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Bachelor Thesis

Empowering Urban Development: The Role of Citizen Science in Gender-Sensitive Urban Planning in Münster

How can we effectively employ citizen science methods to collect gender-sensitive data to promote gender-sensitive urban planning in Münster

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Abstract

This thesis investigates how citizen science can facilitate gender-sensitive urban planning in Münster, Germany. Despite the city's efforts towards gender equality, women's perspectives remain underrepresented in urban development processes. The research employs a qualitative methodology with a case study design, focusing on two citizen science initiatives aimed at urban development in Münster: "Gemeinwohlbarometer Hansaviertel" and "Community-Forscher*innen Berg Fidel." Semi-structured interviews were conducted with the initiators of these projects and the senior project manager of the Citizen Science Department at the University of Münster. The study aims to determine if citizen science methods can effectively include women's perspectives in urban planning decisions and assess whether this approach can serve as an effective participatory planning method that reflects women's needs. Additionally, the research explores the potential benefits of citizen science, an emerging and EU-promoted approach, for the inclusion of diverse target groups. The findings are expected to provide insights into how citizen science can contribute to more diverse, inclusive, and sustainable urban planning in European cities.

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1. Introduction

In 2024, gender disparities remain a critical issue, especially in urban planning, where women's unique needs and perspectives are frequently overlooked. When urban planning neglects women's needs, it creates a multitude of significant issues that impact their daily lives. Firstly, safety concerns are paramount. It is well-documented that many women experience sexual violence and harassment in urban public spaces and transportation systems (Ceccato & Loukaitou-Sideris, 2020). This often makes certain routes unavailable or unsafe for them after dark, leading to increased difficulty and stress in journey planning. Women rely more heavily on public transportation due to lower rates of car ownership and the necessity of combining professional responsibilities with unpaid care work (Ortiz Escalante & Gutiérrez Valdivia, 2015; Sivak, 2013). However, public transport systems are typically designed along inflexible trunk lines and schedules, failing to accommodate the complex travel needs of working mothers who run multiple errands throughout the day (Pojani et al., 2017).

Walking as a form of transport presents additional difficulties. Urban infrastructure issues such as tall curbs, missing sidewalks, poorly lit alleys, and short pedestrian signal times disadvantage young parents, primarily women, who need to push prams. Toilets and sanitation facilities, often inadequate for women's needs or failing to cater to caring responsibilities, add another layer of difficult (Beebeejaun, 2017). These issues underscore the pressing need for gender-sensitive urban planning. Despite women constituting half of any city's population, urban planning and design often prioritize the needs and preferences of men, perpetuating historical biases in contemporary urban landscapes. These disparities arise due to a knowledge gap, commonly referred to as the data gender gap, within urban planning. This gap stems from the underrepresentation and undervaluation of women's experiences and perspectives in data collection and decision-making processes, leading to the prioritization of men's needs and preferences in urban design and planning initiatives (Criado-Perez, 2020). Modern urban planning has shown the extent to which this gap has influenced existing patriarchal structures and perpetuated cycles of inequality for women in cities worldwide (UN Habitat, 2012).

The implementation of EU gender mainstreaming laws, as outlined in the Treaty on the Functioning of the European Union (TFEU), necessitates the collection of gender-disaggregated data (Shreeves & Hahnkamper-Vandenbulcke, 2021).

However, the practical execution of this mandate through local governance often results in data collection methods that offer a more objective rather than subjective view of the use and access of

public spaces (Damyanovic & Zibell, 2013). This approach, while meeting regulatory requirements, may overlook the nuanced needs of women in urban planning. While cities like Münster in Germany may implement gender monitoring, as outlined by the gender mainstreaming laws of the EU, they often fall short in comprehensively capturing the realities of women's experiences in urban settings. Münster grapples with ongoing obstacles in ensuring urban planning that considers gender sensitivity, especially when it comes to collecting data inclusively. Chosen as the focus of this study, Münster offers an interesting setting because, despite the commitment to collect gender-disaggregated data there remains a notable research gap concerning the application of participatory approaches in gender-sensitive urban planning.

Public transportation in Münster faces significant challenges, particularly affecting women who rely on it more frequently than men. Due to ongoing personnel issues, the public transportation system in Münster struggles to meet demand (Hoffmann, 2023). This is leading to difficulties for women trying to reach their workplaces and commute freely. Moreover, the limited space for strollers on buses poses additional hurdles, further complicating the daily commute for women, especially those with young children. As such, there is a pressing need to actively involve women in urban planning processes, ensuring their perspectives and experiences are fully integrated into decision-making frameworks.

A new innovative approach to involve citizens in urban development involves collaborative efforts between researchers and the public, utilizing local knowledge to address research questions that traditional methods may overlook (Vohland et al., 2021). Citizen science, defined as the active participation of non-professionals in scientific research, has gained prominence for its potential to democratize knowledge production and enhance scientific outcomes (Bonney et al., 2014; West & Pateman, 2016). By integrating citizen science methodologies with gender-sensitive approaches, this research seeks to elucidate how participatory data collection and community engagement can inform more equitable and inclusive urban planning practices.

Münster has been at the forefront of advancing citizen science methodologies, particularly through the initiatives spearheaded by the University of Münster. These efforts provide a rich backdrop for examining how citizen science can effectively contribute to urban planning processes, especially in promoting inclusivity and addressing gender-specific needs.

Specifically, the research question is: "How can we effectively employ citizen science methods to collect gender-sensitive data to promote gender-sensitive urban planning in Münster?" To address this overarching question, the thesis is guided by the following sub-questions:

1. Sub-question: How does citizen science enhance data collection methods for urban planning in Münster?
2. Sub-question: In what ways do citizen science methods facilitate the inclusion of diverse target groups in urban planning initiatives in Münster?
3. Sub-question: What are the advantages of using citizen science specifically to collect data from women in urban planning projects in Münster?
4. Sub-question: In what ways can citizen science influence political decision-making processes in urban planning in Münster?

This research employs a multi-faceted approach to investigate how citizen science can contribute to a more equitable urban environment in Münster. Initially, a literature review defines key concepts such as citizen science, its application in urban planning, gender-sensitive urban planning, and feminist urban planning approaches. This theoretical framework sets the stage for an in-depth case study of Münster, highlighting gender-sensitive urban planning measures and citizen science initiatives like the "Gemeinwohlbarometer Hansaviertel" and "Community*forscherinnen Berg Fidel."

Semi-structured interviews with key stakeholders involved in these initiatives are conducted to explore how citizen science can enhance data collection methods, providing more detailed and inclusive information than traditional approaches. The interviews also examine how these methods facilitate the inclusion of diverse target groups, ensuring urban planning initiatives reflect the needs of the entire community. Additionally, the study focuses on the specific advantages of using citizen science to collect data from women, addressing gender-specific challenges in urban planning, and explores how citizen science can influence political decision-making, democratizing the process for more transparent, accountable, and community-oriented policies. The research also highlights the limitations and challenges encountered when using the citizen science approach.

The data collected from the interviews are systematically coded and analyzed to identify themes related to inclusivity, advantages and challenges, and political influence in urban planning. This comprehensive methodology ensures a thorough exploration of how citizen science can promote gender-sensitive urban planning in Münster.

2. Theory

This section will discuss the existing concepts and theories relevant to the topic of citizen science and gender-sensitive urban planning, articulating how these foundations will inform the research question. The aim is to outline the theoretical framework necessary for comprehending the dynamics of citizen science and its intersection with gender-sensitive urban planning. By examining these frameworks, the theory will establish a coherent foundation that will guide the exploration and analysis of research questions in subsequent sections.

2.1. Literature review

At the intersection of citizen science and urban planning lies the concept of gender-sensitive urban planning, which seeks to address historical biases in urban design that have marginalized women's needs(Fainstein & Servon, 2005; Greed, 2005). This approach recognizes that urban environments, traditionally planned by and for men, often fail to consider the diverse needs and experiences of women, resulting in inequitable access to public spaces and services (Criado-Perez, 2020; Moser & Peake, 1994).

Theoretical frameworks such as feminist urbanism and participatory action research provide insights through which to explore how citizen science can be leveraged to advance gender-sensitive urban planning. These frameworks emphasize the importance of inclusive decision-making processes that empower marginalized communities, including women, in shaping their urban environments(Beall, 1996; Kabeer, 2005).

2.1.1. Citizen Science

By 2012, citizen science achieved global recognition, highlighted by increased publications, projects, and funding. Networks of practitioners, such as the European Citizen Science Association (ECSA), were established in Austria, Germany, and Spain to support these initiatives. ECSA, founded to enhance the understanding and practice of citizen science, published the "Ten Principles of Citizen Science" in 2015. These principles emphasize active citizen involvement, genuine scientific outcomes, mutual benefits, transparency, ethical considerations, and open data sharing. They also advocate for evaluating projects based on scientific output, data quality, participant experience, and societal impacts, guiding the integrity and effectiveness of citizen science across Europe (Gold, 2022).

In Germany, citizen science is integral to public participation and aligns with various governmental strategies. The Federal Government's coalition agreement acknowledges its importance in

incorporating civil society perspectives into research. The White Book on Citizen Science Strategy for Germany 2030 outlines a vision for promoting inclusivity, ensuring data quality, and fostering interdisciplinary collaboration. This strategy aims to leverage digital technologies and cultivate a culture of open science, positioning citizen science as central to research and social change (Bonn et al., 2021).

German universities have integrated citizen science into their Third Mission, establishing funding lines, interfaces, and dedicated positions. The University of Jena introduced the first citizen science professorship, while universities like Düsseldorf, Münster, and TU Berlin have created strategic networks to support this research approach. Consequently, citizen science's reputation has significantly improved, with growing acceptance and promotion as a viable research method (Bonn et al., 2021).

Citizen science enables the collection of large-scale, innovative datasets, often leveraging local knowledge and community engagement to gather data that might otherwise be unattainable due to financial or logistical constraints (Bonney et al., 2014). By integrating insights and queries from the public, new research questions can emerge, aligning scientific endeavors more closely with societal needs and expectations, thus fostering a more socially oriented science (West & Pateman, 2016).

Citizen science plays a critical role in advancing concepts such as open science, responsible research, and innovation (RRI), and transformative science. For society, it offers numerous benefits: participants can enhance their knowledge, contribute specific skills, and gain an understanding of scientific methods and processes. This engagement not only broadens scientific literacy but also promotes public trust in scientific knowledge and fosters a positive attitude towards science (Vohland et al., 2021). Furthermore, citizen science empowers individuals to address relevant questions and apply their acquired skills in various contexts, contributing to community-driven solutions and innovations (West & Pateman, 2016).

Distinct from traditional research, citizen science actively involves citizens in various phases of the research process, from developing research strategies and collecting data to evaluating results and communicating findings (Vohland et al., 2021). This participatory approach spans a spectrum of collaborations, from independently initiated projects to those guided by scientific institutions. The rise of open scientific approaches, exemplified by platforms like Wikipedia, has established citizen science as a vital component of contemporary knowledge generation and dissemination. It represents a shift towards an increasingly open and inclusive model of science, where research,

teaching, and knowledge transfer are interconnected, and data collection and analysis are accessible to the broader public.

2.1.2. Citizen Science in Urban Planning

Citizen science, particularly within the realm of social sciences holds significant potential for transforming urban planning (Vohland et al., 2021). This approach builds on participatory action research and knowledge co-production traditions, using social science tools and concepts to achieve scientific rigor while ensuring inclusivity in knowledge production, making it a powerful tool for urban planning (Dörler et al., 2021).

Engaging citizens in urban planning through this approach offers numerous benefits. One of the key advantages is the opportunity for social interactions among volunteers, facilitated through social forums, chat functionalities in project applications, and organized events like field activities for group data collection (Lotfian et al., 2021). These interactions can foster a sense of community and purpose among participants (Vohland et al., 2021).

The integration of citizen science in urban planning can lead to better understanding and relationship with urban environments. Research highlights that cities can significantly benefit from implementing these strategies, which can result in an enhanced quality of life (Craglia & Granell, 2014; Mueller et al., 2012).

Furthermore, citizen science offers significant economic benefits to urban planning. By involving volunteers in the data collection process, municipalities can reduce the costs associated with hiring professional researchers and surveyors (Conrad & Hilchey, 2011). This cost-effective approach allows for more extensive data collection, leading to more informed and effective urban planning decisions (Bonn et al., 2021).

Additionally, the diverse nature of cities means that urban-based citizen science projects can attract participants from a wide range of cultural, social, and demographic backgrounds (Roger & Motion, 2022). This diversity can enhance the quality of scientific research, as increasing the diversity of people involved in science has been shown to improve the quality of scientific outcomes (Brouwer & Hessels, 2019; Palacin et al., 2020).

2.1.3. Gender-sensitive Urban Planning

Urban planning has historically overlooked the needs and experiences of women, leading to gender-biased urban environments.

A study by the University of New South Wales analyzed urban design and found that only a small fraction of parks and public spaces are designed with women's safety and comfort in mind. The research highlighted issues such as inadequate lighting, poor visibility, and limited facilities, which deter women from using these spaces and contribute to a sense of insecurity (Whitzman, 2013).
This disparity reflects broader issues highlighted by Criado Perez in "Invisible Women: Data Bias in a World Designed for Men," where she argues that "gender-biased urban design affects women's mobility and opportunities, such as the seats and routes and timetables in public transportation, public toilets, urban furniture, or disregarded limited childcare facilities."(Criado-Perez, 2020, p. 43)

The history of gender in modern urban planning is rooted in a legacy of male-dominated design and decision-making, which has often marginalized women's needs and reinforced patriarchal norms. Historically, European cities were designed by men in fields such as civil engineering and architecture, which led to urban environments that reflected and perpetuated gender biases (Greed, 2005). The shift during the European Industrial Revolution, where productive work moved from homes to factories, further entrenched gendered divisions as urban planning aimed to address public health issues in overcrowded slums (Zuijderwijk, 2014).
Throughout the late 19th and early 20th centuries, urban planning in Europe and the US was characterized by racial, ethnic, and gender segregation, influenced by colonialism and policies like Jim Crow laws (Njoh, 2007). Cities were designed with the able-bodied, working male as the "neutral" user, which marginalized women by prioritizing male mobility and public access, while relegating women to the private sphere of the home(Fainstein & Servon, 2005; Moser & Peake, 1994). These gendered norms, imposed through colonization, often replaced diverse practices like collective land ownership and matrilineal inheritance in various cultures (Guyo, 2017).
This male-centric urban design persisted until the 1970s when feminist scholars began to highlight the exclusion of women's needs in planning and design. Researchers such as Dolores Hayden, Gerda Werkerle, and Gwendoline Wright documented gender inequities in urban environments, focusing on issues like mobility, safety, and access to resources.

Despite some progress in addressing gender biases in the built environment over the past thirty years, significant challenges remain.
The fields of urban planning and design are still predominantly male-dominated, reflecting a narrow perspective on urban spaces. Women hold only 10% of the highest-ranking positions at

leading global architecture firms(Carpio-Pinedo et al., 2019) (Fairs, 2017). Moreover, women make up only 20% of engineering graduates, with nearly 40% either leaving or never entering the profession (World Bank Group, 2020).

Women, girls, and sexual and gender minorities of all ages and abilities are frequently excluded from community planning and design processes. This exclusion is due to various factors, including economic pressures, social norms, and deficiencies in the urban environment. As Moser (1994) notes, “because of the way that women are so effectively excluded from real decision-making, they often choose to withdraw rather than participate in planning processes.”

This persistent underrepresentation results in women, girls, and sexual and gender minorities struggling to have their voices heard and priorities considered in planning and design decisions globally. The historical and ongoing bias in who makes these decisions has profound and far-reaching impacts on nearly every aspect of daily life.

In response to the historical exclusion of women and gender minorities in urban planning, the European Union has implemented gender mainstreaming (GM), a strategy aimed at integrating a gender perspective into all policies and programs to promote equality (Carpio-Pinedo et al., 2019). This approach involves the collection of gender-disaggregated data to better understand how policies impact different genders, ensuring that the needs and experiences of women and men are considered in decision-making processes. However, despite these efforts and the legal provisions put in place, GM has encountered significant barriers at the policy design and implementation stages (Zibell et al., 2020). As Horelli states, "the planning of public services and urban space ignores the local level where they will actually be used" (Horelli, 2017).This lack of tools to highlight women's needs to decision-makers, practitioners, technicians, and the local community hampers progress. The voices and concerns of women are often overlooked, resulting in urban plans that fail to adequately support those who combine care work and professional responsibilities—mainly women (Zibell et al., 2020). Consequently, the progress towards gender equality in urban planning remains slow and not as transformative as intended, with many women's perspectives and needs still inadequately addressed (Damyanovic & Zibell, 2013).

To address these gaps, it is crucial to amplify women's voices in urban planning, ensuring that more inclusive, diverse, and equitable perspectives are recognized and integrated into the design and development of urban spaces. Women continue to advocate for their needs, such as safer public

transportation options, well-lit streets and public areas to enhance safety, accessible childcare facilities, and infrastructure that supports both their professional and caregiving roles.
This need for greater inclusivity and recognition forms the foundation of feminist urban planning, which is explored in the following section.

2.1.4. Approaches to Feminist Urban Planning

Feminist urbanism is a critical theoretical framework within urban studies that challenges traditional urban planning practices by centering on gender as a fundamental category of analysis. Emerging from feminist critiques of the male-dominated urban planning disciplines, feminist urbanism seeks to uncover and address the gender biases embedded in urban spaces and processes (Haas & Mehaffy, 2024). It emphasizes the lived experiences of women and other marginalized groups in shaping urban environments, advocating for inclusive planning approaches that acknowledge diverse needs and realities. Key principles include promoting safety and accessibility in public spaces, recognizing caregiving responsibilities, and fostering community participation in decision-making processes (Haas & Mehaffy, 2024). By integrating feminist perspectives into urban planning, feminist urbanism aims to create cities that are more equitable, responsive, and conducive to the well-being of all residents, challenging traditional notions of urban development that prioritize economic efficiency over social justice and human rights (Haas, 2023).

Understanding women as experts about their local environments is crucial for effective urban planning. Participatory methods in gender-sensitive urban planning empower organized groups and individuals within cities to articulate their interests, negotiate changes, and transform urban life (Beall, 1996). These methods should be gender-transformative, addressing women's needs according to their realities without limiting them to traditional care roles or reinforcing gender stereotypes (Kabeer, 2005).
Adopting an intersectional perspective highlights how different structural sources of inequality, such as gender, ethnicity, class, and sexual identity, intersect and are socially constructed. Women’s identities intersect with other social identities, and their caregiving roles often give them unique insights into the needs of children, the elderly, youth, and people with disabilities (Molyneux, 1985). Furthermore, local geography, climate, land use, and planning traditions condition how women's context-specific gender interests and needs are addressed (Ortiz Escalante & Gutiérrez Valdivia, 2015).

To gather these insights, a variety of participatory methods can be employed, such as awareness workshops, exploratory walks, neighborhood photovoice, everyday log itineraries, community mapping, and safety audit walks. These tools, adaptable to specific contexts, ensure that urban planning decisions are better informed by the lived experiences of women and diverse community members. This approach is essential for making urban planning more inclusive, progressive, and reflective of all citizens' needs and realities (Damyanovic & Zibell, 2013).

Altogether, this chapter has delved into the foundational concepts of citizen science and gender-sensitive urban planning, highlighting their potential synergies in promoting more inclusive and equitable urban environments. By synthesizing insights from the literature, it becomes evident that citizen science offers a transformative approach to urban planning, enabling the active participation of diverse communities, including women and gender minorities, in decision-making processes. The theoretical framework developed here underscores the importance of integrating participatory research methodologies with feminist urbanism principles to address historical gender biases in urban design (Criado-Perez, 2020).

Citizen science ensures that urban areas are created to reflect the realities of all users, not just a chosen few, by giving locals a voice in their needs and preferences using techniques like participatory mapping, photovoice, and community-led surveys.

A participatory approach aligns well with gender-inclusive planning, as it directly involves women in the research and decision-making stages. Women, as experts on their own environments, can provide invaluable insights into the challenges they face and the improvements they need. By incorporating their perspectives, citizen science has the potential to create urban plans that support safer, more accessible, and more equitable spaces for everyone.

This qualitative research aims to uncover empirical evidence that demonstrates how citizen science can empower marginalized groups to articulate their spatial needs and priorities, ultimately influencing policy and planning outcomes. By leveraging citizen science as a tool for social change, this study aims to contribute to the advancement of gender-sensitive urban planning practices that foster more inclusive and responsive cities for all residents.

3. Methodology

The aim of this chapter is to outline the systematic approach employed in this research to investigate the dynamics and impacts of citizen science in reaching marginalized opinions in urban development. By detailing the case description, data collection methods, and data analysis techniques, this structured methodology ensures the reliability of the results, facilitating a thorough examination of the research questions.

3.1. Case Study on Citizen Science Initiatives for Urban Planning

The objective of this thesis is to explore the integration of citizen science methods in urban planning and the potential of including the perspectives of women through the collection of gender-sensitive data within the context of Münster, focusing on the initiatives "Gemeinwohlbarometer Hansaviertel" and "Community-Forscher*innen Berg Fidel."

3.1.1. Research Design: Case Study

To comprehend the role and effectiveness of citizen science in urban planning, an in-depth case study approach was adopted.

Currently, no case studies have been conducted that explore the potential of urban planning citizen science initiatives in including women's perspectives in urban development strategies. This research aims to close this gap, highlighting the diverse advantages of incorporating gender-sensitive approaches in citizen science research.

A case study is a qualitative research method that explores a particular phenomenon within its real-life context, providing a detailed and nuanced analysis (Yin, 2014). This approach is particularly well-suited for this research as it allows for an in-depth exploration of complex social phenomena within their specific contexts, offering rich insights into the dynamics and impacts of the initiatives being studied (George & Bennett, 2005).

A case study design is advantageous, because it facilitates a comprehensive examination of the processes, outcomes, and contributions of the citizen science initiatives in Münster, capturing the intricacies of how these projects operate and influence urban planning. It allows for the integration of multiple data collection methods, providing a robust and triangulated understanding of the phenomena.

3.1.2. Case Selection: Gemeinwohlbarometer Hansaviertel and Community-Forscher*innen Berg Fidel in Münster

Münster was chosen as the case study location due to its progressive commitment to sustainable urban development, alongside its efforts to implement gender equality in urban planning. Additionally, The University of Münster has been at the forefront of advancing citizen science methodologies. These efforts provide an enriching background for examining how citizen science can effectively contribute to urban planning processes, especially in promoting inclusivity and addressing gender-specific needs.

Conducting case studies on two initiatives that were awarded a citizen science prize from the University of Münster offers insights into the practical application of citizen science for different target groups. The cases of "Gemeinwohlbarometer Hansaviertel" and "Community-Forscher*innen Berg Fidel" were selected due to their innovative approaches to incorporating citizen science in urban planning. These initiatives represent significant efforts in Münster to engage local communities in the planning process, emphasizing participatory research methods. Both initiatives align with broader goals of urban sustainability and community empowerment, making them exemplary cases for studying the impact of citizen science in urban planning.

3.2. Data Collection

The data collection for this study comprises both secondary (textual) and primary data. The textual data includes publications and reports on citizen science initiatives focused on urban development in Münster, particularly those produced by the University of Münster and related projects. To supplement this secondary data, primary data was gathered through semi-structured interviews with key stakeholders involved in the selected citizen science initiatives, the "Gemeinwohlbarometer Hansaviertel" and "Community-Forscher*innen Berg Fidel." These interviews provided firsthand insights into the implementation and impact of these projects, enriching the overall analysis.

3.2.1. Selection of Relevant Literature

The selection of literature was conducted in two main phases. First, literature relevant to the theoretical framework of the study was gathered to inform the section on theory. This included academic articles, books, and reports on citizen science, gender-sensitive urban planning, and the intersection of these fields. The search terms used included “women in urban planning,” “citizen science,” “gender-sensitive urban planning,” “citizen science for urban planning,” “women in

citizen science," and "citizen science in Germany." These searches were conducted primarily through Google Scholar, relevant databases, and library systems of the University of Münster.

Second, literature specific to the background of the case studies was collected. It encompassed the implementation of gender equality measures for urban planning in Münster and the advancements of citizen science at the University of Münster. This literature played an important role in informing the case study analysis, encompassing documents, websites, and publications from both the "Stadt Münster" and the University of Münster.

Additionally, the University of Münster provided access to documents about the selected initiatives, such as project reports, institutional publications, and documentation from the "Gemeinwohlbarometer Hansaviertel" and "Community-Forscher*innen Berg Fidel" projects. These sources offered detailed insights into the objectives, methodologies, and outcomes of the initiatives, providing a rich context for analysis.

This body of literature provided essential context and background for the case studies, highlighting the efforts to integrate more participatory approaches in urban planning to achieve sustainable urban development.

3.2.2. Interviews

The semi-structured interviews were conducted with key individuals directly involved in the citizen science initiatives to gain deeper insights and firsthand accounts of the projects' implementation and impact. An interview guideline structured the interviews around relevant topics to inform the analysis and address the sub-questions of the research. The questions were tailored to each interviewee's experience and position, allowing for focused yet flexible open questions and discussion. The interview guidelines were formulated in German and later translated in English and can be found in the appendix.

The interviews were conducted between June 5, 2024, and June 20, 2024. Each interview lasted approximately 45 to 50 minutes. The interviews were conducted in German, then transcribed and translated into English with Transcriptor for analysis. This ensured accurate representation of the participants' perspectives while making the data accessible for this research. To ensure confidentiality and privacy, all interviews were anonymized, and participants are referred to by assigned participant numbers rather than their real names.

The interviews with the initiators of the initiatives from the Institute for Geography (Participant 1 and Participant 3) were conducted face-to-face at the Institute. The interview with the Senior

Project Manager and Coordinator of the Citizen Science Department at the University of Münster (Participant 2) was conducted via Zoom. All interviews were audio recorded with informed consent from the participants.

Participant 2 provided an overarching perspective on the university's citizen science initiatives and their integration into urban planning. Participant 1, the initiator of the Gemeinwohlbarometer Hansaviertel Citizen Science Initiative, shared her experiences and challenges in mobilizing community participation and measuring the project's societal impact. Similarly, Participant 3, the initiator of the Community-Forscher*innen Berg Fidel Citizen Science Initiative, discussed the methodologies employed and the outcomes achieved through the engagement of local residents in urban research.

These interviews were essential in capturing the nuanced experiences and expert opinions of those at the forefront of citizen science projects in Münster, contributing significantly to the overall understanding of the initiatives' effectiveness and potential for broader application.

Through the detailed accounts and experiences shared by the participants, I gained critical insights into how these projects could include women and promote gender equality in urban planning.

3.2.2.1 Content Analysis

In this thesis, content analysis serves as a qualitative method employed within the framework of a case study in Münster, focusing on two citizen science initiatives aimed at urban planning and community involvement. Content analysis involves organizing textual data into categories and patterns to discern both explicit and implicit messages within the text (Given, 2008). This method acknowledges the researcher's influence on interpretation and utilizes a coding procedure to establish patterns and concepts from raw textual sources such as reports, field notes, or interviews. These codes evolve iteratively, from broad initial categories to refined ones, aiming to identify relationships and patterns in the data. The ultimate goal is to derive meaningful insights from these categories to address the research objectives effectively.

3.3. Data Analysis

To assess and analyze the results of the content analysis, I employed a structured coding framework to identify key themes and patterns within the interview responses. This systematic approach ensures that I can effectively address the sub-questions and the overall research question regarding the potential of citizen science initiatives in Münster to include women and enhance gender equality

in urban planning. I utilized Atlas.ti to facilitate the coding process. The coding was conducted using the following categories: the term citizen science, inclusion of target groups, inclusion of women, challenges, advantages, political influence, and funding and sustainability. These categories were chosen to capture a comprehensive range of relevant themes and to provide a detailed understanding of the interview content.

3.3.1. Coding Procedure

In the initial round of coding, I carefully read through the interview transcripts and identified segments of text that aligned with the predefined categories. Each segment was then assigned a corresponding code. For example, discussions about the definition of citizen science were coded under "definition of citizen science," while mentions of efforts to involve specific demographics, such as women, were coded under "inclusion of target groups" and "inclusion of women."

During the second round of coding, I refined the initial codes and identified subcategories to capture more specific themes within each broader category. For instance, within the "challenges" category, subcategories such as "readiness and acceptance," "terminological challenges," and "application limitations" were created to differentiate between various types of challenges mentioned by the interviewees.

After coding the interview transcripts, the data was synthesized by examining the frequency and context of each code. The coded data was then used to draw connections between the themes and to develop a nuanced understanding of the role of citizen science in promoting gender equality in urban planning. A detailed coding scheme used for the analysis can be found in the appendix.

4. Analysis

This analysis explores how citizen science initiatives in Münster engage communities and impact urban planning decisions, focusing on gender equality and inclusivity. It evaluates the key initiatives “Gemeindewohlbarometer” and “Communityforscher*innen”, alongside contributions from the University of Münster, to assess their effectiveness in incorporating women's perspectives. Interviews with experts and initiative leaders provide insights into citizen science's role in gathering gender-sensitive data for inclusive planning practices. By examining Münster's initiatives comprehensively, this study aims to uncover the strengths, challenges, and potential of citizen science in shaping urban environments towards greater inclusivity and community participation.

4.1. Introduction to Case Study Background

Prior to analyzing the exemplary initiatives and conducted interviews, it is essential to explore Münster as a case study location. Münster has demonstrated a commitment to gender equality in urban planning since signing the European Charter for Equality in 2009. Additionally, the University of Münster has a longstanding commitment to citizen science, pioneering collaborative approaches to urban development and community engagement.

With a population composed of 52% women and 48% men, Münster prioritizes gender-sensitive policies to address disparities and promote inclusivity. Initiatives like the "European Charter Action Plan" underscore Münster's dedication, advocating for gender-neutral life planning and urban design, alongside measures to combat domestic violence (Amt für Gleichstellung, 2023).

A cornerstone of Münster's strategy is the implementation of gender-differentiated data through initiatives like "Gender Monitoring," launched in 2020. This approach provides critical insights into progress and areas needing improvement, guiding policy decisions with comprehensive gender-aware statistics. The introduction of gender budgeting, under the banner of "FINANZfairTEILUNG" since 2021, further enhances transparency and equity in financial planning by analyzing the differential impacts of budget decisions on men and women (Amt für Gleichstellung, 2023).

Despite these advances, challenges persist, including the underrepresentation of women in urban planning processes and biases favoring quantitative data over qualitative insights. Implementation gaps hinder the translation of policies into tangible outcomes that could bridge gender disparities effectively.

Meanwhile, the University of Münster has been instrumental in advancing citizen science initiatives that promote collaborative urban planning. For over a decade, the university has pioneered diverse projects integrating technological innovations with participatory methodologies. This approach not only enriches scientific inquiry but also enhances public trust in scientific methods while fostering community engagement (University of Münster, n.d.).

Led by initiatives such as the Citizen Science Platform and collaborations with international networks, including the European Citizen Science Association, the university has solidified its leadership in the field. The Research Transfer Office (AFO) serves as a hub for knowledge exchange, supporting projects that facilitate dialogue among academia, industry, government, and the public. Recognizing exemplary contributions through annual grants since 2020, the Münster University Foundation continues to drive innovation in citizen science, aiming to address societal challenges through robust community participation (Universität Münster, n.d.).

Together, Münster's proactive stance on gender equality and the University of Münster's commitment to citizen science underscore their shared goal of fostering inclusive urban development strategies that resonate with diverse community needs.

4.2. The Citizen Science Initiatives: Gemeinwohlbarometer Hansaviertel and Community-Forscher*innen Berg Fidel

In exploring the impact of citizen science on urban planning and development, particularly from a gendered perspective, this research analyses two exemplary initiatives from Münster that won the Citizen Science Prices in 2022: the Berg Fidel Community Project and the Hansaviertel Public Welfare Barometer. I selected these initiatives due to their distinctive approaches to integrating local residents into the urban planning process and their focus on addressing specific community needs.

4.2.1. Gemeinwohlbarometer Hansaviertel Münster

The joint Citizen Science project between Hansaforum Münster (represented by B-Side GmBH) and the Working Group on Spatial Planning and Sustainability (RUN) at the Institute of Geography, University of Münster, aimed to develop a public welfare barometer for the Hansaviertel neighborhood in Münster. Initiated to capture and visualize the neighborhood's common good for the general public, the project engaged residents from 2019 to 2021 in assessing and defining community well-being through a neighborhood community welfare index. This tool not only made

the concept of the common good tangible locally but also aimed for broader applicability across districts and civil society initiatives (Moessner, 2023).

By focusing on the common good, the project addressed a timely societal and scientific topic, particularly relevant amidst various global crises affecting human coexistence. It aligned with urban development principles outlined in the New Leipzig Charter, emphasizing good urban policy and providing a framework for the project's planning processes (Viderman & Weidner, 2022).

The project bridged scientific inquiry with civic engagement, leveraging the principles of Citizen Science to co-create the welfare index in collaboration with local stakeholders. This approach aimed to enhance the accessibility and relevance of scientific methods to residents and urban planners alike, promoting inclusive and sustainable urban development practices.

Through its participatory approach, the project facilitated dialogue and cooperation between civil society, academia, and local governance, aiming to democratize urban planning decisions. The resulting public welfare barometer stands as a testament to the potential of Citizen Science in fostering community-driven urban development initiatives that prioritize fairness, participation, and sustainability.

4.2.2. Community-Forscher*innen Berg Fidel

The Berg Fidel Community Project, led by Prof. Dr. Iris Dzudzek and Lisa Kamphaus from the Institute of Geography, in collaboration with community researcher Natividad Abaga Ayecaba, who grew up in Berg Fidel, aimed to address health promotion needs within the district.

The Berg Fidel district, known for its low-income demographics and high migration backgrounds, often encompasses marginalized perspectives that are frequently overlooked in Münster's urban planning measures.

The project focused on identifying health disparities, particularly among children and young people, who were found to perform significantly worse in school entrance examinations compared to their peers from less stigmatized districts (Dudzek & Kamphaus, 2023).

Through participatory research, local residents were engaged to develop strategies for improving health outcomes and tackling healthcare challenges.

The community from the Berg Fidel district are oriented towards the following questions: What health needs do people from Berg Fidel have in the district? How can they be empowered to shape their health? Together, in a tandem of scientists and people from the local community, answers to these questions were being developed.

A workshop involved interested citizens and actors from Berg Fidel, who reflected the collected data back into the community and thus offered space for discussions, networking, and the development of health-relevant strategies (University of Münster, 2022).

The project "Community Researchers for Berg Fidel" highlights a practical example of how citizen science methods can be used to address specific community needs—in this case, health promotion. This project successfully identified health disparities in the district. By engaging local residents in the research process, the project tackled health inequality, particularly among children and young people.

This initiative highlights the efficacy of citizen science in empowering communities to actively participate in addressing localized issues and promoting equitable urban development.

4.3. Analysis of interviews

The following analysis delves into the interviews conducted with the initiators of the exemplary initiatives, and with the Senior Project Manager and Coordinator of the Citizen Science Department at the University of Münster, each pivotal figures in the field of Citizen Science and urban planning initiatives in Münster. These interviews provide firsthand insights into their perspectives on the integration of Citizen Science, gender inclusivity in urban planning, and the impact of community engagement on shaping sustainable urban development strategies.

This examination aims to address my sub-questions regarding the effectiveness of citizen science in engaging diverse communities and collecting gender-sensitive data, while also identifying challenges and limitations.

4.3.1. Sub-question 1: How does citizen science enhance data collection methods for urban planning in Münster?

The collaborative nature of citizen science fosters community building and networking among participants. In the interview, Participant 2, the Senior Project Manager and Coordinator of Citizen Science, highlights that the citizen science community is "incredibly well connected" and that this networking leads to powerful dynamics and influence (see Appendix 2.2). These connections can facilitate the sharing of knowledge and resources, further strengthening community initiatives and advocacy efforts.

One of the key strengths of citizen science is its ability to engage and empower local communities. Participant 2 notes that citizens often have "much better ideas about how to reach the rest of the population than the scientists," indicating that involving citizens can lead to more effective and relevant urban planning initiatives. This engagement fosters a sense of ownership and responsibility among citizens, encouraging active participation in the development of their communities (see Appendix 2.2).

Furthermore, Citizen science promotes interdisciplinary collaboration between citizens and researchers, enriching both parties' understanding and approaches. Participant 2 describes this as a "win-win situation for everyone involved," where scientists gain new perspectives and direct feedback on their research, leading to further development and refinement of their work. This collaboration also demystifies scientific processes for citizens, making science more accessible and understandable (see Appendix 2.2).

Additionally, Citizen science initiatives have the potential to raise awareness of local issues and increase the visibility of community concerns. Participant 1, the initiator of the “Gemeinwohlbarometer” initiative, discusses how their project aimed to make the common good visible, not defined top-down but through the perspectives of local residents (see Appendix 2.1). This visibility can draw attention to neglected issues and mobilize support for community-driven solutions.

By involving citizens in research and decision-making, citizen science fosters long-term sustainability of urban development projects. The intrinsic motivation of participants and the knowledge they gain through involvement can lead to ongoing engagement and support for initiatives. As Participant 2 states, "the population also gets more power, the more they are actually empowered to be part of the knowledge society," indicating that citizen science can build a foundation for sustained community involvement (see Appendix 2.2).

The Citizen Science Initiative "Community-Forscherinnen for Berg Fidel" in Münster, led by Participant 3 exemplifies the unique advantages of citizen science approaches in urban planning data collection. Participant 3 emphasizes that their approach is highly specific, diversity-sensitive, resource-oriented, and collaborative (see Appendix 2.3). This specificity allows for a more focused

implementation of citizen science principles, which ensures that the research addresses the actual needs and contexts of the community members involved.
Unlike traditional methods, this initiative involves the community from the start, not just as participants but as active contributors who gain tangible benefits from the research. Participant 3 explains, "It's about developing this research approach and how it will ultimately be implemented together with people who are actually affected, who live in this district, who live in this community, right from the start and even then, yes, as I said, actually not just participating, but also really giving something back and really implementing something in the community" (see Appendix 2.3). This collaborative model not only enhances the quality and relevance of the data collected but also fosters a sense of ownership and empowerment among the community members.

Furthermore, the initiative aims to empower local residents to conduct their own research, thereby strengthening self-organization and self-confidence within the community. The initiator notes, "Our approach is really about empowering people who come from this community, for example from the district in our case, to do their own research. And, as I said, a lot of it is about strengthening self-organization, self-confidence, and empowerment of people and that this is a result of research" (see Appendix 2.3). This empowerment aspect is crucial as it transforms the research process into a tool for social change and community development.

The integration of scientific methods within the citizen science framework also plays a critical role. Participant 3 highlights the importance of this aspect: "I think this scientific approach is super important because, on the one hand, it really legitimizes the knowledge from the district for the city administration and because it is also a translation service that is then carried out between the knowledge in the district and how this has to be communicated to the city administration" (see Appendix 2.3). This dual function of legitimizing local knowledge and translating it into actionable insights for policymakers ensures that the data collected is both credible and impactful.

Moreover, the transformative approach of the initiative challenges the traditional understanding of scientific research. Participant 3 articulates a broader view of scientific results: "A different understanding of science is needed to say that it's not just about extracting data and then publishing as much as possible from this data, but actually a transformative approach that is also something that gives back to the people, researches together and then actually a different understanding of

what are scientific results and so the strengthening of people on site can also be a scientific result" (see Appendix 2.3). This perspective underscores the value of participatory research in generating not only data but also social and community benefits, making citizen science a more holistic and effective approach for urban planning.

4.3.2. Sub-question 2: In what ways do citizen science methods facilitate the inclusion of diverse target groups in urban planning initiatives in Münster?

Citizen science allows for the involvement of diverse groups in urban planning, ensuring that various perspectives are considered. Participant 2 emphasizes the importance of including women in urban development, stating, "Urban development is an area that doesn't work at all without women being included" and highlighting that citizen science methods make it easier to engage different target groups, including women and marginalized communities (see Appendix 2.2) This approach ensures that urban planning reflects the needs and preferences of the entire population, not just a select few.

Furthermore, Participant 1 highlighted the initiative's efforts to engage diverse groups through strategic methods such as on-site surveys conducted at multiple locations and times. Their approach aimed to encompass a broad spectrum of socio-demographic data to ensure inclusivity and representation across the community. The initiator emphasized the importance of reaching various target groups by adapting survey locations and times accordingly, underscoring the initiative's commitment to capturing diverse perspectives within the Gemeinwohlbarometer project (see Appendix 2.1)

Additionally, citizen science approaches offer significant potential for including specific target groups in data collection, particularly those often marginalized or underrepresented in traditional research methods. The initiator of the Community-Forscher*innen Berg Fidel initiative provides a compelling case for this potential through her project's experiences.

In her project, many participants had a migrant background and often felt voiceless and misrepresented. "In these formats we found out, that the people themselves actually felt that they had no speaker position," Participant 3 explains (see Appendix 2.3). Traditional data collection methods tend to objectify and stigmatize these groups, making assumptions that do not reflect their true experiences. Citizen science, on the other hand, emphasizes qualitative research and long-term,

trust-based approaches that engage participants through conversations, open meetings, and relationship-building rather than purely scientific methods.

Participant 3 highlights that the central goal of community research is not just to collect data but to give back to the community. "The central thing about the community research approach is that it is not just about collecting data and extracting knowledge from the community, but actually reflecting something back into the community or the district together with the community," she says. This participatory and implementation-oriented approach ensures that the data collected leads to concrete actions and improvements in the community's well-being (see Appendix 2.3).

In her project, female participants were particularly active, often bringing their children along. "In fact, the most present, I would say, were female participants," she notes (see Appendix 2.3). This inclusion of women and their families highlights the partcipatory nature of citizen science, which contrasts sharply with traditional methods that may overlook these voices. By involving people closely in research and making their voices more visible, citizen science empowers marginalized groups and addresses their specific issues more effectively.

Moreover, the project in Berg Fidel underscores the importance of addressing structural issues such as racism, discrimination, and stigmatization through citizen science. "The problem lies simply in the structures and in the city administration and in the way this district is looked at, how the people who live in this district are looked at," Participant 3 points out. By implementing alternative participation formats and empowering residents, citizen science can challenge these structures and create more equitable and inclusive urban development processes.

Participant 3 emphasized in the interview the importance of employing citizen science methods that facilitate reaching diverse and often marginalized target groups, particularly those sharing sensitive topics where trust-building is essential. She highlighted the district's unique characteristics, stating, "Berg Fidel is strongly shaped by many people with a migration background and strongly shaped by poverty" (see Appendix 2.3).
To effectively engage non-scientific target groups, she underscored the value of "low-threshold conversations" and "open meetings" that foster relaxed environments conducive to discussing

sensitive needs. She emphasized, "It has to be about creating a room of trust, because otherwise people are somehow not able to open up" (see Appendix 2.3).
Participant 3 also stressed the initial step of "building a little trust at first" as crucial in citizen science initiatives aimed at marginalized communities. She described the methods employed, including "basic interviews" centered on understanding daily life in Berg Fidel, avoiding rigid survey structures typical of traditional scientific approaches. She highlighted the importance of "not so classic scientific methods" that are flexible and adapt to the community's dynamics.
Regular meetings and continuous exchanges with community members were deemed essential by the initiator to ensure sustained engagement and effective participation. She emphasized, "It's really about implementation," highlighting the practical outcomes of community-led research initiatives (see Appendix 2.3).

4.3.3. Sub-question 3: What are the advantages of using citizen science specifically to collect data from women in urban planning projects in Münster?

Furthermore, the interviews explored the broad benefits of employing citizen science methods in urban planning, with a particular focus on their impact on women's participation and representation. Understanding these advantages is crucial to the research as it sheds light on how citizen science can enhance inclusivity and effectiveness in urban planning processes for women.

In the interviews several key themes emerged about the advantages of citizen science in urban planning, particularly for women. Participant 2 emphasized the fluidity and inclusivity of citizen science, noting that "citizen science is this spectrum and at the same time that is what makes it so attractive that citizens can decide to what extent they want to get involved." She argued that urban planning cannot function effectively without women's input and that "citizen science provides a platform for their voices to be heard and valued" (see Appendix 2.2).

Participating in citizen science projects empowers women by providing them with the skills and knowledge needed to influence urban planning. Participant 2 pointed out that citizen science is not just about data collection but also involves citizens in the entire research process, thereby enhancing their understanding and engagement with scientific methods. She noted that this approach "expands your own horizons incredibly" and enables different groups to contribute their perspectives (see Appendix 2.2).

Furthermore, Citizen science could address gender-specific needs more effectively than traditional research methods. Participant 3 mentioned that “you can basically replace seniors with children, with young people, with women, with queer people” and that each target group can be specifically addressed through citizen science (see Appendix 2.2). This tailored approach could ensure that the unique needs of women are considered in urban planning.

Participant 1 provided practical insights from the Gemeinwohlbarometer initiative, illustrating how citizen science can facilitate community-led data collection and enhance the visibility of diverse voices, including women. She underscored the importance of flexible, inclusive methodologies and the potential of citizen science to influence urban planning by integrating local knowledge and experiences. She emphasized that the approach "definitely has the potential to make these voices visible" and can lead to a more inclusive urban development process (see Appendix 2.1).

Participant 2 highlights the value of this approach: "Collecting data is a beautiful thing. It just makes a difference which background you go into it with. When collecting data, you may ask different questions, collect data from a different perspective, and the evaluation of the data is definitely colored by whoever answers it and the question they ask” (see Appendix 2.2). This suggests that citizen science allows for a more nuanced and diverse range of data, as the perspectives and experiences of the participants directly shape the questions and the data collected.

In contrast, traditional gender mainstreaming methods, such as collecting only gender-disaggregated data, may fail to capture the full scope of women's experiences and needs. Insights of Participant 2 reveal the limitations of purely quantitative approaches and underscore the importance of considering the subjective experiences of the community: "Citizen, also the intrinsic motivation of citizen science. That's why all the women's questions often come from women's initiatives, which then say, here we are, but we have a concern." This intrinsic motivation and the direct involvement of citizens can lead to more meaningful and actionable data (see Appendix 2.2).

Participant 3 further highlights these benefits through her experiences and insights. She notes that citizen science projects have the potential to engage women specifically, creating spaces where they feel safe and included. She cites the example of a project in Bochum where a group of district

researchers, primarily women, found a supportive and empowering environment. "In Bochum, they have built up a group of district researchers over the years. These are actually all people who read female, and they feel like that see it a bit as a safe space," she explains (see Appendix 2.3). This model demonstrates how citizen science can foster empowerment and self-organization among women, enhancing their confidence and participation in community development.

Participant 3 emphasizes that community research can significantly strengthen the voices of women in urban planning. "The research approach could contribute to strengthening the voice of many females in Münster," she states (see Appendix 2.3). By using methods such as interviews and inclusive meeting spaces, citizen science can gather more comprehensive and representative data from women, addressing issues that are often overlooked in traditional urban planning processes.

In Münster, particularly in outer city districts, gender-sensitive urban planning is not yet a priority. Participant 3 points out that these areas often face challenges like inadequate public transport, which disproportionately affects women. "For example, there is the problem that many women from outer city districts rely on public transport. And that, for example, is a huge topic," she remarks (see Appendix 2.3). Citizen science projects can highlight such issues, bringing them to the forefront of urban planning discussions and ensuring that solutions are developed with input from the women affected.

The transformative power of citizen science is further illustrated by the long-term impact observed in Bochum. Participant 3 describes how women involved in the project have gained confidence and become more engaged over time. "When the project started in Bochum 10 years ago, many people barely spoke any German and were still very intimidated. Now, it’s kind of cool to see how self-confident they are now. That's really empowering and that's awesome," she shares (see Appendix 2.3). This empowerment through citizen science not only benefits individual participants but also strengthens the overall community by creating informed and active citizens.

4.3.4. Sub-question 4: In what ways can citizen science influence political decision-making processes in urban planning in Münster?

Citizen science could have a positive impact on policy and decision-making in urban planning. Participant 2 mentions that "politicians have recognized this and that is why the federal government

is moving more and more in the direction of saying, we are promoting this," indicating that citizen science has the potential to inform and shape urban policies (see Appendix 2.2). The insights gained from citizen-led research can provide valuable evidence for policymakers, leading to more informed and effective decisions. Citizen science helps to build trust between the public, scientists, and policymakers. As mentioned, Participant 2 emphasized that involving citizens in the research process allows them to better understand scientific methods and findings (see Appendix 2.2). This transparency fosters trust and makes citizens more likely to support and engage with urban planning initiatives.

Furthermore, Participant 2 noted that the federal government is keen on promoting citizen science to build this trust and involve the population in addressing major societal challenges. Citizen science projects generate valuable data that is often more localized and relevant to specific communities than traditional data sources. She mentioned that citizens have a better understanding of their own environments and can provide insights that scientists might miss. This data is crucial for policymakers, as it helps them make informed decisions that accurately reflect the needs and conditions of specific areas (see Appendix 2.2).

Participant 1 highlighted that initiatives like the Gemeinwohlbarometer have gained recognition at various levels, including federal and EU levels, which enhances their influence on urban planning and policy. She noted that their project had received multiple interview requests and was featured in discussions about citizen science in urban development (see Appendix 2.1).

The citizen science approach has shown notable political effectiveness and influence in urban planning in Münster, as illustrated by the experiences of the initiator of the Community-Forscher*innen initiative. This project managed to gain significant attention and support within the city administration, demonstrating how citizen science can foster productive collaborations and drive meaningful change in urban development.

The initiator recounts that the community research project "was able to be played relatively prominently," which caught the interest of city officials who began to see the value of this approach (see Appendix 2.3). This recognition translated into a collaborative working group in Berg Fidel, comprising various actors from the city and local work institutions. Initially, there was skepticism

about the project, perceived as an external initiative from the university. However, over time, trust grew, and the project's open meetings served as an effective interface between citizens and the working group, embedding the community's voice into urban planning discussions (see Appendix 2.3).

One of the key advantages of the citizen science approach, as highlighted by Participant 3 is its ability to create collaborative structures from the outset. "That's why we need these collaborative structures from the outset... people from the district, city administration at best and science," she asserts (see Appendix 2.3). This direct cooperation ensures that qualitative data collected through citizen science has a clear pathway to influence policy and planning decisions. Without such integration, valuable data might remain unused, highlighting the necessity for projects to work closely with city administrations from the beginning.

Participant 3 emphasizes that collaboration with various city departments, such as the city planning office, urban development, and the health department, has been essential. This engagement has facilitated the breakdown of barriers and increased political contact and support. For example, the project received monetary support from the district council for their open meetings, improving the environment for community engagement (see Appendix 2.3).
This success underscores the potential for citizen science to not only gather data but also to actively shape policy and urban development strategies. By establishing early and sustained collaboration with city administrations, citizen science projects can ensure that the insights and needs of the community are effectively communicated and acted upon. This approach can lead to more inclusive and responsive urban planning, reflecting the lived experiences and expertise of local residents.

4.3.5. Challenges and Limitations of Citizen Science Approaches for Urban Planning in Münster

However, citizen science initiatives in urban planning encounter significant challenges and limitations, often rooted in skepticism within the scientific community, interdisciplinary barriers, and definitional ambiguities. Participant 2 highlights the pervasive skepticism towards citizen science among scientists, noting that it is "actually laughed at by many scientists... not taken seriously as a research method" (see Appendix 2.2). This skepticism undermines the credibility and

acceptance of citizen science initiatives, posing a barrier to their integration into mainstream scientific practices.

Interdisciplinary collaboration also presents challenges, described by Participant 2 as requiring "thinking outside the box," which can lead to friction in integrating diverse fields of expertise (see Appendix 2.2). This interdisciplinary barrier complicates efforts to harness the full potential of citizen science in addressing complex urban planning issues effectively.

The political influence and impact of citizen science remain subjects of ongoing debate, as noted by Participant 3: "There is still a lot of discussion about what influence, i.e., what political impact, does what citizen science brings" (see Appendix 2.2). This uncertainty about the tangible outcomes of citizen science initiatives contributes to skepticism and limits their perceived efficacy in influencing decision-making processes.

Participant 1 emphasizes the initial communication challenges in distinguishing between qualitative and quantitative research within citizen science, despite the enriching exchange between researchers and participants (see Appendix 2.1). This barrier underscores the importance of clear methodological frameworks to ensure the rigor and credibility of citizen science projects.

A significant obstacle identified by Participant 3 is the terminology associated with citizen science, which she describes as "simply not understandable for many people," particularly in community contexts like Berg Fidel. This misunderstanding can hinder engagement, prompting initiatives to adopt more relatable terms such as "community research" to foster genuine community involvement (see Appendix 2.3).

Moreover, there is a general lack of awareness about citizen science, both among the public and academia, as highlighted by the observation of Participant 1 that "There are also those who have never heard of citizen science" (see Appendix 2.1). This lack of awareness is compounded by blurred distinctions with participatory research, according to Ms. Nolte, who explains that "participatory is a bit like citizen science," indicating the need for clearer delineation between these methodologies (see Appendix 2.2).

Financial sustainability poses another critical challenge, with Participant 1 noting resource constraints that limit project scope (see Appendix 2.1), while Participant 3 laments the difficulty in securing long-term funding: "The funding ran out six months ago and now our project continues on a voluntary basis" (see Appendix 2.3). This financial instability jeopardizes the continuity and impact of citizen science initiatives, despite the dedication of volunteers.

4.4. Findings

In conclusion, the findings exemplify the impactful use of citizen science in urban planning by prioritizing collaboration, empowerment, and rigorous scientific methods. This approach ensures that community voices are central, resulting in credible and transformative data that enhances urban planning inclusivity and effectiveness.

Citizen science approaches offer a transformative avenue for including specific target groups in data collection, ensuring their voices are heard and their needs addressed. By emphasizing trust-building, qualitative research methodologies, and empowerment, citizen science bridges gaps between marginalized communities and urban planning processes, fostering more inclusive and effective urban outcomes.

In summary, citizen science approaches in urban development effectively amplify women's voices and address their unique needs. These initiatives create supportive spaces for women's participation and highlight critical issues like public transport accessibility, thereby promoting urban planning that is more inclusive and representative of diverse community perspectives.

Lastly, citizen science demonstrates its political influence in urban planning through successful integration and collaboration with city administrations. By fostering trust, establishing collaborative structures, and maintaining open communication channels, citizen science significantly informs and shapes urban development policies for more responsive and equitable outcomes.

However, integrating citizen science into urban planning poses challenges such as addressing skepticism, clarifying methodologies, securing stable funding, and sustaining volunteer engagement. These hurdles highlight the complexity involved but also underscore the potential benefits of overcoming them to maximize citizen science's role in shaping inclusive and effective urban development strategies.

5. Conclusion

In addressing the central question of this thesis, "How can we effectively employ citizen science methods to collect gender-sensitive data to promote gender-sensitive urban planning in Münster?", the findings highlight several key insights into the transformative potential of citizen science in urban planning processes. Throughout this study, it has become evident that citizen science offers a powerful mechanism to engage diverse community members actively in data collection, ensuring their perspectives are integrated into urban planning initiatives. By focusing on inclusivity and empowerment, citizen science initiatives not only enhance the quality and relevance of data but also foster trust and collaboration among stakeholders.

One of the fundamental contributions of this thesis is the exploration of how citizen science methods can specifically address gender disparities in urban planning. The analysis reveals that by employing gender-sensitive data collection approaches and creating participatory platforms, citizen science initiatives in Münster can amplify women's voices and address their unique urban needs more effectively. This approach not only enriches the planning process with nuanced insights but also contributes to creating safer, more accessible urban environments that cater to the diverse needs of all residents.

Reflecting on the knowledge gap identified at the outset of this thesis, it is clear that this study has advanced our understanding of how citizen science can be harnessed to promote gender-sensitive urban planning. By synthesizing empirical findings with existing literature, this research has provided a comprehensive overview of the advantages, challenges, and practical implications of integrating citizen science into urban development practices. Moreover, it has demonstrated that citizen science methodologies not only complement traditional urban planning approaches but also offer innovative solutions to longstanding challenges in urban governance.

The exploration of citizen science in Münster has shed light on the ways in which local initiatives can influence urban policy and decision-making processes. By promoting transparency, accountability, and community engagement, citizen science has the potential to democratize urban planning and ensure that policies align closely with community needs and aspirations. This participatory approach not only enhances the legitimacy of urban policies but also strengthens social cohesion and resilience within communities.

In conclusion, this thesis has contributed to filling the knowledge gap by illustrating how citizen science can serve as a catalyst for gender-sensitive urban planning in Münster. By highlighting the

transformative potential of citizen science methodologies, this study advocates for their wider adoption in urban governance frameworks to foster more inclusive and sustainable cities.

This thesis contributes to new knowledge by systematically exploring how citizen science can effectively collect gender-sensitive data and integrate diverse perspectives into urban planning processes. This emphasis on gender inclusivity is relatively novel within the context of citizen science literature, which often prioritizes broader community engagement without specific attention to gender dynamics.

Comparatively, the findings align with scholars who advocate for participatory approaches in urban planning, emphasizing the role of citizen science in democratizing decision-making processes and enhancing community empowerment. However, the unique contribution lies in the explicit focus on gender-sensitive data collection and its implications for urban policy formulation in Münster. This perspective diverges from traditional urban planning methodologies that may overlook gender disparities in infrastructure and service provision.

Nevertheless, this study also identifies limitations that warrant consideration. Firstly, the scope was primarily focused on theoretical frameworks and case studies from Münster, limiting the generalizability of findings to other geographic contexts. Future research could expand this scope to include comparative analyses with other cities or regions implementing similar citizen science initiatives. Secondly, while the thesis provides insights into the advantages of citizen science for gender-sensitive urban planning, practical implementation strategies and scalability remain underexplored areas. Addressing these gaps could provide a more nuanced understanding of the challenges and opportunities associated with integrating citizen science into broader urban governance frameworks.

Moreover, the limitations of this study underscore the need for further exploration into the long-term impacts of gender-sensitive urban planning facilitated by citizen science. This includes evaluating the sustainability of community engagement strategies, the scalability of gender-sensitive data collection methods, and the influence of citizen science on policy outcomes over time. By addressing these gaps, future research can enhance the robustness of citizen science methodologies in urban planning and contribute to more inclusive and equitable urban development practices.

The practical implications of this thesis for governmental and EU stakeholders can be significant, particularly in the context of advancing gender-sensitive urban planning through citizen science initiatives. Based on the analysis conducted, several key suggestions can be proposed to guide policy and decision-making processes:

Firstly, local governments, including the city administration of Münster, can benefit from integrating gender-sensitive citizen science approaches into their urban planning frameworks. This entails fostering partnerships with community organizations and academic institutions to co-design data collection methods that prioritize gender inclusivity. By adopting participatory methodologies and ensuring diverse representation in decision-making processes, local governments can enhance the relevance and effectiveness of urban policies.

The research revealed that specific citizen science methods are effective in reaching diverse target groups, particularly those from marginalized districts like Berg Fidel in Münster. Through approaches such as low-threshold conversations, open meetings, and building trust between the scientific community and residents, it is possible to engage underrepresented groups and empower them. Although the term "citizen science" itself is not crucial for involving these communities, the principles behind the approach are vital. Open discussions, regular meetings, and a focus on actionable outcomes foster a collaborative environment that encourages participation and trust. The initiatives studied demonstrated that scientific support is beneficial for communities, helping to reflect their needs and wishes in urban development.

Secondly, the European Union (EU) could support member states in adopting standardized guidelines for implementing community-oriented citizen science initiatives in urban planning. This could involve more funding opportunities and capacity-building programs aimed at enhancing the technical expertise of municipal authorities and civil society organizations. Moreover, the EU could facilitate knowledge exchange platforms where best practices and successful case studies from different regions are shared, promoting cross-border collaboration and learning.

In terms of practical recommendations, this thesis suggests that governmental bodies and EU institutions should prioritize the development of gender-sensitive indicators and metrics within urban planning frameworks. This includes monitoring and evaluating infrastructure projects, public services, and spatial planning initiatives through female perspectives to identify and address disparities in access and usage.

Furthermore, decision-making processes at all levels should be transparent and inclusive, ensuring that citizen science data informs policy formulation and implementation. Mechanisms for feedback

and continuous engagement with local communities, particularly marginalized groups, should be institutionalized to uphold accountability and responsiveness in urban governance.

Ultimately, the message derived from this analysis is clear: integrating gender-sensitive citizen science into urban planning practices not only enhances the quality of decision-making but also promotes social equity and sustainable development. By prioritizing gender inclusivity and leveraging citizen science methodologies, governments and EU institutions can foster resilient and inclusive cities that cater to the diverse needs of all residents. The strategic adoption of these insights can pave the way for transformative urban policies that address current challenges and build more equitable urban futures.

6. Literature

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7. Appendix

Appendix A: Interview Guidelines

Interview Guideline for the Initiator of the Gemeinwohlbarometer Hansaviertel Citizen Science Initiative (Participant 1)

General information:

1. Please state your name and your role within the Hansaviertel Citizen Science Ini.a.ve.

Background of the project:

2. Can you briefly describe the main goals of the Hansaviertel Citizen Science project?
3. What motivated you to develop this project?
4. How did the Hansaforum Münster and the Spatial Planning and Sustainability Working Group (RUN) at the Institute of Geography at the University of Münster come together for this project?

Citizen Science Approach:

5. How did you decide or what motivated you to pursue a citizen science approach?
6. How did you manage to involve the residents in the development of the public welfare barometer and in the data collection?

Effect and effectiveness:

7. How has the Citizen Science approach made data collection easier compared to traditional methods?
8. Could you give examples of how the collected data was incorporated into urban development decisions or spatial planning in the Hansaviertel?
9. Were there any challenges for you in integrating Citizen science methods in the process of your ini.a.ve?
10. Did the initiative help to bridge the gap between scientists and citizens?
11. What do you think are the main benefits of using Citizen Science in urban planning?

Gender-sensitive data collection:

12. To what extent did the project also take into account the needs and wishes of local women or people who read as female in the neighborhood planning process?
13. Could you imagine that Citizen Science methods would be suitable for making the specific needs and wishes of women or people who read female visible in community planning?

Conclusion: Results and Recommendations:

14. How has the Common Good Barometer been received by the local community and other stakeholders?

Interview Guideline for the Senior Project Manager of the Citizen Science Department at the University of Münster (Participant 2)

Background and role:

1. Can you describe your role at AFO in Münster and your involvement with Citizen Science AG?
2. What experiences have you had working with Citizen Science projects?

Citizen Science Methods and Data Collection:

3. What are the greatest opportunities and challenges of Citizen science methods?
4. Do you have any examples of Citizen-Science Initiatives that have been used to collect data for urban planning or urban development?
5. What strategies do you think are most effective for increasing citizen participation in Citizen science projects?
6. What do you think could be the biggest benefits of integrating Citizen Science into urban planning or urban development?

Gender-sensitive urban planning:

7. Can you give examples of projects where Citizen Science Initiatives that have collected data from women?
8. Do you have any examples of initiatives in which women and other underrepresented groups were particularly involved?
9. Would you say that overall, there are more men or more women involved?
10. Could you imagine that Citizen Science methods would be suitable to make the subjective perspectives of women in urban development more visible?

Implications for policy and practice:

11. Would you agree that the findings from Citizen-Science-Initiatives could influence the political decision-making processes in Münster? (Scientific approach, proximity to decision-makers, funding through funds, EU strategy)
12. Could you suggest additional resources or contacts that might be helpful to my research?

Interview Guideline for the Initiator of the Community-Forscher*innen Berg Fidel Citizen Science Initiative (Participant 3)

General information:

1. Please indicate your name and role within the community researchers Berg Fidel Citizen Science Initiative.

Background of the project:

2. Can you briefly describe the main goals of the Ci.zen Science project? 3. What motivated you to develop this project?

Citizen Science Approach:

2. How did you decide or what motivated you to pursue a citizen science approach?
3. How did you manage to involve the residents in your Citizen Science Initiative and especially in the data collection?

Effect and effectiveness:

4. How has the Citizen Science approach made data collection easier compared to traditional methods?
5. Were there any challenges for you in integrating Citizen science methods in the process of your initiative?
6. Could the initiative have contributed to bridging the gap between science and citizens?
7. What do you think are the main benefits of using Citizen Science in urban development?

Data collection from specific target groups:

8. To what extent did the project take data from specific or underrepresented target groups into account?
9. Would you argue that Ci.zen Science methods present a particular opportunity or advantage for collecting data from specific audiences?
10. If so, are there any particular methods that you think would be particularly suitable for this?
11. Could you imagine that Ci.zen Science methods would also be suitable for making the specific needs and wishes of women or people who read as female visible in urban development?

Appendix B: Coding Scheme for Interview Analysis

Coding Procedure

1. **Initial Coding Round**

Definition of Citizen Science: Identifying segments where participants discuss the concept and meaning of citizen science.

Inclusion of Target Groups: Highlighting efforts to involve specific demographics, such as marginalized communities.

Inclusion of Women: Focusing on mentions of efforts to include women's perspectives in urban planning.

2. **Secondary Coding Round**

Refinement and Subcategorization: Refining initial codes and identifying specific themes within broader categories:

Challenges

Readiness and Acceptance: Discussing the scientific community's acceptance of citizen science.

Terminological Challenges: Issues related to the understanding and use of the term "citizen science."

Application Limitations: Practical limitations encountered in citizen science projects.

Data Synthesis

Frequency and Context: Analyzing how often and in what context each code appears.

Theme Connections: Drawing connections between themes to understand the role of citizen science in promoting gender equality in urban planning.

Categories and Codes

1. Definition of Citizen Science
    - General Definition: How participants define citizen science.
    - Perception and Understanding: Public and academic understanding of citizen science.
2. Inclusion of Target Groups
    - General Inclusion: Efforts to include various demographics.
    - Marginalized Communities: Specific focus on engaging marginalized groups.
3. Inclusion of Women
    - Strategies for Inclusion: Methods used to involve women in urban planning.

- Impact on Women: The effects of inclusion on women's participation and representation.

4. Effectiveness of Citizen Science
    - Data Collection Methods: Enhancing data collection for urban planning.
    - Community Engagement: Fostering community involvement and ownership.
5. Challenges
    - Readiness and Acceptance: Skepticism and acceptance within the scientific community.
    - Terminological Challenges: Issues with the term "citizen science."
    - Application Limitations: Practical and logistical limitations.
6. Advantages
    - Empowerment: Empowering participants through involvement in research.
    - Interdisciplinary Collaboration: Benefits of collaboration between citizens and researchers.
    - Awareness and Visibility: Raising awareness of local issues through citizen science.
7. Political Influence
    - Policy Impact: Influence on policy and decision-making processes.
    - Collaboration with City Administration: Working with city officials to implement findings.

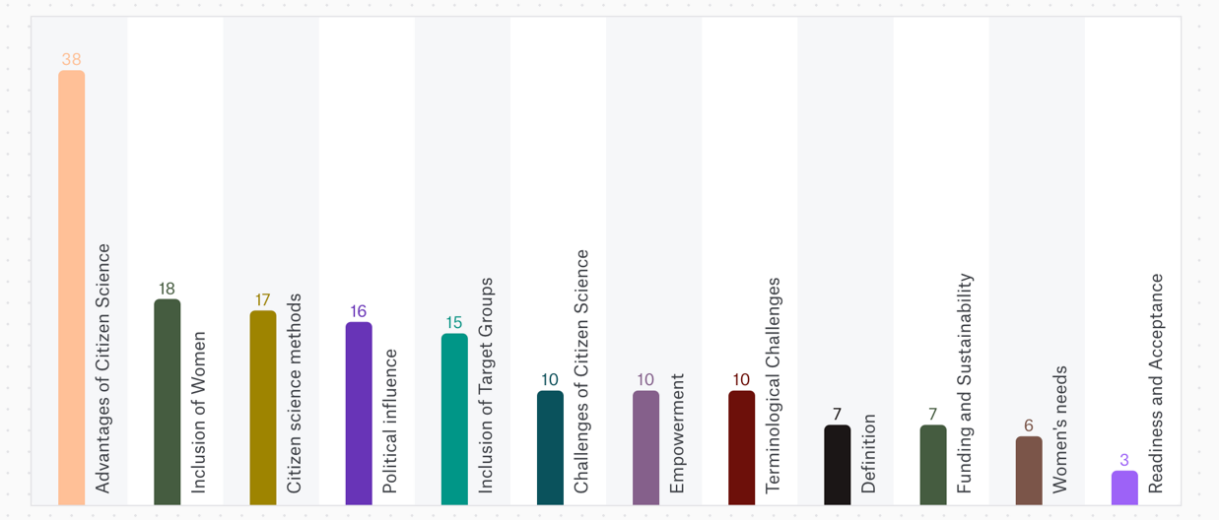

Image Atlas.ti, Code Frequency

Appendix (separate)

Appendix 1: Ethical Approval of the Ethics Committee in Enschede

1.2: Informed Consent Sheet

Appendix 2: Interview Transcripts

2.1. Interview with Initiator of the Gemeinwohlbarometer Hansaviertel Initiative

2.2. Interview with Senior Project Manager and Coordinator of the Citizen Science Department at the University of Münster

2.3. Interview with Initiator of the Community-Forscher*innen Berg Fidel Initiative

Appendix 3: Atlas.ti

3.1. Coding Document (Excel)