communication, February 18, 2025; Interviewee 11, personal communication, February 28, 2025; Interviewee 12, personal communication, February 28, 2025; Interviewee 13, personal communication, February 13, 2025).

Recruitment and training

Recruiting participants was a gradual process that took a lot of work. Flyering, being visible on the street during excavations or corings (recognisable by special vests), presenting at neighbourhood gatherings, and involving well-known locals for door-to-door outreach were some of the tactics used. Public 'dig days' were successful in raising awareness and encouraging registrations. Additionally, the municipality's and NWO's larger communication channels were used, as well as through on-going projects like Constructing the Limes. The national media coverage raised awareness and helped recruit for subsequent projects, such as Rimburg Graaft. The project began with a public event during the National Archaeology Days, and schoolchildren were also actively involved (Interviewee 11; 12).

Volunteers were trained using a combination of different techniques. A mandatory information day, workshops, and lectures were held prior to starting the fieldwork, used to prepare and inform the volunteers. During the actual digging days, archaeologists gave on-site guidance for the fieldwork, documentation, identification of soil layers and finds and how to effectively distribute tasks. Additionally there was a carefully considered preparatory program, which included frequent meeting between organisers and participants and in-depth lectures. This approach aimed to made volunteers well-informed and created a solid foundation for careful and, above all, active engagement (Interviewee 10; 11; 12).

Maintaining engagement

To keep participants engaged throughout the project, a number of tactics were used. For instance, participants were contacted directly by phone and email, ensuring a direct and lasting relationship. With activities ranging from very accessible, low-threshold to more in-depth and active, this diverse program gave participants the chance to continue participating in their own way. In order to increase their sense of ownership, volunteers actively participated in organising the exhibition and creating a book. A follow-up day was also planned following a couple of months after the fieldwork, which helped to keep the contact and interest alive while also creating a perfect moment to share the results with the participants. Crucial in maintaining this engagement is a central point of contact, in this project interviewee 12 held that role, sending out newsletters on new initiatives, organising lectures on a

regular basis, maintaining a list of active participants and overall being a central point for questions, suggestions and feedback (Interviewee 10; 11; 12).

Participation impact

On several levels, citizen participation had a big impact on all those involved in Heel Heerlen Graaft. From a scientific standpoint, working with volunteers allowed for archaeological research in short time, in a large area: test pits were spread out all across Heerlen, creating a thorough picture of the subsurface in only two days. In just 25 m², the excavations produced almost 8,000 items, including a Roman mortar floor, a walking level with roof tiles and ceramics, and information about the Roman hinterland. Even locations with little to no finds held valuable information about topped-off soil layers (Interviewee 10; 11; 13; Interviewee 14, personal communication, February 21, 2025).

Socially, the project helped in strengthening the sense of community within Heerlen. Citizens opened their gardens to one another, got to know each other, and felt proud of their shared past. New friendships were formed in the process, and some participants even joined new archaeological projects. The project also held great personal impact for participant interviewees 13 and 14, they said Heel Heerlen Graaft enhanced their understanding of archaeology, created social relations, and made them feel like they were a part of something greater. For interviewee 13, the project became a source of optimism as he saw the enthusiasm of children and their newfound desires to become archaeologists themselves. The organisers were personally impacted by the project as well. Interviewee 12 saw how volunteers grew in self-confidence, especially in the development of the museum exhibition, and how she personally felt so appreciated by the participants. Reaching so many people inspired interviewee 11, and interviewee 10 highlighted how the excitement around the project helped in building local relations, even resulting in international follow-up projects. Additionally, interviewee 10 stated that Heel Heerlen Graaft served as a solid foundation for making citizen science more visible.

Agreements and differences

With a focus on the social impact and interconnection, the initiative is seen as a huge success by both organisers and participants. Archaeology is viewed by both groups as an approachable and interesting topic that naturally brings people together. The significance and necessity of follow-up immediately after fieldwork are widely acknowledged by all interviewees. Participants express their appreciation for the organising and preparation, while organisers are aware of the time and work this needs (Interviewee 11; 12; 14).

However, there are also clear differences in perspectives and experiences. During the project, participant interviewees 13 and 14 barely encountered any difficulties, but organisers found the intensive recruitment and organisation to be difficult. Although the low lecture attendance was criticised by the organisers, participant interviewee 14 valued the opportunity to participate in deepening sessions, even though they were unable to do so every time. While interviewee 14 viewed the large scale of the project as a strengthening factor for the impact, organisers interviewee 10 and 11 are thinking about taking on future projects on a smaller scale. Participants also indicated that they would like to have a greater say in the scientific analysis and findings in the future. Even though the organisers acknowledge the significance of this, the input still seems to need improvement in practice, as evidenced by the scientific reporting (Interviewee 10; 11; 12; 13; 14).

Lessons learned and improvements for the future

Without sufficient funding, a project remains confined and does not meet expectations. Project managers stress that their work is demanding and that they need a committed team, ideally one that includes an external archaeologist and a project manager with a full-time commitment to the project. In particular, when it comes to the possibility that nothing may be discovered, which is also scientifically valuable, clear communication and reasonable expectation management towards participants are essential. Invest in lasting engagement, that can take shape in many different forms (mementos, follow-ups, digital updates etc.) but always comes down to continuously, long-term reaching out to volunteers. It's crucial to pick a research subject and area carefully; it should be both scientifically fascinating and provide participants with the chance to learn new things. Utilising the abilities and expertise of locals and working from the bottom up is beneficial for everyone involved. To make citizen science more widespread and accessible, pioneering projects like Heel Heerlen Graaft should focus more on impact measurement, possibly done by students, so that future projects can learn from their data (Interviewee 10; 11; 12; 13; 14).

5.1.3. Project 4: Wyldemerck

The Wyldemerck project is a unique archaeological project where former Moluccan residents conducted research themselves into their former camp in Harisch, province Friesland, together with Staatsbosbeheer (State forestry department). The project profiles itself as ‘archaeological collaboration’, rather than participatory archaeology. The aim was to strengthen the heritage of Camp Wyldemerck by conducting joint archaeological research and strengthening the community that keeps the story alive. Along with locals and members of the Histoarysk Wurkferbân Gaasterlân, the participants were primarily former Moluccan residents and their descendants. The Moluccan heritage community played a central role in advising, recording stories and organising meetings (Samenwerkingsverband Moluks Erfgoed, 2023, pp. 5-11).

Test trenches were excavated during fieldwork in September of 2022, in which foundations of a possible mosque and the barracks were searched for. Bricks, pieces of sewer lines, and a coffee maker were among the other items discovered. Additionally, desk research was conducted, and the microrelief of the previous camp was identified using height maps (AHN). 'Favourite Places' was one of the working approaches used to gather the stories and memories of former residents. One significant outcome is a set of recommendations for enhancing Wyldemerck's Moluccan legacy, which were primarily authored by the Moluccan participants themselves (Samenwerkingsverband Moluks Erfgoed, 2023, pp. 5-11, 32, 63, 73-77).

The Moluccan population actively participated in every stage of the archaeological investigation, thereby implementing citizen science. They participated in the fieldwork (including excavation and documentation), contributed their knowledge and memories, helped establish the research goals, and developed their own recommendations for the area's future. To encourage involvement, the project coordinators served as ‘facilitators’ and ‘information sharers’. This project is regarded as an illustration of how archaeology may facilitate dialogue and improve the relationship between site management and the community (Samenwerkingsverband Moluks Erfgoed, 2023, pp. 5-11, 29, 93-99).

Although the Wyldemerck project is the focus of both interviews, the interviews also shed light on different views on archaeological citizen science, enriched with broader participation experiences and policy perspectives. Interviewee 16 was actively involved in the project as a citizen scientist, while interviewee 15 fulfilled a coordinating and advising role within the project of Wyldemerck.

Motivation

The archaeological project of Wyldemerck developed naturally out of the inspiration of archaeological project coordinator interviewee 15, who was fascinated by modern archaeology and the remains of Moluccan history. The chance to take part in a project on interviewee 16's home ground, preexisting relationship with the Moluccan community and the opportunity to connect more with them, and the interviewees overall curiosity about archaeology and the site drove them to participate (Interviewee 15, personal communication, March 6, 2025; Interviewee 16, personal communication, April 14, 2025).

Contributions and the role of citizen scientists

As citizen scientists, the Moluccans who had previously lived in the camp were essential to the Wyldemerck study. One participant, interviewee 16, even said that this was the most significant element of the project as a whole. They are co-owners of the project, thus their involvement is more than just participation. The Moluccan group played a key role in the decision-making process, despite the fact that complete equality proved challenging because of different backgrounds and levels of knowledge. They participated in establishing the goals of the study and made the deliberate decision to only excavate communal areas like the canteen, the lavatory, and most importantly, the mosque, which is a significant representation of their religious identity. An important component of the intangible heritage of the site was the local knowledge and stories of het former residents; they were familiar with the camp from personal experience and were able to interpret field finds right away. For example, they recognised a seemingly unimportant piece of tile from the mosque as being a significant piece of their material identity (Interviewee 15; 16).

Engagement

The Wyldemerck project was able to 'live' within the community because of the participants' strong personal connection to the site, which stemmed from their childhood living there. The project managers deliberately chose to work together on an equal basis, ensuring community approval and discussion at every step. Interviewee 16 mentioned that a sense of community and unity was created as a result of the in-depth discussion of what Wyldemerck meant to them. The threshold for participation was maintained low by using a broad definition of 'participant' (Interviewee 15; 16).

Participation impact

As citizen scientists, the Moluccan former residents' participation in the Wyldemerck project had a significant impact on nearly every facet of the project, the participants, and society and science at large. The project helped the participants feel more connected to their shared history and community. They developed a sense of community, became more conscious of their ancestry, and gained a deeper understanding of the archaeological process by actually excavating their own past. On a personal level, the project also had a significant impact on the participants, who learnt new skills on excavating, interacting with formal institutions and how to handle competing memories. Many people's perceptions about archaeology were also altered by the project. Although some initially had a romantic or shallow perception of archaeology, knowledge of the larger framework of regulations, objectives, and scientific methods increased. The participants explored their own background and history and found new significance in their previous living space. In this sense, the project not only advanced scientific understanding but also raised community awareness and identity. Their relationship with organisations like Staatsbosbeheer improved as a result of their sense of recognition and participation in the process (Interviewee 15; 16).

Wyldemerck had a significant impact on a larger scale as well. In the Netherlands, it was the first citizen science project where a community of former migrants actively engaged in archaeological research, including excavations. The project received national attention, was included in a letter from the State Secretary to Parliament, was mentioned in the House of Representatives, and was awarded a prize. The communication, which included a project video, helped other Moluccan villages get inspired to launch similar projects by making the impact tangible and apparent. The ongoing participation of an active core group even resulted in the creation of a foundation of its own, demonstrating the project's long-term value (Interviewee 15; 16).

Agreements and differences

Both interviewee 15 and 16 highlight how important Moluccan former residents were to the project, it would not have been possible without their passions and active participation. According to both, the project is a huge success, as evidenced by the national attention and award it received. Both demonstrate how their perspectives on archaeology have evolved: interviewee 15 stresses the significance of the meaning behind finds over purely focussing on scientific data, while interviewee 16 discovered that archaeology is more than mere dirt shovelling. Involving younger generations, dealing with personal history, and putting up with contradicting memories are all mentioned as significant challenges for the future. Both also recognise that the value of archaeology and heritage will always be

subjective and highly dependent on the perspective of the person involved. They also emphasise how crucial it is for the project's success that the community, archaeologists, and other relevant organisations like Staatsbosbeheer work together (Interviewee 15; 16).

Yet their perspectives also differ on a number of aspects. While interviewee 16 focusses primarily on the participants' enthusiastic dedication and the resulting social cohesion, interviewee 15 frames the participants' involvement from a larger philosophy of equality and community leadership. Additionally, their perspectives of the main struggles within the project go different ways. Interviewee 16 concentrates on future practical issues like financial sustainability and foundation establishment, whereas interviewee 15 concentrates on policy barriers in archaeology, such as the Heritage Act excavation restriction. The project was a unique experience for interviewee 15, but it was also emotionally and physically taxing, now needing some distance from the whole initiative. On the other hand, interviewee 16 explains how they felt appreciated and involved, and want to stay connected to the project, make it sustainable for the future and keep their heritage alive. Their motivations for taking part were also different, interviewee 16 wanted to be involved in something so deeply related to their heritage, while interviewee 15 was motivated by an intellectual interest in modern archaeology. Last but not least, interviewee 16 primarily expects that the project will encourage other Moluccan communities to take up similar efforts, whereas interviewee 15 is more sceptical and has a revolutionist view of the future for citizen science, advocating for fundamental changes in the archaeological field before a similar project can be successful.

Lessons learned and improvements for the future

Numerous improvements and challenges, both politically and archaeologically, as well as socially and psychologically, have been made clear by the Wyldemerck project. It became evident from an archaeological and policy standpoint that existing laws and regulations present systemic barriers to public involvement. An official permit, for instance, would have made the process slow and unaffordable. So the project had to come up with innovative ways to go around this, like informally involving professional archaeologists. Project coordinator interviewee 15 concluded that, ironically, once a site is marked as cultural heritage, excavation is prohibited. This causes communities to lose access to their own heritage, in turn going directly against the goal of new heritage policies like the Faro Convention. According to interviewee 15, this experience emphasises the necessity of systemic change in the archaeological field, where archaeologists should make room for a variety of bottom-up initiatives and should eventually become redundant in citizen projects. Archaeologists should start encouraging more diverse and publicly-organised archaeological initiatives and associations.

Interviewee 15 also observed that participants gained knowledge just by being in the field. They value this type of physical learning as just as valuable as strictly scientific data.

At the same time, challenges for the future and areas for improvement became clear. The continuation of community involvement is thought to depend on involving younger generations, interviewee 16 supports a more proactive and early approach to involving young people. Furthermore, the establishment of a foundation is required because financial sustainability is a bottleneck that makes it impossible to plan follow-up operations. There is certainly room to improve the project approach itself. Interviewee 15 urges additional in-depth workshops on topics like historical research and hopes to further guide participants in understanding different values and stories in the future.

5.1.4 Project 5: Waterloo Uncovered

The Belgian battlefield of Waterloo served as the inspiration for the conflict archaeology project Waterloo Uncovered. It was founded in 2015 to raise awareness of the conflict and to support the recovery and transition to civilian life of active military members and war veterans. Waterloo Uncovered is a UK charity, working together with Utrecht University and the Dutch branch 'Recovery on the Battlefield' (ROTB). About 25% to 33% of the team is composed of SPV (serving military personnel), alongside archaeologists, students, volunteers, research directors and welfare officers (Evans et al., 2019, pp. 253-256; van Londen et al., 2021, p. 69).

The spirit of international collaboration that was present in the actual battle of Waterloo in 1815 is reflected in the excavation at the site, where veterans from allied countries, including the Netherlands, Belgium, Germany, Denmark and the US, cooperate, bound together by a shared military bond that transcends linguistic and national boundaries (Foinette, 2022, p. 109).

The project's goal is to educate the public about the discoveries that alter could our perception of the Battle of Waterloo. Active public participation in archaeological research is demonstrated by the participation of veterans and other volunteers in excavations and the interpretation of the findings. The project uses the unique experiences and skills of the veterans to interpret the battle and to tell its story (Evans et al., 2019, pp. 253-256).

Although the Waterloo Uncovered project is the starting point, the interviews also provide insight into different views on archaeological citizen science, supplemented with broader experiences around

participation and archaeology as a ways of well-being and personal growth. Interviewee 18 actively participated as a citizen scientist, while interviewee 17 was involved in the organisation and coordination of both Waterloo Uncovered and Recovery on the Battlefield.

Motivations

Although the interviewees reasons for taking part in Waterloo Uncovered differed, they were both highly motivated by the social component. Interviewee 17 fulfilled multiple roles within the project, a military history enthusiast, therapist, and veteran. Their inspiration came from their own passion for history and the exceptional chance to work on a particular project that encourages veterans to engage in society. They were also captivated by the idea of making unique discoveries at unique places. Since interviewee 18 had no prior experience with archaeology, their motivation was originally less rooted in the field itself. The primary source of motivation was the presence of other veterans. Their prior military experiences in Bosnia had shown them that these kinds of social activities can help damaged veterans recover. At first, they viewed the archaeology mostly as an external component that 'just came on top of it' (Interviewee 17, personal communication, March 20, 2025; Interviewee 18, personal communication, March 13, 2025).

Recruitment and training

In the registration process, an intake interview is used to determine whether a candidate is eligible to join the project, taking into consideration both the participants motivation and mental resilience. Participant and group safety are of the utmost importance. While veterans are the project's primary focus, those with similar backgrounds from other emergency services are also more than welcome to participate (Interviewee 17; 18).

Archaeologists are part of the multidisciplinary team, who receive yearly training on topics including trauma management, safety, signalling and conversational tactics. Participants within ROTB were given hand-on training on how to dig, handle discoveries and use tools like metal detectors and GPS material to record locations. Every action was documented in a so-called 'passport' (Interviewee 17; 18).

Contributions and the role of citizen scientists

Both interviewees reflect positively on the citizen scientists' role and contribution within the project, emphasising the personal development of participants. Interviewee 17 highlights that the primary

objective of this project is to assist veterans in their recovery and social engagement, rather than archaeology itself. Finding meaningful stories, working together, and feeling like you're making a difference are all more important than flawless digging. Participants are usually very interested in the finds and their history, and are curious to learn more about archaeology. According to their own observations, interviewee 18 explains that they put in a lot of effort and felt responsible for trying their best at conducting a proper archaeological excavation. They enjoyed working in the trench and utilising tools like metal detectors and GPS, and they learnt how to handle archaeological artefacts with care. Even though interviewee 18 found it difficult to estimate the scientific importance of their contribution, they are convinced that the group's combined work, simply by moving a lot of dirt, was definitely valuable for the project as a whole.

Maintaining engagement

Both interviewees believe that continuing engagement after the initiative is crucial to sustain the impact from the project. The significance of an alumni network on social media, where former participants stay in touch with one another, is highlighted by interviewee 17. Return days and group walks are also planned in order to keep the network active and keep people in contact. Interviewee 18 provided a personal story for the ROTB newsletter, that keeps participants informed about each other's experiences. They also indicated that their newfound interest in archaeology, together with their positive experience in Waterloo, would make them happy to participate again.

Participation impact

The project of Waterloo Uncoverd, and ROTB as an organisation, have a big impact on many levels but particularly on social and personal levels, according to interviewee 17 and 18. According to Interviewee 17, the project helps veterans regain their social engagement and aids in their overall recovery. Making contact with like-minded people makes it so participants don't have to continuously explain their story over and over again, and can therefore create a sense of safety and recognition. For some, involvement in a project like this is a pivotal moment in their recovery that can lead to more positive follow-up activities. Being outside, working together, and physical activity all aid in recovery and the ROTB team makes sure that participants feel valued and seen, which is a healing experience that restores their confidence to work in a group. Interviewee 18 confirmed that the social impact really touched them, especially how amazing it was to see how more closed off participants started to open up day by day. Hearing from others who had gone through more trying times helped them put their own experiences

in perspective, and interacting with like-minded people offered them acceptance and understanding. The initiative ignited their interest in archaeology, and they began reading about it and spreading their excitement about it to others. Interviewee 18 is adamant that these kinds of initiatives do aid in veterans' recuperation.

The scientific value of the project lies in the unique finds, the special nature of the site and the fact that a partnership with different universities can support the scientific processing of the data.

On a societal level, the project supports tourism and education, and public open days help to strengthen the bonds between the public and veterans.

Agreements and differences

The interviewees show both clear similarities and differences, largely due to their different roles within the project. Both veterans stress the value of peer interaction and the social component, and they both think that the project largely improves veterans' well-being. They are both very positive about the project, and valued the hands-on experience with archaeology and soil work. Both are also open to participate again in the future and to keep being involved.

However, there are also differences in their viewpoints. As someone who plays an organising and caring role, interviewee 17 highlights the value of a multidisciplinary team, well thought out structures, targeted team trainings, and positive relationships with outside parties like authorities and universities. As a participant, interviewee 18 mainly focuses on their personal growth within the project, developing from disinterested to very enthusiastic for archaeology. They highlight the memorable moments and group relationships, but also draws attention to the unclear task distribution throughout their edition. The Dutch and British participants' mutual acceptance and positive attitude towards each other are praised by interviewee 18, while interviewee 17 highlights significant cultural differences in how people deal with mental health and the slight frictions that this resulted in.

Lessons learned and improvements for the future

Both interviewees point to important takeaways and areas where the project can be improved going forward. Interviewee 17 concludes that the concept clearly works, but that longevity and sustainability are still major challenges. For this, steady funding, a multidisciplinary and well-trained team, and trustworthy partners are necessary. Expanding the concept to additional areas or target groups may be possible, but doing so will need ongoing funding for training in trauma processing, safety, and signalling.

Interviewee 17 stresses how crucial it is to carefully choose participants, taking into account their individual circumstances and resilience. It is vital to guarantee a voluntary and secure setting where participants can pause without feeling pressure. Additionally, mutual understanding and learning to speak each other's language are crucial for successful collaboration between participants, archaeologists and organisers. In order to avoid disappointments and to provide equal possibilities for everyone's experience, like alternating between trench work, documenting, sorting etc., Interviewee 18 calls for a clearer division of tasks and a more structured organisation of daily reoccurring work.

5.2 Cross-Case Comparison

Although all citizen science projects studied in this thesis are situated within the field of archaeology, they clearly differ in design, target groups and methodology. Heel Heerlen Graaft had a strong local character, with a focus on the Roman period around the Via Belgica. The physical design, small-scale test pits in private gardens, made it accessible and visible in the neighbourhood, reinforced by recognisable regional branding and repetitions at various locations (Interviewee 10; 11; 12). In contrast to this was Heritage Quest, which mainly functioned online and focused on large-scale recognition of landscape traces. Where Heel Heerlen Graaft revolved around physical involvement at a micro level, Heritage Quest aimed for mass and scale, although it supplemented this with smaller-scale physical meetings and educational events (Interviewee 6; 7; 8). Wyldemerck distinguished itself through its deep anchoring in a specific community: intensively involving Moluccan residents in researching their own history and combining archaeological fieldwork with intangible heritage (Interviewee 15; 16). Waterloo Uncovered differed most in target group and approach: this international project explicitly used archaeology as a means of therapy and recovery, targeting veterans with mental or physical complaints. The structure and guidance were tailored to their specific needs, with Waterloo Uncovered adding a unique social and care component (Interviewee 17; 18). Each project thus shows how citizen archaeology can take on a variety of forms, depending on context, scale, target group and objective.

Differing impact

The impact of the citizen science projects studied varied greatly depending on their design, target group and objectives, and manifested itself at different levels, from local to international, and from scientific to societal. Heel Heerlen Graaft had a particularly strong local and regional impact: it raised awareness of archaeological heritage among residents, strengthened social cohesion in neighbourhoods,

generated a lot of media attention and led to repetitions and expansions in nearby areas. In addition, it strengthened cooperation between municipalities and academic institutions (Interviewee 4; 10; 11; 13). In contrast, Heritage Quest had a much broader, national impact. Through large-scale LiDAR analysis, the project yielded significant new archaeological data, useful for heritage management and policy making. It won awards and attracted media attention at European level, thereby also contributing to public education and science communication (Interviewee 6; 8). Wyldemerck was distinguished by its social and cultural impact within a very specific community. By giving the former Moluccan residents a central role, the project contributed to the recognition, ownership and recording of heritage that might otherwise have been lost and would not have received attention. This impact was not broad or public, but profound and transformative for the group involved (Interviewee 15; 16). Finally, Waterloo Uncovered had a very personal, therapeutic impact: it showed how archaeology can be used as a tool for recovery and reintegration of veterans with mental or physical complaints. The emphasis in this initiative is on human well-being, not on preserving heritage, which led to international interest in this new approach to citizen science (Interviewee 2; 17). Together, these projects demonstrate that the impact of citizen science is multifaceted, and can extend from data collection to social healing, depending on how science and society are connected.

Differing takeaways

Although each project had its own context and target group, together they provide valuable and diverse lessons on setting up and executing citizen science projects in archaeology. Heel Heerlen Graaft showed the importance of good preparation, clear organisation and effective communication, both towards participants and involved partners such as municipalities and archaeological companies. Involving different age groups and building a recognisable visual identity also contributed to continuity and visibility (Interviewee 10; 11). In contrast, Heritage Quest emphasised the power of large-scale online collaboration in data-intensive research. It showed that digital training can be effective, but that physical meetings remain crucial for deepening connections and long-lasting motivation. At the same time, the project revealed the importance of sufficient time, budget and aftercare to do justice to both participants and results (Interviewee 6; 8). Wyldemerck, in turn, highlighted the need for true equality: the project showed that involving a specific community requires long-term relationship building, shared decision-making and space for intangible heritage. Creativity in dealing with regulations proved essential to do justice to this form of participatory heritage research (Interviewee 2; 15; 16). Finally, Waterloo Uncovered showed how archaeology can have social impact outside the academic context, for example as a therapeutic tool for veterans. It underlined the importance of a safe, structured working

environment and of sustainable organisational forms and financing to ensure lasting effects (Interviewee 2; 17). Together, these projects show that successful citizen science in archaeological research requires flexibility, careful organisation, clear communication and, above all, an approach that is tailored to the specific goals and needs of the target group.

5.3 Institutional Opinions

The five interviews with overarching policy, knowledge and volunteer associations, outside of the beforementioned case studies, show that citizen science in archaeology is widely seen as a valuable development with potential, although there are also challenges. Important drivers are increasing social involvement in archaeology and heritage, generating new knowledge and data, and anchoring archaeology in society. The ratification of the Faro Convention plays a crucial role in this as a policy driver (Interviewee 1, personal communication, March 4, 2025; Interviewee 2, personal communication, February 11, 2025; Interviewee 3, personal communication, February 17, 2025; Interviewee 4, personal communication, March 14, 2025; Interviewee 5, personal communication, March 10, 2025).

Despite the positive attitude, citizen science projects encounter obstacles in practice. Bureaucracy and the current Heritage Act are mentioned as obstacles that are not optimally set up for citizen participation. There is also a need for clearer rules and guidelines. The need for professional guidance and a clear organisational structure is emphasised by several interviewees as crucial for success (Interviewee 1; 2; 3; 4; 5).

Various solutions and suggestions for the future include structurally integrating participation in policy and implementation processes, developing tools such as decision trees and manuals, proactively approaching various communities, and improving cooperation between the various actors in the archaeological field. Financing is also mentioned as a recurring point of attention, but no clear solutions are given yet (Interviewee 1; 2; 3; 4; 5).

Motivation

The motivation to involve citizens in archaeology is multifaceted and is driven by both policy and social factors. An important driving factor is the Faro Convention, which encourages institutions such as the RCE and the Ministry of Education, Culture and Science to actually integrate participation into their policy. By actively involving citizens, more support for archaeological policy is created and the anchoring

of archaeology in society is strengthened. Citizen science plays a key role in strengthening the link between policy, science and our society: it not only produces more data and discoveries, but also enriches knowledge about the past (Interviewee 1; 2; 3; 4; 5). In addition, archaeology fulfils a valuable social function by, for example, contributing to the well-being of groups such as veterans with PTSD or elderly people with dementia, an aspect that interviewee 2 believes is of great importance.

Institutions such as the National Museum of Antiquities, as mentioned by interviewee 5, aim to reach broader and more representative audiences than the traditional museum-going public, which calls for new approaches. Building a community around archaeology creates a deeper bond with institutions and creates a different, more shared dynamic. Moreover, citizens can ask different questions or contribute different perspectives than archaeologists themselves, which leads to new perspectives and a critical mirror for the field. Citizen involvement also offers the possibility of symbolic recognition: designating heritage sites as monuments, partly based on citizen input, can contribute to the social appreciation of the history of specific groups, even when there is little tangible archaeology in the ground (Interviewee 1; 2; 3; 4; 5). Finally, the social aspect also plays an important role: working together on a shared interest connects people. For many members of the AWN, the desire to actively contribute to the preservation of heritage is often out of concern that it is not always handled carefully (Interviewee 4).

Relationship with policy and legislation

The relationship between citizen science and policy and legislation is complex and has both obstacles and opportunities for development. A major bottleneck is that the current Heritage Act is not yet tailored to citizen science. This legislation was primarily drafted with professional, commercial archaeology in mind, which often leads to ambiguity and conflicting interpretations in participatory projects. This is widely recognised as a constraining factor. At the same time, the Faro Convention, which emphasises participation as a core principle, provides an important policy framework for both OCW and RCE. The Convention serves as a guiding instrument to structurally improve participation (Interviewee 1; 2; 3).

Although the direct influence of citizen initiatives on national policy and resources is currently limited, partly due to the fragmented structure of the archaeological sector and the lack of an organised lobby, substantial influence can be exerted at the municipal level (Interviewee 3). Interviewee 1 and interviewee 3 note that national policy does try to pick up signals from the field, but that the road to actual policy influence is often long and indirect. Parliamentary questions, for example in response to projects such as PAN, can have an effect, for example on subsidy decisions.

Consideration is now being given to adapting the Heritage Act, for example by including participation as a mandatory consideration in the Programme of Requirements for archaeological research. Additionally, more thought is being given to naming national monuments after consulting with the public. In the area of financing, there have already been responses from policy, such as specific subsidies via the Fund for Cultural Participation or innovative platforms with participation criteria. However, there is a clear need for more structural and larger financing flows to sustainably support participation projects. That is why it is also being explored how public-private partnerships can play a role in this (Interviewee 1; 3).

Cooperation

Collaboration plays a crucial role in successfully realising citizen participation in archaeology, but also faces challenges. The RCE collaborates with communities, municipal umbrella organisations (such as the Association of Dutch Municipalities (VNG)) and organisations such as the AWN. This collaboration takes place at policy level, but also internally within the RCE between knowledge archaeologists and policymakers. The RCE actively stimulates citizen initiatives and tries to support them in terms of policy (Interviewee 1).

The AWN emphasises that good collaboration with the competent authorities, such as municipal archaeologists and provinces, is essential for citizen science to proceed effectively and responsibly. According to interviewee 4, this is the only way to prevent derailment. The organisation focuses on training programs and certification of volunteers, so that they can participate responsibly in excavations by professional parties. In addition, the AWN seeks to connect with other organisations such as DDA and ArcheoHotspots, which also work with volunteers and finds.

Museums and knowledge institutions also play an important role, according to interviewee 5. The National Museum of Antiquities (RMO) involves the public through finds days and projects such as Doggerland and Op de Stoel van de Conservator (In the Curator's Chair). In addition, there is a desire to bring universities and museums together at an early stage of research, in order to structurally anchor public involvement. Museums also try to actively involve communities with a cultural or historical connection to the collection, such as Egypt or the Middle East.

Nevertheless, collaboration remains challenging in practice. Reaching certain target groups requires a lot of time and investment, and there is not always consensus within the archaeological profession about the importance or form of participation. Organising collaboration between the various parties involved is often complex. There is therefore a growing need for clear contact persons, better coordination and guidance to successfully shape these collaborations (Interviewee 2; 3).

Agreements and differences

There is broad agreement among the interviewees about the importance and potential of citizen science and public participation in archaeology. The Faro Convention is seen by several parties, such as RCE and OCW, as an important driving force. There is also consensus about the need for professional guidance for successful projects, the importance of less bureaucracy, clearer rules and the valuable contribution that citizen participation can make to knowledge and data collection, a position that is endorsed by RCE, RMO, Leiden University, among others (Interviewee 1; 2; 3; 4; 5).

At the same time, there are clear nuances and differences. For example, interviewee 4 strongly emphasises cooperation with authorities as a crucial aspect to ensure projects are well organised and run, while others see more room for independent citizen initiatives. Interviewee 1 points to the influence of citizen participation at the municipal level, while interviewee 3 sees the role of the Ministry primarily as facilitating frameworks and financing, not as a direct actor in local projects. With regard to policy impact, interviewee 3 also acknowledges that citizen initiatives currently have little direct influence at the national level, partly due to the fragmentation in the sector, while interviewee 1 mentions examples such as Heritage Quest, which did have a policy impact. The focus areas also differ: interviewee 5 emphasises the role of museums and universities in public outreach and community building, interviewee 2 emphasises the social relevance of archaeology, and interviewee 4 focuses on practical field participation and the social aspect within the AWN association.

Impact and success of citizen science

Citizen science in archaeology shows a multifaceted impact and success, both scientifically and socially, according to all 5 institutional interviewees. Projects such as Heritage Quest are mentioned as having not only resulted in a large amount of data and finds, but also making concrete contributions to policy instruments, such as maps that can be used in spatial planning. Thanks to the efforts of many volunteers, more and more detailed work can be done than by professional archaeologists alone. This results in new insights and a broader enrichment of our knowledge of the past. At the same time, citizen science also offers social and therapeutic added value: participation in archaeological projects can have a positive effect on the well-being of the citizens involved. Projects that generate a lot of media attention, such as Beach Archaeology, also contribute to increasing public awareness and the visibility of archaeology. Moreover, the increasing involvement of citizens ensures that archaeologists are challenged to reconsider their working methods and to work from new perspectives, which leads to innovation within the sector (Interviewee 1; 2; 3; 4; 5).

Possible trends

The interviews reveal a number of overarching trends that are widely shared by various stakeholders. For example, there is a clear shift from one-way communication, such as lectures and exhibitions, to more interactive forms of public involvement, in which cooperation, brainstorming and participation are central. At the same time, recognition of the social value of archaeology is growing: it is no longer just about scientific knowledge, but also about social relevance, such as contributing to social issues and recognising the significance of heritage for specific groups. There is also an increasing movement towards structural embedding of participation in the daily practice of archaeologists, museums and policymakers, instead of regarding participation as incidental projects. This trend is accompanied by a strong need for support and capacity building, such as developing tools (decision trees, manuals), improving guidance and offering training for both citizens and professionals. Finally, there is a growing awareness that participation should not only focus on the traditional demographic, but that a broader and more diverse audience should be proactively sought, with attention to their specific interests and needs (Interviewee 1; 2; 3; 4; 5).

Future vision and improvements

For the future of citizen science in archaeology, there are several areas for improvement and ambitions that form the basis for a more structural and effective approach. Participation should no longer be an afterthought, but should be integrated into policy, research and museum activities from the start. This also requires an amendment to the Heritage Act, so that it better matches the practice of citizen science. In addition, there is a great need for structural funding to make participation projects sustainable. Citizens should be more actively involved in the selection and designation of monuments, whereby their vision of historical significance (for example as lieu de mémoire) is taken seriously. In order to better reach relevant target groups, a proactive approach is needed: organisations must respond more specifically to the interests of various social groups. Better and earlier cooperation between parties such as RCE, OCW, AWN, RMO and universities is also crucial to more effectively join forces. Furthermore, there is a need for training courses for volunteers, such as via AWN certification, and for training for professionals in working with participants. At the same time, the archaeological sector as a whole must organise itself more strongly and make a clearer voice heard towards policymakers. Finally, it is essential that authorities, especially at the municipal level, recognise and actively use the value and knowledge of participating citizens, this should be an integral part of their work (Interviewee 1; 2; 3; 4; 5).

5.4 Participant Opinions

The interviews with participants in archaeological citizen science projects provide valuable insights into their experiences and motivations. Participants are generally positive and see both personal and scientific added value. However, there is a need for better communication afterwards and more attention for sustainable involvement. The conversations underline the social power of citizen participation and the shared feeling of meaningful contribution to archaeological research.

Motivation

The motivations of interviewees to participate in archaeological citizen science projects are diverse, but show clear similarities. Many participants have a strong personal interest in archaeology, history or their environment, often combined with a local involvement. For example, interviewee 13 became fascinated by the Roman past of Heerlen after moving there. The social aspect also plays a major role: participants mention the desire to meet new people and be part of a community as an important motivation. Some emphasise the social cohesion within specific groups, such as veterans or the Moluccan community. In addition, the idea of actively contributing to archaeological research is motivating; participants experience their contribution as valuable, precisely because citizen science can lead to a broader and richer picture of the past. The opportunity to visit otherwise closed locations, such as nature reserves or royal domains, makes participation extra attractive. For the participant in the Waterloo Uncovered project, the project also had therapeutic value, with participation contributing to their recovery process (Interviewee 8; 9; 13; 14; 16; 18).

Impact on knowledge and understanding

Participation in archaeological citizen science projects significantly deepened and changed the interviewees' perception of archaeology and science. Where archaeology was previously seen as simply digging, many discovered the scientific complexity of the discipline, including the use of technology, methodology and interdisciplinary collaboration. The hands-on experience provided participants with valuable insights into the precision and care of the work, some even noted that citizens were sometimes more meticulous than professionals. The discipline also became more widely understood, participants were introduced to techniques such as coring, using LiDAR images and analysing soil profiles. At the same time, historical awareness and appreciation for the landscape and the visible traces of the past, such as burial mounds or Roman remains, grew. Participants appreciated good briefings and clear explanations of the broader scientific framework, although some argued for more public-friendly

explanations of technical terms. Although the emphasis shifted per participant, some were mainly impressed by the technological aspects, others by the practical work or the social context, all interviewees shared the feeling that their knowledge and understanding of archaeology had significantly deepened. The projects have successfully rid archaeology of its dusty image and show how rich, nuanced and relevant the field is (Interviewee 8; 9; 13; 14; 16; 18).

Participation impact

The interviewees were strongly aware of the impact of their contributions to the archaeological projects. Through collective efforts, they generated large amounts of data, allowing extensive areas to be investigated in a short period of time. This scale allowed for discoveries that individual contributions would not have yielded. Furthermore, citizens regularly made unexpected discoveries that led to new insights and sometimes even to rewriting existing historical assumptions, such as the discovery of a Roman floor beneath a house. According to several interviewees, the care and precision with which many participants worked directly contributed to the quality of the research. Some, such as interviewees 13 and 8, also took an active role in the media to represent the projects in an accessible way. The dedication of participants was also evident in their persistence: for example, interviewee 8 analysed all 20,000 images in Heritage Quest. The general consensus among participants is that their collective efforts were essential to the success of the projects, not only because of the numbers, but also because of their accuracy, commitment, and perseverance. These experiences underline that citizens can not only be supportive, but also valuable in terms of content within archaeological research (Interviewee 8; 9; 13; 14; 16; 18).

Personal impact

Participating in archaeological citizen science projects had a profound and positive impact on the individual participants. All spoke enthusiastically about the pleasure and satisfaction they got from contributing to meaningful discoveries. For some, it even felt like a ‘party’ (Interviewee 13). The projects not only provided opportunities to meet new people, but also strengthened existing social ties; in some cases, such as in the Moluccan community, this led to closer cohesion. In addition, participation sparked new passions for archaeology, history, landscape and soil science, as in interviewee 18, who developed a lasting fascination thanks to the project. Participants felt valued, both by the project organisations and through broader recognition in the form of media attention and awards. Tangible memories, such as a book, were highly valued. For many, participation also meant personal growth: they learned to

acknowledge multiple perspectives, and found hope in what lies beneath the surface. Common themes among the interviewees were the social aspect, the satisfaction of meaningful work and the growing interest in archaeology. The projects succeeded in providing a rich, personal experience that went beyond the scientific yield (Interviewee 8; 9; 13; 14; 16; 18).

Future participation

The interviewees were unanimously enthusiastic about future participation in archaeological citizen science projects. Statements such as 'always' and '100% yes' illustrate their great willingness, although some participants made nuances regarding age, time and energy. The strong motivation stems from previous positive experiences, the joy of discovery, and the valuable social contacts that have been made during the projects. However, practical factors such as the location of the project, the topic and personal availability can influence participation. In addition, several interviewees expressed the wish that similar initiatives would be continued and replicated in other regions or communities. Overall, there is a clear trend: these projects succeed in creating committed, returning participants, people who want to continue to work as 'permanent' citizen scientists, provided their circumstances allow it (Interviewee 8; 9; 13; 14; 16; 18).

5.5 Identifying Key Success Factors

According to interviews conducted with participants, organisers and other stakeholders, the efficiency, sustainability, and social impacts of citizen science projects are influenced by a number of factors. These key success factors range from flexibility, fostering ownership, and teamwork to providing clear communication and direction. The most significant themes and lessons are listed below using examples from Heritage Quest, Heel Heerlen Graaft, Wyldemerck and the Waterloo Uncovered projects, together with additional information from participants and institutions. When taken as a whole, they paint a clear, broad and multifaceted picture of what citizen science in archaeology can accomplish and what can make future initiatives even more successful.

People-centred approach

Successful citizen science projects place the participant at the centre. This means paying attention to good communication, encouragement, guidance and appreciation. It is essential that participants feel

involved and valued and that their motivation and needs are leading in setting up the project. In Heel Heerlen Graaft this was visible in the personal attention felt by both interviewed volunteers, which to them was essential for their increased motivation and involvement. At Waterloo Uncovered the impact on personal growth was also emphasised: the interviewed participant felt part of a shared mission and experienced the project as meaningful and supportive for their well-being. Realistic expectation management also contributes to a positive experience. In addition, choosing a topic that appeals to and touches people plays an important role in increasing involvement (Interviewee 1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 11; 12; 13; 14; 15; 16; 17; 18).

Professional guidance and structure

A skilled, dedicated project coordinator or -leader is crucial for successful initiatives. Clear research questions, frameworks and well-defined tasks provide structure to participants. Volunteers should receive ongoing, accessible guidance, with empathetic communication and quick feedback. Projects with a strong and committed team, sufficient funding and official recording of the research (PvE) have a greater chance of sustainability and impact. Both Heritage Quest and Heel Heerlen Graaft had strong organisation and collaboration with archaeological professionals, such as RAAP. In Waterloo Uncovered, the daily structure and multidisciplinary guidance contributed to the success and personal development of the participants (Interviewee 4; 6; 7; 8; 10; 11; 12; 17; 18).

Communication and visibility

Effective communication plays a crucial role in involving and maintaining engagement with participants. Heritage Quest reached a huge audience via (inter)national media, which led to broad social impact. Heel Heerlen Graaft received attention from, among others, the NOS Jeugdjournaal, which led to extra involvement and visitors from outside the region. Regularly sharing interim results and success stories via various channels such as social media, local media, newsletters and webinars ensures continuous involvement and motivation. Making the people behind the project visible also strengthens the bond between organisers and participants. In addition, using tangible results, such as books or videos, helps to increase impact and appreciation (Interviewee 6; 7; 8; 10; 11; 12; 13; 14; 15).

Collaboration and community building

Projects that are deemed successful are usually the projects where a variety of parties worked well together, this includes volunteers, archaeologists, heritage organisations and (local) governments. A sense of community is created among these parties when knowledge is openly shared and concerns can be critically discussed. Organising meetings and setting up consultation groups or citizen science councils promotes involvement and relieves project leaders. Volunteers who act as mentors contribute to building and maintaining an active group. Heel Heerlen Graaft created a new concept of how residents came closer together through archaeology with the 'square meter friendships'. At Waterloo Uncovered, a close community emerged among participants due to the shared background and joint mission. Heritage Quest demonstrated that large-scale projects can also realise this social cohesion, including through collaboration with various partner organisations (Interviewee 1; 2; 3; 4; 5; 6; 7; 8; 10; 11; 12; 13; 15; 16; 17; 18).

Relevance and specific connection

Projects that connect to the interests and questions of a specific community or target group are more successful, as is specifically shown in the success of Wyldemerck. A clear and emotionally charged theme, such as local heritage and environments or military history, strengthens involvement. This also applies to projects that have a social added value, such as supporting veterans in reintegration through archaeology, where a safe, structured and flexible environment is crucial (Interviewee 3; 5; 11; 12; 15; 16; 17).

Flexibility and adaptation

A successful citizen science initiative needs to continuously learn from practical experience and adapt to given feedback. This could mean, for example, updating instructions, offering new courses, or adjusting certain research methods. Flexibility in planning and execution, and using volunteers as intermediaries, ensures a better fit with the needs of participants and a greater support base. For example, Waterloo Uncovered demonstrated this by creating space for personal reflection and tailoring activities to the recovery process of participants (Interviewee 1; 2; 3; 4; 5; 6; 7; 10; 11; 12; 15; 17).

Sustainability and long-term engagement

Structurally embedding citizen science within organisations and ensuring continuity remain major challenges. Lack of follow-up causes many projects to end after the first phase. Heel Heerlen Graaft provided a good example of lasting impact through the development of a reusable toolbox and follow-up projects like Heel Rimburg Graaft (working together with Germany on the border region in Limburg). There is a need for structural funding and better institutional integration to ensure long-term engagement. This also requires investments in ongoing communication, appreciation, and creating opportunities for follow-up activities, so that the accumulated heritage and data are used sustainably (Interviewee 1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 11; 12; 13; 14; 15; 16; 17; 18).

Social impact and recognition

Citizen science projects yield more than just data: they increase historical awareness, strengthen the bond with heritage and contribute to education and social involvement. Recognition of volunteers through media attention, awards and inviting participants as representatives increases their motivation and legitimacy. Measuring and making social impact visible remains a point of attention (Interviewee 1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 11; 12; 13; 15; 18).

Organisational and institutional barriers

Bureaucratic barriers, unclear legislation and the lack of accessible information can deter people. The fragmented archaeological sector also hampers the policy influence of citizen science. For sustainable impact, it is necessary to reduce these barriers and create a clear, accessible framework for participation. It is also important that policymakers actively seek new voices outside the traditional networks. The interest and motivations of local authorities are also very influential to the success of citizen science projects. For example, Heel Heerlen Graaft was supported by municipal subsidies and national funds, whereby the connection with the Faro idea was important to obtain administrative support. Without this institutional support, projects of this size would not have been possible (Interviewee 1; 2; 3; 4; 5; 7; 15).

Participant collaboration and trust

Equal collaboration between citizens, archaeologists and other experts, based on respect and shared ownership, increases the quality and success of projects. Strengthening mutual trust, including

recognising the contribution of participants as full-fledged researchers, contributes to the social and scientific value of citizen science. In Waterloo Uncovered and Heel Heerlen Graaft, it was indicated that mutual trust grew through transparency, respect and a shared goal. In Heritage Quest, it was important that participants were involved early in the process and that their contributions were taken seriously, which increased trust and motivation (Interviewee 1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 11; 12; 13; 14; 15; 16; 17; 18).

The interviews make it clear that successful citizen science projects require more than just scientific objectives and methods. The key lies in putting people at the centre: their motivation, involvement and experience. Professional guidance, open communication, tangible recognition and space for collaboration and flexibility not only strengthen the quality of the research, but also ensure lasting social value. Projects that actively think about their long-term impact and take participants seriously as co-owners of knowledge, lay the foundation for a sustainable connection between science, heritage and society. These insights form valuable tools for setting up and improving future citizen science initiatives.

5.6 Identifying Pitfalls

Although the citizen science projects analysed in this thesis were mostly experienced as successful, recurring bottlenecks and challenges also emerged in the interviews. These insights are important for planning future projects more realistically and avoiding reoccurring mistakes. This section discusses the most important pitfalls that were identified by various stakeholders.

Financing and policy barriers

One of the most recurring challenges within the projects was obtaining sufficient funding. At Heritage Quest, applying for subsidies proved to be a time-consuming and laborious process, partly due to bureaucratic requirements and the need to combine funding from multiple sources. In addition, there was insufficient structural funding for the follow-up, such as preservation, management and further analysis of the structures found. Governments and landowners were often hesitant or unprepared in this regard (Interviewee 6; 7).

At Heel Heerlen Graaft and Wyldemerck, it also proved difficult to find sustainable funding. The limited resources were often at odds with the ambition of the project. Wyldemerck also had to deal with

heritage legislation that hindered rather than stimulated participatory research. The required formal procedures, such as applying for an excavation exception, drawing up PvEs and deploying certified archaeologists, would make the project practically impossible to implement. Although the Faro Convention encourages citizen participation, existing legislation and regulations often form an obstacle in practice (Interviewee 11; 15).

Bottlenecks were also experienced at policy level. The government sees itself primarily as a facilitator, not as an active supporter of citizen science. The current Heritage Act also does not sufficiently reflect practice: for example, it is not permitted to excavate without a certificate, which seriously hampers spontaneous or locally initiated projects. The law is perceived as unclear and open to multiple interpretations, and should be amended to better facilitate citizen participation. Initiatives that arise from the curiosity of residents have difficulty getting off the ground; they require perseverance to overcome bureaucratic barriers, while low thresholds are essential for broad involvement. Financially, there is no structural support available. Although incidental funds exist, such as the Faro programme or opportunities for 'matching', an accessible and general incentive fund for participatory projects is lacking. As a result, projects often depend on the personal commitment of the archaeologists involved, especially since costs for public outreach can only be passed on to commercial disrupters to a limited extent. Furthermore, the RCE has no authority to enforce participation from commercial parties or municipalities, and even attempts to include participation as a criterion in the Programme of Requirements can easily be circumvented. Ultimately, participation cannot be forced, if those involved do not want to cooperate, then there is no continuation. However, current legislation and regulations make it unnecessarily difficult to give space to those who do want to (Interviewee 1; 2; 3; 15).

Organisation and expectation management

Organising archaeological citizen science projects poses considerable challenges, both on a practical and organisational level. Projects such as Heel Heerlen Graaft and Wyldemerck required intensive efforts from project leaders, often unpaid and carried out in their spare time, leading to mental pressure and fatigue. Recruiting participants proved to require more than just handing out flyers; a personal approach was essential to engage people. At the same time, it proved difficult to keep participants active, for example during workshops or lectures, especially during holiday periods. Managing expectations also proved to be a challenge: participants often hoped for spectacular finds, and were disappointed when these did not materialise. This underlines the importance of clear communication about the scientific

importance of even ‘negative’ results and the careful selection of fieldwork locations (Interviewee 11; 12; 15).

These issues tie in with broader bottlenecks within citizen science projects. Without professional guidance, many grassroots initiatives fail to get off the ground, partly due to the lack of a structured environment and a clear point of contact such as a municipal archaeologist. The expectation of rapid interaction and feedback also places a heavy burden on the organisation; maintaining contact with participants takes much more time and effort than is often estimated. Formulating realistic expectations about the output and impact of the project is complex, especially when available time, resources and capacity are limited. In projects such as Waterloo Uncovered, specific organisational tensions were added, such as balancing personal, medical and scientific goals. Some editions struggled with a lack of structure and division of tasks, leading to confusion and frustration in the field (Interviewee 1; 2; 3; 4; 6; 11; 12; 17; 18).

In addition, there is often insufficient capacity to adequately guide participants throughout the entire process, while this is crucial for involvement. Involving the public in complex processes such as exhibition development can also lead to disappointment when ideas cannot be implemented due to time pressure, budget or logistics. Maintaining an involved community requires continuous effort; if this is not the case, participants drop out or negative publicity is created. The diverse motivations of participants, ranging from scientific interest to social interaction, also make it difficult to apply a single, uniform approach. It also proves difficult to make clear agreements: where structure can ensure reliability, it can actually deter non-committal participants. In addition, not all members of heritage associations are actually active, and there is often a lack of training in basic archaeological skills. As a result, volunteers remain dependent on intensive guidance. Finally, the organisation of citizen participation by some municipalities leaves much to be desired, which further hinders the effectiveness and sustainability of such projects (Interviewee 1; 2; 3; 4; 5; 11; 12).

Collaboration and interaction

Collaboration between citizens, archaeologists and policy makers within archaeological citizen science projects is not always smooth and is subject to a series of structural and interpersonal challenges. At policy and organisational level, genuine collaboration between scientists and citizens is often still a long way off. Within the archaeological field, there is often resistance to participation. Some professionals want ‘nothing to do with it at all’ or see it as a temporary hype. Institutions such as the RCE are sometimes experienced as inward-looking and do not sufficiently reach out to actively involve citizens. Collaborations with museums or universities are often late or fragmented, which does not fit in with the

long-term planning that such institutions require. Within large organisations, it also proves difficult to mobilise colleagues or students, even if they are physically close by (Interviewee 3; 4; 5; 15).

Obstacles also occur at the project level. For example, tensions arose between citizens at Wyldemerck, partly due to differences in background, experience and personal memories of the past, such as the location of the former mosque (Interviewee 16). At Heel Heerlen Graaft, the collaboration led to friction when museum staff had difficulty partially handing over control of the exhibition to volunteers. The scientific terminology used by archaeologists also acted as a barrier, which sometimes forced participants to act as a kind of 'interpreter' between science and the public (Interviewee 12; 13). At Waterloo Uncovered, there were also significant collaboration challenges, particularly around the mental resilience of participants. Not everyone was ready to participate at that time, which required an empathetic and flexible approach (Interviewee 17).

In addition, reaching a diverse group of participants remains difficult: many projects mainly attract the 'usual suspects'. The RCE also has little insight into local initiatives that originate from municipalities or companies, and organisations such as the AWN lack a clear cooperation policy with other heritage institutions such as DDA and ArcheoHotspots. A deeper cause lies in the lack of training: archaeologists hardly learn during their studies how to position themselves socially or involve citizens. Finally, inspiring some municipal archaeologists appears to be a difficult process; citizen participation is sometimes outright rejected by them, and there is a lack of political pressure or support to change this (Interviewee 3; 4; 5).

Limited involvement after fieldwork

One of the biggest challenges in archaeological citizen science projects is to keep participants engaged in the long term. After the initial activity, many people quickly drop out, especially when there is no quick and continuous feedback or interaction. This requires a continuous and intensive effort, which is often underestimated. With short-term events such as exhibitions, it appears difficult to maintain engagement in the long term, while projects with long-term themes such as Doggerland or metal detecting seem better suited to involve people for a longer period of time (Interviewee 3; 5). In addition, insufficient use is made of opportunities to communicate the results of citizen science projects to the public in an accessible way, for example via newsletters, follow-up moments or exhibitions, which could increase impact and engagement. Also, there is often a lack of good feedback from professional archaeological research to the communities where it takes place. In addition, participants experience a lack of involvement in the analysis phase; they would like to think about or even contribute to the interpretation of the data, while in practice their role is often limited to the implementation phase of

the research. It is crucial that participants get the feeling that their efforts actually yield something and lead to something; Without that experience, there is no motivation to remain involved for a long time (Interviewee 8; 9; 12; 13; 14; 16; 18).

Sustainability and longevity

Several projects, such as Wyldemerck and Heritage Quest, struggle with the sustainability and continuity of their initiatives, mainly due to a lack of structural organisational forms and long-term funding. For example, at Wyldemerck, the establishment of a foundation was seen as an important step to ensure the project's survival. At the same time, involving young people appears to be a major challenge; an earlier attempt to activate them failed, indicating that specific, tailor-made approaches are needed (Interviewee 7; 16). In general, it takes a lot of effort to keep participants involved in the long term, while many projects depend on short-term subsidies and have no structural continuity. Participation is not yet a self-evident and integrated part of archaeological practice, but often depends on the commitment of individual stakeholders (Interviewee 1; 2; 3; 5). In addition, it is difficult to maintain a high percentage of active members within organisations such as the AWN, because many members remain passive. There is also often a lack of recognition and appreciation of the contribution of citizen scientists by the competent authorities, which requires extra effort. Professional agreements with volunteers can increase reliability and continuity, but can at the same time deter participants who are looking for more freedom (Interviewee 4). These factors together make it a complex challenge to anchor citizen science in a structural and sustainable way within archaeology.

Fragmentation of the field

The archaeological sector is highly fragmented, with many different interest groups that make it difficult to present a clear and powerful story about citizen science and its impact to policymakers. This fragmentation often leads to discussions about participation being limited to the circle of stakeholders themselves, while collaboration and communication between different initiatives is also not always optimal. In addition, internal conflicts and different interests create uncertainty among policymakers, making it difficult to receive a clear signal from the sector. This fragmentation stands in the way of citizen science projects having a bigger influence on policy, and policymakers often have to actively search for other voices outside the usual networks to gain a broader and more nuanced picture (Interviewee 3; 5).

The pitfalls that emerged from the interviews show that citizen science projects in archaeology are not inherently successful, but need clear communication, realistic expectations and structural support. Many pitfalls are related to organisation, division of roles and ensuring continuity. By recognising and addressing these obstacles in time, future projects can be set up more effectively and sustainably.

Conclusion

Chapter 5 has provided a detailed overview of how citizen science in archaeology manifests itself in practice, and what impact these initiatives have on individual, social and policy levels. The four case studies, Heritage Quest, Heel Heerlen Graaft, Wyldemerck, Waterloo Uncovered, show that citizen participation in archaeology can take shape in various ways. Each project has its own approach, target group, scale and objective, but all show that citizen science actually contributes to knowledge production, social involvement and personal development.

The interviews with participants show that participation leads to a deeper understanding of archaeology, a stronger connection with the past and the living environment, and often also to personal growth. At the same time, the interviews with policymakers and professionals emphasise that citizen science is not only valuable for science, but also for policy development and the social anchoring of heritage. The Faro Convention plays an important role in this as a driving force behind participation policy.

However, there are also clear bottlenecks visible. Projects regularly encounter structural limitations in the areas of legislation and regulations, financing, organisation and sustainable involvement. In particular, the lack of structural policy, long-term financing and sufficient capacity poses a risk to the continued existence and impact of participatory projects. In addition, it appears that collaboration between professionals, volunteers and policymakers is not always self-evident and is sometimes under pressure due to differences in expectations, language use or objectives.

Nevertheless, the results of this chapter show that citizen science in archaeology has great potential, provided that it is well facilitated, guided and embedded in policy and practice. The key to success lies in clear communication, mutual respect, flexibility, and an approach that recognises both scientific and human value.

Chapter 6. Interpretation & Discussion

In this chapter, the results from Chapter 5 are interpreted using the theory and literature from Chapter 2. The aim is to answer the three sub-questions and thus provide direction for the conclusion in Chapter 7. In paragraphs 6.1 to 6.3, the main findings are critically analysed and linked to the earlier outlined theoretical framework. Paragraphs 6.4 and 6.5 form the discussion section and discuss the limitations of the study and possible directions for future research. In this way, this chapter offers both substantive interpretation and critical reflection on the results of this study.

6.1 Citizen Science Benefits for Participants

This section examines how participation in citizen science projects benefits the citizens involved. Based on the interview results and theoretical insights, it is analysed how participants experience the projects, what they learn, and what personal or social impact participation has. This is used to work towards an answer to the first sub-question of this research.

Educational added value and knowledge development

Chapter 2 described that citizen science can contribute to increasing scientific understanding and critical thinking skills (Schaefer et al., 2021, pp. 500–506). These learning outcomes are also clearly visible in the interviews. However, this also raises the question of whether the knowledge acquired is always of sufficient depth to be of real scientific value, or whether it mainly stimulates a sense of involvement and participation? Participants indicated that their participation gave them more insight into archaeological methods, such as recognising structures on LiDAR maps (at Heritage Quest) or learning fieldwork techniques during excavations (Waterloo Uncovered). This practical experience is in line with the idea that citizen science not only 'communicates science' but also actively enables citizens to perform scientific work (Raddick et al., 2009, p. 2; Reilly et al., 2018, pp. 30-31).

In addition, participants point to a better understanding of how archaeology works in practice, not only the 'romantic' image of treasure hunting, but also the technical, legal and analytical aspects of the profession. One participant in Heritage Quest (Interviewee 8) described that their view of archaeology changed from 'digging in the sand' to 'science, technology, multidisciplinary research'. This confirms previous findings by van Londen *et al.* (2021, p. 13), who emphasise that participants not only learn practical skills, but also develop a deeper understanding of the broader context and value of archaeological heritage.

Although many participants deepened their knowledge, the interviews also showed that motivation and learning gain varied greatly. Not everyone seeks deepening; for some, it is primarily about social or recreational aspects. This questions to what extent citizen science projects should always strive for education, or if they should vary in goal and depth. In projects such as Wyldemerck, for example, the substantive learning outcomes seemed limited, wondering whether similar projects rightly fall under the heading of 'citizen science', or whether they are rather heritage participation.

Social cohesion and meaning

As Holtorf (2007, p. 120) states, archaeology offers a unique opportunity for people to connect with their history and identity. This sense of connectedness was reflected in almost every project, especially in Wyldemerck and Heel Heerlen Graaft, where participants described their experience as coming home to my own history and gaining more appreciation for my environment (Interviewee 16; 13). These kinds of statements reflect the socio-cultural value of citizen science, as formulated in the Faro Convention (see Chapter 3.2), which emphasises that heritage also fulfils a social function and contributes to well-being.

A number of participants indicated that participation helped them to build new social relationships. In line with Reilly *et al.* (2018) and van Londen *et al.* (2021), who state that heritage participation promotes community building, it was mentioned that working together with like-minded people in a non-hierarchical context was experienced as motivating and connecting. This social component appears to be just as valuable to many respondents as the scientific aspect.

It should be noted, however, that this social added value was not universal: some participants experienced a lack of aftercare or feedback (see Chapter 5.4), which can lead to disappointment or loss of motivation. Another critical point is that social cohesion between projects also varied deeply, Heritage Quest, for example, was large in scale, but despite its size had a more limited social connection between participants compared to other projects. At the same time, it is important to acknowledge that this social cohesion has mainly emerged among already motivated target groups. This raises the question to what extent such projects are truly inclusive and whether they deepen existing engagement rather than reaching new target groups.

Care and well-being

In the case of Waterloo Uncovered, it is explicitly visible how citizen science projects can contribute to the mental well-being of participants. Several veterans spoke about the therapeutic effect of digging together, being outside and working on something tangible. This also confirms Holtorf's (2007, p. 145) proposition that participation in heritage projects can help people find purpose and can help participants approach 'bigger life questions' through practical, shared experience.

Recognition and ownership

The interviews also confirm the importance of recognition and shared ownership, two aspects that were previously identified as bottlenecks in the literature (Reilly et al., 2018, pp. 30-31; van Londen et al., 2021, pp. 11, 33, 37; Suman & Alblas, 2023, pp. 4-5). Several participants expressed their appreciation for the fact that their input was taken seriously and sometimes even led to new insights or follow-up actions. This is in line with Irwin's (1995; Bonney et al., 2016, p. 3) call for a 'scientific citizenship', in which citizens are not just helpers, but full partners in knowledge production. At the same time, some projects also showed that this recognition is not always self-evident, some participants indicated that they had not received any feedback on what was done with their input. This underlines the importance of transparent communication and feedback, as also discussed in the success factors of citizen science in Chapter 2.10.

Motivation and intrinsic drivers

The motivation of participants appeared to be largely intrinsic and is in line with previous research (Raddick et al., 2009, p. 1; Raddick et al., 2013, p. 1; Nov et al., 2010, p. 743; Land-Zandstra et al., 2021, p. 251). The most important drivers appeared to be: wanting to contribute to something bigger, interest in history, curiosity and learning, and social interaction. As a participant from Heritage Quest (Interviewee 8) said: 'I was able to contribute to something bigger than myself. That is a really special feeling'. According to Land-Zandstra *et al.* (2021, p. 251), this intrinsic motivation is an important predictor for lasting involvement.

The variation in motivation, involvement and learning outcomes among participants is consistent with the different models of participation distinguished in the White Paper on Citizen Science (Serrano et al., 2014, p. 9). In Figure 9 this is shown as a spectrum, from 'Pooling of Resources' to 'Collective Intelligence', where the degree of influence and ownership of the citizen increases. The projects

examined in this thesis are largely in the middle of this spectrum: participants make substantive contributions and help in data collection, analysis tasks and participatory experiments, but rarely help determine the research questions or establish long lasting collective social- and scientific connections. This raises the question to what extent these projects are truly 'co-creative', or rather remain stuck in a more instrumental form of participation.

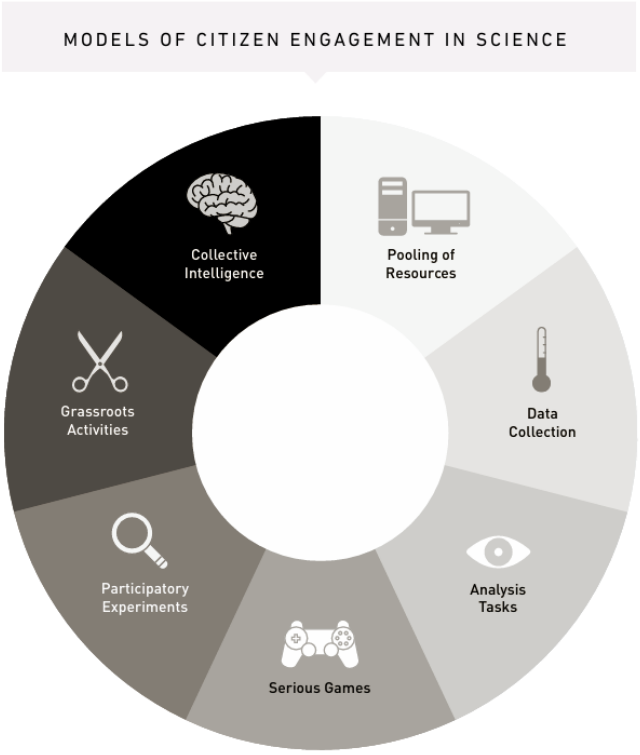

Figure 9. The models of engagement in citizen science, according to the White Paper on Citizen Science. (Serrano et al., 2014, p. 9).

Conclusion

The question of whether citizen science in archaeology enriches participants in terms of knowledge, community, well-being and involvement is largely answered by this research. Participation makes people feel heard, valued and connected to science and heritage. The added value therefore extends beyond participation alone. It contributes to a broader social anchoring of archaeology in our society.

Although the positive effects on participants are evident, it is important not to look too overly optimistic at citizen science. Not all participants experience such just positive effects, and the impact seems to depend strongly on individual motivation, context, communication, the degree of mutual recognition and project design. This underlines that citizen science is not a universal recipe for engagement, but requires a carefully attuned process.

6.2 Contributions to Archaeological Research

The second sub-question in this thesis asks whether citizen science actually contributes to the advancement of archaeological research? For example by increasing the scope of research, improving data collection and -processing, utilising local knowledge and increasing public support. Based on the case-study analysis and interviews with both participants and involved institutions, it can be stated that this question can be largely answered, albeit with some important nuances.

The extent to which citizen science contributes to scientific knowledge is highly dependent on the type of project and the definition of 'scientific benefits'. In Heritage Quest, the large amount of data led to significant discoveries, but also to a significant burden on validation capacity (see Chapter 5.1.1; Bourgeois et al., 2024, pp. 12-14). Illustrating that more data does not automatically lead to better science, without sufficient resources for analysis and interpretation, the added value of such data can remain severely limited. In Heel Heerlen Graaft, the scientific value of the artefacts was limited, but the project did contribute to a more complete picture of the local soil archive. Wyldemerck delivered little formal data, but an important cultural-historical narrative that would otherwise have been lost.

Increasing research volume and data collection

As discussed in Chapter 2.6 (RCE, 2015, pp. 4, 12, 13, 18; Pratz López, 2017, pp. 2-3), volunteers can play an important role in increasing the capacity of archaeological research, especially in the area of large-scale data collection and observation. The findings from the case study of Heritage Quest underline this. Thanks to the efforts of thousands of volunteers, a huge amount of LiDAR data could be screened, leading to the identification of hundreds of new possible archaeological structures.

Heel Heerlen Graaft and Wyldemerck also show how citizen scientists can reduce the workload of professionals, for example by carrying out preparatory studies, such as surface mapping or metal detection. This is in line with Smith's (2014, p. 754) observation that citizen participation is a valuable addition to professional research, especially in time-consuming tasks such as crowdsourcing and preselection.

Professionals indicated that citizen science has the potential to produce valuable data, but that its success depends on strict guidance and clear frameworks (see 5.3). Without these frameworks, the data often remains unused or unsuitable for scientific purposes.

At the same time, this increase in data volume also brings new challenges. As discussed in Chapters 2.4 and 5.5, the enormous amount of data generated often leads to additional work for researchers, for example in the form of validation, interpretation and processing. In the case of Heritage Quest, an impressive number of new burial mounds were identified, but this also entailed a large investment of time in checking the results and filtering out false positives (Bourgeois et al., 2024, pp. 12-14). In projects such as Wyldemerck, it also turned out that the results of participation were in some cases of limited use without professional post-processing (Chapter 5.1.3). As Pratz López (2017, pp. 3–4) already noted: the more open and accessible the participation, the greater the variation in quality of the data provided, and the greater the need for professional checking. Citizen science therefore not only increases capacity, but also places additional demands on organisation, time and resources.

Local knowledge and contextual insight

In addition to performing actions, volunteers also contribute valuable local knowledge that professionals often lack. This was explicitly stated in the Wyldemerck project, where local residents provided information about historical landscape elements and oral traditions that supported the interpretation of the finds. As previously emphasised by the RCE (2015, p. 22) and van Londen *et al.* (2021, p. 31), this local knowledge is a crucial addition to the 'classic' sources and literature studies.

The fact that this local input is also recognised in policy is evident from the fact that there is a desire for participants to be involved in drawing up the Program of Requirements (PvE) (RCE, 2015, p. 22). By using citizen knowledge already in the planning phase, a richer, more nuanced and more socially relevant research process is created.

Improving public involvement and support

Archaeology does not have a self-evident social support base. As Smith and Silvertown (2014, p. 759; 2009, p. 469) state, knowledge about the past is not a basic need and requires public accountability. The interviews with institutions confirm that citizen science contributes to this public legitimacy. By involving people in the process, more understanding, support and interest in archaeological research is created. Project leaders indicated that participants often function as ambassadors: they convey their enthusiasm to their environment and thus ensure broader social visibility.

This is in line with Holtorf's (2007, pp. 139-140) plea not to work against the existing public image of archaeology, but to take it as a starting point. A participant from Wyldemerck (Interviewee 16) noted

that the 'Indiana Jones feeling' initially was a part of their participation, but that they gradually adjusted their image due to the serious, professional approach of the project. This confirms Holtorf's proposition that working with existing archaeological stereotypes (rather than against them) is an effective way to generate public interest and then channel it with correct, in-depth information.

Scientific value and quality assurance

A common concern in the literature (Bonney et al., 2014, p. 1436; Pratz López, 2017, pp. 3-4) concerns the scientific reliability of data collected by citizens. However, various mechanisms have been implemented in the projects studied to address this concern. For example, Heritage Quest used validation by running the same data past a lot of participants, professional archaeologists and AI technology, while Wyldemerck and Waterloo Uncovered provided intensive guidance and training of volunteers. This is in line with recommendations from the RCE (2025, pp. 25, 38, 51), which states that citizen participation is successful and reliable provided that good guidelines, training and reporting agreements are followed.

The AWN plays an important role in this, with courses and certifications for volunteers, and the municipality remains ultimately responsible for the archaeological process (Interviewee 4). This creates a hybrid model in which citizens participate, but operate within a clear professional framework.

Recognition and institutional integration

A point of attention remains the structural recognition of the contribution of volunteers to scientific output. While some institutions consider participants as full partners, others indicated that there is still a certain hierarchy, the scientific value of citizen input is not experienced as equal everywhere. This reflects the findings of Suman & Alblas (2023, pp. 4-5), who point to the tension between professionalization of science and inclusion of citizens.

Nevertheless, projects such as Waterloo Uncovered and Heel Heerlen Graaft show that where this does happen, i.e. where participants receive feedback, receive recognition for their work, and the results are shared publicly, this leads to greater involvement and to sustainable collaborations.

Conclusion

The suggestion that citizen science makes meaningful contributions to archaeological research is largely confirmed by this study. The use of volunteers increases the scope of projects, enriches the substantive perspective through local knowledge, and strengthens the social support for archaeology. When participation is facilitated professionally and mutual recognition is central, citizens can play a substantial role in generating archaeological knowledge.

At the same time, this requires continued investment in guidance, quality assurance and institutional openness. Without these preconditions, there is a risk that the collected data will remain scientifically unusable, and the value of the project will be mainly social or educational. The power of citizen science lies not only in the quantity of participants, but in using their qualities in a way that fits within the broader archaeological field.

6.3 Guidelines for Successful Citizen Science Projects

The third sub-question of this research questioned if, based on a comparative analysis of projects, recurring success factors can be identified that together form guidelines for successful citizen science in archaeology. Indeed, the case study analysis shows that projects that were experienced as successful, by both participants, organisers and institutions, shared certain characteristics and preconditions. These findings are in line with existing theoretical frameworks on successful participation, as discussed in Chapter 2.5, and contribute to a more systematic approach to citizen science within the archaeological field. These include:

- Clear communication of expectations and goals
- Mutual respect between volunteers and professionals
- Active guidance and feedback to participants
- The possibility of long-term involvement
- The recognition and use of local knowledge

Clear communication and expectation management

A central recurring element in successful projects is the importance of clear, transparent communication between the organisation and the participants. In Heritage Quest and Waterloo Uncovered, much attention was paid to informing participants in advance about their role, the purpose

of the data and the final outcome of the project. As also emphasised in Schaefer *et al.* and Collins *et al.* (2021, pp. 495-497; 2022, pp. 12-13), this form of expectation management contributes to the motivation and confidence of participants, and prevents disappointment or confusion about the process.

In addition, it appears that feedback is crucial for participants to experience their involvement and commitment as meaningful. As beforementioned in Chapter 2, an essential component is 'summative evaluation', this means reporting results back to the participants and appreciating their contribution (Schaefer et al., 2021, pp. 496-497). Projects that did not regularly check in with participants, and did not report back results, experienced more dropouts and less sustainable involvement (Interviewee 5).

Recognition of participants as co-producers

A second important characteristic of successful projects is the extent to which participants are recognised as full-fledged co-producers of knowledge. In Heel Heerlen Graaft, for example, volunteers were not only used as 'helpers', but their local knowledge was structurally used and their contribution was included in reports and publications. This is in line with Irwin's (1995) concept of scientific citizenship, in which citizens are recognised not just as 'data providers', but as critical partners in the research process.

This also reflects the criticism from Chapter 2.4, in which Suman & Alblas and Wiesman (2023, pp. 4-5; 2019), among others, emphasise that a lack of recognition and hierarchical relationships can have a demotivating effect. In projects where recognition was made explicit, for example through certificates, mention in reports or public presentations, participants felt more connected to the project goal and were prepared to remain involved in the longer term.

Accessibility and low threshold

A third element in the successful guidelines is the low threshold for participation. In projects such as Heritage Quest and Wyldemerck, participation was deliberately kept simple: participation was possible without prior knowledge, from home or within their own region, and participants received short instructional videos or guidance on location. This approach is in line with the principle that citizen science must be accessible to a broad target group, regardless of education level or experience (Vohland et al., 2021, p. 9; Paleco et al., 2021, pp. 261-262).

Moreover, it appears that digital technologies, such as online maps and mobile apps, play an important role in lowering the threshold for participation (Pratz López, 2017, p. 2; Suman & Alblas, 2023, pp. 5-7). Technology not only makes it easier to participate, but also to share real-time results, measure involvement and promote mutual communication between participants. This does not alter the fact that good guidance remains essential, technology is supportive, but not a replacement for human interaction and contextualisation.

Meaningful content and connection with personal motivation

Another recurring pattern in successful projects is the connection with the intrinsic motivation of participants. Designing a project around the specific interests of a group of people, around a locally interested area or around a broader subject that resonates with people can also be an enormous success factor. Motivation of participants comes more naturally when there is already a pre-existing interest, instead of having to make people enthusiastic about a whole new subject, discipline and area all at the same time.

As discussed in Chapter 2.5 and confirmed in the interviews, people participate not only out of interest in archaeology, but also out of a need for meaningful work, social connection and cultural anchoring (Holtorf, 2007, p. 120; Reilly et al., 2018, pp. 30-31; van Londen et al., 2021, pp. 18 & 34). Projects that recognised these needs, such as Waterloo Uncovered, which explicitly focuses on recovery and meaning, managed to retain participants for longer and had a deeper personal impact.

Institutional support and quality assurance

Finally, it appears that successful citizen science initiatives are structurally supported by institutions such as the RCE, municipalities or archaeological companies. As discussed in Chapter 2.4 (Riesch & Potter, 2014, p. 8; Hecker et al., 2018, pp. 190-197), quality assurance is essential, and that requires clear rules, training and cooperation. The projects in which citizens worked under the supervision of certified archaeologists generally met higher standards of data quality and ethics.

The example of the AWN shows how training, certification and cooperation with governments (RCE, 2025, p. 38) can contribute to professional citizen participation. Combining enthusiasm with quality requirements, for example through supervision, protocols and a transparent reporting system, appears to be a workable middle ground between openness and scientific integrity.

Conclusion

The third sub-question, questioning whether there are recognizable success factors for successful citizen science in archaeology, is clearly answered by this study. Successful projects combine clear communication, recognition of participants, accessibility, connection with motivation and institutional support. Together, these factors form guidelines for success that not only promotes the quality of the research, but also strengthens the involvement, sustainability and social relevance of archaeological citizen science.

At the same time, it appears that these success factors do not arise automatically, but are the result of conscious choices in project design, supervision and policy. A structural anchoring of these insights in project planning, training and financing is therefore necessary to make citizen science in archaeology future-proof.

6.4 Challenges and Limitations

As with any qualitative research, this study also revealed several limitations and challenges that affect the scope, interpretation, and applicability of the results. Although this research provides valuable insights into the experiences of participants and project organisers, it is important to consider the influence of methodological choices, cultural context, and substantive limitations of the research design. The reflections below help put the research results into perspective and create room for improvement in future research.

Selective sampling and self-selection of respondents

A fundamental limitation of this study is the fact that all interviewees were already actively involved in citizen science projects and were therefore mostly already interested in archaeology. As also indicated by Londen *et al.* (2021, p. 19), larger audience surveys show that only a small part of the population actively associates archaeology with personal relevance. In the NEARCH study, less than 10% of the general public saw archaeology as something they would actively want to participate in. This is in stark contrast to the high level of involvement of the interviewees in this study, which indicates that the results mainly represent the perspective of an already committed target group.

This self-selection leads to a positive bias in the data: people who are not interested in citizen science or archaeology are not represented, while their absence can also say a lot about the limitations of public

involvement. The question that must therefore be asked is: does the general public want to actively participate in archaeological research? Or do project leaders and institutions want this, but does this wish not match the support or need among citizens?

Expectation bias in interviews

In open interviews, as applied in this study, there is always the risk that respondents unconsciously say what they think the interviewer wants to hear. Holtorf (2007, p. 58) warns that especially lay people, who do not consider themselves part of a scientific community, may tend to exaggerate their interest or expertise out of respect for the interviewer or the subject. Some participants gave very extensive, positive answers, which could partly be explained by social desirability or the desire to give 'good answers'. This may apply to a greater extent to participants than to institutional actors, because they may see themselves as 'outsiders' within the archaeological field.

At the same time, project coordinators may exhibit confirmation bias with regard to their own project. It is human nature to judge the success of an initiative in which one has personally invested more positively than is objectively possible. As was evident in the interviews, organisers are often strongly connected to their project, which makes their assessment more subjective. Although this is not necessarily a problem within qualitative research, as long as this is stated transparently.

Contextual limitations and Eurocentric perspective

This thesis is written from a European and especially Dutch context, in which citizen science is stimulated by policy (see Chapter 2.3) and where legislation and regulations are relatively well developed. Vohland *et al.* (2021, p. 13) emphasise that citizen science is defined and applied in different ways worldwide, depending on cultural, institutional and political contexts. The success factors and challenges that emerge in this study are therefore not universally applicable. In other contexts, for example outside Europe, or in countries with less accessible heritage structures, other definitions, expectations or forms of involvement could be central.

An additional limitation is that there was little room in this thesis to investigate the role of socio-economic or cultural differences among volunteers. The interviewees did not form a representative cross-section of the Dutch population: they were predominantly highly educated, culturally interested participants with sufficient time and resources to voluntarily participate. The social inclusiveness of citizen science has therefore not been fully evaluated.

Limitations in research design and analysis framework

Although the qualitative nature of this research provides insight into experiences and perceptions, there was no triangulation with quantitative data. The impact on, for example, knowledge development, skills or long-term involvement was measured exclusively on the basis of self-reporting. Future research would benefit from a mixed methods approach in which surveys, measurements or observations are combined with interviews to generate more comparable data (see Schaefer et al., 2021).

In addition, this research is limited to four case studies. Although these were deliberately selected for variation in form and target group, they remain individual cases within a much larger field of archaeological citizen projects. As discussed in Chapters 3.3, 3.4 and 3.5, there are numerous other forms of involvement, digital, policy-related, educational, that fall outside the scope of this study.

Discrepancy between discourse and public perception

Finally, there is a clear gap between the institutional discussion on citizen science and the perception of it among the general public. As discussed in Chapters 2 and 3, citizen science is a much-discussed topic in policy documents, academic research and heritage strategies. However, this topic is still relatively unheard of among the general public. Van Londen *et al.* (2021, p. 19) point out that many people still associate archaeology primarily with 'finding treasures' or with passive consumption (like museums), and not with active participation.

This raises important questions that could not be answered within this study: how desirable is participation actually from the perspective of the citizen themselves? Are we, from a policy and scientific perspective, 'imposing' participation on a public that has not asked for it? Or is the problem precisely that the possibilities for participation are still too unknown or invisible? Such questions can only be answered by also involving people who are not yet participating, and that requires broader public research, outside the circle of volunteers already involved.

Conclusion

This study provides valuable insights into the impact of citizen science, but the results must be interpreted within the framework of the before mentioned limitations. The combination of self-selection, cultural bias, expectation pressure and institutional influence colour the results, without necessarily making them less meaningful. By explicitly naming these limitations, space is created for a

more realistic, nuanced and future-oriented discussion about the role of citizen science within archaeology.

6.5 Suggestions for future research

Although this thesis provides valuable insights into the impact of citizen science in archaeology, the research also has a number of defined boundaries that leave opportunities for further research. The following suggestions focus on deepening, broadening and nuancing our knowledge of citizen science, with explicit attention to underexposed perspectives, contexts and methodological approaches.

Research on non-participants and public perceptions

One of the most pressing gaps in this study is the lack of insight into the attitudes of people who do not participate in archaeological citizen science projects. As discussed in Chapter 5.4, the respondents in this study are all already participating in such projects, making their perspectives unrepresentative of the general public. At the same time, audience surveys such as NEARCH (van Londen et al., 2021, p. 19) show that citizens' association with archaeology is largely passive and stereotypical, with only a small proportion seeing themselves as potential participants.

Future research should therefore explicitly ask the question: how does the general public view citizen participation in archaeology? And more importantly: is there a need for participation among citizens at all, and under what conditions? These questions can be investigated through large-scale surveys, focus groups or audience surveys that specifically target people without previous involvement. This allows institutions to better tailor their approaches to needs and expectations of those not yet reached.

Cross-cultural and international comparisons

As Vohland *et al.* (2021, p. 13) state, definitions and practices of citizen science are highly context-specific. This thesis is written from a Dutch/Western European perspective, in which citizen science is stimulated by policy and in which there is a relatively high degree of institutional support. However, in other geographical contexts, other forms of participation, other expectations of citizens, and other institutional challenges may play a role.

A valuable next step is therefore a comparative, international study of citizen science in archaeology, in which projects from various cultural, political, and economic contexts are analysed. Such research can provide insight into how universal or context-specific the identified success factors really are. For example: are recognition and feedback equally important everywhere, or do these expectations vary culturally?

Research into power relations and hierarchy within projects

In this thesis, limited attention has been paid to the power relationship between professional archaeologists and citizen participants. As discussed by Collins *et al.* (2022, pp. 12-13), there is a risk of a 'top-down' approach within citizen science, in which citizens are mainly given executive tasks without substantive influence or recognition. Although some projects in this study consciously aimed for equality, the question remains how widely this principle is supported within the field.

Follow-up research could therefore focus on the question: to what extent do participants experience real co-determination within archaeological citizen science projects? And how do professionals deal with control, ownership and openness? Methods such as participatory observation or co-creative research with participants as co-researchers can provide valuable insights.

Quality and reliability of citizen data

Although this thesis found that projects use different mechanisms to ensure data quality (see Chapter 5 and RCE, 2025, pp. 25, 38, 51), little empirical research has been done on the scientific reliability of citizen-collected data. Are the data accurate, reproducible and usable for peer-reviewed publications? And under what conditions is this the case?

A logical follow-up study could perform quantitative evaluations of datasets from citizen science projects, and compare them with professionally collected data. Validation methods such as double coding, expert review or AI-supported quality control could also be further developed and tested. This knowledge could be crucial to strengthen trust in citizen science within the academic community. However, in these evaluations it should also be noted that professionals are also not always correct, in any qualitative or subjective research there is a risk of unreliable data, even when sourced by professionals.

Participation from diverse and marginalized groups

Finally, this study did not conduct an in-depth analysis of who does not participate in citizen science and why. Almost all interviewed participants came from relatively similar socio-demographic groups (highly educated, culturally interested, sufficient free time). This leaves the question to which extent projects actually are inclusive.

Future research could focus on the barriers that people from marginalized or underrepresented groups experience when participating in archaeological research. This ties in with the broader international discussion on inclusion and 'equity' within citizen science (Giardullo, 2023, p. 2). Research could look at language barriers, physical accessibility, technological thresholds, and cultural recognition of the subject and approach. At the same time, it is worth critically examining whether reaching these groups should always be a goal: is broader diversity a necessary condition for success, or can citizen science also be meaningful when it focuses on deepening engagement within already interested communities? Future research could therefore also explore whether the inclusion of marginalized groups is always desirable or essential in every context.

Conclusion

Future research on citizen science in archaeology can build on this thesis by broadening the perspectives, deepening the effects, and diversifying the context. By paying more attention to non-participants, inclusion, power relations, and data quality, a more complete picture of the possibilities and limits of citizen science will become clearer. Only through this broadening can citizen science develop into a truly sustainable, democratic, and scientifically valuable part of archaeological research.

Chapter 7. Conclusion

7.1 Summary of Findings

This thesis investigated the impact of citizen science in archaeology, with special attention to the benefits for participants, the contributions to archaeological research and the identification of success factors within Dutch projects. Through a literature study, four case studies and semi-structured interviews with both participants and project leaders, a detailed picture was sketched of how citizen science functions in archaeology.

The results show that citizen science generates a wide range of positive effects, both at the individual and institutional level. For participants, it offers involvement, knowledge, purpose, social connection and a stronger sense of connection with heritage. For archaeology, it increases the scope of research, enriches data collection with local knowledge and increases social support. At the same time, there are important challenges in the field of inclusivity, scientific anchoring and institutional recognition.

7.2 Answering Sub-questions

What is the impact of citizen science for participants?

The impact for participants is multifaceted. As discussed in detail in Chapter 6.1, participants not only experience educational gains (such as learning archaeological methods and acquiring historical knowledge), but also emotional and social benefits. Citizen scientists and find satisfaction in contributing to scientific research, experience a stronger connection to their surroundings, and an increased sense of ownership over their heritage. Projects like Waterloo Uncovered even demonstrate that participation can have therapeutic effects.

How does citizen science impact archaeological research, projects and policy making?

Citizen science contributes to the archaeological field by increasing the scope of research, using local knowledge, strengthening public support and diversifying perspectives (see Chapter 6.2). Projects such as Heritage Quest prove that citizen participation makes large-scale data analysis possible. At the same time, it is important that quality is guaranteed, for example through guidelines such as those drawn up by the RCE. Participation also contributes to renewed public awareness of the importance of archaeology, something that is crucial for legitimacy and financing.

What are the guidelines for successful citizen science in archaeology?

In Chapter 6.3 it became clear that successful projects share five reoccurring characteristics: clear communication, recognition of participants, accessibility, connection with personal motivation, and institutional anchoring. Projects that managed to combine these aspects, such as Heel Heerlen Graaft, were more effective in retaining participants, achieving impact and safeguarding research results.

7.3 Answering the Main Research Question

What is the impact of citizen science on both participants and archaeological research?

The impact of citizen science in archaeology is significant and two-sided. For citizen scientists, it leads to active heritage participation, emotional involvement, knowledge development and social cohesion. For the field of archaeology, it provides broader social involvement, more data, additional knowledge sources and an overall increased legitimacy and appreciation of the discipline. If properly guided, secured and recognised, citizen science can function as a bridge between science and society, with both parties making substantial progress.

7.4 Implications for Archaeological Research

The implications of these results are profound. Citizen science can no longer be considered a side issue within archaeological research. The benefits, if well organised, transcend the original goals of education or public outreach and can become the core of scientific progress and societal support within archaeology. However, this requires a shift in mindset among institutions and archaeologists. Projects should not view participation as an additional task or burden, but as a structural part of their research strategy.

In addition, institutional support is essential. As discussed in Chapter 2.3, the policies of organisations such as the RCE play a central role in enabling and guiding participation. Integrating citizen science into PvEs, municipal policies and subsidy programmes can ensure sustainable embedding in archaeological practice.

7.5 Recommendations for Future Citizen Science Projects

Several recommendations can be made for future citizen science initiatives in archaeology, based on the research in this thesis. First, citizen science initiatives need to be clear about roles and expectations.

Clear communication about responsibilities, goals, expected results and subsequent analysis prevents confusion and increases the involvement of participants. In addition, recognition is of great importance. Participants want to know what happens with their contribution and deserve explicit appreciation. Furthermore, projects should be inclusive and accessible, by using various recruitment methods and tailoring to the needs and wishes of different target groups. In order to guarantee the scientific value of the obtained data, it is necessary to work with clear guidelines, guidance and validation. At the same time, the intrinsic motivation of participants must be linked to project designs, people want to contribute with a purpose (scientifically, socially or personally) and look for personal involvement and connection from organisers. Regular evaluation, both formative and summative, contributes to improving the sustainability of initiatives. Finally, it is important to continuously strive for mutual benefit. Volunteers should not be approached as vehicles to support research, but as full partners.

Abstract

This thesis examines the impact of citizen science in archaeology, with a specific focus on the Dutch context. By means of a comparative case study analysis of four diverse archaeological projects, it is investigated what citizen science contributes to both the participants and to archaeological research and policy. The case studies concern the projects Heritage Quest, Heel Heerlen Graaft, Wyldemerck and Waterloo Uncovered, each of which represents a different type of participation and archaeological context. The central research question is: What is the impact of citizen science on both participants and archaeological research?

Based on literature research, policy analysis and eighteen semi-structured interviews with stakeholders, including volunteers, project leaders and policy makers, this study provides an in-depth insight into the experiences, challenges and success factors of Dutch archaeological citizen science initiatives. The results show that participation in citizen science strengthens the knowledge, involvement and well-being of participants, while at the same time increasing data collection, social relevance and support for archaeology.

In addition to mapping these effects, this thesis also identifies structural bottlenecks such as regulations, financing and time investment. By means of a cross-case analysis, guidelines for successful citizen science in archaeology are sought. The thesis concludes with practical recommendations for future policy and project design, and includes guidelines for developing participatory archaeological projects: successful citizen science in archaeology requires clear communication, mutual trust, accessible participation, recognition of contributions and a good balance between scientific and societal goals.

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Appendices

This appendix contains the supplementary materials that are part of this thesis. These include the full sets of interview questions and consent form. Fully transcribed interviews are not included in these appendices, but can be requested through the author.

Appendix A. Interview Questions

Participant questions:

1. Who are you (age, job, education)?
2. What project were you apart of?
3. What motivated you to join this citizen science project?

Impact:

4. Did your understanding or knowledge about archaeology change through your participation in this project?
5. Did your perspective on archaeology or science change through your participation in this project? If so, how?
6. In what ways do you think your participation has impacted archaeological research?
7. In what ways do you think your participation has impacted the overall success of the project?
8. What impact has this project had on you? What has it brought you?
9. What skills or experiences have you gained through your participation?
10. What social aspects were present in this project? Did you feel a sense of belonging or community?

Suggestions for improvement:

11. In your opinion, was this project successful? If so, in what ways?
12. Did you face any challenges or obstacles during your participation? If so, what were they?
13. What can be improved on this project?
14. Would you participate in similar projects in the future? If so, what would encourage you to do so?

Project Coordinator/Archaeological Researcher questions:

1. Who are you (age, job, education)?
2. What project were you apart of, and what was your role?
3. What motivated you to organise/manage/be involved in this citizen science project?

Impact:

4. What was the role of citizen scientists in this archaeological project?
5. How did participants' contributions affect the direction or outcomes of your research?
6. Were there specific examples of how citizen scientists improved the project on scientific and/or social levels?

Project design and management:

7. How do you recruit (and train) citizen scientists for this project?

8. What strategies, tools, or methods did you use to keep participants engaged and improve research outcomes?
9. What challenges or obstacles have you encountered when integrating citizen science into your research? How have you addressed these challenges?

Evaluation and best practices:

10. What impact has this project had on you personally and professionally?
11. Are there reoccurring factors that have contributed to the failure or success of citizen science initiatives?
12. What role do funding and policy have in enabling successful citizen science projects?

Suggestions for improvement:

13. In your opinion, was this project successful? If so, in what ways?
14. What can be improved on this project?
15. Would you organise similar projects in the future? If so, what would encourage you to do so?

Overarching Institution questions:

1. Who are you (age, job, education)?

Policy and support:

2. How does your institution fund or support archaeological citizen science initiatives?
3. What are the main goals, priorities and motivations for involving citizens in archaeological projects from your institution?
4. How do citizen science projects align with broader cultural heritage policies?

Evaluation and impact:

5. In what ways do citizen science initiatives impact resource allocation or policy-making for archaeological research?

Collaboration and scalability:

6. How does your institution work together with local communities, coordinators and researchers to implement citizen science into archaeological projects?
7. Can you give examples of citizen science initiatives that have impacted your institution's goals or work?

Future directions:

8. What aspects do you think are crucial for sustaining successful citizen science initiatives?
9. Would you, as an institution, consider collaborating with future citizen science projects? And if so, in what ways?
10. How can your institution aid in more impactful citizen science results?

Appendix B. Consent Form

Consent form

For the Master thesis on Citizen Science in archaeology, it is necessary to use your personal data. To use this data during research I need your consent.

You will be contributing to a Master Thesis from the Faculty of Archaeology at Leiden University. The author of this thesis is Mylou van Westerveld, a second year master student in Heritage and Museum Studies. Who's research is supervised by Dr. Q.P.J. Bourgeois & Dr. G. Aktürk Hauser.

The thesis aims to answer the following research question: 'What is the impact of citizen science on both the participants and archaeological research?'. Your input will be crucial in answering this question, so the author is grateful for everything you want to share!

What data are being used?

You will be asked a fixed set of questions. The goal of these questions is to get a clear view of your opinions, ideas and perspectives on citizen science (in archaeology). These questions will be about the concept of citizen science, your role in corresponding projects or the research field and your perspectives on the future of citizen science.

The interviews will be fully transcribed and translated into English for the analysis. The transcripts will not be published but will be included in the appendix of the thesis and can be requested through the author.

The excerpts from the interviews will be used in the thesis, but interviewees will be anonymized.

What will be done with my data?

Your data will be stripped of your name and other clearly identifiable information. You will be numbered as interviewee 1, interviewee 2, and so on. To give a bit of context to each interview, an interviewee profile will be established in the thesis. This profile will include your initials, gender, and role (participant, archaeologist, project leader, researcher etc.), projects you have been involved in, the number of interviews, the interview date(s) and duration of the interviews.

If you agree to further use of your personal data for other research, please indicate this below. Should there be any specific research in the field of citizen science, your data could be used for this research as well if you consent. If your data is to be used for further research you will receive a notification with the possibility to withdraw your consent.

What happens if I change my mind?

If you change your mind, you can send an e-mail to s2899787@vuw.leidenuniv.nl with a short message indicating that you want your personal data to be removed. Your name can be permanently deleted from the collected data. Any other information that can be traced back to you can also be permanently deleted.

Please fill in the box that is applicable.

- ☐ I consent to any use of the information collected about me.
- ☐ I consent to the use of my information in the interviewee profile.
- ☐ I consent to the use of the information collected about me for this research project, but not for further research.
- ☐ I consent to the use of the information collected about me for this research project, as well as for further research in the field of citizen science.
- ☐ I consent that the author of this thesis can publish the research (you will be notified).
- ☐ In case of a Dutch interview, I consent to translating the interview into English.

Name:

Date:

Location:

Signature:

_____